North Thames Estuary & Marshes Terrestrial Invertebrate survey 2022

Compartments A (Mucking Wetlands), B (Thameside Nature Park), C (Enovert Mucking Landfill), D (Walsh East Tilbury Quarry) & Mucking Flats & Marshes SSSI (Units 1-4)

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Foreword

Terrestrial invertebrate assemblages across North Thames Estuary and Marshes were surveyed in 2022 to collect evidence to inform proposals to enlarge the Mucking Flats and Marshes Site of Special Scientific Interest. The report does not itself make a case for designation, rather it provides an objective record of survey findings to support Natural England's independent assessment of special interest.

Natural England commission a range of reports from external contractors to provide evidence and advice to assist us in delivering our duties. The views in this report are those of the authors and do not necessarily represent those of Natural England.

Executive summary

In 2022, Natural England commissioned surveys of terrestrial invertebrate assemblages occurring in habitat close to the Thames in Essex. The surveys were required to inform proposals to enlarge the Mucking Flats and Marshes Site of Special Scientific Interest.

The area considered for survey, encompassed both the estuarine corridor and inland sites under both private and public ownership between Stanford Le Hope in the east, to Tilbury docks in the west. This area includes an extensive array of post-industrial habitats with restored landfill/quarry, flooded pits, grazing marsh and transitional coastal grasslands and inter-tidal habitats, scrublands, and woodland.

The habitats within the surveyed area included reed-fen & pools and transitional brackish habitats in compartments A1 (Stanford Meadow) and A6 (Stanford Warren Wetland (North)); with B (Thameside Nature Park), C (Enovert Mucking landfill site) and D (Walsh East Tilbury Quarry) mainly supporting coastal grassland on former landfill and 'Open mosaic habitat on previously developed land' (OMH); whilst Unit 1 of the existing Mucking Flats and Marshes Site of Special Scientific Interest (SSSI) supported a varied mosaic of dry, herb-rich grassland, brackish transition grassland, reed-fen & pools and scrub and SSSI Units 2,3 and 4, were saltmarsh. Areas A7 (Stanford Meadow) and L (Fields east of Coalhouse Battery), included in the original brief, were rejected for detailed survey following an initial scoping exercise.

A primary focus of the survey was to target species attributed to 'short sward' (F112) and 'bare ground' (F111) assemblages in the Pantheon database. These two Specific Assemblage Types (SATs), alongside the 'Tall sward and scrub' habitat-level assemblage (F21), include many key OMH species found in suitable habitat in south Essex. Additional target assemblages broadly included 'saltmarsh and transitional brackish marsh' (M311) and reed-fen & pools (W314) assemblages. Sampling was undertaken using standard, Pantheon-compatible techniques, as outlined in Drake *et al* (2007). Data were to be supplied 'analysis-ready' upon request; however, species data were run through Pantheon to loosely provide 'habitat-level' context to the invertebrate-specific commentary within this report.

During the survey, mainly undertaken during June and July 2022; 1,012 invertebrate species were recorded from combined survey compartments. Of these 135 species were of recognised conservation importance in the UK. A larger number of beetles (Coleoptera) were recorded from sample data, than any other taxon, followed, in order of abundance, by two-winged flies (Diptera), true bugs (Hemiptera), bees, ants and wasps (Aculeate Hymenoptera) and spiders (Araneae). A large number of the species were of limited range in the UK but are well represented and characteristic within the post-industrial brownfields and coastal grasslands of south Essex.

OMH flagship species including section 41 'priority species' Shrill Carder Bee *Bombus sylvarum*, Brown-banded Carder Bee *B. humilis,* Red-shanked Carder Bee *Bombus ruderarius*, Five-banded Weevil Wasp *Cerceris quinquefasciata*, Black-headed Mason

Wasp *Odynerus melanocephalus* and the Phoenix Fly *Dorycera gramineum*, were recorded, alongside several very rare, short sward and bare ground specialists, such as nationally rare and 'vulnerable' ground beetle *Scybalicus oblongiuscula*; RDB1 nationally endangered spider-hunting wasp *Evagetes pectinipes* and Scarce Black Mining Bee *Andrena nigrospina* and its cleptoparasite, Kirby's Nomad Bee *Nomada subcornuta.* Several species not well recorded from Essex including RDB2-listed Plain Dark Bee *Stelis phaeoptera* and RDB3 Carrot Mining Bee *Andrena nitidiusula,* were also recorded, as well as a number of nationally scarce species.

Species of particular note associated with saltmarsh, included the s41 'priority species' Sea Aster Bee *Colletes halophilus* recorded from SSSI Unit 4, a nationally rare and 'vulnerable' water scavenger beetle *Berosus fulvus* and a nationally rare flea beetle *Neocrepidodera impressa*, recorded from all three saltmarsh SSSI Units.

From reed-fen & pools and transitional brackish habitats, nationally rare species including a foliage spider *Clubiona juvenis*, a solitary wasp *Passaloecus clypealis* and a malachite beetle *Cerapheles terminatus*, were recorded. Specimens of the latter species was considered atypical by freelance entomologist and beetle specialist, Stephen Lane, who speculated that one of the specimens could be *C. lateplagiatus*, a new species in Britain. However, consultation with European authorities in Malachiidae, were inconclusive, highlighting a need for further work to elucidate the true identity of this genus in the UK.

NB: Please note that samples SS.U3.2, SW.U3.1, SWU3.2, VAC.U3.1 and VAC.U3.2 are all reported (analysed in the report) within sub-compartment ‘SSSI Unit ‘3, however they were recorded (sample located) within sub-compartment ‘SSSI Unit 4’ (i.e. the sample points are from the northern side of Mucking Creek). It is not possible to disaggregate these data and recombine them into the correct sub-compartment at this stage of reporting, and so the reader should be aware that a proportion of the total numbers of species; numbers per taxon, and species of recognised conservation status reported in ‘SSSI Unit 3’ should have been reported within ‘SSSI Unit 4’ (where the samples were taken from). It should also be noted that sample SS.U4.2, reported within sub-compartment ‘SSSI Unit 4’, but recorded within sub-compartment ‘A2’ (Stanford Wharf Managed Realignment), also suffers from similar reporting difficulties.

To avoid confusion, these reporting errors have been maintained throughout the report, so that the reader has a consistent understanding of the issue. If in doubt, the reader should use the grid references provided in the text to understand where samples were recorded from. These reporting errors are not considered to significantly affect the overall findings of the report, as the samples recorded have been reported within another saltmarsh sub-compartment, i.e. broadly equivalent habitat.

Contents

Introduction

Natural England is considering the enlargement of Mucking Flats and Marshes Site of Special Scientific Interest (SSSI), to be known as North Thames Estuary & Marshes SSSI

In order to inform the proposed SSSI enlargement, in 2022, Natural England commissioned invertebrate surveys to cover an extensive area of habitat, both within the existing Mucking Flats and Marshes Site of Special Scientific Interest (SSSI) and within a range of survey compartments in the adjoining landscape, spanning from Stanford Le Hope in the north to around Tilbury Ferry Terminal, in the south.

The specific areas covered by this 2022 survey included compartments A1 (Stanford Meadow), A6 (Stanford Warren Wetland (North)), A7 (Stanford Meadow), B (Thameside Nature Park), C (Enovert Mucking landfill site), D (Walsh East Tilbury Quarry), L (Fields east of Coalhouse Battery) and the existing Mucking Flats & Marshes SSSI Unit 1.

Habitat in this area comprised significant areas of former landfill, supporting habitat representative of 'Open mosaic habitat on previously developed land' (OMH), included as a 'priority-habitat' under section 41 of the Natural Environment and Rural Communities (NERC) Act (2006), as well as areas of established herb-rich grassland, wetlands including reed-fen & pools and brackish transition habitats and saltmarsh occupying Units 2, 3 and 4 of the extant Mucking Flats and Marshes SSSI. These habitats are known to support nationally important invertebrate assemblages and owing to their structural and diverse floristic composition, coupled with the nationally unique climate present in south Essex, a number of species otherwise rare or unknown in the UK occur here.

A central remit of the contract was to sample target habitats using standard techniques and provide invertebrate data pertaining to these habitats, which would be subsequently analysed using the Pantheon invertebrate database (Webb *et al*, 2017), a primary function of which is to group species into assemblages, based on their known fidelity to particular habitats. Assemblages targeted within the survey included 'open short sward' and 'bare sand & chalk' assemblages F112 and F111 respectively, which are particularly well represented in the early successional, herb-rich brownfield sites supporting OMH. In addition, 'saltmarsh and transitional brackish marsh' (M311) and 'reed-fen and pools' (W314) were also targeted.

The report provides detailed, invertebrate-specific habitat descriptions, as well as a review of species of greater conservation interest recorded from each of the survey compartments targeted for detailed survey. A comprehensive, site by site, list of all species recorded during the survey is included in the Appendices, as well as a table showing all species of recognised conservation status recorded, with information relating to the distribution and conservation biologies of each and notes on habitat in which they were recorded during the survey.

Aims and objectives

Aim

The main aim of the project was to survey the wider Thames-side landscape for target terrestrial invertebrate assemblages, in order to identify the highest quality sites within the survey area. The survey findings are also intended to inform Natural England's understanding of some newly created habitats as to the qualities emerging. The survey primarily targeted F111 (bare sand and chalk) and F112 (open short sward) Specific Assemblage Types within Pantheon.

Objectives

The aims were achieved by completion of the following objectives:

1. Fieldwork including semi-quantitative sampling of target invertebrate assemblages, was undertaken between late May and the end of July 2022; additional fieldwork was undertaken on a single day visit on 7th September, 2022;
2. *Ex situ* Identification of target invertebrate taxa from collected samples was undertaken
3. Provision of georeferenced species data and other appropriate metadata in spreadsheet format
4. Provision of reporting including maps[1].

Personnel

Delivery of the project was managed and undertaken by Jon Mellings BSc (hons), with significant fieldwork and identification assistance from Dr Ross Piper (FRES) and admin and some order-level sorting by Carol Roberts. Additional identification work was undertaken by specialists including Stephen Lane (Coleoptera and some Hemiptera); Tristan Bantock (Hemiptera including Aucheorrhyncha) and Matthew Harrow and Sam Thomas (Diptera). All Araneae species were identified by Jon Mellings, who also identified species from a range of insect orders both in the field and from samples and Ross Piper, who identified predominately Coleoptera and aculeate Hymenoptera specimens. Some aculeate specimens were sent to Stuart Roberts for authentication and Stephen Lane consulted both UK (Mark Telfer and Andrew Duff) and European Melyridae specialists Gianfranco Liberti and Gabriele Franzini in relation to putative *Cerapheles terminatus/ C. lateplagiatus* specimens.

[1] Maps produced as non-GIS field maps with sampling locations. Georeferenced sample locations provided in table format.

Methodology

Invertebrate survey

Survey compartments

The survey compartments providing the focus for this report comprise are described below. The original brief was to scope and conduct detailed survey work in compartments A (Mucking Wetlands) (sub-compartments A1 (Stanford Meadow), A6 (Stanford Warren Wetland (North)) and A7 (Stanford Warren)), B (Thameside Nature Park), C (Enovert Mucking landfill site) (sub-compartments C1, 2 , 3, 4 and 5), D (Walsh East Tilbury Quarry), L (Fields east of Coalhouse Battery) and Units 1 to 4 of the Mucking flats and Marshes SSSI.

Following initial scoping, the areas subject to detailed invertebrate survey are listed in Table 1.

Table 1: 2022 survey compartments subject to invertebrate sampling

Main Compartment	Compartment name	Code	Centroid grid ref (approximate)	Main habitat(s)	Pantheon Target assemblages
Area A	Stanford Warren (EWT)	A1	TQ 69276 80965	Reed-fen & pools; grassland and open water	W314; M311; F111
		A6	TQ 68790 81404	Reed-fen & pools	W314
Area B	Thameside Nature Park	B	TQ 69286 80588	Tall and short sward herb-rich grassland (capped landfill)	F111, F112
Area C	Enovert Mucking landfill site	C1	TQ 69109 79363	OMH; established grassland; active landfill	F111, F112
		C2	TQ 68875 79876	OMH with varied microtopography	F111, F112
		C3	TQ 68667 80217	OMH; established grassland	F111, F112
		C4	TQ 69273 80097	OMH; active landfill	F111, F112
		C5	TQ 68413 79636	OMH; rough grassland; wetland	F111, F112

Main Compartment	Compartment name	Code	Centroid grid ref (approximate)	Main habitat(s)	Pantheon Target assemblages
Area D	Walsh East Tilbury Quarry	D	TQ 69003 78360	OMH; established grassland; brackish lagoons	F111, F112
SSSI Unit 1	Mucking flats and Marshes SSSI	U1	TQ 69285 77500	Tall and short sward dry herb-rich grassland; brackish grassland; swamp; scrub.	F111, F112
SSSI Unit 2		U2	TQ 69340 77175	Saltmarsh	M311
SSSI Unit 3		U3	TQ 69131 80860	Saltmarsh; spoil bank (historic landfill)	M311; F111
SSSI Unit 4		U4	TQ 70397 81446	Saltmarsh	M311

The following sites were rejected following the scoping phase:

A7 Stanford Meadow (centroid grid reference: TQ 68482 81265). Marshy grassland and rush pasture behind Mucking Church. The habitat within the field was subject to haycutting at the time of scoping; therefore, the site was not considered suitable for further survey at this time.

The whole of compartment L was rejected due to lack of habitat of sufficient quality to warrant further survey of target assemblages. A brief description of the accessed sub-compartments of compartment L is included in the results section (page 21).

Habitat scoping/description

During the initial site visit, all survey units were walked (where access permitted[2]) and representative habitats with potential to support target invertebrate populations selected as sampling locations. In some instances, for example A1 and A6, sample locations replicated those used in previous surveys, the details of which were provided by Natural England to inform the contract. Prioritised habitats in sub-compartments A1 and A6 included reed-fen & pools with potential to support the 'Reed-fen and pools' W314 species assemblage; the former supported grassland habitat alongside the wetland, which was also sampled. Compartments B, C, D and SSSI Unit 1, primarily included Open Mosaic Habitat on Previously Developed Land (OMH), as

[2] Access to certain, operational parts of the Enovert site (compartment C) was not possible due to landworking operations.

well as established herb-rich grassland and remnant Thames Terrace Grassland, with potential to support the F111 ‘bare sand and chalk’ and F112 ‘open short sward’ bare ground assemblages. In SSSI Units 2, 3 and 4, sampling primarily targeted assemblages associated with upper and mid saltmarsh zones, i.e. M311 ‘Saltmarsh and transitional brackish marsh’.

A photographic record of representative habitat within each site was made, together with brief descriptions of habitat with particular reference to invertebrate assemblages. In practice, a geo-referenced habitat description, characterising the habitat within the general area of each separate sample location, was made. In addition, broader, site-level habitat descriptions, enabling each survey compartment to be adequately characterised for reporting purposes, were made.

Although it was understood that output for the current study did not need to adhere strictly to criteria outlined in the ‘Invertebrate Standard Advice for Essex’ (Natural England, 2014); the following elements were generally included in both site-level and sample location descriptives:

- Habitat substrate
- Topography and microtopography
- Wetness
- Vegetation structure
- Vegetation composition (key graminoids and forbs were recorded from each sample location);
- Evidence of disturbance, management and/or grazing.

Invertebrate sampling

Sampling was almost entirely conducted during periods of warm to hot, sunny weather. The only factor potentially compromising sampling success was a persistent wind blowing onshore during some of the SSSI saltmarsh Unit surveys; however, the weather was otherwise warm and sunny during the sampling of these, more exposed habitats.

The survey aimed to characterise assemblages within the identified habitats. However, due to the large size of some of the survey compartments, some pragmatism was exercised, and sampling was generally undertaken within a sufficient range of target habitats to adequately represent the heterogeneity of a site.

Sampling effort and methods used generally followed the specifications provided by Natural England, for a given compartment. Details of the method and number of samples per compartment/sub-compartment, as well as, sampling dates, 10-figure grid reference of sample locations and a summary habitat description of each are included in Appendix 1, Table 1.

In accordance with Drake *et al* (2007), sampling was undertaken using standard direct active capture and passive trapping methods consistent with requirements for robust analysis using Pantheon. Each collected sample was labelled, recorded on a separate sheet, and stored in a cool box in readiness for *ex situ* sorting. An overriding maxim exercised during the survey was that each sample was kept separate throughout the process of sampling, identification, and data recording. This enables precise traceability of most recorded specimens and has the further benefit of enabling different combinations of samples to be analysed using Pantheon, with a

greater level of quantitative accountability, than if samples had been combined. Sampling methods used during the 2022 survey are described as follows:

Timed sweep sampling

A standard sweep net was used to collect specimens from grassland and scrub habitat in accordance with Drake *et al* (2007). Each sweep sample involved continuous sweeping over a walked transect within the target habitat over a timed 10-minute period. At intervals within the transect, the net was inverted over the head of the surveyor and specimens, collected directly into a sample-specific, labelled tube, using a pooter[3]. The catch was immediately killed by inserting acetone impregnated tissue paper darts into the pooter.

Timed vacuum sampling

A vacuum sampler[4] was used to collect ground-dwelling specimens not easily retrieved by other sampling methods. Each vacuum sample was timed for two minutes as specified in Drake *et al* (2007), the surveyor collecting samples from representative substrates on a walked transect. Samples were subsequently collected using an electronic pooter (see footnote 3 above) from a white plastic sampling tray, into a labelled tube (as for sweep sampling).

Pitfall sampling

Pitfall trapping followed methods described in Drake *et al* (2007). Traps comprising 7.5cm diameter x 10cm deep plastic cups were sunk into holes cut into the soil using a handheld bulb-cutter (in softer substrates), or a heavy-duty auger in combination with a trowel in harder substrates. At each sample location, nine traps, spaced two metres apart were set within a 3x3 trap grid (as specified by Natural England). The traps contained ethylene glycol (antifreeze) as a preservative, with a few drops of detergent to break the surface tension. In most cases, samples were retrieved after a period of approximately eight days[5] and on collection, each set of 9 pitfall traps was amalgamated and preserved in Industrial Denatured Alcohol (IDA) as a single, labelled sample.

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[3] To avoid contamination from unknown brownfield substrates, a small, portable battery-operated suction device (designed for blowing and sucking air out of inflatable commodities) was used rather than manual sucking. The devices used were found to be far more effective than commercially available electric pooters.

[4] The vacuum samplers comprised modified, 2 stroke petrol engined leaf blowers; a velcro collared, fine mesh sleeve was inserted into the end of the device in which specimens were collected.

[5] Pitfall traps set within Unit 1 were operated for 14 days.

Pan/water traps

Pan traps used during the 2022 survey comprised shallow, yellow plastic bowls, half-filled with water with added ethylene glycol (antifreeze) and a few drops of detergent to break the surface tension.

Direct searching

Direct searching beneath refugia such as rocks, leaf litter, under bark and in the crevices of standing and fallen trees.

Spot sampling

Direct catching of species not easily caught using other methods (e.g., bees, solitary wasps, large hoverflies etc.).

Although attempts were made to impose time limits on direct searching and spot sampling episodes to enable consistency between samples, the aim was often overridden by a more opportunistic approach, where specimens were collected on sight. This was particularly the case with aculeates on large sites such as compartments C and D, where species occurred diffusely over extensive areas of potentially suitable OMH.

Handling of samples

In order to maintain accountability of samples collected from each sampling location within a given site, each sample was separately labelled, dated and georeferenced. In order to fulfil project requirements, each sample was preserved and kept separate for identification purposes.

Survey timings

Survey timings were based on the specifications provided by Natural England. In most cases, two sampling events per site were conducted. With the exception of a one-off visit to SSSI saltmarsh Units on 7th September, all survey work was undertaken between 13th June and 29th July 2022.

Identification

Whilst many species more readily identified in the field were recorded *in situ*, the vast majority of specimens were collected for *ex situ* identification using a microscope and appropriate taxonomic keys as required.

Following collection, samples were sorted to higher taxon level and were either sent to specialists for identification or identified in house (see page 5 'Personnel').

Invertebrates identified from the survey included most of the larger[6] and smaller[7] terrestrial insect orders as well as other arthropods such as spiders (Araneae), harvestmen (Opiliones) and woodlice (Isopoda); although owing to the sheer number of Isopods within the pitfall samples, it is possible that one or more additional species may have evaded notice. Importantly, whilst butterflies and someday-flying moths were recorded when seen and when captured during sweep sampling or in pan traps, night-flying moths, which constitute by far the greatest proportion of the British Lepidoptera fauna, were virtually unrecorded, as no targeted sampling using overnight Mercury Vapour trapping was undertaken.

For certain large groups, target taxa recognised within Pantheon only were identified. Therefore, no attempt was made to identify parasitic Hymenoptera such as Ichneumonoidea, Braconidae etc. These are not supported within Pantheon and such groups are generally excluded from standard invertebrate surveys. Other groups generally omitted from the survey were molluscs and annelids; however, two species of brackish water snail were recorded during the survey.

Where necessary, specialist verification of rare or uncommon species was sought from a recognised authority in the relevant species group.

Data handling

All species data was entered into a master Excel spreadsheet. Species data identified by third parties was amalgamated into a single spreadsheet and individual species-lists were generated from each sample collected, enabling Pantheon analysis.

Whilst Pantheon analysis was not part of the remit of the current project per se; in order to provide structure to commentary on species recorded from each of the survey compartments, compartment-level data was run through Pantheon and species of recognised conservation status, as well as other species of note, are discussed in relation to habitat-level Pantheon affinity within the current report.

Limitations

Limitations and issues encountered during the 2022 survey are recorded within Table 2.

[6] Larger orders include: Beetles (Coleoptera), two-winged flies (Diptera), bees, ants and wasps (Aculeate Hymenoptera), true bugs (Hemiptera) and butterflies and day-flying moths (Lepidoptera).

[7] Examples of smaller orders include: Grasshoppers and crickets (Orthoptera), dragonflies and damselflies (Odonata) etc.

Table 2: Limitations and issues relating to 2022 survey

Compartment	Issue
General	In accordance with the project brief, both sampling methods and the number of samples collected differed considerably between survey compartments. In addition, samples were collected from a wide range of habitat types, both within and between compartments. A discrepancy would, therefore, be expected in terms of species composition, number of species recorded and the comparative rarity value of species between compartments.
General	Sampling was broadly undertaken in accordance with timings recommended by Natural England within the contract documents and as such, the sampling events were confined to limited periods, in most cases comprising two visits separated by no more than two weeks. Whilst the survey timings generally coincided with anticipated peak times for target invertebrate assemblages, the results must be seen as representing a 'snapshot in time' and as such, certain species will inevitably have been missed due to survey timing limitations.
General	Where referred to, species statuses have been checked in relation to up-to-date published status reviews. However, certain taxa, notably, Aculeate Hymenoptera, weevils (Curculionidea) and various Diptera and Hemiptera families have not been subject to review for some time. Owing to increased recording of certain groups, the current statuses of many species are out of date. Some species have experienced considerable range expansions e.g., Beewolf *Philanthus triangulum*; Lobe-spurred Furrow Bee *Lasioglossum pauxillum* and the mirid bug *Lygus pratensis,* but still await formal status revision. It is possible that some statuses referred to in this report may be inaccurate or may be subject to imminent revision.
A7	The intention to survey compartment A7 which supported wet grassland and rush pasture habitat, was curtailed due to an unexpected haycut being undertaken on the anticipated day of scoping the site.
C1 and C4	Compartments C4 and C1 in particular to the east, were operational at the time of survey and access to the active areas of these sections was prohibited by Enovert. During the initial site visit, JM and RWP were denied access to areas bordering the river Thames on health and safety grounds, meaning passive pitfall traps could not be set. During the second visit, however, accessible sections of C1, including areas adjacent to the seawall, were found to be free from Enovert activity, and active sampling was undertaken.
C3	The northern section of survey compartment C3 received little survey attention, other than spot sweeping and direct search. The habitat was relatively constant

Compartment	Issue
	throughout the C3 area and it was felt that sufficiently representative samples were collected from the southern sections of this, very large, site.
SSSI Unit 1	Due to unavoidable circumstances, pitfall traps set in SSSI Unit 1 on 12/07/22 were not collected until 25/07/22 These traps were, therefore, left for approximately five days longer than the prescribed period of eight days. This may have resulted in a larger proportion of sexton beetles (Silphidae); clown beetles (Histeridae) and other detritivores, occurring in the catches from Unit 1.
SSSI Unit 1, B and C	At the time of survey between May and July 2022, ground conditions were found to be extremely hard and compact within many of the areas subject to pitfall sampling. There was little variation within area C2 in particular and despite using a heavy duty soil auger, trap clusters each took up to two hours to construct, compared to a matter of minutes, as is typically the case in softer substrate. The number of trap clusters set in certain sub-compartments in compartment C in particular, was therefore limited.
SSSI Units 2,3 and 4	A persistent easterly/south-easterly wind was blowing onshore during some of the SSSI saltmarsh Unit surveys. However, the weather was otherwise warm and sunny during the sampling of these, more exposed habitats. It is possible that the recording of nectaring bees, other aculeate Hymenoptera and other aerial taxa attributed to sites such as SSSI Unit 2 and 4, may have been influenced by the windy conditions.
Throughout	Botanical recording was generally undertaken rapidly and whilst the vast majority of species were familiar to the surveyors, there may be a small amount of error. No botanical reference material was taken into the field. One potential error may relate to Tufted Vetch *Vicia cracca* and Fodder Vetch *V. villosa,* which are superficially similar. Whilst Tufted Vetch is a common and well distributed plant within the survey area, Fodder Vetch is also a common, widely naturalised species within the Essex OMH.
Throughout	Adequate recording of night-flying moths relies on usage of overnight moth trapping techniques. Typically traps using mercury vapour bulbs, are deployed overnight, the contents being identified and recorded the following morning. No overnight moth trapping was specified or undertaken for the purpose of the current survey and the relatively small species count for the order Lepidoptera is a direct consequence of this.

Results/discussion

Overview

The main content of this report comprises a series of mini site reports. Each of these includes a detailed description of recorded habitat within the surveyed compartment and sub-compartments and invertebrate assemblages and species of recognised conservation status recorded. Whilst Pantheon analysis was not within the remit of the current project, species lists for each compartment were run through Pantheon and broad biotope and habitat-level results for each compartment were loosely used as a means of structuring the invertebrate related summaries for each compartment in turn.

The other major components of this report include a table showing all species recorded from the 2022 survey (see Appendix 2, Table 2). In addition, Appendix 2, Table 3 shows all species of recognised conservation status recorded from the survey area during the 2022 survey. This table includes summaries of the conservation status, known biologies and distributions of each species and should be regarded as a reference resource for species otherwise mentioned cursorily within the main body of the report.

A range of habitat types were surveyed during 2022. Compartment A1 broadly comprised a mosaic of wet grassland, reed-fen & pools and standing water; A6 was largely reed-fen & pools; compartment B primarily supported coastal grassland established over former landfill; C and D were mainly 'Open mosaic habitat on previously developed land' (OMH), coastal grassland and scrub over former landfill. Areas C and D also contained open water and swamp habitat, whilst landfill activities were still operational in parts of compartment C. Unit 1 of the Mucking Flats and Marshes SSSI comprised free-draining coastal grassland, with small areas of brackish wetland and scrub habitat; whilst SSSI Units 2, 3 and 4 supported mainly estuarine saltmarsh.

Combined Site-level Invertebrate overview

Species recorded and species taxon deployment

From the 2022 survey, a total of 1,002 invertebrate species were recorded from the surveyed compartments (A1, A6, B, C, D and SSSI Units 1, 2, 3 and 4), with 11 further species identified to genus only.

Figure 1 (below) shows a representation of the number of species identified per taxonomic order from the combined 2022 survey data. Beetles (Coleoptera) were particularly well represented with 369 recorded species. The remainder included 202 species of two-winged flies; 145 true bugs

Hemiptera (including Heteroptera and Homoptera/Auchenorrhyncha); 123 species of ants, bees and wasps (Aculeate Hymenoptera[8]) and 109 species of spider (Araneae).

Another large order, butterflies and moths (Lepidoptera) was relatively poorly recorded. Whilst it is considered that butterflies were reasonably represented during the 2022 survey, with a total of 18 recorded species, moths were poorly recorded. The paucity of records is directly attributable to the omission of overnight mercury vapour light trap deployment (see 'Limitations' section). Of only nine recorded moth species recorded during the survey, eight were day-flying species.

Of the smaller orders, Orthoptera (grasshoppers, crickets and groundhoppers) and allied groups including Dermaptera (earwigs) and cockroaches (Dictyoptera) are considered to have been reasonably covered by the survey. Representatives of these groups are usually adequately recorded within samples collected using standard techniques such as sweep netting, vacuum sampling, and pitfall trapping.

Adults of dragonflies and damselflies (Odonata) were recorded incidentally when seen. However, although individuals were recorded during direct searches and occasionally within timed sweep samples, little dedicated survey effort was afforded this group. Greater survey effort would almost certainly have resulted in the recording of a greater number of species during the 2022 survey.

[8] Aculeate Hymenoptera only were identified for the purpose of the project

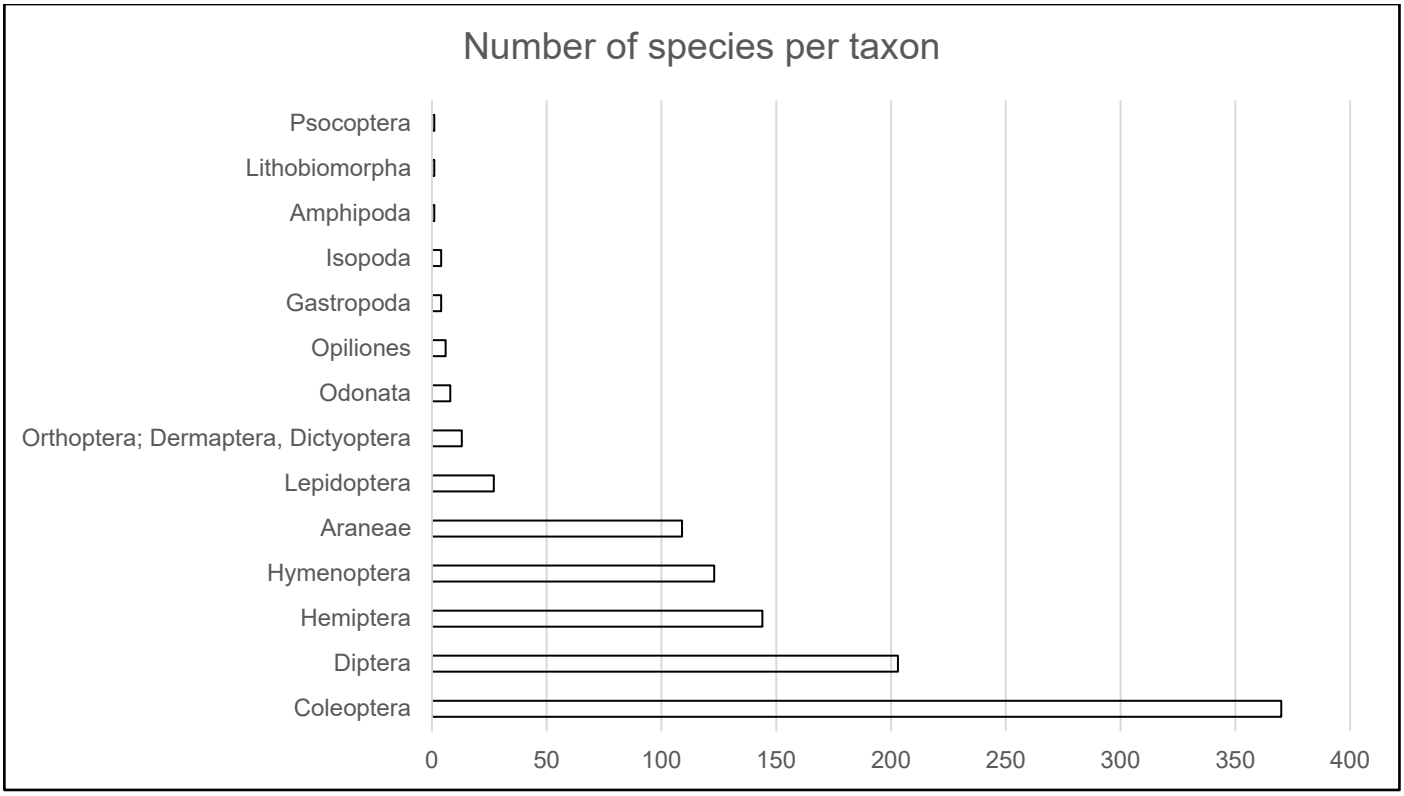

Figure 1: Breakdown of species per higher taxon collected from 2022

Certain other taxa, most noticeably slugs and snails (Gastropoda) and centipedes and millipedes (Myriopoda) were only incidentally recorded during the survey and certain insect orders such as river-flies (Ephemeroptera, Trichoptera, Plecoptera) were not covered by the survey.

Species of recognised conservation status recorded on a whole site basis

From a total 1,012 species recorded during the 2022 survey, 135 are currently classed as being of recognised conservation status in the UK, representing 13.5 percent of the total number of recorded species. The number of species attributed to each of the categories is recorded in.

Table 3: Species of recognised conservation status recorded from 2022 survey data

UK status category	Number of species
s41 (priority species)	9
s41 (research only species)	1
Nationally Rare (Endangered) post-2001 IUCN criteria	0
RDB1 'Endangered' (pre 1994 criteria)	1
Nationally Rare (Vulnerable) post-2001 IUCN criteria	2

UK status category	Number of species
RDB2 'Vulnerable' (pre 1994 criteria)	2
Nationally Rare (Near Threatened) post-2001 IUCN criteria	1
RDB3 'Rare' (pre 1994 criteria)	12
Nationally Rare (Least Concern) post-2001 IUCN criteria)	2
Nationally Scarce and Near Threatened (post-2001 IUCN criteria)	1
Near Threatened only (post-2001 IUCN criteria)	2
RDBK/DD/NE (pre 1994 and post-2001 IUCN criteria)	4
Nationally Scarce (Includes species still classed in pre-1994 Notable A and B categories as well as species classed NS under post-2001 criteria)	96
Species proposed as Nationally Scarce in recent status reviews (pNS)	2
Species known to be rare or uncommon in the UK with no formal UK status[9]	2

In addition, several species only recently known from the UK, currently without formal conservation status, were recorded. Noteworthy examples include *Propsocus pulchripennis*, a species of barkfly (Psocoptera) and a spider-hunting wasp *Agenioideus cinctellus* (Pompilidae). *P. pulchripennis* was first recorded in the UK from saltmarsh habitat in 2009. Tristan Bantock pers. com. (2022) described the species as being 'rare and local' in the UK, where most records are from the Thames Gateway area.

A. cinctellus was, until recently, known only from the Channel Islands, in the UK. Although the species has been recorded in recent years from several locations in southeast England, including from close to the survey area in north Kent. It is uncertain whether *A. cinctellus* has been recorded

[9] Not included in the tally of 135 species of recognised conservation status

from Essex. According to Day (1980), the wasp nests in 'sandy slopes and loose stone walls', preying on spiders of the families Salticidae, Pisuaridae and Thomisidae.

Other, better established recent UK colonists recorded during the 2022 survey included ground bug species *Metopoplax ditomoides*, a recently established vagrant and *Nysius huttoni*, originally from New Zealand, which was introduced to Europe and subsequently colonised the UK. Seed Beetles *Bruchidius imbricornis* and *Bruchus brachialis*, both recorded in numbers during the 2022 survey, are also recent UK colonists. *Bruchidius imbricornis* was first recorded in the UK in 2012, whilst *Bruchus brachialis* was first recorded in 2010. Both species are now well established in brownfield habitats on both Essex and Kent sides of the Thames.

Species not previously recorded from the UK

The identity of specimens initially recorded as *Cerapheles terminatus* was questioned by Stephen Lane. It was noticed that a specimen collected from compartment C2 was both significantly larger and exhibited different leg colouration when compared with *C. terminatus* specimens in Lane's collection from Wicken Fen. Lane investigated the possibility of this, and additional specimens collected from reed-fen & pools habitat in compartments A1 and A6, as being *C. lateplagiatus*, a very similar, albeit slightly larger species known from northern Europe, but not from the UK.

Following discussion with other, UK-based Coleoptera specialists, Andrew Duff and Mark Telfer, further consultation with European specialists Gianfranco Liberti and Gabriele Franzini was undertaken and resulted in the conclusion that, whilst there was thought to be a degree of intraspecific variation in morphology between both *C. terminatus* and *C. lateplagiatus*, there could be overlap between the two species. Franzini stated that 'I doubt that this issue can be solved with morphology alone, not even with males.' It would, therefore, appear that genetic studies may be the only way of conclusively separating the species.

According to Lane (pers. com.) Mark Telfer had sent photographs of specimens he had identified as *C. terminatus* from Tilbury, which conformed to specimens identified by Jon Mellings from the 2022 reed-fen & pools samples. For the purpose of the current report, specimens are treated as *C. terminatus* on a precautionary basis, pending further investigation.

Species deployment by broad habitat

Whilst Pantheon analysis was not required for the purpose of the contract, analysis of the whole 2022 dataset using Pantheon, conveniently illustrates the deployment of recorded species on a broad-biotope level (Table 4).

Table 4: 2022 sample data deployment at broad biotope level

Broad biotope	Total number of species	Percentage representation	Pantheon SQI score	Species of recognised conservation status
Open habitats	647	15	149	112
Wetland	166	6	144	35
Tree-associated	59	2	117	23
Coastal	44	9	289	33

As expected, the number of species attributed to the ‘Open habitats’ assemblage at broad biotope level was by far the most strongly represented in terms of the overall number of species attributed. This deployment reflected the greater survey effort within open habitats at a broad biotope level and also that the species pool for this group represented in Pantheon is much larger than for the other broad biotope assemblages. The 15 percent representation indicates that 15 percent of the national species pool for 'Open habitats' recognised within the Pantheon database, was recorded.

166 species were attributed to ‘Wetland’ habitats. The proportion of species attributed to this group reasonably reflected the degree of sampling effort within reed-fen & pools and other wetland habitats in the survey area. However, a much larger species count would have been expected, had sampling of aquatic habitat been undertaken alongside terrestrial invertebrate sampling methods.

59 species recorded from all sites were attributed to the 'Tree-associated' assemblage at broad biotope level. The percentage representation score of two was particularly low for this group, reflecting the lack of targeted sampling of arboreal habitat within the 2022 survey.

Whilst the 44 species attributed specifically to the 'Coastal' biotope level assemblage appears insignificant compared to the numbers attributed to the other broad biotopes, the percentage representation of nine is second only to the score of 15 for 'Open habitats'. This reflects the fact that the species pool for the 'Coastal' broad biotope is comparatively small in Pantheon and indicates that coastal specialists were reasonably well represented within the 2022 dataset. In fact, the vast majority of species attributed to the 'Coastal' assemblage at biotope level, were attributed to 'Saltmarsh' at habitat level.

Sub-site Reports

In the following section, stand-alone site reports for each of the 2022 areas selected for detailed survey are presented. Each report includes a habitat description and a description of invertebrate species recorded.

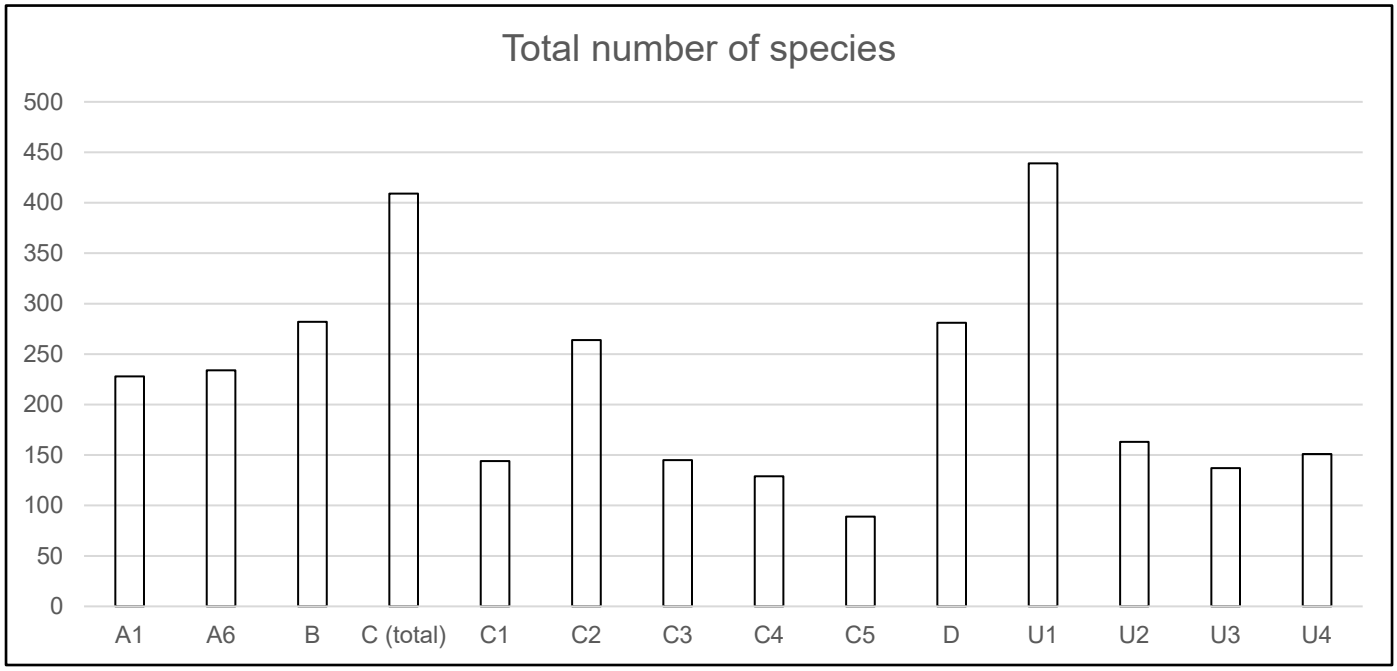

Figure 2: Total number of species recorded per 2022 survey compartment

The number of species per survey compartment varied considerably. This is inevitably due to a combination of factors, the most significant of which were variation in survey effort and sampling technique, habitat type and survey timing. Compartment C data is represented both as a total figure, in which data from all sub-compartments has been amalgamated and as individual sub-compartment datasets.

Compartment A1 (Stanford Meadow)

Habitat

The A1 survey area comprised predominately of a mosaic of Common Reed *Phragmites australis* swamp and open areas of tall sward, rough grassland (Appendix 3, Photograph 1). There were also three distinct open water areas within the reed-fen & pools, with shallow margins and aquatic vegetation. These provided suitable conditions for freshwater to brackish aquatic invertebrate assemblages, as well as the terrestrial/hygrophilous assemblages targeted for the purpose of the survey (Appendix 3, Photograph 2).

The survey area occupied 1.45 hectares, this being a sub-site of a larger wetland mosaic, which formed part of a wetland corridor following the path of the Mucking Creek. However, the creek itself was separated from compartment A1 by a raised sea defence bank/walkway. Further raised banks to the south and east of compartment A1, served to separate the wetland from tidal

influence from the seaward side; however, the site was within 100 metres of the upper saltmarsh of SSSI Unit 3. The geology underlying compartment A1 included alluvium, clay, silt, sand and peat superficial deposits over Thanet formation sandy sedimentary bedrock.

The wetland area surveyed was of flattish topography typical of alluvial habitat, with shelter afforded by the raised grassy banks of the flood defences. However, the habitat varied significantly in terms of microtopography, with drier grassland patches occurring in close proximity to wetter grassland/rush pasture, reed-fen & pools and open water areas.

The drier grassland which surrounded the reed-fen & pools and wetter habitats, was generally fairly herb-poor, with tussocky tall sward habitat with coarse grasses including False Oat Grass *Arrhenatherum elatius*, with Yorkshire fog *Holcus lanatus* and Cock's-foot *Dactylis glomerata* and taller herbs including Creeping Thistle *Cirsium arvense* and occasional patches of Fleabane *Pulicaria dysenterica* and Tufted Vetch *Vicia cracca* (e.g., around TQ 69278 81002). Bramble *Rubus fruticosus* agg. scrub also occurred locally, being sporadically scattered throughout the grassland and reed-fen & pools margins.

In addition to the taller sward grassland were small patches of short sward, wetter grassland, with evidence of rabbit grazing (e.g., around TQ 69277 80948). The habitat in such areas comprised mixtures of Yorkshire Fog *Holcus lanatus*, Creeping Bent *Agrostis stolonifera* and Marsh Foxtail *Alopecurus geniculatus*, with herbs including Creeping Thistle *Cirsium arvense*, Creeping Buttercup *Ranunculus repens* and White Clover *Trifolium repens*. Common Ragwort *Senecio jacobaea* occurred locally, in the drier areas.

The grassland habitat composition was sometimes defined by microtopographic variation, with raised banks giving rise to a close mosaic between patches of drier and wetter vegetation. The swamp habitat comprised, for the most part, fairly uniform stands of Common Reed *Phragmites australis*. However, there were localised stands of Sea Club-rush *Bolboschoenus maritimus* (e.g., around TQ 69240 80945) in and around the reed-fen & pools margins, with stands of Compact Rush *Juncus conglomeratus*, grading between the swamp and grassland margins often in association with Fleabane, Common Nettle *Urtica dioica* and other tall herbs.

The presence of Sea Club-rush within the compartment was perhaps indicative of brackish influence; however, it is uncertain as to whether or not there was still potential saline ingress from the seaward side of the bank, or whether the A1 habitat was hydrologically separate, and any salinity was a residue of historic connectivity.

Open water habitat such as that around TQ 69292 80978, was generally shallow at the confluence with reed-fen & pools and with localised open margins, providing sunny sheltered basking habitat for invertebrates such as the hoverflies *Helophilus hybridus* and *Eristalinus sepulchralis*. There was marginal silt habitat, both at the open edges of the standing water areas and at the margins of the reed-fen & pools, providing potential breeding grounds for species which require such conditions for larval develop, as well as adults of species requiring silt habitats in somewhat brackish marginal habitats. The presence of a hornwort *Ceratophyllum* sp. provided some structural, submerged aquatic vegetation structure beneficial to aquatic invertebrates.

Overall, the habitat within Compartment A1 was relatively poor in terms of floristic diversity; however, the sheltered nature of the site, close mosaic of structurally and hydrologically diverse habitats and probable brackish influence, provided habitat of high potential for specialist invertebrates including those associated both with coastal grassland and upper saltmarsh habitats and reed-fen & pools. The midsummer survey time encompassed a period of drought and the water levels within the site evidently fluctuate significantly over the course of an average year.

Invertebrate species recorded

Sample methods used in compartment A1 included timed sweep and vacuum sampling, pan trapping, direct searching, and spot sweeping. Sample locations are briefly described in Appendix 1, Table 1 and illustrated in Appendix 2, Figure 1.

From the 2022 survey of compartment A1, a total of 228 invertebrate species, including 14 of recognised conservation status in the UK, were recorded. Species deployment, illustrated in Figure 3, reflected that of the combined site data. Beetles (Coleoptera), two-winged flies (Diptera) and true bugs (Hemiptera) being the three most strongly represented species in terms of diversity. The two other larger orders, Araneae and Aculeate Hymenoptera, were represented by somewhat fewer species, with the remaining taxa including Lepidoptera, Odonata, Orthoptera, Opiliones and Gastropoda, each being represented by a handful of species, as expected.

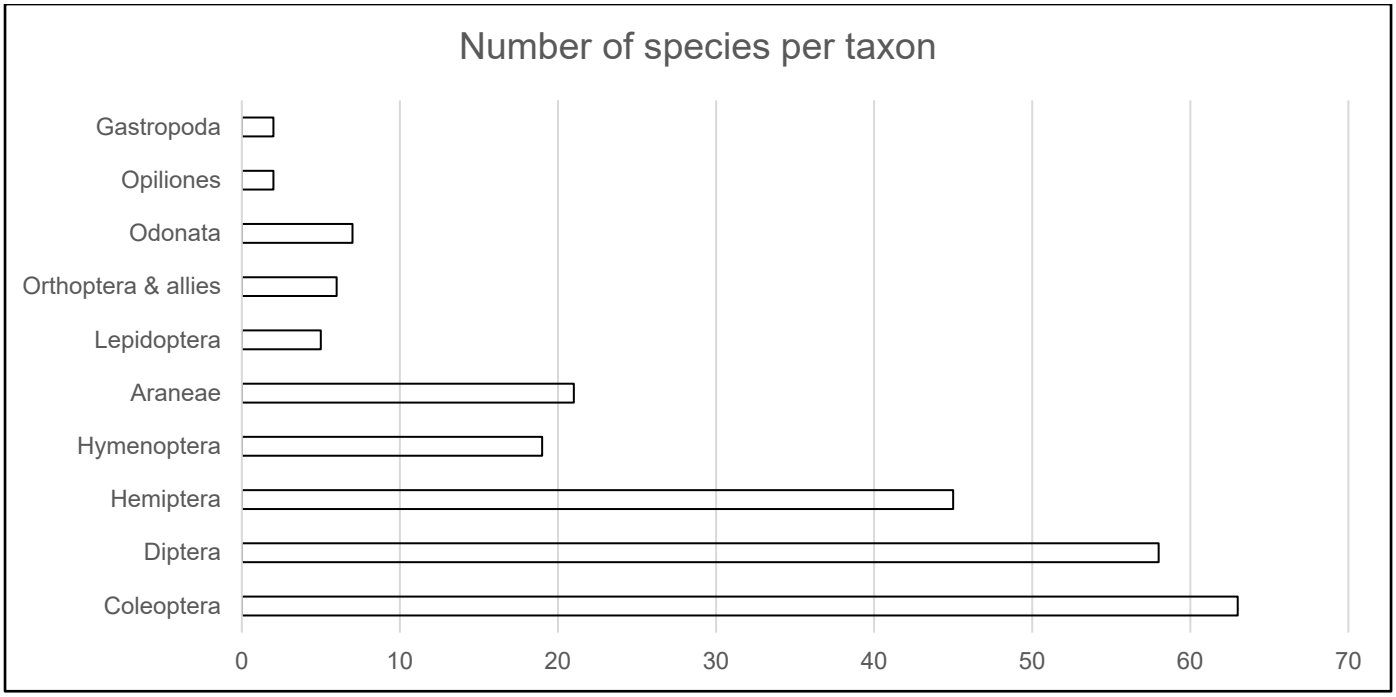

Figure 3: Species per higher taxon collected from compartment A1 during the 2022 survey

From the species data, 118 of the recorded species were classified at broad biotope level in Pantheon, as 'Open habitat' species, 67 as 'Wetland' species, 10 were 'Tree-associated' and eight were associated with 'Coastal' habitats.

Species of recognised conservation status recorded from compartment A1 are listed in Table 5 (below). A summary of the UK distribution and autecology of each is also included in Appendix 1, Table 3.

The three species of highest conservation status recorded from compartment A1, including a foliage spider *Clubiona juvenis*, a malachite beetle *Cerapheles terminatus*[10] and a solitary wasp *Passaloecus clypealis*, were all wetland specialists. All three have been associated with reed-fen & pools habitats and have been previously recorded within close proximity of the 2022 A1 survey area, despite being recorded from very few locations nationally.

Harvey *et al* (2002) cite both brackish and freshwater reedbeds as being the main habitat for *Clubiona juvenis; Passaloecus clypealis* nests in cavities, often in the stems of Common Reed *Phragmites australis* and Hyman and Parsons (1992) stated that *Cerapheles terminatus* is a species of, 'Fens, saltmarshes and other wetland habitats'.

[10]Due to subtle morphological differences, Steven Lane conjectured that the specimens of *C. terminatus* recorded during the 2022 survey may be closer to *C. lateplagiatus*, a species known from Europe, but not previously known from the UK. Following consultation with other UK and European coleopterists familiar with the genus; it was however, considered that the species was more likely to be a form of *C. terminatus*. Whilst there is a need for clarification, the specimens recorded during the survey are listed within this report as *C. terminatus* pending further investigation.

Another species of note associated with reed-fen & pools habitats recorded from compartment A1 included *Colobaea punctata*, a nationally scarce species of marsh fly associated with lush marginal vegetation beside rivers, lakes, ponds, and ditches, where larvae are parasitic on aquatic snails of the families Planorbidae and Lymnaeidae. *C. punctata* was only recorded from compartment A1 during the 2022 survey.

The nationally scarce leafhopper *Paralimnus phragmitis*, which is well recorded within reed-fen & pools habitat the Thames corridor, was recorded from wetland habitat in compartments A1, A6 and SSSI Unit 1 during the 2022 survey.

Table 5: Species of recognised conservation recorded in compartment A1 from 2022 data

Common name	*Scientific name*	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
A malachite beetle	*Cerapheles terminatus*	Malachiidae	Coleoptera	Nationally Rare	LC
A clubionid spider	*Clubiona juvenis*	Clubionidae	Araneae	Nationally Rare	NT
A water scavenger beetle	*Helophorus alternans*	Helophoridae	Coleoptera	Nationally Scarce	LC
A rove beetle	*Astenus immaculatus*	Staphylinidae	Coleoptera	Nationally Scarce	LC
A marsh fly	*Colobaea punctata*	Sciomyzidae	Diptera	Nationally Scarce	-
A tephritid fly	*Campiglossa malaris*	Tephritidae	Diptera	p Nationally Scarce	-
A ulidiid fly	*Melieria picta*	Ulidiidae	Diptera	p Nationally Scarce	-
A stilt bug	*Berytinus hirticornis*	Berytidae	Hemiptera	Nationally Scarce	LC
A leafhopper	*Paralimnus phragmitis*	Cicadellidae	Hemiptera	Nationally Scarce	LC

Common name	*Scientific name*	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
A solitary wasp	*Nysson dimidiatus*	Crabronidae	Hymenoptera	Nationally Scarce	LC
Lobe-spurred Furrow Bee	*Lasioglossum pauxillum*	Halictidae	Hymenoptera	Nationally Scarce	LC
Little Yellow-faced Bee	*Hylaeus pictipes*	Colletidae	Hymenoptera	Nationally Scarce	-
A solitary wasp	*Passaloecus clypealis*	Crabronidae	Hymenoptera	RDB3 pre-1994 criteria	-
Cinnabar	*Tyria jacobaeae*	Erebidae	Lepidoptera	S41 research only	LC

Another uncommon species associated with Common Reed *Phragmites australis*, the Reed Yellow-faced Bee *Hylaeus pectoralis*, was also recorded from compartment A1 during the 2022 survey. According to Falk and Lewington (2015) *H. pectoralis* typically, 'occurs in the 'cigar galls' created by the chloropid fly *Lipara lucens* at the growth tips of Common Reed'. However, the bee has also been recorded from Common Reed in sites where *L. lucens* is absent.

In addition to *H. pectoralis,* the nationally scarce, Little Yellow-faced Bee *Hylaeus pictipes* was also recorded from the A1 samples. This species nests in vacated burrows in Bramble *Rubus fruticosus* agg. and similar woody species and is somewhat more catholic in habitat affinity, having been recorded from, according to Edwards and Roy (2009), 'Open woodland, fens, coastal dunes and shingle, and occasionally urban gardens'.

Another nationally scarce species with an affinity to wetland habitats was *Astenus immaculatus,* one of several species of rove beetle recorded from compartment A1. *A. immaculatus* was described by Lott and Anderson (2011) as 'The most hygrophilous of the British *Astenus*' which in France is associated with 'lake margins and wet woodland'. However, Lott and Anderson (2011) argue that 'in Britain it appears to be less tied to wetlands'. During 2022, *A. immaculatus* was recorded only from the two reed-fen & pools dominated wetland compartments of A1 and A6.

Examples of locally occurring, but not RDB listed, wetland specialists recorded from compartment A1 during the 2022 survey, include a wolf spider *Pirata latitans*, a species of soldier fly, the Three-lined Soldier *Oxycera trilineata*, Marsh Tiger Hoverfly *Helophilus hybridus*, the Small Spotty-eyed Dronefly *Eristalinus sepulchralis* and rove beetle species *Stenus latifrons* and *S. nitens.*
Dragonflies and damselflies (Odonata) were generally poorly recorded during the 2022 survey; however, from compartment A1 several species were recorded including, Scarce Chaser *Libellula*

fulva, which has recently extended its UK range, as well as commoner species such as Brown Hawker *Aeshna grandis*, Emperor *Anax imperator* and Black-tailed Skimmer *Orthetrum cancellatum*. These species were mainly observed in the vicinity of the open water areas.

In addition to the above, several species with an affinity to transitional brackish habitats and saltmarsh were recorded from compartment A1, including two nationally scarce species: a grooved water scavenger beetle *Helophorus alternans* and a picture-winged fly *Melieria picta*. According to Foster *et al* (2014), *H. alternans* is mostly confined to brackish, coastal habitats; however, there are outlying records from sun-exposed heathland pools, on the Lizard, the New Forest and Surrey. *M. picta* is associated with saltmarsh, brackish ditches, and fleets of coastal levels; this species being particularly well represented adjacent to the Thames Estuary in south Essex.

Other local species with a known affinity for brackish habitat including saltmarsh, recorded from compartment A1, included *Paramesus obtusifrons*, a leafhopper associated with Sea Club-rush, picture-winged fly *Melieria omissa*, the long-legged flies *Dolichopus nubilis* and *Poecilobothrus principalis*, a shore fly *Psilopa compta* and a species of pselaphid rove beetle *Brachygluta helferi*.

Other than reed-fen & pools and open water habitat, much of the A1 survey area supported tall sward grassland and this was reflected in the presence of a large proportion of grassland insects and other invertebrates. However, relatively few grassland species of recognised conservation value were recorded.

Nationally scarce species associated with shorter sward grassland recorded from compartment A1, included a stiltbug *Berytinus hirticornis*, a digger wasp *Nysson dimidiatus*, the Lobe-spurred Furrow Bee *Lasioglossum pauxillum*, Sharp-collared Furrow Bee *L. malachurum* and a ragwort *Senecio* spp. associated picture-winged fly *Campiglossa malaris*[11].

In addition, though still common and widespread in the UK, the s41 (research only) Cinnabar Moth *Tyria jacobaeae* was also recorded from the A1 grassland habitat; like *C. malaris*, Cinnabar is associated with ragworts *Senecio* spp.

Berytinus hirticornis is another species for which the majority of UK records are concentrated around the Thames Estuary. The insect has been associated with Grass Vetchling *Lathyrus nissola*, a rather local herb, which was frequently observed in grasslands during the 2022 survey. However, *B. hirticornis* has also been thought to develop in the stems of coarse grasses such as the ubiquitous Cock's-foot *Dactylis glomerata*. The insect is thought to favour rank grassland within disturbance habitats, where areas of bare ground are supported.

[11] *Campiglossa malaris* is listed as pNS in Pantheon, the species is a relatively recent addition to the UK list and was previously listed as *Paroxyna lhommei* with a status of 'Endangered' in a review by Falk (1991).

Nysson dimidiatus is mainly associated with sandy habitats including coastal landslips and it has been recorded from mainly coastal localities in south Essex. The wasp is a cleptoparasite of the ground-nesting solitary wasp *Harpactus tumidus* and possibly *Lindenius albilabris.* Whilst dry, sandy bare ground habitat was not well represented in compartment A1 *per se*, the adjacent banks and raised topography supported potential sandy nesting habitat for the host species.

Both *Lasioglossum pauxillum* and *L. malachurum* have undergone significant range expansions in the UK and they are now considered to be widespread and common in the southern UK. However, at the time of writing status revisions are yet to be implemented.

Compartment A6 (Stanford Warren Wetland (North)

Compartment A6 comprised predominately Common Reed *Phragmites australis* reed-fen & pools. This habitat occupied part of a mosaic of floodplain wetland habitats adjacent to the Mucking Creek, a large stream which flowed southwards before opening into the Thames after passing through the saltmarsh in SSSI Unit 3, also surveyed in 2022. The geology underlying compartment A6 included alluvium, clay, silt, sand, and gravel superficial deposits over Thanet formation sandy sedimentary bedrock. There was some connectivity between the wetland habitats along the course of the Creek and whilst there was an evident transition between the more freshwater sections around A6 and the saltmarsh habitat to the south, there was evident brackish influence throughout the elements of the catchment subject to survey.

The 2022 survey of compartment A6 concentrated on habitat previously surveyed, as mapped by EECOS (2019). The habitat included a small (0.55 hectare) area of reed-fen & pools contiguous with the eastern bank of the Mucking Creek accessible from a track running in a north-easterly direction, between the Mucking Wharf Road around Mucking Church (Church of St John the Baptist), to Wharf Road. At the time of survey, it was found that part of the previously surveyed section of reed-fen & pools, immediately southeast of the track at TQ 68810 81374, was overgrown and inaccessible for the purpose of sampling. Therefore, the more accessible section immediately northwest of the track only was surveyed (TQ 68797 81405). The habitat within the general area was relatively homogeneous and was, therefore, considered representative of the whole, despite its small size. The habitat was accessed by means of a recently cut path through the reed immediately south of a footbridge crossing the Mucking Creek.

On two separate occasions including the 13th and 26th July 2022, the surveyed section of reed-fen & pools was relatively dry at ground-level, with localised soil saturation at the surface. There were narrow channels with some standing water passing through the reed-fen & pools; however, otherwise the habitat was of relatively uniformly flat topography, as is typical of such habitat.

The habitat within the survey compartment comprised more or less continuous Common Reed *Phragmites australis* reed-fen & pools; There was little sign of recent management and other tall herbs including Greater Willowherb *Epilobium hirsutum* and Common Nettle *Urtica dioica* occurred throughout much of the stand, with locally abundant Hedge Bindweed *Calystegia sepium,* sometimes accompanied by Tufted Vetch *Vicia cracca*, forming dense, entangled masses within the reeds (Appendix 3, Photograph 3). Within the wetter and less reed-dominated areas of the stand, there were localised patches of Sea Club-rush *Bolboschoenus maritimus*, with Compact Rush *Juncus conglomeratus* and Fleabane *Pulicaria dysenterica.* The non-native invasive

Himalayan Balsam *Impatians glandulifera* was also recorded mainly in the marginal zone immediately bordering the Mucking Creek. Bramble *Rubus fruticosus* agg. scrub also occurred to some extent, mainly at the reed-fen & pools margin with the track.

The habitat along the track also received some sampling attention, as this edge habitat provided ideal basking conditions for species such as bees, wasps, flies, and beetles associated with the wetland habitats. The vegetation of the reed-fen & pools margin with the track was similar in composition to the interior; however, Bramble scrub was both more abundant and more established and there was generally a greater abundance and diversity of tall herbs, with Greater Willowherb, Hedge Bindweed, Creeping Thistle *Cirsium arvense* and Lesser Burdock *Arctium minus* occurring (Appendix 3, Photograph 4). There was also grassy habitat at the track edge, with yellow composites *Hieracium* agg. providing forage for bees and other insects present.

At the time of survey, it was evident, due to the presence of scrub and the extent of encroachment by plants such as Hedge Bindweed, that the reed-fen & pools had not received recent management by cutting. There was a significant litter layer in places and the lack of management will have enabled a build-up of species, including stem-nesting invertebrates and species associated with litter and flood debris which may be less prevalent in earlier successional stages.

Invertebrate species recorded

Sample methods used in compartment A6 included timed sweep and vacuum sampling, pan trapping, direct searching, and spot sweeping. Sample locations are briefly described in Appendix 1, Table 1 and illustrated in Appendix 2, Figure 2.

From the 2022 survey of compartment A6, a total of 234 invertebrate species, including 13 of recognised conservation status in the UK, were recorded. Species deployment, illustrated in Figure 4, generally reflected that of the combined site data; however, two-winged flies (Diptera) were represented by a greater number of species (74) than Beetles (Coleoptera), which with 59 recorded species, were relatively poorly recorded compared to other survey compartments. The best represented of the remaining taxa included true bugs (Hemiptera) with 41 recorded species, followed by spiders (Araneae) with 25 species and bees, ants and wasps (Aculeate Hymenoptera) with 24 species. The remaining taxa including Orthoptera, Odonata, Lepidoptera and Opiliones, in that order, were each represented by five or fewer species.

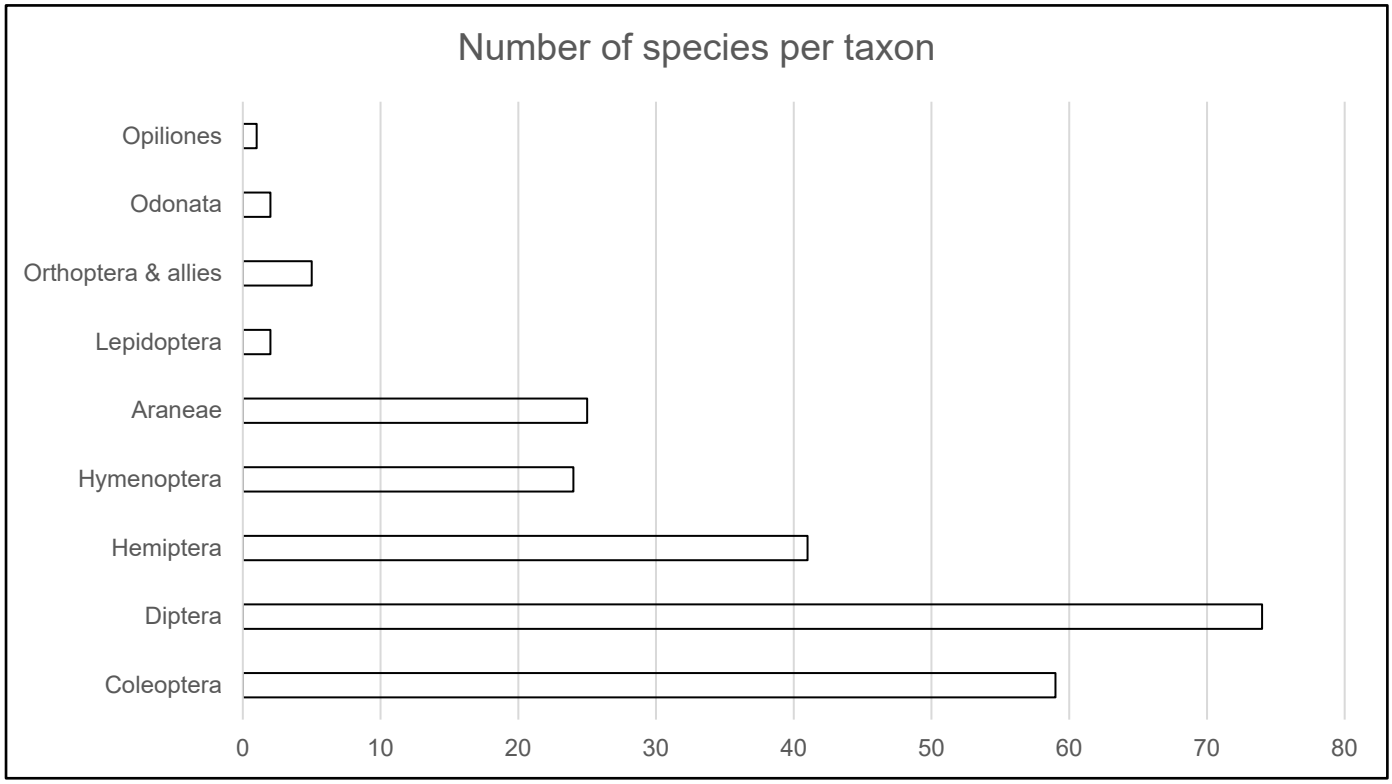

Figure 4: Species per higher taxon collected from compartment A6 during the 2022 survey

From the species data, 112 of the recorded species were classified at broad biotope level in Pantheon, as 'Open habitat' species, 59 as 'Wetland' species, 21 were 'Tree-associated' and five were associated with 'Coastal' habitats.

Species of recognised conservation recorded from compartment A6 are listed in Table 6 (below). A summary of the UK distribution and autecology of each is also included in Appendix 1, Table 3.

The species of highest conservation status recorded from compartment A6, was a malachite beetle *Cerapheles terminatus* (previously discussed in relation to compartment A1 and in the Combined Site-level Invertebrate overview - Page 21).

Whilst *Lygus pratensis*, a species of mirid bug, is still listed under the pre-1994 classification of nationally rare (RDB3), this species, which was formerly confined, according to Kirby (1992) to 'ancient forest rides' and 'open heathland', has hugely increased its range in the UK and has also become less discriminating in its habitat preference; now occurring in a range of habitats including grassland and scrub and OMH, as well as from upper saltmarsh. During the 2022 survey, *L. pratensis* was recorded from all four of the SSSI Units surveyed.

Besides *C. terminatus,* other species of note associated primarily with reed-fen & pools habitat within compartment A6, included the nationally scarce ground beetle *Agonum nigrum*, the Reed Yellow-faced Bee *Hylaeus pectoralis*, the nationally scarce leafhopper *Paralimnus phragmitis* and arguably, the nationally scarce rove beetle *Astenus immaculatus*. The latter three were previously discussed in relation to compartment A1, however, *A.nigrum* was recorded only from A6 during the survey.

Agonum nigrum is an uncommon species, with a mainly coastal distribution in the UK. The beetle is not well recorded in Essex, although there is a post 1990 record from saltmarsh habitat around Rainham Marshes. Luff (2007) described the habitat of *A. nigrum* as, 'In vegetated marshes, usually coastal' and the beetle is associated with lush vegetation with sedges, grasses and reeds on soft soil and mud, as well as under strandline seaweed.

Other species of note associated with freshwater marshland and peatland habitats included the soldierflies Banded General *Stratiomys potamida* and Three-lined Soldier *Oxycera trilineata. S. potamida* was downgraded from its former nationally scarce (notable b) status in a review by Drake (2017). The larvae of both species are aquatic and whilst *S. potamida* larvae are according to Stubbs and Drake (2001), tolerant of harsh conditions and cabable of surviving in seasonally drying out wetlands, *O. trilineata* larvae are tolerant of mildly brackish conditions. *Meligethes fulvipes*, a nationally scarce pollen beetle was also recorded from compartment A6 during the survey. According to Kirk-Spriggs (1996), this species occurs 'near the coast and in marshy places inland'. The beetle is associated with yellow crucifers including Charlock *Sinapis arvensis*, which was widley recorded within the entire 2022 survey area.

Table 1 - Species of recognised conservation recorded in compartment A6 from 2022 data

Common name	*Scientific name*	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
A malachite beetle	*Cerapheles terminatus*	Malachiidae	Coleoptera	Nationally Rare	LC
A ground beetle	*Agonum nigrum*	Carabidae	Coleoptera	Nationally Scarce	LC
A rove beetle	*Astenus immaculatus*	Staphylinidae	Coleoptera	Nationally Scarce	LC
A hoverfly	*Chrysotoxum elegans*	Syrphidae	Diptera	Nationally Scarce	LC
A stilt bug	*Berytinus hirticornis*	Berytidae	Hemiptera	Nationally Scarce	LC

Common name	*Scientific name*	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
A leafhopper	*Paralimnus phragmitis*	Cicadellidae	Hemiptera	Nationally Scarce	LC
Lobe-spurred Furrow Bee	*Lasioglossum pauxillum*	Halictidae	Hymenoptera	Nationally Scarce	LC
Large Velvet Ant	*Mutilla europaea*	Mutillidae	Hymenoptera	Nationally Scarce	LC
A spider-hunting wasp	*Auplopus carbonarius*	Pompilidae	Hymenoptera	Nationally Scarce	LC
A pollen beetle	*Meligethes fulvipes*	Nitidulidae	Coleoptera	Nationally Scarce	NE
A mirid bug	*Lygus pratensis*	Miridae	Hemiptera	RDB3 pre-1994 criteria	LC
Small Heath	*Coenonympha pamphilus*	Nymphalidae	Lepidoptera	S41 Priority species	NT
Brown-banded Carder Bee	*Bombus humilis*	Apidae	Hymenoptera	S41 Priority species	-

The majority of spiders recorded from compartment A6 were widespread generalists; a species with a recorded association with wetlands recorded was *Ozyptila brevipes*, a local species associated with fenland and coastal habitat.

As with compartment A1, several species associated with saltmarsh and transitional brackish habitats were recorded within compartment A6. The presence of Sea Club-rush *Bolboschoenus maritimus*, also indicated brackish influence. *Poecilobothrus principalis*, one of five species of long-legged fly (Dolichopodidae) recorded from the site, is associated with brackish, upper saltmarsh habitats, and was downgraded from the Nationally Scarce by (Drake, 2018), due to an increase in records. Other species with affinities to brackish habitats recorded from A6 included a

fairly widespread species of ant-flower beetle *Anthicus antherinus* and *Campiglossa plantaginis*[12], a tephritid fly, which according to White (1988) is associated with Sea Aster *Aster tripolium*.

Although the habitat surveyed within compartment A6 was, other than the drier, central track, more or less entirely reed-fen & pools habitat, 90 of the recorded species were attributed to the 'Tall sward and scrub' habitat level assemblage in Pantheon and a further 20 were attributed to 'Short sward and bare ground'.

Species of note attributed to the 'Tall sward and scrub' assemblage in Pantheon included two nationally scarce.

species the hoverfly *Chrysotoxum elegans* and the Large Velvet Ant *Mutilla europaea.* The Brown-banded Carder Bee *Bombus humilis*, listed as a priority species under s41 of the NERC Act (2006*)* and the Adonis Ladybird *Hippodamia variegata,* which was recently downgraded from its former nationally scarce status, were also recorded.

Although *Chrysotoxum elegans* is associated mainly with coastal areas of the UK, there are few Essex records. According to Stubbs and Falk (2002), the species is more strongly associated with woodland habitats than other *Chrysotoxum* species; however, the hoverfly has been found in quite open habitats such as clifftops in Cornwall and from open, chalk heath habitat in the East Anglian Breckland.

In the UK, *Mutilla europaea* is particularly associated with lowland heathland; however, the species is also reasonably well recorded from coastal sites, such as within the Thames corridor and there are a number of post-1990 records for the insect from south Essex, including within the general area of the 2022 survey. Large Velvet Ant is, according to Richards (1980) a parasite of various species of bumblebee *Bombus* spp.

Bombus humilis is largely associated with OMH and herb-rich, tall sward grassland habitats adjacent to the Thames Estuary in Kent and Essex; however, workers can often be found foraging on Bramble scrub and other herbs, in areas close to the more favoured habitat, such as in compartment A6.

Species of recognised conservation status attributed to the 'Short sward and bare ground' broad biotope included nationally scarce stiltbug species *Berytinus hirticornis* and Lobe-spurred Furrow Bee *Lasioglossum pauxillum,* both of which were discussed previously in relation to compartment A1 and the Small Heath *Coenonypmpha pamphilus.* Despite still being relatively common and widespread, Small Heath has undergone a significant recorded decline in the UK over recent decades and has consequently been included as a priority species under section 41 of the NERC Act (2006). The butterfly has also been given a threat status as 'Vulnerable' based on post-2001 IUCN criteria.

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[12] Named *Paroxyna plantaginis* in White (1988)

Species such as *Bombus humilis*, *Lasioglossum pauxillum* and *Coenonypmpha pamphilus,* were variously recorded foraging on trackside yellow composites, Bramble *Rubus fruticosus* agg. and other flowering trackside herbs.

Of the remaining species recorded from compartment A6 during 2022, 16 species were attributed to the 'Shaded woodland floor' habitat-level assemblage in Pantheon. The rarest species attributed to this group within compartment A6 was a nationally scarce species of spider-hunting wasp *Auplopus carbonarius*. The wasp is associated with shaded habitats including woodland with streams and marshy areas, which provide wet mud and clay used for nesting. Like other pompilids, *A. carbonarius* provisions its nests with paralysed spiders, particularly of the family Clubionidae, which are consumed by the wasp larvae. The reed-fen & pools habitat was in a relatively advanced stage of succession, with some Bramble and willow *Salix* spp. scrub providing a shaded ground layer, structurally analogous to wet woodland.

Compartment B (Thameside Nature Park)

Compartment B comprised predominately of open, coastal grassland managed as the Thameside Nature Park by Essex Wildlife Trust (EWT). The survey compartment area occupies approximately 45 hectares of habitat occupying the first restored phase of the wider landfill site, now managed under lease to EWT. The topography of the compartment was gently undulating, with the central area being highest, sloping gently to the east and west. There was localised microtopographic variation, in the form of low banks and hummocks of low relief. In addition, there were areas of disturbed habitat due to rabbit activity. The sward throughout much of the site was fairly herb-rich and with little variation in composition; however, sward height varied considerably over the site and as is often the case, the more herb-rich habitat was in areas of shorter sward.

In general, habitat to the south of the visitor centre access track was taller and supported a greater proportion of tall herb and scrub habitat than the larger, northern portion of the site (e.g., around TQ 69322 80484). However, there was structural diversity within this area, with habitat patches of very short sward grassland and sandy, bare ground up to c15 percent cover due to rabbit activity; these forming islands within the taller sward and scrub areas (Appendix 3, Photograph 5). Scrub in this section of the site included abundant, often low growing, Bramble *Rubus fruticosus* agg., with Hawthorn *Crataegus monogyna* and Common Dog Rose *Rosa canina*. The sward height within the grassland varied considerably, being between less than 2cm to about 30cm tall.

Coarse grasses included tussocky Cock's-foot *Dactylis glomerata* and Creeping Bent *Agrostis stolonifera* occurred alongside more occasional Yellow Oat Grass *Trisetum flavescens*. Forbs recorded in this area included Narrow-leaved Bird’s-foot Trefoil *Lotus tenuis*, Common Bird's-foot Trefoil *L. corniculatus*, Black Medick *Medicago lupulina*, White Clover *Trifolium repens*, Ox-eye Daisy *Chrysanthemum leucanthemum*, Daisy *Bellis perennis*, Ribwort Plantain *Plantago lanceolata*, Meadow Buttercup *Ranunculus acris* and Creeping Cinquefoil *Potentilla reptans*.

Although the site was dry throughout at the time of survey, there were signs of localised drainage impedance, often in close proximity to otherwise arid habitats. Locally, Common Reed *Phragmites australis,* encroached into drier grassland patches.

The grassland forming the bulk of the central area of the site was generally of more uniform height and scrub within this area was often less extensive. The grassland around sampling point for SWB1.1 (TQ 69323 80541), close to and immediately north of the field margin with the central visitor centre access track, supported a herb-rich sward ranging from around 10 to 20cm, with relatively little bare ground (Appendix 3, Photograph 6).

Graminoids recorded in this area, included Perennial Rye Grass *Lolium perenne*, Crested Dog's-tail *Cynosurus cristatus* and Cock's-foot. The sward was diverse and flower-rich with Wild Carrot *Daucus carota*, Narrow-leaved Bird's-foot Trefoil, Common Bird's-foot Trefoil, Red Clover *Trifolium pratense*, White Clover, Tufted Vetch *Vicia cracca*, Hop Trefoil *Trifolium campestre*, Meadow Vetchling *Lathyrus pratensis*, Grass Vetchling *L. nissolia*, Yellow Rattle *Rhinanthus minor*, Ox-eye Daisy, Bristly Oxtongue *Picris echioides* and Bee Orchid *Ophrys apifera*. Naturalised, non-native species typical of OMH and coastal grasslands in the area, such as Lucerne *Medicago sativa* and Goat's Rue *Galega officinalis*, were also abundant in this area as elsewhere within the compartment's grasslands.

At TQ 69368 80665 and the location of PFB1.2 (TQ 69402 80608), the sward was relatively short, but uneven (height range two to 25cm), dry and sandy, with localised patches of bare ground, due to rabbit activity. The grassland was generally open; however, aggregations of Bramble, Blackthorn *Prunus spinosa* and Hawthorn *Crataegus monogyna* scrub were present in the general area, as within the compartment as a whole. The sward comprised graminoids including Cock's-foot, Small Timothy *Phleum bertolonii*, Red Fescue *Festuca rubra*, Bent grasses *Agrostis* spp. and False Oat Grass, in taller sward around scrub margins. As with much of the compartment, the sward was fairly herb-rich with Ox-eye Daisy, Wild Carrot, Narrow-leaved Bird's-foot Trefoil, Yellow Rattle, Red Clover, White Clover, Common Knapweed *Centaurea nigra*, Ribwort Plantain, Creeping Cinquefoil, Meadow Vetchling, Meadow Buttercup, Tufted Vetch, Bee Orchid and a hawkweed *Hieracium* sp.

Further north in the compartment at SW.B1.2 (TQ 69368 80665), the sward occupied a gentle northwest-facing slope and was typically around 10cm tall, with small bare ground patches scattered throughout. Graminoids here included Meadow Barley *Hordeum secalinum* alongside Crested Dog's-tail, Cock's-foot, Meadow Foxtail *Alopecurus pratensis* and Perennial Rye Grass *Lolium perenne*, with flowering herbs of a similar diversity and combination as described for the previous locations.

The location of pitfall trap cluster PF.B1.3 (TQ 69260 80675) towards the northern site boundary, was in an area close to the base of a gentle, north facing slope. The presence of Common Reed *Phragmites australis,* with other hygrophilous graminoids including Marsh Foxtail *Alopecurus geniculatus* and Creeping Bent *Agrostis stolonifera* in this area, coupled with exposed bare ground, was indicative of localised seasonal inundation; however, the adjacent sward was typical of the drier grassland of the compartment as a whole, with graminoids such as Cock's-foot, Red Fescue and Perennial Rye-grass, with herbs including Yellow Rattle, Red Clover, Common Vetch *Vicia sativa*, Common Bird's-foot Trefoil, Ribwort Plantain, Bristly Oxtongue, Wild Carrot, White Clover, Tufted Vetch, Goat's-beard *Tragopogon pratensis*, Meadow Vetchling and a hawkweed *Hieracium* sp.

The northern compartment boundary at TQ 69163 80701 overlooked the tidal saltmarsh around the Mucking Creek. The habitat sloped more steeply to the north at this point, the compartment boundary being extensively colonised by Bramble scrub at the slope base. The grassland at this point was fairly herb-poor, albeit with structural diversity due to rabbit activity. The sward ranged in height between one to 30cm (10cm on average). The grassland comprised Common Bent *Agrostis capillaris* and Yorkshire Fog *Holcus lanatus*, with a flowering resource of Creeping Thistle *Cirsium arvense*, Spear Thistle *C. vulgare* and Hoary Ragwort *Senecio erucifolius*. Similar habitat continued east and west, to the north of the footpath/track traversing the northern compartment boundary.

Further east at around TQ 69504 80769, was the location of sweep and vacuum samples, SW.B2.1 and VAC.B2.1 (Appendix 3, Photograph 7). The habitat at this point occupied the slope bottom grassland immediately south of the Mucking Creek and associated saltmarsh habitat of SSSI Unit 3. The sward height was relatively uneven at this point, ranging from around five to 20cm. Graminoids comprised c55 percent cover, with around 45 percent flowering herbs. Small bare ground patches were present within the sward, but very localised. The sward composition was similar to elsewhere on the compartment, with graminoids including Cock's-foot, Perennial Rye-grass, False Oat Grass and Creeping Bent, with herbs including Yellow Rattle, Common Knapweeds, Ribwort Plantain, Tufted Vetch, Bristly Oxtongue, Wild Carrot, Meadow Vetchling, Red Clover, Ox-eye Daisy, Meadow Buttercup, and some localised patches of Rosebay Willowherb *Chamerion angustifolium*.

Close to the Visitor Centre at TQ 69608 80681, was a localised area of dry, sandy ground, heavily disturbed by rabbit activity (Appendix 3, Photograph 8). There was evidence of ground-nesting aculeates in this general area, with a number of burrows and Large Sharp-tailed Bee *Coelioxys conoidea*, a cleptoparasite of the Coast Leafcutter Bee *Megachile maritima*, was recorded here. However, extensive exposures of bare ground occupied by significant populations of ground-nesting not generally apparent within compartment B during the 2022 survey.

Another more significant bare ground area was recorded much further west in the compartment around TQ 68902 80883. The substrate was sparsely vegetated sandy clay, approximately 10 x 20m in area and surrounded by short-sward, herb-poor, rabbit-grazed grassland. Pitfall cluster PF.B1.4 was located in this patch, but there was generally little sign of ground-nesting aculeate activity at the time of survey. However, the patch may be subject to seasonal inundation, Common Reed being scattered in the sward close to this area.

Invertebrate species recorded

Sample methods used in Thameside Nature Park (compartment B) included timed sweep and vacuum sampling, pitfall trapping, direct searching, and spot sweeping. Sample locations are briefly described in Appendix 1, Table 1 and illustrated in Appendix 2, Figure 3.

From the 2022 survey of compartment B, a total of 282 invertebrate species, including 16 species of recognised conservation status in the UK, were recorded. Species deployment, illustrated in Figure 5, generally reflected that of the 2022 combined site data, with Beetles (Coleoptera) being the best represented higher taxon, with 107 recorded species; however, with 42 recorded species,

spiders (Araneae) were marginally more strongly represented than two-winged flies (Diptera) and true bugs (Hemiptera), these each being represented by 37 species, whilst 32 species of bees, ants and wasps (Aculeate Hymenoptera) were recorded from the compartment. Of the remainder, 12 species of butterflies and moths (Lepidoptera), mainly represented by butterflies and seven species of grasshoppers, crickets, and allies (Orthoptera), were recorded. The remainder including Isopoda, Opiliones, Odonata and Lithobiomorpha were, each represented by one or two species.

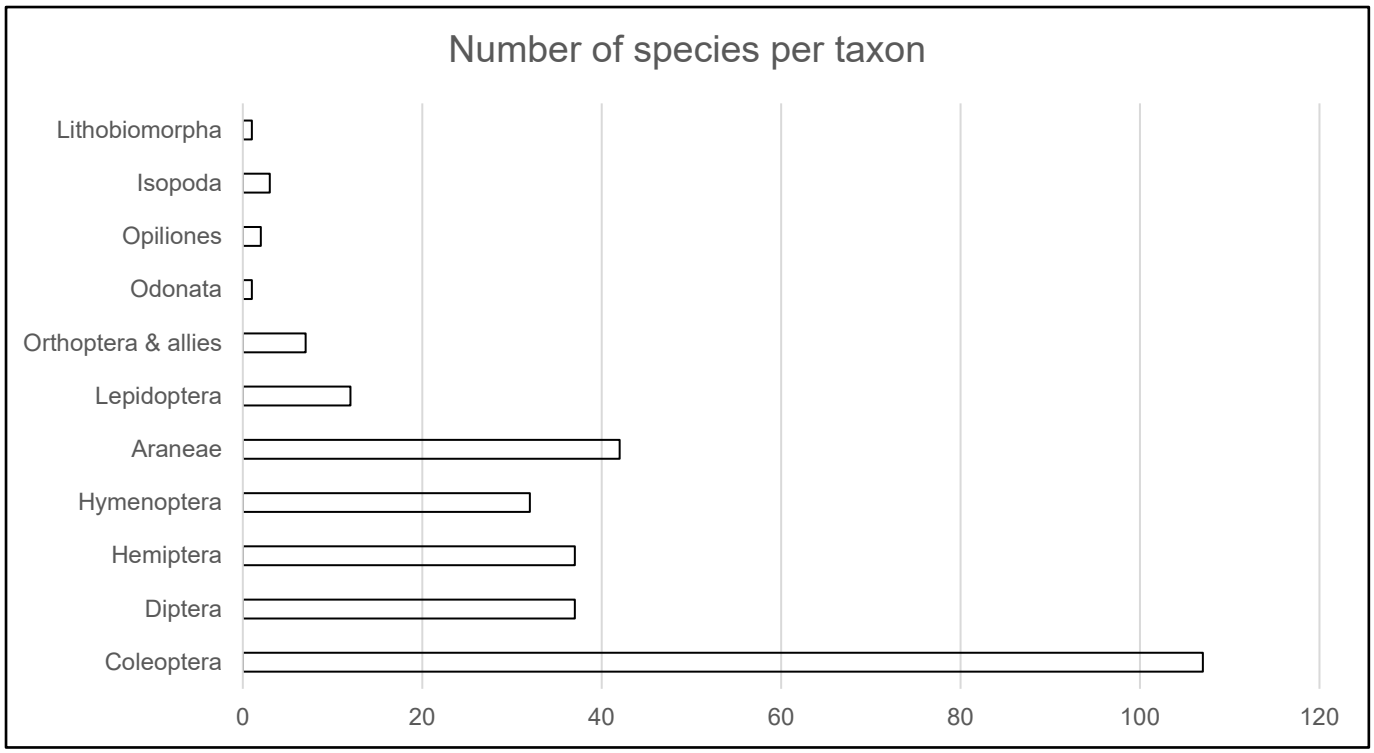

Figure 5: Species per higher taxon collected from compartment B during the 2022 survey

From the data, 223 of the recorded species were classified at broad biotope level in Pantheon, as 'Open habitat' species, 15 were 'Wetland' species, 13 were 'Tree-associated' and three were associated with 'Coastal' habitats.

Species of recognised conservation recorded from compartment B are listed in Table 7 (below). A summary of the UK distribution and autecology of each is also included in Appendix 1, Table 3.

Species deployment reasonably reflected the habitat present within compartment B, with the majority of species (157) being attributed, at habitat-level, to the 'Tall sward and scrub' assemblage, whilst the bulk of the remainder (65) were attributed to 'Short sward and bare ground' broad biotope in Pantheon.

Species of recognised conservation status attributed to 'Tall sward and scrub' included OMH flagship species such as s41 'priority species' Shrill Carder Bee *Bombus sylvarum* and Brown-

banded Carder Bee *B. humilis.* The former of these was only represented by a single queen,[13] swept from short-sward flower-rich grassland, with abundant Red Clover *Trifolium pratense* and Narrow-leaved Bird's-foot Trefoil *Lotus tenuis* and a range of other typical herbs of OMH and coastal grasslands in the general survey area. However, *B. humilis* workers were comparatively well represented, workers of this species typically emerging about a month prior to *B. sylvarum,* indicating that *B. sylvarum* had not yet emerged substantially.

Another s41 grassland species, characteristic of OMH and taller sward grasslands in the Thames corridor recorded from compartment B, was the Phoenix Fly *Dorycera gramineum*. Phoenix Fly is a large and distinctive member of the Ulidiidae family which was formerly widespread in the UK. However, the species was included as a s41 'priority species' and afforded a post-2001 IUCN threat status of 'Near Threatened', due to a significant national decline.

Contrary to its current status, Phoenix Fly is particularly well recorded along the Thames Estuary in south Essex and north Kent and during the 2022 survey it was recorded from compartments C2, C4 and D, as well as compartment B. Despite research by Ismay (2000), the conservation biology of *D. gramineum* in the UK is poorly known. Whilst the species is primarily associated with tall grasslands, Ismay (2000) stated that the 'types of grassland varied greatly' and the only common factor was considered to be a degree of disturbance between sites. Disturbance factors including 'sand, gravel or chalk extraction or major clearance of vegetation.'

In terms of current conservation status, the species of highest conservation status attributed to the 'Tall sward grassland and scrub' assemblage recorded from Compartment B, was the Little Blue Carpenter Bee *Ceratina cyanea*. This bee has been recorded more frequently in recent years on a national level and the Thames corridor area is one of the national strongholds of the species. However, whilst nationally, records are still largely confined to southeast England, the current pre-1994 RDB3 'Nationally Rare' status is considered to be in need of revision. *Ceratina cyanea* is associated with various warm, dry habitats typically with scattered Bramble *Rubus fruticosus* (agg.), or rose *Rosa* spp., in sunny locations such as on south-facing chalk-downland, heathland edge, brownfield and woodland edge habitats.

In addition, six further species currently classed as nationally scarce in the UK, attributed to the 'Tall sward and scrub' category in Pantheon, were recorded during the 2022 survey. These included a gnaphosid spider *Drassodes pubescens*, which occurs at the bases of grass tussocks in similar habitat to the much commoner species of the genus; beetles including a large rove beetle *Ocypus fuscatus*, which is sparsely recorded from dry grassland habitats in East Anglia and southeast England and three weevils Bloody Crane’s-bill Weevil *Zacladus exiguus*, *Glocianus punctiger* and *Orthochaetes setiger*. The former of these is associated with both Bloody Cranesbill *Geranium sanguineum* and other small-flowered *Geranium* species and the remaining two, which

[13] Compartment B was surveyed in mid-June, before the main emergence of *B. sylvarum* workers; however, queens are on the wing from May onwards.

are subject to status review, due to increased recording, are both associated with dry, rough grassland habitats, although *O. setiger* is often also recorded from sparsely vegetated habitats.

The remaining nationally scarce species attributed to the 'Tall sward and scrub' broad biotope was *Geomyza apicalis*, a species of opomyzid fly. Whilst in Europe the species is associated with dry habitats, in the UK it appears to have an affinity with wetlands including grazing marsh, reedbeds and similar habitat. During the 2022 survey, *G. apicalis* was recorded only from compartment B, where it was vacuumed from a mosaic of tall and short sward grassland.

Table 2 - Species of recognised conservation recorded in compartment B from 2022 data. Blank cells indicate where IUCN post-2001 threat status not available.

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
A gnaphosid spider	*Drassodes pubescens*	Gnaphosidae	Araneae	Nationally Scarce	LC
A lycosid spider	*Alopecosa cuneata*	Lycosidae	Araneae	Nationally Scarce	LC
A lycosid spider	*Pardosa agrestis*	Lycosidae	Araneae	Nationally Scarce	LC
A comb-footed spider	*Enoplognatha mordax*	Theridiidae	Araneae	Nationally Scarce	LC
A ground beetle	*Harpalus serripes*	Carabidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Ophonus azureus*	Carabidae	Coleoptera	Nationally Scarce	LC
A rove beetle	*Ocypus fuscatus*	Staphylinidae	Coleoptera	Nationally Scarce	LC
Lobe-spurred Furrow Bee	*Lasioglossum pauxillum*	Halictidae	Hymenoptera	Nationally Scarce	LC
Ridge-cheeked Furrow Bee	*Lasioglossum puncticolle*	Halictidae	Hymenoptera	Nationally Scarce	LC
Swollen-thighed Blood Bee	*Sphecodes crassus*	Halictidae	Hymenoptera	Nationally Scarce	LC
Silvery Leafcutter Bee	*Megachile leachella*	Megachilidae	Hymenoptera	Nationally Scarce	LC

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
Bloody Crane's-bill Weevil	*Zacladus exiguus*	Curculionidae	Coleoptera	Nationally Scarce	NE
A ground beetle	*Polystichus connexus*	Carabidae	Coleoptera	Nationally Scarce	NT
A weevil	*Glocianus punctiger*	Curculionidae	Coleoptera	Nationally Scarce	
A weevil	*Gronops lunatus*	Curculionidae	Coleoptera	Nationally Scarce	
A weevil	*Orthochaetes setiger*	Curculionidae	Coleoptera	Nationally Scarce	
A weevil	*Tychius pusillus*	Curculionidae	Coleoptera	Nationally Scarce	
A rove beetle	*Neobisnius villosulus*	Staphylinidae	Coleoptera	Nationally Scarce	
An opomyzid fly	*Geomyza apicalis*	Opomyzidae	Diptera	NS	
An opomyzid fly	*Geomyza subnigra*	Opomyzidae	Diptera	NS	
A lacehopper	*Pentastiridius leporinus*	Cixiidae	Hemiptera	NS(Nb)	LC
Blue Carpenter Bee	*Ceratina cyanea*	Apidae	Hymenoptera	RDB3 pre-1994 criteria	LC
Bryony Mining Bee	*Andrena florea*	Andrenidae	Hymenoptera	RDB3 pre-1994 criteria	
Broad-faced Mining Bee	*Andrena proxima*	Andrenidae	Hymenoptera	RDB3 pre-1994 criteria	
A ground bug	*Nysius huttoni*	Lygaeidae	Hemiptera	Recent UK colonist	NA
A seed beetle	*Bruchidius imbricornis*	Chrysomelidae	Coleoptera	Recent UK colonist	NE

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
A seed beetle	*Bruchus brachialis*	Chrysomelidae	Coleoptera	Recent UK colonist	NE
A shining flower beetle	*Olibrus flavicornis*	Phalacridae	Coleoptera	Red Data Book-insufficiently known	DD
Small Heath	*Coenonympha pamphilus*	Nymphalidae	Lepidoptera	S41 Priority species	NT
Brown-banded Carder Bee	*Bombus humilis*	Apidae	Hymenoptera	S41 Priority species	
Shrill Carder Bee	*Bombus sylvarum*	Apidae	Hymenoptera	S41 Priority species	
Phoenix Fly	*Dorycera graminum*	Ulidiidae	Diptera	S41 Priority species; Near Threatened (Post-2001 IUCN criteria); RDB3 'rare' pre-1994	NT
Cinnabar	*Tyria jacobaeae*	Erebidae	Lepidoptera	S41 research only	LC

Although considerably fewer 'Short sward and bare ground' species were recorded within the compartment B dataset than for 'Tall sward and scrub', a higher concentration of species of recognised conservation status was recorded relative to the total number of species attributed to this assemblage.

Bryony Mining Bee *Andrena florea* is currently listed under pre-1994 criteria as nationally rare (RDB3), but this status may be reviewed due to a recent range expansion into areas adjacent to the Thames in north Kent and south Essex. The bee collects pollen exclusively from the flowers of White Bryony *Bryonia alba*, although according to Falk and Lewington (2015), 'other flowers such as Bramble and umbellifers seem to act as nectar sources'. Nesting habitat is usually light soil, such as hard sandy paths and it may nest in large aggregations. The bee was recorded only once during the 2022 survey, foraging on White Bryony at the western boundary of compartment B.

The Broad-faced Mining Bee *Andrena proxima* is another species listed as nationally rare (RDB3) in the UK under pre-1994 criteria. It is known only from the southern half of the UK and in Essex there are several records from the Grays area and from around Canvey Island, a few kilometres to

the west and east of the 2022 survey area. Falk (2015) describes the favored habitat of *A. proxima* as 'umbellifer-rich habitats, including chalk grassland, coastal grassland, soft rock cliffs, quarries and sometimes coastal grazing marsh'. During the 2022 survey, the bee was recorded from herb-rich coastal grassland and scrub habitat in compartment B. The grassland supported abundant Wild Carrot and other umbellifers.

Other species of note attributed to short sward and bare ground habitat in compartment B, included the s41 listed Small Heath *Coenonympha pampilus*, previously discussed in relation to compartment A6 and 10 species currently classed as nationally scarce in the UK.

Nationally Scarce species with an affinity for short sward grassland and bare ground habitat included two species of wolf spider (Lycosidae). Both *Alopecosa cuneata* and *Pardosa agrestis* have been historically well recorded within habitats close to the Thames in south Essex, although, in the case of the latter, there has been debate in relation to the very similar and closely related *P. purbeckensis* (see *P. agrestis* account in Appendix 1, Table 3).

According to Harvey *et al* (2002), *Alopecosa cuneata* is associated mainly with chalk grassland and coastal dune habitats, whilst according to Bee *et al* (2017), *P. agrestis* occurs 'predominately on thinly vegetated substrates and in clay pits and chalk pits, but also on dry banks above saltmarshes and flood-plain meadows.'

Nationally scarce beetles associated primarily with short sward grassland and bare ground included the ground beetles *Harpalus serripes* and *Ophonus azureus* and two species of weevil *Gronops lunatus* and *Tychius pusillus*.

Both *Harpalus serripes* and *Ophonus azureus* have distinctly southern distributions in the UK. *H. serripes* is more frequently found in coastal grasslands. Luff (2007) described the habitat of *H. serripes* as 'On sandy or gravelly soils, usually coastal, but also inland in sand and gravel pits'; whilst *O. azureus* is found in both 'open coastal sites' and inland 'on warm chalk or limestone slopes'. In 2022, both species, were recorded from traps separately located in dry flower-rich grassland and from seasonally dried out wet grassland in compartment B.

Gronops lunatus is a distinctive species of weevil, which According to Morris (2002), is found 'In saltmarshes, at their edges and on sandflats etc.' but is also found 'inland in arenaceous areas'. Morris (2002) also cites host plants to include sea-spurreys including *Spergularia media* and *S. marina* (which are generally found on saltmarshes) and Corn spurrey *Spergularia arvensis* and mouse-ears *Cerastium* spp. inland. However, in Pantheon the weevil is attributed to 'Short sward grassland and bare ground', rather than to one of the coastal assemblages such as 'Saltmarsh'. The beetle which has been previously recorded from the general survey area, was recorded only from compartment B, during the 2022 survey.

Another weevil, *Tychius pusillus* is the rarest of several species of the genus *Tychius* recorded during the 2022 survey. According to Hyman and Parsons (1991), *T. pusillus* occurs in 'Grassland, field margins, roadside verges and disturbed ground' where it is associated with Lesser Trefoil *Trifolium dubium* and possibly other species of clover. During the 2022 survey, *T.pusillus* was recorded only from compartment B, where specimens were obtained from vacuum sampling short-sward, flower-rich, coastal grassland.

A reasonable number of bees and other aculeates were recorded from compartment B during the 2022 survey. Of these, four nationally scarce species associated primarily with short sward grassland and bare ground were recorded. These included Lobe-spurred Furrow Bee *Lasioglossum pauxillum* (a species previously discussed in relation to compartments A1 and A6), Ridge-cheeked Furrow Bee *Lasioglossum puncticolle*, Swollen-thighed Blood Bee *Sphecodes crassus* and Silvery Leafcutter Bee *Megachile leachella*.

Lasioglossum puncticolle is according to Falk (2015) 'a scarce and localised species, with most records in southeast England between Dorset and Essex.' The bee was recorded from several compartments during the 2022 survey, including C2, D and SSSI Units 1 and 4, as well as from compartment B. On the coast, the bee is known to nest on steep slopes in various habitats including 'soft rock cliffs, sea walls, vegetated shingle and saltmarsh' (Falk, 2015).

Sphecodes crassus is another species which has been recorded more frequently in recent years than formerly in the UK. The bee, like other members of the genus, is a cuckoo within nests of *Lasioglossum* spp. Else and Edwards (2018) cite *Lasioglossum nitidiusculum* and *L. parvulum,* as the main recorded hosts in the UK, though other furrow bees including *L. pauxillum* and *L. punctatissimum* are considered to be hosts in Europe.

The remaining short sward grassland and bare ground associated bee species recorded from compartment B, *Megachile leachella,* has a predominately coastal distribution in the UK and is particularly well represented in the Thames corridor. *M. leachella* was recorded from compartments C4, D and SSSI Units 1 and 3, as well as compartment B and was frequently observed nesting in bare, sandy ground during the survey. Nest cells are cut from leaf sections and leaves from a wide range of trees and other woody species.

Besides the above and irrespective of favoured habitat, a range of other aculeates characteristic of coastal grassland and OMH in south Essex were recorded were recorded from compartment B. Examples of these included: Spiny-legged Mason Wasp *Odynerus spinipes* and bees including Reed Yellow-faced Bee *Hylaeus pectoralis*, Large Meadow Mining Bee *Andrena labialis,* Yellow-legged Mining Bee *A. flavipes*, Green-eyed Flower Bee *Anthophora bimaculata,* Spined Mason Bee *Osmia spinulosa*, Willughby's Leafcutter Bee *Megachile willughbiella* and Large Sharp-tailed Bee *Coelioxys conoidea.*

Wetland species were poorly represented within the compartment B samples, this reflecting the predominately dry grassland character present; however, a distinctive, nationally scarce ground beetle *Polistichus connexus*, which is attributed to 'running water' at habitat-level and 'riparian sand' at SAT level in Pantheon, was recorded from this compartment. The insect is primarily known from coastal sites in southeast England and East Anglia and according to Luff (2007) it occurs 'In cracks and crevices, usually in clay soils or cliff bases but also on sandy or gravelly soils'.

In addition, two nationally scarce species normally associated with saltmarsh, were also recorded from samples collected in compartment B. These included a comb-footed spider *Enoplognatha mordax* and a lacebug *Pentastiridus leporinus. E. mordax* is confined to scattered coastal sites, around the southern half of the UK, but has been relatively well recorded within the Thames corridor, including from in and around the 2022 survey area. According to Harvey *et al* (2002), the

spider is associated with saltmarshes, occurring amongst strandline litter and vegetation on the upper saltmarsh areas. However, whilst it was recorded from all three saltmarsh compartments of the SSSI during the 2022 survey, *E. mordax* was also recorded from coastal grasslands just inland in compartments C2, C4 and D as well as compartment B.

Pentastiridius leporinus is a scarce species of lacebug which is more or less exclusively confined to coastal areas of the UK, being associated primarily with saltmarsh. There are records from coastal localities as far north as north Norfolk and including Wales, it has been recorded extensively in south Essex, mainly from around Canvey Island, with scattered records in close proximity to the 2022 survey area. The insect is typically found in upper saltmarsh/ grazing marsh habitats, where it can, according to Kirby (1992), 'extend some distance along estuaries.' During the survey, *O. leporinus* was recorded both from upper and mid saltmarsh in SSSI Units 2 and 4 and from compartment B, where it was recorded from a vacuum sample collected from short, rabbit-grazed grassland in mosaic with taller sward habitat, this compartment being located within close proximity to saltmarsh habitat within the tidal creek of SSSI Unit 3.

Compartment C (Enovert Mucking landfill site)

Compartment C comprised an extensive area of both former and active landfill. In total, the compartment occupied approximately 182.3 hectares. For the purpose of the survey, the compartment was divided into distinct survey zones C1 to C5, in accordance with mapping provided by Natural England for the purpose of the project. Whilst much of the habitat further inland was capped and vegetated, extensive areas of land towards the Thames shoreline in Compartments C4 and C1, were active at the time of survey and access to the active areas was prohibited by Enovert (see Limitations section of report). The inactive sections of the site supported habitat typical of brownfield/OMH and in the North Thames area of south Essex. However, the degree of habitat establishment and succession varied considerably, and structural and floristic diversity varied significantly within the compartment as a whole. There were extensive areas of established grassland and tall herb vegetation in compartments C3, C4 and C1.

In addition, whilst much of the compartment was dry and free draining, there was also considerable hydrological variation. Towards the southern border of the compartment, in sub-compartment C1, there were two large ponds. One at TQ 68542 79282, the second at TQ 69315 79215, these waterbodies being surrounded by swamp and wet grassland habitat.

During the survey, sampling was undertaken, to a varying extent, within all five sub-compartments. The aim was to capture the nuances of habitat heterogeneity across Compartment C as a whole. The majority of sampling was confined to the central, southern and south-eastern parts of the compartment, however, other than direct searching, little was undertaken in the northern parts of C3.

Sub-Compartment C1

Sub-compartment C1 occupied approximately 60.7 hectares, mainly of well-established grassland and scrub habitat; however, a large area extending from the central section of the northern boundary, southwards to about the mid-point of the sub-compartment had been excavated at the time of survey. Much of the intact area supported a mosaic of tall sward grassland and fairly well-

established scrub. More open habitat occurred along the track edges, which was also generally more herb-rich than the surrounding grassland and scrub mosaic. The underlying soil varied in composition with drier, free-draining sandy areas and areas of drainage impedance with clays. Although the area was, on the whole, flattish, the ground was frequently uneven, with considerable variation in microtopography.

Scrub species in the drier habitats mainly comprised combinations of Bramble *Rubus fruticosus* agg., Hawthorn *Crataegus monogyna* and Blackthorn *Prunus spinosa*. Established grassland was often tussocky with mixtures of Cock's-foot *Dactylis glomerata*, Yorkshire Fog *Holcus lanatus*, bent grasses *Agrostis* spp. and False Oat Grass *Arrhenatherum elatius*, these stands being relatively herb-poor compared to some of the early successional habitats elsewhere in Compartment C. The more herb-rich and structurally diverse track-edge habitats often supported abundant Narrow-leaved Bird’s-foot Trefoil *Lotus tenuis*, which provided an extensive and long-lasting forage resource, as well as non-native Goat's-rue *Galega officinalis* and yellow composites including Rough Hawk's beard *Crepis biennis* and Bristly Oxtongue *Picris echioides.*

The two main waterbodies of the sub-compartment were relatively large and supported marginal reed-fen & pools habitat, with wet grassland grading into the drier prevailing habitats. Wetter parts also supported areas of Grey Willow *Salix cinerea* scrub.

Sweep and vacuum sampling locations, SW.C1.2.1 and VAC.C1.2.1 (TQ 68618 79375), comprised drier grassland adjacent to a track in close proximity to the pond, towards the western extremity of Sub-compartment C1 (Appendix 3, Photograph 9). The sampled habitat at this point included disused, rutted tracks, which both provided varied microtopography and had become vegetated with graminoids including Creeping Bent *Agrostis stolonifera* and herbs including dominant Narrow-leaved Bird’s-foot Trefoil *Lotus tenuis*, which provides a long-lasting forage resource.

Whilst the habitat was dried out at the time of survey and there was an extensive resource of sparsely vegetated sandy clay substrate; localised patches of False Fox Sedge *Carex otrubae,* indicated a degree of drainage impedence in this area, which may in-part be subject to waterlogging at wetter times of year.

Extensive Bramble *Rubus fruticosus* agg. scrub, provided sheltered conditions within the grassland habitat, as well as, additional structure and a valuable nectaring resource and forage for aculeates, Diptera and other invertebrates.

Sample locations SW.C1.2.2 and VAC.C1.2.2 (TQ 68704 79388) supported more established, tussocky grassland compared with the SW.C1.2.1 location (Appendix 3, Photograph 10). The habitat here occupied an area of varied microtopography, due to small, vegetated banks and mounds colonised with mixtures of Cock's-foot *Dactylis glomerata*, Yorkshire Fog *Holcus lanatus* and False Oat Grass *Arrhenatherum elatius,* with scattered patches of flowering herbs including Narrow-leaved Bird’s-foot Trefoil, with taller Goat's-rue *Galega officinalis,* Mugwort *Artemisia vulgaris* and Rough Hawk'sbeard *Crepis biennis* and scattered Bramble *Rubus fruticosus* agg. and Hawthorn *Crataegus monogyna* scrub. The habitat was immediately adjacent to a track which provided small patches of bare ground.

Both SW.C1.2.3 and VAC.C1.2.3 (TQ 69399 79193) (Appendix 3, Photograph 11) and SW.C1.2.4 and VAC.C1.2.4 (TQ 69429 79305) (Appendix 3, Photograph 12) sample locations, were close to the seawall, at the eastern boundary of sub-compartment C1. The floristic habitat composition, in both cases was similar to that of SW.C1.2.2; however, the SW.C1.2.3 location was between the marginal habitat of the pond and the seawall and therefore, had some encroaching Common Reed *Phragmites australis* at the margin.

Again, the habitat here encompassed the track edge and besides the ubiquitous Narrow-leaved Bird's-foot Trefoil and Goat's-rue, herbs including White Clover *Trifolium repens* and Creeping Buttercup *Ranunculus repens* accompanied Creeping Bent *Agrostis stolonifera*, in a somewhat shorter sward. Scattered Blackthorn *Prunus spinosa* scrub was also present in this area. Sward height in the shorter patrches varied between c5 to 10cm, in the shorter sward areas and c20 to 40cm in the taller grassland habitat. SW.C1.2.4 and VAC.C1.2.4 sample location was further north along the seawall and supported a similar compostion, but with abundant Bristly Oxtongue *Picris echioides* and Rough Hawk's-beard *Crepis biennis*, providing a foraging resource favourable to a wide range of bee species.

Sub-compartment C2

Sub-compartment C2, was relatively small in area, occupying approximately 4.45 hectares, but potentially supported some of the most structurally and floristically diverse OMH habitat within compartment C as a whole. The area occupied a relatively high point in compartment C and was evidently bespoke created habitat, due to the landforming. The habitat substrate was formed of free-draining, chalk ballast. There were five or more, linear chalk banks, ranging in length between c75 and c330 metres; each being c1.5 metres tall, with a basal width of about eight metres, with steeply sloping sides (Appendix 3, Photographs 13 and 14). The longest bank provided southwest and northeast-facing escarpments; the remaining banks were of the east/west and north/south orientation. The habitat between the banks was relatively flat, but rutted, providing a strongly undulating surface. (Appendix 3, Photograph 15).

The floristic composition was consistent between the flatter, open ground areas and on the rasied banks. However, the density of vegetation varied somewhat within the area as a whole, with close to 100 percent vegetation cover in some patches (Appendix 3. Photograph 16), whilst others were very sparsely vegetated. There were localised aculeate burrows within the survey area, although activity was relatively low at the time of survey. The habitat was both diverse and at the time of survey, provided a diverse and abundant flower resource. The vegetation included mainly generalist graminoids, typical of the site as a whole, with Yorkshire Fog *Holcus lanatus*, Cock's-foot *Dactylis glomerata* and Common Bent *Agrostis capillaris*, being most constant, with False Oat Grass *Arrhenatherum elatius* occurring in taller sward areas, especially around the bank bases.

Herbs recorded included ubiquitous species and those generally recorded throughout Compartment C, including: Narrow-leaved Bird's-foot Trefoil *Lotus tenuis*, Goat's-rue *Galega officinalis,* Wild Carrot *Daucus carota,* White Clover *Trifolium repens,* Black Medick *Medicago lupulina,* Bristly Oxtongue *Picris echioides,* Melilots *Melilotus spp,* Charlock *Sinapis arvensis,* Ribwort Plantain *Plantago lanceolata,* Tufted Vetch/Fodder Vetch *Vicia cracca/villosa,* Rough Hawk's-beard *Crepis biennis,* Creeping Thistle *Cirsium arvense,* Common Ragwort *Senecio*

jacobaea, Lesser Trefoil *Trifolium dubium,* Yarrow *Achillea millefolium,* Colt's-foot *Tussilago farfara,* Selfheal *Prunella vulgaris* and Dandelion *Taraxacum officinale agg.*

In addition, several species more typically associated with calcareous grasslands were recorded including, Rough Hawk's-bit *Leontodon hispidus*, Yellow Wort *Blackstonia perfoliata*, Lady's Bedstraw *Galium verum* and Viper's Bugloss *Echium vulgare*. A large pea species *Lathyrus* sp. (possibly Broad-leaved Everlasting Pea *L. latifolius),* was also locally abundant in area.

There was little scrub in sub-compartment C2; however, low growing Bramble *Rubus fruticosus* agg. scrub occurred locally, especially in the more vegetated parts of the site.

Pitfall traps were located both on the top of the chalk banks around TQ 68985 79745 and TQ 68889 79675 (Appendix 3, Photograph 17) and within the flatter open ground habitat around TQ 68889 79675. In addition, sweep sampling, vacuum sampling and spot sampling and direct searching was undertaken in sub-compartment C2.

Sub-Compartment C3

Sub-compartment C3 occupied approximately 69.45 hectares. The habitat within this section mainly included fairly well-established grassland and OMH, with localised patches of Bramble *Rubus fruticosus* agg., Hawthorn *Crataegus monogyna* and Blackthorn *Prunus spinosa* scrub. The habitat was generally flattish, sloping gently to the north and east (Appendix 3, Photographs 18).

As elsewhere within Compartment C, the dominant graminoids included coarse grasses such as Cock's-foot *Dactylis glomerata*, Yorkshire Fog *Holcus lanatus*, Creeping Bent *Agrostis stolonifera*, Common Bent *A. capillaris* and False Oat Grass *Arrhenatherum elatius*, in taller stands and edge habitats.

Herb species recorded in C3 included ubiquitous species and those generally recorded throughout the survey area including: Narrow-leaved Bird’s-foot Trefoil *Lotus tenuis*, Goat's-rue *Galega officinalis,* Wild Carrot *Daucus carota,* White Clover *Trifolium repens,* Black Medick *Medicago lupulina,* Bristly Oxtongue *Picris echioides,* Melilots *Melilotus* spp*.,* Viper's Bugloss *Echium vulgare,* Charlock *Sinapis arvensis,* Ribwort Plantain *Plantago lanceolata,* Tufted Vetch/Fodder Vetch *Vicia cracca/villosa,* Rough Hawk's-beard *Crepis biennis,* Creeping Thistle *Cirsium arvense,* Common Ragwort *Senecio jacobaea,* Lesser Trefoil *Trifolium dubium,* Yarrow *Achillea millefolium,* Colt's-foot *Tussilago farfara,* Selfheal *Prunella vulgaris,* Dandelion *Taraxacum officinale agg.,* Common Knapweed *Centaurea nigra* and mayweeds *Matricaria* spp*.*

In more established and more rank grassland habitats, there were stands of tall herbs including species such as Hemlock *Conium maculatum,* Rosebay Willowherb *Chamerion angustifolium,* Mugwort *Artemisia vulgaris* and yellow crucifers *Sinapis* spp*.,* these species often occurring in association with patches of Bramble scrub.

Bare ground occurred to a varying extent, being most prevalent close to and within disused tracks. Ground-nesting aculeate burrows were evident locally, but no large aggregations were found. However, at TQ 68224 80518, within 40 metres of the northwest extremity of sub-compartment C3, a significant aggregation of nesting aculeates was observed on a south-facing sandy bank

(Appendix 3, Photograph 19). There was also a reasonable amount of sandy bare ground, just within the site around TQ 68345 80472. The sandy bank supported a substantial nesting population of Spiny-legged Mason Bee *Odynerus spinipes* (Appendix 3, Photograph 20 shows nest chimney), as well as possible nesting Black-headed Mason Wasp *O. melanocephalus,* which was recorded elsewhere during the survey. Green-eyed Flower Bee *Anthophora bimaculata* and a sharp-tailed bee *Coelioxys* sp., possibly *C. rufescens*, which is a known parasite of *A. bimaculata*, were also recorded.

Sweep, vacuum and pitfall samples were mainly collected from the extreme south in C3, immediately to the north of C2. The habitat in the vicinity of the pitfall cluster PF.C3.1.1 and sweep sample SW.3.1.1 (both around TQ 68805 79844), was in a slightly raised area, over a substrate appearing to be Pulverised Fly Ash (PFA). The habitat had raised microtopography, with c30 percent bare ground and with graminoids including Wall Barley *Hordeum murinum*, Creeping Bent *Agrostis stolonifera* and Barren Brome *Anisantha sterilis* and herbs including Narrow-leaved Bird's-foot Trefoil, Lesser Trefoil *Trifolium dubium,* Viper's Bugloss, Charlock, Bristly Oxtongue, a mayweed *Matricaria* sp. and Ribwort Plantain.

Vacuum sample VAC.C3.1.1 (TQ 68787 79807) was collected from partially vegetated bare ground fairly close to the above, however, the bare ground cover was c10 percent, with low growing vegetation including Narrow-leaved Bird's-foot Trefoil, Bristly Oxtongue, Lesser Trefoil and Melilots *Melilotus* spp.

Sweep and vacuum samples SW.3.1.1 and VAC.C3.1.1, were both collected from around TQ 68614 79631, from slightly more diverse OMH, very close to the western extremity of C2. The habitat here was more established than the previous samples, with c5 percent bare ground, c70 percent vegetation, c30 percent flowering resource and a variable sward height. A similar range of herbs was recorded at this point, with additional species including Common Knapweed, Goat's-rue, Ox-eye Daisy, Common Bird's-foot Trefoil *Lotus corniculatus*, Lady's Bedstraw *Galium verum*, Selfheal *Prunella vulgaris,* Rough Hawk's-beard *Crepis biennis* and the graminoids, Yorkshire Fog and False Oat Grass.

Sub-Compartment C4

Sub-compartment C4 comprised an area approximately 32.9 hectares within the north-eastern most quarter of compartment C. The sub-compartment shared boundaries with C3 to west, the Thameside Nature Park (compartment B) to the north and the coastal habitat of SSSI Unit 3 to the east. At the time of survey, the coastal boundary of C4 was subject to landfill activity, as were significant areas of both northern and southernmost boundaries. Fieldwork was, therefore, primarily restricted to the westernmost portions of the sub-compartment.

Much of the habitat in C4 comprised fairly well established OMH. The habitat, formed predominately over sand, gravel and clay substrate, was largely free-draining and often fairly herb and flower-rich, with a significant proportion of bare ground, providing a combination of habitats suitable for supporting a representative invertebrate fauna typical of coastal brownfield habitat in the North Thames area. Although the habitat was largely flattish and often with little microtopographic variation, a partially vegetated, Pulverised Fly Ash (PFA) spoil heap located

around TQ 69059 79937, provided vertical and near vertical surfaces, which were extensively colonised by ground-nesting aculeates. This is described in greater detail below.

The vegetation was generally similar to that recorded from elsewhere in compartment C, with graminoids including Creeping Bent *Agrostis stolonifera*, Yorkshire Fog *Holcus lanatus*, Cock's-foot *Dactylis glomerata*, False Oat Grass *Arrhenatherum elatius* and locally, Tall Fescue *Festuca arundinacea.*

Herbs recorded included Narrow-leaved Bird's-foot Trefoil *Lotus tenuis*, Goat's-rue *Galega officinalis,* Common Bird's-foot Trefoil *Lotus corniculatus,* Bristly Oxtongue *Picris echioides,* Melilots *Melilotus spp,* Wild Carrot *Daucus carota,* Tufted Vetch/Fodder Vetch *Vicia cracca/villosa,* Charlock *Sinapis arvensis,* Ox-eye Daisy *Chrysanthemum leucanthemum,* Ribwort Plantain *Plantago lanceolata*, Black Medick *Medicago lupulina,* Creeping Thistle *Cirsium arvense* and White Clover *Trifolium repens.* Hare's-foot Clover *Trifolium arvense was also recorded* locally in C4.

There were also areas with Hemlock *Conium maculatum* and the localised presence of species including Hard Rush *Juncus inflexus* and Curled Dock *Rumex crispus,* indicated areas subject to drainage impedance, although the sub-compartment was dried out at the time of survey.

Bramble scrub occurred locally in the area, but was not as prevalent as some other sub-compartments in compartment C. There was, however, some non-native Buddleia *Buddleja davidii* scrub, scattered throughout the C4 sub-compartment.

Sweep and vacuum samples SW.C4.1.1 and VAC.C4.1.1, were both collected from around TQ 69114 80119 as was pitfall cluster PF.C4.1.1 (Appendix 3, Photograph 21). The habitat was a flattish area of OMH, with some subtle microtopographic variation and extensive colonisation by early successional herbs and grasses. The habitat was capped with similar sandy clay and gravelly substrate as much of compartment C, bare ground constituting around 10 percent cover in this area. Vegetation comprised graminoids including Creeping Bent and Yorkshire Fog*,* with herbs including Narrow-leaved Bird's-foot Trefoil, Common Bird's-foot Trefoil, Melilots *Melilotus* spp., Tufted/Fodder Vetch, Goat's-rue, Bristly Oxtongue, Ox-eye Daisy, and Charlock. Hemlock, Hard Rush, and Curled Dock also occurred locally.

Sweep and vacuum samples SW.C4.1.2 and VAC.C4.1.2, were both collected from around TQ 69213 80167 (Appendix 3, Photograph 22). The substrate and generally flat topography were similar to that described for the previous sample location; however, vegetation was somewhat more advanced in terms of colonisation. Bare ground patches constituted roughly five percent cover, graminoids including abundant Creeping Bent, with frequent Yorkshire Fog and Cock's-foot constituted c50 percent cover and herbs c45 percent.

Short herbs included Narrow-leaved Bird's-foot Trefoil, Bristly Oxtongue, Hare's-foot Clover, White Clover, Ribwort Plantain and Black Medick; these occurring in mosaic with taller species such as Goat's-rue, Melilots, Wild Carrot and Hemlock, which constituted approximately 20 percent cover.

A partially vegetated spoil heap located around TQ 69059 79937, was the location of spot search SS.C4.2. This feature (Appendix 3, Photographs 23 and 24) was composed of PFA, or a similar

substrate (see below) and formed a distinct, albeit smallish feature in a predominately flat landscape. The mound was approximately 10 metres tall, with a relatively narrow base in relation to height. The mound was largely vegetated by graminoids including Yorkshire Fog, but also Tall Fescue (which was otherwise infrequently recorded within the survey area) and tall herbs mainly including Charlock and Creeping Thistle. Natural England advise that this spoil heap is understood to comprise of Lytag material derived from the Tilbury 2 NSIP development. It is understood that the spoil heap is a temporary feature pending completion of the compensatory habitat creation nearby.

There were extensive areas of bare ground, both on the sloping elements of the mound, but also in the form of vertical cliffs. The latter of these, in particular, supported numerous aculeate burrows. Aculeates recorded directly in the area included crabronid wasps such as *Philanthus triangulum, Ammophila sabulosa* and *Astata boops*, mason wasps including both *Odynerus spinipes* and *O. melanocephalus;* bees including Green-eyed Flower Bee *Anthophora bimaculata*, as well as mining bee spp. including *Lasioglossum* spp. and *Andrena* spp. A dense resource of flowering Narrow-leaved Bird's-foot Trefoil and other herbs, at the base of the mound provided a sheltered and sunny forage for aculeates nesting within the bank.

Sub-Compartment C5

Sub-compartment C5 was one of the smaller survey sub-compartments within compartment C. The sub-compartment, comprised approximately 14.8 hectares and was located just south of the centre-point of the western boundary of compartment C. The southern boundary of C5 was adjacent to the large pond and associated wetland habitat in C1 and additional wetland habitat also occurred immediately outside the survey area to the north. To the east, C5 shared a boundary with the extensive compartment C3 and to the west, the sub-compartment was bounded by a scrub edge/field boundary shared with the capped former landfill habitat of compartment D.

Sub-compartment C5 was flattish, with a slight westerly incline and the habitat was, in the main, broadly similar to that described for C1 above; this habitat being well-established, comparatively herb-poor, tussocky rough grassland, with Bramble *Rubus fruticosus,* Hawthorn *Crataegus monogyna* and Blackthorn *Prunus spinosa* scrub. Sampling focused on the shorter and more herb-rich, trackside habitat along the eastern edge of C5, close to the boundary with C3.

Sweep and vacuum samples SW.C5.1.1 and VAC.C5.1.1 (TQ 68549 79522) were collected from short vegetation colonising the flattish, bare ground (clay, gravel, and sand) track margins; deep, historic vehicle tracks provided rutted, now partially vegetated, microtopography (Appendix 3, Photograph 25). Bare, sandy ground in this area comprised c40 percent cover, with the remainder vegetated with herbs including Narrow-leaved Bird's-foot Trefoil *Lotus tenuis*, Bristly Oxtongue *Picris echioides*, Goat's-rue *Galega officinalis* and White Clover *Trifolium repens,* in mosaic with taller sward False Oat Grass *Arrhenatherum elatius* and Cock's-foot *Dactylis glomerata* grassland.

Sweep and vacuum samples SW.C5.2.1 and VAC.C5.2.1 (TQ 68489 79753) were collected from the same track edge habitat as previously sampled, but from approximately 250 metres further north (Appendix 3, Photograph 26). Bare ground comprised a similar clay, gravel and sand substrate as the previous sample location and was similarly rutted by vehicle tracks. Bare ground

itself was recorded at approximately 80 percent cover, with the margins much more heavily vegetated, with a much lower (10 percent) cover of bare ground.

The marginal vegetation again supported extensive, flower-rich habitat predominately comprising Narrow-leaved Bird’s-foot Trefoil and Goat's-rue, with a similar range of additional species as the previously described sample location, with the addition of naturalised Hare's-tail Grass *Lagurus ovatus*; the sward varying between two and 15cm in height. However, the adjacent grassland, immediately to the west was Creeping Bent *Agrostis stolonifera*-dominated at this point.

Invertebrate species recorded

Sample methods used in the combined sub-compartments of compartment C, included timed sweep and vacuum sampling, pitfall trapping, direct searching, and spot sweeping. Sample locations are briefly described in Appendix 1, Table 1 and illustrated in Appendix 2, Figure 4.

From the 2022 survey of compartment C (C1,2,3,4 and 5 combined), a total of 409 invertebrate species, including 47 of recognised conservation status in the UK, were recorded. In terms of species deployment, Beetles (Coleoptera), were by far the best represented taxon (see chart, Figure 6) with 154 recorded species, the remaining larger orders were each represented by a similar number of species, with 60 species of bees, ants, and wasps (aculeate Hymenoptera), 54 species of spider (Araneae), 52 true bugs (Hemiptera) and 51 two-winged fly (Diptera) species.

13 species of butterfly and moth (Lepidoptera) mainly comprising butterflies, were recorded, with grasshoppers, crickets (Orthoptera) and allied species, being relatively well represented in proportion to the national species list, with eight species. The remaining higher-level taxa recorded from compartment C, comprised Isopoda (3 species), Opiliones (2 species) and Odonata and Lithobiomorpha each being represented by a single species.

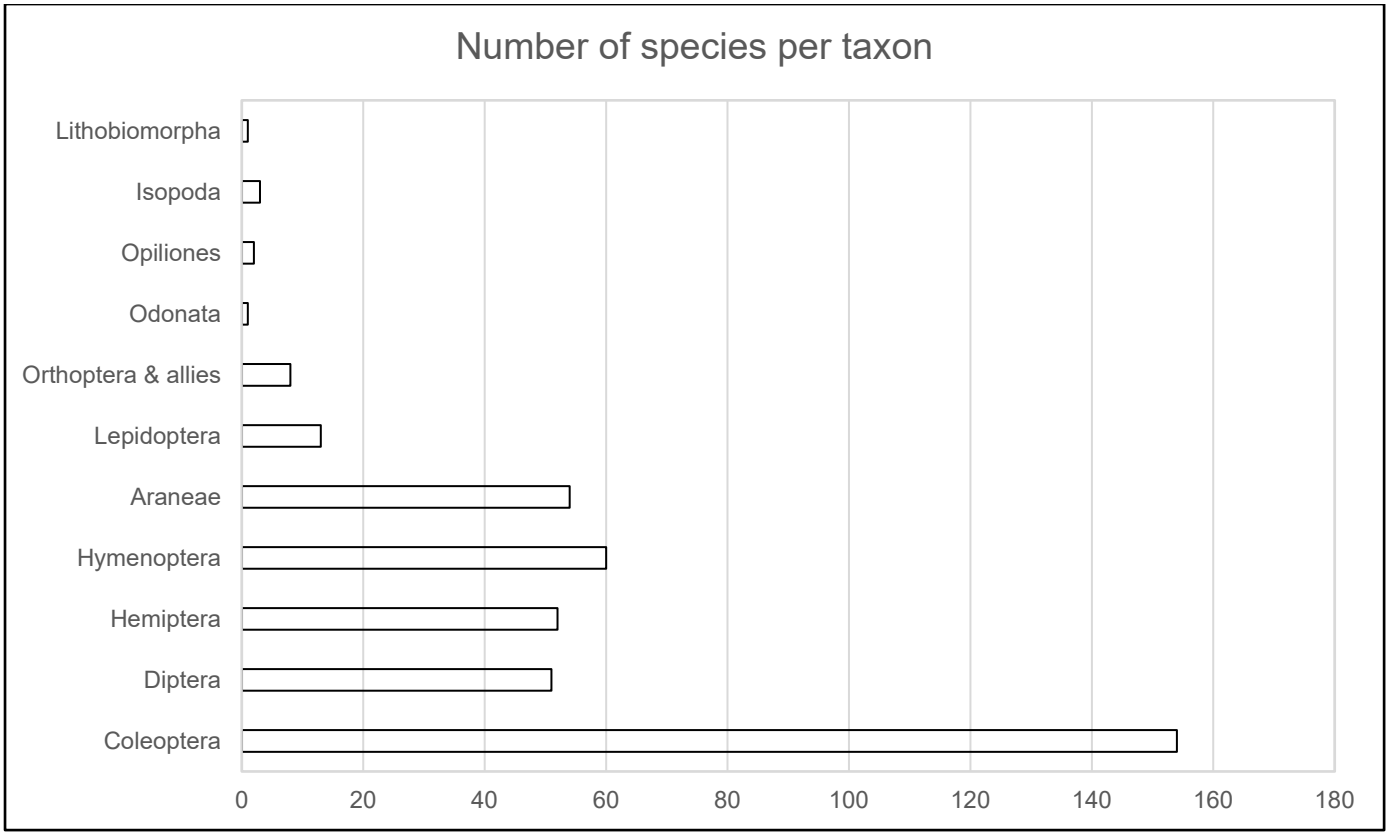

Figure 6: Species per higher taxon collected from combined compartment C samples during the 2022 survey

From the species data, 329 of the recorded species were classified at broad biotope level in Pantheon, as 'Open habitat' species, 23 as 'Wetland' species, 16 were 'Tree-associated' and five were associated with 'Coastal' habitats.

Species of recognised conservation recorded from compartment A1 are listed in Table 8 (below). A summary of the UK distribution and autecology of each is also included in Appendix 1, Table 1.

Species of particular note recorded from compartment C included two species, which despite being undoubted rarities, have yet to be given definite conservation status in the UK. The scarce Black Mining Bee *Andrena nigrospina* and its cuckoo species Kirby's Nomad Bee *Nomada subcornuta*, have both been subject to scrutiny. During the 2022 survey, *A. nigrospina* was recorded from pitfall trap samples set and collected during mid-June within flower rich OMH in sub-compartments C2 and C3. *Nomada subcornuta* was also recorded from sub-compartment C2, from the same pitfall cluster in which the host was found.

A. nigrospina is the rarer of two very similar species of black *Andrena,* both of which were recorded during the survey. Whilst *A. nigrospina* is strongly associated with the same brownfield habitats as *A. pilipes* within the Thames Gateway, the species occurs in widely scattered populations, both inland around Surrey, Staffordshire, and Worcestershire and on the coast. There are a number of recent records along the south Essex coast and the bee has been recorded within and around the general 2022 survey area. *A nigrospina* generally nests in sandy habitats (Pulverised Fuel Ash in Essex sites), using both vertical cliffs (as *A. pilipes*) and flat ground. Unlike

A. pilipes, A. nigrospina is single brooded, occuring from May to mid-July. The insect forages predominately on crucifers.

Else and Edwards (2018) stated that Kirby's Nomad Bee *Nomada subcornuta* 'is part of the *Nomada fulvicornis* species-group, which comprises several sibling species throughout Europe' and Falk (2004) concluded that it should be considered to be a biological form of *N. fulvicornis* Fabricius, apparently associated with a single host, the rare *Andrena nigrospina* Thomson. However, Else and Edwards (2018) also argued that 'Recent genetic analysis strongly suggests it represents a distinct species'.

In the UK, *N. subcornuta* is known from scattered records from southern England, north to Staffordshire. According to Falk and Lewington (2015), *N. subcornuta* is a much-declined species and modern records are confined to a few sites in Worcestershire, Staffordshire, Essex and Jersey. The bee is confined to habitats supporting the host *A. nigrospina*, which was also recorded during the 2022 survey. Falk and Lewington (2015) describe the habitat as being 'sandy habitats such as heathland, sandy arable margins and brownfield sites; also, soft-rock cliffs in Jersey, but rarely at coastal sites on the mainland.'

Another species of particular note recorded from compartment C during the 2022 survey was a malachite beetle *Cerapheles terminatus*[14], discussed previously in 'Combined Site-level Invertebrate overview' and in relation to compartments A1 and A6 (page 21). Whilst specimens recorded from A1 and A6 were both from wetland habitat typical of *C. terminatus*, the specimen from C2 was swept from dry, herb-rich OMH, with partially vegetated bare ground/chalk.

Other species of higher recognised conservation status recorded in compartment C are discussed in relation to habitat-level affinities as defined in Pantheon in the following paragraphs.

The largest number of species recorded by far from the 2022 survey were attributed to the two main open ground habitat-level assemblages, 'Tall sward and scrub' and 'Short sward and bare ground'. Whilst the largest number of species was attributed to 'Tall sward and scrub' (200 species), compared to 128 attributed to 'Short sward and bare ground'. The proportion of the national species pool attributed to the latter assemblage was greater, being 10 percent compared to the eight percent represented for 'Tall sward and scrub'; furthermore, a greater proportion of species of conservation status were attributed to 'Short sward and bare ground', compared with 'Tall sward and scrub'. The species deployment reasonably reflected the habitats targeted within the various subsections of compartment C, which included extensive areas of both early successional OMH and more established taller sward grassland and scrub habitat.

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[14]Due to subtle morphological differences, Steven Lane conjectured that the specimens of *C. terminatus* recorded during the 2022 survey may be closer to *C. lateplagiatus*, a species known from Europe, but not previously known from the UK. Following consultation with other UK and European coleopterists familiar with the genus; it was however considered that the species was more likely to be a form of *C. terminatus*. Whilst there is a need for clarification, the specimens recorded during the survey are listed within this report as *C. terminatus* pending further investigation.

Species of recognised conservation status with an affinity to 'Tall sward and scrub' recorded from compartment C, included section 41 priority species including the Shrill Carder Bee *Bombus sylvarum* (recorded from C1) and Brown-banded Carder Bee *B. humilis* (C1 and C3); the latter of these being better represented than the former, workers of which were just starting to emerge during the second sample event. Another s41 species, classed as Near Threatened under post-2001 IUCN criteria, the Phoenix Fly *Dorycera gramineum*, was recorded from C2 and C4 as well as from compartments B and D. The RDB3 listed Little Blue Carpenter Bee *Ceratina cyanea*, previously discussed in relation to compartment B, was recorded from sub-compartments C2 and C3, during the 2022 survey. The habitats from which the bee was recorded were warm and sheltered and supported at least some Bramble *Rubus fruticosus* agg. habitat for nesting.

Spiders currently classed as nationally scarce, attributed to 'Tall sward and scrub', recorded from compartment C, included a gnaphosid spider *Drassodes pubescens* (previously discussed in relation to compartment B) and a running-crab spider *Thanatus striatus,* which was recorded from C5, as well as from SSSI Unit 1 and from upper saltmarsh in all three SSSI saltmarsh Units surveyed in 2022. Historically, *T. striatus* has been well recorded from both coastal and inland sites in Essex. The spider is typically found on the ground at the base of vegetation, occurring in a variety of habitats including, according to Harvey *et al*. (2002), 'sandy grassland, heathland and dunes but also in tussocky grassland on sea walls, in brackish grassland, saltmarsh, dyke edges, waste ground and old sand pits.'

Another nationally scarce spider not attributed at habitat-level within Panthreon, was *Kochiura aulica*, a species of comb-footed spider, in which the male has distinctively fringed palps. According to Harvey *et al.* (2002) *K. aulica* is restricted mainly to lowland heathland and a few grassland sites in southern England. In Essex and north Kent, the spider occurs in post-industrial habitats in conditions which structurally and climatically resemble heathland and in particular where Gorse *Ulex europaeus* occurs. During the 2022 survey *Kochiura aulica* was recorded both from established grassland adjacent to the sea wall in C1 and from partially vegetated OMH in C5.

Nationally scarce beetles associated with 'Tall sward and scrub' recorded from compartment C included the Bloody Crane's-bill Weevil *Zacladus exiguus* from C1 and a parthenogenetic weevil *Orthochaetes setiger*, recorded from C2 and C5. Both species were previously discussed in relation to compartment B. Another nationally scarce weevil, recorded from sub-compartment C3 (as well as in SSSI Unit 1) was *Liparus coronatus.*

Liparus coronatus is a large and heavily built weevil, which despite its conspicuous size and distinctive appearance, is poorly recorded from Essex. Duff (2016) states that it is usually found 'in open grassland, often on calcareous soils', where it feeds 'on or at the roots of Cow Parsley *Anthriscus sylvestris* and possibly on other members of the umbellifer family (Apiaceae)'. During the 2022 survey, *L. coronatus* individuals were found both in the dry, coastal grassland of sub-compartment C2 and in SSSI Unit 1.

Ladybirds including nationally scarce *Platynaspis luteorubra* and the previously discussed, Adonis Ladybird *Hippodamia variegata* were both recorded from compartment C. Both species are well recorded from the Kent and Essex sides of the Thames and according to Hyman and Parsons (1992), *P. luteorubra* is associated with 'Woodland, hedgerows and coastal shingle,'. The insect

typically occurs in grass roots and from various scrub species and was recorded from sub-compartment C1 during the 2022 survey.

Another nationally scarce beetle attributed to 'Tall sward and scrub' recorded was *Aphthona nigriceps*, a species of flea beetle (Chrysomelidae) which feeds on Crane's-bills *Geranium* spp. and Stork's-bills *Erodium* spp., where it occurs in grassland, wetland, fens, river margins and parkland habitats (Hyman and Parsons, 1992).

Dicraeus tibialis, listed as pNS (nationally scarce) in a review by Falk *et al* (2016) was the least common of 12 species of the family Chloropidae, or grass flies, recorded from compartment C. The fly was recorded only from tall grassland habitat close to the sea wall in C1. Falk *et al* (2016) cites calcareous to neutral unimproved grasslands as the main *D. tibialis* habitat, but the fly has also been recorded from 'waste ground and coastal grassland'.

Table 3 - Species of recognised conservation recorded in compartment C from 2022 data. Blank cells indicate where UK status and IUCN post-2001 threat status not available.

Common name	*Scientific name*	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
A gnaphosid spider	*Drassodes pubescens*	Gnaphosidae	Araneae	Nationally Scarce	LC
A lycosid spider	*Pardosa agrestis*	Lycosidae	Araneae	Nationally Scarce	LC
A running crab spider	*Thanatus striatus*	Philodromidae	Araneae	Nationally Scarce	LC
A jumping spider	*Sibianor aurocinctus*	Salticidae	Araneae	Nationally Scarce	LC
A comb-footed spider	*Enoplognatha mordax*	Theridiidae	Araneae	Nationally Scarce	LC
A comb-footed spider	*Kochiura aulica*	Theridiidae	Araneae	Nationally Scarce	LC
A zodariid spider	*Zodarion italicum*	Zodariidae	Araneae	Nationally Scarce	LC
An anthicid beetle	*Cordicollis instabilis*	Anthicidae	Coleoptera	Nationally Scarce	LC

Common name	*Scientific name*	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
An apionid weevil	*Protapion filirostre*	Apionidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Amara montivaga*	Carabidae	Coleoptera	Nationally Scarce	LC
Bombadier beetle	*Brachinus crepitans*	Carabidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Harpalus attenuatus*	Carabidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Panagaeus bipustulatus*	Carabidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Polystichus connexus*	Carabidae	Coleoptera	Nationally Scarce	NT
A flea beetle	*Aphthona nigriceps*	Chrysomelidae	Coleoptera	Nationally Scarce	LC
A seed beetle	*Bruchidius imbricornis*	Chrysomelidae	Coleoptera	Recent UK colonist	NE
A seed beetle	*Bruchus brachialis*	Chrysomelidae	Coleoptera	Recent UK colonist	NE
Ant-nest Ladybird	*Platynaspis luteorubra*	Coccinellidae	Coleoptera	Nationally Scarce	NE
A weevil	*Calosirus terminatus*	Curculionidae	Coleoptera	Nationally Scarce	NE
A weevil	*Liparus coronatus*	Curculionidae	Coleoptera	Nationally Scarce	NE
A weevil	*Orthochaetes setiger*	Curculionidae	Coleoptera	Nationally Scarce	NE

Common name	*Scientific name*	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
A weevil	*Sitona waterhousei*	Curculionidae	Coleoptera	Nationally Scarce	NE
A weevil	*Smicronyx reichi*	Curculionidae	Coleoptera	Nationally Scarce	NE
A weevil	*Tychius squamulatus*	Curculionidae	Coleoptera	Nationally Scarce	NE
Bloody Crane's-bill Weevil	*Zacladus exiguus*	Curculionidae	Coleoptera	Nationally Scarce	NE
A latridiid beetle	*Melanophthalma suturalis*	Latridiidae	Coleoptera	RDBK (Insufficiently known)	NE
A malachite beetle	*Cerapheles terminatus*	Malachiidae	Coleoptera	Nationally Rare	LC
A pollen beetle	*Meligethes fulvipes*	Nitidulidae	Coleoptera	Nationally Scarce	NE
A shining flower beetle	*Olibrus flavicornis*	Phalacridae	Coleoptera	Red Data Book-insufficiently known	DD
A frit fly	*Dicraeus tibialis*	Chloropidae	Diptera	pNS	LC
Phoenix Fly	*Dorycera graminum*	Ulidiidae	Diptera	S41 Priority species; Near Threatened (Post-2001 IUCN criteria)	NT
A stilt bug	*Berytinus hirticornis*	Berytidae	Hemiptera	Nationally Scarce	LC

Common name	*Scientific name*	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
A leafhopper	*Ophiola decumana*	Cicadellidae	Hemiptera	Nationally Scarce	LC
A planthopper	*Asiraca clavicornis*	Delphacidae	Hemiptera	Nationally Scarce	LC
A ground bug	*Nysius huttoni*	Lygaeidae	Hemiptera	Recent UK colonist	NA
Scarce Tortiose Shieldbug	*Eurygaster maura*	Scutelleridae	Hemiptera	Nationally Scarce	LC
Scarce Black Mining Bee	*Andrena nigrospina*	Andrenidae	Hymenoptera		
Brown-banded Carder Bee	*Bombus humilis*	Apidae	Hymenoptera	S41 Priority species	
Shrill Carder Bee	*Bombus sylvarum*	Apidae	Hymenoptera	S41 Priority species	
Blue Carpenter Bee	*Ceratina cyanea*	Apidae	Hymenoptera	RDB3 pre-1994 criteria	LC
Kirby's Nomad Bee	*Nomada subcornuta*	Apidae	Hymenoptera		
Spined Hylaeus	*Hylaeus cornutus*	Colletidae	Hymenoptera	Nationally Scarce	LC
Beewolf	*Philanthus triangulum*	Crabronidae	Hymenoptera	Nationally Vulnerable (RDB2 pre-1994)	LC
Black-headed Mason Wasp	*Odynerus melanocephalus*	Eumenidae	Hymenoptera	S41 Priority species;	

Common name	*Scientific name*	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
				Nationally Scarce	
Squat Furrow Bee	*Lasioglossum pauperatum*	Halictidae	Hymenoptera	RDB3 pre-1994 criteria	
Lobe-spurred Furrow Bee	*Lasioglossum pauxillum*	Halictidae	Hymenoptera	Nationally Scarce	LC
Ridge-cheeked Furrow Bee	*Lasioglossum puncticolle*	Halictidae	Hymenoptera	Nationally Scarce	LC
Swollen-thighed Blood Bee	*Sphecodes crassus*	Halictidae	Hymenoptera	Nationally Scarce	LC
Little Sickle-jawed Blood Bee	*Sphecodes longulus*	Halictidae	Hymenoptera	Nationally Scarce	LC
Red-tailed Blood Bee	*Sphecodes rubicundus*	Halictidae	Hymenoptera	Nationally Scarce	LC
Silvery Leafcutter Bee	*Megachile leachella*	Megachilidae	Hymenoptera	Nationally Scarce	LC
Small Heath	*Coenonympha pamphilus*	Nymphalidae	Lepidoptera	S41 Priority species	NT

Species of recognised conservation status recorded from compartment C, which are associated with 'Short sward and bare ground' habitats in Pantheon included two species listed as section 41 'priority species'; the Black-headed Mason Wasp *Odynerus melanocephalus* and Small Heath *Coenonympha pamphilus*, the latter of which has been discussed in relation to sub-compartment A6 and compartment B.

During the 2022 survey, both *O melanocephalus* and its more widespread sibling species *Odynerus spinipes* were recorded within compartment C. *O. melanocephalus* was one of several aculeates recorded from the vicinity of a partially vegetated spoil mound in C4. The insect is a scarce and locally distributed species in the UK, which has been historically recorded from several locations in south Essex. The wasp excavates multi-celled nests on level, exposed areas of soil, which it provisions with weevil larvae and smaller butterfly and moth caterpillars. Besides the adult

insects, nesting chimneys of both *O melanocephalus,* on level ground and *O. spinipes* on vertical surfaces (Appendix 3, Photograph 20), were recorded during the survey.

A number of other species of note associated primarily with short sward and bare ground habitats were recorded from compartment C during the 2022 survey.

These included three nationally scarce spiders; including the previously mentioned wolf spider *Pardosa agrestis*, a jumping spider *Sibianor aurocincta* and a zodariid spider *Zodarion italicum.* All three species are strongly thermophilic and occur in sparsely vegetated habitats with a warm microclimate. Whilst these spiders are scarce and locally distributed in the UK as a whole, all three are well represented, both in south Essex and on the north Kent coast immediately south of the Thames. Other locally distributed spiders associated with short sward and bare ground habitats recorded from compartment C, included a crab spider *Xysticus kochi,* another jumping spider *Talavera aequipes* and gnaphosid spiders including *Drassyllus pusillus* and *Trachyzelotes pedestris*.

A number of Nationally Scarce and local beetle species with more xerophilic, free-draining sandy, or calcareous habitat preferences were recorded from compartment C. These included ground beetles *Amara montivaga, Harpalus attenuatus* and *Panageus bipustulatus,* all of which were recorded from the chalky, herb-rich but sparsely vegetated habitat of C2 and the Bombardier Beetle *Brachinus crepitans*, which was recorded from similar OMH in sub-compartments C3 and C4. Whilst these species are of restricted occurrence in the UK, all four are well recorded from the south Essex coastal grassland and brownfield sites.

Besides the Carabidae, weevils of the families Apionidae and Curculionidae were well represented within the 2022 samples collected from compartment C, and several species of recognised conservation status in the UK with a recorded association with sparsely vegetated, short sward habitats, were recorded.

The nationally scarce *Protapion filirostre*, is arguably the least common of the 13 species of the family Apionidae recorded from compartment C. The beetle is, according to Hyman and Parsons (1992), primarily recorded from field margin, disturbed ground and quarry habitats and in the UK, it is associated with Black Medick *Medicago lupulina* (Lucerne *M. sativa* in Europe).

Of the four species of Curculionidae of recognised conservation status attributed to the 'Short sward and bare ground' assemblage in Pantheon, *Smicronyx reichii*, with a current status of RDB3[15] 'rare', under pre-1994 criteria, is arguably the least common. There is a few post-1990 records of the weevil from south Essex in close proximity of the 2022 survey area; however, in the UK as a whole records are sparse. *S. reichii* is associated with calcareous grassland habitats where its primary foodplants include Common Centaury *Centaurium erythraea* and Yellow Wort

[15] The RDB3 status of *Smicronyx reichi* is in parenthesis in the Pantheon output, indicating that this may be subject to review in the near future

Blackstonia perfoliata (Hyman and Parsons, 1992). Both these plants were present in the C2 sample area from which the beetle was recorded.

The three remaining weevils of recognised conservation status with an affinity to 'Short sward and bare ground' habitat, were all also recorded only from sub-compartment C2 during the 2022 survey. These species included *Calosirus terminatus*, a species associated with habitats of warm microclimate supporting its sole UK foodplant Wild Carrot *Daucus carota*; *Tychius squamulatus*, which, according to Duff (2016), is associated with Common Bird's-foot-trefoil *Lotus corniculatus* (*Lotus tenuis* was far commoner in the C2 compartment), in sparsely-vegetated habitats and *Sitona waterhousei*, a distinctive species of pea weevil, which is also mainly associated with calcareous habitats supporting bird's-foot trefoils *Lotus* spp. (Hyman and Parsons (1992) cite both *Lotus corniculatus* and *L. tenuis*).

Besides Coleoptera, several true bugs (Hemiptera) of recognised conservation status associated with short sward and bare ground habitats were recorded from compartment C. These included four species, all nationally scarce; the stiltbug *Berytinus hirticornis* (previously discussed in relation to A1), the Scarce Tortoise Bug *Eurygaster maura*; *Asiraca clavicornis* a highly distinctive species of planthopper (Delphacidae) and *Ophiola decumana*, a leafhopper (Cicadellidae). Whilst these species have restricted ranges nationally, all four have been reasonably well recorded from OMH and dry grassland sites in the south Essex area. *Eurygaster maura* feeds on graminoids, whilst, according to Kirby (1992), *O. decumana* is a species of dry grassy heathland and acid grassland, which has been associated with ericoids as well as Sheep's Sorrel *Rumex acetosella*, Rosebay Willowherb *Chamerion angustifolium* and Creeping Soft Grass *Holcus mollis.*

Aculeate Hymenoptera associated with short sward and bare ground habitat, included the previously mentioned Scarce Black Mining Bee *Andrena nigrospina* and Kirby's Nomad Bee *Nomada subcornuta*. Of the remainder, whilst the Beewolf *Philanthus triangulum* is still listed as RDB2 'Vulnerable', it is now well recorded in suitable habitats in the UK.

The Squat Furrow Bee *Lasioglossum pauperatum* is the rarest of 11 species of Lasioglossum recorded from compartment C. The species currently retains its RDB3 'Rare' status and is still largely restricted to southeast England, including south Essex. According to Else and Edwards (2018), *L. pauperatum* has a 'strong preference for sandy soils, both inland and on the coast' and the majority of Essex records are from brownfield and Thames terrace grassland sites.

Other mining bee species of recognised conservation status recorded from compartment C included previously discussed Ridge-cheeked Furrow Bee *Lasioglossum puncticolle*, Lobe-spurred Furrow Bee *L. pauxillum* and the Large Gorse Mining Bee *Andrena bimaculata*. Three nationally scarce species of blood bee Sphecodes were also recorded including Swollen-thighed Blood Bee *S. crassus* previously discussed in relation to compartment B, Little Sickle-jawed Blood Bee *Sphecodes longulus* and Red-tailed Blood Bee *Sphecodes rubicundus*.

Specodes species are cleptoparasites of other mining bees; The main recorded host of *S. longulus is* Least Furrow Bee *Lasioglossum minutissimum*, whilst *Sphecodes rubicundus* is associated with Meadow Mining Bee *Andrena labialis* and possibly also, the Yellow-legged Mining Bee *Andrena flavipes*; all three of these potential hosts were recorded from compartment C during the 2022 survey.

In addition to the above, the Six-belted Clearwing Moth *Bembicia ichneumoniformis* is worthy of note. The species is no longer classed as nationally scarce in the UK but is usually associated with short-sward grassland habitat of some conservation value. During the 2022 survey, Six-belted Clearwing was recorded from the herb-rich, short sward grassland and bare ground habitat of sub-compartment C2. The main larval foodplant is listed in Waring and Townsend (2003) as Common Bird's-foot Trefoil *Lotus corniculatus*, although it has also been recorded from Kidney Vetch *Anthyllis vulneraria* and may well feed on *Lotus tenuis* within the recorded survey area.

Wetland assemblages were poorly represented within compartment C and of the 23 wetland species recognised in Pantheon, most were relatively widespread and common. However, the running water associated, nationally scarce ground beetle *Polistichus connexus*, previously described in relation to compartment B, was recorded from C4 during the survey.

Three nationally scarce species were attributed to coastal habitats for compartment C. These included two saltmarsh associated species; a comb-footed spider *Enoplognatha mordax,* discussed in relation to compartment B and a picture-winged fly *Melieria picta*, also recorded from sub-compartment A1. The third nationally scarce species with a coastal affinity recorded from compartment C, was *Cordicollis instabilis*, an anthicid beetle associated with saltmarsh, sandy shores and under beach strandline debris. During the 2022 survey, *C. instabilis* was recorded from sub-compartments C2 and C4; on both occasions the habitat was partially vegetated OMH, a reasonable distance inland of the saltmarsh; however, the insect was also recorded from saltmarsh in SSSI Unit 3 during the survey.

Compartment D (Walsh East Tilbury Quarry)

Compartment D was a large site of approximately 99.8 hectares, comprising capped former landfill and areas of active farmland managed for cattle-grazing and hay. The site was topographically diverse, with steep banks, areas of partially vegetated OMH over chalk ballast, with extremely varied topography and microtopography. The eastern boundary of the site adjacent to the sea wall supported a well-established, locally herb-rich grassland strip. Immediately inland of this feature, were vegetated, brackish ditches, which ran parallel to the eastern site boundary, for much of its length. There were also extensive open-water lagoons in the central northern section of the site and also, in the south-eastern corner of the site, adjacent to the seawall.

The raised western boundary of the site culminated in a steep southwest to northwest-facing escarpment, which supported tall sward grassland with tall herb vegetation, including forage species such as Goat's-rue *Galega officinale*, Wild Carrot *Daucus carota* and Ox-eye Daisy *Chrysanthemum leucanthemum* and scrub.

For the purpose of survey, sampling focused primarily on OMH and more herb-rich grassland areas of the site. Some samples were taken from marginal habitat adjacent to the waterbodies and ditches, where herb-rich short-sward, drier grassland merged into wetter, more brackish grassland and macrophyte vegetation at the margins of the site.

In visual terms, certain areas of the site looked promising, but at the time of survey, yielded surprisingly few species when direct sampling and spot searches were carried out. An area of chalky ballast, similar in structure and composition to that recorded in compartment C2, despite

being structurally and floristically diverse, yielded relatively few species at the time of survey, during a period of warm sunny weather. However, more low lying, flower-rich areas of OMH and coastal grassland were often more profitable. A possible explanation was that the chalky substrate was often extremely hard and therefore, less easily excavated by aculeates than some of the softer, more friable substrates on site.

Sweep and vacuum samples SW.D1.1 and VAC.D1.1 were collected around TQ 68759 78709 from OMH situated on the rutted edge of a bund towards the western site boundary in the north of the site. Unvegetated bare ground, comprising sandy clay and gravel, occupied c10 percent cover, in this area (Appendix 3, Photograph 27).

Vegetation at this point was relatively well established and flower-rich, with graminoids including Yorkshire Fog *Holcus lanatus*, Perennial Rye Grass *Lolium perenne*, Bent Grass *Agrostis stolonifera* and Cock's-foot *Dactylis glomerata*, with localised patches of Common Reed *Phragmites australis*, indicating drainage impedance. Herb species recorded included Narrow-leaved Bird's-foot Trefoil *Lotus tenuis,* White Clover *Trifolium repens,* Red Clover *T. pratense,* Melilots *Melilotus spp.,* Ox-eye Daisy *Chrysanthemum leucanthuemum,* Bristly Oxtongue *Picris echioides*, Goat's-rue *Galega officinalis* and Tufted Vetch/Fodder Vetch *Vicia cracca/villosa.*

Sweep and vacuum samples SW.D1.2 and VAC.D1.2 (TQ 68899 78764) were from around 150 metres east of the previous sample location and from broadly similar habitat; however, the substrate here appeared to be closer to PFA than the usual capping material (Appendix 3, Photograph 28). The vegetation composition was, however, more or less identical to that recorded from the previous location, both in terms of graminoids and herbs. As typical throughout much of the OMH encountered during the 2022 survey areas, Narrow-leaved Bird's-foot Trefoil was dominant in this location and the density of flowering resource was high. However, much of the habitat within the general area to the south of this sample location was less diverse and less flower-rich.

The location of sweep and vacuum samples SW.D1.3 and VAC.D1.3 (TQ 69151 78749) (Appendix 3, Photograph 29) was about 250 metres east from sample location SW.D1.2 and comprised partially vegetated clay/gravel capping on generally level ground. The level of succession was not as pronounced in this area than the previous, with c40 percent cover of unvegetated bare ground. The general vegetation composition was similar to elsewhere on the site, with low-growing Narrow-leaved Bird's-foot Trefoil being most abundant, alongside Bristly Oxtongue, Charlock *Sinapis arvensis*, Tufted Vetch/Fodder Vetch *Vicia cracca/villosa,* Black Medick *Medicago lupulina,* Melilots, Goat's-rue and Common Mallow *Malva sylvestris*.

Samples SW.D1.4 and VAC.D1.4 (TQ 69433 78781) were collected from about 285 metres east from previously described sample site, SW.D1.3, from a point approaching the northeast corner of the compartment, adjacent to the seawall (Appendix 3, Photograph 30). The habitat at this location was representative of the more established grassland, which formed a narrow, continuous strip along the western boundary of the site, between the sea wall and parallel wet ditches inland. The grassland at the location of the sample occupied a gentle, northwest-facing slope parallel to the path at its base. The sward height ranged between two to 20cm in height, being shorter around the track, which also provided localised patches of compacted bare ground (c5 percent cover).

The grassland comprised graminoids variously including False Oat Grass *Arrhenatherum elatius*, Cock's-foot *Dactylis glomerata*, Yorkshire Fog *Holcus lanatus*, Yellow Oat Grass *Trisetum flavescens* and Crested Dog's-tail *Cynosurus cristatus*, with herbs including White Clover*,* Red Clover, Narrow-leaved Bird's-foot Trefoil, Bristly Oxtongue, Viper's Bugloss *Echium vulgare*, as well as naturalised non-native species including Lucerne *Medicago sativa* and Salsify *Tragopogon porrifolius.*

The habitat along the seawall benefitted from shelter to the seaward side and provided a continuous foraging resource for aculeates, including the s41 bumblebee species Shrill Carder *Bombus sylvarum* and Brown-banded Carder Bee *B. humilis*.

Samples SW.D1.5 and VAC.D1.5 (TQ 69378 78310) were collected from habitat close to the eastern (seaward) site boundary, roughly midway between the northern and southern extremities of the site. The habitat here was relatively lush and herb-rich, occupying a lowland area between a sparsely vegetated track and a recently created open water lagoon (Appendix 3, Photograph 31). The habitat was relatively flat and sheltered, with approximately five percent cover of bare ground mainly around the track. The sward height was uneven, ranging between c5 to 30cm and comprised a range of coarse grasses such as False Oat Grass, Common Couch *Elytrigia repens*, Yorkshire Fog and Perennial Rye Grass and herbs including abundant Narrow-leaved Bird's-foot Trefoil and Goat's-rue and a range of other species including Fodder Vetch, Curled Dock *Rumex crispus*, Meadow Buttercup *Ranunculus acris*, Creeping Buttercup *R. repens*, Bristly Oxtongue and Melilot spp.

The SW.D1.6 and VAC.D1.6 (TQ 69331 78400) sample location was approximately 100 metres northwest of that of SW.D1.5 and occupied a flower-rich strip between an expanded wet ditch/narrow lagoon to the east and a field cut for hay to the west (Appendix 3, Photograph 32). The habitat was on flattish ground and comprised lush, Fodder Vetch dominated flower-rich habitat, possibly sown. Other herbs recorded included Meadow Buttercup, a mayweed *Matricaria* sp., Prickly Sow-thistle *Sonchus asper*, Wild Carrot *Daucus carota*, Bristly Oxtongue and Charlock, with few graminoids other than False Oat Grass and Common Couch. Bare ground, which was mainly confined to the margin of the adjacent hayfield, constituted c10 percent cover.

Samples SW.D1.7 and VAC.D1.7 (TQ 69185 78503) were collected from the flattish top of an area of chalky ballast substrate (Appendix 3, Photograph 33). There was significant microtopographical variation within the habitat, which was was largely unvegetated. Colonising vegetation occupied approximately 20 percent cover at the time of survey and comprised predominately of low-growing Narrow-leaved Bird's-foot Trefoil with Yorkshire Fog and other herbs including Melilots, Goat's-rue, Charlock and Yellow Wort *Blackstonia perfoliata*.

Samples SW.D1.8 and VAC.D1.8 (TQ 68552 78000) were collected from close to the southwest corner of the site. The habitat here comprised dense, tall sward grassland occupying a fairly steep, southwest facing escarpment with graminoids including False Oat Grass, Cock's-foot, Yorkshire Fog and Yellow Oat Grass *Trisetum flavescens* and herbs including Melilots, Ox-eye Daisy, Fodder Vetch, Creeping Thistle *Cirsium arvense*, Bristly Oxtongue, Viper's Bugloss and Wild Carrot.

The habitat in the locations of spot sweeping and direct searches within compartment D were as follows:

SS.D.2.1 (TQ 68646 77778) (Appendix 3, Photograph 34). Disturbed OMH in the extreme south of compartment D, close to the site entrance. Habitat in this location included partially vegetated spoil mounds. Early successional vegetation comprised: Charlock, Bristly Oxtongue and mayweeds *Matricaria/Tripleurospermum* spp.

SS.D.2.2 (TQ 68469 78253). Tall grassland habitat occupying west-facing bank, close to the western site boundary. The habitat was vegetated with tall graminoids (as other tall grassland areas on site) with Ox-eye Daisy, Goat's-rue, Creeping Thistle, Wild Carrot and mayweeds *Matricaria/Tripleurospermum* spp.

SS.D.2.3 (TQ 68745 78686 to TQ 68848 78852) (Appendix 3, Photograph 35). OMH including a large spoil heap (not photographed) located towards the northwest corner of the site. The spoil heap was banked-up providing a generally east-facing escarpment. The mound was partially vegetated with graminoids including Common Bent Grass *Agrostis capillaris,* Common Couch *Elytrigia repens* and Yorkshire Fog; as well as herbs including Narrow-leaved Bird's-foot Trefoil, Bristly Oxtongue, Goat's-rue, Creeping Thistle and Charlock.

SS.D.2.4 (TQ 69106 78596). OMH in the vicinity of recently created lagoon and raised chalky area (Appendix 3, Photograph 36). Habitat searched included sheltered, partially vegetated bare ground (sand/clay/gravel), with varied microtopography and also, the adjacent raised, partially vegetated chalk ballast habitat (as earlier SW.D1.7 and VAC.D1.7 sample location). The vegetation of the lower, lagoon side habitat included Creeping Bent, with herbs including Narrow-leaved Bird's-foot Trefoil, Goat's-rue, Common Ragwort *Senecio jacobaea,* Bristly Oxtongue, Colt's-foot *Tussilago farfara* and a mayweed *Matricaria/Tripleurospermum* sp.

SS.D.2.5 TQ 69375 78310 (habitat as previously described for SW.D1.5 and VAC.D1.5).

Much of the OMH and grassland habitat within Compartment D, supported a flower-rich resource and the habitats adjacent to the created waterbodies often provided structurally diverse and dynamic habitat in a close mosaic. Such habitat would be expected to support invertebrates typical of F111 (bare sand and chalk) and F112 (open short sward) assemblages including an evident wealth of ground and stem-nesting aculeates. However, despite suitable weather conditions, spot sampling and direct searching did not yield large catches and whilst a reasonable diversity of characteristic species were obtained from the area, including a number of rarities, species were rather diffusely spread over a large area and there were few hotspots of localised abundance. The habitat in this area was recently created and this may have influenced the number of species recorded from spot sampling and direct searching.

Invertebrate species recorded

Sample methods used in compartment D, included timed sweep and vacuum sampling, direct searching, and spot sweeping. Sample locations are briefly described in Appendix 1, Table 1 and illustrated in Appendix 2, Figure 5.

From the 2022 survey of compartment D, a total of 281 invertebrate species, including 26 of recognised conservation status in the UK, were recorded. In terms of species deployment, Beetles (Coleoptera), were the most strongly represented taxon, (illustrated in Figure 7) with 99 recorded species, two-winged flies (Diptera) were represented by 49 species, true bugs (Hemiptera) by 42 species, followed by Araneae (36 spp) and Aculeate Hymenoptera (35 spp).

11 species of butterfly and moth (Lepidoptera) mainly comprising butterflies, were recorded, with grasshoppers, crickets (Orthoptera) and allied species, being represented by five species. Other higher-level taxa recorded from compartment D, included Opiliones (2 species) and Isopoda and Psocoptera, each represented by a single species.

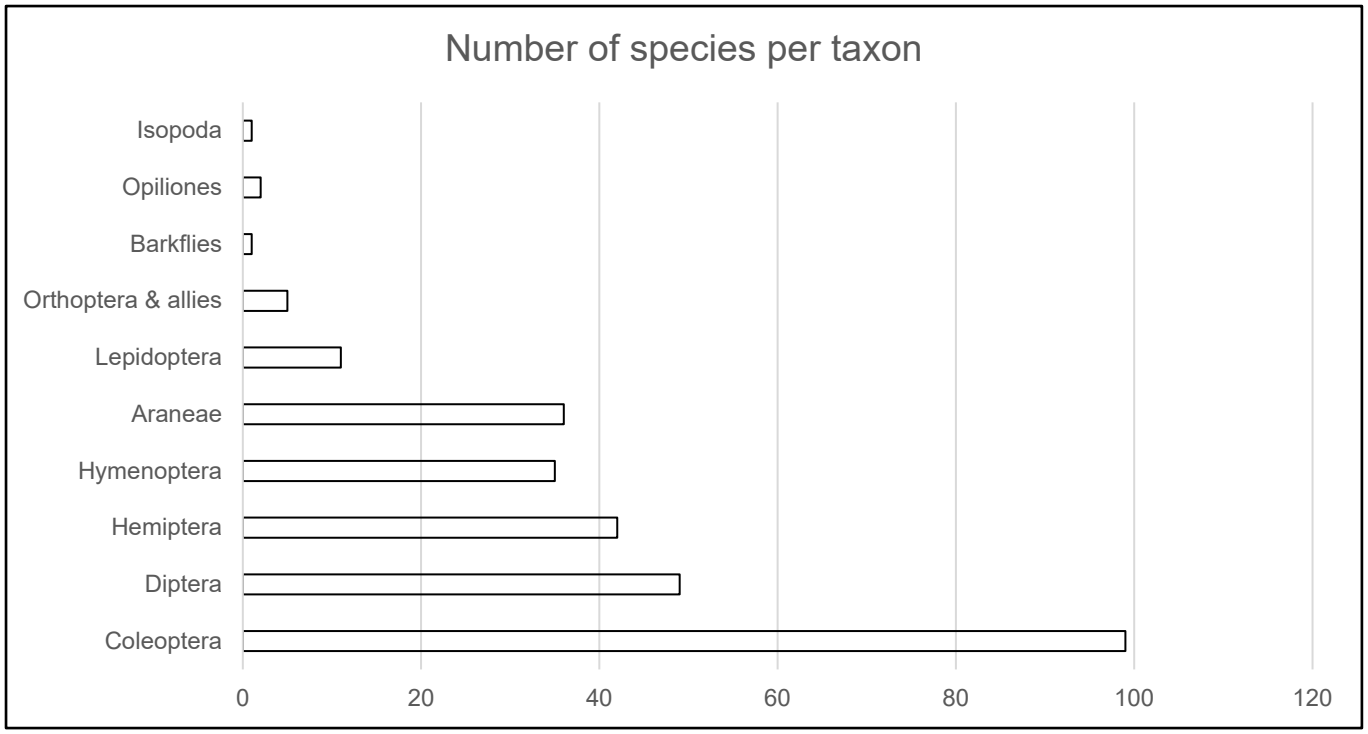

Figure 1 - Species per higher-taxon collected from compartment D during the 2022 survey

From the species data, 205 species were classified at broad biotope level in Pantheon, to the 'Open habitat' assemblage, with 19 'Wetland', 12 'Tree-associated' and seven 'Coastal' species.

Species of recognised conservation recorded from compartment D are listed in Table 9 (below). A summary of the UK distribution and autecology of each is also included in Appendix 1, Table 3.

Species deployment reasonably reflected the habitat present within compartment D, with the majority of species (144) being attributed, at habitat-level, to the 'Tall sward and scrub' assemblage and the bulk of the remainder (60) being attributed to 'Short sward and bare ground' habitat-level assemblage in Pantheon.

Table 4 - Species of recognised conservation recorded in compartment D from 2022 data. Blank cells indicate where IUCN post-2001 threat status not available

Common name	*Scientific name*	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
A comb-footed spider	*Enoplognatha mordax*	Theridiidae	Araneae	Nationally Scarce	LC
An ant beetle	*Cyclodinus constrictus*	Anthicidae	Coleoptera	Nationally Scarce	LC
An apionid weevil	*Protapion difforme*	Apionidae	Coleoptera	Nationally Scarce	LC
A seed beetle	*Bruchidius imbricornis*	Chrysomelidae	Coleoptera	Recent UK colonist	NE
A seed beetle	*Bruchus brachialis*	Chrysomelidae	Coleoptera	Recent UK colonist	NE
A leaf beetle	*Phyllotreta cruciferae*	Chrysomelidae	Coleoptera	Nationally Scarce	LC
A weevil	*Coelositona puberulus*	Curculionidae	Coleoptera	RDBK (insufficiently known) – as 'curticollis partim'	NE
A weevil	*Hypera melancholica*	Curculionidae	Coleoptera	Nationally Scarce	NE
A weevil	*Tychius squamulatus*	Curculionidae	Coleoptera	Nationally Scarce	NE
A water scavenger beetle	*Berosus fulvus*	Hydrophilidae	Coleoptera	Nationally Rare	Vu

Common name	*Scientific name*	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
A latridiid beetle	*Melanophthalma suturalis*	Latridiidae	Coleoptera	RDBK (Insufficiently known)	NE
A pollen beetle	*Meligethes fulvipes*	Nitidulidae	Coleoptera	Nationally Scarce	NE
A shining flower beetle	*Olibrus flavicornis*	Phalacridae	Coleoptera	Red Data Book-insufficiently known	DD
An opomyzid fly	*Opomyza punctata*	Opomyzidae	Diptera	NS	
Phoenix Fly	*Dorycera graminum*	Ulidiidae	Diptera	S41 Priority species; Near Threatened (Post-2001 IUCN criteria)	NT
A planthopper	*Asiraca clavicornis*	Delphacidae	Hemiptera	Nationally Scarce	LC
A ground bug	*Metopoplax ditomoides*	Lygaeidae	Hemiptera	Recent UK colonist	NA
A ground bug	*Nysius huttoni*	Lygaeidae	Hemiptera	Recent UK colonist	NA
A shore bug	*Saldula pallipes*	Saldidae	Hemiptera	Nationally Scarce	LC

Common name	*Scientific name*	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
Brown-banded Carder Bee	*Bombus humilis*	Apidae	Hymenoptera	S41 Priority species	
Red-shanked Carder Bee	*Bombus ruderarius*	Apidae	Hymenoptera	S41 Priority species	
Shrill Carder Bee	*Bombus sylvarum*	Apidae	Hymenoptera	S41 Priority species	
Beewolf	*Philanthus triangulum*	Crabronidae	Hymenoptera	Nationally Vulnerable (RDB2 pre-1994)	LC
Black-headed Mason Wasp	*Odynerus melanocephalus*	Eumenidae	Hymenoptera	S41 Priority species; Nationally scarce	
Lobe-spurred Furrow Bee	*Lasioglossum pauxillum*	Halictidae	Hymenoptera	Nationally Scarce	LC
Ridge-cheeked Furrow Bee	*Lasioglossum puncticolle*	Halictidae	Hymenoptera	Nationally Scarce	LC
Red-tailed Blood Bee	*Sphecodes rubicundus*	Halictidae	Hymenoptera	Nationally Scarce	LC
Silvery Leafcutter Bee	*Megachile leachella*	Megachilidae	Hymenoptera	Nationally Scarce	LC
Cinnabar	*Tyria jacobaeae*	Erebidae	Lepidoptera	S41 research only	LC

Common name	*Scientific name*	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
Small Heath	*Coenonympha pamphilus*	Nymphalidae	Lepidoptera	S41 Priority species	NT

Species of recognised conservation status attributed to 'Tall sward and scrub' recorded from compartment D, included three OMH flagship bumblebee species including s41 'priority species' Shrill Carder Bee *Bombus sylvarum,* Red-shanked Carder Bee *B. ruderarius* and Brown-banded Carder Bee *B. humilis.* Of these, whilst workers of *B. humilis* were recorded fairly frequently throughout the site, *B. sylvarum* was recorded only during the late June visit and then from few individuals, possibly due to this being the very beginning of the flight season for workers. The bee was recorded only from the herb-rich, tall sward grassland bund towards the west of compartment D.

B. ruderarius was knowingly only recorded from a worker collected from flower-rich OMH close to the centre of compartment D (the only other record being from SSSI Unit 1). Whilst a number of red-tailed bumblebees were examined, from compartment D and from the wider 2022 survey area, all but two turned out to be *Bombus lapidarius*. However, checking was not exhaustive, and it is possible that *B. ruderarius* was overlooked in some areas. Like *B. humilis* and *B. sylvarum* (both discussed in relation to compartments B and C), *B. ruderarius* underwent a significant decline in the UK during the latter decades of the C20th and beyond. According to Else and Edwards (2018), 'the bumblebee has a preference for dry, well-drained soils, particularly flower-rich calcareous grassland and coastal dunes'.

Another s41 'priority species' species, characteristic of OMH and taller sward grasslands in the Thames corridor, was the Phoenix Fly *Dorycera gramineum*. Phoenix Fly was recorded in compartment D as well as in compartment B and several sub-compartments of C. The fly was previously discussed in relation to compartment B.

Another two-winged fly species of recognised conservation status recorded from compartment D from the 2022 survey was an opomyzid fly *Opomyza punctata*, classed as Nationally Scarce in a review by Falk *et al* (2016). The habitat associations of *O. punctata* are, according to Falk *et al* (2016), 'unclear' however, known recorded habitats include 'marshland, grassland, coastal dunes and heathland' and the fly is thought to develop in grasses, in common with other members of the genus. During the 2022 survey, *Opomyza punctata* was recorded only from established grassland landward of sea wall in compartment D.

The only other species of recognised conservation status (other than the ubiquitous s41 'research only species, Cinnabar *Tyria jacobaeae*) attributed to the 'Tall sward and scrub' Pantheon habitat-level classification of compartment D data, were nationally scarce beetles including the Crucifer Flea Beetle *Phyllotreta cruciferae* and an apionid weevil *Protapion difforme*.

According to Duff (2016), *Phyllotreta cruciferae* is associated with 'many wild and cultivated Brassicaceae' but can also be found in association with Nasturtiums Tropaeolum and Wild Mignonette *Reseda lutea*. The beetle, which has been previously recorded from the general vicinity of thee 2022 survey area, can occur in a variety of habitats where the food plants are present and yellow crucifers including Charlock *Sinapis arvensis* were found throughout much of compartment D during the 2022 survey.

P. difforme is one of a number of species of apionid weevil recorded during the survey. *P. difforme* has been associated in some localities with knotgrass *Polygonum* spp.; however, Hyman and Parsons (1992) suggest that it may be more closely associated with clovers *Trifolium* spp. *P. difforme* is associated with habitats including, according to Hyman and Parsons (1992) 'Damp grassland, wetland, disturbed ground, hedgebanks and along ditches'. During the survey, the weevil was recorded from established grassland, landward of the sea wall in Area D.

Species of recognised conservation status with an affinity to short sward and bare ground habitats recorded from compartment D, included the Beewolf *Philanthus triangulum*, which is still listed as RDB2 'vulnerable' despite a significant population increase in the UK. Of somewhat greater interest was the section 41 'priority species' and nationally scarce Black-headed Mason Wasp *Odynerus melanocephalus*, which was recorded both in the vicinity of a spoil mound around (between TQ 68745 78686 and TQ 68848 78852) and on Wild Carrot *Daucus carota* flowers close to the compartment's western boundary at TQ 68469 78253. This species is also discussed in relation to compartments B and C, where it was also recorded.

The only other section 41 'priority species' attributed to the 'Short sward and bare ground' assemblage, was the relatively widespread and common Small Heath *Coenonympha pamphilus*.

In addition to the section 41 species, seven nationally scarce species associated with short sward and bare ground habitats were recorded including two weevils *Hypera melancholica* (listed as *H. fuscocinerea* in Pantheon) and *Tychius squamulatus*; one species of planthopper *Asiraca clavicornis* and bees including Sharp-collared Furrow Bee *Lasioglossum malachurum*, Lobe-spurred Furrow Bee *L. pauxillum*, Red-tailed Blood Bee *Sphecodes rubicundus* and Silvery Leafcutter Bee *Megachile leachella*. Other than *Hypera melancholica*, all species have been previously discussed in relation to compartments B and C.

Hypera melancholica is a scarce species of hyperine weevil, restricted to the southern half of the UK and although there are relatively few records from south Essex, the greatest concentration of records is from the southeast, Thames corridor area. According to Morris (2002) *H. melancholia* is found 'In dry, open sandy and chalky situations and in grasslands', where the insect is associated with 'species of Medicago, including *M. sativa, M. falcata* and probably, *M. lupulina*. During the 2022 survey, *H. melancholia* was recorded only from compartment D, from two samples, both in flower-rich grassland. *Medicago* spp. were well represented throughout the survey areas.

Another undoubtedly uncommon grassland weevil *Coelositona puberulus* recorded from compartment D, is not classified in Pantheon and was classed as RDBK 'Insufficiently known' in a review by Hyman and Parsons (1992). There are few UK records of *C. puberulus* and whilst the beetle has been recorded from several locations in Kent, it is uncertain whether or not the beetle has been recorded from Essex prior to the current survey.

According to Hyman and Parsons (1992), the habitat and ecology of *C. puberulus* is uncertain, but grassland and possibly sand dunes, are suggested as possible habitats. Hyman and Parsons further speculate that the foodplants may include bird's-foot trefoils *Lotus* spp. Duff (2016) states that the beetle is found on 'Greater Bird's-foot Trefoil *Lotus pedunculatus* in damp places' and the beetle was recorded from partially vegetated OMH in close proximity to open water, wet grassland and swamp habitat in compartment D.

Only 19 species recorded within compartment D during the 2022 survey were associated with freshwater wetland habitats. Eight of the species were attributed to the 'Acid sedge and peat' assemblage at habitat-level, with a further six 'Marshland' and four species associated with running water. The two most noteworthy species included a nationally scarce saldid bug *Saldula pallipes*, attributed to 'Marshland' and Reed Yellow-faced Bee *Hylaeus pectoralis*, attributed to the 'Acid and sedge peats' habitat-level assemblage. Whilst *H. pectoralis* was also recorded from sub-compartments A1, A6 and compartment B, and is discussed in relation to those sites; *Saldula pallipes* was recorded only from compartment D during the current survey.

S. pallipes was afforded Nationally Scarce status in a review by Cook (2015). The insect has been recorded from widely scattered inland and coastal sites in the southern half of the UK and there are several post-1990 records from the Thames corridor, in close proximity to the 2022 survey area. According to Tristan Bantock (pers. com.), *S. pallipes* occurs in various wetland margin habitats. During the 2022 survey, the insect was recorded only from a sample collected close to a wet ditch near the sea wall in compartment D.

Whilst only seven species with strong coastal affinities were recorded from compartment D, four of these, attributed at habitat level, to 'Saltmarsh' in Pantheon, were of recognised conservation status in the UK.

These included two nationally scarce species discussed in relation to sub-compartment A1, and compartments B and C, a comb-footed spider *Enoplognatha mordax* and a picture-winged fly *Melieria picta*, as well as two beetles; a water scavenger beetle *Berosus fulvus* classed under post-2001 IUCN criteria as nationally rare, with a threat status of 'Vulnerable' and a nationally scarce ant-like flower beetle *Cyclodinus constrictus*.

Berosus fulvus is more or less exclusively coastal in the UK and records are restricted to the south and east coasts of England. In Essex, the species has been recorded from Canvey Island and also from coastal locations further east. Foster *et al* (2014) state that 'This species is confined to shallow water in tidal areas'. During the 2022 survey, *B. fulvus* was recorded only from direct searches close to the sea wall in compartment D. The precise location of the capture was unrecorded, though it is likely that the specimen came from the margins of brackish ditches/lagoons which run parallel to the sea wall in this area. Besides a recorded affinity with saltmarsh, *B. fulvus* is also attributed to closely related 'Brackish pools and ditches' and 'Saline lagoon' habitat-level assemblages in Pantheon.

Cyclodinus constrictus is associated with sandy habitats and records are mainly from coastal areas in southeast England and East Anglia. There are several records from north Kent and south Essex including recent records from in and around the 2022 survey area. During the 2022 survey,

C. constrictus was recorded both from sparsely vegetated OMH, close to the sea wall, in compartment D and from upper and mid saltmarsh in SSSI Unit 2.

Mucking Flats & Marshes SSSI Unit 1

SSSI Unit 1 occupied a generally flat area of coastal grassland and scrub of c17.4 hectares situated to the landward side of the seawall (Appendix 3, Photograph 37). The site is subject to nature conservation management, as part of Coalhouse Fort Park, by Thurrock Council. Rather than livestock grazing, SSSI Unit 1 is managed by rotational cutting, (Ray Reeves, Site Ranger, pers. com.). The underlying geology of the site comprises elements of the Lewes nodular chalk, Seaford and Newhaven chalk formations overlain with superficial deposits of alluvium, clay, silt, sand and peat.

Conditions varied somewhat over the site, with arid, free-draining sandy areas alongside areas of more clayey substrate, subject to drainage impedance. These conditions gave rise to localised seasonal wetting, reflected through the presence of Common Reed *Phragmites australis* and Sea Club-rush *Bolboschoenus maritimus* alongside Grey Willow *Salix cinerea* scrub. The presence of *B. maritimus* can be indicative of brackish conditions. According to the Site Ranger, the superficial geology towards the northern end of the site differed from the sandier southern sections, due to the historic depositing of silt dredgings.

Whilst the site was generally flat, there was a degree of microtopographical variation across the site, with locally occurring banks, as well as vehicle ruts along tracks etc. The vegetation was structurally and floristically diverse, with extensive areas both of open, short sward grassland and areas of taller sward grassland and scrub habitat. Bare ground was well represented within the shorter sward areas of the site, as well as on tracks. Both compact and friable sandy patches were present, providing a range of conditions for ground-nesting aculeates; however, few sloping or vertical bare ground habitats were present, other than mole hills, which were common, particularly in the shorter sward grassland areas towards the north and east of the site.

Pitfall trap samples PF.U1.1 to PF.U1.5 and sweep samples SW.U1.1 to SW.U1.3 were collected from herb-rich, sandy grassland occupying the northeast quarter of the site between around TQ 69325 77576 and TQ 69333 77713.

The sward in this area ranged from c5 to 30 cm (typically around 10cm); supporting graminoids including Yorkshire Fog *Holcus lanatus*, Creeping Bent *Agrostis stolonifera*, Common Bent *A. capillaris,* Red Fescue *Festuca rubra*, False Oat Grass *Arrhenatherum elatius* and locally abundant, Sea Couch *Elytrigia atherica* and Common Couch *E. repens*, with a range of herbs including locally abundant Yellow Rattle *Rhinanthus minor,* Red Clover *Trifolium pratense,* White Clover *T. repens,* Narrow-leaved Bird's-foot Trefoil *Lotus tenuis*, Wild Carrot *Daucus carota*, Goat's-rue *Galega officinalis*, Ribwort Plantain *Plantago lanceolata*, Melilots *Melilotus* spp., Black Medick *Medicago lupulina*, Common Ragwort *Senecio jacobaea* and occasional to locally frequent Yellow Wort *Blackstonia perfoliata*, Common Centaury *Centaurium erythraea*, Common Cat's-ear *Hypocharis radicata*, Hare's-foot Clover *Trifolium arvense*, Hoary Ragwort *Senecio erucifolius*, Meadow Vetchling *Lathyrus pratensis* and Rough Hawk's-beard *Crepis biennis*.

Taller herbs including Creeping Thistle *Cirsium arvense*, Hogweed *Heracleum sphondylium,* Fennel *Foeniculum vulgare* and Mugwort *Artemisia vulgaris*, also occurred locally, mainly in taller sward edge habitats. Scrub in the drier areas of the site included Bramble *Rubus fruticosus* agg., Blackthorn *Prunus spinosa* and Hawthorn *Crataegus monogyna* as well as Common Dog Rose *Rosa canina* and locally, Silver Birch *Betula pendula*. Also, at the western peripheries of the drier northern grassland, where it gradated into wetter, albeit seasonally dried out, wet grassland and reed-fen & pools habitat, Grey Willow colonisation was occurring. Seedlings of this plant and scattered Common Reed were increasingly evident in the sward at this point.

Bare, sandy and siltier substrate occurred frequently throughout the areas of shorter sward. In the north-eastern area of SSSI Unit 1, mole hills were abundant, these being unusually sandy, due to the substrate.

Locally on the compartment were more sparsely vegetated open sandy areas e.g., around TQ 69336 77553, close to the seawall and aculeate nesting aggregations were evident in areas such as this, on the sandy tracks and locally within the shorter sward grasslands. There was also a small area of very short, dry rabbit grazed habitat resembling grass heath between TQ 69261 77462 and TQ 69238 77368 (location of SW.U1.6), immediately east of a wide, sandy central track which ran the entire length of the site on a north/south axis. The habitat here comprised short sward *Festuca rubra/ovina* and Yorkshire Fog grassland, with abundant *Cladonia portentosa/arbuscula* lichens, Hare's-foot Clover and Common Centaury. There were scattered tall herbs in this area, including Fennel, Wild Carrot and taller grassland patches with Sea Couch and False Oat Grass.

The habitat was sheltered by an area of dense, continuous Grey Willow, Silver Birch *Betula pendula* and Bramble *Rubus fruticosus* agg. scrub, which occurred to the west of the track. The scrub also formed shallow, southeast to northeast-facing scallops of taller grassland habitat, which were the locations of pitfall trap clusters PF.U1.11 (TQ 69216 77390) and PF.U1.12 (TQ 69216 77369). The grassland here was generally tall sward Yorkshire Fog and False Oat Grass, with tall herbs including Creeping Thistle, Rough Hawk's-beard, Common Ragwort, Mugwort and Fennel alongside shorter species including Narrow-leaved Bird's-foot Trefoil and Red Clover.

In general, habitat within the southern half of the site, particularly away from the seawall, was taller in comparison to that towards the north (excluding the wetter reed-fen & pools and scrub towards the northwest corner). Habitat around the location of sweep sample SW.U1.8 (TQ 69215 77266) (Appendix 3, Photograph 38) was fairly dense, tall sward grassland, ranging in height between c10 and 40cm. False Oat Grass was dominant in the sward at this point, with Cock's-foot *Dactylis glomerata* and Creeping Bent. This habitat supported mainly tall herbs including Creeping Thistle, Wild Carrot, Common Ragwort, Melilots and Rough Hawk's-beard, alongside somewhat shorter herbs such as Hedge Bedstraw *Galium mollugo,* Bristly Oxtongue *Picris echioides,* Common Knapweed *Centaurea nigra* and Red Clover.

Other sample locations supporting taller sward grassland habitat occurred close to and on the top of the grassy sea-defence bank where pitfall traps PF.U1.13 and PF.U1.14 were located and sweep sample SW.U1.7 was collected (Appendix 3, Photograph 39). The sea-defence grassland frequently comprised coarse grasses including Tall Oat Grass, Sea Couch, Cock's-foot and

Yorkshire Fog with abundant Wild Carrot and other tall herbs including Creeping Thistle, Fennel, Goat's-rue and various yellow composites, as found elsewhere on the site. The flowering umbellifers and yellow composites along the defence bank evidently provided a valuable forage for typical aculeates including species well-recorded on the site, such as Shrill Carder Bee *Bombus sylvarum,* Brown-banded Carder Bee *B. humilis* and Pantaloon Bee *Dasypoda hirtipes* and a range of other species.

The seasonally inundated areas of the site occurred locally towards the western side of the site in the northernmost third. The habitat was often in an ill-defined mosaic with drier, more free-draining grassland patches. Typical damp grasslands with Creeping Bent and Yorkshire Fog, were increasingly encroached by stands of Common Reed and localised stands of Sea Club-rush and tall herbs such as Greater Willowherb *Epilobium hirsutum* and Purple Loosestrife *Lythrum salicaria* around TQ 69135 77650 (SW.U1.5 and Pitfall clusters PF.U1.9 and PF.U1.10). At the time of survey, during a period of drought, the soil was moist at the surface, although there were no significantly inundated areas. Grey Willow formed scrub/semi-carr patches in mosaic with the colonising reed-fen & pools and was also scattered throughout the areas of seasonally damp grassland. The transition between wet and dry vegetation was gradual, creating a gradient between the more xerophilic free-draining habitat patches and the wettest areas.

The diversity of habitat types within SSSI Unit 1 evidently provided invertebrate habitat of high quality; species benefitting from the combination of wetter habitat juxtaposed with drier habitat. The evident brackish influence and close proximity to the saltmarsh habitat in SSSI Unit 2, clearly contributed to the recorded diversity of this site.

Invertebrate species recorded

Sample methods used in SSSI Unit 1, included timed sweep sampling, pitfall trapping, direct searching, and spot sweeping. A single cluster of pan traps was also operated on the site on one occasion. Sample locations are briefly described in Appendix 1, Table 1 and illustrated in Appendix 2, Figure 6.

From the 2022 survey of SSSI Unit 1, a total of 439 invertebrate species, including 62 of recognised conservation status in the UK, were recorded. In terms of species deployment, Beetles (Coleoptera), were, by far, the most strongly represented taxon, with 183 recorded species (illustrated in Figure 8); followed by true bugs (Hemiptera) with 61 species; bees, ants and wasps (Aculeate Hymenoptera) with 59 species; spiders (Araneae) with 57 species and two-winged flies (Diptera) with 45 recorded species.

Of the remaining groups, 13 species of Lepidoptera (mainly butterflies) were recorded; as well as, nine grasshoppers, crickets and allied species (Orthoptera etc.); Harvestmen (Opiliones) and Woodlice (Isopoda) were each attributed with four species and three dragonfly and damselfly species (Odonata) and one stone centipede (Lithobiomorpha), were also recorded.

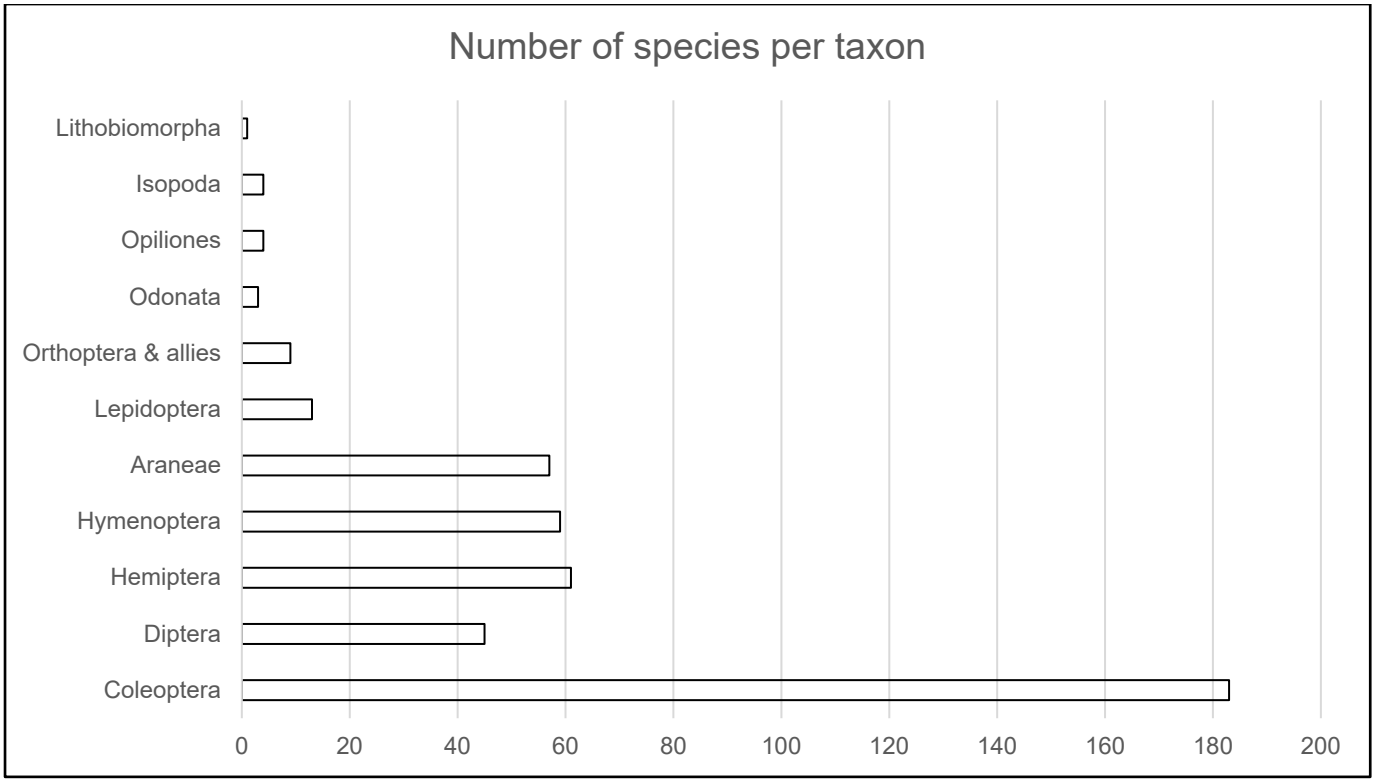

Figure 2 - Species per higher-taxon collected from SSSI Unit 1 during the 2022 survey

From the species data, 336 of the recorded species were classified at broad biotope level in Pantheon, as 'Open habitat' species, 46 as 'Wetland' species, 20 were 'Tree-associated' and 8 were associated with 'Coastal' habitats.

Species of recognised conservation recorded from SSSI Unit 1 are listed in Table 10 (below). A summary of the UK distribution and autecology of each is also included in Appendix 1, Table 3.

Species deployment reasonably reflected the habitat present within SSSI Unit 1, with the largest number of species (201) being attributed, at habitat-level, to the 'Tall sward and scrub' assemblage and the bulk of the remainder (123) being attributed to 'Short sward and bare ground' broad biotope in Pantheon.

Table 5 - Species of recognised conservation recorded in SSSI Unit 1 from 2022 data. Blank cells indicate where IUCN post-2001 threat status not available.

Common name	*Scientific name*	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
A clubionid spider	*Cheiracanthium virescens*	Clubionidae	Araneae	Nationally Scarce	LC

Common name	*Scientific name*	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
A gnaphosid spider	*Drassodes pubescens*	Gnaphosidae	Araneae	Nationally Scarce	LC
A hahnid spider	*Hahnia pusilla*	Hahniidae	Araneae	Nationally Scarce	LC
A lycosid spider	*Alopecosa cuneata*	Lycosidae	Araneae	Nationally Scarce	LC
A running crab spider	*Thanatus striatus*	Philodromidae	Araneae	Nationally Scarce	LC
A zodariid spider	*Zodarion italicum*	Zodariidae	Araneae	Nationally Scarce	LC
An apionid weevil	*Protapion difforme*	Apionidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Amara curta*	Carabidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Bembidion fumigatum*	Carabidae	Coleoptera	Nationally Scarce	LC
Bombadier beetle	*Brachinus crepitans*	Carabidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Harpalus attenuatus*	Carabidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Ophonus azureus*	Carabidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Panagaeus bipustulatus*	Carabidae	Coleoptera	Nationally Scarce	LC

Common name	*Scientific name*	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
A ground beetle	*Pedius longicollis*	Carabidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Scybalicus oblongiusculus*	Carabidae	Coleoptera	Nationally Rare	Vu
A ground beetle	*Syntomus truncatellus*	Carabidae	Coleoptera	Nationally Scarce	LC
A seed beetle	*Bruchidius imbricornis*	Chrysomelidae	Coleoptera	Recent UK colonist	NE
Ant-nest Ladybird	*Platynaspis luteorubra*	Coccinellidae	Coleoptera	Nationally Scarce	NE
A weevil	*Glocianus punctiger*	Curculionidae	Coleoptera	Nationally Scarce	
A weevil	*Liparus coronatus*	Curculionidae	Coleoptera	Nationally Scarce	
A weevil	*Orthochaetes setiger*	Curculionidae	Coleoptera	Nationally Scarce	
A weevil	*Otiorhynchus raucus*	Curculionidae	Coleoptera	Nationally Scarce	
A weevil	*Smicronyx reichi*	Curculionidae	Coleoptera	Nationally Scarce	NE
A hister beetle	*Saprinus aeneus*	Histeridae	Coleoptera	Nationally Scarce	LC
A minute marsh-loving beetle	*Limnichus pygmaeus*	Limnichidae	Coleoptera	Nationally Scarce	

Common name	*Scientific name*	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
A tumbling flower beetle	*Variimorda villosa*	Mordellidae	Coleoptera	Nationally Scarce	LC
A shining flower beetle	*Olibrus flavicornis*	Phalacridae	Coleoptera	Red Data Book-insufficiently known	DD
A silphid beetle	*Nicrophorus interruptus*	Silphidae	Coleoptera	Nationally Scarce	LC
A rove beetle	*Ocypus fuscatus*	Staphylinidae	Coleoptera	Nationally Scarce	LC
A rove beetle	*Tachinus flavolimbatus*	Staphylinidae	Coleoptera	Nationally Scarce	LC
A flesh fly	*Miltogramma germari*	Sarcophagidae	Diptera	NS	
Saltmarsh Horsefly	*Atylotus latistriatus*	Tabanidae	Diptera	Nationally Scarce	LC
Long-horned Cleg	*Haematopota grandis*	Tabanidae	Diptera	Nationally Scarce	LC
A trixoscelid fly	*Trixoscelis marginella*	Trixoscelidae	Diptera	pNS	
Broad-headed Bug	*Alydus calcaratus*	Alydidae	Hemiptera	Nationally Scarce	LC
A leafhopper	*Paralimnus phragmitis*	Cicadellidae	Hemiptera	Nationally Scarce	LC
Cryptic Leatherbug	*Bathysolen nubilus*	Coreidae	Hemiptera	Nationally Scarce	LC

Common name	*Scientific name*	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
Slender-horned Leatherbug	*Ceraleptus lividus*	Coreidae	Hemiptera	Nationally Scarce	LC
A planthopper	*Asiraca clavicornis*	Delphacidae	Hemiptera	Nationally Scarce	LC
A ground bug	*Drymus latus*	Lygaeidae	Hemiptera	Nationally Scarce	LC
A ground bug	*Graptopeltus lynceus*	Lygaeidae	Hemiptera	Nationally Scarce	LC
A ground bug	*Nysius huttoni*	Lygaeidae	Hemiptera	Recent UK colonist	NA
A mirid bug	*Globiceps fulvicollis cruciatus*	Miridae	Hemiptera	NS(Nb)	LC
A mirid bug	*Lygus pratensis*	Miridae	Hemiptera	RDB3 pre-1994 criteria	LC
Sand-runner Shieldbug	*Sciocoris cursitans*	Pentatomidae	Hemiptera	Nationally Scarce	LC
Scarce Tortiose Shieldbug	*Eurygaster maura*	Scutelleridae	Hemiptera	Nationally Scarce	LC
Carrot Mining Bee	*Andrena nitidiuscula?*	Andrenidae	Hymenoptera	RDB3 pre-1994 criteria	
Brown-banded Carder Bee	*Bombus humilis*	Apidae	Hymenoptera	S41 Priority species	

Common name	*Scientific name*	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
Red-shanked Carder Bee	*Bombus ruderarius*	Apidae	Hymenoptera	S41 Priority species	LC
Shrill Carder Bee	*Bombus sylvarum*	Apidae	Hymenoptera	S41 Priority species	
A ruby-tailed wasp	*Hedychrum niemelai*	Chrysididae	Hymenoptera	RDB3 pre-1994 criteria	
Five-banded Weevil-wasp	*Cerceris quinquefasciata*	Crabronidae	Hymenoptera	Section 41 priority species; RDB3 (pre-1994 criteria)	
A myrmicine ant	*Myrmica schencki*	Formicidae	Hymenoptera	Nationally Scarce	LC
Lobe-spurred Furrow Bee	*Lasioglossum pauxillum*	Halictidae	Hymenoptera	Nationally Scarce	LC
Ridge-cheeked Furrow Bee	*Lasioglossum puncticolle*	Halictidae	Hymenoptera	Nationally Scarce	LC
Silvery Leafcutter Bee	*Megachile leachella*	Megachilidae	Hymenoptera	Nationally Scarce	LC
Plain Dark Bee	*Stelis phaeoptera*	Megachilidae	Hymenoptera	pRDB2 pre-1994 criteria	
Large Velvet Ant	*Mutilla europaea*	Mutillidae	Hymenoptera	Nationally Scarce	LC

Common name	*Scientific name*	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
Small Velvet Ant	*Smicromyrme rufipes*	Mutillidae	Hymenoptera	Nationally Scarce	LC
A spider-hunting wasp	*Agenioideus sericeus*	Pompilidae	Hymenoptera	Recent UK colonist	
A spider-hunting wasp	*Evagetes pectinipes*	Pompilidae	Hymenoptera	RDB1 pre-1994 criteria	
Cinnabar	*Tyria jacobaeae*	Erebidae	Lepidoptera	S41 research only	LC
Small Heath	*Coenonympha pamphilus*	Nymphalidae	Lepidoptera	S41 Priority species	NT
Wall	*Lasiommata megera*	Nymphalidae	Lepidoptera	S41 Priority species	NT

A greater number of species and species of recognised conservation status were recorded from SSSI Unit 1 than from any other survey compartment in 2022. For its size, the site was subject to greater sampling effort than any other compartment, over-sampling being specified in the project brief.

Species of highest conservation status recorded from SSSI Unit 1 from 2022 survey data, included a RDB1 'nationally endangered' spider-hunting wasp *Evagetes pectinipes*; a ground beetle *Scybalicus oblongiusculus* classed as 'nationally rare' with a threat status of 'vulnerable' under post-2001 IUCN criteria; s41 'priority species' and RDB3 'nationally rare' Five Banded Weevil Wasp *Cerceris quinquefasciata* and two additional RDB3 species; Carrot Mining Bee *Andrena nitidiuscula* and a weevil *Smicronyx reichii*. These species were, without exception, attributed to the 'Short sward and bare ground' habitat-level assemblage in Pantheon; whilst an additional species, the RDB2 'nationally vulnerable' Plain Dark Bee *Stelis phaeoptera*, was attributed to the 'Decaying wood' habitat-level assemblage.

There are post-1990 records of all the the above species from sites in south Essex, apart from Carrot Mining Bee *Andrena nitidiuscula,* discussed below. *Evagetes pectinipes,* was until recently, only known from a single coastal sand-dune site in Deal, East Kent; however, there has been an increase in records, the insect having been found in coastal and inland localities in both Suffolk and south Essex. *Scybalicus oblongiusculus* was considered to be extinct in the UK, until a specimen was found in Surrey in 1998. The beetle was subsequently recorded from Ebbsfleet, Kent in 2000 and then east Essex and other sites in the area (Telfer, 2016).

Five Banded Weevil Wasp *Cerceris quinquefasciata,* despite being very rare on a national scale, is very well recorded from the south Essex coast, in and around the 2022 survey area. *Smicronyx reichii,* discussed in relation to sub-compartment C2, has also been recorded, post-1990, from several south Essex locations. Whilst *Stelis phaeoptera* has been recorded from Canvey Island and several other sites further east in south Essex, it may not have been previously recorded from the general area of the 2022 survey.

E. pectinipes, *S. oblongiusculus, Cerceris quinquefasciata* and *Smicronyx reichii* are all associated with dry, free-draining and sparsely vegetated habitats. *E. pectinipes* and *C. quinquefasciata* are stongly associated with sandy soils, whilst *Smicronyx reichii* has an affinity with chalk substrates (Hyman and Parsons, 1992) and *S. oblongiusculus* favours well-drained, early successional habitats with plentiful insolation (Telfer, 2016).

According to Day (1988), *E. pectinipes* is considered to be a cleptoparasite of a commoner species of spider-hunting wasp *Episyron rufipes,* which was also recorded from SSSI Unit 1 and elsewhere within the 2022 survey area. *C. quinquefasciata* stocks its nests with weevils (Curculionidae) including pea weevils *Sitona* spp. (Baldock, 2010). It has been conjectured by Telfer (2016), that *S. oblongiusculus* may feed on the seeds of Fennel *Foeniculum vulgare*, which was particularly well recorded from SSSI Unit 1, during the 2022 survey.

Stelis phaeoptera is a cleptoparasite of Orange-vented Mason Bee *Osmia leaiana* and possibly other species of the genus *Osmia*. *O. leaiana* was also recorded from SSSI Unit 1, during the survey, but was less well recorded than closely related sibling species *O. spinulosa,* which was found throughout much of the greater 2022 survey area. Falk and Lewington (2015) describe the habitat of *S. phaeoptera* as being the same as its main host, *O. leaiana*, which includes habitat with 'plentiful composites such as thistles and knapweed, combined with dead wood (e.g. old fence posts) or old walls.'

Carrot Mining Bee *Andrena nitidiuscula* is currently listed as RDB3 under pre-1994 criteria. The bee is mainly restricted to southern England from around Bath southwards and many records are from the south coast, between Devon and Kent. *A. nitidiuscula* does not appear to have been recorded from Essex, prior to the 2022 survey. According to Edwards and Telfer (2002), the bee 'May be found in a variety of open habitats with a preference for clay-based soils, although these need not be acidic'. Edwards and Telfer (2002) also state that *A. nitidiuscula* is 'Oligolectic on flowers of plants in the family Apiaceae, apparently preferring those with white flowers, such as Wild Carrot'. During the survey, two female specimens were collected from spot sweeping in SSSI Unit 1. Wild Carrot *Daucus carota* was well represented within SSSI Unit 1 and the compartment supported areas of bare, clayey substrate potentially suitable as nesting sites for *A. nitidiuscula*.

Species of recognised conservation status attributed to 'Tall sward and scrub' recorded from SSSI Unit 1, included three OMH flagship bumblebee species including s41 'priority species' Shrill Carder Bee *Bombus sylvarum,* Red-shanked Carder Bee *B. ruderarius* and Brown-banded Carder Bee *B. humilis.* Of these, whilst workers of *B. humilis* were well recorded from the site, *B. sylvarum* was less abundant for the reasons described earlier, and *B. ruderarius* was recorded from a single, female worker specimen only. The remaining section 41 listed species attributed to the 'Tall sward and scrub' Pantheon assemblage recorded was the Cinnabar *Tyria jacobaeae*, a declining but common 'research only' species.

All remaining species of recognised conservation status attributed to 'Tall sward and scrub', were either nationally scarce, proposed nationally scarce, or nationally scarce species likely to be subject to revision due to increased records.

Three species of nationally scarce spider (Araneae) were attributed to the assemblage, including a gnaphosid spider *Drassodes pubescens* and running crab spider *Thanatus striatus*, which were previously discussed in relation to compartment B and sub-compartment C5. The third species was a lesser cobweb spider *Hahnia pusilla*; which has been previously recorded in Essex, around Canvey Island. Harvey *et al* (2002) refer to the sheet webs of the spider which can be found in low vegetation 'in leaf litter and under stones, usually in sites with high humidity'.

Nine species of nationally scarce beetle (Coleoptera) were attributed to the 'Tall sward and scrub' assemblage for SSSI Unit 1. These included five species of weevil; *Protapion difforme, Glocianus punctiger, Liparus coronatus* and *Orthochaetes setiger* and a ladybird *Platynaspis luteorubra,* all of *which have been* previously discussed in relation to other 2022 survey areas.

The additional three species were recorded only from SSSI Unit 1 during the 2022 survey and included a ground beetle *Syntomus truncatellus*, a histerid beetle *Saprinus aeneus* and a sexton beetle *Nicrophorus interruptus*; all recorded from pitfall traps deployed across the site. All three of these species are sparsely recorded within the UK as a whole but are reasonably well known from the south Essex coastline, including the general survey area.

According to Luff (2007), *Syntomus truncatellus* is found 'on open ground in fields, pasture woodland and dunes' and Duff (2012) 'In litter in dry grassland in open areas'. *Nicrophorus interruptus* was one of several species of large and striking black and orange carrion beetles recorded from Unit 1. This species is most often found in, or near carrion, or attracted to the mercury vapor light from moth-traps. The beetle is known to occur in a variety of habitats.

Saprinus aeneus was the rarest of several local species of hister (or clown) beetle recorded during the 2022 survey. Due to a significant recorded decline, *S. aeneus* has been classed as Nationally Scarce, in a recent review by Lane (2017). According to Duff (2012), the beetle occurs in 'carrion, dung etc.'. In Essex the species is associated mainly with post-industrial OMH. Whilst *S. aeneus* was only found in SSSI Unit 1 during the 2022 survey, it was present in several of the pitfall samples on this site.

Nationally scarce species from other taxa not previously discussed in relation to 'Tall sward and scrub' for SSSI Unit 1, included the Large Velvet Ant *Mutilla europaea* (Hymenoptera: Mutillidae),

previously discussed in relation to sub-compartment A6, from which it was also recorded and the ground bug *Drymus latus* (Hemiptera: Lygaeidae).

Drymus latus is known from scattered records across the southern half of the UK, the majority being from sites bordering the Thames, including within the general vicinity of the 2022 survey area. According to Kirby (1992) *Drymus latus* occurs in two distinct micro-habitats: moss growing amongst dense grassland or leaves in fairly open situations, and bare ground amongst sparse vegetation on well-drained soils.

A particularly large number of species of recognised conservation status, as well as local species in the UK were attributed to 'Short sward and bare ground'. Overall, this assemblage was better represented than 'Tall sward and scrub', with 10 percent of the species pool, compared to eight for 'Tall sward and scrub'. Species of recognised conservation status with an affinity to short sward and bare ground recorded from SSSI Unit 1, included nationally scarce spiders (Araneae) including a wolf spider *Alopecosa cuneata*, a zodariid spider *Zodarion italicum* and a foliage spider *Cheiracanthium virescens*. *A. cuneata* and *Z. italicum* have been discussed previously in relation to compartments B and C, respectively. All three species are strongly thermophilic and occur in sparsely-vegetated habitats with a warm microclimate.

Cheiracanthium virescens has been recorded from a number of sites in south Essex and Kent sides of the Thames but is very locally distributed elsewhere in the UK. The spider occurs 'under stones or low vegetation such as heather, in dry, sandy or sparsely vegetated habitats such as heathland, waste-ground and dunes' (Harvey *et al.*, 2002). In SSSI Unit 1, *C. virescens* was found in sandy, short-sward coastal grassland.

Beetles attributed to the 'Short sward and bare ground' assemblage recorded from SSSI Unit 1, included five nationally scarce ground beetles; *Amara curta*, *Brachinus crepitans*, *Harpalus attenuatus*, *Ophonus azureus* and *Panagaeus bipustulatus* and two weevils, including a nationally scarce broad-nosed species *Otiorhynchus raucus* and RDB3-listed *Smicronyx reichii.* All species are specialists of dry, free-draining and often sparsely vegetated habitats. *O. azureus* was discussed previously in relation to compartment B, whilst *B.crepitans*, *H. attenuatus*, and *Panagaeus bipustulatus* were considered in relation to compartment C. The remaining two species, *Amara curta* and *Otiorhynchus raucus* were recorded only from SSSI Unit 1 during the 2022 survey.

Historically, there are few *A. curta* records from Essex, the closest recorded north of the Thames being from the from Ilford and Hackney areas. According to Luff (2008), favoured habitats include 'dry grasslands, heath and dunes'. The weevil *O. raucus* has been recorded post-1990, from a number of locations in south Essex, including in the vicinity of the 2022 survey area. Hyman and Parsons (1992) cite 'sand pits, disturbed ground, a cliff edge, woodland and possibly also gardens and allotments' as favored *O. raucus* habitat and refer to a recorded preference for 'loose sandy or chalky soils', reflecting conditions in SSSI Unit 1.

Two nationally scarce species of two-winged fly (Diptera) with affinities to short sward bare ground habitat were recorded from SSSI Unit 1 during the 2022 survey. These included a flesh fly *Miltogramma germari* and *Trixoscelis marginella*, a species formerly considered to be a member of the Opomyzidae family, now placed in Trixoscelidae. Both species were recorded only from SSSI

Unit 1 during the survey. Both species are associated with arid habitats including coastal dunes and sandy heaths whilst *M. germari* has also been recorded from chalk downland.

M. germari is mainly a coastal species in the UK, with inland populations in areas such as the Brecklands of East Anglia. In Essex, the fly has been recorded on several occasions from the southern areas adjacent to the Thames. The larvae of *M. germari* are thought to feed on the food stores provided for the larvae of mining bees and the fly is, consequently, associated with habitats supporting significant mining bee populations.

Falk *et al* (2016) cite rabbit grazing in relation to *T. marginella* and whilst the biology of the fly is poorly known, it is speculated that development in carrion or animal burrows is feasible. During the 2022 survey, *T. marginella* was swept from an area of dry, sandy, short sward grassland with bare ground patches. Sandy mole hills were abundant in this area and occurred locally throughout the site.

Seven nationally scarce species of true bug Hemiptera were attributed to the 'Short sward and bare ground' habitat-level assemblage from the 2022, SSSI Unit 1 samples. All of the species were typical of dry, free draining, sparsely vegetated habitats and all but one, are well recorded from OMH and dry Thames terrace grassland type habitats in and around the south Essex survey area.

All but two of the species, the planthopper *Asiraca clavicornis* and Scarce Tortoise Shieldbug *Eurygaster maura,* which have been discussed previously in relation to compartments C, were recorded only from SSSI Unit 1 during the 2022 survey. These included Broad-headed Bug *Alydus calcaratus,* which was particularly well represented in SSSI Unit 1, as well as Cryptic Leatherbug *Bathysolen nubilus*, Slender-horned Leatherbug *Ceraleptus lividus*, a ground bug *Graptopeltus lynceus* and the Sand-runner Shieldbug *Sciocoris cursitans,* all of which were represented by at most a handful of specimens.

Alydus calcaratus, revised from Local to Nationally Scarce in a review by Bantock (2016), is primarily associated with dry lowland heathland, but occurs in coastal grassland and OMH in areas such as south Essex. The nymphs of *A. calcaratus* are ant mimics, bearing a close resemblance to wood ants *Formica* spp. It is thought that the nymphs may live within ant nests. *Bathysolen nubilus* and *Ceraleptus lividus* are found in well drained and sparsely vegetated habitat. *B. nubilus* is mainly found on Black Medick *Medicago lupulina* (Kirby, 1992), whilst *C. lividus* is associated with various legumes.

Graptopeltus lynceus is not as well recorded in south Essex as the other species but has been recorded post-1990 from close to the Thames in the Purfleet area, a kilometer or so west of the 2022 survey area. According to Kirby (1992), *G. lynceus* is associated with Boraginaceae, including mainly Viper's Bugloss *Echium vulgare*, but also forget-me-nots *Myosotis* spp., both of which were recorded in SSSI Unit 1. Kirby (1992) stated that the insect 'is found in dry, open, sunny situations, most often on sand, less frequently on chalk'. This habitat also covers that of the Sand-runner Shieldbug *Sciocoris cursitans* which is considered by Kirby (1992), to be associated with herbs including Wood Sage *Teucrium scorodonia*, Buckshorn Plantain *Plantago coronopus* and Common Stork's-bill *Erodium cicutarium*, most, if not all of these herbs were recorded from SSSI Unit 1 during the 2022 survey.

Short sward and bare ground associated bees, ants and wasps (Aculeate Hymenoptera) not previously described for SSSI Unit 1 included the nationally scarce Lobe-spurred Furrow Bee *Lasioglossum pauxillum* and Ridge-cheeked Furrow Bee *L. puncticolle*, previously discussed in relation to sub-compartment A1 and compartment B, respectively; as well as two additional nationally scarce species, the Small Velvet Ant *Smicromyrme rufipes* and a spider-hunting wasp *Priocnemis confusor,* both of which were recorded only from SSSI Unit 1 during the 2022 survey.

Small Velvet Ant *Smicromyrme rufipes* is the smaller of two species of the family Mutillidae recorded from SSSI Unit 1 during the 2022 survey. Despite its nationally scarce status, the insect is reasonably well recorded from coastal localities in south Essex and there are several post-1990 records from within the general 2022 survey area. *S. rufipes* is, according to Baldock (2010), 'a parasitoid of various ground-nesting wasps and bees, such as halictines.' Favoured habitat listed in Baldock (2010) include 'coastal dunes and inland on heathland and in sandpits'; however, on the north shores of the Thames, in Essex, the species evidently occurs in OMH and dry grassland habitats.

The spider-hunting wasp *Priocnemis confusor,* also currently classed as nationally scarce, predates spiders, although affinities are poorly known, Helen and Roy (2016) refer to records of the species predating a juvenile clubionid in Kent and the wasp has been associated with jumping spiders (Salticidae) on the Continent. *P. confusor* has been cited by Day (1988) as being a species of woodland and more open ground, on heavy clay; however, Baldock (2010) stated that 'In Surrey, many of the records are from sandy areas'.

Other species of note recorded from SSSI Unit 1 with affinities to short sward and bare ground habitats, included two section 41 butterflies; the Small Heath *Coenonympha pamphilus*, initially discussed in relation to sub-compartment A6 and the Wall *Lasiommata megera*, a species which is still relatively widespread and common in certain parts of the UK, but has declined significantly in its inland UK population in recent decades. The butterfly was recorded only close to the coast in 2022, being recorded from the upper saltmarshes in SSSI Units 2 and 3, as well as from Unit 1 in the 2022 survey. *L. megera* is usually associated with coastal areas with sunny, sheltered, stony or concrete substrates adjacent to grassy habitats with larval foodplants such as Chalk False Brome *Brachypodium pinnatum,* Yorkshire Fog *Holcus lanatus*, Cock's-foot *Dactylis glomerata* and other graminoids.

Whilst SSSI Unit 1 predominately supported dry, free-draining grassland habitat, the somewhat mixed geology, gave rise to localised patches of seasonally damp grassland and brackish wetland habitats. A total of 46 species associated primarily with wetland habitats were recorded from the site. These included some local species, such as the wolf spiders *Arctosa leopardus* and *Pirata latitans;* the loosestrife weevil *Nanophyes marmoratus,* rove beetles including *Stenus pusillus* and *Ochthephilum fracticorne*; a picture winged fly *Rivellia syngenesiae* and a cranefly *Nigrotipula nigra.* The previously discussed Reed Yellow-faced Bee *Hylaeus pectoralis* was also recorded here, as was a dragonfly, the Ruddy Darter *Striolatum sanguineum.*

However, five nationally scarce species were also attributed to wetland habitats from the 2022 SSSI Unit 1 survey data. These included a Common Reed *Phragmites australis* associated leafhopper *Paralimnus phragmitis,* discussed previously in relation to compartment A1, two

species of ground beetle *Bembidion fumigatum* and *Pedius longicollis* (formerly known as *Pterostichus longicollis*), a mirid bug *Globiceps fulvicollis* ssps *cruciatus* and a minute marsh-loving beetle *Limnichus pygmaeus.*

Of these, *B. fumigatum*, *Pedius longicollis* and *G. fulvicollis* ssps *cruciatus* are all attributed to the 'Marshland' habitat-level assemblage in Pantheon, whilst *Limnichus pygmaeus* is attributed to 'Running water'.

B. fumigatum, *Pedius longicollis* and *L. pygmaeus*, are all reasonably well recorded from coastal sites in the south Essex. However, the status of *G. fulvicollis* ssps *cruciatus,* is uncertain in the county, despite its presence on the Essex Red Data List.

According to Hyman and Parsons (1992), *B. fumigatum* occurs 'On well vegetated margins of ponds, ditches in fens and other inland situations' but is also found 'on the banks of estuaries and on the coast'. Hyman and Parsons (1992) also state that the beetle is 'Found amongst wet debris in fens, reed and sedge litter and marsh vegetation.'

P. longicollis occurs on the 'Bare margins of lakes and ponds, also riverbanks, gravel and clay pits' and Hyman and Parsons (1992) also suggest that the species 'may have a preference for calcareous substrates'

L. pygmaeus is described by Duff (2020) as occurring 'On mud or in moss and plant litter at the edge of freshwater, often on sandy or chalky soils.'

Kirby (1992) describes *G. fulvicollis* ssps *cruciatus* as being 'usually associated with low-growing sallows *Salix* spp., particularly Creeping Willow *S. repens*.' Kirby states that 'Most records are from dune slacks or wet heaths, but there are occasional records from other habitats'.

In addition to the wetland assemblage, three nationally scarce species, all two-winged flies (Diptera) were attributed to the 'Saltmarsh' habitat-level assemblage in Pantheon for SSSI Unit 1. These included Saltmarsh Horsefly *Atylotus latistriatus* which was recorded both in SSSI Units 1 and 2, Long-horned Cleg *Haematopota grandis*, recorded only in Unit 1 and a picture-winged fly *Melieria picta,* previously discussed in relation to A1 and several other compartments.

Whilst *H. grandis* has been recorded from coastal habitat within close proximity of the 2022 survey area, *A. latistriatus* does not appear to have been previously recorded as far west along the Thames Estuary, as the 2022 survey area. However, there are numerous records of this species from coastal saltmarsh sites in Essex east of Canvey Island.

According to Stubbs and Drake (2001),'The habitat of *A. latistriatus* is markedly different from that of other British Atylotus.' The association with saltmarsh is a constant theme and Stubbs and Drake (2001) state that 'Several of the named localities have sheltered lagoons where saltmarsh would appear to be the favoured habitat, and others have spits and bars of sand, and dunes.' Larvae have been reared from saltmarsh and strandline seaweed debris.

H. grandis is, according to Stubbs and Drake (2001), predominately found in saltmarsh or brackish water habitats, such as estuarine reed-beds and carr inland of saltmarsh, but it can occasionally

be found further inland. Although there is little literature relating to the biology of the *H. grandis* in the UK, the larvae of most *Haematopota* species develop in wet mud or standing water.

SSSI Unit 1 supports some brackish wetland/carr habitat which could potentially provide breeding habitat for *H. grandis* and possibly *A. latistriatus,* although this species may be more likely to develop in the adjacent saltmarsh.

In addition to the above, several species of recognised conservation status, either not attributed as far as habitat-level in Pantheon, were recorded from SSSI Unit 1. These included two nationally scarce beetles; a tumbling-flower beetle *Variimorda villosa,* which was recorded on several occasions from the flowers of Wild Carrot *Daucus carota* and a tachyporine rove beetle *Tachinus flavolimbatus,* recorded from a single pitfall trap specimen. Details of these species area included in Appendix 1, Table 1.

Mucking Flats & Marshes SSSI Unit 2

SSSI Unit 2 occupied a north/south oriented stretch, around three kilometres in length and comprising approximately 27.25 hectares of saltmarsh habitat. The extensive mudflats also included within the SSSI footprint were not included in the survey. Much of the saltmarsh in SSSI Unit 2 was relatively well developed, the vegetated area of upper to lower saltmarsh extending to a width of approximately 200 metres at the widest point (Appendix 3, Photograph 40), this width was maintained for more or less the entire length of the adjacent SSSI Unit 1, with which the landward margin was contiguous. However, beyond the northern tip of SSSI Unit 1, around TQ 69475 78319, the saltmarsh narrowed to around 20 metres in width adjacent to its boundary with survey compartment D, before becoming broader again towards the northern boundary of the Unit.

The underlying geology and superficial deposits beneath the SSSI Unit 2 saltmarsh, comprises elements of the Lewes nodular chalk, Seaford and Newhaven chalk formations overlain with superficial beach and tidal flat deposits of clay, silt, and sand.

The habitat was structurally and floristically representative of typical estuarine saltmarsh. There was usually a well-defined upper saltmarsh zone, often comprising largely of Sea Couch *Elytrigia atherica,* which often formed a continuous, five to 20 metre band immediately seawards of the sea defence bank, with strandline refugia and other locally occurring vegetation, including Common Reed *Phragmites australis,* Annual Seablite *Suaeda maritima*, Thrift *Armeria maritima* and Sea Beet *Beta vulgaris*. The middle and lower zones were often less well defined, due to the varied microtopography, with elements characteristic of both mid and lower saltmarsh often forming a mosaic, from the lower margin of the upper saltmarsh zone, as far as the outer edge with the sparsely vegetated mudflat.

As is typical within saltmarshes, the vegetated areas of the lower and mid zones were frequently broken up by silted, tidal creeks, which opened into tidal pools, often towards the seaward edge of the upper zone (Appendix 3, Photographs 41 and 42).

The mid saltmarsh was the most floristically and structurally diverse zone. In some areas, Sea Purslane *Atriplex portulacoides*, was the dominant species; in others there were lawns of Common Saltmarsh-grass *Puccinellia maritima*, with a range of halophytes including Golden Samphire *Inula*

crithmoides, Sea Milkwort *Glaux maritima*, Sea Plantain *Plantago maritima*, Sea Arrowgrass *Triglochin maritima*, Saltmarsh Rush *Juncus gerardii*, Sea Rush *Juncus maritimus,* Greater Sea-spurrey *Spergularia media,* glassworts *Salicornia spp.* and locally, Sea Lavender *Limonium vulgare*. Sea Aster *Aster tripolium*, an important forage species for the Sea Aster Mining Bee *Colletes halophilus,* was also an abundant and constant species, often occurring throughout both the mid and lower saltmarsh zones, alongside another valuable foraging composite, Golden Samphire. Sea Club-rush *Bolboschoenus maritima* was also recorded within the more diverse areas, where it formed small stands, in mosaic with shorter mid saltmarsh vegetation.

As is typical for saltmarshes, a cord-grass *Spartina* sp., was often the dominant species at the seaward edge of the lower saltmarsh, with glassworts *Salicornia* spp. and Sea Aster, often also persisted towards the outer saltmarsh margin.

In many areas, the seaward transition of vegetation communities was not clear-cut; *Spartina* and other species more typically associated with lower saltmarsh, persisted as far as the upper saltmarsh margins, due to topological variation and similarly, the mid-zone vegetation including Sea Purslane, sometimes persisted to the outer limit of the saltmarsh. This created a structurally dynamic, close mosaic in some areas.

Notably, there were raised features, some way into the lower saltmarsh in some areas. Examples of these included: two parallel banks close to Coalhouse Fort, at the location of sweep and vacuum samples SW.U2.8 and VAC.U2.8 (TQ 69170 76561) (Appendix 3, Photograph 43) and a vegetated mound towards the south of SSSI Unit 2, which was immediately seawards of the SW.U2.1 and VAC.U2.1 mid saltmarsh sample area at TQ 69429 78624.

Intertidal creeks and pools, which dried out for extensive periods provided potential habitat for both marine invertebrates and species such as shore bugs (Saldidae spp.), wolf spiders (Lycosidae spp.), beetles Coleoptera, two-winged flies (Diptera) and specialist species from other taxa.

Within SSSI Unit 2, samples were collected from both upper and mid saltmarsh zones. These being collected at well-spaced intervals between the site of SW.U2.5 and VAC.U2.5 (TQ 69459 78785) (Appendix 3, Photograph 44) in the north and SW.U2.8 and VAC.U2.8 (TQ 69170 76561) in the south. As elsewhere, some direct searching and spot searching was also undertaken.

The extent and structural dynamism and floristic diversity of the saltmarsh in SSSI Unit 2, provided potential habitat for a range of species associated exclusively or primarily with saltmarsh, as well as a significant nectar resource for foraging aculeates and Diptera, with nesting sites within the seawall and immediately inland. Despite the presence of a sea defence, the juxtaposition of the saltmarsh with inland sites such as the dry and brackish grassland and scrub habitats of SSSI Unit 1 and the flower-rich and structurally dynamic OMH, coastal grassland and brackish wetland habitats of compartment D contributed to the overall potential of SSSI Unit 2 and the other SSSI saltmarsh Units.

Invertebrate species recorded

Sample methods used in SSSI Unit 2, included timed sweep and vacuum sampling, direct searching, and spot sweeping. Sample locations are described in Appendix 1, Table 1 and illustrated in Appendix 2, Figures 7 and 8.

From the 2022 survey of SSSI Unit 2, a total of 163 invertebrate species, including 19 of recognised conservation status in the UK, were recorded. In terms of species deployment, 37 species were jointly attributed to spiders (Araneae), two-winged flies (Diptera) and true bugs (Hemiptera) and 36 species of beetle (Coleoptera) were recorded. Of the remaining larger taxa, only three species of Hymenoptera were recorded from SSSI Unit 2 and two butterfly and moth (Lepidoptera) species. The best represented of the smaller taxa, was grasshoppers, crickets, and allied species, with four species; two species each were attributed to dragonflies and damselflies (Odonata) and woodlice and slaters (Isopoda) and a single identified species each was recorded for taxa including barkflies (Psocoptera), shrimps (Amphipoda) and snails (Gastropoda).

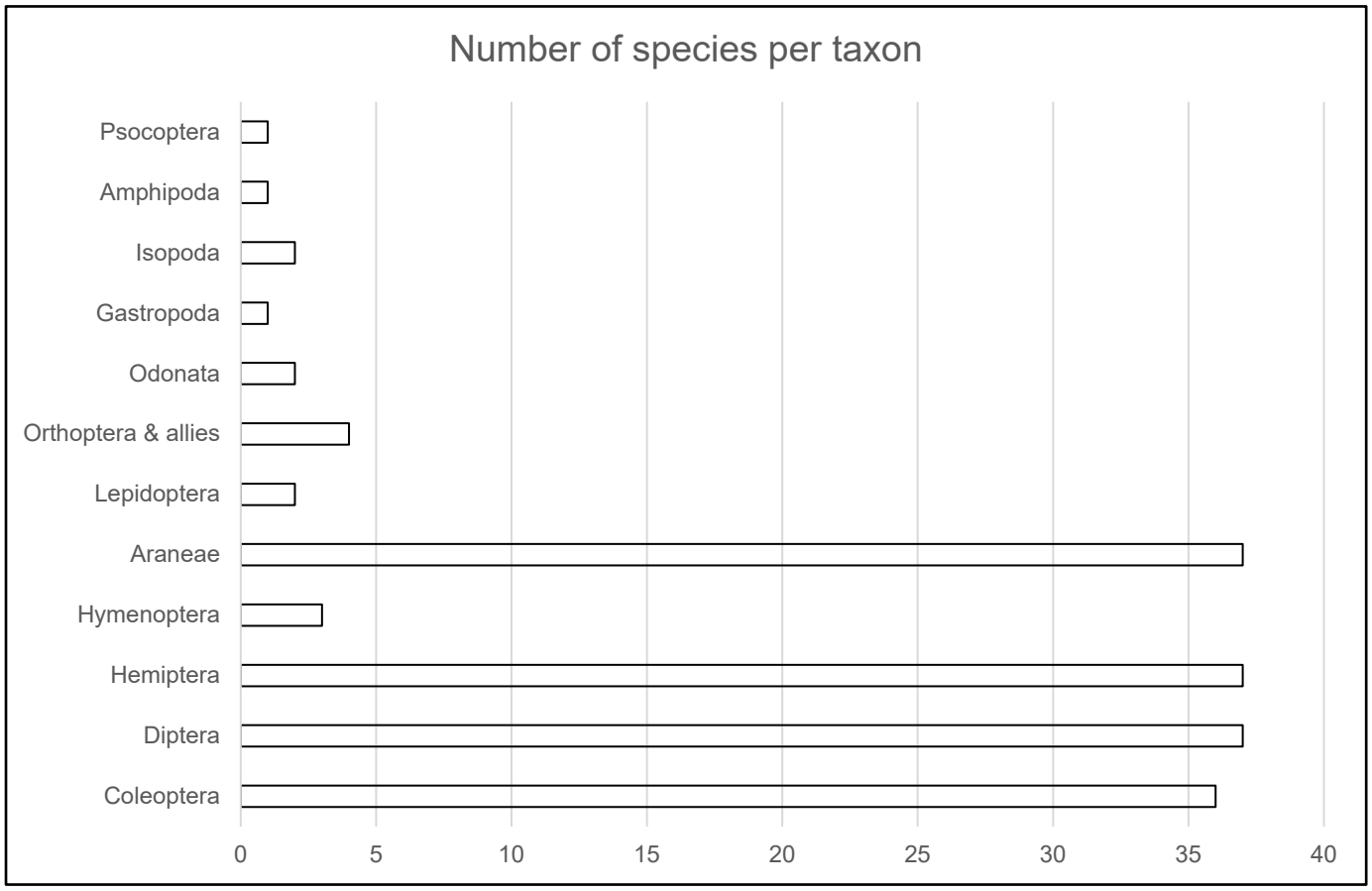

Figure 3 - Species per higher-taxon collected from SSSI Unit 2 during the 2022 survey.

From the SSSI Unit 2 species data, 77 were classed at broad biotope level in Pantheon, as 'Open habitat' species, 27 'Wetland' species were recorded, 20 were associated with 'Coastal' biotopes and 8 were 'Tree-associated' species.

Species of recognised conservation recorded from SSSI Unit 2 are listed in Table 11 (below). A summary of the UK distribution and autecology of each is also included in Appendix 1, Table 3.

The number of species deployed between the better represented Pantheon habitat-level assemblages within SSSI Unit 2, were recorded as follows: 62 species were attributed to 'Tall sward and scrub', 24 species to the 'Saltmarsh' assemblage, 14 species were attributed to 'Acid and sedge peats', 13 to both 'Marshland' and 'Short sward and bare ground' and five species were attributed to the 'Brackish pools and ditches' habitat-level assemblage.

However, if considered in terms of percentage representation in the Pantheon database; 'Saltmarsh' with an eight percent representation, was most strongly represented, followed by 'Brackish pools and ditches', represented by four percent of the national species pool. In comparison, whilst 62 species were attributed to 'Tall sward and scrub', this represents only two percent of this large group.

Table 6 - Species of recognised conservation recorded in SSSI Unit 2 from 2022 data. Blank cells indicate where IUCN post-2001 threat status not available.

Common name	*Scientific name*	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
A running crab spider	*Thanatus striatus*	Philodromidae	Araneae	Nationally Scarce	LC
A jumping spider	*Sibianor aurocinctus*	Salticidae	Araneae	Nationally Scarce	LC
A comb-footed spider	*Enoplognatha mordax*	Theridiidae	Araneae	Nationally Scarce	LC
An ant beetle	*Cyclodinus constrictus*	Anthicidae	Coleoptera	Nationally Scarce	LC
An anthicid beetle	*Stricticollis tobias*	Anthicidae	Coleoptera	Not Evaluated	NE
A ground beetle	*Bembidion normannum*	Carabidae	Coleoptera	Nationally Scarce	LC
A flea beetle	*Neocrepidodera impressa*	Chrysomelidae	Coleoptera	Nationally Rare	LC

Common name	*Scientific name*	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
A weevil	*Cosmobaris scolopacea*	Curculionidae	Coleoptera	RDB3 pre-1994 criteria	
A weevil	*Polydrusus pulchellus*	Curculionidae	Coleoptera	Nationally Scarce	
A latridiid beetle	*Melanophthalma suturalis*	Latridiidae	Coleoptera	RDBK (Insufficientl y known)	NE
A long-legged fly	*Dolichopus strigipes*	Dolichopodida e	Diptera	NS	
A flesh fly	*Sarcophaga sinuata*	Sarcophagida e	Diptera	NS	
Saltmarsh Horsefly	*Atylotus latistriatus*	Tabanidae	Diptera	Nationally Scarce	LC
A leafhopper	*Aphrodes aestuarina*	Cicadellidae	Hemiptera	NS(Nb)	LC
A lacehopper	*Pentastiridius leporinus*	Cixiidae	Hemiptera	NS(Nb)	LC
A planthopper	*Asiraca clavicornis*	Delphacidae	Hemiptera	Nationally Scarce	LC
A mirid bug	*Lygus pratensis*	Miridae	Hemiptera	RDB3 pre-1994 criteria	LC
Lobe-spurred Furrow Bee	*Lasioglossum pauxillum*	Halictidae	Hymenopter a	Nationally Scarce	LC
Wall	*Lasiommata megera*	Nymphalidae	Lepidoptera	S41 Priority species	NT

Whilst the largest number of species were attributed to the 'Tall sward and scrub' habitat-level assemblage for SSSI Unit 2, the only species attributed to this assemblage was the nationally scarce running crab spider *Thanatus striatus*, a species recorded fairly frequently, where it occurs in Essex, at the upper reaches of saltmarsh and in coastal grasslands. The species is discussed in relation to compartment C and was also recorded in saltmarsh SSSI Units 3 and 4.

Local species, without a higher conservation status also attributed to the Tall sward and scrub assemblage recorded from SSSI Unit 2, included the Wasp Spider *Argiope bruennichi*, an orb-web spider *Hypsosinga pygmaea*; the Brown Heath Robberfly *Machimus cingulatus*, which was also fairly commonly recorded throughout the coastal grassland habitats in the greater survey area and a flea beetle *Phyllotreta diademata* (now listed as *P. astrachanica*) described as being 'widely scattered' in a review by Hubble (2014).

Orthoptera generally have not been mentioned so far in this report, as none of the species recorded during the survey are, any longer, of recognised conservation status. However, Lesser Marsh Grasshopper *Chorthippus albomarginatus* was abundant throughout the upper saltmarsh and some of the coastal grassland and wetland edge habitat throughout the wider 2022 survey area, often occurring alongside Roesel's Bush-cricket *Roeseliana roeselii*, Long-winged Conehead *Conocephalus fuscus* and more locally, Short-winged Conehead *C. dorsalis.*

Compared to 'Tall sward and scrub', almost half (11 out of 24) of the species attributed to the 'Saltmarsh' assemblage from SSSI Unit 2, were of recognised conservation status. One of the species, a flea beetle *Neocrepidodera impressa,* was listed under post-2001 IUCN criteria as nationally rare, with a threat status of 'Least Concern'; and a weevil *Cosmobaris scolopacea*, is currently classed under pre-1994 criteria as nationally rare (RDB3). The remainder of saltmarsh species of recognised conservation status, recorded from SSSI Unit 2, were currently listed either as nationally scarce or pNS.

Neocrepidodera impressa is a species of flea beetle associated exclusively with coastal biotopes, where the insect is associated primarily with saltmarsh habitat. The beetle was described as being in decline in a status review by Hubble (2014). In Essex, there are a handful of recent records from coastal areas within close proximity of the 2022 survey area; however, the insect is not widely recorded in the county. Hyman and Parsons (1992) describe the species under the former name of *Crepidodera impressa*, as being 'Associated with Common Sea-lavender *Limonium vulgare*', on saltmarshes. During the 2022 survey, *N. impressa* was recorded from all three SSSI saltmarsh Units. The beetle's host plant occurred in all three compartments but was often localised in extent.

The weevil *Cosmobaris scolopacea* is a very scarce species in the UK, occurring almost exclusively on the south Essex and north Kent coasts within the Thames corridor. There are scattered records of the species predominately from saltmarsh habitat and it has previously been recorded within, or close to, the 2022 survey area. In the UK, *C. scolopacea* is found only in saltmarshes, where according to Duff (2016), it feeds on Sea-purslane *Atriplex portulacoides*, and possibly also Grass-leaved Orache *A. littoralis*. In continental Europe it feeds on other Amaranthaceae and is found in a wider variety of habitats (Duff, 2016).

During the 2022 survey *C. scolopacea* was recorded from a sweep sample collected from the upper portion of the mid saltmarsh zone in SSSI Unit 2 and from a vacuum sample collected from

SSSI Unit 4, where it was recorded from lower saltmarsh, close to the seaward margin. However, the habitat in this area was slightly raised, therefore, closer to mid saltmarsh in composition. The beetle's primary host plant in the UK, Sea-purslane, was abundant throughout much of the mid saltmarsh and wider survey area.

Nationally scarce species recorded from SSSI Unit 2, primarily associated with saltmarsh, but which were previously discussed in relation to habitat in adjoining compartments beyond the seawall, included a comb-footed spider *Enoplognatha mordax* and a lacehopper *Pentastiridius leporinus* (both discussed in relation to compartment B); an ant-like flower beetle *Cyclodinus constrictus* (discussed for compartment D); a picture-winged fly *Melieria picta* (discussed for sub-compartment A1) and the Saltmarsh Horsefly *Atylotus latistriatus,* discussed in connection with SSSI Unit 1.

Other saltmarsh-associated nationally scarce species recorded from SSSI Unit 2, included a ground beetle *Bembidion normannum*, Sea Wormwood Weevil *Polydrusus pulchellus*, a leafhopper *Aphrodes aestuarina* and the Dun Sentinel *Assiminea grayana*, a specialist saltmarsh snail.

All four species have been recorded pre-1990 from saltmarshes in south Essex; although the majority of records are from sites closer to the mouth of the Thames Estuary, from Canvey Island eastwards. Records of species with a strong saltmarsh affinity tend to decrease further inland to the west.

In terms of habitat, *B. normannum* occurs in 'tidal litter in saltmarshes' (Luff, 2007); whilst, according to Hyman and Parsons (1992), *P. pulchellus* occurs in 'saltmarsh, coastal shingle and estuaries', the species being associated with saltmarsh plants including Sea Wormwood *Artemesia maritima*, Sea Purslane *Halimone portulacoides* and Sea Beet *Beta maritima*, as the main foodplants. The leafhopper *Aphrodes aestuarina* has been recorded from Seablites *Suaeda spp.,* although Kirby (1992) states that 'In Essex it occurs most frequently in the upper levels of the saltmarsh where there is dense growth of Saltmarsh Grass *Puccinellia maritima* and Sea Purslane *Halimione portulicoides*.' Kirby (1992) conjectures that *P. maritima* may be the food plant as other species of the genus *Aphrodes* are grass feeders. The Dun Sentinel *Assiminea grayana* is generally recorded at, or around the high tide mark in saltmarshes; the mollusc was fairly well recorded from saltmarsh SSSI Units during the 2022 survey.

In addition to the nationally scarce species, a saltmarsh specialist wolf spider *Pardosa purbeckensis*, which is very similar to *P agrestis* recorded inland, was abundant within the saltmarsh of SSSI Unit 2 and elsewhere and two saltmarsh specialist two-winged flies; a long-legged fly *Dolichopus strigipes* and the Flecked Snout *Nemotelus notatus,* were also recorded. *D. strigipes* was previously classed as nationally scarce but was moderated in a review by Drake (2018); although the species is still decidedly local in the UK. *D. strigipes* occurs in upper saltmarsh in the zones with *Halimione portulicoides* and Saltmarsh Rush *Juncus gerardii*; whilst *N. notatus* is associated with brackish habitats, both on the coast and transitional habitat inland. In saltmarsh the species is associated with tidal pools in the upper saltmarsh (Stubbs and Drake, 2001).

The only other well-represented, habitat-level assemblage represented by species of recognised conservation status recorded from SSSI Unit 2, was 'Short sward and bare ground'. Nationally scarce species attributed to this assemblage, included a jumping spider *Sibianor aurocincta*, a planthopper *Asiraca clavicornis* and Lobe-spurred Mining Bee *Lasioglossum pauxillum.* The latter two species were discussed in relation to compartment C and sub-compartment A1, respectively.

Sibianor aurocinctus, also previously mentioned in relation to compartment C, has no clear recorded habitat affinity, other than being associated with dry, sparsely vegetated habitats including heathland, chalk grasslands and brownfield sites. The species seems to occur fairly frequently in the upper reaches of saltmarsh, sometimes in association with engineered structures such as seawalls adjacent to upper saltmarsh habitat. However, during the 2022 survey the spider was vacuumed from the mid-zone of a wide saltmarsh strip, which supported a mosaic of upper, mid and lower plant communities.

In addition, one section 41 listed butterfly, the Wall *Lasiommata megera* attributed to 'Short sward and bare ground' was also recorded from the upper reaches, where it benefitted from the microclimate created by the concrete seawall, as well as an abundant nectar supply and graminoid foodplant resource. This species was also recorded from SSSI Units 1 and 3 during the 2022 survey.

Mucking Flats & Marshes SSSI Unit 3

SSSI Unit 3 occupied approximately 5.15 hectares, this comprising saltmarsh and soft cliff habitat only. The extensive mudflats also included within the SSSI boundary were not included in the survey area.

The underlying geology and superficial deposits beneath the Unit 3 saltmarsh comprised elements of both the Thanet Formation - sand, silt and clay and the Lambeth Group - clay, silt and sand overlain with superficial beach and tidal flat deposits of clay, silt and sand.

Between the southernmost boundary of SSSI Unit 3 and the more extensive saltmarsh bordering the Mucking Creek to the north, saltmarsh was generally poorly represented, being restricted to smallish patches. These included those subject to sweep and vacuum sampling (SW.U3.4 and VAC.U3.4) (Appendix 3, Photograph 45), located towards the southern border of the Unit at TQ 69493 79115 and another area, slightly to the north of that point at TQ 69513 79347, where samples SW.U3.3 and VAC.U3.3, were collected (Appendix 3, Photograph 46).

Greater survey attention was paid to habitat adjacent to the Mucking Creek immediately to the north of the Thameside Nature Park (compartment B). Here saltmarsh extended about 750 metres inland of the confluence of Mucking Creek and the River Thames. At the location of sample sites SW.U3.1 and VAC.U3.1 (TQ 69266 80793) and SW.U3.2 and VAC.U3.2 (TQ 69358 80857), saltmarsh habitat was up to 60 metres wide and was bordered to the north by a fairly steep, south-facing soil bank, which was partially vegetated, mainly with Common Nettle *Urtica dioica* and Bramble *Rubus fruitcosus* agg. scrub, and from which numerous fragments of pottery, old bottles, clinker blocks and other historic landfill refugia, were becoming exposed (Appendix 3, Photographs 45 to 47).

The clinker cinder blocks emanating from the slope bottom, which were scattered along the drier margins of the saltmarsh, were of the kind considered to be used as refugia for a very rare and endangered jumping spider *Sitticus distinguendus* and the habitat at this point was otherwise potentially suitable to support the species. However, no *S. distinguendus* were recorded during the survey, despite examination of suitable-looking cinder blocks.

Although timed sweep and vacuum samples were confined to the saltmarsh habitat within SSSI Unit 3, some spot sweeping was undertaken on the spoil escarpment between TQ 69172 80808 and TQ 69399 80914, as there were fairly numerous aculeate burrows within the exposed earth at this point and associated species, including the nationally scarce Black Mining Bee *Andrena pilipes* and its typical cleptoparasite the Orange-horned Nomad Bee *Nomada fulvicornis* sbsp *fulvicornis,* were recorded.

The saltmarsh around this point comprised a fairly uniform short (c2 to 5cm) sward in which Common Saltmarsh-grass *Puccinellia maritima* was dominant, with contrastingly tall patches of Sea Rush *Juncus maritimus* and Sea Couch *Elytrigia atherica*. Besides the Mucking Creek, which meandered through the site, there were several pools, which dried out at low tide, with marine Isopods, Amphipods (including shrimps) and other brackish tolerant invertebrates, being evident when inundated. The Common Saltmarsh-grass sward was generally short and rabbit grazing was evident, particularly in these more inland areas. Other typical saltmarsh plants recorded included Sea Milkwort *Glaux maritima*, Greater Sea-spurrey *Spergularia media,* Sea Arrowgrass *Triglochin maritima,* Sea Plantain *Plantago maritima* and occasional Annual Seablite *Suaeda maritima* and Sea Aster *Aster tripolium.*

Sea Purslane *Atriplex portulacoides*, was often abundant in areas of lower relief, such as at the edges of tidal scrapes, pools and along the margins of the Mucking Creek and glasswort *Salicornia* spp. also occurred on bare mud, in some of the more frequently inundated areas.

The habitat in this area was sheltered compared to the more exposed saltmarsh areas facing the Thames. The south-facing spoil bank provided a valuable resource for ground-nesting aculeates, including potentially species which may benefit from the saltmarsh flower resource for foraging.

The more exposed saltmarsh habitat facing the Thames around TQ 69513 79347 and TQ 69493 79115, were narrow zones immediately seaward of the C1 and C4 sub-compartments, which supported herb-rich OMH and grasslands, as well as being actively managed as landfill. The habitat along this stretch was subject to hard engineering and the saltmarsh surveyed here was formed in the location of sweep and vacuum samples, SW.U3.3 and VAC.U3.3, directly inland of a rock and concrete revetment (Appendix 3, Photographs 48 and 49), whilst the SW.U3.4 and VAC.U3.4 samples were collected from saltmarsh vegetation accreting on a shelf of concrete pilings.

Saltmarsh at the former of these sample sites occupied a c60 metre long stretch, of a maximum width of c25 metres (Appendix 3, Photograph 50). Despite being located landward of the sea defence, the vegetation included elements of both upper and mid saltmarsh and there were some small pools subject to tidal inundation. Closest to the inner sea defence bank was typically, a c4 metre wide strip of taller sward (c20 to 30cm) of Sea Couch with Common Orache *Atriplex patula* and locally, Thrift *Armeria maritima;* this upper habitat grading into a generally shorter sward (c5 to

10cm) mixture of Common Saltmarsh Grass and a range of halophytic species more typical of mid saltmarsh. Golden Samphire *Inula crithmoides,* Sea Aster, Sea Purslane, Sea Plantain and Sea Milkwort were all well represented, with Sea Lavender *Limonium vulgare,* glassworts *Salicornia spp*, rushes *Juncus spp.* and cord-grasses *Spartina spp.* occurring more locally.

The location of the SW.U3.4 and VAC.U3.4 sample sites, was approximately 250 metres south of the previously described sample site, being close to the southernmost boundary of the SSSI Unit. As previously mentioned, saltmarsh habitat had accreted on top of a concrete revetment/shelf and was evidently subject to tidal inundation. In some areas the vegetation was more restricted to gaps/recesses in the pilings, in others it formed a more or less continuous sward. The narrow (c3 metre) upper zone sloped fairly steeply upwards from the lower platform to the vertical concrete sea defence. This habitat comprising primarily of Sea Couch. The vegetation colonising the concrete platform to seaward, included typical mid saltmarsh plants like Common Saltmarsh-grass, Sea Purslane, Sea Aster and Golden Samphire, with cord-grasses and Saltmarsh Rush *Juncus gerardii,* sometimes colonising gaps between the pilings.

The saltmarsh habitat occupying these more exposed sections of SSSI Unit 3, despite often occurring on and in conjunction with surfaces of hard engineering, provides some habitat continuity, in the form of stepping-stones between more significant blocks in SSSI Unit 2 in the south and saltmarsh habitat patches in SSSI Unit 4 to the north. The habitat was contiguous with the grassland, scrub and OMH within compartment C inland, which supported potential bare ground-nesting habitat for species of aculeates known to forage within saltmarsh habitat.

The inland habitat of Mucking Creek provided a more sheltered zone of saltmarsh and habitat approximating to soft cliff. The Creek provided a corridor between the more saline coastal saltmarsh, increasingly freshwater inland reed-fen & pools, and other wetland habitats, such as those surveyed in the Stanford Warren Nature Reserve area (sub compartments A1 and A6). Such transitions provide a greater range of opportunities for specialist invertebrates, including species requiring different habitat elements during different lifecycle stages.

Invertebrate species recorded

Sample methods used in SSSI Unit 3, included timed sweep sampling and vacuum sampling, direct searching, and spot sweeping. Sample locations are briefly described in Appendix 1, Table 1 and illustrated in Appendix 2, Figures 9 and 10.

From the 2022 survey of SSSI Unit 3, a total of 137 invertebrate species, including 15 of recognised conservation status in the UK, were recorded. In terms of species deployment, true bugs (Hemiptera) were most strongly represented with 34 species, followed by beetles (Coleoptera) with 27 species; bees, ants and wasps (Aculeate Hymenoptera) with 23 species; Spiders (Araneae) with 22 species and 21 two-winged flies (Diptera) were recorded. The remaining taxa were sparsely represented, with only three species of grasshoppers, crickets and allied species (Orthoptera), two species of butterflies and moths (Lepidoptera) and snails (Gastropoda) and one species per taxon attributed to harvestmen (Opiliones), barkflies (Psocoptera), shrimps (Amphipoda) and snails (Gastropoda).

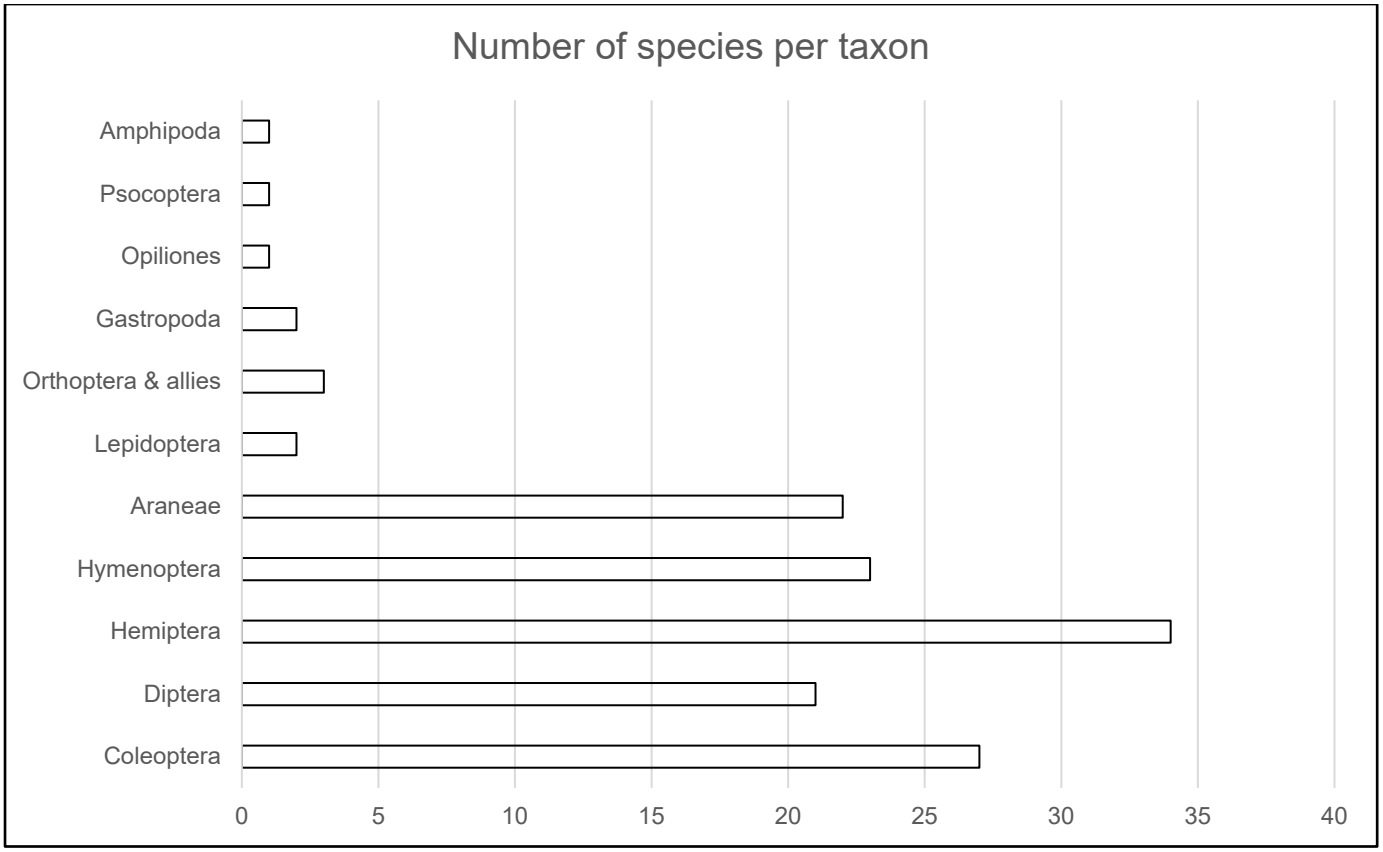

Figure 4 - Species per higher-taxon collected from SSSI Unit 3 during the 2022 survey

From the species data, 79 of the recorded species were classified at broad biotope level in Pantheon, as 'Open habitat' species, 21 were 'Coastal' species, 14 were associated with 'Wetland' biotopes and 6 were 'Tree-associated'.

Species of recognised conservation status recorded from SSSI Unit 3 are listed in Table 12 (below). A summary of the UK distribution and autecology of each is also included in Appendix 1, Table 3.

The number of species deployed between the better represented Pantheon habitat-level assemblages within SSSI Unit 3, were recorded as follows: 52 species were attributed to 'Tall sward and scrub', 24 species to 'Short sward and bare ground', 18 species were attributed to the 'Saltmarsh' assemblage and six species were attributed to each of the 'Brackish pools and ditches', 'Acid and sedge peats' and 'Marshland' assemblages.

If considered in terms of percentage representation of the number of species attributed in the Pantheon database to each group, 'Saltmarsh' was the most strongly represented group with a six percent representation, followed by 'Brackish pools and ditches', which was represented by five percent of the national species pool, recorded in Pantheon. In comparison whilst 52 species were attributed to 'Tall sward and scrub' and 24 species to 'Short sward and bare ground' the percentage representation for each of these groups was two percent.

Table 7 - Species of recognised conservation recorded in SSSI Unit 3 from 2022 data. Blank cells indicate where IUCN post-2001 threat status not available.

Common name	*Scientific name*	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
A running crab spider	*Thanatus striatus*	Philodromidae	Araneae	Nationally Scarce	LC
A jumping spider	*Sibianor aurocinctus*	Salticidae	Araneae	Nationally Scarce	LC
A comb-footed spider	*Enoplognatha mordax*	Theridiidae	Araneae	Nationally Scarce	LC
An anthicid beetle	*Cordicollis instabilis*	Anthicidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Bembidion normannum*	Carabidae	Coleoptera	Nationally Scarce	LC
A flea beetle	*Neocrepidodera impressa*	Chrysomelidae	Coleoptera	Nationally Rare	LC
Top-horned Hunchbank	*Paracrocera orbiculus*	Acroceridae	Diptera	Nationally Scarce	LC
A mirid bug	*Lygus pratensis*	Miridae	Hemiptera	RDB3 pre-1994 criteria	LC
A shore bug	*Saldula palustris*	Saldidae	Hemiptera	Nationally Scarce	LC

Common name	*Scientific name*	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
Black Mining Bee	*Andrena pilipes*	Andrenidae	Hymenoptera	Nationally Scarce	
Brown-banded Carder Bee	*Bombus humilis*	Apidae	Hymenoptera	S41 Priority species	
Shrill Carder Bee	*Bombus sylvarum*	Apidae	Hymenoptera	S41 Priority species	
Orange-horned Nomad Bee	*Nomada fulvicornis sbsp fulvicornis*	Apidae	Hymenoptera	RDB3 pre-1994 criteria	
Silvery Leafcutter Bee	*Megachile leachella*	Megachilidae	Hymenoptera	Nationally Scarce	LC
Wall	*Lasiommata megera*	Nymphalidae	Lepidoptera	S41 Priority species	NT

Due to some survey attention being given to the aculeates associated with the historic landfill spoil banks adjacent to the saltmarsh within the more inland sections of SSSI Unit 3; the assemblages present, unlike for SSSI Units 2 and 4, were not entirely collected from saltmarsh habitat.

Species of recognised conservation status attributed to the 'Tall sward and scrub' habitat-level assemblage in Pantheon from SSSI Unit 3 included section 41 priority species, Shrill Carder Bee *Bombus sylvarum* and Brown-banded Carder Bee *B. humilis*. These species were both recorded from the upper saltmarsh and scrub edge habitat within the Mucking Creek, as well as from the small saltmarsh patches further south. The nationally scarce running crab spider species *Thanatus striatus* (previously discussed in under compartment C) was recorded from the interface of the former landfill cliff-base and upper saltmarsh and cliff in SSSI Unit 3 and was recorded from all three saltmarsh SSSI Units.

The only other nationally scarce species attributed to 'Tall sward and scrub' was a species of two-winged fly; the Top-horned Hunchbank *Acrocera orbiculus* (*Paracrocera orbiculus* in Stubbs and Drake, 2001), which was classed as Nationally Scarce, with a threat status of Least Concern in a review by Drake (2017). In the UK, the majority of records are from central southern England. In Essex, records are mainly from sites one or two kilometers inland of the north Essex coast including locations not far from the 2022 survey area.

According to Stubbs and Drake (2001), *A. orbiculus* is particularly associated with dry grassland, including that on chalk; but the fly has also been recorded from 'fens, bogs and even saltmarsh', although Verrall's records (quoted in Stubbs and Drake, 2001) were frequently from heathland sites. Like other hunchback flies, the larvae of *A. orbiculus* are internal parasitoids of spiders. Stubbs and Drake (2001) cite spiders of the families Gnaphosidae and Lycosidae, including the genus *Pardosa*. Top-horned Hunchback was recorded only from SSSI Unit 3, where it was swept from mid saltmarsh with dried out tidal creeks and silt pools.

Species attributed to the 'Short sward and bare ground' habitat-level assemblage from SSSI Unit 3 included the nationally scarce jumping spider *Sibianor aurocinctus*, the section 41-listed Wall *Lasiommata megera* (discussed previously in relation to sub-compartment C2 and SSSI Unit 1 respectively) and several aculeates, which were collected from the south-facing ‘cliffed’ habitat immediately above the saltmarsh. These included second brood, Black Mining Bee *Andrena pilipes*, a nationally scarce species which was recorded alongside its cleptoparasite, the RDB3 Orange-horned Nomad Bee *Nomada fulvicornis* sbsp *fulvicornis*. *A. pilipes* was not recorded in numbers from SSSI Unit 3, but the species was observed to be one of several aculeate species nesting in the south-facing spoil substrate. The bee typically nests in soft cliffs in coastal areas and forages within the adjacent flower-rich grassland habitats. Unlike the very similar Scarce Black Mining Bee *A. nigrospina*, recorded from sub-compartments C2 and C3 during the survey, *A pilipes* is double-brooded and the timing of recording corresponds with the second brood of the species.

Other 'Short sward and bare ground' associated aculeates recorded from SSSI Unit 3, included the Pantaloon Bee *Dasypoda hirtipes*, which was also recorded in abundance in SSSI Unit 1; the nationally scarce Silvery Leafcutter Bee *Megachile leachella,* discussed in relation to compartment B and several local species including Green-eyed Flower Bee *Anthophora bimaculata,* Dark-winged Blood Bee *Sphecodes gibbus,* Sickle-jawed Blood Bee *S. puncticeps* and several furrow bee species *Lasioglossum* and *Halictus* spp. The Large Sharp-tailed Bee *Coelioxys conoidea*, a parasitoid in the nest of the Coast Leafcutter Bee *Megachile maritima,* was also recorded here, as was the Ornate-tailed Digger Wasp *Cerceris rybyenisis*.

Species attributed to the saltmarsh assemblage in Pantheon recorded in SSSI Unit 3 during the 2022 survey were, arguably of greater conservation interest than either grassland assemblages. A nationally rare flea beetle *Neocrepidodera impressa,* a nationally scarce ground beetle *Bembidion normannum* and a nationally scarce snail, the Dun Sentinel *Assiminea grayana* (all discussed in relation to SSSI Unit 2), were recorded here as were the nationally scarce comb-footed spider *Enoplognatha mordax* (discussed under compartment B) and picture-winged fly *Melieria picta* (discussed in relation to A1).

Species of conservation status recorded from SSSI Unit 3, not previously mentioned in this report, included a nationally scarce saldid bug *Saldula palustris* and Mouse-eared Snail *Myosotella myosotis*, a DD 'Data deficient' listed species, occurring at around the high tide mark in the upper saltmarsh.

S. palustris is almost exclusively restricted to coastal habitats in the UK. Not listed in Kirby (1992), the insect has been afforded Nationally Scarce status in a review by Cook (2015). In Essex, most post-1990 records are from the eastern extremity of the Thames, with further records from Canvey Island. There is also at least one record from within the general area of the 2022 survey.

According to Southwood and Leston (1959), *S. palustris* is partly subaquatic, occurring on estuarine mudflats, with adults and larvae living around the normal high-water mark. However, Southwood and Leston (1959) also state that 'adult bugs are present in abundance at the higher levels of the shore, at about high-water mark, but the larvae tend to frequent the lower cord-grass and Enteromorpha zone. During the 2022 survey, *S. palustris* was recorded only from upper saltmarsh habitat in SSSI Unit 3.

Other saltmarsh associates of note recorded from SSSI Unit 3 included three species of long-legged fly (Dolichopodidae); *Dolichopus strigipes*, *Hydrophorus oceanus* and *Machaerium oceanus*, all of which were included in the nationally scarce category prior to being downgraded in a review by Drake (2018). A local soldier fly associated with brackish habitats, the Barred Snout *Nemotelus uliginosus*, was also recorded from SSSI Unit 3.

The mirid bugs, *Orthotylus flavosparsus* and the decidedly local *O. moncreaffi,* both of which are associated with Chenopods, including Sea Purslane *Atriplex portulacoides,* were also attributed to the SSSI Unit 3 saltmarsh assemblage in Pantheon. *O. moncreaffi,* is more or less confined to saltmarshes in the UK, occurring predominately in the upper saltmarsh zone.

A nationally scarce ant-like flower beetle *Cordicollis* instabillis (discussed in relation to SSSI Unit 2) was also recorded from SSSI Unit 3 during the 2022 survey. Whilst *C. instabillis* is attributed only to the 'Sandy beach' habitat-level assemblage in Pantheon, the species is also associated with saltmarsh habitat from which it was recorded in both cases during the 2022 survey.

Mucking Flats & Marshes SSSI Unit 4

The surveyed area of SSSI Unit 4 occupied approximately 8.6 hectares, this comprising of saltmarsh habitat only (the SSSI Unit extends to include extensive areas of mudflat, which were not surveyed). In Unit 4, saltmarsh was mainly confined to the northernmost section (centroid grid reference: TQ 70429 81443), where a significant area of saltmarsh occupied an otherwise, heavily engineered bay comprising a managed realignment site constructed as part of the London Gateway Port development. Southwest of this area, between TQ 70262 81347 and TQ 69512 81075, the coastal defences formed an abrupt transition from the rocky revetments and the mudflats, with little or no hint of saltmarsh. However, immediately south of this stretch, a small saltmarsh area occupied the angle between the peninsula forming the north bank of the Mucking Creek (to the south) and an engineered section to the north.

The underlying geology and superficial deposits beneath the SSSI Unit 4 saltmarsh comprises sedimentary bedrock of the London Formation - clay, silt and sand overlain with superficial beach and tidal flat deposits of clay, silt, and sand.

The narrow peninsula forming the northern bank of the entrance of the Mucking Creek extended around 500 metres seaward, before turning in a north-easterly direction as a partly engineered outer harbour wall-like feature. After approximately one kilometre, the bank turned shorewards at a right angle, thus forming the southernmost boundary of the more extensive, northern saltmarsh area and enclosing a large expanse of intertidal mudflat between the two saltmarsh sections. The bank itself was significant, particularly adjacent to the northern saltmarsh section, as it supported a partly vegetated raised bank, both providing shelter to the adjacent areas of saltmarsh and where unvegetated patches of clay soil substrate were present, there was evidence of nesting Sea Aster Mining Bee *Colletes halophilus*, which was also observed foraging in the adjacent saltmarsh.

All timed sweep and vacuum samples were collected from the northern saltmarsh section, with SW.U4.4 and VAC.U4.4 being collected from the upper saltmarsh zone (Appendix 3, Photographs 51 and 52), SW.U4.2 and VAC.U4.2 were collected from around TQ 70347 81465, in the upper to mid saltmarsh and both SW.U4.1 and VAC.U4.1 (TQ 70359 81336) and SW.U4.3 and VAC.U4.3 (TQ 70496 81424) were collected from further towards the seaward, lower saltmarsh zone. However, in practice the habitat in these areas was more typical of mid saltmarsh, due to the somewhat varied topography of the Unit. Approximately 150 metres of shoreline at the southwest seaward boundary of the saltmarsh comprised a sandy beach, with strandline refugia, this buffering the saltmarsh behind. For the remaining 450 metres, the seaward margin of the shoreline was more exposed, with large, intermittent tidal creeks persisting someway landwards.

Due to variable microtopography, lower, mid, and upper saltmarsh communities often formed a close mosaic. Stands of Sea Couch *Elytrigia atherica,* more normally confined to the upper few metres of the saltmarsh, persisted some way towards the outer seaward end. The aforementioned tidal creeks, opened into a series of silted pools, some quite large and persisting landwards as far as the outer margin of the upper saltmarsh, Sea Couch zone, around TQ 70347 81465.

The upper saltmarsh itself, in the area of samples SW.U4.2 and VAC.U4.2 and SW.U4.4 and VAC.U4.4, comprised Sea Couch, gradating quickly in the sample areas into extensive Sea Purslane *Atriplex portulacoides* dominated habitat in and around the tidal pools. Typical halophytes including Common Saltmarsh Grass *Puccinellia maritima,* Sea Plantain *Plantago maritima*, Sea Arrowgrass *Triglochin maritima* also occurred in mosaic at this point, adding structural and floristic diversity, alongside Sea Aster *Aster tripolium* and Golden Samphire *Inula crithmoides*, these plants being increasingly abundant throughout much of the entire saltmarsh area.

The habitat around the location of sweep and vacuum samples SW.U4.1 and VAC.U4.1 (TQ 70359 81336), despite its seaward location, comprised a generally similar floristic composition to that previously described for the upper zone. Sea Couch was present in this area, alongside abundant Sea Purslane, Sea Aster and Golden Samphire, with shorter swards of Common Saltmarsh Grass. Strandline debris was also present in this area, on the more raised areas.

At the location of SW.U4.3 and VAC.U4.3 (TQ 70496 81424) (Appendix 3, Photographs 53 and 54), the vegetation structure and microtopography was again varied and the habitat structurally diverse, with narrow channels and silt pools subject to tidal inundation. Common Saltmarsh Grass was abundant in this area, alongside extensive Sea Purslane dominated zones. Both Sea Aster and Golden Samphire provided an abundant forage resource, as elsewhere in the saltmarsh and Sea Arrowgrass and Saltmarsh Rush *Juncus gerardii* were also present.

During the final visit to the Unit in early September 2022, a small area of habitat immediately to the south of the raised bank defining the southern boundary of the northern saltmarsh, around TQ 70383 81425, was searched for Sea Aster Bee *Colletes halophilus* and other aculeates. The habitat at this point was sheltered, southwest facing and supported a dense stand of Sea Aster and Golden Samphire. Sea Aster Bee was recorded foraging in this area, alongside a range of solitary and social bee species.

The smaller southern saltmarsh patch at TQ 69491 81016 (location of spot sample and direct search SS.U4.2) extended to a maximum of 55 metres seaward and occupied approximately 175 metres of the shoreline. The saltmarsh habitat in this area was both structurally and floristically diverse, with stands of lush vegetation and exposed silted pools subject to tidal inundation. There was a narrow, two to five metre wide zone of upper saltmarsh supporting primarily Sea Couch, as elsewhere, but with localised patches of Common Reed *Phragmites australis*. The remaining middle and lower saltmarsh in this area was compositionally heterogenous, with a cord-grass Spartina sp., tussocks throughout and abundant Common saltmarsh Grass and a variety of typical halophytes including Sea Aster, Yellow Samphire, Glassworts *Salicornia* spp., Annual Seablite *Suaeda maritima*, Sea Purslane and occasional Common Sea Lavender *Limonium vulgare*.

A few metres inland of this area were short mown, grassy sea defence banks. There was some exposed bare ground within the banks; however, there was no visible evidence of colonising aculeates despite Sea Aster Bee having been recorded foraging on Sea Aster in both northern and southern saltmarsh areas.

Invertebrate species recorded

Sample methods used in SSSI Unit 4, included timed sweep sampling and vacuum sampling, direct searching, and spot sweeping. Sample locations are briefly described in Appendix 1, Table 1 and illustrated in Appendix 2, Figure 11.

From the 2022 survey of SSSI Unit 4, a total of 151 invertebrate species, including 14 of recognised conservation status in the UK, were recorded. In terms of species deployment two-winged flies (Diptera), were most strongly represented with 39 species, followed jointly by beetles (Coleoptera) and true bugs each with 27 species; 26 species of Spider (Araneae) were recorded and 24 species of bees, ants, and wasps (Aculeate Hymenoptera). Of the remaining taxa, four species of grasshoppers, crickets, and allied species (Orthoptera) were recorded; and butterflies and moths (Lepidoptera), dragonflies and damselflies (Odonata), shrimps (Amphipoda) and snails (Gastropoda) were each represented by a single recorded species.

From the species data, 92 of the recorded species were classified at broad biotope level in Pantheon, as 'Open habitat' species, 23 were 'Wetland' species, 18 were associated with 'Coastal' biotopes and 3 were 'Tree-associated'.

Species of recognised conservation recorded from SSSI Unit 4 are listed in Table 13 (below). A summary of the UK distribution and autecology of each is also included in Appendix 1, Table 3.

The number of species deployed between the better represented Pantheon habitat-level assemblages within SSSI Unit 2, were recorded as follows: 65 species were attributed to 'Tall sward and scrub', 22 species to 'Short sward and bare ground', 17 species were attributed to the 'Saltmarsh' assemblage, 13 to 'Marshland', 11 to 'Acid and sedge peats' and eight species were attributed to the 'Brackish pools and ditches' assemblage.

If considered in terms of percentage representation of the number of species attributed in the Pantheon database to each group, 'Brackish pools and ditches' was the most strongly represented group, with a seven percent representation, followed by 'Saltmarsh', which was represented by six percent of the national species pool recorded in Pantheon. In comparison whilst 65 species were attributed to 'Tall sward and scrub' and 22 species to 'Short sward and bare ground' the percentage representation for each of these groups was only two percent of their respective species pools.

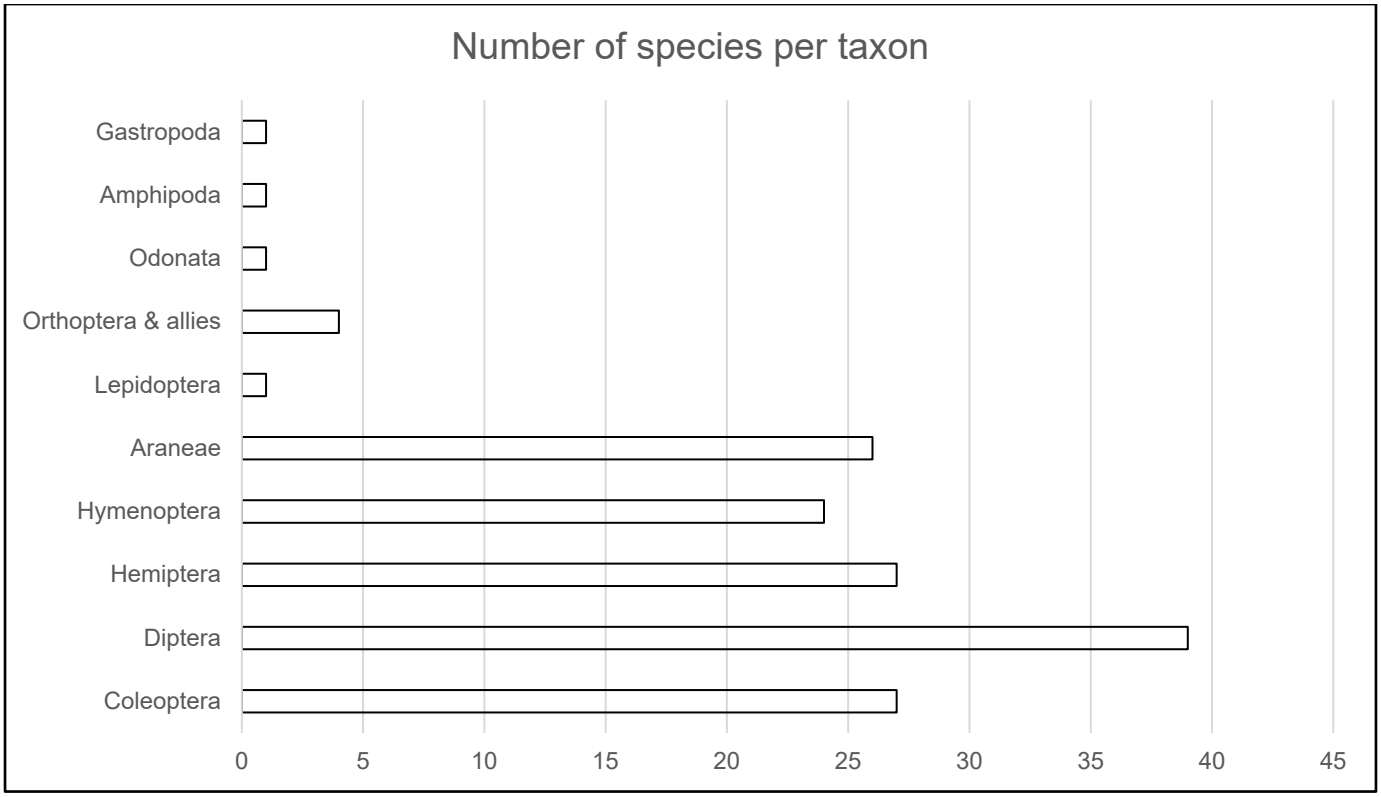

Figure 5 - Species per higher-taxon collected from SSSI Unit 4 during the 2022 survey.

Table 8- Species of recognised conservation recorded in SSSI Unit 4 from 2022 data. Blank cells indicate where IUCN post-2001 threat status not available.

Common name	*Scientific name*	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
A running crab spider	*Thanatus striatus*	Philodromidae	Araneae	Nationally Scarce	LC
A jumping spider	*Sibianor aurocinctus*	Salticidae	Araneae	Nationally Scarce	LC
A comb-footed spider	*Enoplognatha mordax*	Theridiidae	Araneae	Nationally Scarce	LC
A flea beetle	*Neocrepidodera impressa*	Chrysomelidae	Coleoptera	Nationally Rare	LC

Common name	*Scientific name*	Family	Order/higher taxon	UK status	IUCN post-2001 threat status
A weevil	*Cosmobaris scolopacea*	Curculionidae	Coleoptera	RDB3 pre-1994 criteria	
A beach fly	*Pelomyia occidentalis*	Canacidae	Diptera	non-native?	
A long-legged fly	*Dolichopus strigipes*	Dolichopodidae	Diptera	NS	
A ulidiid fly	*Melieria picta*	Ulidiidae	Diptera	pNS	
A leafhopper	*Aphrodes aestuarina*	Cicadellidae	Hemiptera	NS(Nb)	LC
A lacehopper	*Pentastiridius leporinus*	Cixiidae	Hemiptera	NS(Nb)	LC
A mirid bug	*Lygus pratensis*	Miridae	Hemiptera	RDB3 pre-1994 criteria	LC
Brown-banded Carder Bee	*Bombus humilis*	Apidae	Hymenoptera	S41 Priority species	
Shrill Carder Bee	*Bombus sylvarum*	Apidae	Hymenoptera	S41 Priority species	
Sea Aster Colletes	*Colletes halophilus*	Colletidae	Hymenoptera	s41	LC
Ridge-cheeked Furrow Bee	*Lasioglossum puncticolle*	Halictidae	Hymenoptera	Nationally Scarce	LC

Species of particular note recorded from the SSSI Unit 4 saltmarsh included Sea Aster Bee *Colletes halophilus*, which is listed as a priority species under section 41 of the NERC Act (2006) as well as being a nationally scarce (formerly Notable A) species. The nationally rare flea beetle *Neocrepidodera impressa* and a RDB3 listed weevil *Cosmobaris scolopacea* (previously

discussed in relation to SSSI Unit 2 and compartment C respectively), were also recorded from Unit 4, as were s41 listed Shrill Carder Bee *Bombus sylvarum* and Brown-banded Carder Bee *B. humilis,* both of which were also recorded foraging within the upper saltmarsh of the Unit.

The Sea Aster Bee *Colletes halophilus* is almost exclusively a coastal species in the UK. There are a number of records from coastal habitat in south Essex and the species is known to occur within suitable habitat in the 2022 survey area. Besides its national status, the bee is listed in the Essex RDB as 'Regionally Important'. *C. halophilus* generally occurs at the margins of saltmarshes, where it collects pollen primarily from Sea Aster *Aster tripolium*, though it forages for nectar on a wider range of plants including sea lavenders *Limonium* spp. and a range of other species (Else and Edwards, 2018). The insect nests in dense and extensive aggregations in exposed soil, often in sand. Whilst the species is predominately coastal, it has been recorded well inland. During early September 2022, a reasonable number of specimens were recorded foraging on mainly Sea Aster, but also occasionally Golden Samphire *Inula crithmoides* flowers, in SSSI Unit 4.

As the earlier surveys were completed before the flight period of *C. halophilus*, potential nesting aggregations in compartments B, C and D in particular, would have been missed. Also, due to limited time in September, whilst some searching was conducted in SSSI Units 2 and 3; Unit 4, where the species was found, received the greatest survey effort.

In terms of Pantheon habitat-level affinity, the assemblages recorded from SSSI Unit 4 followed a similar pattern to that of the other two saltmarsh Units and whilst 'Tall sward and scrub' was the most strongly represented in terms of attributed species number, followed by 'Short sward and bare ground', the rarity value (denoted by SQI in Pantheon) recorded for the 'saltmarsh' assemblage was considerably higher.

Other than the previously mentioned *Bombus sylvarum* and *B. humilis,* species attributed to the 'Tall sward and shrub' assemblage for SSSI Unit 4 included a nationally scarce running crab spider *Thanatus striatus*, which was recorded from all three SSSI saltmarsh Units during the survey and Adonis Ladybird *Hippodamia variegata*, discussed previously in relation to sub-compartment A6.

Other somewhat local 'Tall sward and shrub' species recorded from SSSI Unit 4 included: Wasp Spider *Argiope bruennichi*, a mirid bug *Lygus maritimus* and Chalk Yellow-faced Bee *Hylaeus dilatatus*. The typical orthoptera fauna found throughout the upper saltmarshes in the survey area, were also recorded here with Lesser Marsh Grasshopper *Chorthippus albomarginatus*, Long-winged Conehead *Conocephalus fuscus,* Short-winged Conehead *C. dorsalis* and Roesel's Bush-cricket *Roeseliana roeselii,* all occurring in good numbers.

Nationally scarce species attributed to 'Short sward and bare ground' included a jumping spider *Sibianor aurocinctus*, which was also recorded from similar parts of the upper saltmarsh in SSSI Units 2 and 3; Ridge-cheeked Furrow Bee *Lasioglossum puncticolle* (discussed in relation to compartment B) and two other bee species; Sharp-collared Furrow Bee *Lasioglossum malachurum* (discussed under compartment D) and the Pantaloon Bee *Dasypoda hirtipes*, both of which are still listed as nationally scarce in Pantheon, but are well overdue for status review.

Other local, but not designated species of interest attributed to this assemblage, included a planthopper *Muirodelphax aubei*, which is associated with dry grassy coastal habitats; *Stictopleurus punctatonervosus,* a species of rhopalid bug, classed until recently, as 'extinct' in the UK; now being well recorded in suitable habitat in southeast England; Slender-bodied Digger Wasp *Crabro cribrarius* which is associated with both sandy and chalk soils, often occurring in coastal habitats and Spined Mason Bee *Osmia spinulosa,* one of several *Osmia* spp. to nest in discarded snail shells, which was recorded in several compartments during the 2022 survey.

Other than previously mentioned *Colletes halophilus, Neocrepidodera impressa* and *Cosmobaris scolopacea*, saltmarsh associated species of recognised conservation status in the UK recorded from SSSI Unit 4 included five nationally scarce species, all of which have been discussed previously in relation to other saltmarsh SSSI Units. These included a comb-footed spider *Enoplognatha mordax*, a picture-winged fly *Melieria picta*, a leafhopper *Aphrodes aestuarina*, a lacebug *Pentastiridius leporinus* and a snail, the Dun Sentinel *Assiminea grayana*. These species were all frequently encountered within the saltmarsh habitats surveyed, occurring in both mid and upper saltmarsh zones.

Other species worthy of note attributed to the 'saltmarsh' habitat-level assemblage, recorded from SSSI Unit 4, included a wolf spider *Pardosa purbeckensis*, a long-headed fly *Dolichopus strigipes* (downgraded from nationally scarce by Drake, 2018) two closely related soldierflies associated with brackish habitats; the Flecked Snout *Nemotelus notatus* and Barred Snout *N. uliginosus*, and a brackish water associated hoverfly *Eristalinus aeneus.*

Survey Compartments rejected during the scoping phase

Sub-compartment A7 and all nine sub-compartments of Area L were scoped at the onset of the project but were not selected for more detailed survey work. Sub-compartment A7, a wet meadow/ rush pasture, was rejected due to it being mowed at the exact time of the scoping study; Area L sub-compartments and the associated seawall corridor, are described and discussed as follows:

L1, L2, L3 and L4 were all privately owned, and access was not granted for these sub-compartments at the time of scoping survey. However, it was possible to reasonably appraise them visually from the seawall corridor.

L1 comprised a small, mature, yet heavily shaded Sycamore *Acer pseudoplatanus* woodland. The woodland had a dense scrub layer comprising mainly Bramble *Rubus fruticosus* agg. with dense Sycamore saplings, but few other trees. Tall herbs, mainly comprising Common Nettle *Urtica dioica,* occurred in the ground layer.

L2, L3 and L4 were herb-poor tall sward grasslands, at best, poor semi-improved, which appear to have received little recent management. Sub-compartments L5, L6 and L9 were uniformly, heavily grazed by ponies (although stocking-rates were low at the time of survey). The sward in these compartments was very short, with little structural, or compositional variation. Again, the habitat was recorded as poor semi-improved at the time of survey. There was, however, a row of mature Hawthorn *Crataegus monogyna*, between fields. These trees potentially provided habitat for arboreal species and possibly saproxylic fauna, but the surrounding grassland offered little structural diversity.

L7 was managed at the time of survey as a camping/glamping site. The manager, who was met on site, was keen to manage the site between the pitches as a wildlife hay-meadow. The site currently receives an annual hay-cut in the late summer. The habitat occupied a flattish area, comprised uniform, tall-sward grassland blocks separated by short mown, linear tracks accessing the pitches. According to the manager (Vince Turner pers. com.) the site had been sown with various wildflower mixes; however, at the time of survey, the flowering plant density was low in comparison to graminoids.

The sward comprised graminoids including False Oat Grass *Arrhenatherum elatius,* Cock's-foot *Dactylis glomerata,* Perennial Rye Grass *Lolium perenne*, Yellow Oat Grass *Trisetum flavescens,* Small Timothy *Phleum bertolonii* and Yorkshire Fog *Holcus lanatus;* with thinly distributed herbs including Narrow-leaved Bird's-foot Trefoil *Lotus tenuis*, Red Clover *Trifolium pratense*, White Clover *T. repens,* Meadow Buttercup *Ranunculus acris,* Smooth/Hairy Tare *Vicia tetrasperma/hirsuta*, Lucerne *Medicago sativa,* Black Medick *Medicago lupulina,* Ox-eye Daisy *Chrysanthemum leucanthemum* and Grass Vetchling *Lathyrus nissolia*.

There were also a number of exotic, non-native species, some such as Salsify *Tragopogon porrifolius,* which is widely naturalised in south Essex had probably self-seeded, other species of dubious origin had possibly originated from the aforementioned 'wildflower' mixes.

During the walkover survey, butterflies including s41 Small Heath *Coenonympha pamphilus*, Meadow Brown *Maniola jurtina,* Small Skipper *Thymelicus sylvestris* and Large Skipper *Ochlodes sylvanus* were recorded within the L7 grassland.

The habitat in compartment L8 seen from the sea defence bank, supported herb-poor, rank grassland considered to be of relatively low potential invertebrate value.

The seawall corridor itself in this area (inland side of the wall), supported somewhat improved, rather herb-poor, tall sward grassland, this occupied an approximately five metre wide strip, which sloped fairly steeply from the concrete seawall. The most abundant herb here was the non-native Hoary Cress *Lepidium draba* and there were also, small patches of Bramble scrub. Whilst generally herb-poor, the seawall corridor provided a sheltered microclimate and species of note were recorded incidentally during the scoping. These included two s41 species; Shrill Carder Bee *Bombus sylvarum* (Queen) and Phoenix Fly *Dorycera graminum*. The corridor forms the boundary of SSSI Unit 1.

At the time of survey, during mid-June 2022, the sub-compartments of Area L were considered to be unexceptional in terms of invertebrate potential. Of these, the campsite hay-meadow (compartment L7) and the seawall corridor appeared to offer habitat of greatest potential for representative invertebrate assemblages; however, the habitat within these areas, in their recorded condition, was unexceptional and therefore, no further invertebrate survey work was conducted following the initial scoping.

Whilst the habitat within the Area L complex was not considered to be of high potential to support significant invertebrate assemblages in its current overall condition, the areas occupy a potentially important ecological position on a landscape scale. The condition of the habitat within the area was in part, at least, due to management and it is clear that both the structure and herb-richness

of the sub-compartments could be increased significantly with changes in management and a targeted management plan.

Evaluation

Both habitat and invertebrate surveys were largely conducted according to plan, during the 2022 field season.

Weather conditions, other than a somewhat constant sea breeze, affecting the saltmarsh habitat in the more exposed areas of SSSI Units 2, 3 and 4, were generally warm and sunny, providing optimal conditions for sampling the target assemblages.

Habitat

Open mosaic habitat on previously developed land (OMH)

OMH and grassland areas outside of the existing Mucking Flats & Marshes SSSI including compartments C and D, were found to be both structurally and floristically diverse, with localised areas of accentuated topographical and micro-topographical variation. The habitat was largely formed through anthropogenic disturbance and the soils and underlying geology, whether created by land-forming and dumping of spoil, or naturally occurring, provided a range of substrates including clay, sand, chalk ballast and PFA. The varied edaphic and geological conditions resulted in localised and sometimes, abrupt transitions, from free-draining xerophilic habitat, though seasonally wet grassland to areas of swamp and open water.

There was an evident brackish element within the created lagoons and other wetland habitat immediately inland of the seawall in compartment D, providing transition habitat between the saltmarsh within the SSSI and habitat further inland.

There were significant areas of bare ground amongst the vegetation and whilst some extensive areas were fairly uniform in terms of succession, both compartments C and D provided habitat ranging from early successional to well established grassland and scrub habitats. Overall, the characteristics in the greater parts of these two extensive compartments clearly fulfil criteria for OMH outlined in the s41 description for this habitat in Maddock (2008).

Established coastal grassland

The more established grassland habitats in the Thameside Nature Park (compartment B) and Unit 1 of the SSSI, were generally herb-rich. Both areas are actively managed for nature conservation; the former by cattle grazing, the latter by mowing and cutting and removal.

The grassland within the Thameside Nature Park supported a flower-rich resource, comprising herbs including Narrow-leaved Bird's-foot Trefoil *Lotus tenuis,* clovers *Trifolium* spp. and a range of other species known to provide valuable forage to aculeates and other taxa characteristic of the Thames corridor. However, structurally diverse areas were rather localised, mainly occurring along

the southern boundary of the compartment. The sward to the north of the visitor centre access track was generally rather uniform and the bare ground resource was somewhat limited and often, there was little micro-topographical variation. The Park is managed by low intensity cattle grazing, which is generally considered to provide a more structurally uneven sward, beneficial to invertebrates, than the uniformly short swards created by other grazing livestock, such as sheep and horses.

The habitat within SSSI Unit 1 was both structurally and floristically diverse and although the compartment was generally flat, there was some micro-topographical variation. The gradual transition between the drier grassland closer to the seawall and the brackish grassland, reed-fen & pools, and willow carr further inland, provided a subtle change in vegetation composition and structure to occur within the site, which was of mixed geology. The compartment supported areas of both shorter and taller sward grassland, as well as sparsely vegetated habitat and there were bare, sandy patches, often utilised by ground-nesting aculeates. SSSI Unit 1 supported a diverse and generally flower-rich flora, with an abundance of herbs such as Narrow-leaved Bird's-foot Trefoil, clovers, Wild Carrot *Daucus carota*, yellow composites and many other species providing forage and foodplants for a range of insects and other invertebrates.

Although no grazing management is currently conducted on SSSI Unit 1; there was localised evidence of rabbit grazing; however, much of the bare ground within some of the more established areas of grassland, was evidently present due to the activity of European Mole *Talpa europaea*. Moles are unusual in such habitat and the molehills were of unfamiliar sandy/silt substrate. There was arguably some variation in terms of habitat quality over SSSI Unit 1 site as a whole and some of the grassland towards the south was tall and relatively herb-poor compared to the swards to the north. There was also a significant scrub resource present. It is possible that, in terms of 'Favorable condition', the scrub element may be considered excessive, comprising >5 percent cover; however, the resource evidently provides shelter, structural variation and a valuable spring nectar resource, as well as providing a nesting resource for stem nesting insects.

Saltmarsh

The saltmarsh within SSSI Unit 2 comprised an extensive, continuous area of representative, estuarine saltmarsh habitat; with a range of zones from upper to lower saltmarsh with numerous creeks and tidal pools extending to close to the upper shore. However, whilst there were significant areas of continuous saltmarsh within both SSSI Units 3 and 4, the patches were somewhat disjunct, with gaps along the more engineered sections of shoreline. In areas where inland succession was curtailed by coastal defences, there was sometimes little, or no room for accretion. Furthermore, where the outer coastal zone was parallel with the active northern extent of compartment C, accretion was evidently curtailed by the jetties and other structures associated with activities within this area.

However, the more significant portions of saltmarsh, including the habitat persisting inland close to the entrance to the Mucking Creek in SSSI Unit 3 and the largish, if disjunct, stand of saltmarsh of Unit 4 in the north; both provided significant areas of saltmarsh, also supporting a representative range of halophytic plants typical of saltmarsh. The sheltered south-facing cliff overlooking the saltmarsh in SSSI Unit 3, provided some additional interest to this survey area, providing nesting

opportunities for aculeates and other species, which may in some cases, use the adjacent saltmarsh for foraging.

The larger patches of saltmarsh in SSSI Units 3 and 4, were also structurally diverse, with both areas supporting a network of tidal creeks and pools. The major saltmarsh block in SSSI Unit 4, in particular, supported a full range of vegetation from upper to lower saltmarsh. Sea Aster *Aster tripoilum,* important for the Sea Aster Bee *Colletes halophilus,* was very well represented throughout the saltmarsh Units; however, whilst the bee is well known to occur in SSSI Unit 2 adjacent to Coalhouse Fort (Ray Reeves pers. com.), it was recorded only from Unit 4 during the 2022 survey.

Reed-fen & pools and other wetland habitat

The wetland habitats of sub-compartment A1 comprised predominately of a mosaic of Common Reed *Phragmites australis* swamp and open areas of tall sward rough grassland with open water areas; whilst A6 comprised entirely of reed-fen & pools habitat. Despite being somewhat inland and hydrologically disjunct from the saline influence of the Thames Estuary, due to coastal defences. These habitats are likely to maintain a residue of salinity, from pre-flood defence times. Brackish tolerant vegetation, Sea Clubrush *Bolboschoenus maritimus,* in particular was present within the vegetation, this species also being present within the damper areas of SSSI Unit 1, as well as being locally represented throughout the saltmarsh SSSI Units.

A1 was a more diverse compartment than A6, in having additional habitat besides reed-fen & pools and also, having somewhat more diverse topography and microtopography, giving rise to a more floristically and structurally diverse habitat and potentially being of value to a greater invertebrate diversity. However, reed-fen & pools habitat, especially when juxtaposed with other habitat of value to invertebrates can support a range of species and the A6 habitat was evidently quite an old stand, which had not been subject to recent management and some of the stem nesting species, especially secondary colonisers of the unoccupied nests of other reed-fen & pools specialists; e.g. *Hylaeus pectoralis,* which nest in the vacated galls of the chloropid fly *Lipara lucens*, may occur more commonly in more mature reed-fen & pools than recently established, or more frequently harvested stands.

Overall, the habitats within sub-compartments A1 and A6 were relatively poor in terms of floristic diversity; however, the sheltered nature of these areas, close mosaic of structurally and hydrologically diverse habitats and probable brackish influence, provided habitat of high potential for specialist invertebrates including those associated both with coastal grassland and upper saltmarsh habitats and reed-fen & pools. The midsummer survey time encompassed a period of drought, and the water levels evidently fluctuate significantly over the course of an average year.

Invertebrates

During the survey, mainly undertaken during June and July 2022; 1,002 invertebrate species were recorded from combined survey compartments. Of these 135 species were of recognised conservation importance in the UK. A larger number of beetles (Coleoptera) were recorded from sample data, than any other taxon, followed, in order of abundance, by two-winged flies (Diptera),

true bugs (Hemiptera), bees, ants and wasps (Aculeate Hymenoptera) and spiders (Araneae). A large number of the species were of limited range in the UK but are well represented and characteristic within the post-industrial brownfields and coastal grasslands of south Essex.

OMH Flagship species including section 41 'priority species' Shrill Carder Bee *Bombus sylvarum*, Brown-banded Carder Bee *B. humilis,* Red-shanked Carder Bee *Bombus ruderarius*, Five-banded Weevil Wasp *Cerceris quinquefasciata*, Black-headed Mason Wasp *Odynerus melanocephalus* and the Phoenix Fly *Dorycera gramineum*, were recorded, alongside several very rare, short sward and bare ground specialists, such as nationally rare and 'vulnerable' ground beetle *Scybalicus oblongiuscula*; RDB1 nationally endangered spider-hunting wasp *Evagetes pectinipes* and Scarce Black Mining Bee *Andrena nigrospina* and its cleptoparasite, Kirby's Nomad Bee *Nomada subcornuta.* Several species not well recorded from Essex, including RDB2-listed Plain Dark Bee *Stelis phaeoptera* and RDB3 Carrot Mining Bee *Andrena nitidiusula,* were also recorded, as well as a number of nationally scarce species.

Species of particular note associated with saltmarsh and/or transitional brackish habitats, included the s41 'priority species' Sea Aster Bee *Colletes halophilus recorded* from SSSI Unit 4, a nationally rare and 'vulnerable' water scavenger beetle *Berosus fulvus* (from brackish habitat in compartment D) and a nationally rare flea beetle *Neocrepidodera impressa*, recorded from all three saltmarsh SSSI Units.

From inland reed-fen & pools and transitional brackish habitats, nationally rare species including a foliage spider *Clubiona juvenis*, a solitary wasp *Passaloecus clypealis* and a malachite beetle *Cerapheles terminatus* were recorded. Specimens of the latter species were considered atypical by Stephen Lane, who speculated that at least one of the specimens could be *C. lateplagiatus*, a new species in Britain. However, consultation with European authorities in Malachiidae, were inconclusive, indicating a need for further work to clarify the true identity of this genus in the UK.

Overall, many invertebrates with a strong fidelity to the target habitats were recorded during the 2022 survey. These included a number of species of recognised conservation status that would be expected to be found within their respective habitats in south Essex, a region of the UK known to support a significant invertebrate fauna. Although surveys were generally undertaken during the peak times for target F111 (‘bare sand and chalk’) and F112 (‘open short sward’) and other invertebrate assemblages targeted within the survey, the resultant dataset should be viewed strictly as a snapshot in time. Survey during the earlier spring and, later in the summer, would have added significantly to the overall species list and as such, certain species of considerable rarity value, also occurring within the survey area, would have been missed.

In addition, the survey effort varied considerably between compartments. SSSI Unit 1 was, in accordance with the brief, given greater survey attention, especially in consideration of its size, than any other compartment. The number of rare, scarce, and local species recorded from this site was markedly higher than for any other compartment and this is in part due to the sampling effort invested.

The data provided in excel format, alongside this report, is at individual sample resolution, in accordance with the brief and as such, enables a greater level of agility for the purposes of data interrogation using Pantheon and other protocols, as required.

Conclusion

In conclusion, all of the survey areas subject to more detailed invertebrate sampling during the 2022 field season, were found to support representative habitat, with structural and compositional features consistent with sites supporting invertebrate faunas of high conservation value. Invertebrates both identified in the field and from samples collected during the survey, yielded species assemblages characteristic of the habitats surveyed. A number of species of recognised conservation status, with a strong fidelity to the target OMH, coastal grasslands, saltmarsh, reed-fen & pools and other brackish transitional brackish habitats, known from south Essex, were recorded.

The connectivity and inland succession of habitat both between and within the surveyed compartments, collectively constituted a landscape scale mosaic of habitat patches. The sites comprising this landscape scale mosaic can be considered to be, both collectively and individually, of considerable value for the invertebrate assemblages they support. Many of the less common species recorded have dual habitat fidelity, requiring different habitat types at different times in their lifecycles, thus the juxtaposition of these different habitat types is important for their survival.

Habitat creation within the former landfill compartment D and still active compartment C has evidently benefitted target invertebrates. However, there is considerable scope to increase the conservation value of these sites, for invertebrates, particularly once compartment C has ceased to be active. OMH is fundamentally a plagioclimax habitat and as such, the main issue in the long term would be the need for continued management, facilitating the ongoing provision of disturbance habitats and habitat of early successional stages. Compartments C and D are extensive and in the long term, management would be required to prevent undue scrub succession.

Extensive areas within compartments C and D were uniformly flat, with little topographic or microtopographic variation. Habitat creation, including the provision of strategically placed spoil mounds, comprising substrates including sandy soil, chalk ballast, clay and/or Pulverised Fly Ash (PFA), especially within the open areas of flattish topography in these compartments, would be beneficial.

In addition, provision of scrapes, especially in close proximity to areas of varied microtopography would be beneficial. Currently there are waterbodies on site, which provide a valuable wetland resource. However, creation of such habitat in new areas of the sites would increase the potential for the sites for wetland and brackish associated invertebrate species, as well as terrestrial species which benefit from resources provided by wetland habitats in juxtaposition with drier habitat. The presence of wetland habitat is considered an important resource within the context of OMH and fine scale changes in hydrology, pH and topography allowing a range of habitats to develop alongside each other, is fundamental to the value of such habitat.

Sites may be managed on a rotational basis, with vegetation cut and habitat disturbed using mechanical vehicles such as diggers and rotovators. A management plan including a protocol for long term management rotation should be produced. In addition, some areas of more established,

permanent herb-rich habitat should be maintained and managed either by low density livestock grazing and/or cutting.

Scrub/open ground habitat mosaics provide important habitat for many invertebrate species within these sites and a number of uncommon species favor scrub edge habitat. However, management should seek to prevent excessive development of continuous scrub and scrub management should be considered on a site-by-site basis, within targeted management plans.

The seedbanks within the sites should ensure a turnover of typical herbs of OMH and general grassland habitat in the north Essex brownfields. Therefore, seeding of habitat is not recommended.

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Appendices

Appendix 1 – Tables

Table 1 - 2022 samples collected and sample habitat

Survey Compartment	New sample number	Sample method	Date(s)	Grid reference	Broad habitat
A1	SS.A1.1	Spot search/direct search	13/07/2022	Whole site	*Phragmites australis* reed-fen & pools; rough wet and dry grassland; *Juncus effusus* and *Bolboschoenus maritimus* stands and open water margins
A1	SS.A1.2	Spot search/direct search	26/07/2022	Whole site	*Phragmites australis* reed-fen & pools; rough wet and dry grassland; *Juncus effusus* and *Bolboschoenus maritimus* stands and open water margins
A1	SW.A1.1	Timed sweep	13/07/2022	TQ 69277 80948	Interface of *Phragmites australis* reed-fen & pools and drier tall sward g/l
A1	SW.A1.2	Timed sweep	13/07/2022	TQ 69276 81001	*Phragmites australis* reed-fen & pools margin
A1	SW.A1.3	Timed sweep	26/07/2022	TQ 69286 80990	Reed-fen & pools interior (*Phragmites australis*)
A1	SW.A1.4	Timed sweep	26/07/2022	TQ 69236 80964	Reed-fen & pools interior (*Phragmites australis*)
A1	VAC.A1.1	Timed vacuum	13/07/2022	TQ 69284 80960	*Phragmites australis* reed-fen & pools margin

Survey Compartment	New sample number	Sample method	Date(s)	Grid reference	Broad habitat
A1	VAC.A1.2	Timed vacuum	13/07/2022	TQ 69242 80945	Interface between raised, rabbit grazed, short-sward g/l and *Juncus effusus/Bolboschoenus maritimus/Phragmites australis* swamp
A1	VAC.A1.3	Timed vacuum	26/07/2022	TQ 69286 80990	Reed-fen & pools interior (*Phragmites australis*)
A1	VAC.A1.4	Timed vacuum	26/07/2022	TQ 69256 80957	Reed-fen & pools interior (*Phragmites australis*)
A1	WT.A1.1	Pan trap cluster	13/07/2022	TQ 69277 80948	Interface of *Phragmites australis* reed-fen & pools and drier tall sward g/l
A1	WT.A1.2	Pan trap cluster	13/07/2022	TQ 69272 80958	*Phragmites australis* reed-fen & pools margin with *Juncus effusus, J. conglomeratus* and *Bolboschoenus maritimus*
A1	WT.A1.3	Pan trap cluster	26/07/2022	TQ 69278 81002	Interface of *Phragmites australis* reed-fen & pools and drier tall sward g/l
A1	WT.A1.4	Pan trap cluster	26/07/2022	TQ 69240 80945	*Phragmites australis* reed-fen & pools margin with *Juncus effusus, J. conglomeratus* and *Bolboschoenus maritimus*
A6	SS.A6.1	Spot search/direct search	13/07/2022	Whole site	*Phragmites australis* reed-fen & pools and reed-fen & pools margin with track
A6	SW.A6.1	Timed sweep	13/07/2022	TQ 68793 81422	Reed-fen & pools interior (*Phragmites australis*) adjacent main drain

Survey Compartment	New sample number	Sample method	Date(s)	Grid reference	Broad habitat
A6	SW.A6.2	Timed sweep	13/07/2022	TQ 68786 81387	Reed-fen & pools (*Phragmites australis*) margin, accessed from track
A6	SW.A6.3	Timed sweep	26/07/2022	TQ 68793 81422	Reed-fen & pools interior (*Phragmites australis*) adjacent main drain
A6	SW.A6.4	Timed sweep	26/07/2022	TQ 68805 81415	Reed-fen & pools (*Phragmites australis*) margin, accessed from track
A6	VAC.A6.1	Timed vacuum	13/07/2022	TQ 68793 81422	Reed-fen & pools interior (*Phragmites australis*) adjacent main drain
A6	VAC.A6.2	Timed vacuum	13/07/2022	TQ 68786 81387	Reed-fen & pools (*Phragmites australis*) margin, accessed from track
A6	VAC.A6.3	Timed vacuum	26/07/2022	TQ 68793 81422	Reed-fen & pools interior (*Phragmites australis*) adjacent main drain
A6	VAC.A6.4	Timed vacuum	26/07/2022	TQ 68793 81422	Reed-fen & pools (*Phragmites australis*) margin, accessed from track
A6	WT.A6.1	Pan trap cluster	13/07/2022	TQ 68805 81415	Reed-fen & pools interior (*Phragmites australis*) adjacent main drain

Survey Compartment	New sample number	Sample method	Date(s)	Grid reference	Broad habitat
A6	WT.A6.2	Pan trap cluster	13/07/2022	TQ 68789 81432	Reed-fen & pools interior (*Phragmites australis*) adjacent main drain
A6	WT.A6.3	Pan trap cluster	26/07/2022	TQ 68805 81415	Reed-fen & pools interior (*Phragmites australis*) adjacent main drain
A6	WT.A6.4	Pan trap cluster	26/07/2022	TQ 68789 81432	Reed-fen & pools interior (*Phragmites australis*) adjacent main drain
B	PF.B.1.1	Pitfall trap 3x3 cluster	13/06/2022	TQ 69298 80577	Short-sward flower-rich g/l
B	PF.B.1.2	Pitfall trap 3x3 cluster	13/06/2022	TQ 69402 80608	Short-sward flower-rich g/l
B	PF.B.1.3	Pitfall trap 3x3 cluster	13/06/2022	TQ 69260 80675	Lower grassland slope, seasonally dried out wet g/l
B	PF.B.1.4	Pitfall trap 3x3 cluster	13/06/2022	TQ 68902 80883	Largish bare ground area comprising sandy clay approximately 10 x 20m in area. Surrounded by short-sward, rabbit grazed grassland. Generally herb-poor compared to elsewhere on site.
B	SS.B.1	Spot search/direct search	13/06/2022	Whole site	Coastal grassland and scrub

Survey Compartment	New sample number	Sample method	Date(s)	Grid reference	Broad habitat
B	SS.B.2	Spot search/direct search	20/06/2022	Whole site	Coastal grassland and scrub
B	SW.B.1.1	Timed sweep	13/06/2022	TQ 692323 80541	Tall-sward, flower-rich g/l
B	SW.B.1.2	Timed sweep	13/06/2022	TQ 69368 80665	Short-sward flower-rich g/l
B	SW.B.2.1	Timed sweep	20/06/2022	TQ 69504 80769	Short and tall sward g/l
B	SW.B.2.2	Timed sweep	20/06/2022	TQ 69294 80696	Short, rabbit-grazed g/l in mosaic with taller sward habitat
B	VAC.B.1.1	Timed vacuum	13/06/2022	TQ 69298 80577	Short-sward flower-rich g/l
B	VAC.B.1.2	Timed vacuum	13/06/2022	TQ 69368 80665	Short-sward flower-rich g/l
B	VAC.B.2.1	Timed vacuum	20/06/2022	TQ 69504 80769	Short and tall sward g/l
B	VAC.B.2.2	Timed vacuum	20/06/2022	TQ 69294 80696	Short, rabbit-grazed g/l in mosaic with taller sward habitat
C1	SS.C1.2	Spot search/direct search	21/06/2022	Whole site	Established grassland and OMH
C1	SW.C1.2.1	Timed sweep	21/06/2022	TQ 68618 79375	Established grassland and OMH near lake
C1	SW.C1.2.2	Timed sweep	21/06/2022	TQ 68704 79388	Established grassland and OMH

Survey Compartment	New sample number	Sample method	Date(s)	Grid reference	Broad habitat
C1	SW.C1.2.3	Timed sweep	21/06/2022	TQ 69399 79193	Established grassland landward of sea wall
C1	SW.C1.2.4	Timed sweep	21/06/2022	TQ 69429 79305	Established grassland landward of sea wall
C1	VAC.C1.2.1	Timed vacuum	21/06/2022	TQ 68618 79375	Established grassland and OMH near lake
C1	VAC.C1.2.2	Timed vacuum	21/06/2022	TQ 68704 79388	Established grassland and OMH
C1	VAC.C1.2.3	Timed vacuum	21/06/2022	TQ 69399 79193	Established grassland landward of sea wall
C1	VAC.C1.2.4	Timed vacuum	21/06/2022	TQ 69429 79305	Established grassland landward of sea wall
C2	PF.C2.1.2	Pitfall trap 3x3 clusters	14/06/2022	TQ 68985 79745; TQ68935 79752	OMH vegetated chalk ballast banks
C2	PF.C2.1.3	Pitfall trap 3x3 cluster	14/06/2022	TQ 68889 79675	OMH vegetated chalk ballast banks
C2	SS.C2.1	Spot search/direct search	14/06/2022	Whole site	OMH vegetated chalk ballast banks
C2	SS.C2.2	Spot search/direct search	23/06/2022	Whole site	OMH vegetated chalk ballast banks
C2	SW.C2.1.1	Timed sweep	14/06/2022	TQ 68889 79675	OMH vegetated chalk ballast banks

Survey Compartment	New sample number	Sample method	Date(s)	Grid reference	Broad habitat
C2	SW.C2.1.2	Timed sweep	14/06/2022	TQ 68938 79758	OMH partially vegetated bare ground/chalk
C2	SW.C2.2.1	Timed sweep	21/06/2022	TQ 68993 79781	OMH partially vegetated bare ground/chalk
C2	SW.C2.2.2	Timed sweep	21/06/2022	TQ 68976 79732	OMH vegetated chalk ballast banks, southern aspect
C2	VAC.C2.1.1	Timed vacuum	14/06/2022	TQ 68889 79675	OMH vegetated chalk ballast banks
C2	VAC.C2.1.2	Timed vacuum	14/06/2022	TQ 68938 79758	OMH partially vegetated bare ground/chalk
C2	VAC.C2.2.1	Timed vacuum	21/06/2022	TQ 68993 79781	OMH partially vegetated bare ground/chalk
C2	VAC.C2.2.2	Timed vacuum	21/06/2022	TQ 68976 79732	OMH vegetated chalk ballast banks, southern aspect
C3	PF.C3.1.1	Pitfall trap 3x3 cluster	14/06/2022	TQ 68805 79844	OMH partially vegetated bare ground
C3	SS.C3.2	Spot search/direct search	20/06/2022	Whole site	OMH partially vegetated bare ground
C3	SW.C3.1.1	Timed sweep	14/06/2022	TQ 68805 79844	OMH partially vegetated bare ground
C3	SW.C3.2.1	Timed sweep	21/06/2022	TQ 68614 79631	OMH, short sward dry grassland
C3	VAC.C3.1.1	Timed vacuum	14/06/2022	TQ 68787 79807	OMH partially vegetated bare ground

Survey Compartment	New sample number	Sample method	Date(s)	Grid reference	Broad habitat
C3	VAC.C3.2.1	Timed vacuum	21/06/2022	TQ 68614 79631	OMH, short sward dry grassland
C4	PF.C4.1.1	Pitfall trap 3x3 cluster	14/06/2022	TQ 69114 80119	OMH partially vegetated bare ground
C4	SS.C4.1	Spot search/direct search	16/06/2022	Whole site	OMH partially vegetated bare ground
C4	SS.C4.2	Spot search/direct search	22/06/2022	TQ 69059 79937	OMH, partially vegetated spoil heap
C4	SW.C4.1.1	Timed sweep	14/06/2022	TQ 69114 80119	OMH partially vegetated bare ground
C4	SW.C4.1.2	Timed sweep	16/06/2022	TQ 69213 80167	OMH, short sward dry grassland
C4	SW.C4.2.1	Timed sweep	22/06/2022	Not recorded	OMH partially vegetated bare ground
C4	VAC.C4.1.1	Timed vacuum	14/06/2022	TQ 69114 80119	OMH partially vegetated bare ground
C4	VAC.C4.1.2	Timed vacuum	22/06/2022	TQ 69213 80167	OMH, short sward dry grassland
C4	VAC.C4.2.1	Timed vacuum	22/06/2022	Not recorded	OMH partially vegetated bare ground
C5	SS.C5.2	Spot search/direct search	20/06/2022	Whole site	OMH partially vegetated bare ground

Survey Compartment	New sample number	Sample method	Date(s)	Grid reference	Broad habitat
C5	SW.C5.1.1	Timed sweep	14/06/2022	TQ 68549 79522	OMH partially vegetated bare ground
C5	SW.C5.2.1	Timed sweep	21/06/2022	TQ 68489 79753	OMH partially vegetated bare ground
C5	VAC.C5.1.1	Timed vacuum	14/06/2022	TQ 68549 79522	OMH partially vegetated bare ground
C5	VAC.C5.2.1	Timed vacuum	21/06/2022	TQ 68489 79753	OMH partially vegetated bare ground
D	SS.D.1.1	Spot search/direct search	15/06/2022	Whole site	OMH partially vegetated bare ground
D	SS.D.2.1	Spot search/direct search	22/06/2022	TQ 68646 77778	OMH; bare ground mounds close to site entrance
D	SS.D.2.2	Spot search/direct search	22/06/2022	TQ 68469 78253	OMH; west-facing bund with tall sward grassland
D	SS.D.2.3	Spot search/direct search	22/06/2022	TQ 68745 78686 to TQ 68848 78852	OMH; track edge habitat including partially vegetated spoil mound
D	SS.D.2.4	Spot search/direct search	22/06/2022	TQ 69106 78596	Partially vegetated OMH with varied microtopography close to newly created waterbodies
D	SS.D.2.5	Spot search/direct search	22/06/2022	TQ 69375 78310	OMH/grassland

Survey Compartment	New sample number	Sample method	Date(s)	Grid reference	Broad habitat
D	SW.D.1.1	Timed sweep	15/06/2022	TQ 68759 78709	OMH partially vegetated bare ground
D	SW.D.1.2	Timed sweep	15/06/2022	TQ 68899 78764	OMH vegetated PFA
D	SW.D.1.3	Timed sweep	15/06/2022	TQ 69151 78749	OMH partially vegetated bare ground
D	SW.D.1.4	Timed sweep	15/06/2022	TQ 69433 78781	Established grassland landward of sea wall
D	SW.D.1.5	Timed sweep	15/06/2022	TQ 69378 78310	OMH/grassland
D	SW.D.1.6	Timed sweep	15/06/2022	TQ 69331 78400	Flower-rich habitat between improved g/l hayfield and wetland margin
D	SW.D.1.7	Timed sweep	15/06/2022	TQ 69185 78503	Partially vegetated op of chalk-ballast bank (created habitat?)
D	SW.D.1.8	Timed sweep	15/06/2022	TQ 68552 78000	OMH tall herb and grassland on steepish slope
D	VAC.D.1.1	Timed vacuum	15/06/2022	TQ 68759 78709	OMH partially vegetated bare ground
D	VAC.D.1.2	Timed vacuum	15/06/2022	TQ 68899 78764	OMH vegetated PFA
D	VAC.D.1.3	Timed vacuum	15/06/2022	TQ 69151 78749	OMH partially vegetated bare ground
D	VAC.D.1.4	Timed vacuum	15/06/2022	TQ 69433 78781	Established grassland landward of sea wall

Survey Compartment	New sample number	Sample method	Date(s)	Grid reference	Broad habitat
D	VAC.D.1.5	Timed vacuum	15/06/2022	TQ 69378 78310	OMH/grassland
D	VAC.D.1.6	Timed vacuum	15/06/2022	TQ 69331 78400	Flower-rich habitat between improved g/l hayfield and wetland margin
D	VAC.D.1.7	Timed vacuum	15/06/2022	TQ 69185 78503	Partially vegetated op of chalk-ballast bank (created habitat?)
D	VAC.D.1.8	Timed vacuum	15/06/2022	TQ 68552 78000	OMH tall herb and grassland on steepish slope
SSSI Unit 1	PF.U1.1	Pitfall trap 3x3 cluster	12/07/2022	TQ 69325 77580	Sandy, short-sward dry coastal g/l, with bare ground patches
SSSI Unit 1	PF.U1.10	Pitfall trap 3x3 cluster	12/07/2022	TQ 69129 77651	Damp, brackish *Phragmites austalis* and *Bolboschoenus maritimus* swamp developing over grassland
SSSI Unit 1	PF.U1.11	Pitfall trap 3x3 cluster	12/07/2022	TQ 69216 77390	Tall sward grassland in scallop adjacent scrub and reed-fen & pools
SSSI Unit 1	PF.U1.12	Pitfall trap 3x3 cluster	12/07/2022	TQ 69216 77369	Tall sward grassland in scallop adjacent scrub and reed-fen & pools
SSSI Unit 1	PF.U1.13	Pitfall trap 3x3 cluster	12/07/2022	TQ 69322 77430	Tall sward grassland close to sea wall

Survey Compartment	New sample number	Sample method	Date(s)	Grid reference	Broad habitat
SSSI Unit 1	PF.U1.14	Pitfall trap 3x3 cluster	12/07/2022	TQ 69296 77265	Not recorded
SSSI Unit 1	PF.U1.2	Pitfall trap 3x3 cluster	12/07/2022	TQ 69325 77580	Sandy, short-sward dry coastal g/l, with bare ground patches
SSSI Unit 1	PF.U1.3	Pitfall trap 3x3 cluster	12/07/2022	TQ 69327 77638	Dry grassland in mosaic with scattered Phragmites australis
SSSI Unit 1	PF.U1.4	Pitfall trap 3x3 cluster	12/07/2022	TQ 69329 77653	Dry grassland in mosaic with scattered Phragmites australis
SSSI Unit 1	PF.U1.5	Pitfall trap 3x3 cluster	12/07/2022	TQ 69253 77689	Sandy, short-sward dry coastal g/l, with bare ground patches and mole hills
SSSI Unit 1	PF.U1.6	Pitfall trap 3x3 cluster	12/07/2022	TQ 69245 77688	Sandy, short-sward dry coastal g/l, with bare ground patches and mole hills
SSSI Unit 1	PF.U1.7	Pitfall trap 3x3 cluster	12/07/2022	TQ 69211 77615	Short-sward dry grassland over dredged sandy silt washings
SSSI Unit 1	PF.U1.8	Pitfall trap 3x3 cluster	12/07/2022	TQ 69213 77621	Short-sward dry grassland over dredged sandy silt washings

Survey Compartment	New sample number	Sample method	Date(s)	Grid reference	Broad habitat
SSSI Unit 1	PF.U1.9	Pitfall trap 3x3 cluster	12/07/2022	TQ 69135 77650	Damp, brackish *Phragmites australis* and *Bolboschoenus maritimus* swamp developing over grassland
SSSI Unit 1	SS.U1.1	Spot search/direct search	12/07/2022	Whole site	Coastal grassland and scrub
SSSI Unit 1	SS.U1.2	Spot search/direct search	14/07/2022	Whole site	Coastal grassland and scrub
SSSI Unit 1	SW.U1.1	Timed sweep	12/07/2022	TQ 69325 77580	Sandy, short-sward dry coastal g/l, with bare ground patches
SSSI Unit 1	SW.U1.2	Timed sweep	12/07/2022	TQ 69327 77638	Taller-sward dry coastal g/l
SSSI Unit 1	SW.U1.3	Timed sweep	12/07/2022	TQ 69251 77688	Sandy, short-sward dry coastal g/l, with bare ground patches and mole hills
SSSI Unit 1	SW.U1.4	Timed sweep	12/07/2022	TQ 69211 77615	Short-sward dry grassland over dredged sandy silt washings
SSSI Unit 1	SW.U1.5	Timed sweep	12/07/2022	TQ 69135 77650	Damp, brackish *Phragmites australis* and *Bolboschoenus maritimus* swamp developing over grassland
SSSI Unit 1	SW.U1.6	Timed sweep	12/07/2022	TQ 69240 77393	Dry, short sward grassland/grass heath
SSSI Unit 1	SW.U1.7	Timed sweep	27/07/2022	TQ 69322 77430	Tall sward grassland and tall herb habitat landward of sea defence bank

Survey Compartment	New sample number	Sample method	Date(s)	Grid reference	Broad habitat
SSSI Unit 1	SW.U1.8	Timed sweep	27/07/2022	TQ 69215 77266	Tall sward dry grassland
SSSI Unit 1	WT.U1.1	Pan trap cluster	Not recorded	Not recorded	Not recorded
SSSI Unit 2	SS.U2.1	Spot search/direct search	13/07/2022	Whole site	Saltmarsh general
SSSI Unit 2	SW.U2.1	Timed sweep	13/07/2022	TQ 69429 78624	Mid saltmarsh immediately inland of raised, vegetated mound
SSSI Unit 2	SW.U2.2	Timed sweep	13/07/2022	TQ 69411 78494	Upper reach of mid saltmarsh
SSSI Unit 2	SW.U2.3	Timed sweep	14/07/2022	TQ 69375 77835	Mid zone of wide saltmarsh strip, with mosaic of upper, mid and lower plant communities
SSSI Unit 2	SW.U2.4	Timed sweep	14/07/2022	TQ 69282 76812	Upper and mid saltmarsh mosaic
SSSI Unit 2	SW.U2.5	Timed sweep	27/07/2022	TQ 69459 78785	Mid saltmarsh at northern end of Unit 2
SSSI Unit 2	SW.U2.6	Timed sweep	27/07/2022	TQ 69433 78127	Upper saltmarsh
SSSI Unit 2	SW.U2.7	Timed sweep	27/07/2022	TQ 69346 77480	Upper saltmarsh with *Elymus pycnanthus, Aster tripolium* and stands of *Bolboschoenus maritimus*
SSSI Unit 2	SW.U2.8	Timed sweep	28/07/2022	TQ 69170 76561	Mid saltmarsh with dried out tidal creeks and silt pools

Survey Compartment	New sample number	Sample method	Date(s)	Grid reference	Broad habitat
SSSI Unit 2	VAC.U2.1	Timed vacuum	13/07/2022	TQ 69429 78624	Mid saltmarsh immediately inland of raised, vegetated mound
SSSI Unit 2	VAC.U2.2	Timed vacuum	13/07/2022	TQ 69411 78494	Upper reach of mid saltmarsh
SSSI Unit 2	VAC.U2.3	Timed vacuum	14/07/2022	TQ 69375 77835	Mid zone of wide saltmarsh strip, with mosaic of upper, mid and lower plant communities
SSSI Unit 2	VAC.U2.4	Timed vacuum	14/07/2022	TQ 69282 76812	Upper and mid saltmarsh mosaic
SSSI Unit 2	VAC.U2.5	Timed vacuum	27/07/2022	TQ 69459 78785	Mid saltmarsh at northern end of Unit 2
SSSI Unit 2	VAC.U2.6	Timed vacuum	27/07/2022	TQ 69433 78127	Upper saltmarsh
SSSI Unit 2	VAC.U2.7	Timed vacuum	27/07/2022	TQ 69346 77480	Upper saltmarsh with *Elymus pycnanthus, Aster tripolium* and stands of *Bolboschoenus maritimus*
SSSI Unit 2	VAC.U2.8	Timed vacuum	28/07/2022	TQ 69170 76561	Mid saltmarsh with dried out tidal creeks and silt pools in the immediate vicinity of two man-made, parallel banks, elevated above the surrounding saltmarsh.
SSSI Unit 3	SS.U3.1	Spot search/direct search	14/07/2022	Whole site	Saltmarsh and sparsely vegetated Soft cliff/ steep bare ground escarpment (south facing)

Survey Compartment	New sample number	Sample method	Date(s)	Grid reference	Broad habitat
SSSI Unit 3	SS.U3.2	Spot search/direct search	29/07/2022	TQ 69212 80774	Sparsely vegetated soft cliff/ steep bare ground escarpment (south facing) historic landfill with C18th-early 19th bottles and pottery fragments, immediately above saltmarsh creek
SSSI Unit 3	SS.U3.3	Spot search/direct search	07/09/2022	Whole site	Saltmarsh and sparsely vegetated Soft cliff/ steep bare ground escarpment (south facing)
SSSI Unit 3	SW.U3.1	Timed sweep	14/07/2022	TQ 69266 80793	Mid saltmarsh with dried out tidal creeks and silt pools in creek
SSSI Unit 3	SW.U3.2	Timed sweep	14/07/2022	TQ 69358 80857	Mid saltmarsh in creek short-grazed by rabbits
SSSI Unit 3	SW.U3.3	Timed sweep	27/07/2022	TQ 69513 79347	Saltmarsh above sea defence. Upper to mid saltmarsh vegetation
SSSI Unit 3	SW.U3.4	Timed sweep	27/07/2022	TQ 69493 79115	Upper to mid saltmarsh formed on concrete sea defence platform
SSSI Unit 3	VAC.U3.1	Timed vacuum	14/07/2022	TQ 69266 80793	Mid saltmarsh with dried out tidal creeks and silt pools in creek
SSSI Unit 3	VAC.U3.2	Timed vacuum	14/07/2022	TQ 69358 80857	Mid saltmarsh in creek short-grazed by rabbits
SSSI Unit 3	VAC.U3.3	Timed vacuum	27/07/2022	TQ 69513 79347	Saltmarsh above sea defence. Upper to mid saltmarsh vegetation

Survey Compartment	New sample number	Sample method	Date(s)	Grid reference	Broad habitat
SSSI Unit 3	VAC.U3.4	Timed vacuum	27/07/2022	TQ 69493 79115	Upper to mid saltmarsh formed on concrete sea defence platform
SSSI Unit 4	SS.U4.1	Spot search/direct search	26/07/2022	TQ 70442 81512	Upper saltmarsh with *Elymus pycnanthus* and *Aster tripolium*
SSSI Unit 4	SS.U4.2	Spot search/direct search	07/09/2022	TQ 69491 81016	Small area of structurally and floristically diverse saltmarsh with *Aster tripolium* and *Inula crithmoides*.
SSSI Unit 4	SS.U4.3	Spot search/direct search	07/09/2022	TQ 70383 81425	Entire saltmarsh area towards the north of Unit 4. Habitat with upper, mid and lower saltmarsh elements, with a sandy beach and a raised vegetated bank, with some cliffed areas forming the southern boundary.
SSSI Unit 4	SW.U4.1	Timed sweep	14/07/2022	TQ 70359 81336	Lower saltmarsh at seaward margin, but slightly raised, therefore, closer to mid saltmarsh in composition
SSSI Unit 4	SW.U4.2	Timed sweep	14/07/2022	TQ 70347 81465	Fairly complex mosaic of upper and mid saltmarsh vegetation with brackish pools
SSSI Unit 4	SW.U4.3	Timed sweep	26/07/2022	TQ 70496 81424	Lower to mid saltmarsh with creeks and tidal pools
SSSI Unit 4	SW.U4.4	Timed sweep	26/07/2022	TQ 70442 81512	Upper saltmarsh with *Elymus pycnanthus* and *Aster tripolium*

Survey Compartment	New sample number	Sample method	Date(s)	Grid reference	Broad habitat
SSSI Unit 4	VAC.U4.1	Timed vacuum	14/07/2022	TQ 70359 81336	Lower saltmarsh at seaward margin, but slightly raised, therefore, closer to mid saltmarsh in composition
SSSI Unit 4	VAC.U4.2	Timed vacuum	14/07/2022	TQ 70347 81465	Fairly complex mosaic of upper and mid saltmarsh vegetation with brackish pools
SSSI Unit 4	VAC.U4.3	Timed vacuum	26/07/2022	TQ 70496 81424	Lower to mid saltmarsh with creeks and tidal pools
SSSI Unit 4	VAC.U4.4	Timed vacuum	26/07/2022	TQ. 70442 81512	Upper saltmarsh with *Elymus pycnanthus* and *Aster tripolium*

Table 2 - List of invertebrate species recorded per survey compartment from 2022 data. Blank cells indicate where UK status and IUCN post-2001 threat status not available and where species were not found.

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A sandhopper	*Talitrus saltator*	Talitridae	Amphipoda	Widespread	JHM	LC											x	x	x
An orb-web spider	*Agalenatea redii*	Araneidae	Araneae	Local	JHM	LC		x		x	x	x				x	x	x	x
An orb-web spider	*Araneus quadratus*	Araneidae	Araneae	Widespread	JHM	LC		x								x	x		x
Wasp Spider	*Argiope bruennichi*	Araneidae	Araneae	Local	JHM	LC											x	x	x
An orb-web spider	*Larinioides cornutus*	Araneidae	Araneae	Widespread	JHM	LC	x	x	x	x	x	x	x		x	x	x	x	x
An orb-web spider	*Mangora acalypha*	Araneidae	Araneae	Local	JHM	LC			x	x	x	x		x	x		x		x
An orb-web spider	*Neoscona adianta*	Araneidae	Araneae	Local	JHM	LC	x		x	x	x	x	x	x	x	x	x		x
A dictynid spider	*Dictyna arundinacea*	Dictynidae	Araneae	Widespread	JHM	LC	x			x	x				x	x	x		x
A gnaphosid spider	*Micaria pulicaria*	Gnaphosidae	Araneae	Widespread	JHM	LC	x		x		x				x	x		x	x
A linyphiid spider	*Bathyphantes gracilis*	Linyphiidae	Araneae	Widespread	JHM	LC	x	x	x		x		x		x		x	x	x
A linyphiid spider	*Erigone dentipalpis*	Linyphiidae	Araneae	Widespread	JHM	LC	x		x		x	x	x		x	x		x	x
A linyphiid spider	*Hypomma bituberculatum*	Linyphiidae	Araneae	Widespread	JHM	LC												x	x
A linyphiid spider	*Microlinyphia pusilla*	Linyphiidae	Araneae	Widespread	JHM	LC	x		x		x		x	x	x	x	x	x	x
A linyphiid spider	*Tenuiphantes tenuis*	Linyphiidae	Araneae	Widespread	JHM	LC	x	x	x	x	x		x	x	x		x	x	x
A linyphiid spider	*Tenuiphantes zimmermanni*	Linyphiidae	Araneae	Widespread	JHM	LC			x		x				x		x		x
A lycosid spider	*Pardosa palustris*	Lycosidae	Araneae	Widespread	JHM	LC			x		x	x	x			x		x	x
A lycosid spider	*Pardosa prativaga*	Lycosidae	Araneae	Widespread	JHM	LC	x	x	x			x	x			x	x		x
A lycosid spider	*Pardosa purbeckensis*	Lycosidae	Araneae	Local	JHM	LC											x	x	x

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A running crab spider	*Thanatus striatus*	Philodromidae	Araneae	Nationally Scarce	JHM	LC								x		x	x	x	x
A running crab spider	*Tibellus oblongus*	Philodromidae	Araneae	Widespread	JHM	LC			x	x	x				x	x			x
A jumping spider	*Heliophanus flavipes*	Salticidae	Araneae	Widespread	JHM	LC	x		x	x	x				x	x	x	x	x
A jumping spider	*Sibianor aurocinctus*	Salticidae	Araneae	Nationally Scarce	JHM/RWP/CU	LC					x						x	x	x
A tetragnathid spider	*Pachygnatha clercki*	Tetragnathidae	Araneae	Widespread	JHM	LC											x		x
A tetragnathid spider	*Pachygnatha degeeri*	Tetragnathidae	Araneae	Widespread	JHM	LC		x	x					x	x	x	x	x	x
A tetragnathid spider	*Tetragnatha extensa*	Tetragnathidae	Araneae	Widespread	JHM	LC			x		x				x		x	x	x
A tetragnathid spider	*Tetragnatha pinicola*	Tetragnathidae	Araneae	Local	JHM	LC	x								x		x		x
A comb-footed spider	*Enoplognatha mordax*	Theridiidae	Araneae	Nationally Scarce	JHM	LC			x		x		x		x		x	x	x
An apionid weevil	*Eutrichapion viciae*	Apionidae	Coleoptera	Local	RWP	LC												x	x
An apionid weevil	*Protapion trifolii*	Apionidae	Coleoptera	Widespread	JHM	LC	x		x		x				x	x			x
A soldier beetle	*Rhagonycha fulva*	Cantharidae	Coleoptera	Widespread	JHM/RWP/SL	LC	x	x	x	x	x	x		x	x	x	x	x	x
A ground beetle	*Demetrias atricapillus*	Carabidae	Coleoptera	Widespread	JHM/RWP	LC	x												x
A ground beetle	*Paradromius linearis*	Carabidae	Coleoptera	Widespread	JHM/SL	LC	x	x			x	x	x		x		x	x	x
A flea beetle	*Chaetocnema hortensis*	Chrysomelidae	Coleoptera	Widespread	RWP	LC	x										**x**		x
A flea beetle	*Neocrepidodera impressa*	Chrysomelidae	Coleoptera	Nationally Rare	RWP/SL	LC											x	x	x
A flea beetle	*Phyllotreta diademata*	Chrysomelidae	Coleoptera	Widely scattered	RWP	LC											x		x

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A flea beetle	*Phyllotreta nigripes*	Chrysomelidae	Coleoptera	Widespread	RWP	LC	x									x	x	x	x
A flea beetle	*Psylliodes chrysocephala*	Chrysomelidae	Coleoptera	Widespread	RWP/SL	LC	x	x							x	x			x
Seven-spot Ladybird	*Coccinella septempunctata*	Coccinellidae	Coleoptera	Widespread	JHM/RWP/SL	LC		x	x	x	x	x	x	x	x	x		x	x
Adonis Ladybird	*Hippodamia variegata*	Coccinellidae	Coleoptera	Local	JHM	LC		x			x								x
A ladybird beetle	*Rhyzobius litura*	Coccinellidae	Coleoptera	Widespread	JHM/RWP/SL	LC			x	x	x	x	x	x	x	x	x	x	x
16-spot Ladybird	*Tytthaspis sedecimpunctata*	Coccinellidae	Coleoptera	Widespread	JHM/RWP	LC	x		x	x	x				x	x	x	x	x
A weevil	*Cosmobaris scolopacea*	Curculionidae	Coleoptera	RDB3 pre-1994 criteria	JHM/SL												x		x
Pea weevil	*Sitona lineatus*	Curculionidae	Coleoptera	Widespread	JHM/RWP/SL		x	x	x	x	x	x		x	x	x	x	x	x
A weevil	*Sitona sulcifrons*	Curculionidae	Coleoptera	Local	JHM/SL				x			x			x	x			x
A malachite beetle	*Cordylepherus viridis*	Malachiidae	Coleoptera	Local	JHM/RWP	LC	x		x	x	x		x	x	x	x	x	x	x
A tumbling flower beetle	*Mordellistena pumila*	Mordellidae	Coleoptera	Local	JHM/RWP/SL	LC			x							x	x	x	x
A pollen beetle	*Meligethes aeneus*	Nitidulidae	Coleoptera	Widespread	RWP/SL	LC		x	x	x	x	x		x	x		x	x	x
A pollen beetle	*Meligethes nigrescens*	Nitidulidae	Coleoptera	Widespread	RWP	LC	x	x									x	x	x
A pollen beetle	*Meligethes sp*	Nitidulidae	Coleoptera		SL														x
A shining flower beetle	*Olibrus affinis*	Phalacridae	Coleoptera	Local	RWP	LC		x										x	x
A shining flower beetle	*Stilbus testaceus*	Phalacridae	Coleoptera	Widespread	RWP/SL	LC	x	x										x	x
A scirtid beetle	*Contacyphon hilaris*	Scirtidae	Coleoptera	Widespread	RWP														x
A rove beetle	*Tachyporus hypnorum*	Staphylinidae	Coleoptera	Widespread	JHM/RWP/SL	LC	x	x	x		x				x	x	x	x	x
A rove beetle	*Tachyporus nitidulus*	Staphylinidae	Coleoptera	Widespread	JHM/RWP/SL	LC	x	x	x		x			x			x		x

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A root-maggot fly	*Anthomyia liturata*	Anthomyiidae	Diptera		MH														x
A root-maggot fly	*Stiphrosoma cingulatum*	Anthomyzidae	Diptera		MH											x	x		x
A root-maggot fly	*Stiphrosoma sabulosum*	Anthomyzidae	Diptera		ST														x
An asteiid fly	*Asteia concinna*	Asteiidae	Diptera		MH		x	x	x	x	x				x		x	x	x
A beach fly	*Pelomyia occidentalis*	Canacidae	Diptera	non-native?	ST														x
An aphid fly	*Chamaemyia herbarum*	Chamaemyiidae	Diptera		ST				x	x	x			x		x			x
A frit fly	*Dicraeus fennicus*	Chloropidae	Diptera		ST				x	x					x	x	x	x	x
A frit fly	*Lasiosina herpini*	Chloropidae	Diptera		ST		x									x			x
A frit fly	*Melanochaeta pubescens*	Chloropidae	Diptera		ST		x	x								x	x	x	x
A frit fly	*Meromyza nigriventris*	Chloropidae	Diptera		ST											x	x		x
A frit fly	*Oscinella frit*	Chloropidae	Diptera		ST		x	x							x	x	x	x	x
A frit fly	*Thaumatomyia hallandica*	Chloropidae	Diptera		ST					x			x						x
A long-legged fly	*Dolichopus latilimbatus*	Dolichopodidae	Diptera	Local	JHM	LC													x
A long-legged fly	*Dolichopus strigipes*	Dolichopodidae	Diptera	Local	MH, ST												x	x	x
A shore fly	*Hyadina guttata*	Ephydridae	Diptera		MH														x
A shore fly	*Hydrellia griseola*	Ephydridae	Diptera		MH														x
A shore fly	*Philygria interstincta*	Ephydridae	Diptera		ST														x
A shore fly	*Psilopa compta*	Ephydridae	Diptera		ST		x	x											x
A shore fly	*Psilopa leucostoma*	Ephydridae	Diptera		MH														x

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A shore fly	*Scatella tenuicosta*	Ephydridae	Diptera		ST														x
A spear-winged fly	*Lonchoptera lutea*	Lonchopteridae	Diptera		MH		x	x	x		x				x		x	x	x
A marsh fly	*Coremacera marginata*	Sciomyzidae	Diptera	Widespread	JHM/MH	LC						x							x
A marsh fly	*Limnia unguicornis*	Sciomyzidae	Diptera		MH				x	x		x			x	x			x
A marsh fly	*Pherbina coryleti*	Sciomyzidae	Diptera		MH										x		x	x	x
An ensign fly	*Sepsis fulgens*	Sepsidae	Diptera		MH			x							x				x
Flecked Snout	*Nemotelus notatus*	Stratiomyidae	Diptera	Local	JHM/MH	LC									x	x	x		x
Barred Snout	*Nemotelus uliginosus*	Stratiomyidae	Diptera	Local	JHM	LC									x			x	x
A hoverfly	*Cheilosia latifrons*	Syrphidae	Diptera	Local	JHM/MH	LC										x			x
A hoverfly	*Cheilosia pagana*	Syrphidae	Diptera	Widespread	JHM	LC													x
A hoverfly	*Cheilosia proxima*	Syrphidae	Diptera	Widespread	JHM	LC													x
A hoverfly	*Eristalinus aeneus*	Syrphidae	Diptera	Local	JHM	LC													x
A hoverfly	*Melanostoma mellinum*	Syrphidae	Diptera	Widespread	JHM/MH	LC		x	x			x				x	x		x
A hoverfly	*Syritta pipiens*	Syrphidae	Diptera	Widespread	JHM	LC									x				x
A tephritid fly	*Campiglossa plantaginis*	Tephritidae	Diptera	Local	JHM/MH	LC		x								x	x	x	x
A tephritid fly	*Sphenella marginata*	Tephritidae	Diptera		MH										x				x
A tephritid fly	*Tephritis divisa*	Tephritidae	Diptera		MH		x		x		x				x	x	x		x
A ulidiid fly	*Melieria omissa*	Ulidiidae	Diptera		MH		x									x			x
A ulidiid fly	*Melieria picta*	Ulidiidae	Diptera	pNS	MH		x			x					x	x	x	x	x

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
Dun Sentinel	*Assiminea grayana*	Assimineidae	Gastropoda	Nationally Scarce	JHM	LC											x	x	x
A froghopper	*Neophilaenus lineatus*	Aphrophoridae	Hemiptera	Widespread	JHM	LC	x			x					x	x	x	x	x
Common Froghopper	*Philaenus spumarius*	Aphrophoridae	Hemiptera	Widespread	JHM/SL	LC		x	x	x	x	x	x	x	x	x	x	x	x
A leafhopper	*Anoscopus albifrons*	Cicadellidae	Hemiptera	Widespread	SL/TB	LC	x		x		x					x	x	x	x
A leafhopper	*Aphrodes aestuarina*	Cicadellidae	Hemiptera	NS(Nb)	TB	LC											x		x
A leafhopper	*Conosanus obsoletus*	Cicadellidae	Hemiptera	Widespread	JHM/TB	LC		x	x	x	x	x	x			x	x	x	x
A leafhopper	*Limotettix striola*	Cicadellidae	Hemiptera	Local	JHM	LC	x												x
A leafhopper	*Mocydia crocea*	Cicadellidae	Hemiptera	Widespread	JHM/TB	LC	x	x										x	x
A leafhopper	*Psammotettix confinis*	Cicadellidae	Hemiptera	Widespread	SL/TB	LC					x							x	x
A leafhopper	*Psammotettix helvolus*	Cicadellidae	Hemiptera		TB		x										x		x
A leafhopper	*Zyginidia scutellaris*	Cicadellidae	Hemiptera	Widespread	JHM/SL	LC	x		x	x	x		x	x	x	x		x	x
A lacehopper	*Pentastiridius leporinus*	Cixiidae	Hemiptera	NS(Nb)	TB	LC			x								x		x
A planthopper	*Javesella pellucida*	Delphacidae	Hemiptera	Widespread	JHM/TB	LC	x	x								x	x		x
A planthopper	*Muirodelphax aubei*	Delphacidae	Hemiptera	Local	JHM/TB	LC	x	x							x	x	x	x	x
Lucerne Bug	*Adelphocoris lineolatus*	Miridae	Hemiptera	Widespread	JHM/SL	LC										x		x	x
A mirid bug	*Lygus maritimus*	Miridae	Hemiptera	Local	JHM	LC											x	x	x
A mirid bug	*Lygus pratensis*	Miridae	Hemiptera	RDB3 pre-1994 criteria	JHM/TB	LC		x								x	x	x	x
A mirid bug	*Lygus rugulipennis*	Miridae	Hemiptera	Widespread	JHM/TB	LC					x				x		x	x	x

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A mirid bug	*Megaloceroea recticornis*	Miridae	Hemiptera	Widespread	JHM	LC					x				x	x			x
A grass bug	*Notostira elongata*	Miridae	Hemiptera	Widespread	JHM/RWP	LC			x	x	x			x	x	x	x	x	x
A mirid bug	*Orthotylus moncreaffi*	Miridae	Hemiptera	Local	JHM/TB	LC											x	x	x
A mirid bug	*Phytocoris varipes*	Miridae	Hemiptera	Widespread	JHM	LC	x	x			x					x	x	x	x
A grass bug	*Stenodema calcarata*	Miridae	Hemiptera	Widespread	JHM	LC	x	x	x						x	x	x	x	x
A mirid bug	*Trigonotylus caelestialium*	Miridae	Hemiptera	Local	JHM	LC													x
Field Damselbug	*Nabis ferus*	Nabidae	Hemiptera	Widespread	JHM/SL	LC									x	x	x	x	x
Broad Damselbug	*Nabis flavomarginatus*	Nabidae	Hemiptera	Widespread	JHM/SL	LC									x	x	x	x	x
Reed Damselbug	*Nabis lineatus*	Nabidae	Hemiptera	Local	JHM	LC												x	x
A rhopalid bug	*Stictopleurus punctatonervosus*	Rhopalidae	Hemiptera	Unknown	JHM														x
Shiny-margined Mini-mining Bee	*Andrena semilaevis*	Andrenidae	Hymenoptera	Widespread	RWP	LC		x											x
Honey Bee	*Apis mellifera*	Apidae	Hymenoptera	Widespread	JHM	LC		x	x			x	x		x			x	x
Brown-banded Carder Bee	*Bombus humilis*	Apidae	Hymenoptera	S41 Priority species	JHM			x	x	x		x			x	x		x	x
Common Carder Bee	*Bombus pascuorum*	Apidae	Hymenoptera	Widespread	JHM	LC		x	x					x	x	x			x
Shrill Carder Bee	*Bombus sylvarum*	Apidae	Hymenoptera	S41 Priority species	JHM/RWP				x	x					x	x		x	x
Buff-tailed/White-tailed Bumblebee	*Bombus terrestris (agg.)*	Apidae	Hymenoptera	Widespread	JHM	LC		x	x				x		x	x		x	x
Black-thighed Epeolus	*Epeolus variegatus*	Apidae	Hymenoptera	Local	JHM	LC													x
Sea Aster Colletes	*Colletes halophilus*	Colletidae	Hymenoptera	s41	JHM	LC													x

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
Chalk Yellow-face Bee	*Hylaeus dilatatus*	Colletidae	Hymenoptera	Local	JHM/RWP	LC									x				x
Reed Yellow-faced Bee	*Hylaeus pectoralis*	Colletidae	Hymenoptera	Local	JHM/RWP	LC	x	x	x	x					x	x		x	x
Ornate-tailed Digger Wasp	*Cerceris rybyensis*	Crabronidae	Hymenoptera	Local	JHM/RWP	LC										x		x	x
A solitary wasp	*Crabro cribrarius*	Crabronidae	Hymenoptera	Widespread	RWP	LC													x
A formicine ant	*Formica fusca*	Formicidae	Hymenoptera	Widespread	JHM	LC	x		x		x			x	x	x		x	x
A formicine ant	*Lasius niger*	Formicidae	Hymenoptera	Widespread	JHM/RWP	LC	x	x	x	x	x	x	x	x	x	x	x	x	x
Orange-legged Furrow Bee	*Halictus rubicundus*	Halictidae	Hymenoptera	Widespread	JHM	LC													x
Sharp-collared Furrow Bee	*Lasioglossum malachurum*	Halictidae	Hymenoptera	Widespread	JHM	LC	x								x				x
Least Furrow Bee	*Lasioglossum minutissimum*	Halictidae	Hymenoptera	Local	JHM	LC	x	x	x			x	x			x			x
Common Green Furrow Bee	*Lasioglossum morio*	Halictidae	Hymenoptera	Widespread	JHM	LC	x	x						x				x	x
Long-faced Furrow Bee	*Lasioglossum punctatissimum*	Halictidae	Hymenoptera	Local	JHM/RWP	LC						x		x	x				x
Ridge-cheeked Furrow Bee	*Lasioglossum puncticolle*	Halictidae	Hymenoptera	Nationally Scarce	JHM/RWP	LC			x		x				x	x			x
Shaggy Furrow Bee	*Lasioglossum villosulum*	Halictidae	Hymenoptera	Widespread	JHM/RWP	LC			x				x			x		x	x
Box-headed Blood Bee	*Sphecodes monilicornis*	Halictidae	Hymenoptera	Widespread	JHM	LC													x
Spined Mason Bee	*Osmia spinulosa*	Megachilidae	Hymenoptera	Local	JHM/RWP	LC	x	x	x	x	x	x	x			x			x
Pantaloon Bee	*Dasypoda hirtipes*	Melittidae	Hymenoptera	Local	JHM	LC										x		x	x
Small Skipper	*Thymelicus sylvestris*	Hesperiidae	Lepidoptera	Widespread	JHM	LC	x		x		x		x	x	x	x	x		x
Emperor Dragonfly	*Anax imperator*	Aeshnidae	Odonata	Widespread	JHM	LC	x												x
Lesser Marsh Grasshopper	*Chorthippus albomarginatus*	Acrididae	Orthoptera	Widespread	JHM	LC	x	x		x				x	x	x	x	x	x

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
Short-winged Conehead	*Conocephalus dorsalis*	Conocephalidae	Orthoptera	Local	JHM	LC	x	x								x	x	x	x
Long-winged Conehead	*Conocephalus fuscus*	Conocephalidae	Orthoptera	Widespread	JHM	LC	x	x	x	x	x				x	x	x	x	x
Roesel's Bush-cricket	*Roeseliana roeselii*	Tettigoniidae	Orthoptera	Widespread	JHM	LC	x		x	x		x				x	x		x
Labyrinth Spider	*Agelena labyrinthica*	Agelenidae	Araneae	Widespread	JHM	LC										x			
An agelenid Spider	*Eratigena agrestis*	Agelenidae	Araneae	Nonnative introduction	JHM	LC										x			
An anyphaenid spider	*Anyphaena accentuata*	Anyphaenidae	Araneae	Widespread	JHM	LC										x			
An orb-web spider	*Hypsosinga pygmaea*	Araneidae	Araneae	Local	JHM	LC									x	x	x	x	
An orb-web spider	*Zygiella atrica*	Araneidae	Araneae	Widespread	JHM	LC											x		
A clubionid spider	*Cheiracanthium erraticum*	Clubionidae	Araneae	Local	JHM	LC											x		
A clubionid spider	*Cheiracanthium virescens*	Clubionidae	Araneae	Nationally Scarce	JHM	LC										x			
A clubionid spider	*Clubiona juvenis*	Clubionidae	Araneae	Nationally Rare	JHM	NT	x												
A clubionid spider	*Clubiona stagnatilis*	Clubionidae	Araneae	Widespread	JHM	LC										x			
A clubionid spider	*Clubiona subtilis*	Clubionidae	Araneae	Local	JHM	LC					x								
A dictynid spider	*Dictyna latens*	Dictynidae	Araneae	Local	JHM	LC		x	x	x	x		x	x	x	x			
A dictynid spider	*Dictyna uncinata*	Dictynidae	Araneae	Widespread	JHM	LC		x			x		x						
A woodlouse spider	*Dysdera crocata*	Dysderidae	Araneae	Widespread	JHM	LC										x			
A woodlouse spider	*Dysdera erythrina*	Dysderidae	Araneae	Local	JHM	LC					x								
A gnaphosid spider	*Drassodes cupreus*	Gnaphosidae	Araneae	Widespread	JHM	LC					x	x				x			

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A gnaphosid spider	*Drassodes lapidosus*	Gnaphosidae	Araneae	Local	JHM	LC					x								
A gnaphosid spider	*Drassodes pubescens*	Gnaphosidae	Araneae	Nationally Scarce	JHM	LC			x		x	x				x			
A gnaphosid spider	*Drassyllus pusillus*	Gnaphosidae	Araneae	Local	JHM	LC			x			x				x			
A gnaphosid spider	*Haplodrassus signifer*	Gnaphosidae	Araneae	Local	JHM	LC			x		x	x	x			x			
A gnaphosid spider	*Trachyzelotes pedestris*	Gnaphosidae	Araneae	Local	JHM	LC					x					x			
A gnaphosid spider	*Zelotes apricorum*	Gnaphosidae	Araneae	Local	JHM	LC										x			
A gnaphosid spider	*Zelotes latreillei*	Gnaphosidae	Araneae	Local	JHM	LC										x			
A hahnid spider	*Hahnia nava*	Hahniidae	Araneae	Local	JHM	LC			x		x					x			
A hahnid spider	*Hahnia pusilla*	Hahniidae	Araneae	Nationally Scarce	JHM	LC										x			
A linyphiid spider	*Bathyphantes approximatus*	Linyphiidae	Araneae	Widespread	JHM	LC		x										x	
A linyphiid spider	*Dismodicus bifrons*	Linyphiidae	Araneae	Widespread	JHM	LC							x		x				
A linyphiid spider	*Erigone atra*	Linyphiidae	Araneae	Widespread	JHM	LC	x		x	x	x		x		x	x	x		
A linyphiid spider	*Gnathonarium dentatum*	Linyphiidae	Araneae	Widespread	JHM	LC		x											
A linyphiid spider	*Gongylidiellum vivum*	Linyphiidae	Araneae	Widespread	JHM	LC					x								
A linyphiid spider	*Kaestneria pullata*	Linyphiidae	Araneae	Widespread	JHM	LC	x												
A linyphiid spider	*Lepthyphantes leprosus*	Linyphiidae	Araneae	Widespread	JHM	LC									x		x	x	
A linyphiid spider	*Linyphia hortensis*	Linyphiidae	Araneae	Widespread	JHM	LC		x											
A linyphiid spider	*Linyphia triangularis*	Linyphiidae	Araneae	Widespread	JHM	LC											x		

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A linyphiid spider	*Microlinyphia impigra*	Linyphiidae	Araneae	Local	JHM	LC											x		
A linyphiid spider	*Neriene clathrata*	Linyphiidae	Araneae	Widespread	JHM	LC		x		x									
A linyphiid spider	*Oedothorax apicatus*	Linyphiidae	Araneae	Widespread	JHM	LC		x			x	x	x		x				
A linyphiid spider	*Oedothorax fuscus*	Linyphiidae	Araneae	Widespread	JHM	LC		x			x				x				
A linyphiid spider	*Pelecopsis parallela*	Linyphiidae	Araneae	Local	JHM	LC			x										
A linyphiid spider	*Pocadicnemis juncea*	Linyphiidae	Araneae	Widespread	JHM	LC									x				
A linyphiid spider	*Tenuiphantes cristatus*	Linyphiidae	Araneae	Local	JHM	LC				x									
A linyphiid spider	*Tenuiphantes flavipes*	Linyphiidae	Araneae	Local	JHM	LC		x							x		x		
A linyphiid spider	*Tenuiphantes mengei*	Linyphiidae	Araneae	Widespread	JHM	LC			x				x		x				
A linyphiid spider	*Walckenaeria atrotibialis*	Linyphiidae	Araneae	Local	JHM	LC										x			
A linyphiid spider	*Walckenaeria unicornis*	Linyphiidae	Araneae	Local	JHM	LC		x											
A lycosid spider	*Alopecosa barbipes*	Lycosidae	Araneae	Local	JHM	LC										x			
A lycosid spider	*Alopecosa cuneata*	Lycosidae	Araneae	Nationally Scarce	JHM	LC			x							x			
A lycosid spider	*Alopecosa pulverulenta*	Lycosidae	Araneae	Widespread	JHM	LC			x		x		x			x			
A lycosid spider	*Arctosa leopardus*	Lycosidae	Araneae	Local	JHM	LC										x			
A lycosid spider	*Pardosa agrestis*	Lycosidae	Araneae	Nationally Scarce	JHM	LC			x		x	x	x						
A lycosid spider	*Pardosa amentata*	Lycosidae	Araneae	Widespread	JHM	LC		x									x		
A lycosid spider	*Pardosa monticola*	Lycosidae	Araneae	Local	JHM	LC					x								

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A lycosid spider	*Pardosa nigriceps*	Lycosidae	Araneae	Widespread	JHM	LC		x	x	x	x	x			x	x	x		
A lycosid spider	*Pardosa pullata*	Lycosidae	Araneae	Widespread	JHM	LC	x	x	x		x	x	x			x	x		
A lycosid spider	*Pirata latitans*	Lycosidae	Araneae	Local	JHM	LC	x	x								x			
A lycosid spider	*Pirata piraticus*	Lycosidae	Araneae	Widespread	JHM	LC										x	x		
A lycosid spider	*Piratula uliginosa*	Lycosidae	Araneae	Local	JHM	LC										x			
A lycosid spider	*Trochosa ruricola*	Lycosidae	Araneae	Widespread	JHM	LC			x		x	x	x			x			
A lycosid spider	*Trochosa terricola*	Lycosidae	Araneae	Widespread	JHM	LC			x							x			
A running crab spider	*Philodromus cespitum*	Philodromidae	Araneae	Widespread	JHM	LC		x	x	x	x	x			x	x	x		
A running crab spider	*Tibellus maritimus*	Philodromidae	Araneae	Local	JHM	LC					x				x				
A phrurolithid spider	*Phrurolithus festivus*	Phrurolithidae	Araneae	Widespread	JHM	LC	x		x		x					x			
Nursery-web Spider	*Pisaura mirabilis*	Pisauridae	Araneae	Widespread	JHM	LC	x	x	x								x	x	
A jumping spider	*Euophrys frontalis*	Salticidae	Araneae	Widespread	JHM	LC	x		x	x	x	x	x	x	x	x			
A jumping spider	*Heliophanus cupreus*	Salticidae	Araneae	Widespread	JHM	LC				x	x								
A jumping spider	*Salticus scenicus*	Salticidae	Araneae	Widespread	JHM	LC					x								
A jumping spider	*Talavera aequipes*	Salticidae	Araneae	Local	JHM	LC			x		x	x							
A comb-footed spider	*Enoplognatha latimana*	Theridiidae	Araneae	Widespread	JHM	LC		x			x		x		x	x	x	x	
A comb-footed spider	*Enoplognatha ovata*	Theridiidae	Araneae	Widespread	JHM	LC					x		x		x	x			
A comb-footed spider	*Kochiura aulica*	Theridiidae	Araneae	Nationally Scarce	JHM	LC				x				x					
A comb-footed spider	*Neottiura bimaculata*	Theridiidae	Araneae	Widespread	JHM	LC			x	x			x		x		x		

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A comb-footed spider	*Phylloneta impressa*	Theridiidae	Araneae	Local	JHM	LC			x										
A comb-footed spider	*Phylloneta sisyphia*	Theridiidae	Araneae	Widespread	JHM	LC									x				
A crab spider	*Misumena vatia*	Thomisidae	Araneae	Widespread	JHM	LC				x	x								
A crab spider	*Ozyptila atomaria*	Thomisidae	Araneae	Local	JHM	LC					x					x			
A crab spider	*Ozyptila brevipes*	Thomisidae	Araneae	Local	JHM	LC		x											
A crab spider	*Ozyptila praticola*	Thomisidae	Araneae	Local	JHM	LC				x		x							
A crab spider	*Ozyptila sanctuaria*	Thomisidae	Araneae	Local	JHM	LC			x							x			
A crab spider	*Ozyptila simplex*	Thomisidae	Araneae	Local	JHM	LC	x		x		x	x	x		x	x			
A crab spider	*Ozyptila trux*	Thomisidae	Araneae	Local	JHM	LC										x			
A crab spider	*Xysticus cristatus*	Thomisidae	Araneae	Widespread	JHM	LC	x		x	x	x	x			x	x			
A crab spider	*Xysticus kochi*	Thomisidae	Araneae	Local	JHM	LC			x		x					x			
A zodariid spider	*Zodarion italicum*	Zodariidae	Araneae	Nationally Scarce	JHM	LC					x		x			x			
A zorid spider	*Zora spinimana*	Zoridae	Araneae	Widespread	JHM	LC				x						x			
An anthicid beetle	*Anthicus antherinus*	Anthicidae	Coleoptera	Local	JHM/SL	LC		x					x			x		x	
An anthicid beetle	*Cordicollis instabilis*	Anthicidae	Coleoptera	Nationally Scarce	JHM/SL	LC					x		x					x	
An ant beetle	*Cyclodinus constrictus*	Anthicidae	Coleoptera	Nationally Scarce	SL	LC									x		x		
An anthicid beetle	*Notoxus monoceros*	Anthicidae	Coleoptera	Local	JHM/SL	LC										x			
An anthicid beetle	*Omonadus floralis*	Anthicidae	Coleoptera	Local	JHM/SL	LC			x						x	x			

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
An anthicid beetle	*Stricticollis tobias*	Anthicidae	Coleoptera	Not Evaluated	RWP	NE											x		
An apionid weevil	*Aspidapion aeneum*	Apionidae	Coleoptera	Local	RWP	LC									x				
An apionid weevil	*Aspidapion radiolus*	Apionidae	Coleoptera	Local	RWP/SL	LC									x				
An apionid weevil	*Catapion seniculus*	Apionidae	Coleoptera	Local	JHM/SL	LC			x			x			x	x			
A seed weevil	*Ceratapion carduorum*	Apionidae	Coleoptera	Local	SL	LC						x							
A seed weevil	*Ceratapion gibbirostre*	Apionidae	Coleoptera	Widespread	SL	LC									x				
An apionid weevil	*Hemitrichapion waltoni*	Apionidae	Coleoptera	Local	RWP	LC									x				
A seed weevil	*Holotrichapion aethiops*	Apionidae	Coleoptera	Local	SL	LC									x				
An apionid weevil	*Holotrichapion pisi*	Apionidae	Coleoptera	Local	JHM	LC			x			x	x						
An apionid weevil	*Ischnopterapion loti*	Apionidae	Coleoptera	Widespread	JHM/SL/RWP	LC			x	x	x	x	x	x	x	x			
An apionid weevil	*Ischnopterapion virens*	Apionidae	Coleoptera	Widespread	JHM/SL/RWP	LC				x	x		x	x	x				
An apionid weevil	*Malvapion malvae*	Apionidae	Coleoptera	Widespread	RWP/SL	LC									x				
An apionid weevil	*Omphalapion hookerorum*	Apionidae	Coleoptera	Local	JHM/SL	LC					x		x		x				
A seed weevil	*Oxystoma pomonae*	Apionidae	Coleoptera	Widespread	SL										x				
An apionid weevil	*Protapion apricans*	Apionidae	Coleoptera	Widespread	JHM/RWP/SL	LC			x			x			x	x			
An apionid weevil	*Protapion assimile*	Apionidae	Coleoptera	Widespread	JHM/RWP/SL	LC			x						x	x			
An apionid weevil	*Protapion difforme*	Apionidae	Coleoptera	Nationally Scarce	JHM	LC									x	x			
An apionid weevil	*Protapion filirostre*	Apionidae	Coleoptera	Nationally Scarce	JHM	LC					x								

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
An apionid weevil	*Protapion fulvipes*	Apionidae	Coleoptera	Widespread	JHM/RWP/SL	LC			x	x	x				x	x			
An apionid weevil	*Protapion nigritarse*	Apionidae	Coleoptera	Local	JHM/RWP/SL	LC			x	x	x					x			
A seed weevil	*Stenopterapion meliloti*	Apionidae	Coleoptera	Local	SL						x								
An apionid weevil	*Stenopterapion tenue*	Apionidae	Coleoptera	Local	RWP/SL	LC				x	x					x			
A pill beetle	*Byrrhus pilula*	Byrrhidae	Coleoptera	Widespread	JHM/SL	LC			x										
A pill beetle	*Chaetophora spinosa*	Byrrhidae	Coleoptera	Local	JHM/SL	LC			x		x	x			x				
A pill beetle	*Cytilus sericeus*	Byrrhidae	Coleoptera	Local	JHM/SL	LC										x			
A soldier beetle	*Cantharis lateralis*	Cantharidae	Coleoptera	Widespread	JHM/RWP/SL	LC			x	x	x		x	x	x	x			
A soldier beetle	*Cantharis rustica*	Cantharidae	Coleoptera	Widespread	JHM	LC			x										
A soldier beetle	*Crudosilis ruficollis*	Cantharidae	Coleoptera	Local	JHM	LC		x							x				
A soldier beetle	*Rhagonycha nigriventris*	Cantharidae	Coleoptera	Widespread	RWP	LC		x											
A ground beetle	*Acupalpus dubius*	Carabidae	Coleoptera	Widespread	JHM/SL	LC	x									x			
A ground beetle	*Acupalpus parvulus*	Carabidae	Coleoptera	Local	JHM	LC			x										
A ground beetle	*Agonum emarginatum*	Carabidae	Coleoptera	Widespread	JHM	LC										x			
A ground beetle	*Agonum gracilis*	Carabidae	Coleoptera	Widespread	JHM	LC										x			
A ground beetle	*Agonum marginatum*	Carabidae	Coleoptera	Widespread	SL	LC										x			
A ground beetle	*Agonum nigrum*	Carabidae	Coleoptera	Nationally Scarce	RWP	LC		x											
A ground beetle	*Amara aenea*	Carabidae	Coleoptera	Widespread	JHM/SL	LC			x		x		x			x			
A ground beetle	*Amara communis*	Carabidae	Coleoptera	Widespread	JHM/SL	LC										x			

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A ground beetle	*Amara convexior*	Carabidae	Coleoptera	Widespread	JHM/SL	LC			x		x					x			
A ground beetle	*Amara curta*	Carabidae	Coleoptera	Nationally Scarce	JHM	LC										x			
A ground beetle	*Amara eurynota*	Carabidae	Coleoptera	Widespread	JHM/SL	LC						x	x			x			
A ground beetle	*Amara familiaris*	Carabidae	Coleoptera	Widespread	JHM	LC										x			
A ground beetle	*Amara lunicollis*	Carabidae	Coleoptera	Widespread	JHM/SL	LC			x							x			
A ground beetle	*Amara montivaga*	Carabidae	Coleoptera	Nationally Scarce	SL	LC					x								
A ground beetle	*Amara plebeja*	Carabidae	Coleoptera	Widespread	JHM/SL	LC			x						x	x			
A ground beetle	*Amara similata*	Carabidae	Coleoptera	Widespread	JHM	LC			x										
A ground beetle	*Amara tibialis*	Carabidae	Coleoptera	Widespread	JHM/SL	LC			x		x	x	x	x	x	x			
A ground beetle	*Anchomenus dorsalis*	Carabidae	Coleoptera	Widespread	JHM	LC									x				
A ground beetle	*Badister bullatus*	Carabidae	Coleoptera	Widespread	JHM/SL	LC			x		x	x				x			
A ground beetle	*Bembidion assimile*	Carabidae	Coleoptera	Widespread	SL	LC	x												
A ground beetle	*Bembidion biguttatum*	Carabidae	Coleoptera	Widespread	RWP	LC		x									x		
A ground beetle	*Bembidion femoratum*	Carabidae	Coleoptera	Widespread	JHM	LC						x							
A ground beetle	*Bembidion fumigatum*	Carabidae	Coleoptera	Nationally Scarce	JHM	LC										x			
A ground beetle	*Bembidion genei*	Carabidae	Coleoptera	Widespread	SL	LC									x				
A ground beetle	*Bembidion lampros*	Carabidae	Coleoptera	Widespread	JHM/RWP	LC					x	x				x	x		
A ground beetle	*Bembidion minimum*	Carabidae	Coleoptera	Local	JHM/RWP/SL	LC			x						x		x		

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A ground beetle	*Bembidion normannum*	Carabidae	Coleoptera	Nationally Scarce	RWP/SL	LC											x	x	
A ground beetle	*Bembidion properans*	Carabidae	Coleoptera	Widespread	JHM/SL	LC					x	x	x			x			
A ground beetle	*Bembidion quadrimaculatum*	Carabidae	Coleoptera	Widespread	JHM/SL	LC			x			x				x			
A ground beetle	*Bembidion tetracolum*	Carabidae	Coleoptera	Widespread	JHM	LC						x							
A ground beetle	*Bembidion varium*	Carabidae	Coleoptera	Local	JHM/SL	LC									x		x	x	
Bombadier beetle	*Brachinus crepitans*	Carabidae	Coleoptera	Nationally Scarce	JHM/RWP/SL	LC						x	x			x			
A ground beetle	*Bradycellus harpalinus*	Carabidae	Coleoptera	Widespread	JHM/SL	LC					x			x		x			
A ground beetle	*Bradycellus verbasci*	Carabidae	Coleoptera	Widespread	JHM	LC						x							
A ground beetle	*Calathus cinctus*	Carabidae	Coleoptera	Local	JHM/SL	LC					x	x	x						
A ground beetle	*Calathus fuscipes*	Carabidae	Coleoptera	Widespread	JHM/SL	LC			x		x					x			
A ground beetle	*Calathus melanocephalus*	Carabidae	Coleoptera	Widespread	JHM/SL	LC					x	x				x			
A ground beetle	*Calathus mollis*	Carabidae	Coleoptera	Widespread	JHM	LC										x			
A ground beetle	*Calathus rotundicollis*	Carabidae	Coleoptera	Widespread	JHM	LC										x			
A ground beetle	*Carabus granulatus*	Carabidae	Coleoptera	Widespread	JHM/SL	LC										x			
A ground beetle	*Carabus problematicus*	Carabidae	Coleoptera	Widespread	JHM	LC										x			
Violet Ground Beetle	*Carabus violaceus*	Carabidae	Coleoptera	Widespread	SL						x					x			
A ground beetle	*Clivina fossor*	Carabidae	Coleoptera	Widespread	JHM/SL	LC										x			
A ground beetle	*Curtonotus aulicus*	Carabidae	Coleoptera	Widespread	JHM/SL	LC					x	x				x			

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A ground beetle	*Dyschirius globosus*	Carabidae	Coleoptera	Widespread	SL	LC					x								
A ground beetle	*Elaphrus riparius*	Carabidae	Coleoptera	Widespread	SL	LC									x				
A ground beetle	*Harpalus affinis*	Carabidae	Coleoptera	Widespread	JHM/RWP/SL	LC			x		x	x	x			x			
A ground beetle	*Harpalus attenuatus*	Carabidae	Coleoptera	Nationally Scarce	JHM/SL	LC					x					x			
A ground beetle	*Harpalus rubripes*	Carabidae	Coleoptera	Widespread	JHM/SL	LC			x		x					x			
A ground beetle	*Harpalus rufipes*	Carabidae	Coleoptera	Widespread	JHM/SL	LC			x		x	x				x			
A ground beetle	*Harpalus serripes*	Carabidae	Coleoptera	Nationally Scarce	JHM/SL	LC			x										
A ground beetle	*Harpalus tardus*	Carabidae	Coleoptera	Local	JHM	LC					x								
A ground beetle	*Loricera pilicornis*	Carabidae	Coleoptera	Widespread	JHM/SL	LC		x								x			
A ground beetle	*Microlestes maurus*	Carabidae	Coleoptera	Local	JHM/SL	LC			x	x	x	x			x	x			
A ground beetle	*Microlestes minutulus*	Carabidae	Coleoptera	Local	JHM/SL	LC			x		x	x	x	x	x	x			
A ground beetle	*Nebria brevicollis*	Carabidae	Coleoptera	Widespread	SL	LC										x			
A ground beetle	*Nebria salina*	Carabidae	Coleoptera	Local	JHM	LC					x								
A ground beetle	*Notiophilus palustris*	Carabidae	Coleoptera	Widespread	JHM	LC										x			
A ground beetle	*Notiophilus substriatus*	Carabidae	Coleoptera	Widespread	JHM/SL	LC					x		x		x	x			
A ground beetle	*Ophonus ardosiacus*	Carabidae	Coleoptera	Local	JHM/SL	LC					x					x			
A ground beetle	*Ophonus azureus*	Carabidae	Coleoptera	Nationally Scarce	JHM/SL	LC			x							x			
A ground beetle	*Ophonus puncticeps*	Carabidae	Coleoptera	Local	SL	LC					x					x			

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A ground beetle	*Oxypselaphus obscurus*	Carabidae	Coleoptera	Widespread	JHM/RWP/SL	LC		x								x			
A ground beetle	*Panagaeus bipustulatus*	Carabidae	Coleoptera	Nationally Scarce	JHM	LC					x					x			
A ground beetle	*Pedius longicollis*	Carabidae	Coleoptera	Nationally Scarce	SL	LC										x			
A ground beetle	*Philorhizus melanocephalus*	Carabidae	Coleoptera	Widespread	JHM/SL	LC	x	x	x		x	x							
A ground beetle	*Poecilus cupreus*	Carabidae	Coleoptera	Widespread	JHM/SL	LC			x		x	x	x			x			
A ground beetle	*Pogonus chalceus*	Carabidae	Coleoptera	Local	RWP	LC											x		
A ground beetle	*Polystichus connexus*	Carabidae	Coleoptera	Nationally Scarce	JHM/SL	NT			x				x						
A ground beetle	*Pterostichus macer*	Carabidae	Coleoptera	Local	JHM	LC			x							x			
A ground beetle	*Pterostichus madidus*	Carabidae	Coleoptera	Widespread	JHM/SL	LC	x		x										
A ground beetle	*Pterostichus melanarius*	Carabidae	Coleoptera	Widespread	JHM/SL	LC										x			
A ground beetle	*Pterostichus minor*	Carabidae	Coleoptera	Widespread	RWP/SL	LC	x	x											
A ground beetle	*Pterostichus niger*	Carabidae	Coleoptera	Widespread	JHM/SL	LC	x									x			
A ground beetle	*Pterostichus nigrita*	Carabidae	Coleoptera	Widespread	JHM (dissected)	LC										x			
A ground beetle	*Pterostichus nigrita/rhaeticus*	Carabidae	Coleoptera	Widespread	SL	LC										x			
A ground beetle	*Pterostichus strenuus*	Carabidae	Coleoptera	Widespread	JHM	LC										x			
A ground beetle	*Pterostichus vernalis*	Carabidae	Coleoptera	Widespread	JHM/SL	LC										x			
A ground beetle	*Scybalicus oblongiusculus*	Carabidae	Coleoptera	Nationally Rare	JHM/SL	Vu										x			

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A ground beetle	*Stomis pumicatus*	Carabidae	Coleoptera	Local	JHM/SL	LC					x					x			
A ground beetle	*Syntomus foveatus*	Carabidae	Coleoptera	Widespread	JHM/SL	LC					x	x		x		x			
A ground beetle	*Syntomus obscuroguttatus*	Carabidae	Coleoptera	Widespread	JHM/SL	LC			x		x	x		x	x				
A ground beetle	*Syntomus truncatellus*	Carabidae	Coleoptera	Nationally Scarce	JHM/SL	LC										x			
A ground beetle	*Synuchus vivalis*	Carabidae	Coleoptera	Widespread	SL	LC										x			
A ground beetle	*Trechus obtusus*	Carabidae	Coleoptera	Widespread	JHM/SL	LC					x	x				x			
A ground beetle	*Trechus quadristriatus*	Carabidae	Coleoptera	Widespread	SL	LC									x				
A ground beetle	*Trechus secalis*	Carabidae	Coleoptera	Local	JHM	LC										x			
Fairy Ring Longhorn Beetle	*Pseudovadonia livida*	Cerambycidae	Coleoptera	Widespread	JHM/RWP	LC			x										
Black and Yellow Longhorn Beetle	*Rutpela maculata*	Cerambycidae	Coleoptera	Widespread	JHM/RWP	LC			x										
A flea beetle	*Altica lythri*	Chrysomelidae	Coleoptera	Widespread	RWP	LC		x											
A flea beetle	*Altica sp*	Chrysomelidae	Coleoptera	Unknown	SL			x							x				
A flea beetle	*Aphthona nigriceps*	Chrysomelidae	Coleoptera	Nationally Scarce	SL	LC				x									
A seed beetle	*Bruchidius imbricornis*	Chrysomelidae	Coleoptera	Recent UK colonist	JHM/RWP/SL	NE			x	x	x	x		x	x	x			
A seed beetle	*Bruchidius varius*	Chrysomelidae	Coleoptera	Local	SL	NE			x						x	x			
A seed beetle	*Bruchus brachialis*	Chrysomelidae	Coleoptera	Recent UK colonist	JHM/SL	NE			x	x	x	x	x	x	x				
A seed beetle	*Bruchus loti*	Chrysomelidae	Coleoptera	Local	JHM	LC			x	x	x				x				

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A seed beetle	*Bruchus rufimanus*	Chrysomelidae	Coleoptera	Local	JHM/RWP/SL	LC			x						x	x			
A seed beetle	*Bruchus rufipes*	Chrysomelidae	Coleoptera	Widespread	JHM	LC			x		x		x						
A leaf beetle (tortoise beetle)	*Cassida vibex*	Chrysomelidae	Coleoptera	Widespread	SL	LC		x											
A tortoise beetle	*Cassida viridis*	Chrysomelidae	Coleoptera	Widespread	RWP	LC		x											
A flea beetle	*Chaetocnema picipes*	Chrysomelidae	Coleoptera	Local	RWP	LC	x												
A leaf beetle	*Cryptocephalus fulvus*	Chrysomelidae	Coleoptera	Widespread	JHM/SL	LC				x				x		x			
A leaf beetle	*Galeruca tanaceti*	Chrysomelidae	Coleoptera	Local	JHM	LC	x									x			
A flea beetle	*Longitarsus jacobaeae/flavicornis*	Chrysomelidae	Coleoptera	Widespread	JHM/SL	LC	x				x								
A flea beetle	*Longitarsus melanocephalus*	Chrysomelidae	Coleoptera	Widespread	JHM	LC								x					
A flea beetle	*Longitarsus pratensis*	Chrysomelidae	Coleoptera	Widespread	JHM	LC					x								
A flea beetle	*Longitarsus succineus*	Chrysomelidae	Coleoptera	Widespread	SL	LC						x			x				
A flea beetle	*Neocrepidodera ferruginea*	Chrysomelidae	Coleoptera	Widespread	JHM/SL	LC			x				x	x	x				
A flea beetle	*Neocrepidodera transversa*	Chrysomelidae	Coleoptera	Widespread	JHM	LC			x		x		x	x					
A leaf beetle	*Phaedon cochleariae*	Chrysomelidae	Coleoptera	Widespread	RWP	LC											x		
A leaf beetle	*Phaedon tumidulus*	Chrysomelidae	Coleoptera	Widespread	JHM/SL	LC				x				x					
A leaf beetle	*Phyllotreta cruciferae*	Chrysomelidae	Coleoptera	Nationally Scarce	SL	LC									x				
A flea beetle	*Phyllotreta vittula*	Chrysomelidae	Coleoptera	Local	RWP	LC	x	x									x		
A flea beetle	*Psylliodes laticollis*	Chrysomelidae	Coleoptera	Widely scattered	RWP	LC		x											

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A flea beetle	*Psylliodes picina*	Chrysomelidae	Coleoptera	Widely scattered	SL	LC		x											
A flea beetle	*Sphaeroderma rubidum*	Chrysomelidae	Coleoptera	Widespread	SL	LC										x			
A flea beetle	*Sphaeroderma testaceum*	Chrysomelidae	Coleoptera	Widespread	JHM/SL	LC			x						x				
A ladybird beetle	*Coccidula rufa*	Coccinellidae	Coleoptera	Widespread	JHM/SL	LC							x					x	
Harlequin Ladybird	*Harmonia axyridis*	Coccinellidae	Coleoptera	Introduced invasive	JHM			x				x							
Red-patched Nephus	*Nephus redtenbacheri*	Coccinellidae	Coleoptera	Widespread	SL	LC			x		x	x							
Ant-nest Ladybird	*Platynaspis luteorubra*	Coccinellidae	Coleoptera	Nationally Scarce	SL	NE				x						x			
14-spot Ladybird	*Propylea quattuordecimpunctata*	Coccinellidae	Coleoptera	Widespread	JHM	LC		x							x				
22-spot Ladybird	*Psyllobora vigintiduopunctata*	Coccinellidae	Coleoptera	Widespread	JHM	LC		x			x	x	x		x			x	
A ladybird beetle	*Rhyzobius chrysomeloides*	Coccinellidae	Coleoptera	Local	JHM	LC								x					
24-spot Ladybird	*Subcoccinella vigintiquatuorpunctata*	Coccinellidae	Coleoptera	Widespread	JHM/RWP	LC	x		x	x	x			x	x	x			
A minute hooded beetle	*Corylophus sublaevipennis*	Corylophidae	Coleoptera	Local	SL						x								
A cryptophagid beetle	*Atomaria mesomela*	Cryptophagidae	Coleoptera	Widespread	RWP		x	x											
Strawberry Blossom Weevil	*Anthonomus rubi*	Curculionidae	Coleoptera	Widespread	SL					x									
A weevil	*Brachypera zoilus*	Curculionidae	Coleoptera	Local	SL											x			
A weevil	*Calosirus terminatus*	Curculionidae	Coleoptera	Nationally Scarce	SL	NE					x								
A weevil	*Ceutorhynchus contractus*	Curculionidae	Coleoptera	Widespread	JHM/RWP		x	x							x				

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A weevil	*Ceutorhynchus obstrictus*	Curculionidae	Coleoptera	Widespread	JHM/SL		x		x		x		x		x				
A weevil	*Ceutorhynchus pallidactylus*	Curculionidae	Coleoptera	Widespread	JHM/SL						x				x				
A weevil	*Ceutorhynchus typhae*	Curculionidae	Coleoptera	Widespread	SL										x				
A weevil	*Coelositona puberulus*	Curculionidae	Coleoptera	RDBK (insufficiently known) – as 'curticollis partim'	SL	NE									x				
A weevil	*Euophyrum confine*	Curculionidae	Coleoptera	Established introduction (New Zealand)	JHM											x			
A broad-nosed weevil	*Exomias pellucidus*	Curculionidae	Coleoptera	Widespread	JHM		x		x										
A weevil	*Glocianus distinctus*	Curculionidae	Coleoptera	Local	JHM/SL				x	x	x			x					
A weevil	*Glocianus punctiger*	Curculionidae	Coleoptera	Nationally Scarce	JHM				x							x			
A weevil	*Gronops lunatus*	Curculionidae	Coleoptera	Nationally Scarce	JHM				x										
A bark beetle	*Hylastinus obscurus*	Curculionidae	Coleoptera	Local	SL											x			
A weevil	*Hypera melancholica*	Curculionidae	Coleoptera	Nationally Scarce	SL	NE									x				
A weevil	*Hypera nigrirostris*	Curculionidae	Coleoptera	Widespread	SL				x						x	x			
A weevil	*Hypera plantaginis*	Curculionidae	Coleoptera	Widespread	JHM/SL						x	x			x	x			
A weevil	*Hypera postica*	Curculionidae	Coleoptera	Widespread	JHM/RWP/SL				x	x	x	x	x		x	x			
A weevil	*Larinus turbinatus*	Curculionidae	Coleoptera		SL	NE									x	x			

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A weevil	*Liparus coronatus*	Curculionidae	Coleoptera	Nationally Scarce	RWP/JHM							x				x			
A weevil	*Mecinus pascuorum*	Curculionidae	Coleoptera	Widespread	JHM/RWP/SL				x	x	x	x	x	x	x	x		x	
A weevil	*Mecinus pyraster*	Curculionidae	Coleoptera	Widespread	RWP											x			
Loosestrife Weevil	*Nanophyes marmoratus*	Curculionidae	Coleoptera	Widespread	JHM											x			
A weevil	*Nedyus quadrimaculatus*	Curculionidae	Coleoptera	Widespread	JHM/SL				x		x								
A weevil	*Orthochaetes setiger*	Curculionidae	Coleoptera	Nationally Scarce	JHM/SL				x		x			x		x			
A weevil	*Otiorhynchus ovatus*	Curculionidae	Coleoptera	Widespread	JHM/SL											x			
A weevil	*Otiorhynchus raucus*	Curculionidae	Coleoptera	Nationally Scarce	JHM/SL											x			
Vine Weevil	*Otiorhynchus sulcatus*	Curculionidae	Coleoptera	Widespread	SL											x			
A weevil	*Polydrusus pulchellus*	Curculionidae	Coleoptera	Nationally Scarce	RWP												x		
A weevil	*Rhinoncus pericarpius*	Curculionidae	Coleoptera	Widespread	JHM							x							
A weevil	*Sitona cylindricollis*	Curculionidae	Coleoptera	Local	JHM/SL					x	x	x	x	x	x	x			
A weevil	*Sitona hispidulus*	Curculionidae	Coleoptera	Widespread	JHM/SL				x	x	x	x		x	x	x			
A weevil	*Sitona humeralis*	Curculionidae	Coleoptera	Local	JHM/SL				x	x	x	x	x	x	x	x			
A weevil	*Sitona obsoletus*	Curculionidae	Coleoptera	Widespread	JHM/SL				x		x		x	x	x				
A weevil	*Sitona suturalis*	Curculionidae	Coleoptera	Widespread	SL					x		x							
A weevil	*Sitona waterhousei*	Curculionidae	Coleoptera	Nationally Scarce	SL	NE					x								

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A weevil	*Smicronyx reichi*	Curculionidae	Coleoptera	RDB3 pre-1994 criteria	SL	NE					x					x			
A weevil	*Tanysphyrus lemnae*	Curculionidae	Coleoptera	Local	RWP/SL		x												
A weevil	*Trichosirocalus thalhammeri*	Curculionidae	Coleoptera		SL	NE												x	
A weevil	*Trichosirocalus troglodytes*	Curculionidae	Coleoptera	Widespread	JHM/SL				x		x	x				x			
A weevil	*Tychius junceus*	Curculionidae	Coleoptera	Local	JHM/SL						x	x			x	x			
A weevil	*Tychius picirostris*	Curculionidae	Coleoptera	Widespread	JHM				x	x	x			x	x	x			
A weevil	*Tychius pusillus*	Curculionidae	Coleoptera	Nationally Scarce	JHM				x										
A weevil	*Tychius squamulatus*	Curculionidae	Coleoptera	Nationally Scarce	SL	NE					x				x				
A weevil	*Tychius stephensi*	Curculionidae	Coleoptera		SL										x				
Bloody Crane's-bill Weevil	*Zacladus exiguus*	Curculionidae	Coleoptera	Nationally Scarce	SL	NE			x	x									
A click beetle	*Agriotes acuminatus*	Elateridae	Coleoptera	Widespread	JHM	LC			x							x			
A click beetle	*Agriotes lineatus*	Elateridae	Coleoptera	Widespread	JHM/SL	LC			x		x					x			
A click beetle	*Agriotes sputator*	Elateridae	Coleoptera	Widespread	JHM/SL	LC			x	x						x			
A click beetle	*Agrypnus murinus*	Elateridae	Coleoptera	Widespread	JHM/RWP/SL	LC			x							x			
A water scavenger beetle	*Helophorus alternans*	Helophoridae	Coleoptera	Nationally Scarce	SL	LC	x												
A grooved water scavenger beetle	*Helophorus rufipes*	Helophoridae	Coleoptera	Local	JHM	LC						x							
A hister beetle	*Kissister minimus*	Histeridae	Coleoptera	Local	JHM	LC										x			

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A hister beetle	*Margarinotus purpurascens*	Histeridae	Coleoptera	Local	JHM/SL	LC			x			x				x			
A hister beetle	*Saprinus aeneus*	Histeridae	Coleoptera	Nationally Scarce	JHM/SL	LC										x			
A hister beetle	*Saprinus semistriatus*	Histeridae	Coleoptera	Local	JHM	LC										x			
A water scavenger beetle	*Anacaena limbata*	Hydrophilidae	Coleoptera	Widespread	JHM	LC										x			
A water scavenger beetle	*Berosus fulvus*	Hydrophilidae	Coleoptera	Nationally Rare	SL	Vu									x				
A water scavenger beetle	*Cercyon sternalis*	Hydrophilidae	Coleoptera	Widespread	SL		x												
A water scavenger beetle	*Coelostoma orbiculare*	Hydrophilidae	Coleoptera	Widespread	SL		x												
A water scavenger beetle	*Megasternum concinnum*	Hydrophilidae	Coleoptera	Widespread	JHM/SL				x							x			
A short-winged flower beetle	*Brachypterus glaber*	Kateretidae	Coleoptera	Widespread	SL			x											
Nettle Pollen Beetle	*Brachypterus urticae*	Kateretidae	Coleoptera	Widespread	RWP/SL			x											
Glow-worm	*Lampyris noctiluca*	Lampyridae	Coleoptera	Widespread	JHM									x		x			
A latridiid beetle	*Cartodere bifasciata*	Latridiidae	Coleoptera	Widespread	JHM/RWP/SL		x	x	x						x		x		
A latridiid beetle	*Corticaria crenulata*	Latridiidae	Coleoptera	Local	JHM						x								
A latridiid beetle	*Corticaria impressa*	Latridiidae	Coleoptera	Local	RWP/SL		x	x		x		x							
A latridiid beetle	*Corticarina minuta*	Latridiidae	Coleoptera	Widespread	RWP/SL			x		x	x		x		x				
A latridiid beetle	*Cortinicara gibbosa*	Latridiidae	Coleoptera	Widespread	RWP/TB/SL			x	x		x				x				
A latridiid beetle	*Enicmus transversus*	Latridiidae	Coleoptera	Widespread	RWP/SL		x			x	x				x				

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A latridiid beetle	*Melanophthalma suturalis*	Latridiidae	Coleoptera	RDBK (Insufficiently known)	SL	NE				x	x		x		x		x		
A fungus beetle	*Leiocyrtusa vittata*	Leiodidae	Coleoptera		JHM				x							x			
A fungus beetle	*Leiodes badia*	Leiodidae	Coleoptera		SL						x					x			
A minute marsh-loving beetle	*Limnichus pygmaeus*	Limnichidae	Coleoptera	Nationally Scarce	SL											x			
A malachite beetle	*Anthocomus rufus*	Malachiidae	Coleoptera	Local	JHM	LC	x	x											
A malachite beetle	*Cerapheles terminatus*	Malachiidae	Coleoptera	Nationally Rare	JHM/SL	LC	x	x			x								
A tumbling flower beetle	*Variimorda villosa*	Mordellidae	Coleoptera	Nationally Scarce	JHM/RWP/SL	LC										x			
A pollen beetle	*Meligethes carinulatus*	Nitidulidae	Coleoptera	Widespread	SL	LC		x		x	x		x	x	x				
A pollen beetle	*Meligethes fulvipes*	Nitidulidae	Coleoptera	Nationally Scarce	SL	NE		x					x		x				
A pollen beetle	*Pria dulcamarae*	Nitidulidae	Coleoptera	Local	RWP	LC		x											
Wharf Borer	*Nacerdes melanura*	Oedemeridae	Coleoptera	Local	SL	LC											x		
Lurid Flower Beetle	*Oedemera lurida*	Oedemeridae	Coleoptera	Widespread	JHM/RWP/SL	LC			x	x	x	x	x	x	x				
Thick-kneed Flower Beetle	*Oedemera nobilis*	Oedemeridae	Coleoptera	Widespread	JHM/RWP	LC	x		x	x	x	x	x	x	x	x	x		
A shining flower beetle	*Olibrus aeneus*	Phalacridae	Coleoptera	Local	JHM/RWP/SL	LC	x								x	x			
A shining flower beetle	*Olibrus corticalis*	Phalacridae	Coleoptera	Local	JHM/RWP	LC										x			
A shining flower beetle	*Olibrus flavicornis*	Phalacridae	Coleoptera	Red Data Book-	JHM/SL	DD			x	x	x	x	x	x	x	x			

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
				insufficiently known															
A shining flower beetle	*Olibrus liquidus*	Phalacridae	Coleoptera	Local	JHM/RWP/SL	LC					x				x			x	
A shining flower beetle	*Phalacrus fimetarius*	Phalacridae	Coleoptera	Local	JHM/SL	LC			x	x					x				
A shining flower beetle	*Stilbus oblongus*	Phalacridae	Coleoptera	Local	SL			x											
A featherwing beetle	*Acrotrichis sp*	Ptiliidae	Coleoptera		SL		x												
A scarabaeid dung beetle	*Onthophagus joannae*	Scarabaeidae	Coleoptera	Local	SL	LC				x									
Brown Chafer	*Serica brunnea*	Scarabaeidae	Coleoptera	Local	JHM/SL	LC										x			
A scirtid beetle	*Contacyphon coarctatus*	Scirtidae	Coleoptera	Widespread	RWP		x												
A marsh beetle	*Contacyphon laevipennis*	Scirtidae	Coleoptera	Widespread	SL		x								x		x		
A marsh beetle	*Contacyphon ochraceus*	Scirtidae	Coleoptera	Widespread	SL		x	x											
A scirtid beetle	*Microcara testacea*	Scirtidae	Coleoptera	Widespread	JHM											x			
A silphid beetle	*Ablattaria laevigata*	Silphidae	Coleoptera	Local	JHM/RWP/SL	LC									x	x			
A silphid beetle	*Nicrophorus humator*	Silphidae	Coleoptera	Widespread	JHM	LC										x			
A silphid beetle	*Nicrophorus interruptus*	Silphidae	Coleoptera	Nationally Scarce	JHM/SL	LC										x			
A silphid beetle	*Nicrophorus vespillo*	Silphidae	Coleoptera	Widespread	JHM	LC										x			
A silphid beetle	*Phosphuga atrata*	Silphidae	Coleoptera	Widespread	JHM/RWP/SL	LC										x			
A silphid beetle	*Silpha tristis*	Silphidae	Coleoptera	Local	JHM/RWP/SL	LC	x				x	x	x			x			
A silphid beetle	*Thanatophilus sinuatus*	Silphidae	Coleoptera	Local	JHM/SL	LC										x			
A silvanid beetle	*Psammoecus bipunctatus*	Silvanidae	Coleoptera	Widespread	JHM/RWP	LC		x											

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A rove beetle	*Aleochara bipustulata*	Staphylinidae	Coleoptera		SL						x								
A rove beetle	*Aleochara curtula*	Staphylinidae	Coleoptera	Widespread	JHM/SL											x			
A rove beetle	*Amischa decipiens*	Staphylinidae	Coleoptera		SL						x								
A rove beetle	*Anotylus rugosus*	Staphylinidae	Coleoptera	Widespread	JHM/RWP			x	x										
A rove beetle	*Astenus immaculatus*	Staphylinidae	Coleoptera	Nationally Scarce	RWP/SL	LC	x	x											
A rove beetle	*Astenus lyonessius*	Staphylinidae	Coleoptera	Local	SL	LC			x										
A rove beetle	*Bledius gallicus*	Staphylinidae	Coleoptera	Local	SL	LC									x				
A pselaphiine rove beetle	*Brachygluta helferi*	Staphylinidae	Coleoptera	Local	SL	LC	x										x		
A rove beetle	*Carpelimus corticinus*	Staphylinidae	Coleoptera		SL		x												
A rove beetle	*Carpelimus incongruus*	Staphylinidae	Coleoptera		SL										x				
A rove beetle	*Cilea silphoides*	Staphylinidae	Coleoptera	Local	RWP												x		
A rove beetle	*Cypha longicornis*	Staphylinidae	Coleoptera		SL			x	x	x	x		x	x	x				
A rove beetle	*Drusilla canaliculata*	Staphylinidae	Coleoptera	Widespread	JHM/SL	LC	x		x		x					x			
A rove beetle	*Euaesthetus ruficapillus*	Staphylinidae	Coleoptera		SL		x												
A rove beetle	*Gabrius breviventer*	Staphylinidae	Coleoptera		SL											x			
A rove beetle	*Gabrius sp*	Staphylinidae	Coleoptera		SL		x												
A rove beetle	*Gyrohypnus angustatus/wagneri*	Staphylinidae	Coleoptera		JHM											x			
A rove beetle	*Gyrohypnus wagneri*	Staphylinidae	Coleoptera		SL											x			
A rove beetle	*Lathrobium brunnipes*	Staphylinidae	Coleoptera	Widespread	JHM	LC										x			

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A rove beetle	*Lathrobium fulvipenne*	Staphylinidae	Coleoptera	Widespread	JHM	LC										x			
A rove beetle	*Metopsia clypeata*	Staphylinidae	Coleoptera	Widespread	JHM/SL	LC			x	x	x					x			
A rove beetle	*Mocyta fungi agg.*	Staphylinidae	Coleoptera		SL					x	x	x						x	
A rove beetle	*Neobisnius villosulus*	Staphylinidae	Coleoptera	Nationally Scarce	JHM				x										
A rove beetle	*Ochthephilum fracticorne*	Staphylinidae	Coleoptera		SL											x			
A rove beetle	*Ocypus aeneocephalus*	Staphylinidae	Coleoptera	Widespread	JHM	LC										x			
A rove beetle	*Ocypus brunnipes*	Staphylinidae	Coleoptera	Local	JHM/SL	LC										x			
A rove beetle	*Ocypus fuscatus*	Staphylinidae	Coleoptera	Nationally Scarce	JHM/SL	LC			x							x			
Devil's Coach-horse	*Ocypus olens*	Staphylinidae	Coleoptera	Widespread	JHM/SL	LC			x		x	x				x			
A rove beetle	*Ocyusa maura*	Staphylinidae	Coleoptera		SL		x												
A rove beetle	*Ontholestes murinus*	Staphylinidae	Coleoptera	Widespread	JHM	LC										x			
A rove beetle	*Othius punctulatus*	Staphylinidae	Coleoptera	Widespread	JHM/SL	LC										x			
A rove beetle	*Paederus littoralis*	Staphylinidae	Coleoptera	Widespread	SL	LC										x			
A rove beetle	*Paederus riparius*	Staphylinidae	Coleoptera	Widespread	JHM	LC	x	x								x			
A rove beetle	*Pella limbata*	Staphylinidae	Coleoptera		SL						x								
A rove beetle	*Philonthus carbonarius*	Staphylinidae	Coleoptera	Widespread	JHM	LC										x			
A rove beetle	*Philonthus cognatus*	Staphylinidae	Coleoptera	Widespread	JHM/RWP/SL	LC	x	x	x							x			
A rove beetle	*Philonthus jurgans*	Staphylinidae	Coleoptera		SL			x											

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A rove beetle	*Philonthus politus*	Staphylinidae	Coleoptera	Local	JHM	LC										x			
A rove beetle	*Philonthus succicola*	Staphylinidae	Coleoptera	Local	RWP	LC		x											
A rove beetle	*Philonthus tenuicornis*	Staphylinidae	Coleoptera	Local	RWP	LC		x											
A rove beetle	*Philonthus varians*	Staphylinidae	Coleoptera	Widespread	JHM/RWP	LC		x											
A rove beetle	*Platydracus stercorarius*	Staphylinidae	Coleoptera	Local	JHM/SL	LC	x		x							x			
A rove beetle	*Quedius boops*	Staphylinidae	Coleoptera		SL	LC										x			
A rove beetle	*Quedius boops complex*	Staphylinidae	Coleoptera		SL											x			
A rove beetle	*Quedius levicollis*	Staphylinidae	Coleoptera		SL	LC					x								
A rove beetle	*Quedius longicornis*	Staphylinidae	Coleoptera	Local	JHM	LC										x			
A rove beetle	*Quedius maurorufus*	Staphylinidae	Coleoptera	Widespread	JHM	LC										x			
A rove beetle	*Quedius molochinus*	Staphylinidae	Coleoptera	Widespread	JHM	LC			x		x								
A rove beetle	*Quedius nitipennis*	Staphylinidae	Coleoptera	Local	JHM	LC										x			
A rove beetle	*Quedius schatzmayri*	Staphylinidae	Coleoptera		SL											x			
A rove beetle	*Quedius semiobscurus*	Staphylinidae	Coleoptera	Widespread	JHM/SL				x							x			
A pselaphiine rove beetle	*Rybaxis longicornis*	Staphylinidae	Coleoptera	Widespread	RWP/SL		x	x											
A rove beetle	*Sepedophilus nigripennis*	Staphylinidae	Coleoptera	Widespread	JHM/SL					x	x	x							
A rove beetle	*Staphylinus dimidiaticornis*	Staphylinidae	Coleoptera	Local	JHM/SL						x					x			
A rove beetle	*Stenus aceris*	Staphylinidae	Coleoptera	Local	JHM/SL	LC	x		x		x	x	x	x	x				
A rove beetle	*Stenus bimaculatus*	Staphylinidae	Coleoptera	Widespread	RWP	LC		x											

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A rove beetle	*Stenus brunnipes*	Staphylinidae	Coleoptera	Widespread	SL	LC			x	x									
A rove beetle	*Stenus clavicornis*	Staphylinidae	Coleoptera	Widespread	JHM/RWP/SL	LC			x	x						x	x		
A rove beetle	*Stenus fulvicornis*	Staphylinidae	Coleoptera	Widespread	SL	LC	x									x			
A rove beetle	*Stenus impressus*	Staphylinidae	Coleoptera	Widespread	JHM	LC									x				
A rove beetle	*Stenus juno*	Staphylinidae	Coleoptera	Widespread	SL	LC	x												
A rove beetle	*Stenus latifrons*	Staphylinidae	Coleoptera	Widespread	SL	LC	x												
A rove beetle	*Stenus nanus*	Staphylinidae	Coleoptera	Local	SL	LC										x			
A rove beetle	*Stenus nitens*	Staphylinidae	Coleoptera		SL	LC	x												
A rove beetle	*Stenus ossium*	Staphylinidae	Coleoptera	Widespread	RWP/SL	LC	x				x	x							
A rove beetle	*Stenus pallipes*	Staphylinidae	Coleoptera	Local	RWP/SL	LC	x	x										x	
A rove beetle	*Stenus pusillus*	Staphylinidae	Coleoptera	Local	SL	LC										x			
A rove beetle	*Stenus subaeneus*	Staphylinidae	Coleoptera	Local	JHM	LC			x		x				x				
A rove beetle	*Tachinus flavolimbatus*	Staphylinidae	Coleoptera	Nationally Scarce	JHM	LC										x			
A rove beetle	*Tachinus rufipes*	Staphylinidae	Coleoptera	Widespread	JHM	LC										x			
A rove beetle	*Tachyporus atriceps*	Staphylinidae	Coleoptera		SL											x			
A rove beetle	*Tasgius ater*	Staphylinidae	Coleoptera	Local	SL	LC											x		
A rove beetle	*Xantholinus elegans*	Staphylinidae	Coleoptera	Local	JHM/SL	LC					x					x			
A rove beetle	*Xantholinus linearis*	Staphylinidae	Coleoptera		SL											x			
A rove beetle	*Xantholinus longiventris*	Staphylinidae	Coleoptera	Widespread	JHM/SL	LC										x			

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A darkling beetle	*Isomira murina*	Tenebrionidae	Coleoptera	Local	JHM	LC				x									
A false click beetle	*Trixagus obtusus*	Throscidae	Coleoptera	Local	SL										x				
Common Earwig	*Forficula auricularia*	Forficulidae	Dermaptera	Widespread	JHM/SL	LC	x	x	x		x	x	x	x	x	x			
Top-horned Hunchbank	*Paracrocera orbiculus*	Acroceridae	Diptera	Nationally Scarce	JHM	LC												x	
A leaf-miner fly	*Cerodontha biseta*	Agromyzidae	Diptera		ST			x											
A leaf-miner fly	*Cerodontha denticornis*	Agromyzidae	Diptera		ST		x												
A leaf-miner fly	*Chromatomyia ramosa*	Agromyzidae	Diptera		ST		x												
A root-maggot fly	*Delia florilega*	Anthomyiidae	Diptera		MH			x											
A root-maggot fly	*Pegoplata infirma*	Anthomyiidae	Diptera		MH			x											
A root-maggot fly	*Anagnota bicolor*	Anthomyzidae	Diptera		MH												x		
A root-maggot fly	*Anthomyza collini*	Anthomyzidae	Diptera		ST		x									x			
A root-maggot fly	*Anthomyza gracilis*	Anthomyzidae	Diptera		ST		x			x									
A root-maggot fly	*Paranthomyza nitida*	Anthomyzidae	Diptera		ST			x											
Stripe-legged Robberfly	*Dioctria baumhaueri*	Asilidae	Diptera		MH											x			
Striped Slender Robberfly	*Leptogaster cylindrica*	Asilidae	Diptera	Widespread	JHM/RWP	LC			x	x	x			x	x	x			
Brown Heath Robberfly	*Machimus cingulatus*	Asilidae	Diptera	Widespread	JHM/MH	LC										x	x		
A blow fly	*Calliphora vicina*	Calliphoridae	Diptera		MH		x												
A blow fly	*Lucilia sericata*	Calliphoridae	Diptera		MH		x	x											
A blow fly	*Melanomya nana*	Calliphoridae	Diptera		MH		x									x			

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A blow fly	*Pollenia rudis*	Calliphoridae	Diptera		MH			x											
A frit fly	*Aphanotrigonum fasciella*	Chloropidae	Diptera		ST												x		
A frit fly	*Aphanotrigonum femorellum*	Chloropidae	Diptera		ST												x		
A frit fly	*Calamoncosis duinensis*	Chloropidae	Diptera		ST			x											
A frit fly	*Calamoncosis minima*	Chloropidae	Diptera		ST			x											
A frit fly	*Camarota curvipennis*	Chloropidae	Diptera		MH		x	x											
A frit fly	*Cetema neglectum*	Chloropidae	Diptera		MH				x										
A frit fly	*Cetema sp.*	Chloropidae	Diptera		ST										x				
A frit fly	*Chlorops pumilionis*	Chloropidae	Diptera		MH				x						x				
A frit fly	*Chlorops sp.*	Chloropidae	Diptera		ST										x				
A frit fly	*Cryptonevra flavitarsis*	Chloropidae	Diptera		ST		x	x											
A frit fly	*Dicraeus sp.*	Chloropidae	Diptera		ST										x				
A frit fly	*Dicraeus tibialis*	Chloropidae	Diptera	pNS	ST					x									
A frit fly	*Dicraeus vagans*	Chloropidae	Diptera		ST					x		x							
A frit fly	*Elachiptera brevipennis*	Chloropidae	Diptera		MH		x	x		x							x		
A frit fly	*Elachiptera cornuta*	Chloropidae	Diptera		ST			x											
A frit fly	*Elachiptera megaspis*	Chloropidae	Diptera		MH		x	x											
A frit fly	*Elachiptera sp.*	Chloropidae	Diptera		ST			x											
A frit fly	*Elachiptera tuberculifera*	Chloropidae	Diptera		ST			x											

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A frit fly	*Incertella albipalpis*	Chloropidae	Diptera		ST										x	x	x	x	
A frit fly	*Lasiosina sp.*	Chloropidae	Diptera		ST			x									x		
A frit fly	*Meromyza femorata*	Chloropidae	Diptera		ST			x						x		x			
A frit fly	*Meromyza sp.*	Chloropidae	Diptera		ST		x			x									
A frit fly	*Meromyza triangulina*	Chloropidae	Diptera		ST							x							
A frit fly	*Oscinimorpha minutissima*	Chloropidae	Diptera		ST				x		x			x	x				
A frit fly	*Thaumatomyia glabra*	Chloropidae	Diptera		MH			x					x		x				
A frit fly	*Thaumatomyia notata*	Chloropidae	Diptera		MH			x		x									
A frit fly	*Tricimba cincta*	Chloropidae	Diptera		ST						x								
Ferruginous Bee-grabber	*Sicus ferrugineus*	Conopidae	Diptera	Widespread	JHM/RWP/MH	LC			x						x	x			
A long-legged fly	*Chrysotus gramineus*	Dolichopodidae	Diptera		ST		x	x											
A long-legged fly	*Dolichopus campestris*	Dolichopodidae	Diptera		MH			x											
A long-legged fly	*Dolichopus festivus*	Dolichopodidae	Diptera		MH/ST		x	x								x			
A long-legged fly	*Dolichopus griseipennis*	Dolichopodidae	Diptera		MH		x		x		x		x	x	x		x		
A long-legged fly	*Dolichopus nubilus*	Dolichopodidae	Diptera		MH		x												
A long-legged fly	*Hercostomus plagiatus*	Dolichopodidae	Diptera		ST			x											
A long-legged fly	*Hydrophorus oceanus*	Dolichopodidae	Diptera	Local	ST													x	
A long-legged fly	*Machaerium maritimae*	Dolichopodidae	Diptera	Local	MH											x		x	
A long-legged fly	*Poecilobothrus nobilitatus*	Dolichopodidae	Diptera		MH											x			

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A long-legged fly	*Poecilobothrus principalis*	Dolichopodidae	Diptera		MH/ST		x	x											
A long-legged fly	*Scellus notatus*	Dolichopodidae	Diptera		MH								x		x		x		
A long-legged fly	*Sciapus contristans*	Dolichopodidae	Diptera	Local	JHM	LC						x							
A fruit fly	*Lordiphosa andalusiaca*	Drosophilidae	Diptera		ST			x											
A fruit fly	*Lordiphosa fenestrarum*	Drosophilidae	Diptera		ST			x											
A fruit fly	*Scaptomyza flava*	Drosophilidae	Diptera		MH										x		x		
A fruit fly	*Scaptomyza pallida*	Drosophilidae	Diptera		MH		x	x							x			x	
A dagger fly	*Empis femorata*	Empididae	Diptera		MH				x										
A dagger fly	*Empis livida*	Empididae	Diptera		MH		x								x				
A dagger fly	*Empis praevia*	Empididae	Diptera		MH				x										
A dagger fly	*Nephrotoma flavescens*	Empididae	Diptera		MH						x	x							
A shore fly	*Clanoneurum cimiciforme*	Ephydridae	Diptera		MH			x									x	x	
A shore fly	*Coenia palustris*	Ephydridae	Diptera		ST		x												
A shore fly	*Diasemocera leucostoma*	Ephydridae	Diptera		ST												x	x	
A shore fly	*Hydrellia porphyrops*	Ephydridae	Diptera		MH			x											
A shore fly	*Notiphila riparia*	Ephydridae	Diptera		ST		x	x											
A shore fly	*Psilopa nitidula*	Ephydridae	Diptera		ST			x								x			
A heleomyzid fly	*Suillia variegata*	Heleomyzidae	Diptera		MH			x											
A dance fly	*Elaphropeza ephippiata*	Hybotidae	Diptera		MH		x												

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A dance fly	*Platypalpus longiseta*	Hybotidae	Diptera		MH					x		x							
A lauxaniid fly	*Calliopum aeneum*	Lauxaniidae	Diptera		MH			x			x				x				
A lauxaniid fly	*Calliopum elisae*	Lauxaniidae	Diptera		MH			x											
A lauxaniid fly	*Minettia fasciata*	Lauxaniidae	Diptera		MH				x	x	x				x	x			
A lauxaniid fly	*Sapromyza quadripunctata*	Lauxaniidae	Diptera		MH		x	x	x	x		x	x		x				
A spear-winged fly	*Lonchoptera bifurcata*	Lonchopteridae	Diptera		MH		x	x		x					x				
A stilt-legged fly	*Micropeza corrigiolata*	Micropezidae	Diptera		MH			x						x	x				
A house fly	*Coenosia tigrina*	Muscidae	Diptera		MH		x									x			
A house fly	*Musca autumnalis*	Muscidae	Diptera		MH			x											
A house fly	*Schoenomyza litorella*	Muscidae	Diptera		MH			x					x						
An opomyzid fly	*Geomyza apicalis*	Opomyzidae	Diptera	NS	MH				x										
An opomyzid fly	*Geomyza subnigra*	Opomyzidae	Diptera	NS	MH				x										
An opomyzid fly	*Geomyza tripunctata*	Opomyzidae	Diptera		MH			x	x	x					x				
An opomyzid fly	*Opomyza florum*	Opomyzidae	Diptera		MH		x	x			x								
An opomyzid fly	*Opomyza germinationis*	Opomyzidae	Diptera		MH		x		x		x				x				
An opomyzid fly	*Opomyza petrei*	Opomyzidae	Diptera		MH		x		x		x					x			
An opomyzid fly	*Opomyza punctata*	Opomyzidae	Diptera	NS	MH										x				
An opomyzid fly	*Geomyza balachowskyi*	Opomyzidae	Diptera		ST				x										
A platystomatid fly	*Rivellia syngenesiae*	Platystomatidae	Diptera	Local	JHM	LC									x	x			

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Black Snipefly	*Chrysopilus cristatus*	Rhagionidae	Diptera	Widespread	JHM	LC			x										
A woodlouse fly	*Rhinophora lepida*	Rhinophoridae	Diptera		MH		x	x								x	x	x	
A flesh fly	*Miltogramma germari*	Sarcophagidae	Diptera	NS	MH											x			
A flesh fly	*Sarcophaga anaces*	Sarcophagidae	Diptera		MH		x												
A flesh fly	*Sarcophaga incisilobata*	Sarcophagidae	Diptera		MH		x												
A flesh fly	*Sarcophaga melanura*	Sarcophagidae	Diptera		MH		x	x											
A flesh fly	*Sarcophaga sinuata*	Sarcophagidae	Diptera	NS	MH												x		
A flesh fly	*Sarcophaga subvicina*	Sarcophagidae	Diptera		MH		x												
A flesh fly	*Sarcophaga vagans*	Sarcophagidae	Diptera		MH		x												
A dung fly	*Cleigastra apicalis*	Scathophagidae	Diptera		MH		x												
A dung fly	*Norellisoma spinimanum*	Scathophagidae	Diptera		MH		x												
A dung fly	*Scathophaga litorea*	Scathophagidae	Diptera		MH												x	x	
A dung fly	*Scathophaga stercoraria*	Scathophagidae	Diptera		MH				x						x				
A marsh fly	*Colobaea punctata*	Sciomyzidae	Diptera	Nationally Scarce	MH		x												
A marsh fly	*Ilione albiseta*	Sciomyzidae	Diptera		MH					x						x			
A marsh fly	*Pherbellia cinerella*	Sciomyzidae	Diptera		MH		x		x	x	x		x	x	x		x		
An ensign fly	*Nemopoda nitidula*	Sepsidae	Diptera		MH		x	x											
An ensign fly	*Sepsis punctum*	Sepsidae	Diptera		MH		x												
An ensign fly	*Themira annulipes*	Sepsidae	Diptera		MH			x											

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Broad Centurion	*Chloromyia formosa*	Stratiomyidae	Diptera	Widespread	JHM	LC									x		x		
Black-horned Gem	*Microchrysa polita*	Stratiomyidae	Diptera	Widespread	JHM/MH	LC		x											
Three-lined Soldier	*Oxycera trilineata*	Stratiomyidae	Diptera	Local	JHM	LC	x	x											
Dark-winged Black	*Pachygaster atra*	Stratiomyidae	Diptera	Widespread	JHM	LC		x											
Yellow-legged Black	*Pachygaster leachii*	Stratiomyidae	Diptera		MH										x				
Banded General	*Stratiomys potamida*	Stratiomyidae	Diptera	Local	JHM	LC		x											
A hoverfly	*Chrysotoxum bicinctum*	Syrphidae	Diptera	Widespread	JHM	LC			x						x				
A hoverfly	*Chrysotoxum elegans*	Syrphidae	Diptera	Nationally Scarce	JHM	LC		x											
A hoverfly	*Chrysotoxum festivum*	Syrphidae	Diptera	Widespread	JHM	LC			x										
Marmalade Hoverfly	*Episyrphus balteatus*	Syrphidae	Diptera	Widespread	JHM	LC		x											
A hoverfly	*Eristalinus sepulchralis*	Syrphidae	Diptera	Widespread	JHM/MH	LC	x	x							x	x	x		
A hoverfly	*Eristalis interruptus*	Syrphidae	Diptera	Widespread	JHM	LC			x										
A hoverfly	*Eumerus strigatus*	Syrphidae	Diptera	Widespread	JHM	LC							x						
A hoverfly	*Eupeodes corollae*	Syrphidae	Diptera		MH										x				
A hoverfly	*Eupeodes luniger*	Syrphidae	Diptera	Widespread	JHM	LC		x	x										
A hoverfly	*Helophilus hybridus*	Syrphidae	Diptera	Widespread	JHM	LC	x												
A hoverfly	*Helophilus pendulus*	Syrphidae	Diptera	Widespread	JHM	LC		x											
A hoverfly	*Melanostoma scalare*	Syrphidae	Diptera	Widespread	JHM	LC		x		x						x			
A hoverfly	*Myathropa florea*	Syrphidae	Diptera	Widespread	JHM	LC		x											

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A hoverfly	*Neoascia geniculata*	Syrphidae	Diptera	Widespread	JHM	LC		x											
A hoverfly	*Neoascia tenur*	Syrphidae	Diptera	Widespread	JHM	LC	x	x		x									
A hoverfly	*Paragus haemorrhous*	Syrphidae	Diptera	Widespread	JHM/MH	LC				x	x							x	
A hoverfly	*Parahelophilus frutetorum*	Syrphidae	Diptera	Local	JHM	LC		x											
A hoverfly	*Pipizella viduata*	Syrphidae	Diptera		MH		x												
A hoverfly	*Platycheirus albimanus*	Syrphidae	Diptera	Widespread	JHM	LC			x										
A hoverfly	*Platycheirus rosarum*	Syrphidae	Diptera	Widespread	JHM	LC			x										
A hoverfly	*Sphaerophoria rueppellii*	Syrphidae	Diptera		MH												x		
A hoverfly	*Sphaerophoria scripta*	Syrphidae	Diptera	Widespread	JHM/MH	LC			x		x	x				x			
A hoverfly	*Tropidia scita*	Syrphidae	Diptera		MH		x												
A hoverfly	*Volucella pellucens*	Syrphidae	Diptera	Widespread	JHM	LC			x										
Orange-belted Hoverfly	*Xylota segnis*	Syrphidae	Diptera	Widespread	JHM/RWP	LC			x										
Saltmarsh Horsefly	*Atylotus latistriatus*	Tabanidae	Diptera	Nationally Scarce	JHM	LC										x	x		
Twin-lobed Deerfly	*Chrysops relictus*	Tabanidae	Diptera	Widespread	JHM	LC		x											
Long-horned Cleg	*Haematopota grandis*	Tabanidae	Diptera	Nationally Scarce	JHM	LC										x			
A tachinid fly	*Eriothrix rufomaculata*	Tachinidae	Diptera		MH		x	x								x	x	x	
A tachinid fly	*Gymnosoma rotundatum*	Tachinidae	Diptera		MH											x			
A tachinid fly	*Voria ruralis*	Tachinidae	Diptera		MH		x												

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A tephritid fly	*Campiglossa malaris*	Tephritidae	Diptera	Previous status of EN not warranted	MH		x												
A tephritid fly	*Campiglossa misella*	Tephritidae	Diptera		MH			x	x	x	x	x			x	x			
A tephritid fly	*Chaetorellia jaceae*	Tephritidae	Diptera		MH							x							
A tephritid fly	*Tephritis cometa*	Tephritidae	Diptera		MH			x											
A tephritid fly	*Tephritis formosa*	Tephritidae	Diptera		MH			x											
A tephritid fly	*Terellia ruficauda*	Tephritidae	Diptera		MH										x				
A tephritid fly	*Terellia serratulae*	Tephritidae	Diptera		MH							x							
A tephritid fly	*Urophora cardui*	Tephritidae	Diptera		MH										x				
A tephritid fly	*Urophora jaceana agg.*	Tephritidae	Diptera		MH							x							
A tephritid fly	*Urophora quadrifasciata*	Tephritidae	Diptera	Widespread	JHM/MH	LC						x							
Common Stiletto	*Thereva nobilitata*	Therevidae	Diptera	Widespread	JHM/MH	LC		x							x	x			
A crane fly	*Nephrotoma cornicina*	Tipulidae	Diptera		MH						x								
A crane fly	*Nigrotipula nigra*	Tipulidae	Diptera		MH			x							x	x			
A trixoscelid fly	*Trixoscelis marginella*	Trixoscelidae	Diptera	pNS	MH											x			
A ulidiid fly	*Ceroxys urticae*	Ulidiidae	Diptera		MH												x		
Phoenix Fly	*Dorycera graminum*	Ulidiidae	Diptera	S41 Priority species; Near Threatened (Post-2001 IUCN	JHM/MH	NT			x		x		x		x				

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
				criteria); RDB3 'rare' pre-1994															
Mouse-eared Snail	*Myosotella myosotis*	Ellobiidae	Gastropoda	Data deficient	JHM	DD												x	
Nautilus Ramshorn	*Gyraulus crista*	Planorbidae	Gastropoda	Widespread	JHM	LC	x												
Flat Ramshorn	*Hippeutis complanatus*	Planorbidae	Gastropoda	Widespread	JHM	LC	x												
Broad-headed Bug	*Alydus calcaratus*	Alydidae	Hemiptera	Nationally Scarce	JHM	LC										x			
Common Flower Bug	*Anthocoris nemorum*	Anthocoridae	Hemiptera	Widespread	JHM/TB	LC		x											
A flower bug	*Orius laevigatus*	Anthocoridae	Hemiptera	Local	JHM/TB	LC		x							x	x	x		
A flower bug	*Orius majusculus*	Anthocoridae	Hemiptera	Widespread	JHM/TB	LC	x	x										x	
A flower bug	*Orius niger*	Anthocoridae	Hemiptera	Widespread	JHM/SL/TB	LC	x	x							x	x		x	
A froghopper	*Neophilaenus campestris*	Aphrophoridae	Hemiptera	Widespread	JHM	LC			x	x	x	x	x	x	x	x			
A froghopper	*Neophilaenus exclamationis*	Aphrophoridae	Hemiptera	Widespread	JHM	LC									x	x			
A stiltbug	*Berytinus crassipes*	Berytidae	Hemiptera	Local	JHM/SL	LC										x			
A stilt bug	*Berytinus hirticornis*	Berytidae	Hemiptera	Nationally Scarce	JHM	LC	x	x		x									
A stiltbug	*Berytinus signoreti*	Berytidae	Hemiptera	Widespread	JHM/SL	LC					x	x				x			
A leafhopper	*Adarrus ocellaris*	Cicadellidae	Hemiptera	Widespread	JHM	LC				x							x		
A leafhopper	*Anaceratagallia ribauti*	Cicadellidae	Hemiptera	Local	JHM/SL/TB	LC			x		x	x	x			x			
A leafhopper	*Anaceratagallia venosa*	Cicadellidae	Hemiptera	Widespread	JHM	LC			x		x				x	x			

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A leafhopper	*Anoscopus flavostriatus*	Cicadellidae	Hemiptera	Widespread	JHM	LC	x												
A leafhopper	*Anoscopus serratulae*	Cicadellidae	Hemiptera	Widespread	JHM/SL	LC			x							x			
A leafhopper	*Aphrodes makarovi*	Cicadellidae	Hemiptera	Widespread	JHM/SL/TB	LC	x		x	x	x	x	x	x	x	x	x	x	
A leafhopper	*Arthaldeus pascuellus*	Cicadellidae	Hemiptera	Widespread	JHM/TB	LC	x		x		x	x	x		x				
A leafhopper	*Arthaldeus striifrons*	Cicadellidae	Hemiptera	Widespread	JHM	LC			x	x			x	x	x	x	x		
A leafhopper	*Athysanus argentarius*	Cicadellidae	Hemiptera	Local	JHM	LC	x								x		x		
A leafhopper	*Cicadula quadrinotata*	Cicadellidae	Hemiptera	Widespread	TB	LC									x				
A leafhopper	*Doratura stylata*	Cicadellidae	Hemiptera	Widespread	JHM/SL	LC	x		x							x			
A leafhopper	*Empoasca decipiens*	Cicadellidae	Hemiptera	Widespread	TB	LC		x											
A leafhopper	*Eupelix cuspidata*	Cicadellidae	Hemiptera	Local	JHM/SL	LC	x		x	x				x		x			
A leafhopper	*Eupteryx aurata*	Cicadellidae	Hemiptera	Widespread	TB	LC		x											
A leafhopper	*Eupteryx florida*	Cicadellidae	Hemiptera	Local	TB	LC	x												
A leafhopper	*Eupteryx urticae*	Cicadellidae	Hemiptera	Widespread	JHM/TB	LC		x											
A leafhopper	*Euscelis incisus*	Cicadellidae	Hemiptera	Widespread	JHM/SL/TB	LC	x				x		x		x	x			
A leafhopper	*Euscelis lineolatus*	Cicadellidae	Hemiptera	Widespread	JHM/SL	LC				x	x				x				
A leafhopper	*Evacanthus acuminatus*	Cicadellidae	Hemiptera	Widespread	JHM	LC		x											
A leafhopper	*Graphocraerus ventralis*	Cicadellidae	Hemiptera	Local	JHM/SL	LC			x						x	x			
A leafhopper	*Idiocerus herrichi*	Cicadellidae	Hemiptera	Local	JHM	LC										x			
A leafhopper	*Macropsis fuscula*	Cicadellidae	Hemiptera	Local	TB	LC	x												

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A leafhopper	*Macustus grisescens*	Cicadellidae	Hemiptera	Widespread	JHM	LC	x		x										
A leafhopper	*Megophthalmus scabripennis*	Cicadellidae	Hemiptera	Widespread	JHM	LC			x		x			x		x			
A leafhopper	*Megophthalmus scanicus*	Cicadellidae	Hemiptera	Widespread	JHM/SL/TB	LC	x		x	x	x	x			x	x			
A leafhopper	*Mocydiopsis parvicauda*	Cicadellidae	Hemiptera	Local	SL/TB	LC	x				x								
A leafhopper	*Ophiola decumana*	Cicadellidae	Hemiptera	Nationally Scarce	SL	LC							x						
A leafhopper	*Paralimnus phragmitis*	Cicadellidae	Hemiptera	Nationally Scarce	JHM	LC	x	x								x			
A leafhopper	*Paramesus obtusifrons*	Cicadellidae	Hemiptera	Local	JHM	LC	x										x	x	
A leafhopper	*Psammotettix sp*	Cicadellidae	Hemiptera		SL						x								
A leafhopper	*Recilia coronifera*	Cicadellidae	Hemiptera	Widespread	JHM/SL	LC	x									x			
A leafhopper	*Streptanus aemulans*	Cicadellidae	Hemiptera	Widespread	SL/TB	LC	x	x							x				
A leafhopper	*Streptanus sordidus*	Cicadellidae	Hemiptera	Widespread	JHM/TB		x								x				
Cryptic Leatherbug	*Bathysolen nubilus*	Coreidae	Hemiptera	Nationally Scarce	JHM	LC										x			
Slender-horned Leatherbug	*Ceraleptus lividus*	Coreidae	Hemiptera	Nationally Scarce	JHM	LC										x			
Denticulate Leatherbug	*Coriomeris denticulatus*	Coreidae	Hemiptera	Widespread	JHM	LC					x		x			x			
A planthopper	*Asiraca clavicornis*	Delphacidae	Hemiptera	Nationally Scarce	JHM/RWP	LC				x					x	x	x		
A planthopper	*Chloriona unicolor*	Delphacidae	Hemiptera	Widespread	TB	LC		x											
A planthopper	*Conomelus anceps*	Delphacidae	Hemiptera	Widespread	JHM/TB	LC	x										x	x	

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A planthopper	*Delphax pulchellus*	Delphacidae	Hemiptera	Local	JHM/TB	LC	x	x											
A planthopper	*Euides basilinea*	Delphacidae	Hemiptera	Local	JHM	LC	x	x											
A planthopper	*Euides speciosa*	Delphacidae	Hemiptera	Local	JHM	LC		x											
A planthopper	*Eurybregma nigrolineata*	Delphacidae	Hemiptera	Local	JHM	LC			x										
A planthopper	*Eurysa lineata*	Delphacidae	Hemiptera	Local	JHM	LC			x										
A planthopper	*Megamelus notula*	Delphacidae	Hemiptera	Local	JHM	LC											x	x	
A planthopper	*Prokelisia marginata*	Delphacidae	Hemiptera	Introduced invasive	JHM/TB	LC											x	x	
A pond skater	*Gerris odontogaster*	Gerridae	Hemiptera	Widespread	JHM	LC	x												
A ground bug	*Cymus melanocephalus*	Lygaeidae	Hemiptera	Widespread	JHM	LC	x										x		
A ground bug	*Drymus latus*	Lygaeidae	Hemiptera	Nationally Scarce	JHM	LC										x			
A ground bug	*Graptopeltus lynceus*	Lygaeidae	Hemiptera	Nationally Scarce	JHM	LC										x			
European Clinchbug	*Ischnodemus sabuleti*	Lygaeidae	Hemiptera	Widespread	JHM/RWP/SL	LC	x	x	x	x	x	x		x		x	x		
Birch Catkin Bug	*Kleidocerys resedae*	Lygaeidae	Hemiptera	Widespread	JHM	LC									x				
A Groundbug	*Megalonotus chiragra*	Lygaeidae	Hemiptera	Widespread	SL	LC			x										
A ground bug	*Metopoplax ditomoides*	Lygaeidae	Hemiptera	Recent UK colonist	JHM	NA									x				
A ground bug	*Nysius huttoni*	Lygaeidae	Hemiptera	Recent UK colonist	JHM/SL	NA			x		x		x		x	x			

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A ground bug	*Nysius senecionis*	Lygaeidae	Hemiptera	Widely scattered	TB	LC												x	
A groundbug	*Plinthisus brevipennis*	Lygaeidae	Hemiptera	Local	SL	LC										x			
A ground bug	*Scolopostethus thomsoni*	Lygaeidae	Hemiptera	Widespread	JHM	LC		x											
A ground bug	*Stygnocoris fuligineus*	Lygaeidae	Hemiptera	Widespread	JHM	LC							x	x					
A mirid bug	*Amblytylus nasutus*	Miridae	Hemiptera	Widespread	JHM	LC			x	x					x				
A mirid bug	*Apolygus lucorum*	Miridae	Hemiptera	Widespread	JHM	LC		x											
A mirid bug	*Capsus ater*	Miridae	Hemiptera	Widespread	JHM	LC			x	x			x		x				
A mirid bug	*Chlamydatus saltitans*	Miridae	Hemiptera	Widespread	JHM	LC									x				
A mirid bug	*Closterotomus norwegicus*	Miridae	Hemiptera	Widespread	JHM/SL	LC		x	x	x	x	x	x	x	x	x			
A mirid bug	*Dicyphus epilobii*	Miridae	Hemiptera	Widespread	JHM	LC		x											
A mirid bug	*Dicyphus stachydis*	Miridae	Hemiptera	Widespread	JHM	LC		x											
A mirid bug	*Globiceps fulvicollis cruciatus*	Miridae	Hemiptera	NS(Nb)	TB	LC										x			
A mirid bug	*Leptopterna dolabrata*	Miridae	Hemiptera	Widespread	JHM	LC			x						x				
A mirid bug	*Leptopterna ferrugata*	Miridae	Hemiptera	Local	JHM	LC			x										
A mirid bug	*Liocoris tripustulatus*	Miridae	Hemiptera	Widespread	JHM	LC		x											
A mirid bug	*Lopus decolor*	Miridae	Hemiptera	Widespread	JHM	LC										x			
A mirid bug	*Orthocephalus saltator*	Miridae	Hemiptera	Local	JHM	LC						x							
A mirid bug	*Orthonotus rufifrons*	Miridae	Hemiptera	Widely scattered	JHM	LC		x											

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A mirid bug	*Orthops kalmii*	Miridae	Hemiptera	Widespread	JHM	LC			x							x			
A mirid bug	*Orthotylus flavosparsus*	Miridae	Hemiptera	Widespread	TB	LC											x	x	
A mirid bug	*Pithanus maerkeli*	Miridae	Hemiptera	Widespread	JHM/RWP	LC	x		x	x					x				
A mirid bug	*Plagiognathus arbustorum*	Miridae	Hemiptera	Widespread	JHM	LC		x											
A mirid bug	*Plagiognathus chrysanthemi*	Miridae	Hemiptera	Widespread	JHM/SL	LC				x	x	x	x		x	x			
A mirid bug	*Polymerus nigrita*	Miridae	Hemiptera	Widely scattered	JHM	LC				x									
A grass bug	*Stenodema laevigata*	Miridae	Hemiptera	Widespread	JHM	LC	x	x	x		x				x			x	
A mirid bug	*Stenotus binotatus*	Miridae	Hemiptera	Widespread	JHM	LC		x		x				x	x				
A mirid bug	*Teratocoris antennatus*	Miridae	Hemiptera	Local	JHM/TB	LC	x										x		
A mirid bug	*Teratocoris saundersi*	Miridae	Hemiptera	Widely scattered	TB	LC											x	x	
Grey Damselbug	*Himacerus major*	Nabidae	Hemiptera	Widespread	JHM	LC	x	x	x	x						x	x	x	
Ant Damselbug	*Himacerus mirmicoides*	Nabidae	Hemiptera	Widespread	JHM/SL	LC				x	x	x		x	x	x	x		
Marsh Damselbug	*Nabis limbatus*	Nabidae	Hemiptera	Widespread	JHM	LC	x	x											
Common Damselbug	*Nabis rugosus*	Nabidae	Hemiptera	Widespread	JHM	LC		x				x							
Bishop's Mitre Shieldbug	*Aelia acuminata*	Pentatomidae	Hemiptera	Widespread	JHM	LC				x					x	x		x	
Hairy Shieldbug	*Dolycoris baccarum*	Pentatomidae	Hemiptera	Widespread	JHM/SL	LC		x				x				x			
Bordered Shieldbug	*Legnotus limbosus*	Pentatomidae	Hemiptera	Widespread	JHM	LC										x			
Turtle Shieldbug	*Podops inuncta*	Pentatomidae	Hemiptera	Widespread	JHM/SL	LC			x		x	x				x			

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
Sand-runner Shieldbug	*Sciocoris cursitans*	Pentatomidae	Hemiptera	Nationally Scarce	JHM	LC										x			
A beet bug	*Parapiesma quadratum*	Piesmatidae	Hemiptera	Widespread	JHM	LC											x	x	
A rhopalid bug	*Chorosoma schillingi*	Rhopalidae	Hemiptera	Local	JHM	LC					x					x			
A rhopalid bug	*Myrmus miriformis*	Rhopalidae	Hemiptera	Widespread	JHM	LC	x			x	x								
A shore bug	*Chartoscirta cincta*	Saldidae	Hemiptera	Widespread	JHM	LC	x												
A shore bug	*Saldula pallipes*	Saldidae	Hemiptera	Nationally Scarce	JHM	LC									x				
A shore bug	*Saldula palustris*	Saldidae	Hemiptera	Nationally Scarce	JHM	LC												x	
A shore bug	*Saldula saltatoria*	Saldidae	Hemiptera	Widespread	TB	LC		x											
Scarce Tortiose Shieldbug	*Eurygaster maura*	Scutelleridae	Hemiptera	Nationally Scarce	JHM	LC				x						x			
Tortoise Shieldbug	*Eurygaster testudinaria*	Scutelleridae	Hemiptera	Widespread	JHM	LC				x						x			
A lacebug	*Acalypta parvula*	Tingidae	Hemiptera	Widespread	JHM	LC			x										
A lacebug	*Agramma laetum*	Tingidae	Hemiptera	Local	JHM	LC	x										x		
A lacebug	*Kalama tricornis*	Tingidae	Hemiptera	Local	JHM/SL	LC			x		x	x	x	x		x			
A lacebug	*Tingis ampliata*	Tingidae	Hemiptera	Widespread	TB	LC		x											
A lace bug	*Tingis cardui*	Tingidae	Hemiptera	Widespread	JHM	LC					x								
A psyllid	*Trioza urticae*	Triozidae	Hemiptera (Psylloidea)	Widespread	TB	LC	x	x											
Gwynne's Mining Bee	*Andrena bicolor*	Andrenidae	Hymenoptera	Widespread	JHM	LC									x				

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
Large Gorse Mining Bee	*Andrena bimaculata*	Andrenidae	Hymenoptera	Nationally Scarce	JHM	LC						x				x			
Short-fringed Mining Bee	*Andrena dorsata*	Andrenidae	Hymenoptera	Widespread	RWP	LC			x		x								
Yellow-legged Mining Bee	*Andrena flavipes*	Andrenidae	Hymenoptera	Widespread	JHM	LC			x		x			x	x	x			
Bryony Mining Bee	*Andrena florea*	Andrenidae	Hymenoptera	RDB3 pre-1994 criteria	JHM				x										
Orange-tailed Mining Bee	*Andrena haemorrhoa*	Andrenidae	Hymenoptera	Widespread	RWP	LC							x						
Large Meadow Mining Bee	*Andrena labialis*	Andrenidae	Hymenoptera	Local	JHM/RWP	LC			x		x		x		x	x			
Common Mini-mining Bee	*Andrena minutula*	Andrenidae	Hymenoptera	Widespread	JHM/RWP	LC	x								x				
Buffish Mining Bee	*Andrena nigroaenea*	Andrenidae	Hymenoptera	Widespread	JHM	LC					x	x							
Scarce Black Mining Bee	*Andrena nigrospina*	Andrenidae	Hymenoptera		JHM						x	x							
Grey-patched Mining Bee	*Andrena nitida*	Andrenidae	Hymenoptera	Widespread	RWP	LC							x						
Carrot Mining Bee	*Andrena nitidiuscula?*	Andrenidae	Hymenoptera	RDB3 pre-1994 criteria	JHM											x			
Black Mining Bee	*Andrena pilipes*	Andrenidae	Hymenoptera	Nationally Scarce	JHM													x	
Broad-faced Mining Bee	*Andrena proxima*	Andrenidae	Hymenoptera	RDB3 pre-1994 criteria	RWP				x										
Wilke's Mining Bee	*Andrena wilkella*	Andrenidae	Hymenoptera	Widespread	JHM	LC									x				
Large Shaggy Bee	*Panurgus banksianus*	Andrenidae	Hymenoptera	Local	JHM		x												
Small Shaggy Bee	*Panurgus calcaratus*	Andrenidae	Hymenoptera	Local	RWP								x			x			
Green-eyed Flower Bee	*Anthophora bimaculata*	Apidae	Hymenoptera	Local	JHM/RWP				x	x			x					x	

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
Large Red-tailed Bumblebee	*Bombus lapidarius*	Apidae	Hymenoptera	Widespread	JHM	LC		x	x			x	x	x	x	x		x	
Red-shanked Carder Bee	*Bombus ruderarius*	Apidae	Hymenoptera	S41 Priority species	JHM	LC									x	x			
Blue Carpenter Bee	*Ceratina cyanea*	Apidae	Hymenoptera	RDB3 pre-1994 criteria	JHM/RWP	LC			x		x	x							
Red-thighed Epeolus	*Epeolus cruciger*	Apidae	Hymenoptera	Local	JHM	LC										x			
Small Nomad Bee	*Nomada flavoguttata*	Apidae	Hymenoptera	Widespread	JHM	LC												x	
Orange-horned Nomad Bee	*Nomada fulvicornis sbsp fulvicornis*	Apidae	Hymenoptera	RDB3 pre-1994 criteria	JHM													x	
Kirby's Nomad Bee	*Nomada subcornuta*	Apidae	Hymenoptera		JHM							x							
Wheat stem borer sawfly	*Cephus pygmeus*	Cephidae	Hymenoptera	Local	RWP			x											
A cuckoo wasp	*Hedychridium ardens*	Chrysidae	Hymenoptera	Local	JHM	LC						x				x			
A ruby-tailed wasp	*Hedychrum niemelai/nobile*	Chrysididae	Hymenoptera	RDB3 pre-1994 criteria	JHM											x			
A cuckoo wasp	*Trichrysis cyanea*	Chrysididae	Hymenoptera	Widespread	JHM											x			
A sawfly	*Abia fasciata*	Cimbicidae	Hymenoptera	Local	RWP			x											
Hairy-saddled Colletes	*Colletes fodiens*	Colletidae	Hymenoptera	Local	JHM	LC										x			
Bare-saddled Colletes	*Colletes similis*	Colletidae	Hymenoptera	Local	JHM/RWP	LC					x				x	x			
Spined Hylaeus	*Hylaeus cornutus*	Colletidae	Hymenoptera	Nationally Scarce	RWP	LC							x						
Little Yellow-faced Bee	*Hylaeus pictipes*	Colletidae	Hymenoptera	Nationally Scarce	RWP		x												

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
A solitary wasp	*Astata boops*	Crabronidae	Hymenoptera	Local	RWP								x		x				
Five-banded Weevil-wasp	*Cerceris quinquefasciata*	Crabronidae	Hymenoptera	Section 41 priority species; RDB3 (pre-1994 criteria)	JHM/RWP											x			
A solitary wasp	*Crossocerus podagricus*	Crabronidae	Hymenoptera	Widespread	RWP	LC										x			
A solitary wasp	*Diodontus minutus*	Crabronidae	Hymenoptera	Local	JHM	LC										x			
A solitary wasp	*Ectemnius cavifrons*	Crabronidae	Hymenoptera	Widespread	JHM/RWP	LC		x											
A solitary wasp	*Ectemnius continuus*	Crabronidae	Hymenoptera	Widespread	RWP	LC										x			
A solitary wasp	*Nysson dimidiatus*	Crabronidae	Hymenoptera	Nationally Scarce	JHM	LC	x												
A Solitary Wasp	*Oxybelus uniglumis*	Crabronidae	Hymenoptera	Widespread	RWP										x				
A solitary wasp	*Passaloecus clypealis*	Crabronidae	Hymenoptera	RDB3 pre-1994 criteria	JHM		x												
Beewolf	*Philanthus triangulum*	Crabronidae	Hymenoptera	Nationally Vulnerable (RDB2 pre-1994)	JHM/RWP	LC							x		x				
A solitary wasp	*Tachysphex pompiliformis*	Crabronidae	Hymenoptera	Local	JHM											x			
A solitary wasp	*Trypoxylon attenuatum*	Crabronidae	Hymenoptera	Widespread	JHM/RWP	LC	x	x								x			
A solitary wasp	*Trypoxylon clavicerum*	Crabronidae	Hymenoptera	Widespread	JHM	LC		x											
A solitary wasp	*Trypoxylon figulus*	Crabronidae	Hymenoptera	Local	JHM/RWP	LC	x				x								
Black-headed Mason Wasp	*Odynerus melanocephalus*	Eumenidae	Hymenoptera	Section 41 priority	RWP								x		x				

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
				species; Nationally Scarce															
A mason wasp	*Odynerus spinipes*	Eumenidae	Hymenoptera	Local	RWP				x	x					x				
A formicine ant	*Formica cunicularia*	Formicidae	Hymenoptera	Local	JHM/RWP	LC	x		x	x	x	x		x	x	x	x	x	
Yellow Meadow Ant	*Lasius flavus*	Formicidae	Hymenoptera	Widespread	JHM	LC			x		x				x	x			
A myrmicine ant	*Myrmica rubra*	Formicidae	Hymenoptera	Widespread	RWP		x	x		x						x			
A myrmicine ant	*Myrmica ruginodis*	Formicidae	Hymenoptera	Widespread	JHM	LC			x							x			
A myrmicine ant	*Myrmica sabuleti*	Formicidae	Hymenoptera	Widespread	JHM	LC			x		x					x			
A myrmicine ant	*Myrmica scabrinodis*	Formicidae	Hymenoptera	Widespread	JHM	LC	x		x		x				x	x			
A myrmicine ant	*Myrmica schencki*	Formicidae	Hymenoptera	Nationally Scarce	JHM	LC										x			
A myrmicine ant	*Tetramorium caespitum*	Formicidae	Hymenoptera	Local	JHM	LC			x										
Bronze Furrow Bee	*Halictus tumulorum*	Halictidae	Hymenoptera	Widespread	JHM	LC		x										x	
Bloomed Furrow Bee	*Lasioglossum albipes*	Halictidae	Hymenoptera	Widespread	JHM	LC		x							x				
Chalk Furrow Bee	*Lasioglossum fulvicorne*	Halictidae	Hymenoptera	Widespread	JHM	LC								x					
White-zoned Furrow Bee	*Lasioglossum leucozonium*	Halictidae	Hymenoptera	Local	JHM	LC					x	x	x		x			x	
Smooth-gastered Furrow Bee	*Lasioglossum parvulum*	Halictidae	Hymenoptera	Local	JHM	LC					x								
Squat Furrow Bee	*Lasioglossum pauperatum*	Halictidae	Hymenoptera	RDB3 pre-1994 criteria	JHM							x							
Lobe-spurred Furrow Bee	*Lasioglossum pauxillum*	Halictidae	Hymenoptera	Nationally Scarce	JHM/RWP	LC	x	x	x	x	x				x	x	x		

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
Bull-headed Furrow Bee	*Lasioglossum zonulum*	Halictidae	Hymenoptera	Local	RWP						x								
Swollen-thighed Blood Bee	*Sphecodes crassus*	Halictidae	Hymenoptera	Nationally Scarce	RWP	LC			x	x									
Bare-saddled Blood Bee	*Sphecodes ephippius*	Halictidae	Hymenoptera	Widespread	JHM	LC					x				x				
Dark-winged Blood Bee	*Sphecodes gibbus*	Halictidae	Hymenoptera	Widespread	RWP	LC												x	
Little Sickle-jawed Blood Bee	*Sphecodes longulus*	Halictidae	Hymenoptera	Nationally Scarce	JHM	LC						x							
Sickle-jawed Blood Bee	*Sphecodes puncticeps*	Halictidae	Hymenoptera	Widespread	JHM	LC					x							x	
Red-tailed Blood Bee	*Sphecodes rubicundus*	Halictidae	Hymenoptera	Nationally Scarce	JHM	LC					x				x				
Large Sharp-tailed Bee	*Coelioxys conoidea*	Megachilidae	Hymenoptera	Local	JHM/RWP	LC			x				x	x		x		x	
Rufescent Sharp-tailed Bee	*Coelioxys rufescens*	Megachilidae	Hymenoptera	Local	JHM	LC								x					
Silvery Leafcutter Bee	*Megachile leachella*	Megachilidae	Hymenoptera	Nationally Scarce	JHM/RWP	LC			x				x		x	x		x	
Coast Leafcutter Bee	*Megachile maritima*	Megachilidae	Hymenoptera	Local	JHM	LC										x			
Brown-footed Leafcutter Bee	*Megachile versicolor*	Megachilidae	Hymenoptera	Widespread	JHM	LC								x					
Willughby's Leafcutter Bee	*Megachile willughbiella*	Megachilidae	Hymenoptera	Widespread	RWP	LC			x										
Orange-vented Mason Bee	*Osmia leaiana*	Megachilidae	Hymenoptera	Widespread	RWP	LC										x			
Plain Dark Bee	*Stelis phaeoptera*	Megachilidae	Hymenoptera	pRDB2 pre-1994 criteria	JHM											x			
Clover Melitta	*Melitta leporina*	Melittidae	Hymenoptera	Local	JHM	LC										x			

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
Large Velvet Ant	*Mutilla europaea*	Mutillidae	Hymenoptera	Nationally Scarce	JHM	LC		x								x			
Small Velvet Ant	*Smicromyrme rufipes*	Mutillidae	Hymenoptera	Nationally Scarce	JHM	LC										x			
A spider-hunting wasp	*Agenioideus sericeus*	Pompilidae	Hymenoptera	Recent UK colonist	JHM											x			
A spider-hunting wasp	*Anoplius infuscatus*	Pompilidae	Hymenoptera	Local	JHM	LC						x							
A spider-hunting wasp	*Anoplius nigerrimus*	Pompilidae	Hymenoptera	Widespread	JHM	LC										x			
A spider-hunting wasp	*Arachnospila anceps*	Pompilidae	Hymenoptera	Widespread	JHM											x			
A Spider-hunting Wasp	*Arachnospila minutula*	Pompilidae	Hymenoptera	Local	JHM	LC										x			
A Spider-hunting Wasp	*Arachnospila spissa*	Pompilidae	Hymenoptera	Local	JHM/RWP	LC	x						x						
A spider-hunting wasp	*Auplopus carbonarius*	Pompilidae	Hymenoptera	Nationally Scarce	JHM	LC		x											
A spider-hunting wasp	*Episyron rufipes*	Pompilidae	Hymenoptera	Local	JHM	LC										x			
A spider-hunting wasp	*Evagetes crassicornis*	Pompilidae	Hymenoptera	Local	JHM	LC							x			x			
A spider-hunting wasp	*Evagetes pectinipes*	Pompilidae	Hymenoptera	RDB1 pre-1994 criteria	JHM											x			
A spider-hunting wasp	*Priocnemis confusor*	Pompilidae	Hymenoptera	Nationally Scarce	JHM											x			
A spider-hunting wasp	*Priocnemis parvula*	Pompilidae	Hymenoptera	Local	JHM						x	x				x			
Sand Digger Wasp	*Ammophila sabulosa*	Sphecidae	Hymenoptera	Widespread	JHM/RWP	LC					x		x		x	x			
A social wasp	*Dolichovespula sylvestris*	Vespidae	Hymenoptera	Widespread	RWP	LC										x			

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
German wasp	*Paravespula germanica*	Vespidae	Hymenoptera	Widespread	JHM	LC		x											
Common Wasp	*Paravespula vulgaris*	Vespidae	Hymenoptera	Widespread	JHM	LC		x											
Common Pill Woodlouse	*Armadillidium vulgare*	Armadillidiidae	Isopoda	Widespread	JHM/RWP/SL	LC			x		x	x	x		x	x			
Curly Woodlouse	*Cylisticus convexus*	Cylisticidae	Isopoda	Local	JHM	LC						x				x			
Common Striped Woodlouse	*Philoscia muscorum*	Philoscidae	Isopoda	Widespread	JHM	LC			x		x	x	x			x	x		
Common Rough Woodlouse	*Porcellio scaber*	Porcellionidae	Isopoda	Widespread	JHM	LC			x							x	x		
Cream-spot Tiger	*Arctia villica*	Erebidae	Lepidoptera	Local	JHM	LC					x								
Burnet Companion	*Euclidia glyphica*	Erebidae	Lepidoptera	Widespread	JHM	LC			x		x				x				
Cinnabar	*Tyria jacobaeae*	Erebidae	Lepidoptera	S41 research only	JHM	LC	x		x						x	x			
Latticed Heath	*Chiasmia clathrata*	Geometridae	Lepidoptera	Widespread	JHM	LC			x										
Large Skipper	*Ochlodes sylvanus*	Hesperiidae	Lepidoptera	Widespread	JHM	LC			x				x			x			
Essex Skipper	*Thymelicus lineola*	Hesperiidae	Lepidoptera	Widespread	JHM	LC									x				
Brown Argus	*Aricia agestis*	Lycaenidae	Lepidoptera	Widespread	JHM	LC										x			
Small Copper	*Lycaena phlaeas*	Lycaenidae	Lepidoptera	Widespread	JHM	LC										x			
Common Blue	*Polyommatus icarus*	Lycaenidae	Lepidoptera	Widespread	JHM	LC			x		x		x	x	x	x			
Puss Moth	*Cerura vinula*	Notodontidae	Lepidoptera	Widespread	JHM	LC										x			
Small Tortoiseshell	*Aglais urticae*	Nymphalidae	Lepidoptera	Widespread	JHM	LC			x		x				x				
Ringlet	*Aphantopus hyperantus*	Nymphalidae	Lepidoptera	Widespread	JHM	LC	x												

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
Small Heath	*Coenonympha pamphilus*	Nymphalidae	Lepidoptera	S41 Priority species	JHM	NT		x	x		x		x		x	x			
Peacock	*Inachis io*	Nymphalidae	Lepidoptera	Widespread	JHM	LC		x	x		x	x							
Wall	*Lasiommata megera*	Nymphalidae	Lepidoptera	S41 Priority species	JHM	NT										x	x	x	
Meadow Brown	*Maniola jurtina*	Nymphalidae	Lepidoptera	Widespread	JHM	LC			x		x				x				
Marbled White	*Melanargia galathea*	Nymphalidae	Lepidoptera	Widespread	JHM	LC	x		x	x					x	x			
Speckled Wood	*Pararge aegeria*	Nymphalidae	Lepidoptera	Widespread	JHM	LC	x												
Comma	*Polygonia c-album*	Nymphalidae	Lepidoptera	Widespread	JHM	LC			x									x	
Gatekeeper	*Pyronia tithonus*	Nymphalidae	Lepidoptera	Widespread	JHM	LC										x			
Painted Lady	*Vanessa cardui*	Nymphalidae	Lepidoptera	Regular migrant	JHM	LC									x				
Green-veined White	*Pieris napi*	Pieridae	Lepidoptera	Widespread	JHM	LC										x			
Six-belted Clearwing	*Bembecia ichneumoniformis*	Sesiidae	Lepidoptera	Local	JHM/RWP	LC					x								
Hummingbird Hawkmoth	*Macroglossum stellatarum*	Sphingidae	Lepidoptera	Migrant	JHM	LC								x					
Six-spot Burnet Moth	*Zygaena filipendulae*	Zygaenidae	Lepidoptera	Widespread	JHM	LC				x						x			
Five-spot Burnet Moth	*Zygaena trifolii*	Zygaenidae	Lepidoptera	Widespread	JHM	LC									x				
A centipede	*Lithobius forficatus*	Lithobiidae	Lithobiomorpha	Widespread	JHM				x		x					x			
Brown Hawker	*Aeshna grandis*	Aeshnidae	Odonata	Widespread	JHM	LC	x	x											
Azure Damselfly	*Coenagrion puella*	Coenagrionidae	Odonata	Widespread	JHM	LC	x		x										
Common Blue-tailed Damselfly	*Ischnura elegans*	Coenagrionidae	Odonata	Widespread	JHM	LC	x				x	x				x	x		

Common name	*Scientific name*	Family	Order/higher taxon	UK status	Identified by	IUCN post-2001 threat status	A1	A6	B	C1	C2	C3	C4	C5	D	U1	U2	U3	U4
Scarce Chaser	*Libellula fulva*	Libellulidae	Odonata	Local	JHM	NT	x												
Black-tailed Skimmer	*Orthetrum cancellatum*	Libellulidae	Odonata	Widespread	JHM	LC	x	x											
Ruddy Darter	*Sympetrum sanguineum*	Libellulidae	Odonata	Local	JHM	LC										x			
Common Darter	*Sympetrum striolatum*	Libellulidae	Odonata	Widespread	JHM	LC	x									x	x		
A harvestman	*Nemastoma bimaculatum*	Nemastomatidae	Opiliones	Widespread	JHM	LC										x			
A harvestman	*Leiobunum rotundum*	Phalangiidae	Opiliones	Widespread	JHM	LC	x									x			
A harvestman	*Mitopus morio*	Phalangiidae	Opiliones	Widespread	JHM	LC	x												
A harvestman	*Paroligolophus agrestis*	Phalangiidae	Opiliones	Widespread	JHM	LC		x											
A harvestman	*Phalangium opilio*	Phalangiidae	Opiliones	Widespread	JHM	LC			x		x	x	x	x	x	x		x	
A harvestman	*Platybunus triangularis*	Phalangiidae	Opiliones	Widespread	JHM	LC			x	x	x		x		x	x			
Field Grasshopper	*Chorthippus brunneus*	Acrididae	Orthoptera	Widespread	JHM	LC			x	x	x		x	x	x	x			
Meadow Grasshopper	*Chorthippus parallelus*	Acrididae	Orthoptera	Widespread	JHM	LC	x		x	x	x		x	x	x	x			
Common Green Grasshopper	*Omocestus viridulus*	Acrididae	Orthoptera	Widespread	JHM	LC			x										
Speckled Bush Cricket	*Leptophyes punctatissima*	Phaneropteridae	Orthoptera	Widespread	JHM	LC			x	x									
Slender Groundhopper	*Tetrix subulata*	Tetrigidae	Orthoptera	Widespread	JHM	LC							x						
Common Groundhopper	*Tetrix undulata*	Tetrigidae	Orthoptera	Widespread	JHM	LC										x			
Dark Bush Cricket	*Pholidoptera griseoaptera*	Tettigoniidae	Orthoptera	Widespread	JHM	LC		x											
Great Green Bush-cricket	*Tettigonia viridissima*	Tettigoniidae	Orthoptera	Local	JHM	LC										x			
A psocid	*Propsocus pulchripennis*	Elipsocidae	Psocoptera		TB										x		x	x	

Table 3 - species of recognised conservation status in the UK recorded during the 2022 survey. Cells blank where UK status and IUCN post-2001 threat status not available.

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
Scarce Black Mining Bee	*Andrena nigrospina*	Andrenidae	Hymenoptera			C2,C3	Open habitats - Short sward and bare ground	Scarce Black Mining Bee *Andrena nigrospina* is the rarer of two very similar species of black *Andrena* both of which were recorded during the survey. Whilst *A. nigrospina* is strongly associated with the same brownfield habitats as *A. pilipes* within the Thames Gateway, the species occurs in widely scattered populations, both inland around Surrey, Staffordshire, and Worcestershire and on the coast. There are a number of recent records along the south Essex coast and the bee has been recorded within and around the general 2022 survey area. *A nigrospina* generally nests in sandy habitats (Pulverised Fuel Ash in Essex sites), using both vertical cliffs (as *A. pilipes*) and flat ground. Unlike *A. pilipes, A. nigrospina* is single brooded, occuring from May to mid-July. The insect forages predominately on crucifers. During the 2022 survey, *A. nigrospina* was recorded from pitfall trap samples set and collected during mid-June within OMH in compartments C2 and C3. *Nomada subcornuta,* a known cleptoparasite of *A. nigrospina* was also recorded from compartment C2.
Kirby's Nomad Bee	*Nomada subcornuta*	Apidae	Hymenoptera			C3	Open habitats - Short sward and bare ground	Else and Edwards (2018) stated that Kirby's Nomad Bee *Nomada subcornuta* 'is part of the *Nomada fulvicornis* species-group, which comprises several sibling species throughout Europe' and that Falk (2004) 'concludes that it should be considered to be a biological form of *N. fulvicornis* Fabricius, apparently associated with a single host, the rare *Andrena nigrospina* Thomson. However, Else and Edwards (2018) continue to state that 'Recent genetic analysis strongly suggests it represents a distinct species'. In the UK, *N. subcornuta* is known from scattered records from southern England, north to Staffordshire. According to Falk and Lewington (2015) *N. subcornuta* is a much-declined species and modern records are confined to a few sites in Worcestershire, Staffordshire, Essex and Jersey. The bee is confined to habitats supporting the host *A. nigrospina*, which was also recorded during the 2022 survey. Falk and Lewington (2015) describe the habitat as being 'sandy habitats such as heathland, sandy arable margins and brownfield sites; also soft-rock cliffs in Jersey, but rarely at coastal sites on the mainland.' During the 2022 survey *N. subcornuta* was recorded from a female specimen obtained from a single pitfall cluster located in an area of OMH with partially vegetated bare ground in compartment C3. Several female specimens of the host species *Andrena nigrospina* were recorded from the sample sample.
A flea beetle	*Neocrepidodera impressa*	Chrysomelidae	Coleoptera	Nationally Rare	LC	U2,U3,U4	Coastal - Saltmarsh	*Neocrepidodera impressa* is a species of flea beetle associated exclusively with coastal biotopes, where the insect is associated primarily with saltmarsh habitat. The beetle was described as being in decline in a status review by Hubble (2014) and afforded the rarity status Nationally Rare with a threat status of Least Concern. In the UK, *N. impressa* has been recorded northwards as far as the north Norfolk coast, with widely scattered coastal records further south in East Anglia, from the south and southwest coasts of England and south Wales. In Essex, there are a handful of recent records from coastal areas within close proximity of the 2022 survey area; however, the insect is not widely recorded in the county. Hyman and Parsons (1992) describe the species under the former name of *Crepidodera impressa*, as being 'Associated with Common Sea-lavender *Limonium vulgare*', on saltmarshes. During the 2022 survey, *N. impressa* was recorded from all three SSSI saltmarsh Units. The beetle's host plant occurred in all three compartments but was often localised in extent.

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
A malachite beetle	*Cerapheles terminatus*	Malachiidae	Coleoptera	Nationally Rare	LC	A1, A6, C2	Wetland; Acid & sedge peats; Reedfen and pools	*Cerapheles terminatus* is an extremely rare species of Malachite Beetle. In the UK, it is restricted to just a few sites, with strongholds at Wicken Fen and Chippenham Fen in Cambridgeshire, at several sites in the Norfolk Broads area, and at Stodmarsh National Nature Reserve in east Kent. There are also records from the Swansea area in south Wales, Brownsea Island in Dorset. There are post-1990 records of *C. terminatus* in south Essex within close proximity to the 2022 records. Duff (2020) states that this species is usually found 'on flowers in meadows and fens' and Hyman and Parsons (1992) cite 'Fens, saltmarshes and other wetland habitats'. During the 2022 survey, *C. terminatus* was recorded from samples collected from reed-fen & pools in both Area A1 and A6.
A clubionid spider	*Clubiona juvenis*	Clubionidae	Araneae	Nationally Rare	NT	A1	Wetland; Acid & sedge peats	*Clubiona juvenis* is a rare spider in the UK, currently known from only 10 locations in the UK (Harvey *et al,* 2017), with known populations around Poole Harbour, Dorset as well as in East Anglia and the Thames corridor, where it occurs both to the north of the estuary in Essex and in Kent to the south. In Essex it has been recorded both in the Canvey Island area and in the vicinity of the A1 location within which it was recorded during the 2022 survey. Harvey *et al* (2002) cite both brackish and freshwater reedbeds as being the main habitat for the species stating that 'In Essex females were taken from silken retreats in reedheads in an area of wet grass and reeds'. During the 2022 survey, a single adult male spider was obtained from a vacuum sample at the margin of a Common Reed *Phragmites australis* reed-fen & pools and rough grassland. The presence of Sea *Clubrush Bolboschoenus maritimus* within the habitat in this location, possibly indicates some brackish element in this habitat, although this was not mentioned in Harvey *et al* (2002).
A ground beetle	*Scybalicus oblongiusculus*	Carabidae	Coleoptera	Nationally Rare	Vu	U1	Open habitats - Short sward and bare ground	*Scybalicus oblongiusculus* is a nationally rare species of ground beetle, with a threat status of 'Vulnerable' under post-2001 IUCN criteria. In the UK, the beetle was first discovered near Portland, Dorset in 1878. After being considered 'extinct' in Shirt (1987), the beetle was rediscovered in 1998 when a specimen was found in Surrey. In 2000, a specimen was collected from Ebbsfleet, Kent (close to the current survey area) and it was subsequently recorded from east Essex and other sites in the area (Telfer, 2016). Despite earlier conjecture that *S. oblongiusculus* was introduced to the UK, the species is now considered to be native (Telfer, 2016). Recorded habitat for the beetle include grassland in well-drained conditions with plentiful insolation and it is considered to favour early successional conditions such as those found in brownfield sites. Several specimens of *S. oblongiusculus* have been recorded from around the bases of Fennel *Foeniculum vulgare* and it has been conjectured that the beetle may feed on the seeds of this plant (Telfer, 2016). During the 2022 survey, *S. oblongiusculus* was recorded from 8 of 14 pitfall samples collected from the SSSI Unit 1, in both short, dry, sandy grassland and in longer sward grassland with patches of *Phragmites australis*. According to Telfer (2016), the species is considered to have an elevated vulnerability to local and regional extinction in the UK.
A water scavenger beetle	*Berosus fulvus*	Hydrophilidae	Coleoptera	Nationally Rare	Vu	D	Coastal - Saltmarsh	*Berosus fulvus* is a Nationally Rare species of water scavenger beetle currently with a threat status of Vulnerable in the UK. The species is more or less exclusively coastal, and records are restricted to the coasts of East Anglia and with sporadic records along the Channel coast from Kent, as far west as Portland, Dorset. In Essex, the species has been recorded from Canvey Island and from coastal locations further east. Foster *et al* (2014) state that 'This species is confined to shallow water in tidal areas'. During the 2022 survey, *B. fulvus* was recorded from direct searching habitat close to the landward side of the sea wall in compartment D. The precise location of the capture was unrecorded,

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
								though it is likely that the specimen came from the margins of brackish ditches/lagoons which run parallel to the sea wall.
A clubionid spider	*Cheiracanthium virescens*	Clubionidae	Araneae	Nationally Scarce	LC	U1	Open habitats - Short sward and bare ground - Bare sand and chalk	*Cheiracanthium virescens* has a UK stronghold in the Thames Gateway area, with a number of records from sites on both Essex and Kent sides of the Thames. The species is, however, uncommon or absent in many parts of the UK. Harvey *et al.* (2002) describes the habitat for this spider as being 'under stones or low vegetation such as heather, in dry, sandy or sparsely-vegetated habitats such as heathland, waste-ground and dunes'. *C. virescens* remains in a silk cell during the day, being active at night. However, during the 2022 survey, *C. virescens* was recorded only from a single sweep sample collected from the SSSI Unit 1 survey area. The habitat was sandy, short-sward dry coastal g/l, with bare ground patches.
A gnaphosid spider	*Drassodes pubescens*	Gnaphosidae	Araneae	Nationally Scarce	LC	B,C2,C3,U1	Open habitats - Tall sward and scrub	*Drassodes pubescens* is a scarce gnaphosid spider. Whilst the spider has been recorded from widely scattered inland and coastal sites throughout the UK, the majority of records are from southern England. The spider has been recorded from several locations on the Kent and Essex sides of the Thames estuary. The spider is associated with grassland and heathland habitats, occurring at the bases of tussocks and under stones etc. During the 2022 survey, *D. pubescens* was recorded mainly from dry, sparsely vegetated OMH from pitfall samples collected in Areas C2 and C3, but also from more established coastal grassland in Area B and SSSI Unit 1. The much commoner species *Drassodes cupreus* and *D. lapidosus* were also frequently found within the pitfall samples.
A hahnid spider	*Hahnia pusilla*	Hahniidae	Araneae	Nationally Scarce	LC	U1	Open habitats - Tall sward and scrub	*Hahnia pusilla* is a scarce spider in the UK; however, records are widely scattered throughout much of England, Wales, and the southern half of Scotland. The majority of the records are from southeast England and in Essex, there are scattered coastal and inland records, the closest to the 2022 survey area being around Canvey Island. Harvey *et al* (2002) refer to the sheet webs of the spider which can be found in low vegetation 'in leaf litter and under stones, usually in sites with high humidity'. This statement more or less reflects the species habitat description in Roberts (1995). During the 2022 survey the spider was recorded only from a pitfall trap cluster located in dry, sandy, short-sward coastal grassland with bare ground patches in SSSI Unit 1. However, the Unit 1 site has a variable geology, with free-drained areas occurring in mosaic with patches of wetland habitat including damp grassland reed-fen & pools.
A lycosid spider	*Alopecosa cuneata*	Lycosidae	Araneae	Nationally Scarce	LC	B,U1	Open habitats - Short sward and bare ground - Bare sand and chalk	*Alopecosa cuneata* is a locally distributed species of wolf spider (Lycosidae) which has a mainly southern distribution in the UK, occurring both inland and on the coast. The species has been well recorded from both Kent and Essex sides of the Thames and there are historic records from within close proximity to the 2022 survey area. According to Harvey *et al* (2002), the spider is associated mainly with chalk grassland and coastal dune habitats. In 2022, *A. cuneata* was recorded from dry coastal grassland in Area B and SSSI Unit 1.

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
A lycosid spider	*Pardosa agrestis*	Lycosidae	Araneae	Nationally Scarce	LC	B,C2,C3,C4	Open habitats - Short sward and bare ground - Bare sand and chalk	*Pardosa agrestis* is a species of wolf spider which is often scarcely distinguishable from the closely related and slightly more common *P. purbeckensis.* In fact, there is some disagreement as to whether *P. purbeckensis* is a separate species, or merely a variety of *P. agrestis.* The current determinator of presence of *P. agrestis* is habitat; *P. purbeckensis* being restricted to saltmarsh and other intertidal habitats, whilst *P. agrestis* occurs in a variety of habitats including, according to Bee *et al* (2017), 'predominately on thinly vegetated substrates and in clay pits and chalk pits, but also on dry banks above saltmarshes and flood-plain meadows.' For the purpose of the current survey, spiders conforming to *P. agrestis* were found in the dry grassland and OMH habitat beyond tidal influence were taken to be that species, whilst those evidently found within the tidal zones of saltmarsh were taken to be *P. purbeckensis.* *P. agrestis* has a widely scattered UK distribution, with both coastal and inland records reaching towards the north of Scotland. The spider is, however, most strongly recorded in southeast England, where there is a concentration of records around the Thames corridor. In Essex, there are numerous records from coastal grassland and OMH sites and post-1990 *P. agrestis* has been well-recorded in the area of the 2022 survey area. During the 2022 survey, the spider was abundant in coastal grassland in compartment B, as well as in both grassland and partially vegetated habitat in compartments C2, C3 and C4.
A running crab spider	*Thanatus striatus*	Philodromidae	Araneae	Nationally Scarce	LC	C5, U1,U2,U3,U4	Open habitats - Tall sward and scrub	*Thanatus striatus* is a scarce species of crab spider which has a recorded stronghold in Essex. Harvey *et al.* (2002) states that '*T. striatus* occurs on the ground at the base of vegetation in sandy grassland, heathland and dunes but also in tussocky grassland on sea walls, in brackish grassland, saltmarsh, dyke edges, waste ground and old sand pits.' During the 2022 survey, the spider was recorded from the three saltmarsh SSSI Units 2,3 and 4 as well as from coastal grassland and OMH in SSSI Unit 1 and C5, respectively.
A jumping spider	*Sibianor aurocinctus*	Salticidae	Araneae	Nationally Scarce	LC	C2,U2,U3,U4	Open habitats; Short sward and bare ground; Bare sand and chalk	*Sibianor aurocinctus* is a rare jumping spider which is more or less restricted to the south-east of England, where it is commonest in the Thames Corridor area (Bee *et al,* 2017). The spider has been historically recorded from a number of locations in and around the general 2022 survey area. *S. aurocinctus* has no clear recorded habitat affinity other than being associated with dry, sparsely vegetated habitats including heathland, chalk grasslands and brownfield sites. During the 2022 survey, the spider was recorded from OMH in Area C2, but was recorded from all three saltmarsh Units of the North Thames SSSI, where it was most frequently recorded from upper saltmarsh.
A comb-footed spider	*Enoplognatha mordax*	Theridiidae	Araneae	Nationally Scarce	LC	B,C2,C4,D,U2,U3,U4	Coastal - saltmarsh - Saltmarsh and transitional brackish marsh	*Enoplognatha mordax* is a scarce species of comb-footed spider (Theridiidae) which is confined to scattered coastal sites, around the southern half of the UK. The spider is relatively well represented within the Thames corridor, with records on both Kent and Essex sites of the estuary. There are records of *E. mordax* from in and around the 2022 survey area. According to Harvey *et al* (2002), the spider is associated with saltmarshes, occurring amongst strandline litter and vegetation on the upper saltmarsh areas. During the 2022 survey, *E. mordax* was well recorded, from OMH and coastal grassland in Areas B,C2,C4 and D and occurred in all three saltmarsh compartments of the North Thames Marshes SSSI.

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
A comb-footed spider	*Kochiura aulica*	Theridiidae	Araneae	Nationally Scarce	LC	C1,C5	Open habitats; Tall sward and scrub; F003 Scrub heath and moorland	According to Harvey *et al*. (2002) *Kochiura aulica* is restricted mainly to lowland heathland and a few grassland sites in southern England. Whilst the spider is mainly a heathland species, it also occurs in post-industrial habitats in conditions which structurally and climatically resemble heathland and in particular where Gorse *Ulex europaeus* occurs. There are a number of historic records of the spider both from within close proximity of the 2022 survey area in Essex and from similar habitat in north Kent. *K. aulica* records from the 2022 survey were from established grassland adjacent to the sea wall in C1 and from partially vegetated OMH in C5.
A zodariid spider	*Zodarion italicum*	Zodariidae	Araneae	Nationally Scarce	LC	C2,C4,U1	Open habitats - Short sward and bare ground	*Zodarion italicum* is a scarce spider which is also listed as 'Regionally important' in the Essex RDB. In the UK the spider is largely restricted to the Thames corridor area and is particularly well represented on either side of the Thames estuary in south Essex and north Kent. According to Harvey *et al* (2002) *Z. italicum* benefits from the unique climate of the east Thames corridor, due to the 'low rainfall, high summer temperatures and mild winters'. The spider is associated with 'dry, warm, sunny open habitats containing a proportion of bare ground' (Harvey *et al,* 2002). During the 2022 survey, *Z. italicum* was frequently recorded from pitfall samples collected from the sparsely-vegetated coastal grassland habitat of SSSI Unit 1 and from OMH habitat in Areas C2 and C4.
An anthicid beetle	*Cordicollis instabilis*	Anthicidae	Coleoptera	Nationally Scarce	LC	C2,C4,U3	Coastal - Sandy beach	*Cordicollis instabilis* is a scarce species of anthicid beetle which is confined to coastal sites in the UK, occurring sporadically around the English and Welsh coasts in the southern half of the UK. The highest concentration of records is from the Thames corridor area, the beetle having been recorded both in north Kent and in south Essex, where it has been recorded in close proximity to the survey area. *C. instabilis* is associated primarily with saltmarsh habitat, but also occurs on sandy shores and under beach strandline debris. During the 2022 survey, the beetle was recorded both from partially vegetated OMH in Areas C2 and C4 and from SSSI Unit 3, where it was collected from upper to mid saltmarsh habitat forming over a concrete sea defence platform.
An ant beetle	*Cyclodinus constrictus*	Anthicidae	Coleoptera	Nationally Scarce	LC	D,U2	Coastal - Saltmarsh - Saltmarsh and transitional brackish marsh	*Cyclodinus constrictus* is a species of ant-like flower beetle associated with sandy habitats and records are mainly from coastal areas in southeast England and East Anglia. There are several records from north Kent and south Essex including recent records from in and around the 2022 survey area. During the 2022 survey, *C.constrictus* was recorded both from sparsely-vegetated OMH, close to the sea wall, in Area D and from upper and mid saltmarsh in SSSI Unit 2.
An apionid weevil	*Protapion difforme*	Apionidae	Coleoptera	Nationally Scarce	LC	D,U1	Open habitats; Tall sward and scrub	*Protapion difforme* is one of a number of species of the genus recorded during the survey. The species is largely confined to the southern half of the UK, and it is arguably most frequently recorded from the southeast. The beetle has been recorded from several locations in close proximity to the 2022 survey area. *P. difforme* has been associated in some localities with knotgrass P*olygonum* spp.; however, Hyman and Parsons (1992) suggest that it may be more closely associated with clovers *Trifolium* spp. *P. difforme* is associated with habitats including, according to Hyman and Parsons (1992) 'Damp grassland, wetland, disturbed ground, hedge banks and along ditches'. During the survey, the weevil was recorded from established grassland landward of the sea wall in Area D and from dry, short sward grassland/grass heath in SSSI Unit 1.

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
An apionid weevil	*Protapion filirostre*	Apionidae	Coleoptera	Nationally Scarce	LC	C2	Open habitats - Short sward and bare ground - Open short sward	In Hyman and Parsons (1992), *Protapion filirostre,* one of a number of Apionid weevils recorded during the survey, is described as favouring grassland, field margin, disturbed ground and quarry habitats; the species occurring particularly on calcareous sites with thin, sparsely-vegetated soils. Duff (2016) associates the species with brownfield habitats. In the UK it is associated with Black Medick *Medicago lupulina* (Lucerne *M. sativa* in Europe). The insect has a largely central and southern distribution in the UK, with the greatest number of records being in the east. There are a number of historic records from the Thames corridor, mainly from the south of the Thames in north Kent. However, there is an existing record from the general survey area, as well as from a few kilometres east at Canvey Island. During the survey, *P. filirostre* was recorded only from herb rich OMH/grassland habitat in Area C2. 6a and inland at the Former Landfill site (Area 13). Both Black Medick and naturalised Lucerne *Medicago sativa* are well represented within the survey areas.
A ground beetle	*Agonum nigrum*	Carabidae	Coleoptera	Nationally Scarce	LC	A6	Wetland; Acid & sedge peats; Reedfen and pools	*Agonum nigrum* is an uncommon species of ground beetle with a mainly coastal distribution in the UK. The beetle has been recorded from the southeast, southwest, and southern coasts of England and around the Welsh coasts, with some inland records and with relatively fewer records in northern England and Scotland. The beetle is not well recorded in Essex, although there is a post 1990 record from saltmarsh habitat around Rainham Marshes. Luff (2007) described the habitat of *A. nigrum* as 'In vegetated marshes, usually coastal' and the beetle is associated with lush vegetation with sedges, grasses and reeds on soft soil and mud, as well as under strandline seaweed. During the 2022 survey, the beetle was recorded from compartment A6, where it was recorded from a vacuum sample collected within the interior of a Common Reed *Phragmites australis* reed-fen & pools.
A ground beetle	*Amara curta*	Carabidae	Coleoptera	Nationally Scarce	LC	U1	Open habitats - Short sward and bare ground - Bare sand and chalk	*Amara curta* is a scarce species of ground beetle which has been recorded from widely scattered locations in the UK, as far north as the west coast of Scotland. However, the majority of records are from central, southern England. The species has been sparsely recorded in Essex, with records around Ilford and Hackney, north of the Thames. According to Luff (2008), the favoured habitats of *A. curta* include 'dry grasslands, heath and dunes'. During the 2022 survey, *A. curta* was recorded only from SSSI Unit 1, where it was recorded from pitfall samples collected from sparsely vegetated, short, dry grassland.
A ground beetle	*Amara montivaga*	Carabidae	Coleoptera	Nationally Scarce	LC	C2	Open habitats - Short sward and bare ground - Bare sand and chalk	*Amara montivaga* is a species of ground beetle recorded mainly from southeast and central England. There are records within the Thames corridor, both in south Essex and north Kent. There are recent records within or in close proximity of the 2022 survey area. According to Luff (2007), the beetle is found 'open, sandy or chalky sites with ruderal vegetation'. In a review of the conservation status of UK Carabidae by Telfer (2016), *A. montivaga* was classed as Nationally Scarce in the UK. During the 2022 survey, the beetle was recorded from a pitfall sample situated within OMH on vegetated chalk ballast banks in Area C2.
A ground beetle	*Bembidion fumigatum*	Carabidae	Coleoptera	Nationally Scarce	LC	U1	Wetland - Marshland	*Bembidion fumigatum* is a scarce species of ground beetle, which occurs mainly in the southern half of the UK. There are several records within the Thames corridor, both in north Kent and south Essex and there are records within the general 2022 survey area. According to Hyman and Parsons (1992), *B. fumigatum* occurs 'On well vegetated margins of ponds, ditches in fens and other inland situations' but is also found 'on the banks of estuaries and on the coast'. Hyman and Parsons (1992) also state that the beetle is 'Found amongst wet debris in fens, reed and sedge litter and marsh vegetation. During

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
								the 2022 survey, the beetle was recorded from three pitfall clusters located in Unit 1 of the North Thames Marshes SSSI. Two sets of traps were situated in damp, brackish *Phragmites austalis* and *Bolboschoenus maritimus* swamp developing over grassland; the third was from drier grassland habitat colonising an area of sandy silt estuarine dredgings.
A ground beetle	*Bembidion normannum*	Carabidae	Coleoptera	Nationally Scarce	LC	U2,U3	Coastal - saltmarsh - Saltmarsh and transitional brackish marsh	In the UK, *Bembidion normannum* is mainly a coastal species of ground beetle, with scattered records from throughout the English and Welsh coasts. The majority of records of the beetle are from the southeast; the Thames gateway in particular and there are records from both sides of the Estuary in south Essex and north Kent. According to Luff (2007), *B. normannum* occurs in 'tidal litter and saltmarshes' and during the survey, the insect was recorded from coastal saltmarsh habitat within SSSI Units 2 and 3.
Bombadier beetle	*Brachinus crepitans*	Carabidae	Coleoptera	Nationally Scarce	LC	C3,C4,U1	Open habitats - Short sward and bare ground - Bare sand and chalk	The Bombardier Beetle *Brachinus crepitans* is the commoner of two British species of the genus *Brachinus* occurring in the UK. The species is, however, uncommon and of local distribution in the UK, and is mainly restricted to the south. In the Thames corridor, the Bombardier Beetle is well represented and locally common and there are numerous recent records from in and around the 2022 survey area. According to Hyman and Parsons (1991), *B. crepitans* occurs in 'Grassland and open country, on calcareous soils, chalk and limestone quarries, the margins of arable fields on limestone, clay brick-pits, undercliffs, sea walls, and stabilised shingle on the coast'. During the 2022 survey, Bombardier Beetle was recorded from OMH in Areas C3 and C4 and from dry, coastal grassland in Unit 1 of the North Thames Marshes SSSI.
A ground beetle	*Harpalus attenuatus*	Carabidae	Coleoptera	Nationally Scarce	LC	C2,U1	Open habitats - Short sward and bare ground - Bare sand and chalk	*Harpalus attenuatus* is listed as Nationally Scarce in Telfer (2016) but does not appear in Hyman and Parsons (1992). The insect has a largely coastal distribution in the southern half of the UK and there is a concentration of historic records both to the north and south of the Thames within the Thames Gateway area. Luff (2007) describes the insect as occurring 'On dunes and dry, sandy soils'. During the 2022 survey, the beetle was recorded from OMH in Area C2 and from dry grassland in Unit 1 of the North Thames Marshes SSSI.
A ground beetle	*Harpalus serripes*	Carabidae	Coleoptera	Nationally Scarce	LC	B	Open habitats - Short sward and bare ground - Bare sand and chalk	*Harpalus serripes* is an uncommon species of ground beetle with a mainly coastal distribution in the UK. The beetle has been recorded from scattered coastal locations in southeast, southwest and southern coasts of England and from the coast of south Wales, with isolated with inland aggregations of records from East Anglia. The beetle has a compact recorded distribution in Essex, where it has been recorded only from sites in close proximity of the 2022 survey area. Luff (2007) described the habitat of *H. serripes* as 'On sandy or gravelly soils, usually coastal, but also inland in sand and gravel pits'. All three 2022 records of *H. serripes* were from pitfall samples located in compartment B. Two of the clusters were located in short-sward, flower-rich grassland; the third was in seasonally dried out wet grassland.
A ground beetle	*Ophonus azureus*	Carabidae	Coleoptera	Nationally Scarce	LC	B,U1	Open habitats; Short sward and bare ground;	*Ophonus azureus* is a distinctive species of ground beetle, which was listed as both Nationally Scarce and within the Amber List in a review by Telfer (2016). The beetle is relatively widely distributed in the southern half of the UK, the beetle being fairly well recorded along the south coast of England and there are a number of recent records within and around the 2022 south Essex survey area. According

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
							Bare sand and chalk	to Luff (2007), *O. azureus* is found in both 'open coastal sites' and inland 'on warm chalk or limestone slopes'. During the 2022 survey, the beetle was recorded from dry grassland habitat within Area B and in Unit 1 of the North Thames Marshes SSSI.
A ground beetle	*Panagaeus bipustulatus*	Carabidae	Coleoptera	Nationally Scarce	LC	C2,U1	Open habitats - Short sward and bare ground - Bare sand and chalk	*Panagaeus bipustulatus* is a medium-sized black carabid beetle with striking red spots on the elytra. The beetle is more or less confined to the south in the UK, with the majority of records being from the east. In Essex, *P. bipustulatus* has been well recorded from coastal grassland and OMH sites adjacent to the Thames and there are records from the vicinity of the 2022 survey area. According to Luff (2008), the beetle occurs on 'open, well-drained grasslands and dunes, also chalk and gravel pits'. During the 2022 survey, *P. bipustulatus* was recorded from partially vegetated chalky ballast/OMH in compartment C2 and from pitfall samples located in tall sward grassland in mosaic with reed-fen & pools and short, free-draining grass-heath, in SSSI Unit 1.
A ground beetle	*Pedius longicollis*	Carabidae	Coleoptera	Nationally Scarce	LC	U1	Wetland - Marshland	*Pedius longicollis (formerly known as Pterostichus longicollis)* is a scarce species of ground beetle, which has a scattered distribution within the southern half of the UK. The beetle occurs both on the coast and inland. The beetle has been well recorded in north Kent and south Essex, within the Thames corridor and there are records within close proximity of the survey area. According to Hyman and Parsons (1992), *P. longicollis* occurs on the 'Bare margins of lakes and ponds, also riverbanks, gravel and clay pits' and Hyman and Parsons (1992) also suggest that the species 'may have a preference for calcareous substrates'. During the 2020 survey, *P. longicollis* was recorded only from pitfall traps situated in tall sward grassland adjacent to scrub and reed-fen & pools habitat in SSSI Unit 1.
A ground beetle	*Syntomus truncatellus*	Carabidae	Coleoptera	Nationally Scarce	LC	U1	Open habitats - Tall sward and scrub	*Syntomus truncatellus* is described by Luff (2007) as being 'very local in eastern England as well as occasionally on the coasts of south-west England, Wales, Scotland and south-east Ireland; scarce'. There are a number of records from the Thames corridor area including north Kent and south Essex records and there are several recent records from within close proximity to the 2022 survey area. According to Luff (2007), the beetle is found 'on open ground in fields, pasture woodland and dunes' and Duff (2012) 'In litter in dry grassland in open areas'. During the survey *S. truncatellus* was recorded from several pitfall trap samples collected from coastal grassland habitat in SSSI Unit 1.
A flea beetle	*Aphthona nigriceps*	Chrysomelidae	Coleoptera	Nationally Scarce	LC	C1	Open habitats - Tall sward and scrub	*Aphthona nigriceps* is a species of flea beetle which feeds on Crane's-bills *Geranium* spp. and Stork's-bills *Erodium* spp. (Duff, 2016). The beetle is found in habitats including grassland, wetland, fens, river margins and parkland (Hyman and Parsons, 1992). According to Hyman and Parsons (1992) beetle is very local and with a widely scattered distribution on England. There are scattered recent records from South Essex within close proximity of the 2022 survey area. During the survey the species was recorded only from a vacuum sample collected Area C1, from established grassland and OMH in close proximity to open water habitat.
A leaf beetle	*Phyllotreta cruciferae*	Chrysomelidae	Coleoptera	Nationally Scarce	LC	D	Open habitats - Tall sward and scrub	The Crucifer Flea Beetle *Phyllotreta cruciferae* is a shiny and metallic flea beetle with a scattered and localised UK distribution. It occurs predominantly in central and southern England, with old records in Wales and SE Scotland (Duff 2016). There are several records from the Thames Gateway and London area, and it has been well recorded within and around the general 2022 survey area. According to Duff (2016), this species is associated with 'many wild and cultivated Brassicaceae' but

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
								can also be found in association with Nasturtiums *Tropaeolum* and Wild Mignonette *Reseda lutea*. It can occur in a variety of habitats where the food plants are present. During the 2022 survey, *P. cruciferae* was recorded OMH and grassland in Area D. Yellow crucifers were well represented throughout the OMH within the survey area.
A water scavenger beetle	*Helophorus alternans*	Helophoridae	Coleoptera	Nationally Scarce	LC	A1	Coastal - Brackish pools and ditches; saltmarsh	*Helophorus alternans* is a scarce species of grooved water scavenger beetle, which has a scattered distribution around the coasts of the southern half of the UK. Whilst there are a number of records from the Welsh coast and south coast, the highest concentration of records is from south Kent, the Thames corridor and the east coast including Essex and Suffolk. There are several recent records from in and around the 2022 survey area. According to Foster *et al* (2014), *H. alternans* 'records are almost entirely coastal, in brackish water, but *H. alternans* is also found in sun-exposed heathland pools, on the Lizard, in the New Forest and in Surrey, the key requiremnets being warmth'. During the 2022 survey, *H. alternans* was recorded from a vacuum sample collected from the boundary between raised, rabbit grazed, short-sward grassland and swamp comprising *Juncus effusus, Bolboschoenus maritimus* and *Phragmites australis.* The presence of *B. maritimus* indicates a brackish influence within the habitat, which occurs in close proximity to the coast.
A hister beetle	*Saprinus aeneus*	Histeridae	Coleoptera	Nationally Scarce	LC	U1	Open habitats - Tall sward and scrub	*Saprinus aeneus* was the rarest of several species of hister beetle recorded during the 2022 survey. In the UK, the species has been recorded exclusively from the coast in the west, where it has been recorded from several locations in both South and North Wales; however, there are a number of both inland and coastal records in East Anglia and the beetle has been reasonably well recorded in southeast England. In Essex, there are a number of post-1990 records, from sites adjoining the Thames Estuary area, including records from the vicinity of the 2022 survey area. The species is not listed in Hyman and Parsons (1991), but due to a significant recorded decline, S. *aeneus* has been classed as Nationally Scarce with a threat status of Least Concern, in a recent review by Lane (2017). According to Duff (2012), the beetle occurs in 'carrion, dung etc.'. In Essex the species is associated mainly with post-industrial OMH. Whilst *S. aeneus* was only found in SSSI Unit 1 during the 2022 survey, it was present in several of the pitfall samples on this site.
A tumbling flower beetle	*Variimorda villosa*	Mordellidae	Coleoptera	Nationally Scarce	LC	U1	Not specified	*Variimorda villosa* is a species of tumbling-flower beetle which was afforded the status of Nationally Scarce in a review by Alexander *et al* (2015). In the UK, there are scattered records of the beetle as far north as Leicester; however, the majority of records, by far are from southeast England, where it is relatively well recorded. In Essex, *V. villosa* has been recorded from coastal grasslands around Canvey Island to the east of the 2022 survey area and from a few kilometres to the west of the site in the Grays area. Hyman and Parsons (1992) describe the favoured habitat of *V. villosa* as 'Ancient woodland and pasture-woodland', the larvae developing in wood or plant stems, probably the latter'. The beetle is associated with flowers including umbellifers and during the 2022 survey, specimens were recorded only from SSSI Unit 1, from which several specimens were obtained from Wild Carrot *Daucus carota* flowers. The site cannot be described as either ancient woodland or wood pasture but did support stands of Grey Willow *Salix cinerea* and other trees and scrub, creating sheltered, structurally similar habitat to that occurring in woodland rides and clearings.

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
A silphid beetle	*Nicrophorus interruptus*	Silphidae	Coleoptera	Nationally Scarce	LC	U1	Open habitats - Tall sward and scrub	*Nicrophorus interruptus* is a large and striking black and orange carrion beetle that is found locally in central and southern England and Wales. There are previous records from Essex, as well as in London and throughout the Thames Gateway area and there are recent records within the general area of the 2022 survey. *Nicrophorus* species are known as sexton or burying beetles, owing to their habit of burying small animal corpses to provision their larvae with food. This species is most often found in or near carrion, or attracted to mercury vapour light, such as that given out by moth-trap bulbs, in a variety of habitats. During the 2022 survey, *N. interruptus* was recorded from pitfall traps situated in the coastal grassland habitat of SSSI Unit 1. The traps in Unit 1 were in operation for longer than the specified eight-day period adhered to in other 2022 sample sites and evidently, beetles of the family Silphidae were better represented in this area, being attracted by carrion, as if the traps were baited.
A rove beetle	*Astenus immaculatus*	Staphylinidae	Coleoptera	Nationally Scarce	LC	A1,A6	Not specified	*Astenus immaculatus* is the rarer of two rove beetles of the genus *Astenus* recorded during the survey, the other being *A. lyonessius*. In the UK, *A. immaculatus* is confined to southern and central England, with the majority of records being from southeast England. The species is listed as an Essex RDB species and has been recorded from habitat within the general 2022 survey area. Lott and Anderson (2011) describe *A. immaculatus* as 'The most hygrophilous of the British *Astenus'* and state that the species has been recorded in France in 'lake margins and wet woodland'. However, Lott and Anderson (2011) argue that 'in Britain it appears to be less tied to wetlands' with the species being found 'in peripheral habitats, such as under the loose bark of fallen branches, rather than in marsh litter *per se*.' During the 2022 survey, the beetle was recorded only from the two reed-fen & pools dominated wetland areas A1 and A6.
A rove beetle	*Ocypus fuscatus*	Staphylinidae	Coleoptera	Nationally Scarce	LC	B,U1	Open habitats - Tall sward and scrub	*Ocypus fuscatus* is a large species of rove beetle with a very scattered recorded UK distribution. The beetle was classed Nationally Scarce in a status review by Boyce (2022). Although there are isolated records as far north as northern Scotland, the majority of UK records are from East Anglia and southeast England. There are several post-1990 records from coastal localities in south Essex including records from close to the 2022 survey area at Tilbury, as well as a number of records from Canvey Island a few kilometres to the east. The habitat preferences of *O. fuscatus* appear to be poorly known; Lott and Anderson (2011) state 'Uncertain, but probably on dry soils in the main'. During the 2022 survey, the beetle was recorded from pitfall clusters located in compartment B and SSSI Unit 1. In compartment B, the traps were set in tall-sward, flower-rich grassland and in SSSI Unit 1, the beetle was recorded from three separate clusters, one two located in dry, sandy, short-sward coastal g/l, with bare ground patches and mole hills and one in dry grassland with encroaching Common Reed *Phragmites australis.*
A rove beetle	*Tachinus flavolimbatus*	Staphylinidae	Coleoptera	Nationally Scarce	LC	U1	Not specified	*Tachinus flavolimbatus* is a scarce species of rove beetle in the UK, which according to Lane (2019) was first recorded for certain in the UK in 1939. Lane (2019) states that 'Although the species is a recent arrival, there is no reason to assume that its arrival in Britain was either deliberately or accidentally through importation'. Since that time, the beetle has expanded its UK range somewhat; however, Lane (2019) classed the beetle as Nationally Scarce in a status review. Apart from an isolated record from eastern Scotland, records of the beetle are more or less confined to East Anglia and southeast England, where records are concentrated around the Thames corridor. In Essex, there are several post-1990 records of *T. flavolimbatus* scattered along the Thames shoreline of south

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
								Essex. The beetle has been recorded from the general vicinity of the 2022 survey area, as well as from sites immediately to the east and west. The beetle is associated with open ground, and it has been recorded from decaying grass, seaweed, haystack litter, the roots of grass and in a fungus on elm. During the 2022 survey, *T. flavolimbatus* was recorded only from pitfall samples collected from coastal grassland habitat in SSSI Unit 1.
Top-horned Hunchbank	*Paracrocera orbiculus*	Acroceridae	Diptera	Nationally Scarce	LC	U3	Open habitats - Tall sward and scrub	Top-horned Hunchbank *Paracrocera orbiculus* is a species of hunchback fly from a small family (Acroceridae) closely allied to the soldierflies. The fly was classed Nationally Scarce with a threat status of Least Concern in a review by Drake (2017). Top-horned Hunchbank has been recorded fairly widely from the southern half of the UK, with scattered records as far north as Glasgow. The largest number of records are concentrated in central southern England and in Essex, records are mainly from sites one or two kilometres inland of the north Essex coast including locations not far from the 2022 survey area. According to Stubbs and Drake (2001), *P. orbiculus* is particularly associated with dry grassland, including that on chalk; but has also been recorded from 'fens, bogs and even saltmarsh' although Verrall's records (quoted in Stubbs and Drake, 2001) were frequently from heathland sites. Like other hunchback flies, the larvae of *P. orbiculus* are internal parasitoids of spiders. Stubbs and Drake (2001) cite spiders of the families Gnaphosidae and Lycosidae, including the genus Pardosa. Representatives of both families were well recorded during the 2022 survey. During the 2022 survey, Top-horned Hunchback was recorded only from SSSI Unit 3, where it was swept from mid saltmarsh with dried out tidal creeks and silt pools. The habitat was in close proximity to the dry grassland habitat of compartment B and also, Elder *Sambucus nigra*, scrub cited by Stubbs and Drake (2001) as having been recorded as foci for swarming, was well represented on the banks immediately above the saltmarsh.
A hoverfly	*Chrysotoxum elegans*	Syrphidae	Diptera	Nationally Scarce	LC	A6	Open habitats - Tall sward and scrub	*Chrysotoxum elegans i*s a scarce species of hoverfly, associated mainly with coastal areas of the UK, although there are inland aggregations of records in the East Anglian Brecks and the south London area. The insect has been reasonably well recorded from sites along both north and south coasts of Devon, Cornwall and the south coast of Wales into the Severn Estuary around Bristol. In Essex the species has been poorly recorded, although it has been recorded from a garden near Dagham Park, a few kilometres northwest of the 2022 survey area. According to Stubbs and Falk (2002). Although the species is more strongly associated with woodland habitats than other *Chrysotoxum* species, *C. elegans* has been found in quite open habitats such as clifftops in areas such as Cornwall. It is also known from open, chalk heath habitat in the East Anglian Breckland. During the 2022 survey, the insect was recorded only from a pan trap sample collected from reed-fen & pools habitat in compartment A6.
Saltmarsh Horsefly	*Atylotus latistriatus*	Tabanidae	Diptera	Nationally Scarce	LC	U1,U2	Coastal - saltmarsh - Saltmarsh and transitional brackish marsh	Saltmarsh Horsefly *Atylotus latistriatus*, as its name suggests is associated with coastal saltmarsh habitats. In the UK, the insect has been recorded from three main areas, including the north Norfolk coast, the central south coast of England between Poole Harbour in the west and Bognor Regis in the west and on both Essex and Kent coasts of the outer Thames Estuary. Whilst the greatest number of records are from coastal saltmarsh sites in Essex, *A. latistriatus* does nota appear to have been previously recorded as far west along the Thames Estuary, as the 2022 survey area. According to Stubbs and Drake (2001),'The habitat of *latistriatus* is markedly different from that of other British *Atylotus*.' The association with saltmarsh is a constant theme and Stubbs and Drake (2001) state that

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
								'Several of the named localities have sheltered lagoons where saltmarsh would appear to be the favoured habitat, and others have spits and bars of sand, and dunes, in some cases.' Larvae have been reared from saltmarsh and strandline seaweed debris. During the 2022 survey, a specimen was recorded from a pitfall trap cluster set in an area of dry grassland in mosaic with scattered *Phragmites australis* in SSSI Unit 1 and from spot sweeping in saltmarsh habitat in SSSI Unit 2.
Long-horned Cleg	*Haematopota grandis*	Tabanidae	Diptera	Nationally Scarce	LC	U1	Coastal - Brackish marsh and ditches; Saltmarsh - Saltmarsh and transitional brackish marsh	The Long-horned Cleg *Haematopota grandis* is a scarce species of two-winged fly, mainly associated with coastal habitat in the UK. The species was classed as nationally rare (RDB3) in the UK, but the status was revised to nationally scarce in a review by Drake (2017). The majority of Long-horned Cleg records are from scattered coastal localities within the southern half of the UK and there are several records from sites around the Thames Estuary in Essex, where it has mainly been recorded from the Canvey Island area. According to Drake and Stubbs (2001), the insect is predominately found in saltmarsh or brackish water habitats, such as estuarine reed-beds and carr inland of saltmarsh, but it can occasionally be found further inland. Although there is little literature relating to the biology of the Long-horned Cleg in the UK, the larvae of most *Haematopota* species develop in wet mud or standing water. Adult members of the genus feed on the blood of mammals including livestock and humans. During the survey an adult female was collected during spot sampling. The habitat is in close proximity to the saltmarsh of Unit 2 and Unit 1 itself supports some brackish wetland/carr habitat which could potentially provide breeding habitat for the species.
Broad-headed Bug	*Alydus calcaratus*	Alydidae	Hemiptera	Nationally Scarce	LC	U1	Open habitats; Short sward and bare ground-Bare sand and chalk	*Alydus calcaratus* is the only UK representative of the family Alydidae. The status of the species has recently been revised from Local to Nationally Scarce in a review by Bantock (2016). *A. calcaratus* has been recorded from widely scattered sites across southern England and coastal sites in Wales and it occurs widely within suitable lowland heathland sites in Dorset and the New Forest. Although the species is primarily associated with dry lowland heathland, *A. calcaratus* is also found in sparsely vegetated brownfield habitats and there are a number of records from coastal grassland and OMH, including around the general 2022 survey area in south Essex. Like much commoner bugs such as the Ant Damselbug *Himacerus mirmicoides*, frequently recorded during the survey, the nymphs of *A. calcaratus* are ant mimicks, bearing a close resemblance to wood ants *Formica* spp. it is thought that the nymphs may live within ant nests. During the current survey, *A. calcaratus* was recorded only from observations and samples collected in SSSI Unit 1; however, the insect was particularly well represented in this compartment.
A stilt bug	*Berytinus hirticornis*	Berytidae	Hemiptera	Nationally Scarce	LC	A1,A6,C1,	Open habitats - Short sward and bare ground	One of several species of stiltbug recorded during the survey, *Berytinus hirticornis* has a restricted distribution within the UK. The vast majority of UK records are from coastal grassland and OMH habitats within southeast England, with scattered records elsewhere along the south coast as far as the western tip of Cornwall. The Thames Gateway area of south Essex and north Kent are thought to have been recently colonised and the species is considered to be increasing nationally (Kirby, 1992). *B. hirticornis* is associated predominately with dry, sparse, grassland habitats. It has been associated with Grass Vetchling *Lathyrus nissola* but has also been thought to develop in the stems of coarse grasses such as Cock's-foot *Dactylis glomerata.* The insect is thought to favour rank grassland within disturbance habitats, where areas of bare ground are supported. During the 2018 survey, *B. hirticornis* was recorded from both the A1 and A6 wetland sites and from OMH and grassland in Area C1. Grass Vetchling was noted at some, though not all the recorded sites.

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
A leafhopper	*Aphrodes aestuarina*	Cicadellidae	Hemiptera	Nationally Scarce	LC	U2,U4	Coastal - saltmarsh - Saltmarsh and transitional brackish marsh	*Aphrodes aestuarina* is a nationally scarce species of leafhopper which has a widely scattered distribution from coastal sites in the southern half of the UK. The species is associated exclusively with coastal saltmarshes and according to Kirby (1992), 'It has been recorded from Shrubby Seablite *Suaeda fruiticosa* and on one occasion from Annual Seablite *S. maritima,* but these may not be foodplants'. Kirby also states that 'In Essex it occurs most frequently in the upper levels of the saltmarsh where there is dense growth of Saltmarsh Grass *Puccinellia maritima* and Sea Purslane *Halimione portulicoides*.' Kirby (1992) conjectures that *P. maritima* may be the food plant as other species of the genus *Aphrodes* are grass feeders. During the 2022 survey, *A. aestuarina* was recorded from saltmarsh habitat in SSSI Units 2 and 4.
A leafhopper	*Ophiola decumana*	Cicadellidae	Hemiptera	Nationally Scarce	LC	C4	Open habitats - Short sward and bare ground	*Ophiola decumana* (previously known as *Scleroracus decumanus*) is a scarce species of leafhopper which has been recorded in the UK from widely scattered coastal and inland locations south of Anglesey, north Wales. There are records of the species from the London area and there are several post-1990 records from coastal sites in south Essex, including from the general vicinity of the 2022 survey area. According to Kirby (1992) preferred habitats of *O. decumana* include 'Dry grassy heathland and acid grassland', as well as coastal dunes. Kirby (1992) also refers to records within chalk and limestone areas, where, at the time of writing, no habitat details were available. The Essex records are mainly, if not all from coastal post-industrial brownfield sites. Recorded plant associations mentioned in Kirby (1992) included Common Heather *Calluna vulgaris* and Bilberry *Vaccinium myrtillus* on heathland and a range of other plants including Sheep's Sorrel *Rumex acetosella*, Rosebay Willowherb *Chamerion angustifolium* and Creeping Soft Grass *Holcus mollis*. However, Kirby stated that the biology of the species was poorly known. During the 2022 survey, *O. decumana* was recorded only from compartment C4, where the leafhopper was recorded from a pitfall trap cluster located in OMH with partially vegetated bare ground.
A leafhopper	*Paralimnus phragmitis*	Cicadellidae	Hemiptera	Nationally Scarce	LC	A1,A6,U1	Not assigned	*Paralimnus phragmitis* is a distinctive, but scarce species of leafhopper, which according to Tristan Bantock (pers com) occurs in marshes, where it is associated with *Phragmites australis*. In the UK, the insect is mainly restricted to eastern England, occurring inland in the fens of East Anglia and mainly in coastal wetlands elsewhere. The species has been well recorded from the Thames corridor and there are records from close to the survey area. During the 2022 survey, *P. phragmitis* was recorded from both the *Phragmites australis* reed-fen & pools dominated compartments A1 and A6, as well as occurring in the reed-fen & pools element of SSSI Unit 1.
A lacehopper	*Pentastiridius leporinus*	Cixiidae	Hemiptera	Nationally Scarce	LC	B,U2,U4	Coastal - saltmarsh	*Pentastiridius leporinus* is a scarce species of lacebug which is more or less exclusively confined to coastal areas of the UK, being associated primarily with saltmarsh. There are records from coastal localities as far north as north Norfolk and including Wales, it has been recorded extensively in south Essex, mainly from around Canvey Island, with scattered records in close proximity to the 2022 survey area. According to Kirby (1992) the foodplants of this lacebug are not known, however, it has been associated with Common Reed *Phragmites australis* and various wetland graminoids. The insect is typically found in upper saltmarsh/grazing marsh habitats, where it can, according to Kirby (1992), 'extend some distance along estuaries.' Other than saltmarshes, *O. leporinus* has also been recorded from inland bog habitats in the New Forest, Hampshire. Where it occurs on saltmarsh habitat, it has been found to be confined to limited areas; however, the precise habitat requirements are not known. During the survey, *O. leporinus* was recorded both from upper and mid saltmarsh in SSSI Units 2 and

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
								4 and from the Thameside Nature Park (compartment B), where it was recorded from a vacuum sample collected from short, rabbit-grazed grassland in mosaic with taller sward habitat, this site being located within close proximity to saltmarsh habitat within the tidal creek of SSSI Unit 3.
Cryptic Leatherbug	*Bathysolen nubilus*	Coreidae	Hemiptera	Nationally Scarce	LC	U1	Open habitats - Short sward and bare ground	In the UK, the Cryptic Leatherbug *Bathysolen nubilus* is more or less restricted to parts of East Anglia and southeast England around London and the Thames Gateway. The insect is listed as Essex RDB and has been recorded from several brownfield sites in south Essex and Kent, including within the general area of the 2022 survey. Cryptic Leatherbug is mainly associated with Black Medick *Medicago lupulina* and other *Medicago* species (Kirby, 1992). The recorded habitats are generally well drained and sparsely-vegetated land the insect hides beneath the foodplant as well as under stones, within debris and buried in the ground (Kirby, 1992). During the 2022 survey, Cryptic Leatherbug was recorded from three separate pitfall trap clusters collected from SSSI Unit 1. The site supports a resource of sparsely vegetated short sward grassland habitat with abundant Black Medick.
Slender-horned Leatherbug	*Ceraleptus lividus*	Coreidae	Hemiptera	Nationally Scarce	LC	U1	Open habitats - Short sward and bare ground	Slender-horned Leatherbug *Ceraleptus lividus* is restricted to the southern half of the UK. There are scattered records both from coastal and inland sites; however, the majority of records are from sites in Essex, Kent and East Anglia and there are records from within the immediate vicinity of the survey area. Slender-horned Leatherbug is mainly a ground-dwelling species, which occurs on sparsely vegetated soils on sand or chalk where it is associated with various legumes. During the 2022 survey, the insect was recorded only from SSSI Unit 1, where it was recorded from a pitfall cluster located in tall sward grassland within close proximity to short sward dry grassland, as well as scrub and reed-fen & pools.
A planthopper	*Asiraca clavicornis*	Delphacidae	Hemiptera	Nationally Scarce	LC	C1,D,U1,U2	Open habitats - Short sward and bare ground - Open short sward	*Asiraca clavicornis* is a very distinctive species of planthopper associated with both sparse and tussocky grassland habitats and although it is considered to be a 'ready coloniser' of ruderal habitats (Kirby, 1992), the insect appears to have suffered a significant range contraction in the UK and is now largely confined to the London area around the Thames Estuary, where it is well established (Kirby, 1992). There are numerous records of *A. clavicornis* from the Thames Gateway area of south Essex including within and around the 2022 survey area. In 2022, the insect was recorded from OMH and coastal grassland in compartments C1, D and SSSI Unit 1. It was also recorded from upper saltmarsh in SSSI Unit 2.
A ground bug	*Drymus latus*	Lygaeidae	Hemiptera	Nationally Scarce	LC	U1	Open habitats - Tall sward and scrub	*Drymus latus* is an uncommon species of ground bug with scattered records across the southern half of the UK. The majority of records are from the east of the country. The insect is listed as an Essex RDB species and the majority of records are from the sites bordering the Thames including those within the general vicinity of the 2022 survey. Kirby (1992) states that the 'habitat requirements of this species are unclear', but cites recorded habitats for the bug as including 'grassland at the edge of a marsh; tall calcareous grassland; on derelict arable land on chalk; amongst dense moss at the margins of scrub on chalk; at the base of fallen chalk cliffs; amongst rather sparse grassland on mildly acidic soil; amongst ruderal vegetation on waste ground in the London suburbs, and in a wood'. Kirby (1992) goes on to state that 'Two distinct micro-habitats seem to be involved: moss growing amongst

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
								dense grassland or leaves in fairly open situations, and bare ground amongst sparse vegetation on well-drained soils'. In Essex, the insect has been recorded recently from dry grassland and derelict urban sites in the southwest of the county. During the 2022 survey, *D. latus* was recorded from two separate pitfall samples in SSSI Unit 1. The pitfall clusters were located in short-sward dry grassland over dredged sandy silt washings and in sandy, short-sward dry coastal grassland with bare ground
A ground bug	*Graptopeltus lynceus*	Lygaeidae	Hemiptera	Nationally Scarce	LC	U1	Open habitats - Short sward and bare ground - Bare sand and chalk	*Graptopeltus lynceus* is a species of ground bug which, besides widely scattered, coastal and inland records have been recorded primarily from East Anglia in the UK, with most records coming from the Brecklands. There are scattered inland records from Essex, as well as a single, post-1990 record from close to the Thames in the Purfleet area, a few kilometres west of the 2022 survey area. According to Kirby (1992), *G. lynceus* is associated with Boraginaceae, including Viper's Bugloss *Echium vulgare*, in particular, but also forget-me-nots *Myosotis* spp. Kirby (1992) stated that the insect 'is found in dry, open, sunny situations, most often on sand, less frequently on chalk'. and listed habitats including 'coastal dunes, the East Anglian Breckland, disused sand pits, chalkpits and clay-pits, rocky hillsides and stable shingle'. The bug is able to occur in sparsely vegetated, open areas. During the 2022 survey, *G. lynceus* was recorded only from SSSI Unit 1, where the insect was recorded both from pitfall and pan trap samples, these being located in areas of sandy, short-sward grassland with bare ground patches.
A mirid bug	*Globiceps fulvicollis cruciatus*	Miridae	Hemiptera	Nationally Scarce	LC	U1	Wetland - Marshland	*Globiceps fulvicollis* ssps *cruciatus* is a scarce species of mirid bug with a widely scattered UK distribution. The species has been recorded as far as the north coast of Scotland and there are records from coastal sites in North and South Wales, Cornwall, Dorset, the Midlands and from southeast England. Although *G. fulvicollis ssps cruciatus* has been recorded from Kent near Canterbury, it is uncertain whether or not the species has been previously recorded from Essex. Kirby (1992) describes the insect as being 'usually associated with low-growing sallows *Salix* spp., particularly Creeping Willow S. repens.' Kirby states that 'Most records are from dune slacks or wet heaths, but there are occasional records from other habitats'. During the 2022 survey, *G. fulvicollis ssps cruciatus* was recorded only from SSSI Unit 1, when it was swept from dry, sandy, short-sward coastal grassland with bare ground patches. Salix repens was recorded in certain areas of the site, however.
Sand-runner Shieldbug	*Sciocoris cursitans*	Pentatomidae	Hemiptera	Nationally Scarce	LC	U1	Open habitats - Short sward and bare ground - Open short sward	The Sand-runner Shieldbug *Sciocoris cursitans* is one of several very similar species known to occur in the UK. The insect has a limited distribution with the main populations occurring in southeast England, East Anglia and the Bristol/north Somerset area. There are a number of records in south Essex, particularly in areas close to the Thames corridor, the area supporting nationally important populations of this species, which in turn is host to a Nationally Endangered (RDB1) tachinid fly *Gymnosoma nitens*. The Sand-runner is listed on the Essex RDB. According to Kirby (1992), the Sand-runner occurs in 'In open, dry, sunny localities, often on chalk or sand but also on other substrates provided they are well-drained'. Habitats listed by Kirby (1992) include 'coastal dunes, chalk downland, disused chalk-pits, cliff-tops and dry earth banks.' and 'It is found amongst fairly low vegetation which may be quite sparse and with much bare ground.' The Sand-runner is considered to be phytophagous and potential foodplants cited by Kirby (1992) include Wood Sage *Teucrium scorodonia*, Buckshorn Plantain *Plantago coronopus* and Common Stork's-bill *Erodium cicutarium.*

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
								During the 2022 survey, the insect was recorded only from a pitfall cluster located within dry, sandy, short-sward coastal grassland, with bare ground in SSSI Unit 1.
A shore bug	*Saldula pallipes*	Saldidae	Hemiptera	Nationally Scarce	LC	D	Wetland - Marshland	*Saldula pallipes* is a species of saldid bug, which was afforded Nationally Scarce status in a review by Cook (2015). The insect has been recorded from widely scattered inland and coastal sites in the southern half of the UK. There are several records from the Thames corridor, in close proximity to the 2022 survey area. According to Tristan Bantock (pers com) *S. pallipes* occurs in a various wetland margin habitats. During the 2022 survey, the insect was recorded from close to a wet ditch close to the sea wall in compartment D.
A shore bug	*Saldula palustris*	Saldidae	Hemiptera	Nationally Scarce	LC	U3	Coastal - Saltmarsh	*Saldula palustris* is a scarce species of shorebug, almost exclusively restricted to coastal habitats in the UK. Not listed in Kirby (1992), the insect has been afforded Nationally Scarce status in a review by Cook (2015). *S. palustris* has a scattered distribution around the UK coasts, with records from as far north as northern Scotland. It has been recorded from much of the Welsh coast, from the central south coast of England and there are several records from East Anglia and the southeast including the Thames corridor. In Essex, most post-1990 records are from the eastern extremity of the Thames, with further records from Canvey Island. There is also a single record from within the general area of the 2022 survey. According to Southwood and Leston (1959) *S. palustris* is partly subaquatic, occurring on estuarine mudflats, with adults and larvae living around the normal high-water mark. However, Southwood and Leston (1959) also state that 'adult bugs are present in abundance at the higher levels of the shore, at about high-water mark, but the larvae tend to frequent the lower cord-grass and Enteromorpha zone. During the 2022 survey, *S. palustris* was recorded only from upper saltmarsh habitat in SSSI Unit 3.
Scarce Tortiose Shieldbug	*Eurygaster maura*	Scutelleridae	Hemiptera	Nationally Scarce	LC	C1,U1	Open habitats - Short sward and bare ground - Open short sward	The Scarce Tortoise Bug *Eurygaster maura* is the rarer of two British species, both of which were recorded during the 2022 survey. The insect is scarce in the UK with most records being from southeast England, including Kent and Essex. There are a number of records from calcareous and other grassland and brownfield sites in Kent and south Essex especially from sites bordering the Thames and the insect has been recorded within and around the general 2022 survey area. Nymphs of the insect feed on grasses and during the survey, Scarce Tortoise Bug was recorded from dry, short sward grassland/grass heath habitat in SSSI Unit 1 and from OMH and grassland in compartment C1.
Spined Hylaeus	*Hylaeus cornutus*	Colletidae	Hymenoptera	Nationally Scarce	LC	C4	Open habitats; Tree associated - Decaying wood; Bark and sapwood decay; Scrub edge; rich flower resource	The Spined Hylaeus, *Hylaeus cornutus,* is widespread but very locally distributed in south-east England. It is most frequent in the Brecklands of East Anglia, the London area and the wider Thames Gateway area, and there are numerous records from south Essex, both within and in close proximity of the 2022 survey area. Falk and Lewington (2015) states that it 'occurs in a variety of umbellifer-rich habitats, especially where Wild Carrot is abundant', including chalk grassland and brownfield sites. Wild Carrot *Daucus carota* is the favoured foodplant, but it has also been recorded foraging on other umbellifers and other herbs such as Yarrow *Achillea millefolium* and Oxeye Daisy *Leucanthemum vulgare*. *H. cornutus* has gained its vernacular name due to the pair of spine-like projections on the

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
								sides of the face of females. These border a slight depression which it uses to carry part of its pollen load. During the 2022 survey, *H. cornutus* was recorded only from herb-rich grassland and OMH in compartment C4. Both Wild Carrot and Oxeye Daisy are well represented within the general 2022 survey area.
A solitary wasp	*Nysson dimidiatus*	Crabronidae	Hymenoptera	Nationally Scarce	LC	A1	Open habitats - Short sward and bare ground	*Nysson dimidiatus* is a species of digger wasp which occurs predominately within the southern half of the UK. The wasp is largely coastal in Wales, but there are many inland records, particularly in East Anglia and the west Midlands. It occurs on the lowland heaths of Dorset and Surrey and in the Greater London area. In Essex, there are post-1990 records of the wasp along the Thames shoreline and the species have been recorded within the vicinity of the 2022 survey area. Baldock (2010) cites the main habitats of *N. dimidiatus* as sandy areas, mainly including lowland heaths and coastal dunes, as well as acid grasslands. According to Richards (1980) the insect is a cleptoparasite of *Gorytes* (now *Harpactus) tumidus* but may be associated with *Lindenius albilabris* when this species is absent. Both these species appear to be well represented within the and around the general, 2022 survey area. During the 2022 survey, *N. dimidiatus* was recorded from a pan trap sample collected from the interface of Common Reed *Phragmites australis* reed-fen & pools and drier tall sward grassland.
A myrmicine ant	*Myrmica schencki*	Formicidae	Hymenoptera	Nationally Scarce	LC	U1	Open habitats - Short sward and bare ground	*Myrmica schencki* is most well-known from eastern England in the UK and there are a number of records from the Thames Gateway area, including within the vicinity of the 2022 survey area. *M. schencki* is usually associated with warm, dry conditions in sparsely vegetated habitats such as short sward grassland. Dunes, cliffs, unimproved pasture, heaths, banks, and railway cuttings (Edwards and Roy (eds), 2009). The ant forms smallish colonies in soil and occasionally grass tussocks, predating other ant species, but also feeding on nectaries of plants and can be found amongst aphids. During the 2022 survey a single worker was recorded from a pitfall sample collected from SSSI Unit 1, which occupied an area of dry, sandy, short-sward coastal grassland, with bare ground patches.
Lobe-spurred Furrow Bee	*Lasioglossum pauxillum*	Halictidae	Hymenoptera	Nationally Scarce	LC	A1,A6,B,C1,C2,D,U1,U2	Open habitats - Short sward and bare ground - Rich flower resource	Formerly a rare species in the UK, Lobe-spurred Furrow Bee has increased its UK range in recent years and has now been recorded over much of southern England and therefore its conservation status is likely to be revised. There are numerous recent records from the south Essex coastal grassland and brownfield sites, including within the general 2022 survey area. The species is associated with a range of habitats including chalk grassland and open woodland. It nests in bare ground forming small to large nesting aggregations. Lobe-spurred Furrow Bee is polylectic, nectaring on a range of flowering herb. During the 2022 survey the bee was mainly recorded from compartments containing OMH and coastal grassland; however, it was also recorded from the saltmarsh SSSI Unit 2 and from reed-fen & pools and wet grassland habitat in compartments A1 and A6 (sources: Else and Edwards (2018) and Edwards and Broad (2005).
Ridge-cheeked Furrow Bee	*Lasioglossum puncticolle*	Halictidae	Hymenoptera	Nationally Scarce	LC	B,C2,D,U1,U4	Open habitats - Short sward and bare ground - Rich flower resource	Falk (2015) describes the Ridge-cheeked Furrow Bee *Lasioglossum puncticolle* as 'A scarce and localised species, with most records in southeast England between Dorset and Essex.' The female of the species is readily identified due to the coarse ridges occupying the underside of the head and the bee is known to nest on steep slopes in various habitats including 'soft rock cliffs, sea walls, vegetated shingle and saltmarsh' (Falk, 2015). Though it also occurs inland in 'chalk downland, heathland, open woodland, old quarries and pits and arable margins'. *L. puncticolle* is polylectic. The species has been

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
								recorded historically from within the Thames Gateway on both sides of the river and there are now numerous records from the within and around the 2022 survey area. During the 2022 survey Ridge-cheeked Furrow Bee was variously from flower-rich coastal grassland and OMH in compartments B, C2, D2 and SSSI Unit 1, as well as from upper saltmarsh in SSSI Unit 4.
Swollen-thighed Blood Bee	*Sphecodes crassus*	Halictidae	Hymenoptera	Nationally Scarce	LC	B,C1	Open habitats - Short sward and bare ground - Rich flower resource	The Swollen-thighed Blood Bee *Sphecodes crassus* was regarded as a scarce, but widespread species nationally; however, it is now considered frequent at least in southern Britain (Else and Edwards, 2018). In Essex the bee is well represented, particularly in the south of the county adjacent to the Thames corridor. The bee, like other *Sphecodes* spp. is a cuckoo within nests of *Lasioglossum nitidiusculum* and *L. parvulum*, though other furrow bees including *L. pauxillum* and *L. punctatissimum* are considered to be hosts in Europe (Else and Edwards, 2018). *Sphecodes crassus* does not appear to have strong habitat preferences, though it is clearly confined to sites supporting the host bees. Male bees of the species have been observed nectaring from ericoids including *Callluna vulgaris,* but also from composites such as Creeping Thistle *Cirsium arvense*, Yarrow *Achillea millefolium* and mayweeds *Tripleurospermum* spp. During the 2022 survey, Swollen-thighed Blood Bee was recorded from an area of short, rabbit-grazed grassland in mosaic with taller sward habitat in compartments B and in established grassland and OMH near a waterbody in compartment C1.
Little Sickle-jawed Blood Bee	*Sphecodes longulus*	Halictidae	Hymenoptera	Nationally Scarce	LC	C3	Open habitats - Short sward and bare ground	The Little Sickle-jawed Blood Bee *Sphecodes longulus* is a scarce species in the UK. It is mainly confined to southern England, between Dorset and Kent, northwards to north Norfolk and with recent (2005) outlying records in South Wales (Else and Edwards, 2018). There are a number of post-1990 records from the Thames corridor area of south Essex and there are also records from north Kent. According to Collins and Roy (eds.) (2018), the bee is 'mainly associated with dry, sandy heathland and other disturbed sandy situations such as sandpits' and is 'Occasionally found in open, broad-leaved woodland.'. Like other bees of the genus *Sphecodes*, *S. longulus* is a a cleptoparasite in the nests of other Halicticine bees. The main host cited in Else and Edwards (2018) and Collins and Roy (eds.) (2018) is the Least Furrow Bee *Lasioglossum minutissimum*, a rather local species, which is also mainly found in southern England, and which was recorded in several locations during the 2022 survey. Collins and Roy (eds.) (2018) also list *L. morio* and *L.leucopus* as possible hosts. Else and Edwards (2018) list nectaring sources as umbellifers such as Wild Angelica *Anglica sylvestris* and Wild Carrot *Daucus carota,* as well as composites including Creeping Thistle *Cirsium arvense,* Yarrow *Achillea millefolium* and mayweeds *Tripleurospermum*.During the 2022 survey, *Sphecodes longulus* was recorded only from a single pitfall sample collected from OMH with partially vegetated bare ground in compartment C3, the host species, *Lasioglossum minutissimum* was also recorded from the same sample.
Red-tailed Blood Bee	*Sphecodes rubicundus*	Halictidae	Hymenoptera	Nationally Scarce	LC	C2,D	Open habitats - Short sward and bare ground	Red-tailed Blood Bee *Sphecodes rubicundus* has been recorded mainly from the southern UK, with scattered records from both coastal and inland sites in England and to a lesser extent, Wales. In Essex, there recent records, mainly from the coastal brownfield and grassland sites and the bee has been well recorded in and around the 2022 survey area. According to Edwards and Broad (2006), *S. rubicundus* is found in 'old, herb-rich meadowland, and soft-rock coastal cliffs and landslips'. Like other members of the genus *Sphecodes*, *S. rubicundus* is a cleptoparasite of mining bees. Edwards and Broad (2006) cite Large Meadow Mining Bee *Andrena labialis* as being the main recorded host, but also mention the Yellow-legged Mining Bee *Andrena flavipes* and state that 'the parasitic behaviour

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
								has not been well documentated'. The bee has been recorded nectaring on Wild Angelica *Angelica sylvestris,* Wild Carrot *Daucus carota* and spurges *Epilobium* spp. During the 2022 survey, both *Andrena labialis* and *A. flavipes* were both well recorded extensively, including records from compartments C2 and D which also supported *Sphecodes rubicundus.*
Silvery Leafcutter Bee	*Megachile leachella*	Megachilidae	Hymenoptera	Nationally Scarce	LC	B,C4,D,U1,U3	Open habitats - Short sward and bare ground	Silvery Leafcutter Bee *Megachile leachella* has a predominately coastal distribution in the UK, with records from south Lincolnshire to Kent in the in the east and sporadically to the west from south Lancashire, Wales, and Cornwall and patchily across the south coast. There are numerous records for coastal sites in south Essex including from within the general 2022 survey area. According to Else and Edwards (2018), the bee has a 'marked preference for light, sparsely vegetated, sandy soils' and 'it is often locally common on, for example, the wind-blown sands of coastal dunes and the sandy banks of flooded gravel pits'. Nest burrows are excavated in sandy banks, but it may also nest in holes in dead wood. Nest cells are cut from leaf sections and leaves from a wide range of trees and other woody species such as *Clematis vitalba*, have been recorded as being used. The bee is polylectic in its pollen and nectar foraging (Else and Edwards, 2018). During the survey, Silvery Leafcutter Bee was abundant in a number of compartments supporting herb-rich vegetation and a supply of sandy bare ground and was often abundant.
Large Velvet Ant	*Mutilla europaea*	Mutillidae	Hymenoptera	Nationally Scarce	LC	A6,U1	Open habitats - Tall sward and scrub	Large Velvet Ant *Mutilla europaea* is the larger of the two velvet ant species recorded during the 2022 survey.The vast majority of UK records for the insect are from southern England, where it is particularly associated with lowland heathland in Dorset and the New Forest, Hampshire. Besides heathlands, there is also a reasonable number of Large Velvet Ant records from coastal sites, such as within the Thames corridor and there are a number of post-1990 records for the insect from south Essex, including within the general area of the 2022 survey. Large Velvet Ant is, according to Richards (1980) a parasite of various species of bumblebee *Bombus* spp., the adult female stings the bumblebee larvae and depositing eggs which develop in the cells provisioned by the host. During the 2022 survey, female Large Velvet Ant specimens were recorded from pan traps located within seasonally dried-out reedbed habitat of compartment A6 and a winged male specimen was retreived from a pitfall cluster located in short-sward dry grassland, over dredged sandy silt washings, in SSSI Unit 1.
Small Velvet Ant	*Smicromyrme rufipes*	Mutillidae	Hymenoptera	Nationally Scarce	LC	U1	Open habitats - Short sward and bare ground	Small Velvet Ant *Smicromyrme rufipes* is the smaller of the two species of the family Mutillidae recorded during the 2022 survey. In the UK, Small Velvet Ant is more or less restricted to southern England, where it has a largely eastern distribution, spanning from Purbeck, Dorset in the west, east to near Sandwich in Kent and northwards, as far as Lowestoft in Suffolk. In Essex, the insect is reasonably well recorded from coastal localities and there are several post-1990 records from within the general 2022 survey area. Small Velvet Ant is, according to Baldock (2010), 'a parasitoid of various ground-nesting wasps and bees, such as halictines.' However, Baldock (2010) stresses that little work investigating the identity of host species. Favoured habitat listed in Baldock (2010) include 'coastal dunes and inland on heathland and in sandpits'; however, on the north shores of the Thames, in Essex, the species evidently occurs in OMH and dry grassland habitats. During the 2022 survey, *S. rufipes* was recorded only from SSSI Unit 1. The insect was found in a single pitfall cluster situated in dry, sandy, short-sward coastal grassland, with bare ground patches and mole hills.

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
A spider-hunting wasp	*Auplopus carbonarius*	Pompilidae	Hymenoptera	Nationally Scarce	LC	A6	Tree associated - Shaded woodland floor	*Auplopus carbonarius* is a scarce species of spider-hunting wasp in the UK, found throughout southern England and south Wales, but very sparsely distributed. It is locally more frequent in the Thames Gateway area and has been recorded previously in close proximity to the survey site. *A. carbonarius* is a relatively distinctive all-black species with clear wings, the males with a distinctively white lower face. It can be found in a variety of habitats, where it builds multiple nest cavities for its larvae from wet mud (Day, 1988). It provisions these larvae with paralysed spiders from a variety of families, most frequently Clubionids (Day, 1988). During the 2022 survey, *A. carbonarius* was recorded only from pan/water trap samples within reed-fen & pools in compartment A6.
Ant-nest Ladybird	*Platynaspis luteorubra*	Coccinellidae	Coleoptera	Nationally Scarce	NE	C1,U1	Open habitats - Tall sward and scrub	*Platynaspis luteorubra* is an uncommon ladybird which has been recorded mainly from southeastern England in the UK, with additional records from the south coast, East Anglia, Cornwall, and South Wales. There are records from both Kent and Essex sides of the Thames within the general survey area and the insect has been increasingly recorded within and around the vicinity of the 2022 survey area. Hyman and Parsons (1992) list habitats including 'Woodland, hedgerows and coastal shingle,' and state that the beetle is 'Probably predatory. Recorded at roots of grass, by beating dead hedgerow shrubs and hawthorn blossom, from under broom bushes and particularly during winter, from under the bark of firs and willows. During the survey, *P. luteorubra* was found in compartments C1, and SSSI Unit 1. The habitats of both sites included elements of OMH, wet and dry grassland and scrub.
A weevil	*Calosirus terminatus*	Curculionidae	Coleoptera	Nationally Scarce	NE	C2	Open habitats; Coastal - Short sward and bare ground; Sea cliff - Open short sward	*Calosirus terminatus* is a locally distributed weevil in the UK, found in southern and central England, mainly near the coast (Duff 2016). There are scattered records from within close proximity of the 2022 survey area in south Essex and there are also records from the opposite bank of the Thames Estuary, in south Kent. In the UK, it feeds only on Wild Carrot *Daucus carota*, but has been recorded on other Apiaceae in continental Europe (Duff 2016). It can be found in a variety of grassland habitats where the foodplant is present, but is rarely common, and seems to prefer areas with a warm microclimate. During the 2022 survey, *C. terminatus* was found only from compartment C2. A specimen was recorded from a vacuum sample collected from the southern slope of a partially vegetated chalk ballast bank, within an area of herb rich OMH.
A weevil	*Hypera melancholica*	Curculionidae	Coleoptera	Nationally Scarce	NE	D	Open habitats - Short sward and bare ground	*Hypera melancholia* is a scarce species of hyperine weevil, restricted to the southern half of the UK, where it is recorded from widely scattered localities, both on the coast and inland. However, the greatest concentration of records is from the southeast, Thames corridor area. In south Essex, there are records from within a few kilometres of the 2022 survey area around Canvey Island to the east and from the Rainham Marshes area to the west. According to Morris (2002) where the beetle is cited as *H. fuscocinerea; H. melancholia* is found 'In dry, open sandy and chalky situations and in grasslands', where the insect is associated with 'species of Medicago, including *M. sativa, M. falcata* and probably, *M. lupulina*. During the 2022 survey, *H. melancholia* was recorded only from compartment D, from two samples, both in flower-rich grassland. *Medicago* spp. were well represented throughout the survey areas.

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
A weevil	*Sitona waterhousei*	Curculionidae	Coleoptera	Nationally Scarce	NE	C2	Open habitats - Short sward and bare ground - Open short sward	*Sitona waterhousei* has a mainly coastal distribution in the UK, and whilst there are a number of records from the south coast and coastal sites in Wales as far north as Anglesea, there are fewer records from eastern England. However, there are records from the Thames Gateway area and there are a few records in the vicinity of the 2022 survey area. *S. waterhousei* is a distinctive member of the genus, with protruberant eyes. Like other pea weevils, *S. waterhousei* is associated with legumes and in this case, foodplants cited by Hyman and Parsons (1992) include Common Bird's-foot Trefoil *Lotus corniculatus* and Narrow-leaved Bird's-foot Trefoil *Lotus glaber* (L. tenuis) and the larvae are thought to feed on the roots of these plants. The weevil is associated with habitats such as coastal undercliffs, calcareous grasslands and possibly coastal shingle and quarries near the coast (Hyman and Parsons, 1992). During the survey *S. waterhousei* was recorded from flower-rich, calcareous grassland/OMH habitat in compartment C2. Narrow-leaved Bird's-foot Trefoil was an abundant component of the OMH and coastal grasslands within the entire 2022 survey area.
A weevil	*Smicronyx reichii*	Curculionidae	Coleoptera	RDB3 pre-1994 criteria	NE	C2,U1	Open habitats - Short sward and bare ground - Open short sward	*Smicronyx reichii* is a scarce species of weevil in the UK, which has been recorded historically only from southern English counties and there appear to be few Essex records prior to the 2022 survey, although the species has been recorded from around Canvey Island and south of the Thames, in Kent, where it has been recorded from south of the Swanscombe Peninsula. *S. reichi* is associated with calcareous grassland habitats where its primary foodplants include Common Centaury *Cerastium erythraea* and Yellow Wort *Blackstonia perfoliata* (Hyman and Parsons, 1992). During the 2022 survey the beetle was recorded from pitfall samples as follows: from compartment C2, where it was recorded from OMH with vegetated chalk ballast banks and from SSSI Unit 1 from dry, sandy, short-sward coastal grassland, with bare ground patches and from dry grassland in mosaic with scattered *Phragmites australis.* Both *Cerastium erythraea* and Yellow Wort *Blackstonia peroliata* were recorded within these compartments, with the latter being somewhat more frequently recorded.
A weevil	*Tychius squamulatus*	Curculionidae	Coleoptera	Nationally Scarce	NE	C2,D	Open habitats - Short sward and bare ground - Open short sward	*Tychius squamulatus* is one of a number of similar species in the genus *Tychius* with a uniform covering of sandy brown scales. It occurs locally in southern England, where most records are from Kent and the Thames Gateway/ wider London area. There are a few recent records from the south Essex coast in close proximity to the 2022 survey area. It is also found in Wales, where it is widespread around the coast. *T. squamulatus* is usually found in sparsely vegetated habitats, particularly near the coast, its foodplant being Common Bird's-foot-trefoil *Lotus corniculatus* (Duff, 2016). During the 2022 survey, it was found both in compartment C2 and D. Bird's-foot-trefoils *Lotus spp.* were abundant within the dry grassland and OMH in both compartments.
Bloody Crane's-bill Weevil	*Zacladus exiguus*	Curculionidae	Coleoptera	Nationally Scarce	NE	B,C1	Open habitats - Tall sward and scrub	Bloody Crane's-bill Weevil *Zacladus exiguus* is locally distributed in the UK with most records from southeast England and East Anglia. The beetle is fairly well recorded from the Thames Gateway area and there are several post-2000 records from south Essex, including within the vicinity of the 2022 survey area. The species is listed as an Essex RDB species. According to Morris (2008) the Bloody Cranesbill Weevil *Z. exiguus* is associated with small-flowered *Geranium* species including Bloody Cranesbill *G. sanguineum*, as well as several other common species of the genus. The insect can be found in a range of habitats including the sides of roads, paths and tracks, in unmanaged grassland and on cliffs and stable sand dunes. During the survey the weevil was recorded from herb-rich grassland and OMH in compartments B and C1.

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
A pollen beetle	*Meligethes fulvipes*	Nitidulidae	Coleoptera	Nationally Scarce	NE	A6,C4,D	Not specified	*Meligethes fulvipes* is a species of pollen beetle which has been recorded from widely scattered, mainly coastal sites, in England and Wales. There are several records from the Thames Gateway area including south Essex, where the beetle has been previously recorded within close proximity to the 2022 survey area. According to Kirk-Spriggs (1996), the insect is found 'near the coast and in marshy places inland'. The foodplant is thought to be Charlock *Sinapsis arvensis*, a very common plant of roadsides and arable margins. But it may also occur on other yellow brassicae species. During the 2022 survey, *M. fulvipes* specimens were recorded from reed-fen & pools habitat in compartment A6, as well as from OMH in compartments C4 and D. Yellow brassicas including Charlock were well represented throughout much of the survey area.
A ground beetle	*Polystichus connexus*	Carabidae	Coleoptera	Nationally Scarce	NT	B,C4	Wetland - Running water - W122 Riparian sand	*Polistichus connexus* is generally a scarce species of ground beetle, which is mainly known from coastal sites in southeast England and East Anglia. However, in recent years there have been a number of records of the insect being recorded from mercury vapour moth traps, in some cases some way inland. In Essex, there are several records of *P. connexus* from the Canvey Island area and it has also been recorded in close proximity to to 2022 survey area. The species was previously classed as RDB2 'Vulnerable' but has been reassessed as Nationally Scarce and 'Near Threatened' in a review by Telfer (2016). Luff (2007) states that *Polystichus connexus* occurs 'In cracks and crevices, usually in clay soils or cliff bases but also on sandy or gravelly soils'. During the 2022 survey, *P. connexus* was recorded from pitfall trap samples collected from coastal grassland in compartment B and from OMH with partially vegetated bare ground in C4.
A weevil	*Glocianus punctiger*	Curculionidae	Coleoptera	Nationally Scarce		B,U1	Open habitats - Tall sward and scrub	*Glocianus punctiger* is a small ceutorhyncine weevil, which has been recorded widely but thinly throughout much of central and southern England and Wales. There are several records from the Thames Gateway, though Essex records appear to be sparse, and the species is easily confused with the similar *G. distinctus,* which was also recorded during the 2022 survey. Morris (2008) describes the favoured habitats as 'grasslands, waste places, at the borders of roads, tracks and woods and in open and rough ground generally'. The beetle is associated with Dandelion *Taraxacum officinale* (agg.), the larvae feeding within the flowerheads. During the 2022 survey, *G. punctiger* was recorded from vacuum samples collected from short-sward, flower-rich grassland in compartment B.
A weevil	*Gronops lunatus*	Curculionidae	Coleoptera	Nationally Scarce		B	Open habitats - Short sward and bare ground	*Gronops lunatus* is an infrequently recorded species of weevil, which has been recorded in the UK from widely scattered locations within the southern half of the UK south of the Humber. The majority of UK records are from East Anglia and the southeast and whilst many records are coastal, it has also been recorded from a number of inland locations. In Essex the beetle has been recorded primarily from locations within close proximity to the 2022 survey area. According to Morris (2002), *G. lunatus* is found 'In saltmarshes, at their edges and on sandflats etc' but is also found 'inland in arenaceous areas'. Morris (2002) also cites host plants to include sea-spurrey species including Spergularia media and S. marina (which are generally found on saltmarshes) and Corn spurrey *Spergularia arvensis* and mouseears *Cerastium* spp. inland. During the 2022 survey, *G. lunatus* was recorded from a pitfall sample collected from grassland close to saltmarsh habitat in compartment B.

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
A weevil	*Liparus coronatus*	Curculionidae	Coleoptera	Nationally Scarce		C3,U1	Open habitats - Tall sward and scrub	*Liparus coronatus* is a very large (10mm +) and heavily built weevil that occurs locally in south-east England, with a few records from elsewhere in England and in south Wales (Duff 2016). Its distribution is centred around west Kent, where there are numerous records; however, despite the beetle's conspicuous size and distinctive appearance, there are relatively few Essex records. Duff (2016) states that it is usually found 'in open grassland, often on calcareous soils', where it feeds 'on or at the roots of Cow Parsley *Anthriscus sylvestris'* and possibly on other members of the umbellifer family (Apiaceae). During the 2022 survey, *L. coronatus individuals* were found both in the dry, coastal grassland of compartment C2 and SSSI Unit 1.
A weevil	*Orthochaetes setiger*	Curculionidae	Coleoptera	Nationally Scarce		B,C2,C5,U1	Open habitats - Tall sward and scrub	*Orthochaetes setiger* is a distinctive species of weevil which is uncommon in the UK, but has a widely scattered distribution as far as southern Scotland. Many of the records are coastal, especially to the west of its range. There are several records from sites close to the Thames in both north Kent and Essex and *O. setiger* has been previously recorded in close proximity to the 2022 survey area. The weevil is parthenogenetic, with males rarely being found. The beetle is associated with grassland and open habitat and Morris (2002), also refers to a preference for calcareous grassland. In open situations it is often found in moss or under stones. During the 2022 survey, *O. setiger* was fairly frequently recorded from both pitfall and vacuum samples collected in compartments B,C2,C5,U1. The habitat being typically sparsely vegetated OMH and established, short sward grassland.
A weevil	*Otiorhynchus raucus*	Curculionidae	Coleoptera	Nationally Scarce		U1	Open habitats - Short sward and bare ground - Bare sand and chalk	*Otiorhynchus raucus* is an uncommon species of broad-nosed weevil with a restricted range in the UK, most records being from eastern England, with main aggregations in East Anglia and Kent/Greater London. In Essex, there is a concentration of records adjacent to the Thames, including sites within the general vicinity of the 2022 survey area and the beetle is listed as an Essex RDB species. Hyman and Parsons (1992) associate the species with habitats including 'sand pits, disturbed ground, a cliff edge, woodland and possibly also gardens and allotments' and state that 'the species appears to prefer loose sandy or chalky soils'. The larvae of the species feed on roots of plants whilst adults are found at the base of plants and/or in litter. During the 2022 survey, *O. raucus* was recorded exclusively from pitfall samples collected from coastal grassland in SSSI Unit 1.
Sea Wormwood Weevil	*Polydrusus pulchellus*	Curculionidae	Coleoptera	Nationally Scarce		U2	Coastal - saltmarsh - Saltmarsh and transitional brackish marsh	The Sea Wormwood Weevil *Polydrusus pulchellus* is restricted to coastal sites in the UK with scattered records from the Cumbrian coast, southwards, with concentrations along the coast of South Wales, the south coast of England, the Thames corridor, and East Anglia. In Essex, the beetle has been recorded mainly from the, eastern seaward extremity of the Thames Estuary, with several records from Canvey Island and an isolated record from the vicinity of the 2022 survey area. Hyman and Parsons (1992) describe the favoured habitat of P. pulchellus as 'Saltmarsh, coastal shingle and estuaries' citing Sea Wormwood *Artemesia maritima*, Sea Purslane *Halimone portulacoides* and Sea Beet *Beta maritima*, as the main foodplants. During the 2022 survey, the beetle was recorded only from SSSI Unit 2, where it was swept from mid saltmarsh immediately inland of raised, vegetated mound. Sea Purslane was amongst the dominant species within the vegetation in this area.

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
A weevil	*Tychius pusillus*	Curculionidae	Coleoptera	Nationally Scarce		B	Open habitats - Short sward and bare ground	*Tychius pusillus* is one of several species of weevil of the genus recorded during the 2022 survey. The beetle his confined to the south in the UK, occurring mainly in East Anglia, central southern England and along the south coast. There are several records from the Greater London area and there are a number of post-1990 records from coastal sites in south Essex, including from sites in close proximity to the 2022 survey area. According to Hyman and Parsons (1991) *T. pusillus* occurs in 'Grassland, field margins, roadside verges and disturbed ground' where it is associated with Lesser Trefoil *Trifolium dubium* and possibly other species of clover. Morris (2012) states that 'Larvae feed in the flower heads and pupate in the soil' and adds 'sandpits' and 'occasionally on maritime sand dunes' to the loist of habitat associations. During the 2022 survey, T.pusillus was recorded only from compartment B, where specimens were obtained from vacuum sampling short-sward, flower-rich, coastal grassland.
A minute marsh-loving beetle	*Limnichus pygmaeus*	Limnichidae	Coleoptera	Nationally Scarce		U1	Wetland - Running water	*Limnichus pygmaeus* is the sole British representative of the family Limnichidae, known as minute marsh-loving beetles. The beetle, classed as Nationally Scarce in the UK, has a widely scattered UK distribution, with both coastal and inland records from the Humber southwards. It is mainly recorded from East Anglia and the south coast of England, with fewer records from the west, where there are coastal records from Wales. In Essex, the beetle has been recorded from the Canvey Island area, from saltmarsh and post-industrial brownfield sites. *L. pygmaeus* is described by Duff (2020) as occurring 'On mud or in moss and plant litter at the edge of freshwater, often on sandy or chalky soils.' During the 2022 survey, the beetle was recorded from several pitfall samples in which the recorded habitat was dry, sandy, short-sward coastal grassland with bare ground patches and mole hills in SSSI Unit 1.
A rove beetle	*Neobisnius villosulus*	Staphylinidae	Coleoptera	Nationally Scarce		B	Wetland - Running water - Riparian sand	One of a number of rove beetles recorded during the survey, *Neobisnius villosulus* has recently been classed as Nationally Scarce in the UK in a status review by Boyce (2022). The beetle has a scattered distribution with records extending northwards as far as Cumbria. However, it has been most frequently recorded in the Midlands and southeast England. In Essex, it has been recorded from the north Thames around Canvey Island, in the east and from around Grays to the west of the survey area. There are also a few inland records in the area. According to Lott and Anderson (2011), the beetle is associated with 'deposits of sand or silt by slow-flowing rivers'. During the 2022 survey *N. villosulus* was recorded only from compartment B, where it was recorded from a pitfall trap cluster located in seasonally dried out wet grassland at the base of a slope.
A long-legged fly	*Dolichopus strigipes*	Dolichopodidae	Diptera	Nationally Scarce		U2,U4	Coastal - saltmarsh - Saltmarsh and transitional brackish marsh	*Dolichopus strigipes* is one of several species of long-legged fly recorded during the 2022 survey. The insect, which was afforded the status of Nationally Scarce in a review by Drake (2018), has been recorded from scattered locations around the UK coasts from Lincolnshire southwards. Whilst the fly has been recorded from north Wales and the coast of central southern England, the majority of records are from East Anglia and around the Thames Estuary. In Essex, *D. strigipes* has been recorded mainly from the seaward end of the Thames Estuary; however, there are scattered records from suitable sites further west, including from the general vicinity of the 2022 survey. According to Drake (2018), *D. strigipes* is 'An obligate saltmarsh species found almost exclusively on upper saltmarsh in the zones with *Halimione* to *Juncus gerardii*.' During 2022, the insect was recorded both from sweep and vacuum samples collected from upper to mid saltmarsh habitat in SSSI Units 2 and 4.

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
								Most specimens came from habitat with a structurally complex mosaic of mid and upper saltmarsh plants, characterised by the presence of tidal pools and creeks.
An opomyzid fly	*Geomyza apicalis*	Opomyzidae	Diptera	Nationally Scarce		B	Open habitats - Tall sward and scrub	*Geomyza apicalis* is an uncommon species of opomyzid fly in the UK, with records distributed thinly as far north as Scotland. There are a number of historic records in habitat adjacent to the Thames Estuary in Essex, but there are few records away from the coast. Whilst in Europe the species is associated with dry habitats, in the UK it appears to have an affinity with wetlands including grazing marsh, reedbeds and similar habitat. The larvae develop in the stems and middle shoots of grasses. In 2022, *G. apicalis* was recorded only from established coastal grassland compartment B.
An opomyzid fly	*Geomyza subnigra*	Opomyzidae	Diptera	Nationally Scarce		B	Open habitats; Tall sward and scrub	*Geomyza subnigra* is one of two uncommon species of two-winged flies of the family Opomyzidae recorded during the 2022 survey. The species was listed as pNationally Scarce in a review by Falk *et al* (2016). Historically, the insect has been recorded from widely scattered locations in southern England and Wales as well as from Scotland. There are a number of recent records of the species from south Essex in the general vicinity of the 2022 survey area. According to Falk *et al* (2016) *G. subnigra* has been recorded from mainly dry habitats including 'dry grassland on chalk downs, heathland, dunes and shingle ridges behind beaches'. Adults of the insect have been recorded from around the roots of grasses including False Oat-grass *Arrhenatherum elatius,* Tufted Hair-grass *Deschampsia cespitosa*. Falk *et al* (2016) suggest that the species may be more widespread than records indicate, due to its illusive nature and that vacuum sampling (used during the current survey) may be a more effective capture method than sweep netting. During the 2022 survey, *G. subnigra* was recorded only from established coastal grassland compartment B.
An opomyzid fly	*Opomyza punctata*	Opomyzidae	Diptera	Nationally Scarce		D	Open habitats - Tall sward and scrub	*Opomyza punctata* is a species of opomyzid fly which was classed as pNationally Scarce in a review by Falk *et al* (2016). In the UK, the species has been recorded from widely scattered sites from north Yorkshire southwards. There are records from Wales, south Yorkshire and from well removed sites along the south coast of England; however, the greatest number of records are from East Anglia. In Essex, there are several, scattered, post-1990 records from south Essex to the east and west of the 2022 survey area. According to Falk et al (2016), the habitat associations of *O. punctata* are 'unclear'; however, ' records refer to marshland, grassland, coastal dunes and heathland.' The fly is thought to develop in grasses, in common with other members of the genus. During the 2022 survey, *O. punctata* was recorded only from compartment D, where it was obtained from a vacuum sample collected from established grassland landward of sea wall.
A flesh fly	*Miltogramma germari*	Sarcophagidae	Diptera	Nationally Scarce		U1	Open habitats - Short sward and bare ground	*Miltogramma germari* is a rare species of flesh fly which appears to be confined to the south of the UK occurring in a widely scattered and mainly coastal distribution, with populations along the coast of South Wales and around Poole Harbour, Dorset. In the East there are inland records from around the Breckland area of East Anglia. In Essex, the fly has been recorded on several occasions from the southern areas adjacent to the Thames. The larvae of *M. germari* are thought to feed on the food stores provided for the larvae of mining bees and the fly is, consequently, associated with habitats supporting significant mining bee populations. Habitats from which the species has been recorded

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
								include dunes, sandy heaths and chalk downland. However, in south Essex, OMH habitats on previous industrial sites, supporting important mining bee populations are evidently important. During the 2022 survey, *M. germari* was recorded only in SSSI Unit 1, it was identified from sweep samples collected from dry, sandy, short-sward, coastal grassland, with bare ground patches.
A flesh fly	*Sarcophaga sinuata*	Sarcophagidae	Diptera	Nationally Scarce		U2	Wetland - Acid & sedge peats; Marshland	*Sarcophaga sinuata* is a species of flesh fly with a mainly southern and western distribution in the UK. The fly is recorded widely on the western seaboard of Wales and north Devon, but has also been reasonably well recorded from the south coast of England, along the Thames Estuary and East Anglian coasts as far north as Lincolnshire. In Essex, there are few records of the insect, although there are two post-1990 records from around Canvey Island, a few kilometres east of the 2022 survey area. According to Falk and Pont (2017) *S.sinuata* is found in 'Coastal saltmarshes, and inland fens with peat.' and 'on mainland Europe, it has been reared from the Bulrush Wainscot *Nonagria typhae* (Lepidoptera: Noctuidae).' however, 'in North America it is a parasitoid of grasshoppers (Orthoptera: Acrididae)'. During the 2022 survey, *S. sinuata* was recorde only from saltmarsh habitat in SSSI Unit 2.
Black Mining Bee	*Andrena pilipes*	Andrenidae	Hymenoptera	Nationally Scarce		U3	Open habitats - F002 Rich flower resource; Open habitats - Short sward and bare ground	The Black Mining *Bee Andrena pilipes* is the commoner of two very similar, black *Andrena* species recorded during the 2022 survey, the other being the rarer, Scarce Black Mining Bee *A. nigrospina*. In the UK, *A. pilipes* is largely restricted to coastal areas of southern England, with few inland records. There are several records of the bee from south Essex, including records from the vicinity of the 2022 survey area. The bee typically nests in soft cliffs and forages within the adjacent flower-rich grassland habitats.Black Mining Bees has two generations per year. The spring generation, which occurs during April and May forages on scrub including Blackthorn *Prunus spinosa* and willows *Salix* spp., as well as umbellifers and crucifers. The summer generation emerges in July and feeds on Bramble *Rubus fruticosus* agg. blossom, as well as umbellifers such as Hogweed *Heracleum sphondylium*. During the 2022 survey, a single female bee was recorded emerging from a burrow at the base of a partially vegetated, soft steep incline/cliff containing fragments of pottery, glass and other refugia from historic landfilling activities, which overlooked the tidal saltmarsh creek of SSSI Unit 3. The record from mid-July corresponds to the second brood of this species.
Large Gorse Mining Bee	*Andrena bimaculata*	Andrenidae	Hymenoptera	Nationally Scarce		C3, U1	Open habitats - F002 Rich flower resource; Open habitats - Short sward and bare ground	The Large Gorse Mining Bee *Andrena bimaculata* is recorded in the UK from north Norfolk southwards, there are records in central England and Wales, but the greatest number of records from southeast England. There are several records from habitat close to the Thames in south Essex in the Thurrock area and also around Colchester, though the species is of restricted range. The bee is listed in the Essex RDB as an 'Essex Threatened' species, due to its perceived vulnerability to habitat loss. Large Gorse Mining Bee is according to Collins and Roy (eds.) (2012) 'associated almost entirely with light, sandy soils, such as heaths, commons and sandpits'. The bee is bivoltine and polylectic. According to Falk and Lewington (2015), 'The spring generation forages mainly on blossoming shrubs such as Gorse, willows and Blackthorn.' Whilst in summer 'brambles, umbellifers and Common Ragwort are favoured'. Falk and Lewington describe typical nesting sites as 'sparsely-vegetated sandy ground, especially south-facing slopes and the edges of footpaths' and it can also nest communally in 'loose nesting aggregations'. During the survey, Large Gorse Mining Bee was recorded only from areas C3 and SSSI Unit 1.

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
Little Yellow-faced Bee	*Hylaeus pictipes*	Colletidae	Hymenoptera	Nationally Scarce		A1	Tree associated - Decaying wood - Bark and sapwood decay; Scrub edge	The Little Yellow-faced Bee *Hylaeus pictipes* is largely restricted to southeast England and parts of East Anglia in the UK, with scattered records from the west Midlands, south Wales and the southcoast as far as Exeter, Devon. There are several records from sites on and inland of the north Thames shoreline of south Essex and the bee has been recorded close to the 2022 survey area. According to Edwards and Roy (2009). favoured habitats of *H. pictipes* include 'Open woodland, fens, coastal dunes and shingle, and occasionally urban gardens'. The bee has been found nesting in burrows in Bramble *Rubus fruticosus* agg. and rose *Rosa* spp. stems and according to Edwards and Roy (2009), the bee has also been recorded from the vacated burrows of woodworm beetle *Anobium punctatum*, in dead gorse *Ulex* spp. stems in Kent. During the 2022 survey, *H. pictipes* was recorded only from compartment A1, where it was recorded from the interior of an area of Common Reed *Phragmites australis* reed-fen & pools.
Black-headed Mason Wasp	*Odynerus melanocephalus*	Eumenidae	Hymenoptera	S41 Priority species; Nationally Scarce		C4,D	Open habitats - Short sward and bare ground	Black-headed Mason Wasp *Odynerus melanocephalus* is a scarce and locally distributed species in the UK, where it is found across southern England, west to Devon and north to the midlands. There are several records of the wasp in the south Essex, Thames Gateway area, including within close proximity to the survey area. *O. melanocephalus* is found in a variety of open habitats on light, clayey soils, including grasslands, saltmarshes and brownfield sites. The wasp excavates multi-celled nests on level, exposed areas of soil, which it provisions with weevil larvae and smaller butterfly and moth caterpillars. During the 2022 survey, *O. melanocephalus* was recorded from grassland and partially vegetated OMH in compartments C4 and D.
Beewolf	*Philanthus triangulum*	Crabronidae	Hymenoptera	Nationally Vulnerable (RDB2 pre-1994)	LC	C4,D	Open habitats - Short sward and bare ground	The Beewolf *Philanthus triangulum* is a large ground-nesting species of solitary wasp, which is a predator of Honey Bee *Apis mellifera*, as well as similar-sized, ground-nesting solitary bees. According to Baldock (2010) it is often found in association with Panteloon Bee *Dasypoda hirtipes*. In the UK, Beewolf was considered an extreme rarity prior to the late 1980s when it was restricted to the Isle of Wight. The subsequent population explosion lead to the species being recorded across much of the southern half of the UK, with large nesting aggregations being recorded in suitable sites supporting sandy soil. However, at around 2008, 2009 the species declined significantly, possibly due to a succession of wet summers at around this time, but also according to Baldock (2010) to a crash in Honeybee populations. There are many recent Beewolf records from coastal grassland and OMH sites in south Essex, including within the general survey area. During the 2022 survey, the insect was recorded from partially vegetated OMH in compartments C4 and D.
An anthicid beetle	*Stricticollis tobias*	Anthicidae	Coleoptera	Not Evaluated	NE	U2	Not specified	*Strictocollis tobias* is an uncommon species of ant beetle, with a widely scattered UK population, There are records as far north as south Yorkshire. However, the greatest number of records are from Norfolk and southeast England. There appears to be only a single record from Essex, in the Romford area. S. tobias is not listed in Hyman and Parsons (1992), but is described by Duff (2020) as an established introduction 'originally from the Oriental region'. Duff (2020) describes the habitat affinities of S. tobias as being 'Often synanthropic, on rubbish dumps and in woodchip heaps, but also found on sandy shores, usually in open, sunny situations'. During the 2022 survey, *S. tobias* was recorded only from wetland, reed-fen & pools habitat in compartment A6.

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
A frit fly	*Dicraeus tibialis*	Chloropidae	Diptera	pNationally scarce		C1	Open habitats - Tall sward and scrub	*Dicraeus tibialis* is an uncommon species of grass fly which has been classed nationally scarce in a review by Falk *et al* (2016). The fly has been recorded historically from the southern half of the UK, with most records being from grazing levels and coastal sites centred around the Bristol Channel, with inland records as far north as Sheffield. There are apparently relatively few records of the species from Essex; Harvey (2014) recorded the species during a survey of the Thurrock Thameside Nature Park (2022 survey compartment B). Falk *et al* (2016) refers to calcareous to neutral unimproved grasslands as the main habitat for *D. tibialis*, but 'waste ground and coastal grassland' are also cited as recorded habitats. Like other chloropids, the larvae of the species develop in grass seed and calcicolous grasses such as Upright Brome *Bromopsis erecta* and Downy Oat-grass *Helictotricon pubescens* are cited amongst the hosts recorded on the continent. In the current suvery, *D. tibialis* was recorded only from compartment C1, when it was recorded from a sweep sample collected from established grassland close to the sea wall.
A trixoscelid fly	*Trixoscelis marginella*	Trixoscelidae	Diptera	pNationally scarce		U1	Open habitats - Short sward and bare ground - Bare sand and chalk	*Trixoscelis marginella* is a species of two-winged fly of the family Trixoscelidae. The species was formerly classed within the family Opomyzidae and has a similar general appearance and wing patterning to species in this group. In the UK, the fly has been recorded from Anglesey southwards. Records to the west are confined to the Welsh coast; however, to the east the fly has been recorded from the East Anglian Brecks and from closer to the coast in southeast England. There are a number of post-1990 records from the Thames Estuary in south Essex and the fly has been recorded from the general vicinity of the 2022 survey area. Falk *et al* (2016) describe the recorded habitat of *T. marginella* as 'Sandy areas on heaths, also coastal dunes.' and state that 'The species has been recorded by sweeping areas of bare ground on dry grassland that has been very heavily grazed by rabbits.' The biology is poorly known; however, Falk et al (2016) speculate that development in carrion or animal burrows is feasible. During the 2022 survey, *T. marginella* was recorded only from SSSI Unit 1, where it was swept from an area of dry, short sward grassland resembling grass heath.
Plain Dark Bee	*Stelis phaeoptera*	Megachilidae	Hymenoptera	pRDB2 pre-1994 criteria		U1	Tree associated - Decaying wood - Bark and sapwood decay	Plain Dark Bee *Stelis phaeoptera* is a rare species in the UK which has been recorded as fare north as Chester. The majority of records are from inland sites in the west Midlands west of Birmingham and into Wales and from East Anglia. There are relatively few records from the southern counties, although it has been recorded from sites in Dorset as well as from Seaton, Devon. Post-1990, *S. phaeoptera* has been recorded from a few, scattered locations in south Essex, including from the Canvey Island area, a few kilometres east of the 2022 survey area. There are also records from south of the Thames in Kent; the closest to the 2022 survey area being from near Cobham. *S. phaeoptera* is a cleptoparasite in the nests of bees of the genus *Osmia*. According to Falk and Lewington (2015), the main host is *Osmia leaiana,* although it is known also to use *O. niveata* and *Anthidium manicatum* in Europe and an unsubstantiated association with *O. bicornis* has also been made. Falk and Lewington (2015) describe the habitat of *S. phaeoptera* as being the same as its main host, *O. leaiana*, which includes habitats with 'plentiful composites such as thistles and knapweed, combined with dead wood (e.g. old fence posts) or old walls.' During the 2022 survey, *S. phaeoptera* was recorded only from SSSI Unit 1, where an individual female was recorded from a pitfall trap cluster located in short-sward dry grassland over dredged sandy silt washings.

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
A spider-hunting wasp	*Evagetes pectinipes*	Pompilidae	Hymenoptera	RDB1 pre-1994 criteria	LC	U1		*Evagetes pectinipes* is a rare species of spider-hunting wasp . Until recently, the insect was known in the UK mainland only from sand dune habitat in East Kent. However, there has been an increase in records, the insect having been found in coastal and inland localities in Suffolk, from the south coast of England and from the Thames Estuary. In south Essex, the wasp has been recorded from coastal brownfield sites to the east of the 2022 survey area, around Rainham Marshes and from Canvey Island to the west. Whilst the female is relatively easy to identify, due to a its strongly developed tarsal comb, the male is somewhat less obvious. Day (1988) states that *E. pectinipes* is 'Almost certainly cleptoparasitic on *Episyron rufipes*, from which it is recorded on the continent. During the 2022 survey a single male specimen was recorded from a pan trap sample collected from SSSI Unit 1.The putative host species *Episyron rufipes,* was particularly well recorded from Unit 1 during the survey and occurred in the same pan trap sample.
A mirid bug	*Lygus pratensis*	Miridae	Hemiptera	RDB3 pre-1994 criteria	LC	A6, U1,U2,U3,U4	Open habitats - Scrub heath and moorland	*Lygus pratensis* is one of a group of very similar species in the same genus, which can only reliably separated by microscopic examination. This mirid bug was formerly regarded as rare in the UK, but has undergone a significant range expansion in recent years. According to Kirby (1992), *L. pratensis* was most frequently recorded from ancient forest rides, although there are also records of the species being recorded from low-growing, more open situations and also from open heathland. However, recent evidence suggests that the species has become less discriminating in its habitat preference, occurring in a range of habitats including grassland and scrub and OMH, as well as from upper saltmarsh. Many of the records for this species are from southeast England including the Thames Gateway and there are numerous recent records within and around the 2022 survey area. During the 2022 survey *L. pratensis* was recorded from reed-fen & pools habitat in compartment A6, as well as from all four of the SSSI Units surveyed.
Blue Carpenter Bee	*Ceratina cyanea*	Apidae	Hymenoptera	RDB3 pre-1994 criteria	LC	B,C2,C3	Open habitats - Tall sward and scrub - Rich flower resource	Until relatively recently, The Little Blue Carpenter Bee *Ceratina cyanea* was considered to be a great rarity in southern England, but it has been recorded more frequently in recent years and the Thames corridor area is one of the national strongholds of the species. However, nationally, records are still largely confined to southeast England and the current RDB3 status is considered in need of revision to nationally scarce. There are a number of records from south Essex, within and around the 2022 survey area. Little Blue Carpenter Bee is associated with various dry, warm habitats typically with scattered Bramble *Rubus fruticosus* (agg.) or rose *Rosa* spp. in sunny locations such as on south-facing chalk-downland, heathland edge, brownfield and woodland edge habitats. The bee nests in hollow stems of woody species such as Bramble and roses and adults forage on a range of flowering plants. During the 2022 survey, the bee was recorded from coastal grassland and scrub habitat in compartment B, as well as from OMH vegetated chalk ballast banks in C2 and flatter OMH, with partially vegetated bare ground in compartment C3.
A weevil	*Cosmobaris scolopacea*	Curculionidae	Coleoptera	RDB3 pre-1994 criteria		U2,U4	Coastal - saltmarsh - Saltmarsh and transitional brackish marsh	The weevil *Cosmobaris scolopacea* is a very scarce species in the UK, occuring almost exclusively on the south Essex and north Kent coasts within the Thames Gateway area. There are scattered records of the species predominately from saltmarsh habitat and it has previously been recorded within or close to the 2022 survey area. In the UK, *C. scolopacea* is found only in saltmarshes, where according to Duff (2016) it feeds on Sea-purslane *Atriplex portulacoides*, and possibly also Grass-leaved Orache *A. littoralis.* In continental Europe it feeds on other Amaranthaceae and is found in a wider variety of habitats (Duff 2016). During the 2020 survey *C. scolopacea* was recorded from a sweep sample

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
								collected from the upper portion of the mid saltmarsh zone in SSSI Unit 2 and from a vacuum sample collected from SSSI Unit 4, where it was recorded from lower saltmarsh, close to the seaward margin, but slightly raised, therefore, closer to mid saltmarsh in composition. The beetle's primary host plant in the UK, Sea-purslane, was abundant throughout much of the mid saltmarsh within the survey area.
Bryony Mining Bee	*Andrena florea*	Andrenidae	Hymenoptera	RDB3 pre-1994 criteria		B	Open habitats - Short sward and bare ground - Scrub edge; Rich flower resource	Bryony Mining Bee *Andrena florea* is a rare species with a very limited range in the UK. The species is restricted to southeast England, with records historically centering around an area from south London including Surrey and West Sussex. However, from around 2014, there has been a range expansion into areas adjacent to the Thames in north Kent and south Essex and this area now supports nationally important population, there are many recent records from in and around the 2022 survey area. Bryony Mining Bee collects pollen exclusively from the flowers of White Bryony *Bryonia alba*, though according to Falk and Lewington (2015), 'other flowers such as Bramble and umbellifers seem to act as nectar sources'. The bee requires 'Sites with plentiful White Bryony, including woodland edge, scrubby grassland and scrubby heathland' and it can be found on sites with both 'sandy and chalky soils' (Falk and Lewington (2015). Nesting habitat is usually light soil, such as hard sandy paths and it may nest in large aggregations. During the 2020 survey, Bryony Mining Bee was recorded on a single occasion. A female insect was foraging on White Bryony was recorded at the western boundary of compartment B.
Carrot Mining Bee	*Andrena nitidiuscula*	Andrenidae	Hymenoptera	RDB3 pre-1994 criteria		U1	Open habitats - Short sward and bare ground	Carrot Mining Bee *Andrena nitidiuscula* is an uncommon species in the UK, with a limited geographical range. The bee is restricted to sites in the southern England from around Bath southwards, with an isolated record from near Cardiff, South Wales. Many of the records are from the south coast, there being scattered records from Salcombe, Devon in the west, to near Rye in Kent. *A. nitidiuscula* does not appear to have been recorded from Essex, prior to the 2022 survey. According to Edwards and Telfer (2002), the bee 'May be found in a variety of open habitats with a preference for clay-based soils, although these need not be acidic'. Edwards and Telfer (2002) also state that *A. nitidiuscula* is 'Oligolectic on flowers of plants in the family Apiaceae, apparently preferring those with white flowers, such as Wild Carrot, although it has been found collecting pollen on Wild Parsnip' During the survey, two female specimens were collected from spot sweeping in SSSI Unit 1. Wild Carrot *Daucus carota* was well represented within SSSI Unit 1 and the compartment supported areas of bare, clayey substrate potentially suitable as nesting sites for *A. nitidiuscula.*
Broad-faced Mining Bee	*Andrena proxima*	Andrenidae	Hymenoptera	RDB3 pre-1994 criteria		UB	Open habitats - Short sward and bare ground	The Broad-faced Mining Bee *Andrena proxima* is a rare species in the UK. It is known only from the southern half of the UK, where it has been recorded inland within East Anglia and the Greater London area, but is otherwise largely coastal, having been recorded from scattered locations along the south coast of England and from coastal sites in north Wales. In Essex there are several records from the Grays area and from around Canvey Island, a few kilometres to the west and east of the 2022 survey area. There are further scattered records from the north of the county. Falk (2015) describes the favoured habitat of *A. proxima* as 'Various umbellifer-rich habitats, including chalk grassland, coastal grassland, soft rock cliffs, quarries and sometimes coastal grazing marsh'. During the 2022 survey, the bee was recorded from herb-rich coastal grassland and scrub habitat in compartment B. The grassland supported abundant Wild Carrot and other umbellifers.

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
Orange-horned Nomad Bee	*Nomada fulvicornis sbsp fulvicornis*	Apidae	Hymenoptera	RDB3 pre-1994 criteria		U3	Open habitats - Short sward and bare ground	*Nomada fulvicornis* is widely distributed but very localised species in the UK with most records being from East Anglia and the heathlands of central southern England. There are records from coastal brownfield sites in Essex and north Kent. *N. fulvicornis* is a cuckoo bee which lays its eggs in the nest of hosts of the genus *Andrena*. There are two recognised subspecies; one is a cleptoparasite of *Andrena pilipes* and *A. bimaculata*, the other is associated with *A. nigrospina* and *A tibialis*. During the 2022 survey, the female specimen recorded conformed with descriptions for sbsp. *fulvicornis* and the recorded presence of *Andrena pilipes* in the same location, would further endorse this conclusion. However, A. *nigrospina* was also recorded during the 2022 survey, but only from site C. *N. fulvicornis* is bivoltine, with a spring and summer generation and habitat varies depending on the host. Falk (2015) refers to 'heathland and sandy brownfield sites (especially populations associated with *A. bimaculata* and 'soft rock cliffs (especially populations associated with *A. pilipes*)' During the 2022 survey, the insect was recorded only from SSSI Unit 3, where it was swept from the steeply-sloping, south-facing, spoil margins of historic landfill immediately above a creek supporting the upper reaches of intertidal saltmarsh.
A ruby-tailed wasp	*Hedychrum niemelai*	Chrysididae	Hymenoptera	RDB3 pre-1994 criteria		U1	Open habitats - Short sward and bare ground	In the UK, *Hedychrum niemelai* is restricted to southern England from Cornwall to Kent and northwards to Norfolk. A recent increase of records within its known range has led to calls for the status to be revised from the current RDB3 category (Edwards and Telfer (eds.), 2002). There are a number of records within the Thames Gateway and the species has been well recorded from the vicinity of the 2022 survey. However, owing to the recent arrival in the UK of the closely related and very similar, *H. nobile*, which has also been recorded from sites in south Essex, there may be question marks over authenticity of some records. Both *H. niemelai* and *H. nobile* are cuckoo species of solitary wasps of the genus Cerceris. Whilst Edwards and Telfer (2002) cite *Cerceris ruficornis, C. arenaria, C. rybyensis* and *C. quinquefasciata,* as being host species of *H. niemelai,* the sole host of *N. nobile* is considered by Baldock and Hawkins (2016) to be *C. arenaria*. Both C. rybyensis and *C. quinquefasciata* were both recorded from SSSI Unit 1, where the female *H. niemelai* specimen was found. Edwards and Telfer (2002), describe *H. niemelai* habitat as 'Open sandy localities, lowland heaths, coastal dunes, cliffs with sandy deposits and other disturbed locations'. The *N. niemelai* specimen was recorded from short, sandy grassland habitat during the 2022 survey.
A solitary wasp	*Passaloecus clypealis*	Crabronidae	Hymenoptera	RDB3 pre-1994 criteria		A1	Wetland; Acid & sedge peats; Reedfen and pools	*Passaloecus clypealis* is a rare species of solitary wasp, its UK distribution being restricted to south-east England. Most modern records are from east Norfolk, Dungeness and in south Essex, there are several records in close proximity to the survey area. *P. clypealis* is a small, elongate, all-black wasp that nests in cavities, often in the stems of Common Reed *Phragmites australis*, an abundant plant in the wetland habitats preferred by the wasp. It is not known what *P. clypealis* preys upon, but other members of the genus feed on aphids. During the 2022 survey, it was recorded only from *Phragmites australis* reed-fen & pools in compartment A1, the insect was also recorded from pan traps located at this site.
Squat Furrow Bee	*Lasioglossum pauperatum*	Halictidae	Hymenoptera	RDB3 pre-1994 criteria		C3	Open habitats - Short sward and bare ground - Rich flower resource	The Squat Furrow Bee *Lasioglossum pauperatum* is generally a rare species confined to southern England. The recorded range extends from west Dorset east as far as kent and north as far as Norfolk; however, the majority of records, by far, are from the area around the Thames corridor in Essex, where the species can sometimes be abundant (Else and Edwards, 2018). The species is listed as RDB3 'rare' in the UK and is also listed on the Essex RDB. The majority of Essex records are

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
								from brownfield and Thames terrace grassland sites in the south and the bee has been well recorded in the vicinity of the 2022 survey area. According to Else and Edwards (2018), *L. pauperatum* has a 'strong preference for sandy soils, both inland and on the coast'. The nesting habitats are considered to be unknown, though it is presumed to nest in light soils. The bee is said to be polylectic in terms of pollen foraging, but according to Else and Edwards (2018) nectars on flowers including Viper's Bugloss *Echium vulgare* and composites such as Hawk's-beards *Crepis* and Ragworts *Senecio*. During the 2022 survey, Squat Furrow Bee was recorded only from a pitfall cluster located within sparsely vegetated, albeit herb-rich OMH in compartment C2.
A latridiid beetle	*Melanophthalma suturalis*	Latridiidae	Coleoptera	RDBK (Insufficiently known)	NE	C1,C2,C4,D,U2	Tree associated - Decaying wood - Fungal fruiting bodies	*Melanophthalma suturalis* is a species of mould beetle which has been recorded from relatively few, widely scattered locations in the UK. There are records from the north Norfolk coast southwards, with the largest aggregations of records centred around the Thames and Severn Estuaries. There is a strong concentration of post-1990 records of the beetle from locations close to the Thames in south Essex and it has previously been recorded within the general proximity of the 2022 survey area. According to Duff (2020), *M. suturalis* is found 'In decaying vegetation in damp places, overwintering in Ivy *Hedera*.' During the 2022 survey, the beetle was recorded from coastal grassland, OMH and saltmarsh habitats in compartments CC1,C2,C4,D,U2.
A weevil	*Coelositona puberulus*	Curculionidae	Coleoptera	RDBK (insufficiently known) – as 'curticollis partim'	NE	D	Not specified	*Coelositona puberulus* (formerly *Sitona puberulus)* is a species of pea weevil with a widely scattered distribution in the UK, with few confirmed records. The beetle was classed in the 'Insufficiently known' category in a review by Hyman and Parsons (1992). There are scattered UK records in the Midlands, as well as coastal records in south Wales. In southeast England, the beetle has been recorded from several locations in Kent; however, it is uncertain whether or not the beetle has been recorded from Essex. According to Hyman and Parsons (1992), the habitat and ecology of *C. puberulus* is 'Uncertain, but probably associated with grassland and possibly sand dunes.'Hyman and Parsons further speculate that the foodplants may include bird's-foot trefoils *Lotus* spp. Duff (2016) state that the beetle is found on 'Greater Bird's-foot Trefoil *Lotus pedunculatus* in damp places'. During the 2022 survey, *C. puberulus* was recorded only from partially vegetated OMH in close proximity to open water, wet grassland and swamp habitat in compartment D.
A shining flower beetle	*Olibrus flavicornis*	Phalacridae	Coleoptera	Red Data Book-insufficiently known	DD	B,C1,C2,C3,C4,C5,D,U1	Not specified	*Olibrus flavicornis* has a very limited distribution in the UK and due to uncertaincy and probable under-recording, it has been classified as RDBK 'unknown' category. The beetle has been recorded from the Sussex coast and an outlying record from the Gower, South Wales; however, the majority of records are from southeast England including the Thames corridor, these being centred around sites in south Essex and north Kent. There are a number of recent records both from within and around the 2022 survey area. According to Hyman and Parsons (1992), *O. flavicornis* is 'probably associated with grassland and coastal habitats' and on the Continent the beetle has been recorded from Autumn Hawkbit *Leontodon autumnalis*, the larvae feeding on the seed head and adults on the pollen. During the 2022, *O. flavicornis* was widely recorded, with records from compartments B,C1 to C5,D and SSSI Unit 1.

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
Red-shanked Carder Bee	*Bombus ruderarius*	Apidae	Hymenoptera	S41 Priority species	LC	D,U1	Open habitats - Tall sward and scrub - Rich flower resource	Although Red-shanked Carder Bee *Bombus ruderarius* is still widely distributed in the southern half of the UK, the species underwent a significant decline in the latter half of the C20th and has continued to decline since. Consequentially, the bee has been listed as a Priority Species under Section 41 (England) and 42 (Wales) of the NERC Act (2006). The majority of recent Essex records are from the post-industrial OMH habitats of Thames corridor area of Essex and there are records from the vicinity of the 2022 survey area. According to Else and Edwards (2018), 'the bumblebee has a preference for dry, well-drained soils, particularly flower-rich calcareous grassland and coastal dunes'. The bee is polylectic, nectaring and foraging for pollen from a variety of herbs; however, legumes are particularly favoured for pollen. During the 2022 survey, *B. ruderarius* was recorded from partially vegetated OMH in compartment D and from coastal grassland in SSSI Unit 1. The bee may have been overlooked elsewhere due to the similarity of workers to the much commoner *B. lapidarius* and most examined specimens turned out to be that species.
Sea Aster Colletes	*Colletes halophilus*	Colletidae	Hymenoptera	S41 Priority species	LC	U4	Coastal; Open habitat - Brackish pools and ditches; Saltmarsh	The Sea Aster Bee *Colletes halophilus* is almost exclusively a coastal species and its recorded UK range follows the east coast southwards from as far north as the Humber, to the tip of Kent and then along the south coast as far as Hengistbury Head, Dorset. Else and Edwards (2018), state that the bee is an endemic to coastal areas in the southern North Sea, the English Channel and the Atlantic coast of France. There are a number of records from coastal habitat in south Essex and the species has been recorded within and in close proximity to the 2022 survey area. The species is listed in the Essex RDB as 'Regionally Important'. *C. halophilus* generally occurs at the margins of saltmarshes, where it collects pollen primarily from Sea Aster *Aster tripolium,* though it forages for nectar on a wider range of plants including sea lavenders *Limonium* spp. on saltmarsh and a range of other species (Else and Edwards, 2018). The insect nests in dense and extensive aggregations in exposed soil, often in sand. Whilst the species is predominately coastal, it has been recorded well inland. During early September, 2022, a reasonable number of specimens were recorded foraging on mainly Sea Aster, but also occasionally Golden Samphire *Inula crithmoides* flowers, in SSSI Unit 4.
Small Heath	*Coenonympha pamphilus*	Nymphalidae	Lepidoptera	S41 Priority species	VU	A6,B,C2,C4,D,U1	Open habitats; Short sward and bare ground; Open short sward	Small Heath *Coenonympha pamphilus* is a small butterfly which is still widespread and common over the whole of the UK; however, a dramatic recorded decline within recent decades has led to the species being included as an S41 and S42 'Species of principal importance' in England and Wales respectively. The species, which has been recorded throughout the 2022 survey area and south Essex as a whole, has also been classed under post-2001 IUCN criteria as 'Near Threatened'. The butterfly is found in open, sunny habitats including grassland, heaths, meadows, sand dunes etc. Adults favour areas with short sward. Larvae feed on various grasses including bent grasses *Agrostis* spp., fescues *Festuca* spp. and meadow grasses *Poa* spp. During the 2022 survey Small Heath was recorded from suitable dry grassland throughout the survey area.
Wall	*Lasiommata megera*	Nymphalidae	Lepidoptera	S41 Priority species	NT	U1,U2,U3	Open habitats - Short sward and bare ground - Open short sward	Although the Wall *Lasiommata megera* is still relatively widespread in the UK, the species has experienced a substantial decline in its inland UK population in recent decades, leading to the butterfly being included as an s41 species under the NERC Act (2006). There are, however, numerous post-1990 records of the butterfly throughout much of the county of Essex and it is particularly well recorded from sites adjacent to the Thames, including within the general area of the 2022 survey area. The Wall is associated with dry, stony grassland habitats such as disused quarries nd sites offering similar sheltered, yet sunny microclimates. Larvae feed on a range of grasses including Chalk False

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
								Brome *Brachypodium pinnatum*, Yorkshire Fog *Holcus lanatus* and Cock's-foot *Dactylis glomerata*. During the 2022 survey, Wall was recorded mainly from the upper parts of saltmarshes, especially in the vicinity of concrete coastal defences in SSSI Units 2 and 3 and the butterfly also recorded from sparsely vegetated coastal grassland in Unit 1.
Brown-banded Carder Bee	*Bombus humilis*	Apidae	Hymenoptera	S41 Priority species		A6,B,C1,C3,D,U1,U3,U4	Open habitats - Tall sward and scrub - Rich flower resource	The Brown-banded Carder Bee *Bombus humilis* suffered a serious decline during the latter decades of the C20th. This has led to the inclusion of the species as a 'Species of Principal Importance under Section 41 of the NERC Act (2006). Currently the bee's UK strongholds include the Thames gateway and a few other areas in southern England and South Wales. Although Brown-banded Carder Bee shows no strong habitat preference, it favours flower-rich grasslands including the early successional mosaic habitats on previously developed land characteristic of the post-industrial areas. The bee is also associated with the flower-rich Thames terrace grasslands. There are numerous previous records from within and in close proximity to the 2022 survey area. During the survey the bee was recorded extensively from flower-rich grassland and OMH, as well as from the saltmarshes of SSSI Units 3 and 4.
Shrill Carder Bee	*Bombus sylvarum*	Apidae	Hymenoptera	S41 Priority species		B,C1,D,U1,U3,U4	Open habitats - Tall sward and scrub - Rich flower resource	The Shrill Carder Bee *Bombus sylvarum* is one of the species frequently used as a flagship for OMH habitats. During the latter half of the C20th, the species suffered a massive decline from its former UK range, and it is now a rare and threatened species in the UK. This decline led to its being included originally as a UK BAP and now as a 'Species of principal importance' under Section 41 and 42 of the NERC Act (2006). The few known remaining populations are mainly confined to southern England and coastal sites in South Wales. The ex-industrial sites and remnant Thames terrace grasslands in south Essex and north Kent support, what is considered to be, one of the most important remaining metapopulations of *B. sylvarum* is the UK and the species is listed as 'Essex Vulnerable'. Shrill Carder Bee is thought to require a much larger area of suitable habitat than closely related *B. humilis* and is therefore, particularly susceptible to loss and reduction of suitable habitat, through development and intensive agriculture. According to Falk and Lewington (2015), Shrill Carder Bee uses 'A variety of habitats including species-rich grassland, coastal grazing marsh (especially flood-defence banks), coastal dunes, vegetated shingle and brownfield sites'. The species is polylectic, both in terms of pollen collected and nectar foraging. Early season queens are said by Falk and Lewington (2015) to favour White Dead-nettle *Lamium album*, but workers feed on a variety of leguminous plants. On coastal flood defences Red Clover *Trifolium pratense*, Red Bartsia *Odontites vernus*, Creeping Thistle *Cirsium arvense* and Bristly Oxtongue *Picris echioides* are particularly important foraging plants. During the 2022 survey, Shrill Carder Bee was recorded from OMH and herb-rich coastal grassland habitats in compartments B,C,D and SSSI Unit 1, as well as from saltmarsh in Units 3 and 4.
Phoenix Fly	*Dorycera graminum*	Ulidiidae	Diptera	S41 Priority species; Near Threatened (Post-2001 IUCN criteria)	pNT	B,C2,C4,D	Open habitats - Tall sward and scrub	The Phoenix Fly is a large and distinctive member of the Ulidiidae family. The insect was classed Nationally Rare (RDB3 (pre-1994) but was revised to Near Threatened based on post-2001 IUCN criteria in a review by Falk *et al* (2016). In addition, the species was included as a Biodiversity Action Plan priority species and is now a Section 41 'Species of principal importance' in England. Phoenix Fly is of restricted range in the UK, with the largest aggregation of recent records being from south-east England around the Thames Gateway. There are numerous recent records of the species within and around the 2022 survey area. The habitat preferences of the Phoenix Fly remain unresolved despite research undertaken for Natural England by Ismay (2000). Ismay refers to anecdotal records of the

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
								species ovipositing on flowers of Black Bryony *Tamus communis*, but the adult insect has most frequently been recorded in the UK on the flowers of umbellifers such as Hogweed *Heracleum sphondylium*, Alexanders *Smyrnium olusatrum* and Hemlock Water-dropwort *Oenathe crocata*. Whilst the species is primarily associated with tall grasslands, Ismay (2000) the 'types of grassland varied greatly', ranging from both acid and calcareous and dry to wet grasslands. The only common factor was considered to be a degree of disturbance between sites. Disturbance factors including 'sand, gravel or chalk extraction or major clearance of vegetation' were cited by Ismay (2000). In 2022, Phoenix Fly was frequently recorded, with records from OMH and established grassland habitats in B,C2,C4 and D; however, it was also seen but not formerly recorded in SSSI Unit 1 during fieldwork.
Cinnabar	*Tyria jacobaeae*	Erebidae	Lepidoptera	S41 research only	LC	A1,B,D,U1	Open habitats - Tall sward and scrub	Whilst the Cinnabar *Tyria jacobaeae* is still a common and widespread day flying moth in the UK, the species has suffered a significant recorded decline in recent decades. This has led to its inclusion as a 'Species of Principal Importance' for 'research only' under Section 41 of the NERC Act (2006). The insect is associated with a range of grassland and brownfield habitats, the larvae feeding on ragworts *Senecio* spp. Cinnabar has been well recorded throughout the southern half of the UK and there are a number of records within and in close proximity to the 2022 survey area. During the 2022 survey, adults and larvae of the moth were recorded throughout the grassland and OMH areas supporting the foodplant.
Five-banded Weevil-wasp	*Cerceris quinquefasciata*	Crabronidae	Hymenoptera	Section 41 priority species; RDB3 (pre-1994 criteria)		U1	Open habitats - Short sward and bare ground	The Five Banded Weevil Wasp *Cerceris quinquefasciata* is a rare species in the UK, it has been historically recorded from the southern half of the UK, the majority of records coming from East Anglia, with further concentrations of records from lowland heathland sites in Dorset and the Thames corridor area of south Essex and north Kent. In Essex there are a number of records including several within and in close proximity to the 2022 survey area. The species is listed as an S41 'Species of principal importance' and was previously included as a priority species in the UK BAP due to a severe recorded decline in the UK. In Essex the species is listed as an 'Essex Threatened' species in the Essex RDB. *C. quinquefasciata* is another species often used as a flagship for brownfield sites, by organisations such as Buglife. Like other members of the genus *Cerceris,* the Five Banded-tailed Digger Wasp is ground-nesting, typically using sandy soils. The insect stocks its nests with weevils (Curculionidae) including pea weevils *Sitona* spp. and sometimes on orthocerous species such as Apionidae (Baldock, 2010), on which the developing larvae feed. During the 2022 survey, *C. quinquefasciata* was recorded only from SSSI Unit 1; however, a number of individuals were recorded.
A marsh fly	*Colobaea punctata*	Sciomyzidae	Diptera	Notable		A1	Wetland; Acid & sedge peats; Reedfen and pools	*Colobaea punctata* is a widespread, but locally distributed species of marsh fly which has been recorded from both inland and coastal locations from Yorkshire southwards. The fly is mainly coastal to the west. There are a number of inland records from the East Anglian fens, and it has been well recorded from sites bordering the Thames in south Essex, including the general survey area. According to Falk (1991), *C. punctata* is associated with lush marginal vegetation beside rivers, lakes, ponds and ditches. Like other species of marsh or snail-killing fly, the larvae are specialist parasitoids of terrestrial and aestivating aquatic snails. Falk (1991) cites known host species as including *Planorbarius cornueus, Planorbis planorbis* and *Lymnaea peregra* (*Ampullaceana balthica*). The adults are characteristically found where lower summer water-levels leave their snail hosts stranded beside ditches and ponds. During the 2022 survey, *C. punctata* was recorded only from compartment A1.

Common name	Scientific name	Family	Order/higher taxon	UK status	IUCN post-2001 threat status	Recorded compartments	Pantheon affinities	Description
A picture-winged fly	*Melieria picta*	Ulidiidae	Diptera	pNationally scarce		A1,C1,D,SSSI Unit 1,2,3,4	Coastal - Brackish marsh and ditches; Saltmarsh - Saltmarsh and transitional brackish marsh	*Melieria picta* is a very local species in the UK, with scattered records as far north as Westmorland. However, the fly is recorded mainly in southeast England where the bulk of records are from the Thames Estuary. There are numerous post-1990 records for the insect in south Essex and it has been well recorded in the general vicinity of the 2022 survey area. According to Falk *et al* (2016), *M. picta* is associated with saltmarsh, brackish ditches, and fleets of coastal levels. The biology is poorly known, although Falk *et al* (2016) conjecture that the larvae may develop in decaying vegetable matter. During the 2022 survey, *M. picta* was recorded in all four SSSI Units, as well as from compartments A1,C1 and D.
A picture-winged fly	*Campiglossa malaris*	Tephritidae	Diptera	pNationally scarce		A1,C1,D,SSSI Unit 1,2,3,4	Open habitats - Short sward and bare ground; Tall sward & scrub	*Campiglossa malaris* is a species of picture wing fly which was relatively recently added to the British list. There are now scattered records as far north as south Yorkshire, the insect having mainly been recorded from the midlands, South Wales and in southeast England. There are several post-1990 records for the *C. malaris* in south Essex and it has been recorded in close proximity to the 2022 survey area. According to Falk (1991), *C. malaris* (then called *Paroxyna lhommei)* had been found on chalk grassland and coastal shingle in the UK and adults had been recorded in association with ragworts *Senecio* spp. (now *S. erucifolius* and *S. jacobaea* have been confirmed as hostplants). During the 2022 survey, *M. picta* was recorded only from compartment A1. The status of the fly is listed as Pantheon as pNS; this being a revision of the previous status of 'Endangered' afforded by Falk (1991).
A spider-hunting wasp	*Priocnemis confusor*	Pompilidae	Hymenoptera	Nationally Scarce	LC	U1	Open habitats - Short sward and bare ground	*Priocnemis confusor* is a scarce species of spider-hunting wasp in the UK, with widely scattered records as far north as north Yorkshire; however, the species is commonest in southeast England and there are several records within the Thames corridor area. Helen and Roy (2016) refer to habitat descriptions in Day (1988) who described *P. confusor* as being a species of woodland and more open ground, on heavy clay, also citing Baldock (2010) who stated that 'In Surrey, many of the records are from sandy areas'. Helen and Roy (2016) state that 'There is very little data on the spider prey' but mention that in Kent a female wasp had been recorded with a juvenile clubionid, but that jumping spiders (Salticidae) have been recorded as prey on the Continent. During the 2022 survey, *P. confusor* was recorded only from pitfall trap samples located within SSSI Unit 1. The trap cluster was set in sandy, short-sward coastal grassland, with bare ground patches.
Dun Sentinel	*Assiminea grayana*	Assimineidae	Gastropoda	Nationally Scarce	LC	U2,U3,U4	Coastal - Brackish marsh and ditches; Saltmarsh	The Dun Sentinel *Assiminea grayana* is a nationally scarce species of snail associated with saltmarsh habitats. In the UK, the species is exclusively coastal, with most records being from the East Anglian coast and the Thames Estuary. There are also scattered aggregations of records from the top of Wales, northwards, as far as the Solway in Scotland. In Essex, there are a number of records from the more exposed southeast coast at the entrance of the Thames Estuary, these becoming less frequent inland, where the snail has been recorded from Canvey Island to the east of the 2022 survey area, but also from the Rainham Marshes area to the west.

Appendix 2

Figure 1 - Sub Compartment A1 survey area and sample locations

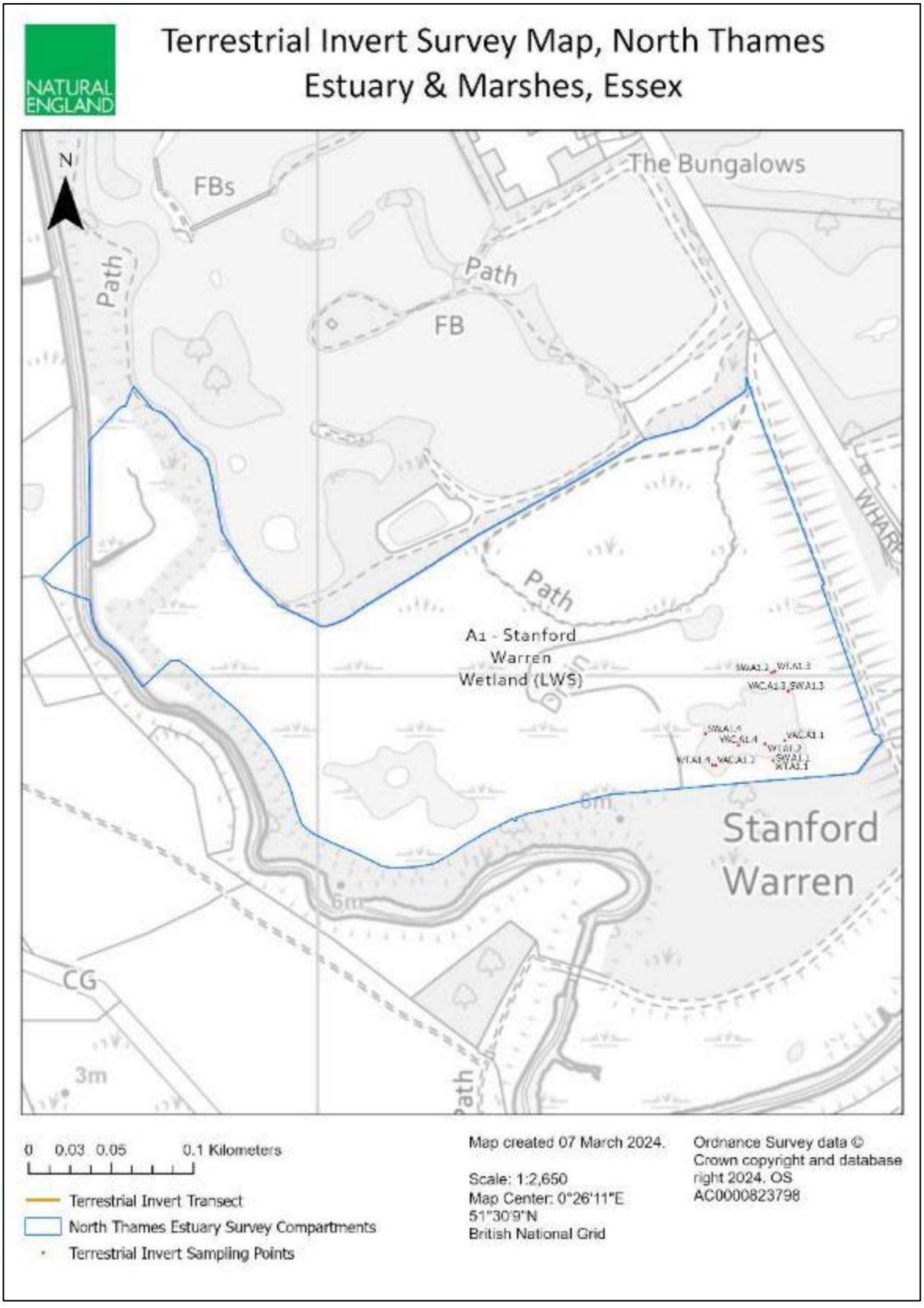


Figure 2 – Sub compartment A2 survey area and sample locations

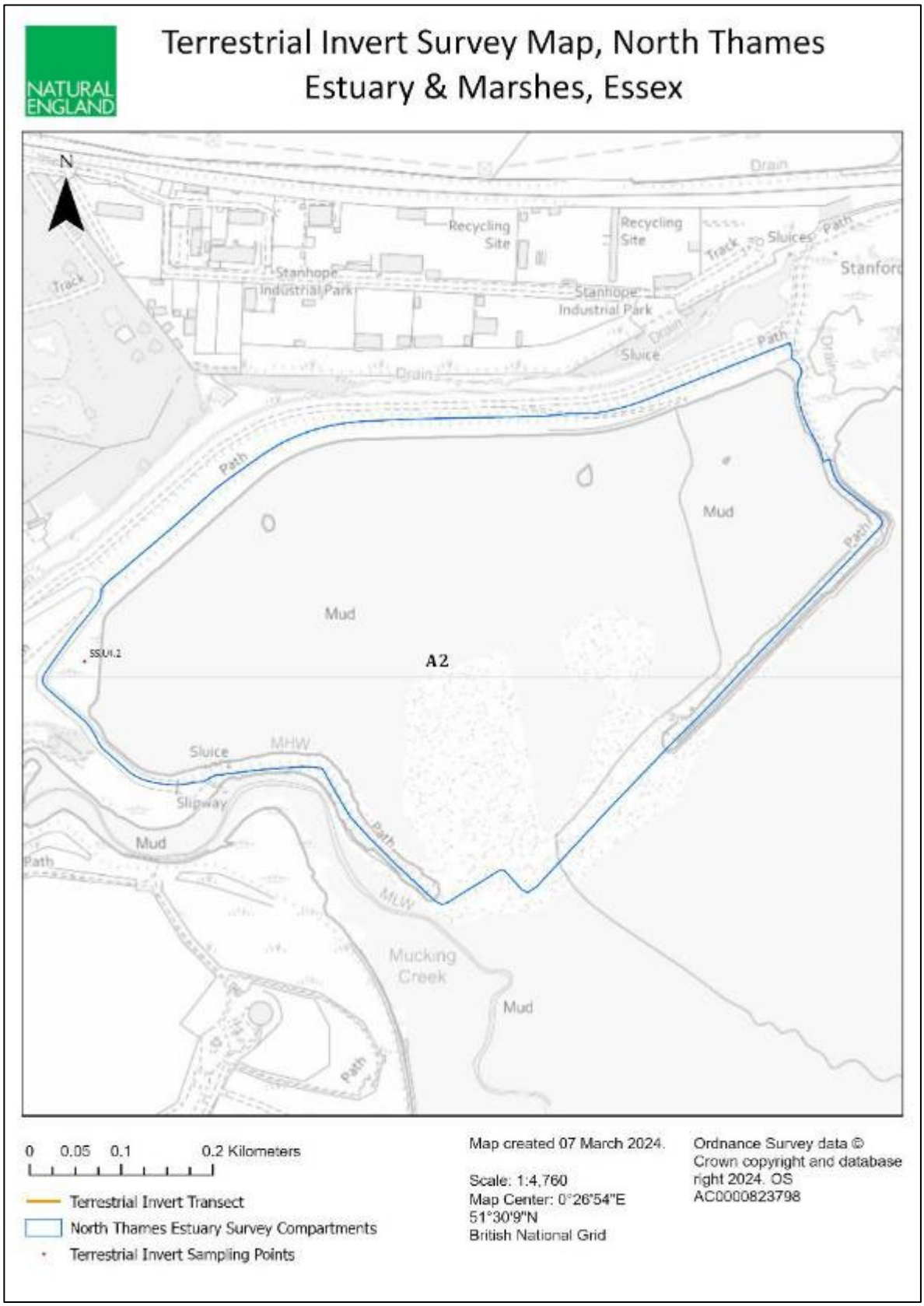


Figure 3 – Sub-Compartment A6 survey area and sample locations

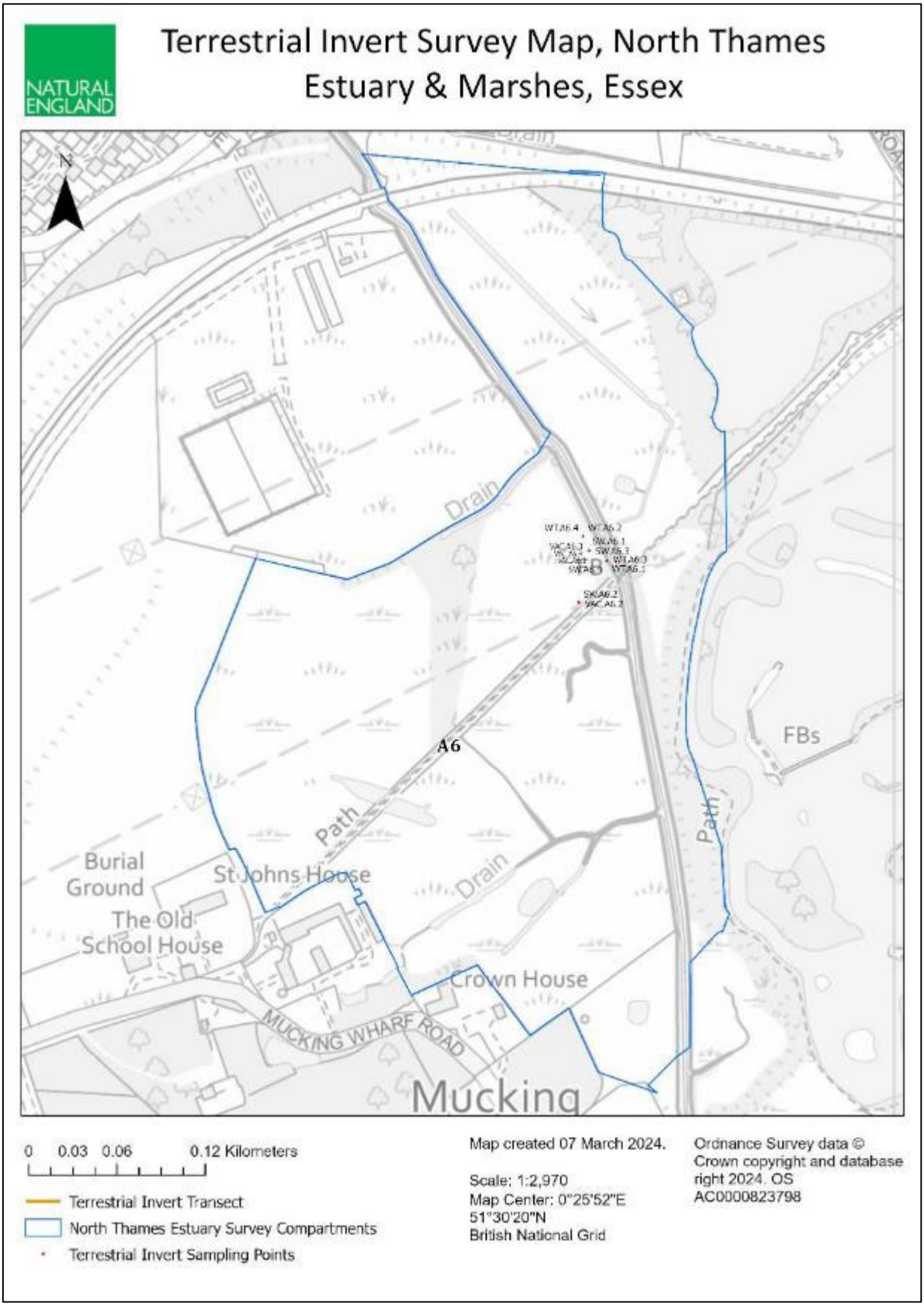


Figure 4 - Compartment B survey area and sample locations

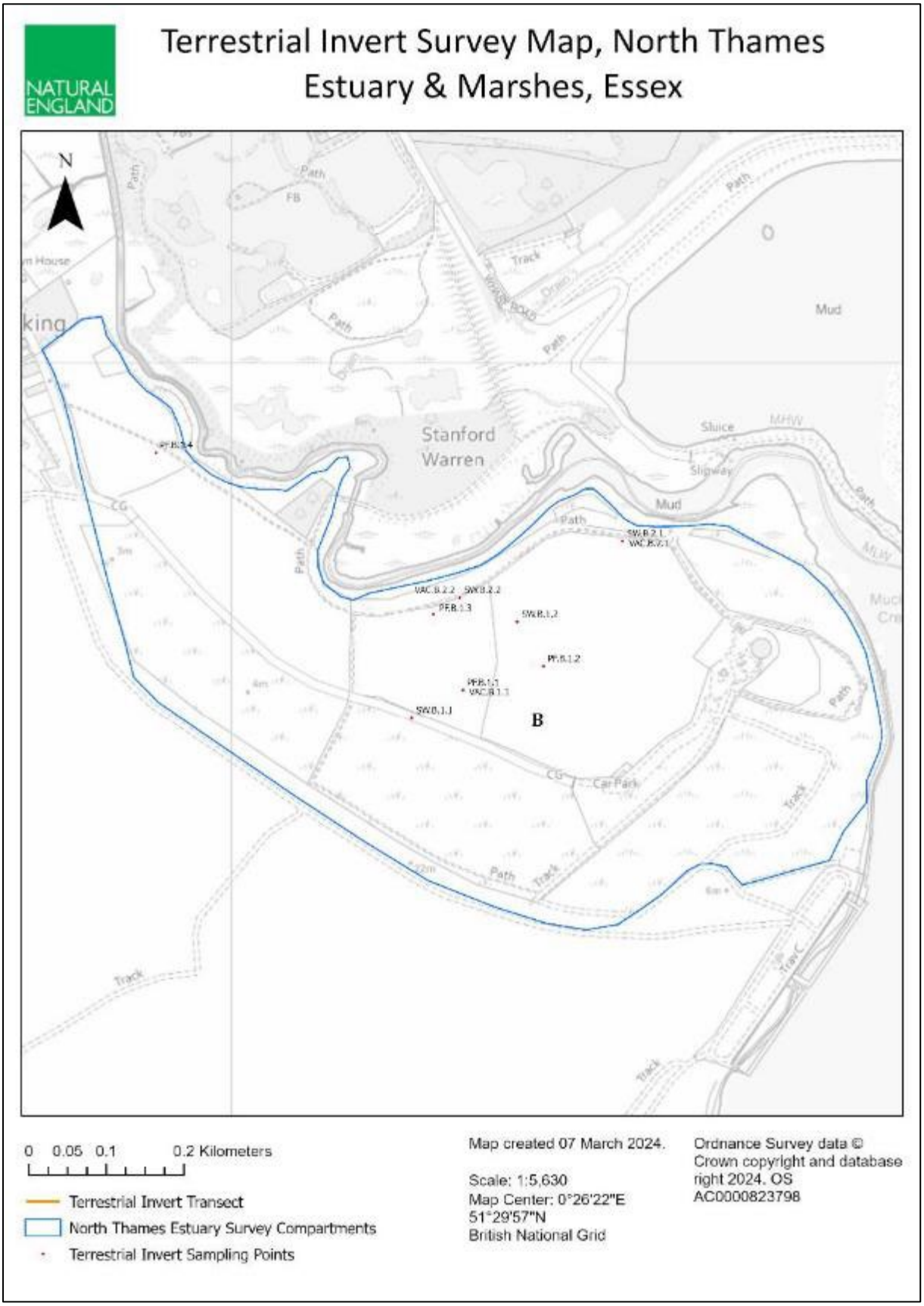


Figure 5 - Compartment C1 survey area and sample locations

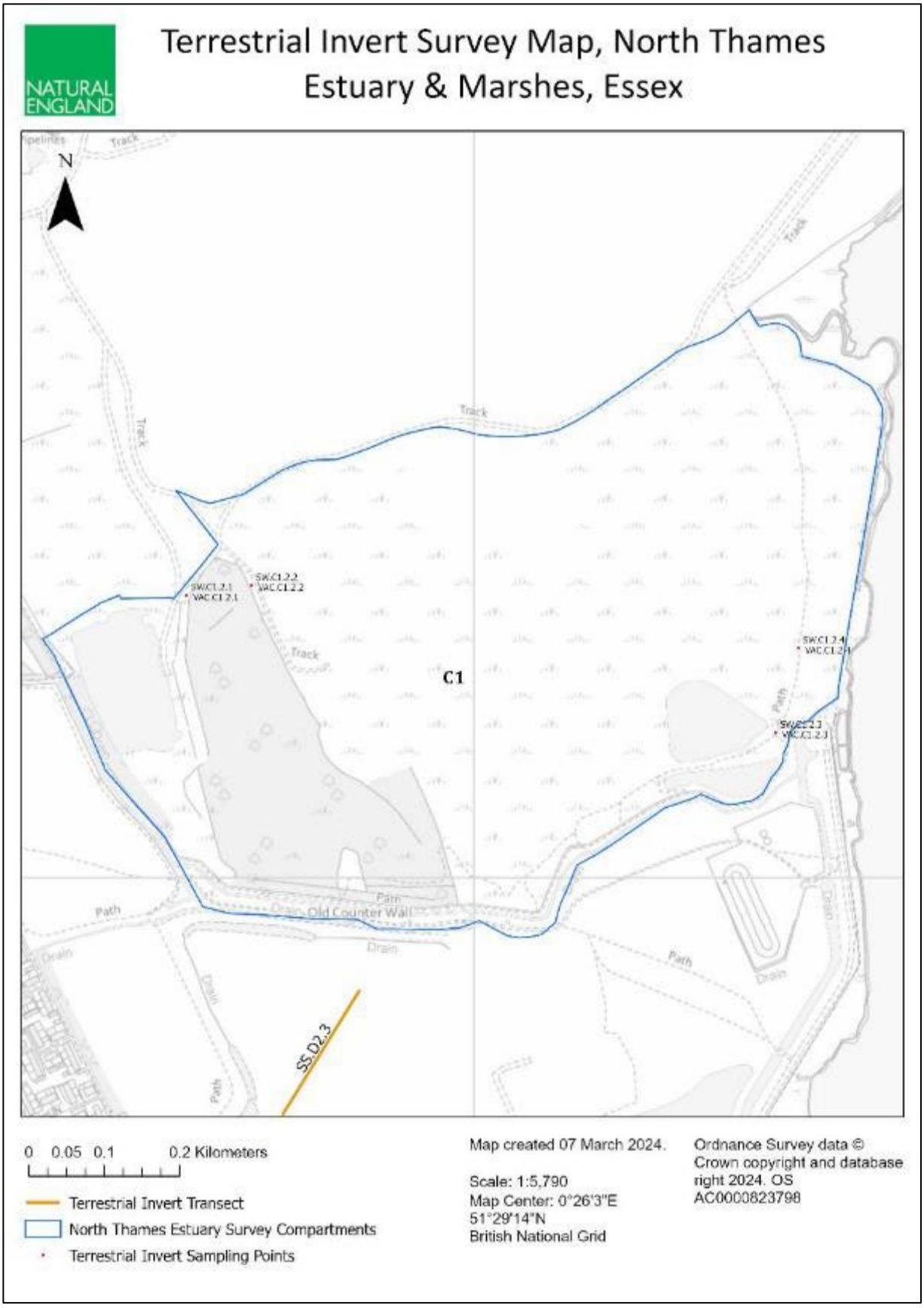


Figure 6 - Compartment C2 survey area and sample locations

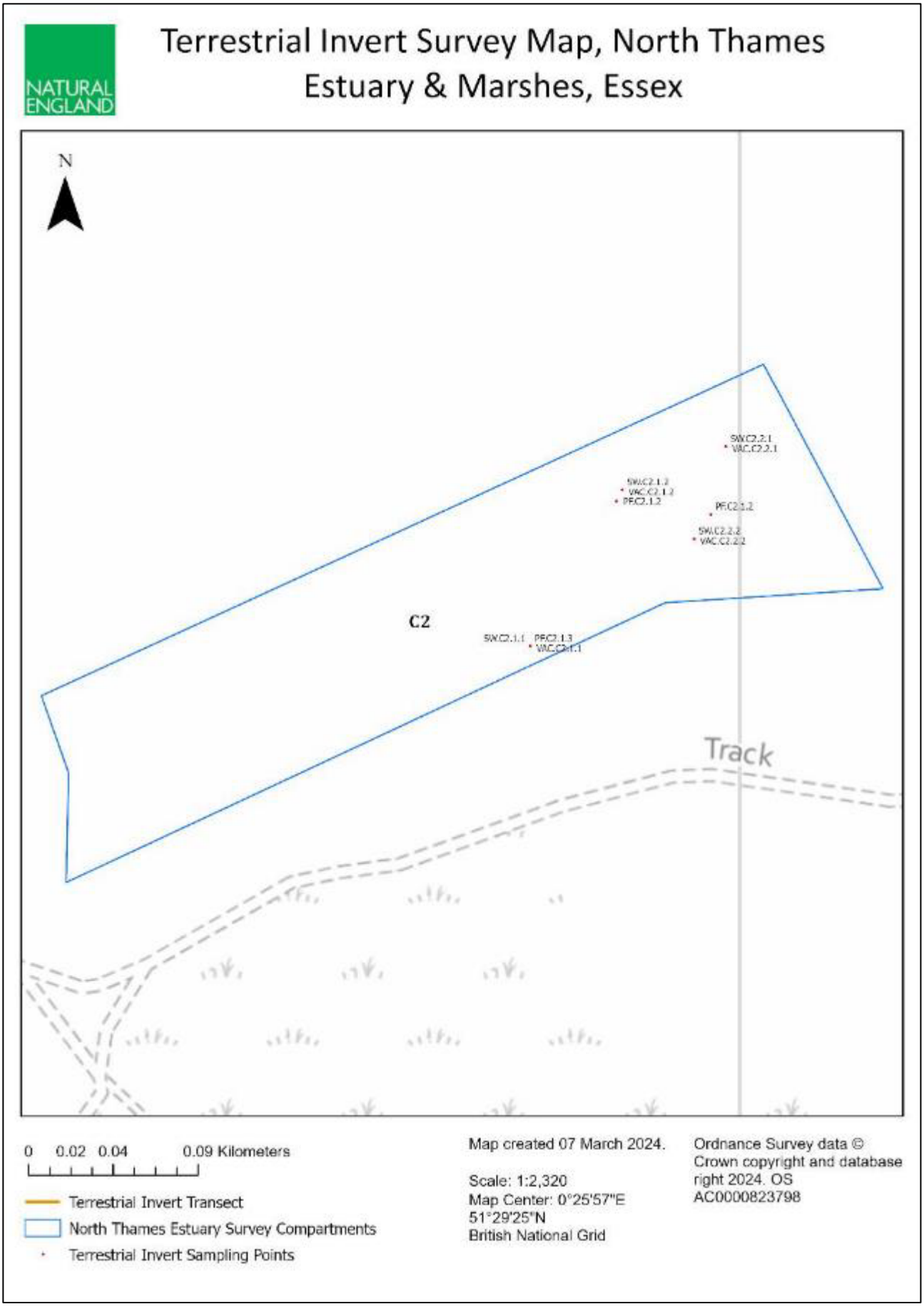


Figure 7 - Compartment C3 survey area and sample locations

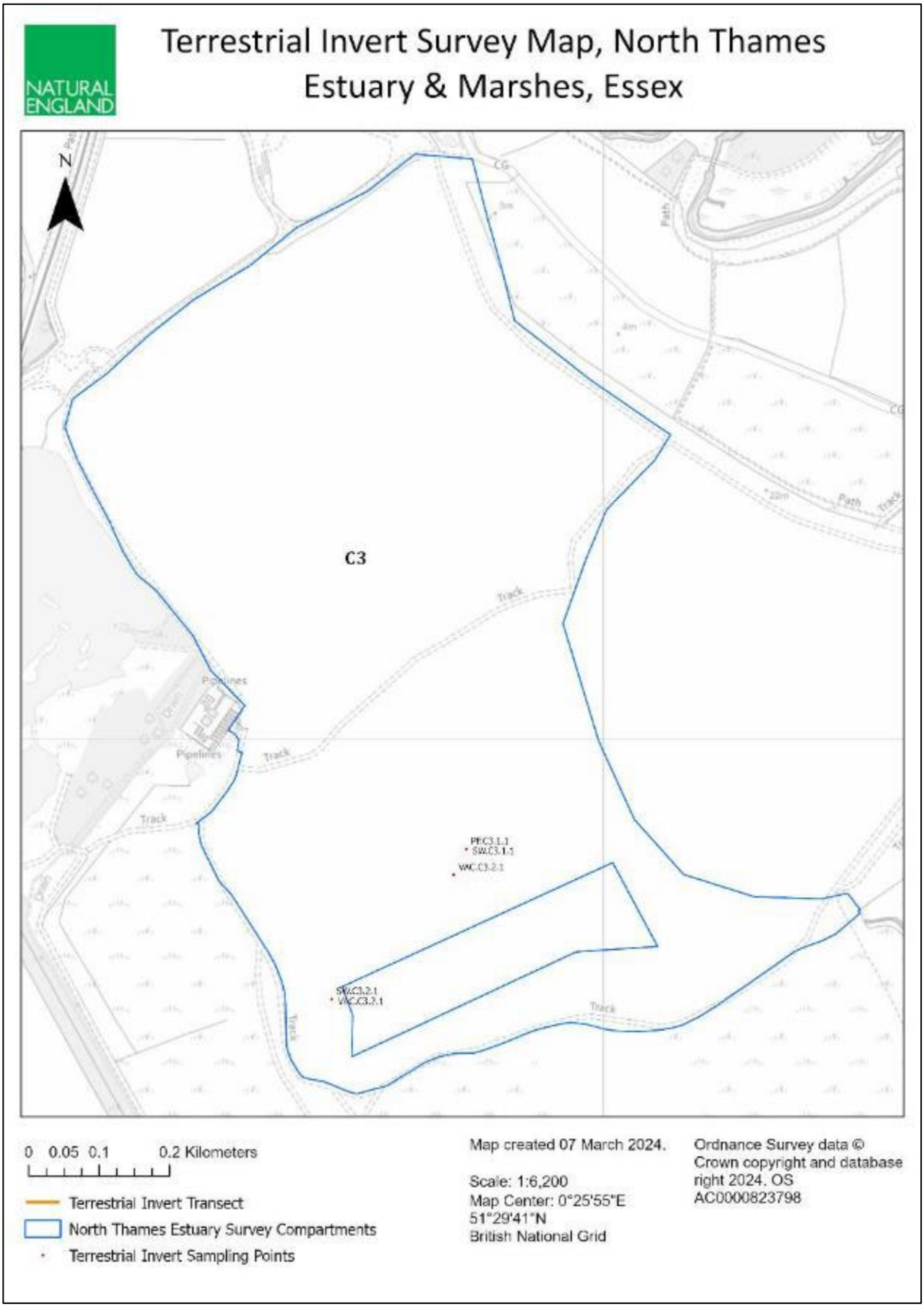


Figure 8 - Compartment C4 survey area and sample locations

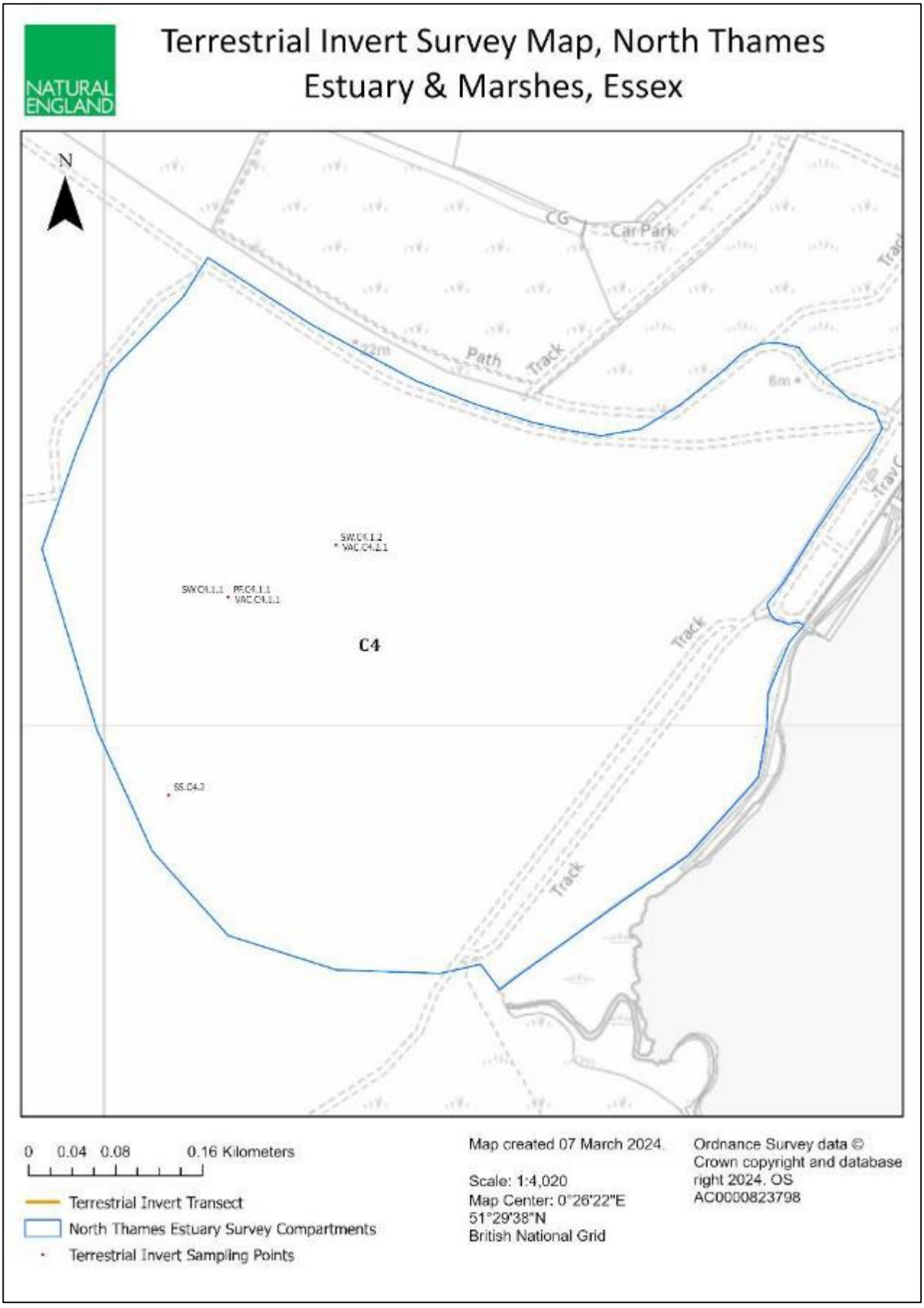


Figure 9 – Compartment C5 survey area and sample locations

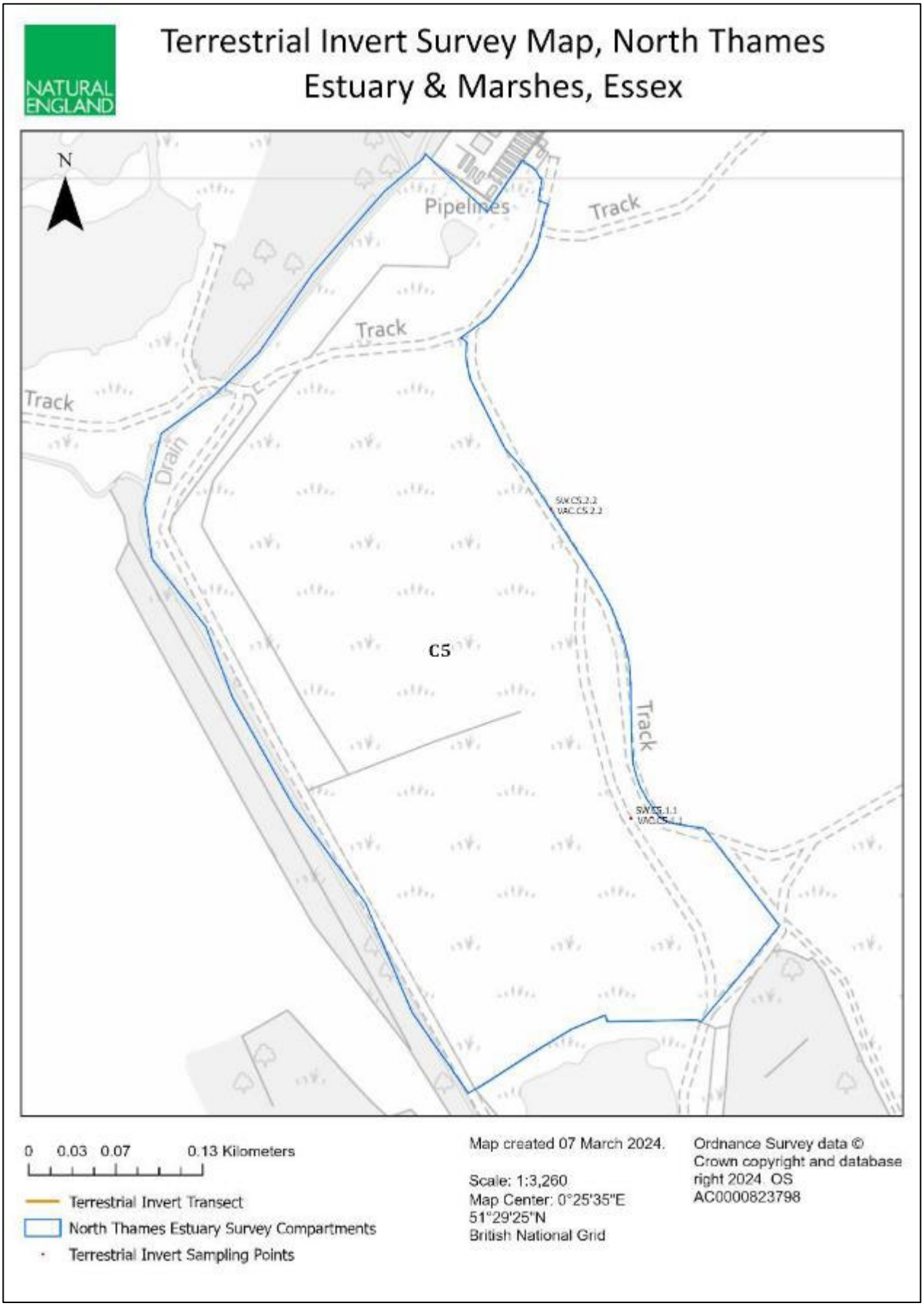


Figure 10 - Compartment D survey area and sample locations

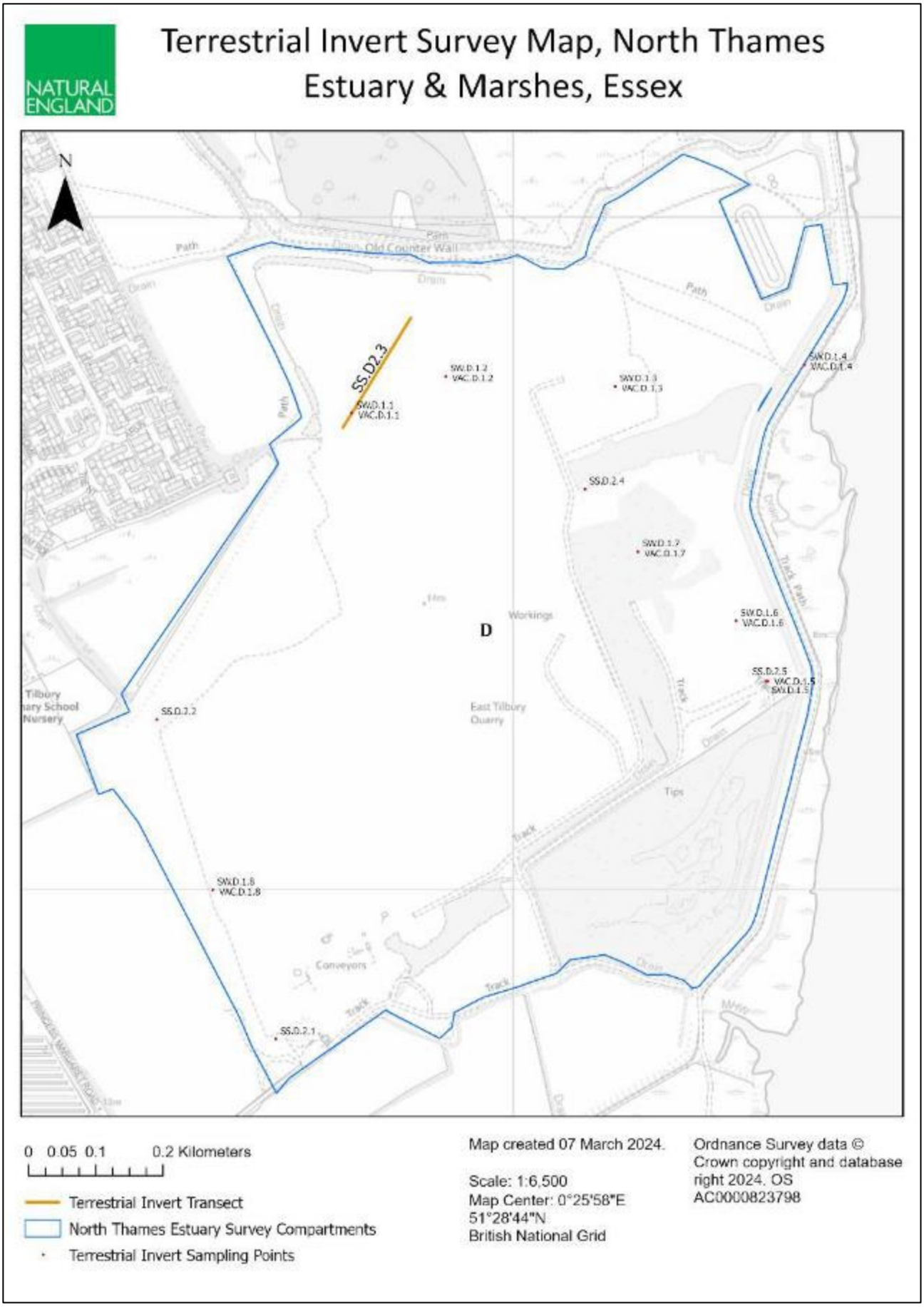


Figure 11 - SSSI Unit 1 survey area and sample locations

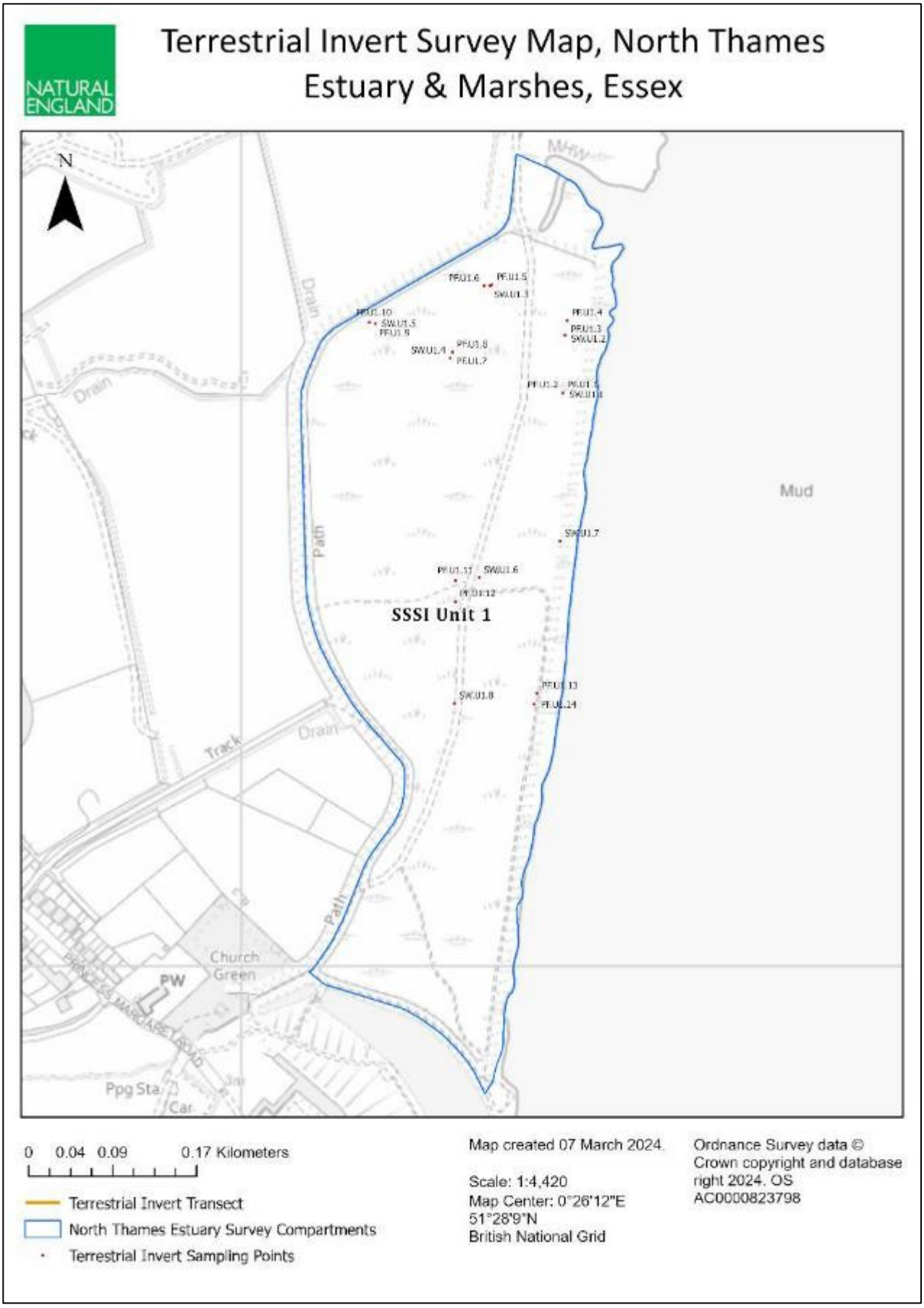


Figure 12 - SSSI Unit 2 survey area and sample locations

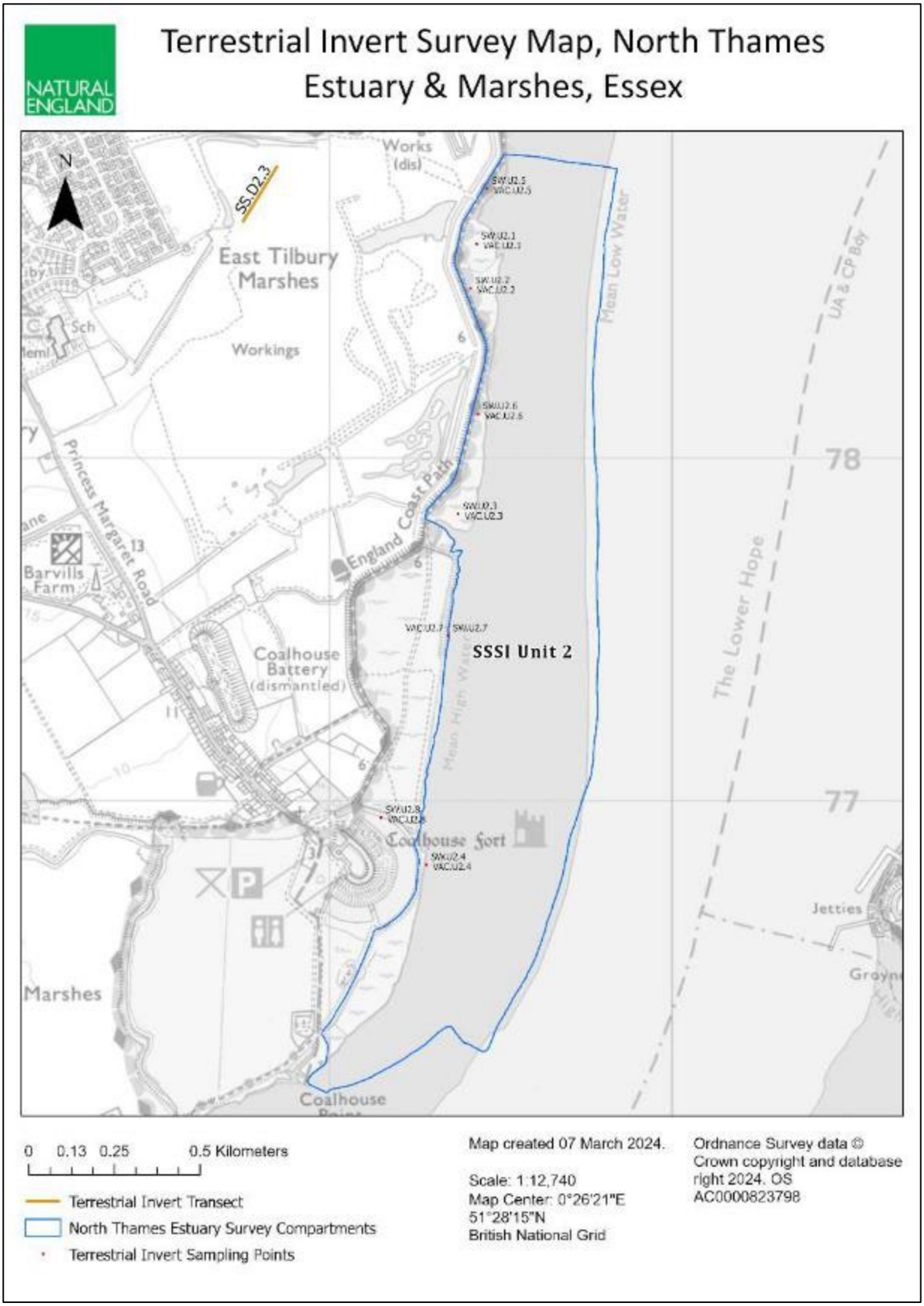


Figure 13 - SSSI Unit 3 survey area and sample locations

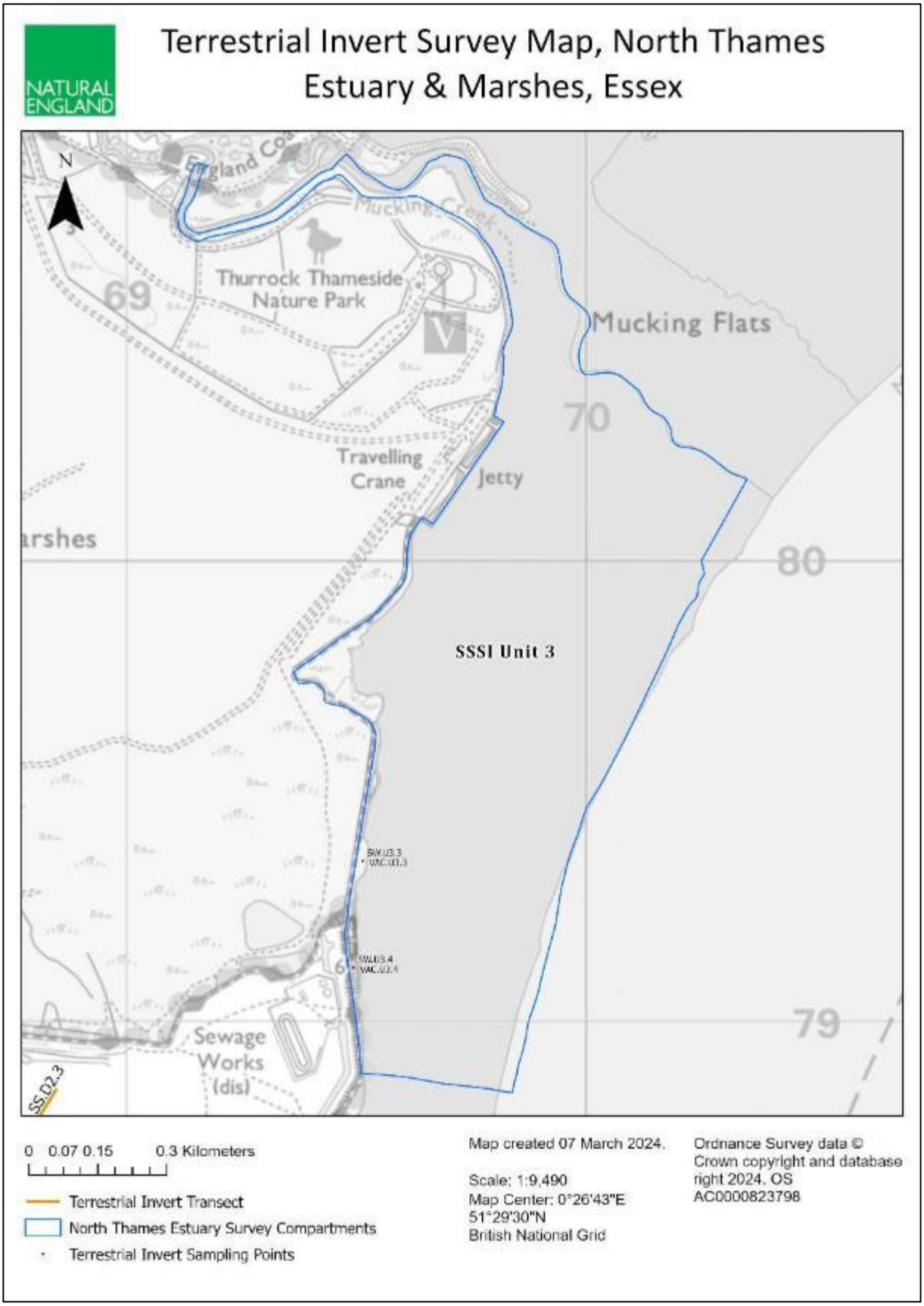
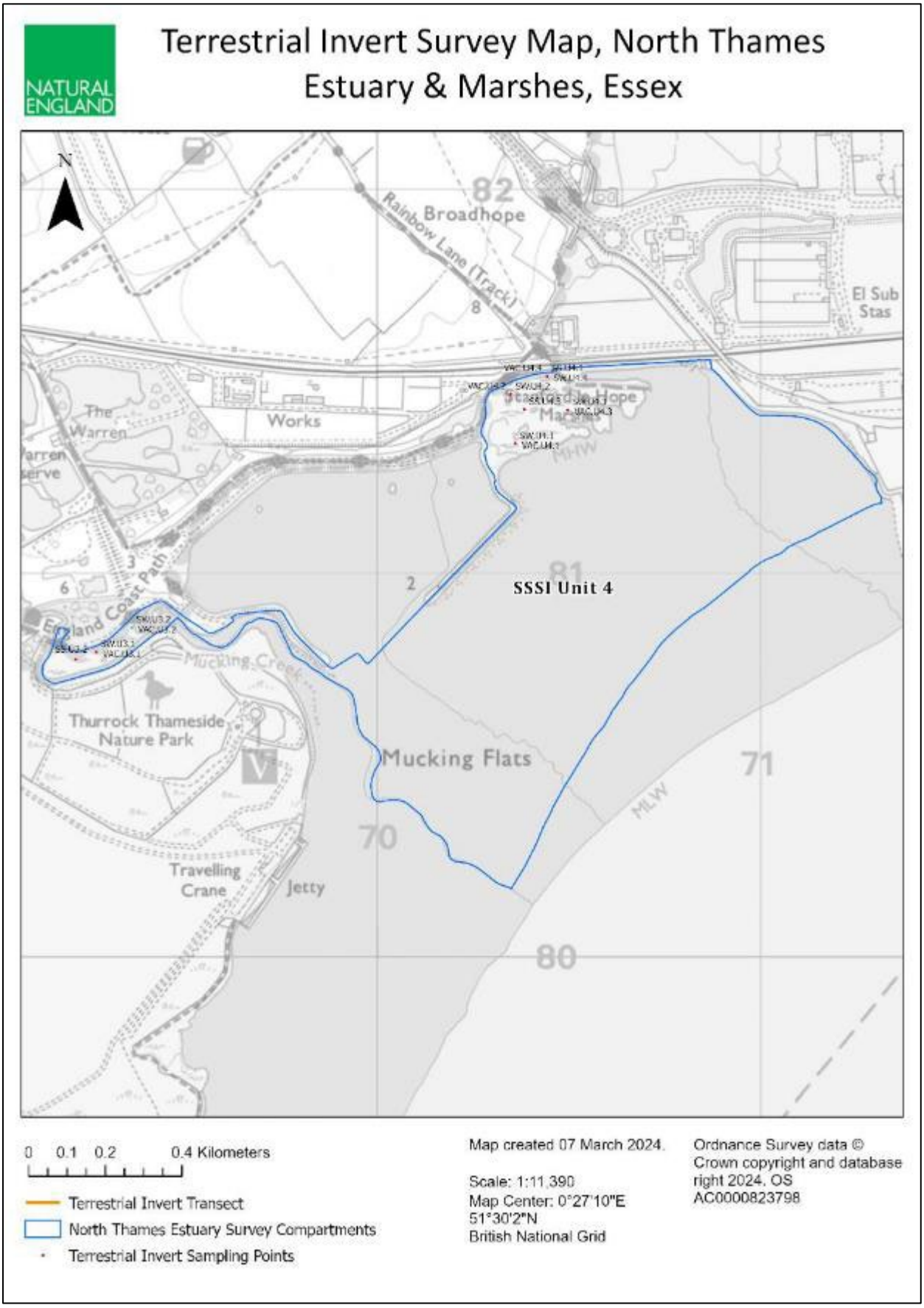


Figure 14 - SSSI Unit 4 survey area and sample locations



Appendix 3

Photographs (All photos copyright Jon Mellings, apart from Photo 20, copyright Ross Piper)

Photo 1 - grassland and *Phragmites australis* mosaic (A1)

Photo 2 - open water and reed-fen & pools margin (A1)

Photo 3 - general reed-fen & pools (A6)

Photo 4 - reed-fen & pools margin and track (A6)

Photo 5 - rabbit-disturbance compartment B

Photo 6 - flower-rich grassland compartment B

Photo 7 - general grassland compartment B

Photo 8 - partially disturbed ground compartment B

Photo 9 - track edge habitat compartment C1

Photo 10 - taller sward grassland compartment C1

Photo 11 - grassland and scrub C1

Photo 12 - grassland and scrub by sea wall C1

Photo 13 - partially vegetated ballast banks in C2

Photo 14 - ballast banks C2

Photo 15 - early successional habitat in C2

Photo 16 - established grassland compartment C2

Photo 17 - pitfall location compartment C2

Photo 18 - OMH - compartment C3

Photo 19 - spoil bank - compartment C3

Photo 20 - *Odynerus spinipes* nest - compartment C3

Photo 21 - OMH - compartment C4

Photo 22 - OMH - compartment C4

Photo 23 - vegetated spoil mound (C4)

Photo 24 - vegetated spoil mound (C4)

Photo 25 - track edge OMH compartment C5

Photo 26 - track edge OMH compartment C5

Photo 27 - partially vegetated OMH compartment D

Photo 28 - flower-rich OMH compartment D

Photo 29 - sparsely-vegetated OMH compartment D

Photo 30 - grassland by seawall compartment D

Photo 31 - flower-rich OMH by lagoon compartment D

Photo 32 - flower-rich field margin compartment D

Photo 33 - sparsely-vegetated chalk compartment D

Photo 34 - partially vegetated spoil compartment D

Photo 35 - established OMH compartment D

Photo 36 - flower-rich OMH compartment D

Photo 37 - general grassland SSSI Unit 1

Photo 38 - tall sward grassland SSSI Unit 1

Photo 39 - sea-defence bank SSSI Unit 1

Photo 40 – seaward extent of saltmarsh SSSI Unit 2

Photo 41- dried out tidal pool SSSI Unit 2

Photo 42- *Salicornia* vegetated tidal pool SSSI Unit 2

Photo 43 - raised banks in saltmarsh SSSI Unit 2

Photo 44 - narrow northern saltmarsh SSSI Unit 2

Photo 45 - Mucking Creek saltmarsh SSSI Unit 3

Photo 46 - Mucking Creek saltmarsh SSSI Unit 3

Photo 47 - spoil cliff and saltmarsh SSSI Unit 3

Photo 48 - saltmarsh adjacent the Thames SSSI Unit 3

Photo 49 - saltmarsh adjacent the Thames SSSI Unit 3

Photo 50 - saltmarsh on hard standing SSSI Unit 3

Photo 51 - upper saltmarsh SSSI Unit 4

Photo 52 - upper saltmarsh SSSI Unit 4

Photo 53 - mid saltmarsh SSSI Unit 4

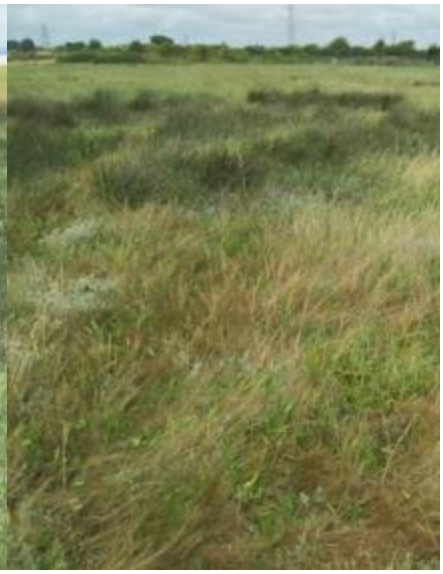


Photo 54 - mid saltmarsh SSSI Unit 4

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