THE LONDON RESORT

The London Resort Development Consent Order

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Environmental Statement
Volume 2: Appendices

Appendix 12.1 – Ecology Baseline Report

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Planning Act 2008
The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009
Regulation 5(2)(a)
The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017
Regulation 12(1)

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The London Resort

Appendix 12.1: Ecology Baseline Report

Prepared by:
The Environmental Dimension Partnership Ltd

On behalf of:
London Resort Company Holdings Limited

December 2020
Report Reference
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Executive Summary

S1 This Ecology Baseline Report provides the baseline ecological conditions and identified Important Ecological Features (IEFs) relevant to the Proposed Development of land on the Swanscombe Peninsula, Ebbsfleet Valley, and south side of the River Thames (referred to as 'the Kent Project Site'), and land to the east of the A1089 Ferry Road and the Tilbury Ferry Terminal (referred to as 'the Essex Project Site'). Collectively these two parts of the Development Consent Order (DCO) Limits are referred to as 'the Project Site'. It comprises 413.07 hectares (ha).

S2 The baseline ecological investigations include a desk study, Extended Phase 1 Habitat Survey, River Corridor Survey and River Habitat Survey, and detailed (Phase 2) surveys including a botanical survey and others relating to birds, bats, dormouse (*Muscardus avellanarius*), badger (*Meles meles*), otter (*Lutra lutra*), water vole (*Arvicola amphibious*), harvest mice (*Micromys minutus*), great crested newts (*Triturus cristatus*), reptiles and aquatic and terrestrial invertebrates.

S3 No part of the Project Site is covered by any statutory designations designated for ecological reasons however, Bakers Hole Site of Special Scientific Interest (SSSI) designated for geological reasons is within the Kent Project Site. There are four international statutory designations within 15km; two of which are considered likely to be impacted by the Proposed Development (Thames Estuary and Marshes Special Protection Area (SPA)/Ramsar and Medway Estuary and Marshes SPA/Ramsar/SSSI).

S4 LRCH Ltd have received correspondence from Natural England informing them of an area of land within the DCO boundary that is being considered for notification as a SSSI. Given the early stage of this process, this pre-notification is not considered any further as part of this assessment. The Applicant is will be working closely with Natural England as further details of the SSSI notification process emerge.

S5 There are seven statutory designations of national importance within 5km and five more at a greater distance but considered to be within the Zone of Influence due to ecological connectivity. Nine of these national designations have potential to be impacted by the Proposed Development and therefore considered as IEFs in the Ecological Impact Assessment (EcIA), including Darenth Woods SSSI, Inner Thames Marshes SSSI, South Thames Estuary and Marshes SSSI, Mucking Flats and Marshes SSSI, Medway Esturary SSSI, West Thurrock Marshes SSSI, Shorne and Ashenbank Woods SSSI, Cobhan Woods SSSI and Great Cabbles Wood SSSI.

S6 There are 19 non-statutory designations within 2km of the DCO boundary including Botany Marshes Local Wildlife Site (LWS) within the Kent Project Site and Ebbsfleet Marshes LWS partially within the Kent Project Site and two further LWSs within 100m of the DCO boundary; these four LWSs are considered likely to be impacted by the Proposed Development.

S7 The Essex Project Site comprises predominantly hardstanding with small linear areas of poor semi-improved grassland and scrub, adjacent to seasonally wet ditches.

S8 The Kent Project Site supports a range of habitats including intertidal sediment, saltmarsh, wetlands, including running water (the Ebbsfleet), open water (ponds), reedbed/swamp and ditch networks, a range of grasslands and open mosaic habitats, arable, scrub, woodland, chalk cliffs/exposures, buildings and bare ground. The extensive semi improved grassland and scrub mosaic, broadleaved semi-natural woodland, poor semi-improved grassland and the River Ebbsfleet corridor are of value at the Local level. The open mosaic on previously developed land, coastal/floodplain grazing marsh, waterbodies (primarily the ditch network), and areas of higher quality grassland are all considered of district level importance. The swamp (reedbed) is considered of County level importance. There are also populations of a number of nationally scarce plant species which are of National importance. Areas of ancient woodland, considered of County level importance, are present in the zone of influence of the Project Site.

S9 Species surveys were undertaken in 2012 and 2016 and are currently being updated in 2020. Surveys have confirmed that the Kent Project Site supports a wintering wading bird assemblage of International value, a wintering terrestrial bird assemblage of County value, a breeding bird assemblage of County value, a roosting bat assemblage of Local value, a foraging bat assemblage of District value, a breeding dormouse population of District value, a breeding population of water vole of District value, an otter population of Local value, a harvest mouse population of Local value, an amphibian assemblage of Local to District value, a terrestrial invertebrate assemblage of National value and an aquatic invertebrate assemblage of County to regional value.

S10 The IEFs that are pertinent to an EcIA in respect of the Proposed Development are those considered to be of Local value or higher and likely to be impacted by the Proposed Development They are listed in **Table EDP S1**. The freshwater fish assemblage is not an IEF as the value is considered likely to be at a Site level only however, the assemblage will inform a 'no deteroration assessment' of on-site waterbodies. Therefore, due to consultation responses from the Environment Agency, the freshwater fish assemblage will be taken forward and considered within the EcIA.

Table EDP S1: IEFs to be taken forward for the EcIA, based on survey work completed to date.

Important Ecological Feature	Key Attributes	Nature Conservation Value
Designations		
Thames Estuary and Marshes SPA/Ramsar (includes Mucking Flats and Marshes SSSI)	Extensive intertidal mudflats with saltmarsh and channel systems. Internationally important assemblage of birds and wintering populations of many wader species.	International
Medway Estuary and Marshes SPA/Ramsar/SSSI	Single tidal system with the Swale and joins the southern part of the Thames Estuary between the Isle of Grain and Sheerness. Internationally importance of assemblage of birds and wintering populations of many wader species.	International
Darenth Woods SSSI	Some of the most valuable areas of ancient semi-natural woodland in north-west Kent with rare woodland types.	National
Inner Thames Marshes SSSI	Largest remaining expanse of wetland bordering the upper reaches of the Thames Estuary. Diverse bird interest especially the variety of breeding birds and the numbers of wintering wildfowl, waders, finches and birds of prey.	National
South Thames Estuary and Marshes SSSI	Extensive mosaic of grazing marsh, saltmarsh, mudflats and shingle characteristic of the estuarine habitats of the north Kent marshes. Freshwater pools and some areas of woodland provide additional variety and complement the estuarine habitats. Supports outstanding numbers of waterfowl, total counts regularly over 20,000.	National
West Thurrock Lagoon and Marshes SSSI	One of the most important sites for wintering waders and wildfowl on the Inner Thames Estuary. Extensive intertidal mudflats together with a large and secure high tide roost, attracts waders in nationally important numbers, with significant populations of other bird species. The adjacent Stone Ness saltmarsh is noted for the size and character of its high marsh plant community.	National
Shorne and Ashenbank Woods SSSI	A complex of ancient and plantation woodland that includes a variety of stand-types associated with Tertiary gravels, clays and sands. Supports a diverse invertebrate fauna, especially its Coleoptera (beetles), Hemiptera (true bugs), and Odonata (dragonflies).	National
Cobhan Woods SSSI	Woodland and old parkland representative of woods in North Kent which occur in part on acidic Thanet Sands and in part on chalk soils. An outstanding assemblage of plants is present. Also of importance for breeding birds.	National
Great Cabbles Wood SSSI	Representative of woods on North West Kent Tertiary sediments. Most of the woodland is mixed coppice under oak standards, with sweetchestnut as the dominant species. A number of scarce plants occur, including ladyorchid (*Orchis purpurea*) and man orchid (*Aceras anthropophorum*).	National

Important Ecological Feature	Key Attributes	Nature Conservation Value
Botany Marshes LWS	Reedbed and potential for ditch & grazing marsh restoration. Reedbed and grazing marsh are of principal importance in England. Also supports three species of reptile, water vole, otter and is of value to birds.	County
Ebbsfleet Marshes, Northfleet LWS	Range of habitats including reedbed, calcareous stream, lake, scrub, woodland, calcareous and neutral grassland. Protected species have been recorded including reptiles and great crested newts.	County
Alkerden Lane Pit LWS	Contains nationally scarce plants and Kent's largest population of green-flowered helleborine (*Epipactis phyllanthes*). Also contains round leaved wintergreen (*Pyrola rotundifolia*) and several species of nationally rare and scarce invertebrates.	County
Tilbury Marshes LWS	Diverse saltmarsh flora. Good grazing-marsh flora. An important invertebrate habitat destroyed by development, but some of the key species may survive on these remaining fragments.	County
Habitats/Flora		
Rare plants	Populations of 13 nationally scarce species were found in 2016. Eight were refound in 2020.	National
Broad leaved semi natural woodland	Woodland with good canopy species and ground flora species diversity. Connects to other woodlands in wider area. – Meets criteria for Priority habitat[1].	Local
Ancient woodland	Considered an irreplaceable habitat in planning terms, with Darenth Woods also designated as a SSSI. Remaining areas of ancient woodland not designated as SSSI or LWS. Collectively, considered of county value	County
Scrub	Extensive mature and colonising scrub forming a corridor of woody habitats between the A2 and the River Thames.	Local
Semi-improved grassland	Including areas of species-poor semi-improved grassland and areas of semi-improved neutral, and calacareous grassland (with relict areas of more species-rich grassland of NVC MG1d and CG2 but not extensive or fine examples).	Local to District
Coastal/Floodplain Grazing Marsh	Botany Marsh West - Priority Habitat[2] coastal/floodplain grazing marsh but a species poor example. Would qualify as a LWS.	District
Open Mosaic on Previously Developed Land	Discrete areas within the Kent Project Site that fulfil the Priority Habitat description[3].	District

1 UK Biodiversity Action Plan Priority Habitat Descriptions Lowland Mixed Deciduous Woodland From: UK Biodiversity Action Plan; Priority Habitat Descriptions. BRIG (ed. Ant Maddock) 2008

2 UK Biodiversity Action Plan Priority Habitat Descriptions Coastal and Floodplain Grazing Marsh From: UK Biodiversity Action Plan; Priority Habitat Descriptions. BRIG (ed. Ant Maddock) 2008

3 UK Biodiversity Action Plan Priority Habitat Descriptions Open Mosaic Habitats on Previously Developed Land From: UK Biodiversity Action Plan; Priority Habitat Descriptions. BRIG (ed. Ant Maddock) 2008

Important Ecological Feature	Key Attributes	Nature Conservation Value
Waterbodies (ponds, standing water and ditches)	Extensive ditch network around the peninsula with associated ponds. Ditch network forms part of a large marsh area including Botany Marshes LWS and adjacent grazing marsh and is considered of district level. Some ponds, within Broadness Grassland particularly, are contaminated by leachate from the nearby cement production facility and are of negligible ecological value.	District
Swamp (reedbed)	Three main areas in Black Duck Marsh, CTRL Wetland and Botany Marsh, the latter of which is partially designated as a LWS. The other areas could qualify as LWSs and all qualify as Priority habitat[4].	County
River Ebbsfleet	Acts as a wildlife corridor and is linked to reed bed and woodland habitats. Moderate water quality.	Local
Species		
Wintering waterfowl and wading bird assemblage	Supports many of the species associated with the nearby SPA/Ramsars.	International
Wintering terrestrial bird assemblage	28 species of conservation concern recorded in low to moderate numbers.	County
Breeding bird assemblage	91 species recorded of which 29 were listed on the Amber list of Birds of Conservation Concern and 17 on the Red list.	Regional
Pochard breeding population	Possibly breeding with 7-10 pairs present, which would equate to between 0.99% and 1.4% of the national breeding population.	National
Bat assemblage	Assemblage of at least eight species, potentially up to 10 including one Kent Biodiversity Action Plan (BAP) species. However, the activity is predominantly of common pipistrelle (*Pipistrellus pipistrellus*) bats. Two buildings confirmed as transistional summer roosts for low numbers of common and widespread species. Other buildings with high, moderate and low bat roost potential are present, and some that could not be adequately surveyed due to access restrictions. No tree roosts confirmed but nine trees with high bat roost potential are present.	District
Dormouse	Confirmed breeding population within the Kent Project Site. Considered to be using the Kent Project Site for dispersal, foraging and breeding. Likely to be a meta population with that close to the Bluewater shopping centre.	District

4 UK Biodiversity Action Plan Priority Habitat Descriptions Reedbed From: UK Biodiversity Action Plan; Priority Habitat Descriptions. BRIG (ed. Ant Maddock) 2008

Important Ecological Feature	Key Attributes	Nature Conservation Value
Otter	Confirmed present within Blackduck Marsh and assumed present in low numbers on the suitable habitat throughout the ditch network, reedbeds, marshes and on the River Ebbsfleet.	Local
Water vole	Latrines and feeding sign found in Botany Marsh East and West, on Black Duck Marsh and in the Channel Tunnel Rail Link (CTRL) wetland – likely breeding and therefore qualifies as LWS.	Local to District
Harvest mouse	Present on the peninsula especially in Broadness grassland and on Botany Marsh and so would qualify the Project Site as an LWS.	Local
Amphibian assemblage	Likely to support four species and meet criteria for LWS selection.	Local to District
Reptile assemblage	Reptile populations present within seven separate areas across the Kent Project Site due to geographical separation. Two large/exceptional, two medium/good and three small/low populations of common lizard supported. One large/exceptional and three small/low populations of grass snake supported. One medium/exceptional, one medium/good and two small/low populations of slow worm supported. Many parts of the Kent Project site meet criteria for LWS selection.	District
Invertebrate assemblage	Assemblage comprising a total of 1,446 species recorded in 2020 including 204 species of recognised conservation status in the UK.	National

Section 1
Introduction

1.1 This Ecology Baseline Report has been prepared by The Environmental Dimension Partnership Ltd (EDP) on behalf of London Resort Company Holdings Limited (LRCH). It provides the baseline ecological conditions relevant to the Proposed Development on land on the Swanscombe Peninsula, and the Ebbsfleet Valley, on the south side of the River Thames (referred to as 'the Kent Project Site', and land to the east of the A1089 Ferry Road and the Tilbury Ferry Terminal (referred to as 'the Essex Project Site'). Collectively these two parts of the Development Consent Order (DCO) boundary are referred to as 'the Project Site'.

1.2 The Project Site will be subject to a DCO application for a world class entertainment resort with associated infrastructure, staff accommodation, A2 upgrade, public amenity space and habitat creation. The application will be supported by an Environmental Impact Assessment (EIA), with this report provided as a technical appendix to inform the baseline section of Chapter 12 of the Environmental Statement (Document 6.1.12). Aquatic features in the Thames Estuary intertidal and subtidal environment are dealt with separately in Chapter 13 of the Environmental Statement (Document 6.1.13).

Project Site Context

1.3 The Project Site location is shown on Figure 12.1 (Document Reference 6.3.12.1). It comprises two parts as described above: the 'Kent Project Site', which is centred approximately at Ordnance Survey Grid Reference (OSGR) TQ 606 758, and the 'Essex Project Site', which is centred approximately at OSGR TQ 643 752. The Project Site lies partly within three local planning authority areas; Dartford Borough and Gravesham Borough for the Kent Project Site, and Thurrock Council for the Essex Project Site.

1.4 The Kent Project Site measures 387.53ha and the Essex Project Site measures 25.54 ha, giving a total DCO Limit of 413.07ha. The Project Site comprises a range of habitat types including woodland and scrub, grasslands of varying quality, salt marsh, intertidal zones, brownfield areas, running and standing water, chalk exposures and developed land.

1.5 The principal ecological features within the Project Site (based on the results of the Extended Phase 1 Survey) are described, along with illustrative site photographs, in **Annex EDP 1**.

Scope of Baseline Report

1.6 This report describes the updated ecological assessment undertaken in 2019/2020, comprising both desk- and field-based investigations, and summarises these findings in the context of baseline investigations undertaken by Chris Blandford Associates at the Kent Project Site in 2012 and 2015-2016. The report has been written in accordance with the latest Chartered Institute of Ecology and Environmental Management (CIEEM) guidance on report writing and EcIA[5,6]. The remainder of the report is structured as follows:

- **Section 2** summarises the methodology employed in determining the ecological baseline within and around the Project Site (with further details provided within annexes and plans where appropriate at the end of this report);

- **Section 3** summarises the baseline ecological conditions (with further details also provided within annexes and on plans where appropriate) and identifies and evaluates any pertinent ecological features/receptors; and

- **Section 4** summarises the IEFs that are relevant to the Project Site, to be taken forward for further assessment in the EcIA.

[5] CIEEM (2017) *Guidelines on Ecological Report Writing*. Chartered Institute of Ecology and Environmental Management, Winchester.
[6] CIEEM (2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland.* Chartered Institute of Ecology and Environmental Management, Winchester.

Section 2
Methodology (Baseline Investigations)

2.1 This section summarises the methodologies employed in determining the baseline ecological conditions within and around the Project Site in 2019 and 2020. The investigations have been undertaken by suitably experienced and licensed ecologists, using relevant best practice methodologies, wherever possible. Full details of the techniques and process adopted are, where appropriate, provided within annexes and plans to the rear of this report. Throughout this section parts of the Project Site are referred to using commonly used names, as shown on Figure 12.1 (Document Reference 6.3.12.1).

Desk Study and Consultation

2.2 The desk study is an important element of a wider ecological assessment of a site, enabling the initial collation and review of contextual information such as designations together with known records of protected and priority species.

2.3 The desk study involved collating information from the following sources:

- Kent and Medway Biological Records Centre (KMBRC);
- Essex Wildlife Trust and Biological Records Centre;
- Essex Field Club;
- Multi-Agency Geographic Information for the Countryside (MAGIC) website[7]; and
- National Biodiversity Network (NBN) Atlas website[8].

2.4 The desk study was undertaken during April 2020 and involved obtaining the following information (search radii from the DCO Order Limits of the Project Site are also provided):

- International statutory designations (15km);
- National statutory designations (5km);

[7] www.magic.gov.uk
[8] www.nbnatlas.org

- Non-statutory local sites (2km);
- Annex II bat species[9] records (6km); and
- All other protected/notable species records (2km).

2.5 These search areas were agreed by the consultees and are considered sufficient to cover the potential Zone of Influence (ZoI)[10] of the Proposed Development in relation to designations, habitats and species.

2.6 EDP also obtained information from Natural England on granted EPS licences in the potential ZoI of the Proposed Development, and that this has been used to inform the scope of surveys and increase understanding of the local bat and dormouse populations as well as the presence of nearby bats roosts.

2.7 The potential ZoI of the Project Site along with those statutory designations that occur within it are illustrated on Figure 12.2 (Document Reference 6.3.12.2), with non-statutory designations illustrated on Figure 12.3 (Document Reference 6.3.12.3).

Extended Phase 1 Habitat survey

2.8 The survey technique adopted for the initial habitat assessment was at a level intermediate between a standard Phase 1 survey[11], based on habitat mapping and description, and Phase 2 surveys, based on detailed habitat and species surveys. The survey technique is commonly known as an Extended Phase 1 Habitat Survey and involves identifying and mapping the principal habitat types and identifying the dominant plant species present in each principal habitat type. In addition, any actual or potential protected species or species of principal importance are identified and scoped.

2.9 An Extended Phase 1 Habitat survey of the Project Site was undertaken by a suitably experienced surveyor in May 2020. May is within the recommended April to mid-October period as per current guidance (Joint Nature Conservation Committee; JNCC, 2010) and is therefore not considered to be constrained by any seasonal factors.

[9] Bat species listed in Annex II of the *EC Habitats Directive*, namely Greater horseshoe, Lesser horseshoe, Barbastelle and Bechstein's bats

[10] Zone of Influence - the areas and resources that may be affected by the proposed development

[11] Joint Nature Conservation Council (2010) *Handbook for Phase 1 Habitat Survey – A Technique for Environmental Audit*

2.10 A detailed botanical survey was then undertaken of certain areas within the Kent Project Site identified during the Extended Phase 1 Habitat survey, as detailed below. This included a search for the rare plants previously recorded at the Project Site. The botanical survey was completed by an experienced botanist with 30+ years experience. During this survey, the results of the Extended Phase 1 Habitat survey were verified. No detailed botanical surveys were deemed necessary for the Essex Project Site due to the lack of natural habitats present.

2.11 Access to Botany Marshes West and the swamp area southeast of Black Duck Marsh was granted in July. Therefore, the botanical surveys of these areas were conducted separately on 28 July 2020.

2.12 A dedicated invasive species survey was undertaken in October 2020.

2.13 Habitats recorded during the course of the Extended Phase 1 Habitat survey and invasive species survey are described in **Annex EDP 1** and illustrated on Figure 12.4 (Document Reference 6.3.12.4). The rare plant populations recorded are shown on Figure 12.5 (Document Reference 6.3.12.5).

River Corridor/River Habitat Survey

2.14 To establish a detailed baseline for the River Ebbsfleet and associated riparian habitats, an approximate 2km stretch from its upstream extent at Springhead Garden Centre (OSGR TQ 617 727) to its downstream extent north of Ebbsfleet International Station (OSGR TQ 614 744), was surveyed in accordance with standard River Corridor Survey (RCS) methodology. The RCS was undertaken by a suitably qualified ecologist on 18 May 2020. To aid an assessment of the watercourse, the extent of the River Ebbsfleet within the Kent Project Site, was subdivided into three sections, each circa 500 metres long and each broadly representative of the different habitat types across the catchment. The survey sections are illustrated in Figure 12.6 (Document Reference 6.3.12.6).

2.15 A River Habitat Survey (RHS) of the River Ebbsfleet was also undertaken in tandem with the RCS on 18 May 2020, in accordance with methodologies established by the Environment Agency[12]. As dense vegetation and expansive areas of wetland/reedbeds limited access to several sections of the River Ebbsfleet, the RHS was confined to two 500m sections of the watercourse as illustrated on Figure 12.7 (Document Reference 6.3.12.7).

2.16 Full details of the RCS and RHS can be found in **Annex EDP 2**.

[12] River Habitat Survey in Britain and Ireland, Field Survey Guidance Manual: 2003 Version, Environment Agency

Detailed (Phase 2) Surveys

2.17 The scope of Phase 2 Surveys undertaken within the Project Site were defined following completion of the 2020 desk study, a review of the previous ecology surveys undertaken on the Kent Project Site and review of the Extended Phase 1 Habitat survey information. Surveys that have been, or will be, undertaken in 2019 and 2020 include:

- Botanical survey;
- Wintering bird surveys;
- Breeding bird surveys;
- Passage bird surveys;
- Bat surveys;
- Dormouse surveys;
- Badger survey;
- Otter and water vole surveys;
- Harvest mouse surveys;
- Great crested newt survey;
- Reptile surveys;
- Terrestrial invertebrate surveys; and
- Aquatic invertebrate surveys.

2.18 No detailed Phase 2 surveys were deemed necessary for the Essex Project Site due to the lack of natural habitats present with potential to support protected or notable species.

2.19 The methodologies used for these surveys are described in further detail below.

Botanical Survey

2.20 The Extended Phase 1 Habitat survey undertaken in May 2020 identified several areas of grassland of botanical interest within the Kent Project Site. Furthermore, following review of previous habitat/ plant surveys on the Kent Project Site, a range of nationally rare plant species are known to be present. Therefore, a detailed botanical survey was undertaken in June 2020 and July 2020 (for Botany Marsh east and land southeat of Black Duck Marsh only) by a botanist with over 30 years of UK botanical experience, to record plant species within areas of higher botanical interest throughout the Swanscombe Peninsula on the Kent Project Site. The survey used Dominant, Abundant, Frequent, Occasional and Rare (DAFOR) grades. Homogenous stands of National Vegetation Classification (NVC) types were determined in the field and supported by sampling of representative quadrats to establish their ecological value where deemed appropriate. Details of the results of the botanical survey have been included within **Annex EDP 1**, with habitats displayed on Figure 12.4 (Document Reference 6.3.12.4) and rare plant populations illustrated on Figure 12.5 (Document Reference 6.3.12.5).

2.21 Detailed botanical surveys were not deemed necessary for the Essex Project Site due to the lack of natural habitats present.

Ornithological Surveys

2.22 Ornithological surveys at the Kent Project Site have been completed in November 2019 to March 2020 (wintering birds), April to July 2020 (breeding birds), and passage bird surveys at high and low tide in April, September and October 2020.

2.23 Ornithological surveys were not carried out at the Essex Project Site due to lack of suitable habitat.

Breeding Bird Surveys

2.24 As well as designations for wintering birds, the Thames Estuary and Marshes SPA/Ramsar and Medway Estuary and Marshes SPA/Ramsar are also designated for breeding populations of certain species. The Kent Project Site supports suitable breeding habitat for a range of bird species including those recorded on these SPA/Ramsar sites. The Essex Project Site does not support suitable breeding habitat to support these bird species.

2.25 Therefore, full breeding bird surveys comprising four survey visits across the Kent Project Site were undertaken in April, May, June and July 2020 to record bird activity and ascertain breeding status of any species/individuals identified. The surveys were based on a hybrid methodology, referring to Common Bird Census

(CBC) 'territory mapping' methodology[13], black redstart (*Phoenicurus ochruros*)[14] and breeding wader survey methodology[15].

Passage Bird Surveys

2.26 Passage bird surveys were undertaken along the estuary front only, at the Kent Project Site, during the daytime in April, September and October 2020. Passage surveys comprise two surveys per month: one focussed on High Tide; and the other focussed on Low Tide. Each visit consisted of core counts for one hour before peak tide to one hour after.

Spotted Crake Surveys

2.27 Species specific surveys for spotted crake (*Porzana porzana*) were also undertaken after an individual of this species was incidentally recorded within the Kent Project Site during the breeding bird survey on 02 June 2020. A targeted nocturnal survey was subsequently undertaken between 23:00 19 June 2020 and 03:00 on 20 June 2020 by two surveyors and involved a targeted survey of wetland habitat using sound recording equipment. Playback was also employed in an attempt to elicit call responses from any birds that may be present within areas of suitable breeding habitat.

2.28 Full details of the breeding bird, passage bird and spotted crake surveys can be found in **Annex EDP 4** and on Figures 12.8 to 12.11 (Document References 6.3.12.8 and 6.3.12.11).

Criteria for Evaluation

2.29 A number of criteria are available to determine the conservation status of those bird species recorded during the completed surveys as well as attributing a value to the overall bird assemblage. The most appropriate of these are listed below:

- Schedule 1 of the Wildlife and Countryside Act (1981) – The Wildlife and Countryside Act affords greater protection to certain species that are considered appropriately at risk nationally and are as such listed as specially protected under Schedule 1;

- Birds of Conservation Concern 4[16] – Under this approach, UK bird populations are assessed using quantitative criteria, to determine the population status of each species and then placed on one of three lists; Red, Amber or Green:

[13] British Trust for Ornithology. Common Bird Census. www.bto.org.
[14] Morgan, R. A. and Glue, D. E. (1981) Breeding survey of black redstarts in Britain, 1977. Bird study 28: 163-168
[15] Brown, A. F. and Shepherd, K. B. (1993) A method for censusing upland breeding waders. Bird Study, 40, pp. 189-195.

  - Red list species are of high conservation concern, being either globally threatened, having historical UK population declines between 1800 and 1995 or a rapid population decline or breeding range contraction by 50% or more in the last 25 years;

  - Amber list species are of medium conservation concern due to a number of factors, for example having suffered between 25% and 49% contraction of UK breeding range or a 25-49% reduction in breeding or non-breeding populations over the last 25 years; and

  - Green list species have a favourable conservation status.

- Species of Principal Importance included under Section 41 (England) of the Natural Environment and Rural Communities (NERC) Act 2006 as well as those for which specific Local Biodiversity Action Plans have been prepared;

- Species included in the Thames Estuary and Marshes SPA/Ramsar and Medway Estuary and Marshes SPA/Ramsar citations;

- Species listed as being of Global Conservation Concern by the International Union for the Conservation of Nature (IUCN). Species listed as being Vulnerable, Endangered or Critically Endangered are considered within this assessment; and

- The combined assemblage and individual species recorded are, where relevant, assessed against the criteria for the section of Local Wildlife Sites in Kent[17].

2.30 The results of the survey as well as conservation status of the species recorded are broadly assessed against these selection criteria to assist in the valuation of the bird assemblage on the Project Site.

Interpretation of Survey Results

General

2.31 The data is compiled into an initial summary table giving information on species recorded and conservation status. Conservation status is defined with special emphasis on species included on lists including IUCN Red List, Schedule 1, Birds

[16] Eaton MA, Aebischer NJ, Brown AF, Hearn RD, Lock L, Musgrove AJ, Noble DG, Stroud DA and Gregory RD (2015) Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 108, 708–746.

[17] Local Wildlife Sites in Kent: Criteria for Selection and Delineation. Version 1.5 (August 2015)

of Conservation Concern, Section 41 of the NERC Act 2006 and designated site citations and any Local BAP species.

2.32 Breeding status as defined using criteria devised by the European Bird Census Council (EBBC), which is presented below.

EBBC Criteria for Categorisation of Breeding Status

2.33 The results of the breeding bird surveys are assessed against the EBBC criteria for breeding bird status. These are shown below:

- Confirmed breeding (C):
    - Distraction-display or injury feigning;
    - Used nest or eggshells found (occupied or laid within period of survey);
    - Recently fledged young (nidicolous species) or downy young (nidifugous species);
    - Adults entering or leaving nest-site in circumstances indicating occupied nest (including high nest or nest-holes, the contents of which cannot be seen) or adult seen incubating;
    - Adult carrying faecal sac or food for young;
    - Nest containing eggs; and
    - Nest with young seen or heard.
- Probable breeding (PR):
    - Pair observed in suitable nesting habitat in breeding season;
    - Permanent territory presumed through registration of territorial behaviour (song, etc.) on at least two different days a week or more apart at the same place;
    - Courtship and display;
    - Visiting a probable nest site;
    - Agitated behaviour or anxiety calls from adults;

- Brood patch on adult examined in the hand; and
- Nest building or excavating nest-hole.

- Possible breeding (PO):
  - Species observed in breeding season in possible nesting habitat; and
  - Singing male(s) present (or breeding calls heard) in breeding season.

- Non-breeding (NB):
  - A species present during the survey but considered to be not breeding within the survey area. Recorded simply as a bird flying over the site or are present on site but considered to be a non-breeding species due to a lack of suitable breeding habitat or lack of behaviour characteristic of breeding.

2.34 Full details of the breeding bird, passage bird and spotted crake surveys can be found in **Annex EDP 4** and on Figures 6.3.12.8 to 6.3.12.11 (Document References 6.3.12.8 and 6.3.12.11).

Bat Surveys

2.35 Full details of bat surveys that have been undertaken across the Project Site are provided in **Annex EDP 5**, and on Figures 12.12 to 12.17 (Document Reference 6.3.12.12 and 6.3.12.17). A summary of the survey effort is provided below.

2.36 Bat surveys were not deemed necessary for the Essex Project Site due to the lack of potential roost features and foraging habitat.

Bat Roosting – Trees

Preliminary Roost Assessment

2.37 The Kent Project Site supports a small number of trees that were identified as being potentially suitable for roosting bats. As such, to determine the potential impacts of the Proposed Development on bats potentially roosting within trees, all trees across the Kent Project Site were subject to a preliminary ground-level visual assessment in June 2020 by a suitably experienced ecologist. These are shown on Figure 12.12 (Document Reference (6.3.12.12). The Essex Project Site does not support any trees that will be affected by the Proposed Development.

Presence/Absence Surveys

2.38 Upon completion of the preliminary tree roost assessment, 19 were considered to have bat roost potential; 15 trees with high, two with medium and two with low potential. Of these trees, 12 with high potential and all those with moderate and low potential were considered likely to be impacted by the Proposed Development. These 16 trees were subject to thorough aerial surveys using tree climbing equipment in August 2020. Tree locations and gradings are shown on Figure 12.12 (Document Reference (6.3.12.12). As the London Resort proposals develop, if it becomes apparent that any further trees with bat roost potential will be impacted, further surveys on those trees will be conducted.

2.39 In accordance with the Good Practice Guidelines[18], the following survey effort was applied:

- Low potential = no further surveys;
- Medium potential = two survey visits, May to September with at least one survey between May and August; and
- High potential = three survey visits, May to September with at least two surveys between May and August.

2.40 Further details can be found in **Annex EDP 5**.

Bat Roosting – Buildings

Preliminary Roost Assessment

2.41 There are also a number of buildings within the Project Site potentially suitable to support roosting bats. A preliminary external roost assessment of buildings across the Manor Way Industrial Estate was undertaken on 01 May 2020, with further site visits conducted on 07 July 2020, 15 July 2020 and 17 July 2020, and informed the level of further survey effort to be undertaken. These buildings are shown on Figure 12.13 (Document Reference (6.3.12.13).

2.42 Internal inspections then took place of all buildings deemed to have bat roost potential from the preliminary external roost inspection and scheduled to be demolished or otherwise affected by the Proposed Development. Internal inspections were subject to landowner permission being granted and internal inspections being able to be undertaken without contravening Government

[18] Collins, J (ed) (2016) Bat Surveys for professional ecologists: Good Practice Guidelines. (3rd edn) Bat Conservation Trust, London.

guidance at the time in relation to social distancing due to the COVID-19 pandemic. Further details of which buildings could be internally inspected can be found in **Annex EDP 5**.

Presence/Absence Surveys

2.43 Upon completion of the external preliminary roost assessment, three buildings were considered to have high potential for roosting bats, 10 to have moderate potential and 10 to have low potential within the DCO order limit. An additional 26 buildings (16% of the total) are 'requiring further assessment' as access limitations prevented a full visual inspection, as illustrated on Figure 12.13 (Document Reference 6.3.12.13).

2.44 Detailed emergence/re-entry surveys to confirm the presence/likely absence of roosting bats within those buildings identified as high, medium or low potential were undertaken.

2.45 The scope of emergence/re-entry surveys was informed by industry-standard best practice guidance, namely the Bat Conservation Trust's Bat Surveys for Professional Ecologists, Good Practice Guidelines, 3rd edition[19]. In accordance with these guidelines the following survey effort was applied where possible:

- Low potential = one survey visit, May to August;
- Medium potential = two survey visits, May to September with at least one survey between May and August; and
- High potential = three survey visits, May to September with at least two surveys between May and August.

2.46 For those 26 buildings that could not be surveyed a precautionary approach to the assessment of effects upon these buildings is provided within *Chapter 12: Terrestrial and freshwater ecology and biodiversity* (Document reference 6.1.12) of the Environmental Statement. Furthermore, in the unlikely event that roosting bats are present (considered unlikely based on the overwhelming majority of buildings being of negligible bat roost potential and the relative lack of confirmed roosts), precautionary mitigation measures are detailed within the 'Bat Mitigation Strategy' enclosed within the Ecological Mitigation and Management Framework (EMMF) (Document reference: 6.2.12.3)

[19] Collins, J (ed) (2016) Bat Surveys for professional ecologists: Good Practice Guidelines. (3rd edn) Bat Conservation Trust, London.

Bat Roosting – Tunnels

Preliminary Roost Assessment

2.47 An initial assessment of all 10 tunnels to be affected by the Proposed Development was undertaken on 04 August 2020. Tunnel locations are shown on Figure 12.13 (Document Reference (6.3.12.13). The inspection was undertaken by a bat licensed ecologist and assessed the suitability of the tunnels to support summer day roosts, autumn swarming roosts and hibernation roosts.

Summer Roosting Surveys

2.48 Of the 10 tunnels inspected, 10 were considered to have some summer roosting potential. Those tunnels considered to have summer roosting potential were subject to emergence/re-entry surveys following the same level of survey effort as for buildings.

Autumn Swarming Surveys

2.49 Of the 10 tunnels inspected, nine were considered to have some autumn swarming potential. These were subject to static detector deployments to be undertaken over five nights each in August, September and October 2020.

Activity Surveys

2.50 Bat activity surveys have been undertaken at the Kent Project Site, comprising a combination of manual transect surveys and automated detector surveys between May and September 2020 as shown on Figure 12.14 (Document Reference (6.3.12.14). No activity surveys were conducted at the Essex Project Site which supports predominantly hardstanding and built development of negligible value to foraging/commuting bats.

2.51 Bat activity transect surveys were completed in May, June, July, August and September 2020 (as shown on Figure 12.15 (Document Reference (6.3.12.15)) to determine the usage of the Kent Project Site by bats. Surveys were undertaken with reference to the Bat Conservation Trust Guidelines[19] for a site with '*moderate suitability habitat for bats*' and include seven walked transects which cover all suitable bat foraging habitat. In addition, 16 static, automated bat detectors were also deployed across the Kent Project Site to record for a period of five nights in each of the survey months.

2.52 There is currently no requirement, or agreed survey methodology, for completion of winter foraging surveys within the Bat Conservation Trust (BCT) guidelines[20], and such surveys were not considered necessary to inform the Ecological Impact Assessment (EcIA) presented in Chapter 12: Terrestrial and freshwater ecology and biodiversity (Document reference 6.1.12) of the Environmental Statement, and were not requested by consultees during the Environmental Information Assessment (EIA) Scoping Opinion received in July 2020 or through the Preliminary Environmental Information Report (PEIR) consultation in July 2020. Nevertheless, the potential for the Kent Project Site to be used for winter foraging, on warmer nights, given the habitats present and the proximity to the River Thames, as identified by Natural England through their Discretionary Advice Service letter of 9th October 2020 (copy of which is enclosed as Annex EDP 13 to the EMMF (Document reference: 6.2.12.3)), has been considered. On a precautionary basis, the potential effects of the Proposed Development on potential winter foraging habitats is included within the EcIA in Chapter 12: Terrestrial and freshwater ecology and biodiversity (Document reference 6.1.12).

Dormouse Survey

2.53 Records of dormouse were returned during the updated 2020 Desk Study and during the previous desk study conducted in 2015, as shown on Figure 12.18 (Document Reference (6.3.12.18). Therefore, owing to the suitability of the continuous scrub and woodland habitat within the Kent Project Site, a sample of these habitats was surveyed, including much of the edge habitat along the Ebbsfleet Valley and Swanscombe Peninsula, including Station Quarter North and South, the former landfill adjacent to Ebbsfleet International, Bamber Pit, the Sportsground and Botany Marsh as shown on Figure 12.18 (Document Reference (6.3.12.18).

2.54 The survey methodology is a nest tube survey to determine the presence/likely absence of dormouse. A total of 284 nest tubes were deployed and then checked four times between May and October. From September, to extend the coverage of the Kent Project Site, a further 217 tubes were deployed which were checked three times between September and November.

2.55 No dormouse surveys were carried out at the Essex Project Site due to lack of suitable habitat.

2.56 Full details of the dormouse survey are provided in **Annex EDP 6** and on Figures 12.18 to 12.20 (Document References 6.3.12.18 and 6.3.12.20).

[20] Collins, J. (ed) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London.

Badger Survey

2.57 The Kent Project Site offers suitable foraging and sett building opportunities for badger. A detailed badger walkover survey was undertaken in conjunction with the Extended Phase 1 Survey by a suitably experienced surveyor to determine the presence and distribution of badgers and their setts across the Kent Project Site, and the current (breeding) status of any setts present.

2.58 During the detailed survey, any signs of badger activity were recorded, including the following:

(i) Setts, the number of entrances and any evidence of current use;

(ii) Tracks that are confirmed as badger pathways (i.e. there is a clear link to a sett or there is additional evidence of badger activity nearby such as latrines, hairs, footprints or feeding signs); and

(iii) The presence of discarded bedding, hairs, footprints, latrines and feeding signs.

2.59 An additional badger survey took place at the same time as the harvest mouse survey in October 2020.

2.60 No badger surveys were carried out at the Essex Project Site due to lack of suitable habitat.

Water Vole Survey

2.61 There are a number of ditches in the marsh areas (Black Duck Marsh, Botany Marsh and CTRL wetland) and the River Ebbsfleet within the Kent Project Site that support suitable habitat for water vole.

2.62 A water vole survey was carried out on ditches within Black Duck Marsh, within CTRL wetland, around Botany Marsh and along the River Ebbsfleet on 25 June and 18 August 2020 to determine presence or absence. Due to health and safety constraints, and difficulty in accessing the banks due to dense vegetation, the standard survey methodology which involves searching the banks of each ditch for evidence of water voles was not possible on a majority of the ditches. Therefore, as per best practice guidelines in these situations[21], Styrofoam rafts were deployed to act as artificial latrine sites. A total of 193 Styrofoam rafts were

[21] Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016). The Water Vole Mitigation Handbook (The Mammal Society Mitigation Guidance Series)

deployed on 02 and 10 June 2020, as shown on Figure 12.21 (Document Reference (6.3.12.21).

2.63 The August check of the rafts was limited by dense vegetation which meant many rafts could not be located. Given this constraint, an update survey was completed on 29 September during which all rafts were located.

2.64 Access to the interior of Botany Marsh West was obtained in July 2020. Rafts were not deployed here as, due to the easier accessibility of these ditches, standard water vole surveys were completed on 28 July and 29 September 2020.

Otter Survey

2.65 The ditches in the marsh areas and the River Ebbsfleet within the Kent Project Site also have the potential to support otter.

2.66 A visual inspection of the watercourses for characteristic signs of otters, such as prints, tracks, spraints, feeding remains and resting sites/holts was undertaken in conjunction with the water vole surveys on 25 June, 18 August and 29 September 2020 around Botany Marsh, within Black Duck Marsh, within the CTRL wetland and along the River Ebbsfleet and on 28 July and 29 September 2020 within Botany Marsh.

2.67 An additional otter survey was undertaken in late October to increase the survey effort for this species. Features considered to have the potential to be used as holts were documented during this survey.

2.68 Full details of the water vole and otter survey can be found at **Annex EDP 7** and on Figures 12.21 and 12.22 (Document References 6.3.12.21 and 6.3.12.22).

2.69 No water vole or otter surveys were conducted at the Essex Project Site due to lack of suitable habitat.

Harvest Mouse Survey

2.70 Harvest mouse evidence was found on the Kent Project Site during the 2015 surveys. Therefore, to determine if harvest mice remain present on the Kent Project Site, a hand search of tall grassland/ruderal/scrub vegetation for the presence of harvest mouse nests was undertaken.

2.71 The survey involved a team of surveyors systematically hand searching through grassland for abandoned summer nests. The survey area was confined to Swanscombe Peninsula and suitable habitat within Station Quarter and took place

on 29 October 2020. The areas surveyed are shown on Figure 12.23 (Document Reference (6.3.12.23).

2.72 October is an ideal time for this type of survey as the vegetation has started to die back, making searching easier but is prior to 'full' winter conditions where storms can destroy nests.

2.73 No harvest mouse surveys were conducted at the Essex Project Site due to lack of suitable habitat.

Great Crested Newt Survey

2.74 There are several ponds and ditches on both the Kent Project Site and the Essex Project Site and within 250m of the Project Site boundary at the time of surveying. For the purposes of this report, the ponds have been numbered as **P1** to **P33** and ditches as **D1** to **D43** and their locations are shown on Figure 12.24 (Document Reference (6.3.12.24).

2.75 A total of 8 ponds and 21 ditches were tested for great crested newt (GCN) environemtal DNA (eDNA) during the 2020 breeding season. Full details are provided in **Annex EDP 8**.

Reptile Survey

2.76 Many records of all four common and widespread British reptile species were returned during the desk study and populations of grass snake (*Natrix natrix*), slow worm and common lizard were found on the Kent Project Site during the 2015 surveys as shown on Figure 12.25 (Document Reference (6.3.12.25).

2.77 Therefore, an artificial refugia survey across a sample of suitable habitats within the Kent Project Site was conducted. This included representative parts of the Kent Project Site apart from the central grazed areas of Botany Marsh West (the track and ditch banks immediately to the west will be surveyed) and the industrial estate. Edge habitats will be surveyed around the former landfill site. No reptile surveys are proposed at the Essex Project Site due to lack of suitable habitat.

2.78 The location of reptile refugia are shown on Figure 12.25 (Document Reference (6.3.12.25) and full details of the reptile survey are provided in **Annex EDP 9** and Figure 12.26 (Document Reference (6.3.12.26).

2.79 In addition, a direct oberservation survey for adders was undertaken in early spring. This involved a slow walk over of suitable habitat, focusing on potential hibernation features[22].

2.80 No reptile surveys were conducted at the Essex Project Site due to lack of suitable habitat.

Invertebrate Surveys

2.81 An invertebrate habitat scoping study was undertaken within the Project Site in April 2020. From the study, a detailed terrestrial and aquatic invertebrate survey was designed accross 17 units of land (sample areas).

2.82 The sample areas comprised nine subunits of the Swanscombe Peninsula and a further seven more or less contiguous subunits directly south of the A212 as far as the A2. An additional area occupying a small area of road verge habitat northeast of the Swanscombe Peninsula, at Tilbury Docks, Essex was also initially selected for survey but was rejected from subsequent detailed surveys owing to its small size and supporting unexceptional habitat.

2.83 Terrestrial survey work commenced in May 2020 and was mainly undertaken over four, evenly-spaced sampling events, concluding in mid-August, 2020. The work broadly followed protocol outlined in NERR005 (Drake et al, 2007), as required for data analysis using the Pantheon versions of Invertebrate Species-habitat Information System and associated metrics.

2.84 Terrestrial survey work was undertaken within a range of habitats, including semi-improved grassland and scrub and early successional habitats occupying areas of former chalk quarry, landfill and other habitat subject to historic human industrial activity. In addition, coastal saltmarsh, coastal grazing marsh, reed-swamp and carr habitats were surveyed.

2.85 In addition to the standard survey work, some survey effort was also dedicated to relocating the critically endangered s41 Distinguished Jumping Spider (Sitticus distinguendus), which has been previously recorded from the Swanscombe Peninsula. Pitfall traps were deployed in areas of previous records of the spider and transects comprising low-density aggregate blocks were deployed in several parts of the site; however, the spider was not found during the 2020 survey.

2.86 Full details of the terrestrial invertebrate survey methodology are provided in **Annex EDP 10**.

[22] Natural England Technical Information Note TIN102, Reptile mitigation guidelines (withdrawn)

2.87 No terrestrial invertebrate surveys were conducted at the Essex Project Site due to lack of suitable habitat.

Aquatic Invertebrate Surveys

Standing Waterbodies

2.88 Aquatic invertebrate samples of standing waterbodies across the Project Site encompassing areas associated with Black Duck Marsh, Botany Marsh, Swanscombe Marsh and land adjacent to the River Ebbsfleet, were undertaken over three, discrete sampling events. The first sampling period took place during May 2020 alongside terrestrial sampling, with additional sampling completed in July and August 2020.

Sample Site Selection and Collection of Macroinvertebrate Samples

2.89 Where a number of waterbodies occurred within a single survey area, samples were taken from a sufficient range of waterbodies to represent the area as a whole with sampling prioritised across those waterbodies exhibiting habitat characteristics of highest potential to support macroinvertebrate assemblages of higher conservation value. The locations where samples have been collected from are shown on Figure 12.27 (Document Reference (6.3.12.27).

2.90 Each aquatic invertebrate sample was collected by a three-minute sweep method from a sufficient range of representative meso-habitats to adequately cover the main invertebrate niches of the waterbody.

2.91 Once collected, each sample was preserved in 99.9% ethanol and transported to the laboratory for washing sorting and identification.

2.92 At each sample location, waterbody characracteristics and a range of other environmental features were recorded including exposed and submerged bank profiles, channel width and depth, levels of grazing, poaching and shelving. Abiotic parameters were recorded in the surface 10cm of water including pH, conductivity, total dissolved solids and temperature using a Hanna HI83303 Aquaculture Photometer.

Washing, Sorting and Identification of Samples

2.93 Each sample was thoroughly washed and graded by rinsing through a series of different sized meshes. All invertebrates were separated from the retained sediment/detritus into major taxonomic groups and referred to an appropriately exeperienced taxonomist for identification. Where possible, all specimens were

identified to species level. Exceptions to this were such groups as chironmidae larve and oligochatea.

2.94 Data collected during the surveys were processed using SAFIS analysis (Site Analysis for Freshwater Invertebrate Surveys v.30.0, (Adrian Chalkley)). The SAFIS routine uses an inbuilt species dictionary to automate the calculation of metrics relating to conservation values and water quality, outlined below. The SAFIS analysis allowed an assessment of conservation value and water quality and also highlighted any species of conservation interest present. For each of the sample sites, the following standard measurements or metrics have been calculated:

- The Biological Monitoring Working Party Score (BMWP);
- The Average Score Per Taxon (ASPT);
- The Community Conservation Index; and
- Lincoln Quality Index (LQI).

2.95 Full details can be found in **Annex EDP 11**.

2.96 In addition to the above the species data from the aquatic invertebrate survey was combined with the species data from the terrestrial invertebrate survey for the purposes of the Pantheon analysis of the overall invertebrate assemblage.

River Ebbsfleet

2.97 To assess current biological water quality of the River Ebbsfleet and establish a baseline against any future monitoring scheme required to ensure future compliance of development with the objectives of the Water Framework Directive (WFD) (2000/60/EC), the aquatic invertebrate community was sampled at four locations along the length of the Rivers Ebbsfleet as illustrated in Figure 6.3.12.28 and 6.3.12.29 (Document References 6.3.12.28 and 6.3.12.29).

2.98 Sampling of the watercourse was undertaken on 26 May 2020 by a suitably qualified ecologist. Further sampling is proposed for completion during autumn (September/October) 2020.

2.99 At each location a single three-minute kick/sweep sample was collected. Additionally, a further one-minute hand search of submerged stones, woody debris, plants and tree roots was undertaken to capture any animals that might have evaded the kick/sweep sample. Each sample was then transferred to a

sealed plastic sample pot and preserved in 90% Industrial Methylated Spirit for future washing, sorting and identification.

Washing, Sorting and Identification of Samples

2.100 Samples will be washed using a 500µm sieve to separate preservative and fine silt from the retained sample fraction. Specimens will be identified to species level (or as far as possible) with the aid of dichotomous keys.

2.101 From the taxonomic data, a suite of standards biotics indices will be calculated including BWMP, ASPT and N-Taxa (Number of Scoring Taxa) which together provide a standard measure of biological quality and indicate background levels of organic pollution. The Community Conservation Index (CCI) Score will be assigned to each taxon to evaluate the conservation value of the invertebrate community. Further details can be found in **Annex EDP 11**.

Freshwater Fish Surveys (Swanscombe Marshes)

2.102 To assess the importance of a fish assemblage assoicated with standing waterbodies across the Swanscombe peninsula, an extensive walkover of the survey area was undertaken by APEM on 28th September 2020 to identify suitable and representative survey locations, with no constraints to access. Six sample sites were identified, spread across pond P3 and ditches D9-11.

2.103 Electric fishing (EF), fyke netting and hand net sampling surveys of these waterbodies were undertaken between 28th and 30th September 2020 in accordance with the below methodologies:

- Electric fishing: APEM surveyors conducted presence/absence electric fishing surveys at accessible locations across the extensive ditch network to establish the fish species present, their range of life stages and relative abundance. Fishing was undertaken in an upstream direction (if flow was evident) (as per Environment Agency (EA) standards[23] on sampling fish with electricity). If fish were netted they would have been transferred to aerated containers for the catch to be identified, counted, and measured (standard length to the nearest mm) before being returned to the watercourse. Eel would be kept in a separate aerated container to all other fish species as they secrete mucus which can infest the gills of other fish;

- Fyke netting: Fyke netting and sweep sampling using a fine mesh net were also deployed where appropriate. A small (150 mm aperture) double ended

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fyke net was set and left overnight at sample site P3A to allow complete soak time and two small double ended fykes were deployed at D9A and D9B and left in during the daytime to allow maximum time for fish capture. Sample site P3A was the only suitable site to leave the fyke net in overnight as the other sites were very shallow and there was a risk that diving birds could become entangled in the fyke nets; and

- Sweep netting: Sweep net samples were conducted to target heavily vegetated habitats where electric fishing and fyke netting would be less effective. The net was repeatedly swept through the wetted vegetation and any captured fish transferred to fish aerated containers for processing before being returned to the watercourse.

2.104 Further details regarding site selection and sampling methodologies is provided at **Annex EDP 34.**

Limitations

2.105 The ditch network across Botany Marsh comprising the eastern extents of Swanscombe peninsula were predominantly dry at the time of survey whilst extensive reed growth precluded access to several waterbodies across the CTRL Wetland and Black Duck Marsh. Of particular pertinence, the methods employed for sampling of a fish community requires open water such that waterbodies colonised by extensive vgetation and reed growth precluded survey. Sample locations are illustrated at **Annex EDP 34**.

2.106 No aquatic invertebrate surveys were conducted at the Essex Project Site due to lack of suitable habitat.

Previous Ecology Assessments

2.107 The Kent Project Site has previously been subject to a suite of ecological baseline surveys as set out in the following reports prepared in 2012/2013 and 2015/2016:

- 2012 Desk Study and Phase 1 Habitat Survey Report (CBA, 2012) (**Annex EDP 12**);

- 2012 Botanical Survey Report (CBA, 2012) (**Annex EDP 13**);

- Phase 1 and Botanical Survey Report (CBA February 2016) (**Annex EDP 14**);
- 2012/13 Wintering Birds Survey Report (CBA, 2013) (**Annex EDP 15**);
- Wintering Bird Survey Report (Corylus Ecology April 2016) (**Annex EDP 16**);
- 2012 Breeding Birds Survey Report (CBA, 2012) (**Annex EDP 17**);
- Common Bird Survey Report (Corylus Ecology April 2016) (**Annex EDP 18**);
- Bat Activity Report 2015 (Corylus Ecology June 2016) (**Annex EDP 19**);
- Dormouse Report (Corylus Ecology February 2016) (**Annex EDP 20**);
- 2015 Badger Survey Report (CBA February 2016) (**Annex EDP 21**);
- 2015 Water Vole Survey Report (CBA February 2016) (**Annex EDP 22**);
- 2015 Harvest Mouse Survey Report (CBA February 2016) (**Annex EDP 23**);
- 2012 Amphibian Survey Report (CBA, 2012) (**Annex EDP 24**);
- 2015 Amphibian Survey Report (CBA February 2016) (**Annex EDP 25**);
- 2015 & 2016 Reptile Survey Report (CBA August 2016) (**Annex EDP 26**);
- 2012 Terrestrial Invertebrate Survey Report (CBA, 2012) (**Annex EDP 27**);
- Invertebrate Survey and Assessment of the London Paramount Entertainment Resort 2015 (Edwards Ecological Services, 2015) (**Annex EDP 28**);
- 2012 Terrestrial Invertebrate Survey Supplementary Report (Spiders [Araneae] and related groups) (CBA, 2012) (**Annex EDP 29**);
- An ecological survey of the waterbodies and wetlands on and around the Swanscombe Peninsula, Kent (Aseda, 2016) (**Annex EDP 30**);
- A targeted ecological survey of selected waterbodies and wetlands on the Swanscombe peninsula, Kent (Aseda, 2016) (**Annex EDP 31**);
- Fish survey of Swanscombe Marshes (Colclough and Coates, 2015) (**Annex EDP 32**); and

- Fish survey of the Ebbsfleet Stream (Colclough and Coates, 2015) (**Annex EDP 33**).

2.108 The findings of the 2019/2020 surveys are discussed in relation to the previous surveys in **Section 3** of this report.

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Section 3
Results (Baseline Conditions)

3.1 This section summarises the baseline ecological conditions determined through the course of the desk-based and field-based investigations described in **Section 2**. In particular, it identifies and evaluates those ecological features that lie within the Project Site and its potential ZoI. Where appropriate, further technical details are provided within annexes and on plans to the rear of this report. Throughout this section parts of the Project Site are referred to using commonly used names, as shown on Figure 12.1 (Document Reference 6.3.12.1).

3.2 In 2013, the *UK Biodiversity Action Plan* (UKBAP) Priority Habitats and Priority Species, and the Section 41 Species and Habitats of Principal Importance for Conservation under the *Natural Environment and Rural Communities* (NERC) *Act* 2006, were rationalised. This rationalisation occurred under the *Post-2010 Biodiversity Framework*. As a result, a new list of Priority Species and Priority Habitats is now in operation at the UK level. These new lists supersede the former UKBAP; they are the new 'Biodiversity Indicators' that are used to monitor the status of biodiversity at the UK level. Each of the four devolved countries of the UK also has a similar list. Within England, the new rationalised lists of 24 Priority Habitats and 213 Priority Species are provided in *Biodiversity 2020,* which is the national biodiversity policy for England.

3.3 Within this Ecology Baseline report, where relevant, these species and habitats of national nature conservation priority will therefore be referred to as 'Priority Species' and 'Priority Habitats'[24].

3.4 The guidelines recommend that the value or potential value of an ecological resource or feature should be determined within a defined geographical context, and the guidelines provide a geographical range ('frame of reference') that can be adapted. The geographical frame of reference used in this assessment, based upon the CIEEM guidelines, is as follows:

- International value (SACs, SPAs, Ramsar sites);

[24] Priority habitats and species include those habitats and species which are 'of principal importance for the purpose of conserving biodiversity' under Section 41 of the Natural Environment and Rural Communities Act, 2006, and are therefore a focus for conservation action in England
See the following for more detail:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/382483/2a._priority_habitats2a_2014_final.pdf;
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/382951/Technical_Background_Priority_Species__abundance__2014.pdf;
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/382487/4a_Status_of_Priority_Species_2014_final.pdf

- National value (within England), e.g. SSSIs and NNRs;
- Regional value (within south-east England);
- County value (within Kent or Essex), e.g. Local Nature Reserves, Local Wildlife Sites, atypical and diverse species assemblages with good population sizes;
- District value (within the Borough of Dartford, Borough of Gravesend or Thurrock Council), e.g. where species rich/extensive/atypical examples are present – moderate population sizes or species assemblages with moderate to high diversity;
- Local value (within Swanscombe and Greenhithe Civil Parish, Bean Civil Parish, or Southfleet Civil Parish, or the towns of Northfleet, Gravesend or Tilbury), e.g. common and widespread species with relatively moderate populations and relatively limited diversity;
- Site value (the Project Site and immediate environs), e.g. small areas of common habitats such as species-poor grassland and scrub (common and widespread species with small populations and limited diversity); and
- Negligible value (typically applied to areas of bare open ground/built development/areas of hardstanding).

Designated Sites

3.5 Information regarding designated sites was obtained during the ecological desk study in 2020 and previously in 2012 (as shown in **Annex EDP 12**). Statutory designations (those receiving legal protection) and non-statutory designations (those receiving planning policy protection only) are discussed in turn below.

Statutory Designations

3.6 Statutory designations represent the most significant ecological receptors, being of recognised importance at an international and/or national level. International designations include Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar Sites[25]. National designations include Sites of Special Scientific Interest (SSSIs) and National Nature Reserves (NNRs). Local designations include Local Nature Reserves (LNRs).

[25] Sites designated under the Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat, 1971.

International Designations (SPAs/SACs/Ramsar)

3.7 No part of the Project Site is covered by any statutory designations of international importance. However, there are four statutory designations of international importance within 15km. Full details on these designations is provided in **Tables EDP 3.1** and **3.2** and they are displayed on Figure 12.2 (Document Reference 6.3.12.2).

Table EDP 3.1: International Statutory Designations (SPA/Ramsars) within the Project Site's Potential ZoI.

Site Name	Distance and Direction from the Project Site	Site Description	ARTICLE 4.1 QUALIFICATION (79/409/EEC)	ARTICLE 4.2 QUALIFICATION (79/409/EEC)	Ramsar Criterion
Thames Estuary & Marshes SPA/Ramsar	SPA - c.3.3km east of the Essex Project Site, and c.6.0km east of the Kent Project Site. Ramsar - c.2.8km east of the Essex Project Site, and c.4.8km east of the Kent Project Site.	Extensive intertidal mudflats that are visible at low tide. Additionally, there is saltmarsh and complex channel systems.	**Over winter the area regularly supports**: *Circus cyaneus* 1% of the population in GB *Recurvirostra avosetta* (Western Europe/Western Mediterranean - breeding) 28.3% of the population in GB	**Over winter the area regularly supports**: *Calidris alpina* alpine (Northern Siberia/Europe/Western Africa) 2.1% of the population *Calidris canutus* (North-eastern Canada/ Greenland/Iceland/ North-western Europe) 1.4% of the population *Limosa limosa islandica* (Iceland - breeding) 2.4% of the population *Pluvialis squatarola* (Eastern Atlantic - wintering) 1.7% of the population *Tringa tetanus* (Eastern Atlantic - wintering) 2.2% of the population **On passage the area regularly supports**: *Charadrius hiaticula* (Europe/Northern Africa - wintering) 2.6% of the population **AN INTERNATIONALLY IMPORTANT ASSEMBLAGE OF BIRDS** Over winter the area regularly supports: 75,019 waterfowl	**Criterion 2** The site supports more than 20 British Red Data Book invertebrates and populations of the GB Red Book endangered least lettuce (*Lactuca saligna*), as well as the vulnerable slender hare's-ear (*Bupleurum tenuissimum*), divided sedge (*Carex divisa*), sea barley (*Hordeum marinum*), Borrer's saltmarsh-grass (*Puccinellia fasciculata*), and dwarf eelgrass (*Zostera noltei*). **Ramsar criterion 5** Assemblages of international importance: Species with peak counts in winter: 45,118 waterfowl (5 year peak mean 1998/99-2002/2003) **Ramsar criterion 6** Species/populations occurring at levels of international importance. **Species with peak counts in spring/autumn**: **Black-tailed godwit** (*Limosa limosa islandica*) Iceland/Western Europe 1,640 individuals, an average of

Site Name	Distance and Direction from the Project Site	Site Description	ARTICLE 4.1 QUALIFICATION (79/409/EEC)	ARTICLE 4.2 QUALIFICATION (79/409/EEC)	Ramsar Criterion
					4.5% of the population (5 year peak mean 1998/9-2002/3) **Species with peak counts in winter**: **Dunlin** (*Calidris alpina alpine*), Western Siberia/Western Europe 15,171 individuals, an average of 1.1% of the population (5 year peak mean (1998/9-2002/3). **Red knot** (*Calidris canutus islandica*), Western & Southern Africa(wintering) 7,279 individuals, an average of 1.6% of the population (5 year peak mean 1998/9-2002/3).
Medway Estuary and Marshes SPA/Ramsar	13.1km south-east of the Essex Project Site, and c.16.4km east of the Kent Project Site.	The estuary forms a single tidal system with the Swale and joins the southern part of the Thames Estuary between the Isle of Grain and Sheerness.	**During the breeding season the area regularly supports**: *Recurvirostra avosetta* (Western Europe/Western Mediterranean - breeding) 6.2% of the GB breeding population *Sterna albifrons* (Eastern Atlantic - breeding) 1.2% of the GB breeding population *Sterna hirundo*	**Over winter the area regularly supports**: *Anas acuta* (North-western Europe) 1.2% of the population *Anas clypeata* (North-western/Central Europe) 0.8% of the population in GB *Anas crecca* (North-western Europe) 1.3% of the population in GB *Anas penelope* (Western Siberia/North-western/North-eastern Europe) 1.6% of the population in GB *Arenaria interpres* (Western Palearctic -	**Criterion 2a** Site supports a nuber of species of rare plants and animals including sea barley, curved hard grass, annual beard grass, Borrer's saltmarsh grass, slender hare's ear, sea clover, small ghoosefoot, golden samphire, perennial glasswort and one flowered glasswort. At least 12 Red Data book species of wetland invertebrates occur and a

Site Name	Distance and Direction from the Project Site	Site Description	ARTICLE 4.1 QUALIFICATION (79/409/EEC)	ARTICLE 4.2 QUALIFICATION (79/409/EEC)	Ramsar Criterion
			(Northern/Eastern Europe - breeding) 0.6% of the GB breeding population **Over winter the area regularly supports**: *Cygnus columbianus bewickii* (Western Siberia/North-eastern & North-western Europe) 0.2% of the GB population *Recurvirostra avosetta* (Western Europe/Western Mediterranean - breeding) 24.7% of the GB population	wintering) 0.9% of the population in GB *Branta bernicla bernicla* (Western Siberia/Western Europe) 1.1% of the population *Calidris alpina alpina* (Northern Siberia/Europe/Western Africa) 1.9% of the population *Calidris canutus* (North-eastern Canada/Greenland/Iceland/North-western Europe) 0.2% of the population *Charadrius hiaticula* (Europe/Northern Africa - wintering) 1.6% of the population *Haematopus ostralegus* (Europe & Northern/Western Africa) 1% of the population in GB *Limosa limosa islandica* (Iceland - breeding) 12.9% of the population in GB *Numenius arquata* (Europe - breeding) 1.7% of the population in GB *Pluvialis squatarola* (Eastern Atlantic - wintering) 2% of the population *Tadorna tadorna* (North-western Europe) 1.5% of the population	significant number of non wetland Red data book species occur. **Criterion 3a** Internationally important wildfowl assemblage (greater than 20,000 birds). **Criterion 3c** Over winter the site regularly supports internationally important populations of dark bellied brent goose, Dunlin, grey plover, knot, pintail, redshank, ringed plover and shelduck.

Site Name	Distance and Direction from the Project Site	Site Description	ARTICLE 4.1 QUALIFICATION (79/409/EEC)	ARTICLE 4.2 QUALIFICATION (79/409/EEC)	Ramsar Criterion
				Tringa nebularia (Europe/Western Africa) 2.6% of the population in GB *Tringa totanus* (Eastern Atlantic - wintering) 2.1% of the population.	

Table EDP 3.2: International Statutory Designations (SACs) within the Project Site's Potential ZoI

Site Name	Distance from Project Site	Description
North Downs Woodland SAC	8.0km south-east of Kent Project Site and 9.7km south-east of Essex Project Site	Annex I habitats that are a primary reason for selection: • 9130 Asperulo-Fagetum beech forests; and • 91J0 Taxus baccata woods of the British Isles * Priority feature.
Peters Pit SAC	12.8km south-east of the Kent Project Site and 13.8 south-east of the Essex Project Sites	Annex II species that are a primary reason for selection of this site: • Great crested Newt for which this is considered to be one of the best areas in the United Kingdom.

National Designations (SSSIs)

3.8 Within the Kent Project Site lies Bakers Hole SSSI, designated for its geological interest. Additionally, within the potential ZoI of the Project Site lie Swanscombe Skull Site SSSI, Lion Pit SSSI, Globe Pit SSSI and Purfleet Chalk pit SSSI which are also designated for geological reasons. These SSSI's will be scoped out of the EcIA as the reasons for designation are not related to ecology.

3.9 In addition, within the potential ZoI of the Project Site, there lies a further seven statutory designations of national importance within 5km of the Project Site plus a further five which lie beyond 5km but are considered based on potential ecological connectivity to the Project Site or because they form part of an International Designation. Details are provided in **Table EDP 3.3** and sites are shown on Figure 12.2 (Document Reference 6.3.12.2).

Table EDP 3.3: National statutory Designations Within the Potential ZoI of the Project Site.

Designation	Approximate Distance and Direction from the Project Sites	Site Description
Darenth Woods SSSI	Adjacent to the south-west corner of the Kent Project Site and 6.2km south-west of the Essex Project Site	This site comprises some of the most valuable areas of ancient seminatural woodland in north-west Kent and includes several rare woodland types.
West Thurrock Lagoon and Marshes SSSI	890m west of Kent Project site and 4.2km west of the Essex Project Site	One of the most important sites for wintering waders and wildfowl on the Inner Thames Estuary. The combination of extensive intertidal mudflats together with a large and secure high tide roost, attracts waders in nationally important numbers, with significant populations of other bird species. The adjacent Stone Ness saltmarsh is noted for the size and character of its high marsh plant community.

Designation	Approximate Distance and Direction from the Project Sites	Site Description
Grays Thurrock Chalk Pit SSSI	1.9km north of Kent Project Site and 2.5km north of the Essex Project Site	Natural colonisation of the pit bottom has created a range of woodland, scrub and calcareous grassland habitats that are important for the assemblage of invertebrate fauna they support.
Hangmans Wood and Denholes	1.9km north of Essex Project Site and 3.3km northeast of the Kent Project Site	Remains of medieval chalk mines that provide the most important underground hibernation site for bats in Essex. Three species recorded; Brown longeared (*Plecotus auritus*), Natterer's (*Myotis nattereri*) and Daubenton's (*Myotis daubentonii*). A total of 62 were recorded early in 1991.
South Thames Estuary and Marshes SSSI (within Thames Estuary and Marshes SPA)	2.5km east of Essex Project Site and 4.7km east of the Kent Project Site	Component SSSI to the Thames Estuary and Marshes SPA/Ramsar. Forms a major component of the Greater Thames Estuary. An extensive mosaic of grazing marsh, saltmarsh, mudflats and shingle characteristic of the estuarine habitats of the north Kent marshes. Freshwater pools and some areas of woodland provide additional variety and complement the estuarine habitats. Supports outstanding numbers of waterfowl, total counts regularly over 20,000.
Mucking Flats and Marshes SSSI (within Thames Estuary and Marshes SPA)	4.1km east of Essex Project Site and 7.5km east of the Kent Project Site	Component SSSI for the Thames Estuary and Marshes SPA and Ramsar. Comprise an extensive stretch of Thames mudflats and saltmarsh with sea wall grassland. Wintering wildfowl and waders reach nationally and internationally important numbers on the mudflats, roosting and feeding on saltmarsh and silt lagoons.
Shorne and Ashenbank Woods SSSI	4.8km south-east of both Project Sites	A complex of ancient and plantation woodland and includes a variety of stand-types associated with Tertiary gravels, clays and sands. The site supports an important and diverse invertebrate fauna, especially its Coleoptera (beetles), Hemiptera (true bugs), and Odonata (dragonflies).
Inner Thames Marshes SSSI	5.5km north-west of Kent Project Site and 8.3km north-west of the Essex Project Site	Form the largest remaining expanse of wetland bordering the upper reaches of the Thames Estuary. The site is of particular note for its diverse bird interest and especially for the variety of breeding birds and the numbers of wintering wildfowl, waders, finches and birds of prey.
Wouldham to Detling Escarpment SSSI	13.0km south-east of the Essex Project Site, and 12.4km SE of Kent Project Site	Component SSSI of the North Downs Woodland SAC. Designated for chalk grassland, woodland and invertebrate interest.
Medway Estuary and Marshes SSSI	13.0km south-east of the Essex	Component SSSI to the Medway Estuary and Marshes SPA/ Ramsar.

Designation	Approximate Distance and Direction from the Project Sites	Site Description
	Project Site and 14.7km east of the Kent Project Site	Forms the largest area of intertidal habitats that have been identified as of value for nature conservation in Kent and are representative of the estuarine habitats found on the North Kent coast. A complex of mudflats and saltmarsh is present, with in, places grazing marsh behind the sea walls, which is intersected by dykes and fleets.
Cobhan Woods SSSI	6.7km south-east of the Kent Project Site and 7.5km south-east of the Essex Project Site	Woodland and old parkland is representative of woods in North Kent which occur in part on acidic Thanet Sands and in part on chalk soils. One nationally rare plant species occurs in the arable land close to the wood. An outstanding assemblage of plants is present at this site which is also of importance for its breeding birds.
Great Cabbles Wood SSSI	7.5km south-east of the Kent Project Site and 6.9km south-east of the Essex Project Site	Representative of woods on North West Kent Tertiary sediments. Most of the woodland is mixed coppice under oak standards, with sweetchestnut as the dominant species. A number of scarce plants occur, including ladyorchid Orchis purpurea and man orchid Aceras anthropophorum.

3.10 In their response to the 2020 Scoping report (Natural England ref: 320306, dated 16 July 2020), Natural England identified that the Proposed Development has potential to indirectly impact on:

- Darenth Woods SSSI;
- Medway Estuary and Marshes SSSI, SPA and Ramsar Site;
- Inner Thames Marshes SSSI;
- Mucking Flats and Marshes SSSI;
- South Thames Estuary and Marshes SSSI;
- Thames Estuary and Marshes Special Protection Area and Ramsar Site;
- Swanscombe Skull Site SSSI and National Nature Reserve;
- Wouldham to Detling Escarpment SSSI; and
- West Thurrock Lagoon and Marshes SSSI.

3.11 As described above, Swanscombe Skull Site SSSI and NNR, which comprises a landscaped area over deposits rich in fossils, is designated for its geological interest. Owing to its' reason for designation, it is considered that effects upon Swanscombe Skull Site SSSI and NNR are best addressed within Chapter 14: Cultural Heritage and Archaeology of the Environmental Statement.

3.12 Following a review of the SSSIs located within the potential ZoI of the Project Site, as illustrated in **Figure 12.2**, it is not considered that Wouldham to Detling Escarpment SSSI would experience a potential adverse risk from the Project Site due to the geographical separation and lack of effect-receptor pathways. At 13.2km south-east of the Essex Project Site, and 14km SE of Kent Project Site, this SSSI is unlikely to receive any increased recreational pressure as a result of the Proposed Development and this SSSI has not been identified to be at risk from changes in air quality within Chapter 16 of the Environmental Statement (Document 6.1.16).

3.13 Shorne and Ashenbank Woods SSSI, Cobhan Woods SSSI and Great Cabbles Wood SSSI are scoped into the potential ZoI due to air quality impacts and so are taken forward as IEFs. Discussion on the impacts on these three SSSIs will be dealt with separately in the Chapter 16 of the Environmental Statement (Document 6.1.16).

3.14 Therefore, the following statutory designations will be included within the EcIA as IEFs:

- Thames Estuary and Marshes SPA and Ramsar Site (includes Mucking Flats and Marshes SSSI);
- Medway Estuary and Marshes SPA, Ramsar Site and SSSI;
- Darenth Woods SSSI;
- Inner Thames Marshes SSSI;
- South Thames Estuary and Marshes SSSI;
- West Thurrock Lagoon and Marshes SSSI;
- Shorne and Ashenbank Woods SSSI;
- Cobhan Woods SSSI; and
- Great Cabbles Wood SSSI.

3.15 LRCH Ltd have received correspondence from Natural England informing them of an area of land within the DCO boundary that is being considered for notification as a SSSI. Given the early stage of this process, this pre-notification is not considered any further as part of this assessment. The Applicant is working closely with Natural England as further details of the SSSI notification process emerge.

Non-statutory Designations

3.16 Non-statutory designations are also commonly referred to in planning policies as 'local sites', although these designations are typically considered to be important at a county level. In Kent, and Essex, such designations are referred to as Local Wildlife Sites (LWSs).

3.17 Additional designations which should be considered at this level include Local Nature Reserves (LNRs) and Ancient Semi-natural Woodland (ASNW) where these are not covered by other designations.

3.18 Within the Kent Project Site, there lies the Botany Marshes LWS and Ebbsfleet Marshes, Northfleet. These LWSs, along with 17 other LWSs that occur within a 2km radius (potential ZoI) of the Project Site, are described in **Table EDP 3.4** and shown in Figure 12.3 (Document Reference 6.3.12.3).

Table EDP 3.4: Local Wildlife Sites Within the Potential ZoI of the Project Site

Site Name and Reference (Figure 6.3.12.3)	Approximate distance from both Project Sites	Reason for Designation
Botany Marshes (GR19)	Within the Kent Project Site and 2.2km W of the Essex Project Site	Important owing to the presence of reedbed and the potential for ditch & grazing marsh restoration. Reedbed and grazing marsh are of principal importance in England. Also supports three species of reptile, water vole, otter and is of value to birds.
Ebbsfleet Marshes, Northfleet (GR05)	Some of it is within the Kent Project Site and 2.2km SE of the Essex Project site	Designated for its range of habitats including reedbed, calcareous stream, lake, scrub, woodland, calcareous and neutral grassland. Protected species have been recorded including reptiles and great crested newts.
Alkereden Lane Pit (DA13)	28m S of the Kent Project Site and 3.7km W of the Essex Project Site	Contains nationally scarce plants and Kent's largest population of *Epipactis phyllanthes*. Also contains *Pyrola rotundifolia* and several species of nationally rare and scarce invertebrates.
Bluewater Quarry (DA1)	Adjacent to the W edge of Kent Project Siteand 6.1km W of the Essex Project Site	Geological interest.

Site Name and Reference (Figure 6.3.12.3)	Approximate distance from both Project Sites	Reason for Designation
Disused Hospital Grounds, Mabledon (DA12)	1.3km SW of Kent Project Site and 7.7km SW of Essex Project Site	Designated for its chalk habitats including chalk grassland. The designation contains mixed scrub. The habitats within the designation support reptiles and lepidoptera.
Green Street Common (DA01)	1.6km SW of Kent Project Site and 6.9km SW of the Essex Project Site	Designated for its acid grassland, which supports four plant species that are of county or national importance. The designation also supports a range of lepidoptera species.
Th37. Tilbury Marshes (39.8ha)	25m E of the Essex Project Site and 3.3km E of the Kent Project Site	Relict grazing-marsh, brackish ditches and the outer moats and grasslands of Tilbury Fort. Supports a diverse saltmarsh flora, with species such as *Juncus gerardii, Salicornia spp., Aster tripolium, Suaeda maritima* and the nationally scarce *Puccinellia rupestris* and *Hordeum marinum*. Grazing land supports a good grazing-marsh flora, with many Nationally Scarce plants such as *Carex divisa. Bupleurum tenuissimum*, with some *Ranunculus sardous, Galium verum. Lotus glaber [tenuis]. Parapholis sp.* and *Spergularia spp.* The north-western section lies adjacent to the now-lost "Ferry Fields" grassland, an important invertebrate habitat destroyed by development, but some of the key species may survive on these remaining fragments.
Th39. Lytag Brownfield (12.4ha)	730m NE of Essex Project Site and 4.2km E of the Kent Project Site	Populations of all four Essex reptiles *Vipra beris, Natrix natrix. Zootoca vivipara* and *Anguis fragilis*, making this one of the more important reptile sites in the borough. Extensive developing acid grassland, which falls within the remit of the Essex heathland BAP project. Such brownfield sites are also likely to be of interest for their invertebrate populations, but no data is currently available. However, given the presence of UK BAP invertebrates on similar habitats around Th40, it is likely that an important fauna will be present here.
Th40. Tilbury Centre (2.8ha)	900m E of Essex Project Site and 4.3km E of the Kent Project Site	Comprises the grounds surrounding the Tilbury Energy and Environment centre. A complex mosaic of grassland, flower-rich early successional/pioneer vegetation, ditches, a small reedbed and a pond, notable for its colony of *Chara sp.* and the nationally rare (Red Data Book) *Hydrophilus piceus*. The pioneer vegetation includes abundant *Lotus corniculatus*, on which the national BAP bumblebees (*Bombus humilis*) forages. Other important invertebrates have been recorded.

Site Name and Reference (Figure 6.3.12.3)	Approximate distance from both Project Sites	Reason for Designation
Th15. West Thurrock Reedbed (2.8ha)	1.8km NW of Kent Project Site and 4.8km W of the Essex Project Site	Reedbed that forms a significant habitat extension to the bordering LWS (Th18) and the West Thurrock Lagoons and Marshes SSSI. Both Reed and Sedge Warbler have been recorded. One of the largest continuous blocks of reedbed habitat left in Thurrock.
Th18. West Thurrock Lagoon (20.5ha)	1.4km NW of Kent Project Site and 4.2km W of the Essex Project Site	Former pulverised fuel ash dump that has developed a complex vegetation mosaic and supports an exceptionally diverse and important invertebrate fauna. Peripheral ditches support bands of reedbed, complementing the West Thurrock Reedbed Site. Flora includes plants normally associated with chalk grassland, such as *Blackstonia perfoliata* and *Inula conyzae*, and a suite of saltmarsh species, such as *Aster tripolium, Scirpus maritimus, Puccinellia* spp. and *Spergularia marina*. The remaining areas of dry grassland are species-rich and provide foraging for the invertebrates. At least 59 Essex Red Data List species have been recorded.
Th22. Grenville Road Grasslands (1.3ha)	2.0km NW of Kent Project Site and 4.1km NW of Essex Project Site	The western boundary of the old Mill Wood Pit, an important invertebrate site that has been all but lost to the housing development. Small chalk bank and part of the associated railway line cutting still supports an interesting flora and an insect assemblage that includes *Myrmeleotettix maculatus*. This is rare in Essex and this is its only known location in Thurrock and only third known in south Essex. Site supports at least eight other Essex Red Data List species.
Th23. Anchor Field (3.3ha)	1.7km NW of Kent Project Site and 4.0km W of the Essex Project Site	Principal value is the invertebrate interest, which includes possibly the largest British population of the national BAP fly *Dorycera graminum*. Includes many nationally rare and scarce species and over 40 Essex Red Data List species. Also supports adder (*Vipera berus*), common lizard and slow-worm.
Th24. Mill Wood and Cliff (3.5ha)	2.0km N of Kent Project Site and 3.8km NW of Essex Project Site	Thought to be an ancient woodland fragment. Ancient woodland ground flora plants are rather sparse but *Conopodium majus* and Euphorbia *amygdaloides* occur sparingly. The southern fringe supports a rather trampled acid grassland flora, characterised by *Centaurium erythraea, Pilosella officinarum, Odontites vernus, Trifolium arvense* and *Trifolium campestre*. Lower slopes towards the cliff support two chalk grassland species: *Inula conyzae* and *Anthyllis vulneraria*. The cliff is a small remnant of the once vast and regionally, if not nationally, important Mill Wood Pit. This supported an exceptional invertebrate fauna. The cliff here supports many Essex Red Data List invertebrates.

Site Name and Reference (Figure 6.3.12.3)	Approximate distance from both Project Sites	Reason for Designation
Th28. Lion Gorge (7.4ha)	1.7km NW of Kent Project Site and 3.4km NW of Essex Project Site	Comprises steep, wooded chalk cliffs capped with sand and gravel deposits with relic grassland and scrub, forming an unusual habitat assemblage. *Daphne mezereum*, though possibly introduced, has been recorded. Old quarry tunnels at the back of the Gorge are important for bats. The invertebrate fauna includes five nationally rare (Red Data Book) species, including two UK BAP species.
Th31. Grays Pit Extensions (5.9ha)	1.8km N of Kent Project Site and 2.3km NW of Essex Project Site	The core of the Grays Chalk Pit nature reserve is a SSSI and excluded from the LWS network. The eastern section is an area of grassland lying on the chalk at the edge of the old quarry, whilst the main section to the west is more akin to brownfield land, being re-landscaped and disturbed ground. Provides an important ecological corridor to other LWSs to the west, most notably Lion Gorge and Warren Gorge.
Th38. Broom Hill (11.3ha)	1.8km N of Essex Project Site and 4.0km E of Kent Project Site	Hilltop site of interest for its ancient acid-grassland flora, particularly *Scilla autumnalis* along with *Saxifraga granulata*, *Potentilla argentea* and many legumes. Such acid grasslands fall within the remit of the Essex Heathland BAP. Invertebrate populations are of exceptional importance, being one of the key Thames Terrace grassland sites in Thurrock. The invertebrates include seven nationally rare (Red Data Book) species, 39 Nationally Scarce species and over 120 Local species.
Th49. Goshems Farm (74.0ha)	1.8km E of Essex Project Site and 5.1km E of Kent Project Site	Old landfill area that supports two important species: the Red Data Book plant *Chenopodium vulvaria* and the national BAP Hornet Robberfly (*Asilus crabroniformis*). Other plants on the Essex Red Data List, are *Chenopodium chenopodioides* and *Marrubium vulgare*.

Note: N = north, S = south, E = east, W = west

3.19 Also considered at this level is the Greater Thames Marshes Nature Improvement Area (NIA). NIAs seek to protect and enhance certain habitat types within a target area, in this case wetland habitats in particular. The Greater Thames Marshes NIA takes in the majority of the north Kent and South Essex coastlines and aims to provide additional coastal/floodplain grazing marsh within this area through targeted enhancement of improved grassland.

3.20 Of those non-statutory designations described within **Table EDP 3.4**, it is considered that only those occurring within the DCO Limits or within its immediate surroundings will be at potential risk from the Proposed Development. However, Disused Hospital Grounds, Mabledon LWS is scoped into the potential ZoI due to air quality impacts and so will be taken forward as an IEF. Discussion on the

impacts on this LWS will be dealt with separately in the Chapter 16 of the Environmental Statement (Document 6.1.16).

3.21 On this basis, the following LWSs will be scoped into the EcIA as IEFs requiring further consideration:

- Botany Marshes LWS;
- Ebbsfleet Marshes, Northfleet LWS;
- Alkerden Lane Pit LWS;
- Tilbury Marshes LWS; and
- Disused Hospital Grounds, Mabledon LWS.

3.22 The remaining non-statutory designations are not considered to be affected by the Proposed Development and have been scoped out of the EcIA as an IEF owing to their spatial separation and/or lack of ecological connections with the Project Site. The Proposed Development is unlikely to increase recreational pressure on any of these local sites and there are not terrestrial or hydrological linkages between them and the Project Site. Bluewater Quarry LWS is scoped out of the EcIA as its reasons for designation is due to its geological rather than ecological interest.

Habitats/Flora

3.23 The distribution of the different habitat types within and adjacent to the Project Site, confirmed through the 2020 Extended Phase 1 Habitat survey and detailed botanical survey, are illustrated on Figures 12.4 and 12.5 (Document References 6.3.12.4 and 6.3.12.5). In addition, detailed descriptions of these habitat types, together with illustrative photographs, are provided in **Annex EDP 1**.

3.24 As shown on Figure 12.4 (Document Reference 6.3.12.4), the Essex Project Site comprises predominantly hardstanding, being occupied by a large area used for vehicle storage, and buildings associated with Tilbury Ferry Terminal. There are small linear areas of poor semi-improved grassland and scrub adjacent to seasonally wet ditches along the A1089, which traverses the western part of the Essex Project Site.

3.25 The Kent Project Site supports a range of habitats including, intertidal sediment, saltmarsh, wetlands, including running water (the River Ebbsfleet), open water (ponds), reedbed/swamp and ditch networks, a range of grasslands and open

mosaic habitats, arable, scrub, woodland, chalk cliffs/exposures, buildings and bare ground. The saltmarsh and intertidal habitat are described and valued in Chapter 13 of the Environmental Statement (Document Reference 6.1.13). The Kent Project Site also supports populations of several rare plant species as shown on Figure 12.5 (Document Reference 6.3.12.5).

3.26 A summary and qualitative assessment of the habitats within the Project Site is provided in **Table EDP 3.5**.

Table EDP 3.5: Summary of Habitats within the Project Site.

Habitat/Flora	Distribution within the Project Site	Intrinsic Ecological Importance
Rare plants	Populations of 13 nationally scarce species were found on Swamscombe Peninsula in the Kent Project Site in 2016[26]. Nine were refound in 2020.	**National**, nationally scarce.
Broad-leaved semi-natural woodland	Mainly in the south of the Kent Project Site along the A2 corridor, some along the eastern boundary.	**Local**, owing to connectivity, good canopy species diversity, ground flora diversity and status as a Priority Habitat.
Broad-leaved plantation woodland	Many areas throughout the Kent Project Site.	**Site**, as small in extent and immature planting.
Scrub	Many areas throughout the Kent Project Site.	**Local**, despite being a common habitat, due to extent and structure.
Tall ruderal	Small extent in Station Quarter South.	**Site**, owing to small extent and low species diversity.
Arable	Small areas in the A2 corridor.	**Negligible**, owing to low species diversity and high levels of disturbance and management.
Improved grassland	Small area in the A2 corridor.	**Site**, owing to low species diversity.
Poor semi-improved grassland	Botany Marsh East and West, Broadness Grasslands and the Former Landfill.	**Local**, species diversity is low across most of extent, but forms large area of continuous habitat.
Semi-improved neutral and calcareous grassland	Neutral grassland in Broadness Grassland and to the west of Black Duck Marsh, calcareous grassland in Craylands Pit, Black Duck Marsh and north of Tiltman Lane.	**Local to District**, some areas of lower botanical diversity but supports nationally scarce plant species. One small area of MG1d grassland in Broadness Grassland with increased value.
Coastal/Floodplain Grazing Marsh	Botany Marsh West.	**District**, a large area of Priority Habitat[27] coastal/floodplain grazing marsh but a poor

26 Chris Blandford Associates, London Resort Company Holdings (LRCH) Ltd. London Paramount Entertainment Resort, Phase I and Botanical Survey Report, February 2016 (**Annex EDP 14**)

27 UK Biodiversity Action Plan Priority Habitat Descriptions Coastal and Floodplain Grazing Marsh From: UK Biodiversity Action Plan; Priority Habitat Descriptions. BRIG (ed. Ant Maddock) 2008

Habitat/Flora	Distribution within the Project Site	Intrinsic Ecological Importance
		example of it. Qualifies for LWS
Open mosaic on previously developed land	Bamber Pit and along main access track (including tunnel storage area).	**District**, Priority Habitat[28] forming a reasonable area just to the north of Manor Way Industrial Estate. The areas are not floristically diverse but have the potential to support important invertebrate assemblages.
Amenity grassland and shrub	Small area concentrated around Northfleet and road- and trackside verges.	**Negligible**, owing to low species diversity, intensive management.
Marshy grassland	Small area in Station Quarter South.	**Site**, owing to small extent and limited species diversity.
Waterbodies (ponds, standing water and ditches)	Scattered throughout the Kent Project Site, ditches forming two main networks at Black Duck Marsh and Botany Marsh.	**District**, many ponds are leachate treatment lagoons or contaminated by leachate. The remaining ponds and ditches support little vegetation other than reeds. Ditch network forms part of a large marsh area including Botany Marshes LWS and adjacent grazing marsh and is considered of district level.
Swamp (reedbed)	Black Duck Marsh and CTRL Wetland form extensive reedbed, smaller areas exist within Botany Marsh East and along ditch network.	**County**, Priority Habitat forming a large area of the Project Site in close proximity to the River Thames.
Bare ground	Mostly around Manor Way Industrial Estate.	**Negligible**, no species diversity and surrounded by buildings.
Hardstanding and buildings	Mostly around Manor Way Industrial Estate, Station Quarter North and the Essex Project Site	**Negligible**, man-made structures.
River Ebbsfleet	Along the Eastern boundary of the Kent Project Site.	**Local**, as this river corridor and its associated riparian habitat provide a green corridor.

Ancient Woodland

3.27 There are a number of areas of ancient woodland present along the A2 corridor, to the south of the Kent Project Site. Their location is shown on Figure 12.56: Tree Constraints Plan (Document reference: 6.3.12.56). As described within Appendix 12.9: Arboricultural Impact Assessment (Document reference: 6.2.12.9), ancient woodland is defined as an area which has been continuously wooded since at

[28] UK Biodiversity Action Plan Priority Habitat Descriptions Open Mosaic Habitats on Previously Developed Land (Updated July 2010) From: UK Biodiversity Action Plan; Priority Habitat Descriptions. BRIG (ed. Ant Maddock) 2008

least 1600 AD[29] and includes ancient semi- natural woodland and plantation on anicent woodland. 'Wooded continuously' does not mean there has been continuous tree cover across the whole area. Not all trees in the woodland must be old. Open space, both temporary and permanent, is also an important component of ancient woodland.

3.28 As described in paragraph 175c of the NPPF, ancient woodland is recognised in planning terms as an irreplaceable habitat:

"Development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused, unless there are wholly exceptional reasons and a suitable compensation strategy exists".

3.29 Of those areas of ancient woodland shown on Figure 12.56 (Document reference 6.3.12.56), Darenth Woods is designated as a SSSI (as described in Table EDP 3.3 above), and therefore considered of national importance commensurate with its statutory designation.

3.30 The remaining areas of ancient woodland within the potential zone of influence of the Proposed Development are not recognised as either SSSI or Local Wildlife Site. Within Kent, ancient woodlands are relatively well represented, and not all examples of ancient woodland would be considered of county/ national value.

3.31 For the purpose of the Ecological Impact Assessment (EcIA), ancient woodland is considered of at least county value.

Invasive Non-Native Species

3.32 A number of Invasive non-native plant species were recorded on the Kent Project Site in 2012 and 2015 including giant hogweed (*Heracleum Mantegazzianum*), Japanese knotweed (*Fallopia japonica*), wall cotoneaster (*Cotoneaster horizontalis*), Himalayan balsam (*Impatiens glandulifera*) and buddleia (*Buddleja davidii*).

3.33 A dedicated update survey took place in October 2020 but most locations could not be found due to the extensve colonisation of scrub throughout the Kent Project Site. Giant hogweed has been found in the NE tip (TN9). Japanese knotweed has been found along the River Ebbsfleet corridor and Broadness Grasslands on the peninsula (TN10) and wall cotoneaster has been found on the access track close to the southeast corner of Black Duck Marsh (TN11). All

[29] https://www.gov.uk/guidance/ancient-woodland-and-veteran-trees-protection-surveys-licences#history

locations are shown on Figure 6.3.12.4 (Document Reference 6.3.12.4). Buddleia is present throughout much of the Kent Project Site.

Habitat IEFs

3.34 The following habitats, being of Local value or higher, will be taken forward for further consideration in the EcIA as IEFs:

- Rare plants;
- Reedbed/swamp;
- Coastal/floodplain grazing marsh;
- Open mosaic habitat on previously developed land;
- Semi-improved grassland (including areas of poor semi-improved grassland, and semi-improved neutral and calcareous grassland);
- Scrub;
- Broadleaved semi-natural woodland;
- Ancient woodland; and
- The River Ebbsfleet.

3.35 The habitats, together with a number of the habitats or other features present within the Project Site, also require consideration in relation to their importance in maintaining populations of protected and/or notable species, as discussed further below.

Protected and/or Notable Species

3.36 The likelihood or confirmed presence of protected/and or notable wildlife species within the Project Site is summarised below with reference to previous survey work, updated desk study records, habitat suitability and detailed surveys where relevant. Further details are made available within annexes and plans where referenced.

3.37 Where a particular species or taxonomic group has been confirmed to be present, or presence is inferred based on habitat suitability, the ecological value or

significance of the population or assemblage is assessed on the geographical scale in paragraph 3.4.

3.38 A summary of previous survey findings and the updated 2020 record centre returns can be found at the beginning of each species section.

Birds

Wintering Birds

Previous Surveys

3.39 In 2015, the total number of wetland species (including birds of prey) recorded on the Kent Project Site over the two wintering bird survey periods of 2012/13 and 2014/15 was 42 with additional wetland bird species recorded incidentally or by London Bird Club. Six birds of prey species were recorded during the wintering bird and marine mammal surveys and three Kent RDB3[30] species were recorded over the two survey periods and from records from the London Bird Club, none have been recorded as regularly occurring species. The wintering bird assemblage was '*considered to be of County Importance*'[31]. No surveys were conducted on the Essex Project Site.

2019/2020 Update Surveys

3.40 A combined total of up to 44 species were recorded during 2012/13, 2014/15 and 2019/20 intertidal and high tide surveys. Of the 30 Ramsar/SPA/SSSI qualifying species mentioned in the Thames Estuary and Marshes and Medway Estuary and Marshes designation citations, a total of 22 have been recorded either low or high tide. Of the 22 Ramsar/SPA qualifying species which have stated peak population counts, EDP recorded an overall total of 12 over the course of the 2019/20 high and low tide surveys, with the numbers recorded during surveys at either low or high tide between 0.07% and 8.66% of the peak population counts stated in the citations.

3.41 In 2019/2020 it was concluded that the Project Site itself is not regarded to have value at the International level. However, the wintering wader/wildfowl assemblage present within inland areas of the Kent Project Site (namely Botany Marsh West and Blackduck Marsh), given their status as 'functionally linked' to the estuary assemblage, must be valued at the International level for nature conservation value. Botany Marsh West and Black Duck Marsh are considered

30 RDB3 = Kent Red Data Book 3 - Rare Species that have been recorded in 6-10 tetrads

31 Corylus Ecology, London Paramount Entertainment resort WINTERING BIRD SURVEY REPORT DRAFT For and on behalf of Chris Blandford Associates APRIL 2016 (**Annex EDP 16**)

locally important areas at dawn (rest)/ high tide (refuge) for small numbers of several target species.

3.42 Additionally, 28 other terrestrial species (non-wader, non-wildfowl species) of conservation concern were also recorded in generally low to moderate numbers, typically relating to individuals or small flocks of each species recorded on one or two survey visits, but also including a high diversity and reasonable numbers of Schedule 1 Birds[32] and Birds of Conservation Concern. Therefore, the terrestrial wintering bird assemblage present within the Kent Project Site should be considered separately and is of County Importance. Full details can be found in **Annex EDP 3**.

3.43 No surveys were conducted on the Essex Project Site due to lack of natural habitats suitable to support wintering birds.

Breeding Birds

Previous Surveys

3.44 In 2012, 36 bird species were recorded breeding within the Kent Project Site with a further six species considered likely to be breeding although this could not be confirmed. Of these 42 species, there was only one Schedule 1 species (Cetti's warbler (*Cettia cetti*)) and six Red List species including song thrush (*Turdus philomelos*), cuckoo (*Cuculus canorus*), starling (*Sturnus vulgaris*), dunnock (*Prunella modularis*), linnet (*Linaria cannabina*), lapwing (*Vanellus vanellus*), skylark (*Alauda arvensis*) and reed bunting (*Emberiza schoeniclus*)[33].

3.45 In 2016, it was found that the breeding bird assemblage within the Swanscombe Peninsula fulfilled the Kent Wildlife Trust criteria to be considered of County Importance[34]. However, based on the range of species of conservation importance recorded it was considered that the Swanscombe Peninsula should be considered as being of at least Regional Importance for its breeding birds, as it supported:

- At least three WCA Schedule 1 species breeding in 2015;
- 11 Birds of Conservation Concern (BoCC) Red List species and Priority Species; and

[32] Species listed on Schedule 1 of the Wildlife & Countryside Act (WCA) 1981 (as amended)

[33] Chris Blandford Associates, London Resort Company Holdings (LRCH) Ltd. London Paramount 2012 Breeding Birds Survey Report, January 2014 (**Annex EDP 17**)

[34] Based on Fuller, R.J., A method for assessing the ornithological interest of sites for conservation. Biological Conservation Volume 17, Issue 3, April 1980, Pages 229-239 and Local Wildlife Sites in Kent, Criteria for Selection and Delineation Version 1.5, Kent Wildlife Trust, August 2015. Report found in Annex EDP 18

- Seven species monitored by the Rare Breeding Bird Panel.

3.46 The three other survey areas, Bamber Pit, Northfleet Landfill and Station Quarter South supported fewer bird species and fewer of the species of conservation importance. The evaluations of these areas are set out below:

- Botany Marshes – Local Importance;
- Station Quarter South – Local Importance; and
- Northfleet Landfill – Neighbourhood Importance.

2020 Surveys

3.47 KMBRC returned numerous bird records within the search radius, 89 of which have been confirmed to have bred on at least one occasion. Of those 89, 37 are BoCC[35] with 21 (24%) within the Red List[36] and 16 (18%) within the Amber List[37]. The remaining 52 species are not considered to be of conservation concern. The majority of those Red and Amber list species records relate to terrestrial species; however, several wildfowl and waders have also been confirmed to have bred including, redshank (*Tringa totanus*), mute swan (*Cygnus olor*), greylag goose (*Anser anser*), shelduck (*Tadorna tadorna*), mallard (*Anas platyrhynchos*), shoveler (*Spatula clypeata*) and oystercatcher (*Haematopus ostralegus*).

3.48 Essex Field Club (EFC) returned records of 187 bird species, 72 of which were breeding records. There were no different species recorded. The record resolution was too low to ascertain a distance from either Project Site.

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35 Eaton MA, Aebischer NJ, Brown AF, Hearn RD, Lock L, Musgrove AJ, Noble DG, Stroud DA and Gregory RD (2015) Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. *British Bird*s 108, 708–746.

36 Red list criteria includes:
Species is globally threatened.
Historical population decline in UK during 1800–1995.
Severe (at least 50%) decline in UK breeding population over last 25 years, or longer-term period (the entire period used for assessments since the first BoCC review, starting in 1969).
Severe (at least 50%) contraction of UK breeding range over last 25 years, or the longer-term period.

37 Birds in the amber list will be subject to at least one of the relevant factors listed below:
Species with unfavourable conservation status in Europe (SPEC = Species of European Conservation Concern).
Historical population decline during 1800–1995, but recovering; population size has more than doubled over last 25 years.
Moderate (25-50%) decline in UK breeding population over last 25 years, or the longer-term period.
Moderate (25-50%) contraction of UK breeding range over last 25 years, or the longer-term period.
Moderate (25-50%) decline in UK non-breeding population over last 25 years, or the longer-term period.
Rare breeder; 1–300 breeding pairs in UK.
Rare non-breeders; less than 900 individuals.
Localised; at least 50% of UK breeding or non-breeding population in 10 or fewer sites, but not applied to rare breeders or non-breeders.
Internationally important; at least 20% of European breeding or non-breeding population in UK (NW European and East Atlantic Flyway populations used for non-breeding wildfowl and waders respectively).

3.49 A diverse assemblage has been recorded within the Kent Project Site due to the presence of a range of wetland, grassland and scrub habitats. A summary of these species has been included within **Annex EDP 4**, and plans showing all registrations as Figures 12.8 to 12.11 (Document References 6.3.12.8 and 6.3.12.11) along with estimated numbers of pairs.

3.50 A total of 99 species were recorded during the breeding bird surveys and these are shown in **Annex EDP 4**. Of those species recorded during the survey 33 species were confirmed as breeding within the survey area, 26 are considered to have probably bred, 18 possibly bred and the remaining 22 species are considered to be non-breeding species.

IUNC Red List Species

3.51 Pochard (*Aythya ferina*) are included on the IUCN Red List as Vulnerable (decreasing) due to recent significant global population declines which are a result of multiple factors including pollution, hunting, recreational disturbance, reduction in breeding success, habitat loss and pollution. Pochard are also included as on the Birds of Conservation Concern Red List.

3.52 Pochard were recorded in Black Duck Marsh and Pond P3 between April and June 2020 and it is estimated that the Kent Project Site supports between seven and ten breeding pairs. Whilst chicks were not observed during the survey effort this species is very likely to have bred within the Kent Project Site. Pochard are very secretive when breeding and chicks are prone to predation making them very difficult to detect.

Schedule 1 Species

3.53 Fifteen species that are included on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) were recorded during the 2020 breeding bird surveys. Of these, greylag goose, bearded tit (*Panurus biarmicus*) and Cetti's warbler are confirmed breeding species, marsh harrier (*Circus aeruginosus*) probably bred within the Kent Project Site, spotted crake (*Porzana porzana*), little ringed plover (*Charadrius dubius*), barn owl (*Tyto alba*), kingfisher (*Alcedo atthis*) and peregrine falcon (*Falco peregrinus*) possibly bred. The remaining six species; whimbrel (*Numenius phaeopus*), greenshank (*Tringa nebularia*), mediterranean gull (*Larus melanocephalus*), little tern (*Sternula albifrons*), redwing (*Turdus iliacus*) and black redstart (*Phoenicurus ochruros*) are considered to be non-breeding species.

3.54 Greylag goose were recorded on all surveys and it is considered that the Kent Project Site supports between two and sixteen breeding pairs.

3.55 Bearded tit was recorded in the Black Duck Marsh and the CTRL Wetlands between April and June with recently fledged juveniles recorded in June. Based on recorded activity it is considered that the Kent Project Site supports between three and five breeding pairs.

3.56 Cetti's warbler were recorded across the whole of the Kent Project Site, although the greatest density of singing males was recorded in the marsh areas. This Schedule 1 and Green List Species is considered to a common breeding bird with between 51 and 87 breeding pairs recorded.

3.57 Marsh harrier were recorded on all surveys and it is considered probable that a single pair breeds within the marsh areas of the Kent Project Site. Activity to confirm breeding was not recorded.

3.58 A single spotted crake was recorded on the track by Pond P8 in June by an ecologist who was completing invertebrate surveys. This species was not recorded during the breeding bird survey or during the nocturnal spotted crake survey, which was completed in late June after the incidental sighting. The Kent Project Site contains habitat that is suitable breeding habitat for this species so based on the EBBC criteria it is considered to be a possible breeding species, although based on the results of the survey effort it is more than likely that the incidental record relates to a migrant bird.

3.59 A pair of little ringed plover were recorded displaying in April however were not recorded on subsequent surveys.

3.60 A single barn owl was recorded foraging in the southern part of the Kent Project Site in July. Barn owl are considered to have possibly bred.

3.61 A pair of kingfisher were recorded in the Ebbsfleet Car Park 2 area in May and are considered to have possibly bred somewhere off-site, although this speices is likely to use the Kent Project Site for foraging.

3.62 Peregrine falcon were recorded in April and June. In April, a pair was recorded displaying, although breeding could not be confirmed. This species regularly hunts over the Kent Project Site.

3.63 A single whimbrel was recorded foraging in Swanscombe Marsh North in May. This speices is a non-breeding species and the registration relates to a bird on spring migration.

3.64 Greenshank was recorded in May and relates to a bird on passage.

3.65 Mediterranean gull were recorded on Black Duck Marsh, Bamber Pit and Botany Marsh West with a peak count of nine birds. Mediterranean gull are considered to be a non-breeding species.

3.66 There was a single registration of little tern flying over the Kent Project Site and this species is considered to be a non-breeding bird.

3.67 A single redwing was recorded in April. This record relates to a late winter visitor and this species is considered to be a non-breeding bird.

3.68 A single male black redstart was recorded within the CEMEX Northfleet Concrete plant, just to the east of the DCO Order Limits. This species did not breed within the survey area in 2020, although are known to breed to the east of Kent Project Site.

Red List Birds of Conservation Concern

3.69 Seventeen Red List Birds of Conservation Concern were recorded on the Kent Project Site during 2020 and these are pochard, cuckoo, lapwing, whimbrel, herring gull (*Larus argentatus*), skylark, grasshopper warbler (*Locustella naevia*), starling, redwing, song thrush, mistle thrush (*Turdus viscivorus*), nightingale (*Luscinia megarhynchos*), black redstart, house sparrow (*Passer domesticus*), yellow wagtail (*Motacilla flava*), grey wagtail (*Motacilla cinerea*) and linnet.

3.70 Pochard and black redstart have been discussed above.

3.71 Cuckoo are considered to have probably breed as adults were recorded between April and June. The Kent Project Site supports suitable host species including dunnock and reed warbler.

3.72 Lapwing are considered to have possibly bred with a single bird recorded displaying in May.

3.73 Herring gull were only recorded flying over and are considered to be a non-breeding speices.

3.74 Skylark were recorded on all surveys and are considered to have probably bred with nine to 13 territorial males occurring in suitable grassland habitats.

3.75 Grasshopper warbler were recorded on all visits and are considered to have probably bred with 12 to 15 territorial males recorded in suitable scrubby and ruderal habitats.

3.76 Starling were recorded on all surveys and are considered to have possibly bred, although it is more likely breeding occurs in adjacent built up areas and birds use the Kent Project Site for foraging.

3.77 Song thrush were recorded on all survey visits and this species was confirmed as breeding as adults were recorded carrying food in May and June. Based on the registrations of singing males the Kent Project Site is considered to support up to 67 breeding pairs.

3.78 Mistle thrush were recorded in low numbers in all survey months and juvenile birds were recorded in June. The Kent Project Site is considered to support approximately three breeding pairs.

3.79 Nightingale were recorded in April and May and are considered to have probably bred. Based on the registrations of signing male birds it is considered that the Kent Project Site supports between three and four breeding pairs.

3.80 House sparrow were recorded in low numbers throughout the survey period and are considered to probably breed with up to eight pairs present.

3.81 A single yellow wagtail was recorded in June. The Kent Project Site supports suitable habitat for this species to breed although it is likely that this registration relates to a bird passing through.

3.82 A single pair of grey wagtail were confirmed as breeding. This species was recorded April, May and June and adults were also recorded carrying food.

3.83 Linnet were recorded on all survey visits and were confirmed as breeding within areas of scrubby habitat. Juvenile birds were recorded in July and based on the registrations of singing males it is considered that up to 39 pairs bred across the Kent Project Site.

Amber List Birds of Conservation Concern

3.84 Twenty-nine Amber List Birds of Conservation Concern were recorded on or over the Kent Project Site during the 2020 breeding bird surveys and these are greylag goose, mute swan, shelduck, shoveler, gadwall (*Mareca Strepera*), mallard, teal (*Anas crecca*), swift (*Apus apus*), stock dove (*Columba oenas*), spotted crake, oystercatcher, redshank, greenshank, black-headed gull (*Chroicocephalus ridibundus*), mediterranean gull, common gull (*Larus canus*), great black-backed gull (*Larus marinus*), yellow-legged gull (*Larus michahellis*), lesser black-backed gull (*Larus fuscus)*, little tern, common tern (*Sterna hirundo*), marsh harrier, kingfisher, kestrel (*Falco tinnunculus*), house martin (*Delichon urbicum*), willow

warbler (*Phylloscopus trochilus*), dunnock, bullfinch (*Pyrrhula pyrrhula*) and reed bunting.

3.85 Of the above species greylag goose, spotted crake, greenshank, little tern, marsh harrier and kingfisher are included on Schedule 1 and have been discussed above.

3.86 It is considered that the Kent Project Site supports a probable breeding pair of mute swan.

3.87 Shelduck are considered to be possibly breeding with up to eleven breeding pairs. Adults were recorded from April to June with displaying noted in April.

3.88 Shoveler were recorded in low numbers in April and May and it is considered that up to four pairs possibly bred.

3.89 Gadwall were also recorded in low numbers from April to June with display behaviour noted in April and are a probable breeding species. It is considered that the Kent Project Site supports up to six breeding pairs.

3.90 Mallard were recorded in all months of surveys and the Kent Project Site is considered to support between fourteen and seventeen probable breeding pairs.

3.91 A single teal was recorded in April in Botany Marsh West. This species is considered to have possibly bred.

3.92 Swift were recorded foraging in May, June and July. This species not considered to have bred, although there is suitable nesting habitat within the industrial areas.

3.93 Small numbers of stock dove were recorded on all survey visits. Based on the number of registrations it is considered that the Kent Project Site supports up to ten breeding pairs.

3.94 Oystercatcher were recorded in May, June and July with juveniles also recorded in July. It is likely that one or two breeding pairs are supported.

3.95 Kestrel were recorded in low numbers on all survey visits. It is considered they are a probable breeding species with between one and three breeding pairs.

3.96 House martin were recorded foraging in May. They are considered to be non-breeding.

3.97 Singing male willow warbler were recorded in April and June. It is considered possible that a single pair bred in 2020.

3.98 Dunnock are common and widely distributed across the whole of the Kent Project Site. Adults were recorded on all surveys and juveniles were recorded in June and July. Based on the registrations, it is considered that between 45 and 84 breeding pairs are present.

3.99 Bullfinch were recorded in all months of survey and it is considered that between three and five breeding pairs are supported.

3.100 Reed bunting were also recorded in all months of survey in areas of suitable habitat including scrub and marshy and wetland habitats. It is considered that the Kent Project Site supports between seven and fourteen breeding pairs.

3.101 Redshank, black-headed gull, common gull, great black-backed gull, yellow-legged gull, lesser black-backed gull and common tern are all considered to be non-breeding birds and registrations of these species are limited to individual or low numbers of birds or of birds flying over.

Species of Principal Conservation Importance

3.102 Thirteen Species of Principal Importance (as listed on the NERC Act 2006) were recorded but these are also Birds of Conservation Concern and have been discussed above.

Green List Birds of Conservation Concern

3.103 Green listed species were present in large numbers across all areas. The most commonly recorded green listed species were wren (*Troglodytes troglodytes*), with a peak count of 87-155 pairs, whitethroat (*Sylvia communis*) with 85-130 pairs, reed warbler (*Acrocephalus scirpaceus*) with 70-133 pairs, robin (*Erithacus rubecula*) with 47-103 pairs, blackcap (*Sylvia atricapilla*) with 57-113 pairs, blackbird (*Turdus merula*) with 61-116 pairs and chiffchaff (*Phylloscopus collybita*) with 43-73 pairs and most notable Cetti's warbler, a WCA Schedule 1 Species discussed above.

Notable Registrations by Habitat

3.104 The Kent Project Site supports a notable assemblage of wetland bird species which are present within Botany Marsh, the CTRL Wetland and Black Duck Marsh. In Botany Marsh West, greylag geese, shelduck, shoveler, gadwall, mallard, teal, pochard and tufted duck (*Aythya fuligula*) were all recorded. Black Duck Marsh is

likely to support a pair of marsh harriers and a small heronry (grey heron, *Ardea cinerea*), and there are a small number of pairs of bearded tit spread between the CTRL Wetland and Black Duck Marsh. A single spotted crake was also recorded crossing a track near Black Duck Marsh in early June.

3.105 The scrubland across the peninsula, and to a lesser extent the chalk pits to the south, supports a range of scrubland specialists, including grasshopper warbler, nightingale, cuckoo, as well as the aforementioned whitethroats and other more common species. Dunnock are particularly abundant, with between 45 and 84 breeding pairs.

Evaluation

General

3.106 The Kent Project Site supports a combined breeding bird assemblage of 77 species which are considered to be confirmed, probable and possible breeding species, along with 22 non-breeding species. The site supports one IUCN Vulnerable species, fifteen Schedule 1 species, seventeen species that are listed on the Red List of Birds of Conservation Concern and twenty-nine Amber List Birds of Conservation Concern. In addition, thirteen of the species recorded during the 2020 breeding bird survey are listed as Species of Principal Conservation Importance on the NERC Act 2006.

Schedule 1 Species

3.107 A total of fifteen Schedule 1 species were recorded across the Kent Project Site. Of these three; greylag goose, bearded tit and Cetti's warbler were confirmed as breeding, although the records of greylag goose are not considered to be significant as they are likely to be naturalised birds and not part of migratory populations that breed in northern Scotland. Spotted crake could possibly have bred as optimal breeding habitats are present in the centre of the Kent Project Site, but it is more likely that the single record of this species related to a migratory bird or could possibly have been mid-identified. Other possible breeding species included little ringed plover, barn owl, kingfisher and peregrine, all of which are fairly widespread throughout the UK. A single pair of marsh harrier are considered to have probably bred within Black Duck Marsh. Six additional Schedule 1 species were recorded but registrations were limited to individuals or birds flying over.

IUCN Red List Species

3.108 Pochard is listed as Vulnerable on the IUCN Red List and is also included as a rare breeding bird within the UK (Rare Breeding Bird Panel (RBBP). The latest freely-available RSBP Report published in 2016 estimates the UK breeding population of this species to be 701 breeding pairs, with 50 confirmed pairs in Kent and a likely maximum county population of 63. The results of the 2020 breeding bird surveys estimates that the Kent Project Site supports a population of between seven and ten breeding pairs and this equates to between 0.99% and 1.4% of the national breeding population of this species. On a county level the Kent Project Site supports between 14% and 20% of the confirmed county population and between 11% and 15% of the likely maximum breeding population within Kent, based on the 2016 species nesting data.

3.109 Based on the above it is therefore considered that the Kent Project Site is of National importance for breeding pochard.

Birds of Conservation Concern

3.110 The Kent Project Site supports seventeen species included on the Red List of Birds of Conservation Concern of which four, song thrush, mistle thrush, grey wagtail and linnet, are confirmed as breeding on the site, pochard, cuckoo, skylark, grasshopper warbler, nightingale and house sparrow are all considered to have probably bred. Lapwing, starling and yellow wagtail possibly bred and the remaining four species are non-breeders.

3.111 A total of 29 Amber List Birds of Conservation Concern were recorded in 2020 and these included four species, greylag goose, mallard, oystercatcher and dunnock which were confirmed as breeding. Eight species, mute swan, shelduck, gadwall, stock dove, marsh harrier, kestrel, bullfinch and reed bunting are considered to have probably bred. Shelduck, teal, swift, spotted crake, kingfisher and willow warbler are considered to have possibly bred with the remaining eleven species are non-breeders.

3.112 Shoveler and marsh harrier are both included as rare breeding birds within the UK and the RSBP report shows that the Kent breeding population for shoveler was 12 confirmed nests with a likely maximum of 37 breeding pairs. The Kent Project Site is considered to support between one and four breeding pairs, which equates to between 8% and 33% of confirmed breeding within the county. The Kent Project Site is therefore of at least County importance for breeding shoveler.

3.113 According to the RSBP report Kent was considered to support 36 nesting pairs of marsh harrier, which means the Kent Project Site supports approximately 3% of

the Kent population, although the true proportion is likely to be lower as marsh harrier populations continue to increase across the county as well as the UK. That said, the Kent Project Site is of County importance for breeding marsh harrier – particularly the reedbed in Black Duck Marsh and the CTRL Wetland.

Local Wildlife Site Selection Criteria

3.114 Taking into consideration the information contained within the Local Wildlife Site selection criteria in Kent (Version 1.5, 2015) the Kent Project Site should be considered to be of at least County Importance for breeding birds as it meets the following criteria as set out below.

3.115 It is occupied by at least five species that use the site regularly or breed at the site which has a Kent population of 50 or fewer territories. These species are shoveler, pochard, marsh harrier, little ringed plover and peregrine. The species included here are those that are confirmed, probable and possible breeding species which are included in the RBBP Reports which includes data for confirmed breeding pairs with the county as being below 50. Spotted crake has not been included as part of this assessment, despite being included on the RBBP report as this species was only recorded on one occasion as an incidental sighting and is likely to relate to a bird on passage.

3.116 The Kent Project Site supports six Kent Red Data Book 3 (KRDB3) species during the breeding bird season. The threshold for selection as a LWS is three. These species are gadwall (probable), pochard (probable), bearded tit (confirmed), reed warbler (confirmed), nightingale (probable) and house sparrow (probable).

3.117 The Kent Project Site supports a breeding assemblage of at least 50 speices. In 2020 the combined assemblage of confirmed, probable and possible breeding species was 77. Even with discounting some of the possible species (e.g. teal, swift, spotted crake, lapwing) it would be reasonable to consider that the Kent Project Site would regularly meet this criterion.

Valuation of the Breeding Bird Assemblage

3.118 The combined assemblage of breeding birds recorded at the Kent Project Site in 2020 is considered to be of Regional value. The valuation of the combined assemblage is based on the overall number of Red and Amber Birds of Conservation Concern recorded, the usage by an IUCN Vulnerable species as well as meeting at least three of the criteria for the selection of LWss in Kent.

3.119 With 7-10 pairs present, this equates to between 0.99% and 1.4% of the national breeding population. The Kent Project Site is therefore considered to be of National importance for breeding Pochard.

3.120 No surveys were conducted on the Essex Project Site due to lack of natural habitats suitable to support breeding birds.

Passage Birds Survey

3.121 The results of the passage bird surveys are included in **Annex EDP 4**. Thirty-seven species were recorded during the passage surveys, with ten of those not being species directly associated with the wetland habitat. Abundance and diversity were significantly reduced from that found along the estuary front throughout winter, with the most abundant birds being black-headed gulls and mallard. Three Peregrines were recorded flying over on 15 April.

3.122 Ringed plover (*Charadrius hiaticula*), Dunlin (*Calidris alpina*) and Redshank (*Tringa totanus*) were recorded and are species listed as a qualifying feature of the Thames Estuary and Marshes SPA.

3.123 One Ringed Plover was recorded during the 21 April 2020 high tide survey and twelve were recorded during the 02 September 2020 low tide survey. The Thames Estuary and Marshes SPA supported 2.6% of the European/North African wintering population according to the 1993/4-1997/8 peak mean of 1,324 individuals (English Nature (EN), 2000), allowing the site to qualify for classification as an SPA. The numbers recorded during the surveys constitute 0.9% of the SPA population and is not significant.

3.124 Two Dunlin were recorded during the 02 September 2020 low tide survey. The Thames Estuary and Marshes SPA supported 2.1% of the North Siberian/European/West African population according to the 1993/4-1997/8 peak mean of 29,646 individuals (English Nature (EN), 2000). The numbers recorded during the surveys are not significant.

3.125 Fourteen Redshank were recorded during the 08 October low tide survey and one during the 20 October 2020 high tide survey. The Thames Estuary and Marshes SPA supported 2.2% of the Eastern Atlantic wintering population according to the 1993/4-1997/8 peak mean of 3,251 individuals (English Nature (EN), 2000). The numbers recorded during the surveys constitute a peak of 0.4% of the SPA population and is not significant.

3.126 The combined assemblage of passage birds recorded at the Kent Project Site in 2020 is considered to be of Site value only.

3.127 No surveys were conducted on the Essex Project Site due to lack of natural habitats suitable to support passage birds.

Bats

Previous Surveys

3.128 In 2015, a total of nine species were recorded within the Kent Project Site. Unidentified *Myotis* bats were recorded in all areas but at Station Quarter South, two species were confirmed: Natterer's (*Myotis natterii*) and Daubenton's (*Myotis daubentonii*). A tree roost was identified in Station Quarter South and two further likely tree roosts were also determined[38].

3.129 The results of the bat surveys revealed a bat assemblage in Swanscombe Peninsula, Craylands Pit, Bamber Pit and Station Quarter South of at least 'Local Importance', and within Northfleet Landfill of 'Neighbourhood Importance'.

2020 Desk Study Records

3.130 In 2020, Kent bat group returned 390 records of bats of which 169 related to roosting; Daubenton's bat (57), Natterer's bat (37) and brown long eared (*Plecotus auritus*) (36). Other species roosting were serotine (*Eptesicus serotinus*), Brandt's (*Myotis brandtii*), Leisler's (*Nyctalus leisleri*), noctule (*Nyctalus noctule*), common pipistrelle and soprano pipistrelle (*Pipistrellus pygmaeus*). Only Nathusius pipistrelle (*Pipistrellus nathusii*) had been recorded without any roosts. No roost records came from within the Project Site.

3.131 EFC returned records of nine species, five of which were recorded as hibernating or roosting; Daubenton's, natterers bat, *Myotis* sp., pipistrelle species and brown long eared bat. Hibernation records are from Chafford Tunnels, Grays Tunnels and bunkers and a maternity roost was found in Stifford St Mary's Church. No roost or hibernation records are from within the Project Site.

3.132 The EPS licence search found that a licence (NE ref: 2016-21327-EPS-MIT) located approximately 1.8km east of the Kent Project Site, was granted in 2016 for the loss of a day roost for a single common pipistrelle. Another (NE ref: EPSM2009-1165), located approximately 700m west of the Kent Project Site was granted in 2009 but NE no longer hold the information for this licence.

[38] London Paramount Entertainment Resort, Bat Activity Report 2015, Corylus Ecology (on behalf of Chris Blandford Associates), June 2016 (**Annex EDP 19**).

Roosting Bats

Trees

3.133 During the visual assessment for roosting bats on 04 June 2020, no bats or evidence of bats was found from ground level. However, a total of 19 trees were identified as offering potential to support roosting bats. Fifteen trees were identified as having high potential, two with moderate potential and two as low potential. Details are provided in **Annex EDP 5** and the locations of these trees are illustrated on Figure 12.12 (Document Reference (6.3.12.12).

3.134 Following the aerial inspections, an additional tree (G120n) with moderate potential was added, eight trees were down graded in potential and two trees were upgraded from the initial ground assessment. This results in nine trees considered to have high potential, five with moderate and six with low potential.

3.135 No evidence of a roost has been found in any of the trees. As the Proposed Development progresses, if it becomes apparent that other trees with roost potential will be impacted, aerial inspections will be conducted on these trees.

Buildings

3.136 There are a total of 166 buildings within the DCO Limits. Of these, 117 buildings were assessed as having negligible potential to support roosting bats due to their construction or are no longer present. These buildings were therefore not subject to any further survey.

3.137 A total of 23 buildings were found to have potential to support roosting bats during the assessment, with 10 assessed as having Low potential, 10 as Moderate potential and three as High potential. There are 26 buildings that could not be adequately assessed due to access restrictions. Locations and gradings of the buildings are shown on Figure 12.13 (Document Reference (6.3.12.13).

3.138 An individual soprano pipistrelle was recorded entering B67 during the survey on 27 August 2020. An individual common pipistrelle was recorded entering B32 on 17 September 2020. It is considered B67 and B32 each support a summer day roost for individual bats and it is likely the buildings are only occasionally used as other surveys on the buildings recorded no bats emerging.

3.139 No emergences or re-entries have been detected from any other buildings surveyed.

3.140 As described within Section 2: Methodology, for those 26 buildings that could not be surveyed (16% of the total) a precautionary approach to the assessment of effects upon these buildings is provided within Chapter 12: *Terrestrial and freshwater ecology and biodiversity* (Document reference 6.1.12) of the Environmental Statement. Furthermore, in the unlikely event that roosting bats are present (considered unlikely based on the overwhelming majority of buildings being of negligible bat roost potential and the relative lack of confirmed roosts), precautionary mitigation measures are detailed within the 'Bat Mitigation Strategy' enclosed within the EMMF (Document reference: 6.2.12.3)

Tunnels

3.141 The assessment of roosting potential undertaken by EDP in August 2020 noted 10 tunnels with suitability for roosting, swarming and hibernating bats, as described further below, with full details included in **Annex EDP 5**.

Tunnels (Summer Roosts)

3.142 Of the 10 tunnels inspected, 10 were considered to have some summer roosting potential, including two tunnels with moderate potential to support roosting bats and eight with low potential as shown on Figure 12.13 (Document Reference (6.3.12.13).

3.143 Those tunnels considered to have summer roosting potential were then subject to survey emergence/re-entry surveys following the same level of survey effort as for buildings.

3.144 No emergences or re-entries were recording during the surveys.

Tunnels - Autumn Swarming

3.145 For autumn swarming; five tunnels had moderate potential to support roosting bats, four had low potential and one negligible potential.

3.146 Static detectors deployed at the entrance of the tunnels in August and September 2020 recorded low levels of bat activity. Due to access constraints for health and safety reasons it was not always possible to position statics so that recordings were from solely within the tunnels themselves. As such it is difficult to determine absolutely whether behaviour can be attributed to autumn swarming or general foraging. The acoustic surveys undertaken were aiming to identify repeated peaks of activity between 2-5 hours after sunset indicative of swarming behaviour.

3.147 A number of the tunnels returned no records of bats or low numbers of recordings of an assemblage typical of the area including common pipistrelle, soprano pipistrelle, noctule, long-eared bat and *Myotis* bats. Of the tunnels surveyed, tunnel T7 and tunnel T16 recorded larger than average numbers of *Myotis* sp. calls. There were 14 *Myotis* recordings made between midnight and 1am on 25 September at tunnel T7 but no bats were recorded at tunnel T7 during the August or October deployments.

3.148 There were 42 *Myotis* recordings made between 10.30pm and midnight on 1 September were made at the south end of T16. Conversely, there were no *Myotis* calls recorded at the northern end of T16 during this time, nor was there a distinct, repeated peak of activity within the target period in August or October.

3.149 The results do not indicate autumn swarming behavior by any species at the tunnels.

Valuation of the Roosting Bat Assemblage

3.150 Based on the results of the surveys and assessment of the conservation status of the bat species present, the roosting bat assemblage is considered to be of Local level importance.

3.151 No roosting features are present on the Essex Project Site.

Bat Foraging/Commuting Activity

3.152 A bat assemblage of at least eight species has been recorded within the Kent Project Site. This assemblage includes one nationally rare bat; Nathusius' pipistrelle and three Kent Red Data Book species; noctule, Leisler's and Serotine (the latter also being a Kent BAP species), however, recordings from these species are few with 82.6-89.3% of activity resulting from common pipistrelle. Results from the bat activity surveys are detailed in **Annex EDP 5** and on Figures 12.15 to 12.17 (Document References 6.3.12.15 and 6.3.12.17).

3.153 Total amount of activity was lowest along the A2 corridor and highest in Botany Marshes, Black Duck Marsh, Peninsula North and the NE tip. This is not surprising as the grassland and wetland habitat on these high activity areas provides food foraging habitat for bats. Land north of Tiltman Avenue recorded the highest average number of species.

3.154 The abundance and diversity of bat species recorded at the Kent Project Site is considered to be high but with common and widespread generalist species such as common pipistrelle bats accounting for the vast majority of foraging and

commuting activity. However, a number of bat species considered rarer in the UK were recorded using the Kent Project Site in low numbers including Nathusius' pipistrelle, Noctule, Leislers and Serotine. These bars are also considered rare, scarce or declining in Kent. Serotine bats are a BAP species in Kent. As *Myotis* species canot be reliably recorded to species level, there is the potential for the recorded *Myotis* species to be Brandt's (*Myotis brandti*), Natterer's (*Myotis nattereri*) or Daubenton's (*Myotis daubentonii*) bats as records of these species were returned during the desk study.

3.155 The overall foraging bat assemblage, taking into consideration the presence (and potential presence) of rare and uncommon species (albeit only present in low numbers), is considered to be of District level value.

3.156 There is no suitable forging habitat present on the Essex Project Site.

Dormouse

Previous Surveys

3.157 Despite the records close to the Kent Project Site, the previous survey work in 2015 concluded that '*It is considered highly unlikely that dormice will occur within the Springhead Site (Station Quarter South)*' and as a result, no further surveys were undertaken[39].

2020 Surveys

3.158 In 2020, 12 records of dormouse were returned by KMBRC. Three of the records dated from 2017 from near the Bluewater Shopping Centre. The closest of these was 250m west of the Kent Project Site. Another record from 2011 originated from a similar area between the Bluewater Shopping Centre and the A296. The other records were all over ten years old, none of which originated within the Project Site. EFC returned one 2009 record from Tilbury Marshes. Records returned from KMBRC and those extracted from previous survey work are displayed on Figure 12.18 (Document Reference (6.3.12.18).

3.159 During the deployment of the tubes in April 2020, three individual dormice were found in old tubes that had remained on the Kent Project Site from previous surveys.

3.160 A summary of the dormice and nests found in each area of the Kent Project Site during each visit can be found in **Tables EDP 3.6** and **3.7**.

[39]Corylus Ecology, London Paramount Entertainment Resort DORMOUSE REPORT (For and on behalf of Chris Blandford Associates, FEBRUARY 2016 (**Annex EDP 20**).

Table EDP 3.6: Dormouse and Nest Counts for Deployment 1

Area (Figure 6.3.12.1)	Dormouse count					Nest count				
	May	Aug	Sep	Oct	Nov	May	Aug	Sep	Oct	Nov
Main access	-	-	-	-	-	-	-	2	-	1
Black Duck	1A	-	1A	1A	-	-	4	11	2	6
Sports Ground	6A	1A 1A w/6J	1A w/1J 1J	2A	-	3	1	5	8	10
Bamber Pit	1A	-	6A 1A w/1J	1A 1A w/4J 1A w/1J 5J	-	1	-	3	10	15
Former Landfill	-	1A w/4J 1A w/3J 2A	1A (lactating) 1A w/3P 1A w/1J 8 A	5 A 1 A w/1J 1 J	2A 1A w/1J 1J	-	15	13	19	23
Station Quarter North	-	-	-	-	-	-	2	2	2	2
Station Quarter South	-	-	1A w/1J 1A w/7J 2A	2A	1	-	1	3	5	3

Note: w/ = with, A = adult, J = juvenile, P = pink

Table EDP 3.7. Dormouse and Nest Counts for Deployment 2

Area (Figure 6.3.12.1)	Dormouse count			Nest count		
	Sep	Oct	Nov	Sep	Oct	Nov
Broadness Grassland	1A	3A	1A	-	3	2
NE Tip	-	-	-	-	-	1
Botany Marsh East	1A	2A	1A	-	2	4
Land north of Tiltman Ave	-	-	-	-	-	-

Note: A = adult, TBC = to be completed

3.161 Dormouse activity is greatest within the Former Landfill with a majority of nests, adults and juveniles found there. Breeding has been confirmed (through the presence of adults with juveniles) in the Sportsground, Bamber Pit, the Former Landfill and Station Quarter South.

3.162 Adults have been found on the Former Landfill, Sportsground, around Black Duck Marsh, in Bamber Pit, on Botany Marsh East, on Broadness Grasslands and in Station Quarter South. Nests have been found in the Former Landfill, Bamber Pit,

Sports Ground, around Black Duck Marsh, Station Quarter North and South and around the SW Tip and Main Access Track.

3.163 The locations of these dormice sightings can be found in Figure 12.19 (Document Reference 6.3.12.19). Further details can be found in **Annex EDP 6**.

3.164 A summary of dormouse evidence at the Kent Project Site is shown in Figure 12.20 (Document Reference 6.3.12.20). This species is considered likely to be using the woodland and scrub habitats within the Kent Project Site for breeding, foraging, refuge and dispersal. Breeding is confirmed/ considered very likely within the southern half of the site in Station Quarter South, Former Landfill, Bamber Pit and the Sports Ground. The northern half of the Kent Project Site; in the areas of Botany Marsh, Black Duck Marsh, NE Tip and Boradness Grasslands, only adults and nests have been found. Breeding is not thought to be occurring in these areas, they are likely used for foraging in the summer months.

3.165 It is considered that the Kent Project Site supports suitable foraging habitat for dormouse across the Swanscombe Peninsula, alongside some, albeit sub-optimal breeding/hibernation habitat within the Sportsground, Former Landfill, Bamber Pit and Station Quarter South. The Kent Project Site is therefore considered of importance to the local dormouse population at the District level.

3.166 There is no suitable dormouse habitat present on the Essex Project Site.

Badger

Previous Surveys

3.167 In 2015, no signs of badgers were found within or adjacent to most of the Kent Project Site: 'Badger setts were found only in the [redacted] around the [redacted] and between the [redacted] and [redacted][40].

2020 Surveys

3.168 In 2020, KMBRC and EFC returned many records of badger. None of the records originate from within the Project Site.

3.169 The Kent Project Site has been surveyed extensively and no evidence of badger has been found during the Extended Phase 1 survey, dedicated badger survey or any other survey visits in 2020 and there is no suitable habitat within the Essex

[40] Chris Blandford Associatesm London Resort Company Holdings (LRCH) Ltd. London Paramount Entertainment Resort 2015 Badger Survey Report (Confidential), February 2016 (**Annex EDP 21**)

Project Site. It is not considered likely that badgers are using the Project Site and they will not be taken forward as an IEF.

Water Vole

Previous Surveys

3.170 In 2015 it was concluded that despite previous records of water voles on Swanscombe Peninsula and along the Ebbsfleet, current survey evidence strongly suggested that water voles were absent from the Kent Project Site[41].

2020 Surveys

3.171 In 2020, KMBRC returned 25 records for water vole, the most recent record originates from 2016 for a location 5.0km east of the Kent Project Site. The other records all predate 2005 with the majority originating from within the marshes in the north of the Kent Project Site. EFC returned six records of water vole with the most recent from 2009 from Thurrock Park.

3.172 Following the first water vole survey, latrines and feeding remains were found in Botany Marsh East and West.

3.173 The August 2020 check of the latrine rafts returned no sightings of water vole or any field sign. However, many of the rafts had been untethered and lost or were difficult to locate due to dense vegetation. Absence was not confirmed at this time due to these significant limitations.

3.174 Given this constraint an update survey was completed on 29 September 2020, during which only one additional latrine was recorded on ditch D12 to the north of the NE Tip.

3.175 A single water vole latrine has also been found in Black Duck Marsh on 07 September 2020.

3.176 This would imply that there are breeding populations present in three areas of the Kent Project Site; Botany Marsh (East and West), CTRL Wetland and Black Duck Marsh. A breeding population of water vole would meet the criteria for designation as an LWS in Kent[42].

[41] Chris Blandford Associates, London Resort Company Holdings (LRCH) Ltd. London Paramount Entertainment Resort 2015 Water Vole Survey Report, February 2016 (**Annex EDP 22**)

[42] Local Wildlife Sites in Kent (Formerly called Sites of Nature Conservation Interest) Criteria for Selection and Delineation Version 1.5, August 2015, Kent Wildlife Trust on Behalf of the Kent Nature Partnership

3.177 The population on Black Duck Marsh is isolated. There are no water courses linking this marsh with other areas of the Kent Project Site. The water voles on Botany Marsh east and west and those on the NE Tip are linked. The population as a whole, occupying the Swanscombe Peninsula, is considered to be of District level value. The locations of all water vole signs are shown on Figure 12.21 (Document Reference (6.3.12.21).

Otter

3.178 No otter records were returned during the 2020 desk study.

3.179 No sign of otter or water vole was found during the standard surveys of the internal ditches of Botany Marsh (D19 to 24) on 28 July and 29 September 2020 with full visibility and accessibility.

3.180 An otter was sighted in Black Duck Marsh during the March winter bird survey but no sign of otter was found during the targeted surveys. The habitat within the reedbeds and River Ebbsfleet is suitable. Therefore, otter are considered to be present, and, on a precautionary basis, the population is considered to be of at least Local value. The otter siting is shown on Figure 12.22 (Document Reference 6.3.12.22).

3.181 There is no suitable habitat for otter or water vole within the Essex Project Site.

Harvest Mouse

Previous Surveys

3.182 In 2015 it was concluded that harvest mice were present on Swanscombe Peninsula, especially Broadness Grasslands, but also among grassland and scrub to the south east of Black Duck Marsh. There have also been records of harvest mouse nests from Botany Marsh East in 2010. Outside Swanscombe Peninsula no harvest mouse nests were found in Station Quarter South[43].

2020 Surveys

3.183 In 2020, one record was returned by KMBRC dating from 1963 located within the peninsula on the Kent Project Site. Three records were returned from EFC records with only one from the last 10 years and none from the Project Site. There is no suitable habitat within the Essex Project Site.

[43] Chris Blandford Associates, London Resort Company Holdings (LRCH) Ltd. London Paramount Entertainment Resort, 2015 Harvest Mouse Survey Report Draft, February 2016 (**Annex EDP 23**)

3.184 The 2020 surveys found 11 full harvest mouse nests and a further three partial nests as shown on Figure 12.23 (Document Reference (6.3.12.23). The majority of the nests were found on Broadness Grasslands with a nest on the NE Tip and another nest in Botany Marsh. This is broadly in agreement with the 2015 surveys.

3.185 Presence/absence surveys based on nest searches are unable to estimate population size, however the population is considered of at least local level value.

Other Mammals

3.186 No previous survey work has been undertaken on other mammals.

3.187 KMBRC returned 62 records for hedgehog (*Erinaceus europaeus*) of which 10 records dated from within the last decade and EFC returned seven records with only three from the last decade. None originated from within the Project Site.

3.188 Ten records for common shrew (*Sorex araneus*) were returned by KMBRC with the majority originating from within the Project Site. Three old records were returned from EFC not from within the Project Site. Six records for pygmy shrew (*Sorex minutus*) were returned by KMBRC of these one originated from within the Project Site dating from 1975.

3.189 Four records of stoat (*Mustela erminea*) and five records of weasel (*Mustela nivalis*) were returned by KMBRC. Three of the weasel records originate from within the Project Site on the Swanscombe Peninsula. EFC retuned a single weasel record from Tilbury.

3.190 Two records of brown hare (*Lepus europaeus*) were returned by KMBRC, and one from EFC. All originated from locations outside of the Project Site and the records werein excess of 10 years old. Whilst all of the above species could potentially be supported by the Kent Project Site, populations are considered likely to be of less than local importance. None of these species are likely to be supported by the Essex Project Site. Other mammals will not be taken forward as an IEF.

Great Crested Newt

Previous Surveys

3.191 From the 2012 and 2015 surveys, it was concluded that no waterbodies within the Kent Project Site are used for breeding by great crested newts. However, it is possible that populations recorded nearby may use terrestrial habitat within the

Kent Project Site, although the risk is considered to be low due to the presence of barriers to dispersal[44].

2020 Surveys

3.192 KMBRC returned 29 records of great crested newts of which only one was from within the last decade. EFC returned seven records with only two from the last decade. That record dated from 2012 and was from 800m south of the Kent Project Site, to the south of the village of Bean. No records were returned from within the Project Site.

3.193 All eDNA results were returned negative. Therefore, great crested newts are considered unlikely to be present and breeding within the Project Site and will not be taken forward as an IEF. Full details are provided on Figure 12.24 (Document Reference (6.3.12.24) and in **Annex EDP 8**.

Other Amphibian Assemblage

3.194 In 2020, KMBRC and EFC returned many amphibian records: for palmate newts (*Lissotriton helveticus*), smooth newt (*Lissotriton vulgaris*) common toad (*Bufo bufo*), marsh frog (*Pelophylax ridibundus*) and common frog (*Rana temporaria*). Only one smooth newt record was from the Project Site however, there were incidental records of smooth newt and marsh frog from the Swanscombe Peninsula, smooth newt from Botany Marsh East and smooth newt and common toad from Bamber Pit during the 2015 surveys.

3.195 The extent of the wetland habitat and waterbodies within the Kent Project Site has the potential to support large numbers of amphibians and records suggest that smooth and palmate newt, common toad and common frog are present. Even with low populations of these species, if all four were present, this would mean Swanscombe Peninsula could be designated as a LWS on grounds of its amphibian assemblage[45]. Large numbers of marsh frog have been heard/seen throughout the Peninsula during the course of ecological surveys.

3.196 Collectively, the amphibian assemblage considered likely to be present across the Kent Project Site is valued at local to district level.

44 Chris Blandford Associates, London Resort Company Holdings (LRCH) Ltd. London Paramount 2012 Amphibian Survey Report, November 2012 (**Annex EDP 24**) and Chris Blandford Associates, London Resort Company Holdings (LRCH) Ltd. London Paramount Entertainment Resort 2015 Amphibian Survey Report, February 2016 (**Annex EDP 25**)

45 Local Wildlife Sites in Kent (Formerly called Sites of Nature Conservation Interest) Criteria for Selection and Delineation Version 1.5, August 2015, Kent Wildlife Trust on Behalf of the Kent Nature Partnership

3.197 There is no suitable habitat within the Essex Project Site to support significant numbers of amphibians.

Reptiles

Previous Surveys

3.198 In 2015, common lizard, slow worm and grass snake were recorded during the surveys, of which common lizard was the most widespread and abundant, being recorded in all survey areas and with an exceptional population on Swanscombe Peninsula[46].

3.199 It was also found that Swanscombe Peninsula, Craylands Lane Pit/West Quarry, Bamber Pit and Station Quarter South qualify as Key Reptile Sites and would be eligible for designation as Local Wildlife Sites based on their reptile populations/assemblages. They are therefore considered to be of County Importance for reptiles. All other areas are considered to be of Local Importance.

2020 Surveys

3.200 In 2020, KMBRC returned many reptile records. The majority of records were from the Old Malbeon Hospital which is located 1.5km west of the Kent Project Site. There were 189 records for common lizard (nine of which were from within the Kent Project Site), 104 records of slow worm (two from within the Kent Project Site) and 22 records of grass snake (three from within the Kent Project Site) returned.

3.201 KMBRC returned 53 records of adder but none of these were from the Project Site. EFC returned less records of all four species, none of which were from the Project Site.

3.202 No adder were found during the direct observation surveys in spring 2020.

3.203 Populations of grass snake, common lizard and slow worm have been recorded on the Kent Project Site with males, females (including some gravid) and juveniles all recorded.

3.204 All survey areas (Figure 12.1; Document Reference 6.3.12.1) on the Swanscombe Peninsula, including Blackduck Marsh, Botany Marsh, Broadness Grassland, CTRL Wetland, NE Tip and SW Tip, are considered to be suitably connected for reptiles

[46] Chris Blandford Associates, London Resort Company Holdings (LRCH) Ltd. London Paramount Entertainment Resort
2015 & 2016 Reptile Survey Report, August 2016 (**Annex EDP 26**)

to be able to move freely between these areas without barriers to dispersal. Therefore, the peak survey counts for these areas are grouped together and referred to as 'Swanscombe Peninsula'.

3.205 Due to topographical barriers, roads or other built up areas forming barriers to reptile movement, it is thought that the reptiles present within Bamber Pit, the Sports Ground, the Former Landfill, Station Quarter North and Station Quarter South cannot disperse freely between these areas and are thus separate, isolated populations. The peak survey counts of these areas are therefore considered separately.

3.206 **Table EDP 3.8** shows the peak survey counts for each individual area along with the corresponding population size classes using the population size classes drawn up by Kent Reptile and Amphibian Group, as provided in the Kent LWS selection criteria[47]. Common lizard are distributed throughout the Kent Project Site with the highest concentrations on the Peninsula and Station Quarter South. Slow worm are not found on the peninsula but there are concentrations within Craylands and Bamber Pit and small/low populations on the Landfill and Station Quarter south. Grass snake are concentrated on the Peninsula with small/low populations in Bamber Pit, the Landfill and Station Quarter South.

Table EDP 3.8. Peak Survey Counts of Individual Reptile Populations Within the Kent Project Site.

Kent Project Site Area (Figure 6.3.12.1)	Peak survey count (Population size class (Kent LWS selection criteria)		
	Slow worm	Common lizard	Grass snake
Swanscombe Peninsula	-	21 (Exceptional)	11 (Exceptional)
Craylands Pit	39 (Exceptional)	5 (Good)	-
Bamber Pit	14 (Good)	3 (Low)	1 (Low)
Sports Ground	-	2 (Low)	-
Landfill	2 (Low)	9 (Good)	1 (Low)
Station Quarter North	-	1 (Low)	-
Station Quarter South	3 (Low)	23 (Exceptional)	2 (Low)

3.207 All areas of the Kent Project Site, with the exception of the Sports Ground and Station Quarter North would qualify as a LWS on reptile criteria.

[47] Kent Wildlife Trust (2015) 'Local Wildlife Sites in Kent. Criteria for Selection and Delineation', Version 1.5 August 2015.

3.208 Figure 12.26 (Document Reference (6.3.12.26) shows the results of all of the 2020 reptile surveys from all survey areas.

3.209 The reptile population within the Kent Project Site is considered likely to be of at least district value and will be taken forward as an IEF. Reptiles are not considered to be present on the Essex Project Site due to the paucity of suitable habitat.

Invertebrates

3.210 The Kent Project Site contains a large complex of habitats offering very diverse array of different micro-habitats and, accordingly, it supports a diverse range of terrestrial and aquatic invertebrate species.

3.211 A significant number or assemblage of invertebrates are not considered to be present on the Essex Project Site due to the paucity of suitable habitat.

3.212 Rather than one particular habitat being of key importance, the value of the Project Site to invertebrates lies in its complex mosaic of habitats in which a range of different successional stages and are represented and in which other environmental conditions such as water/moisture levels and salinity vary significantly. These conditions are in large part the result of a long history of modification and disturbance by industrial activity which continues on the site to the present day. The mosaic of habitats formed upon previously disturbed or made ground, which cover large portions of the Swanscombe Peninsula and the disused chalk pits in the Ebbsfleet Valley, meet the definition of Open Mosaic Habitats on Previously Developed Land (OMH) which are known to support particularly diverse invertebrate populations.

3.213 The habitat mosaics of particular importance to invertebrates are as follows:

- Dry habitats on made ground and/or hardstanding with well drained generally nutrient poor thin soils and supporting a mosaic of bare ground, early colonising/ephemeral vegetation, grassland and scrub; and

- Fresh water and brackish wetland habitats predominantly comprising saltmarsh reedbed, and marshy grassland but including open water (ponds, ditches and streams).

3.214 The previous surveys and assessment of the invertebrate population at the Project Site in 2012. and 2015 considered terrestrial and aquatic invertebrate populations as somewhat separate entities and the previous findings, summarised below, are divided on these lines. However, in reality there is continuum between wet and dry conditions, and many species of conservation importance rely on

habitats at the transition between the two. The 2020 invertebrate survey and assessment recognises transitional as well as purely wet or dry biotopes and habitat types. Therefore, whilst the aquatic invertebrate survey findings will play a specific and separate role in assessing the water quality within the Project Site's waterbodies, the evaluation of the invertebrate population, the assessment of impacts and the strategy for avoidance and mitigation of impacts will consider the invertebrate assemblage as a whole.

Terrestrial Invertebrates

Previous Surveys

3.215 The terrestrial invertebrate population supported by the Project Site was assessed as being of National importance based on the findings of previous surveys in 2012[48] and 2015[49]. A large number of species (1,193) were recorded including 253 Red Data Book and/or Nationally Scarce species and 16 Species of Principal Importance as listed on Section 41 (S41) of the Natural Environment and Rural Communities (NERC) Act 2006. In 2012, it was concluded that the site was of most importance for its thermophilic spider fauna, including the S41 distinguished jumping spider (Sitticus distinguendus), although this species was not recorded during update surveys in 2015.

3.216 As noted above, the most notable invertebrate fauna present are associated with the remnant saltmarsh community and with bare ground and/or sparsely vegetated habitats on skeletal and/or disturbed soils and hardstanding. Across most the Swanscombe peninsula the alkaline substrate, made up of deposited cement kiln dust (CKD), is heavily influential in terms of the botanical communities and associated invertebrate populations. Other important OMH habitats are present within the disused and partially infilled chalk pits, in particular Craylands Pit and Bamber Pit.

2020 Surveys

3.217 In 2020, KMBRC returned records of the following species within 2km of the Project Site: 61 lepidoptera records (five butterfly, 56 moth); 10 Hymenoptera; two diptera; and three coleptera. EFC returned records of 215 different beetle species, 10 butterfly species, four dragonfly species, 154 Hymenoptera species, 125 moth species, six orthoptera species, 48 hemiptera species and 485 diptera species. None were from the Essex Project Site.

[48] Chris Blandford Associates, London Resort Company Holdings (LRCH) Ltd. London Paramount 2012 Terrestrial Invertebrate Survey Report, October 2012 (**Annex EDP 27**)

[49] Edwards Ecological Services, Invertebrate Survey and Assessment of the London Paramount Entertainment Resort 2015 for Chris Blandford Associates (**Annex EDP 28**)

3.218 From the combined 2020 survey area a total of 1,446 invertebrate species were recorded, comprising 1,304 derived from terrestrial sampling methods and 142 from aquatic sampling.

3.219 In total, 204 species of recognised conservation status in the UK were recorded from the 2020 survey. These included 10 species listed as 'Species of Principal importance' and two 'research only' species under Section 41 of the NERC Act (2006); as well as 33 species listed in one of the pre-1994 or post-2001 IUCN red data book categories as being RDB3 or 'Near Threatened', or rarer and 159 species currently classed as Nationally Scarce in the UK.

3.220 Of the s41 species, the Nationally Rare and Endangered Duffey's Bell-head Spider (*Praestigia duffeyi*), a saltmarsh specialist was recorded from the Swanscombe Saltmarsh alongside the Saltmarsh Short-spur (*Anisodactylus poeciloides*), a ground beetle species; and several s41 flagship species of Open Mosaic Habitat (OMH) and Thames terrace grasslands were also recorded included the Brown-banded Carder Bee (*Bombus humilis*) (recorded from several samples area) as well as the Five-banded Weevil Wasp (*Cerceris quinquefasciata*), Black-headed Mason Wasp (*Odynerus melanocephalus*) and Phoenix Fly (*Dorycera graminum*). However, a huge number of other equally rare and in some cases rarer species, equally representative of their respective habitats were recorded during the survey.

3.221 In addition, two species were recorded for the first time in the UK from 2020 survey data. These included an aderid beetle (*Anidorus sanguinolentus*) and a leafhopper (*Macrosteles sardus*), both of which were recorded from Area 8 Botany Marsh East. Several species only recorded from the UK in recent years were also recorded including a jumping spider (*Macaroeris nidicolens*), a weevil (*Larinus turbinatus*), Variable Nomad Bee (*Nomada zonata*) and a jewel wasp (*Hedychrum nobile*), as well as several other species.

3.222 From Pantheon biotope-level analysis of all survey data, 783 species were attributed to 'Open habitats'. 257 to 'Wetlands', 175 to 'Tree-associated' habitats and 61 species with an affinity to 'Coastal' habitats were recorded. Whilst from site-level Pantheon analysis of data 'Tall sward and shrub' habitat-level assemblages were best represented on grassland and scrub mosaic/OMH sites; stand-out assemblages were almost always recorded for the 'Short sward and bare ground' habitat-level assemblages, and on the best sites the nested SAT assemblages F111 'Bare sand and chalk' and F112 'Open short sward' assemblages frequently obtained scores exceeding their respective Favourable Condition thresholds in Pantheon.

3.223 From coastal saltmarsh, brackish coastal marsh ditches and brackish/freshwater transition marshes, some assemblages of national importance were also recorded, attributed to W211 'Open water on disturbed mineral sediments' and M311 'Saltmarsh and transitional brackish marsh' SATs; these often being expressed in samples from similar habitats.

3.224 Besides Pantheon analysis, independent SQI scores were calculated for each sub-site using a method described in Ball (1986), used by Harvey (2014). These were used alongside Pantheon output and other ecological considerations including habitat and species assemblage representativeness, ecological position and overall condition, to inform subsite level conservation value. In addition a SQI score was calculated for the entire 2020 invertebrate dataset. The resultant score of 11.9 indicated that the whole site supported an invertebrate population of National Importance; whilst the majority of sites within the survey area have been found to support representative invertebrate assemblages of National Importance, usually the aquatic elements of the freshwater habitats and the more wooded areas were of somewhat lower conservation value. However, the interdependence of species requiring a combination of one or more habitat means that the value of wooded and wetland elements in relation to open ground habitats should not be disregarded.

3.225 From evaluation of the 2020 survey results on a sub-site level; ten of the 17 sample areas were found to support invertebrate assemblages of National Importance; five sample areas were considered to support assemblages of Regional importance; one sample area was assessed as supporting an assemblage of County Importance; and one sample area (Tilbury Docks, verges) was considered to support an assemblage of District importance at most.

Aquatic Invertebrates

Previous Surveys

3.226 The aquatic invertebrate population supported by the Project Site was assessed as being of County to Regional importance based on the findings of previous surveys in 2015[50], with a total of 199 species of aquatic macroinvertebrate recorded amongst approximately 70,000 individuals. Amongst these, several species of conservation concern were recorded; one Vulnerable, three Near Threatened, 11 Nationally Scarce and 51 with a Local distribution within the UK.

[50] ASEDA, An ecological survey of the waterbodies and wetlands on and around the Swanscombe Peninsula, Kent, A report on behalf of Chris Blandford Associates, February 2016 (**Annex EDP 30**) and ASEDA, A targeted ecological survey of selected waterbodies and wetlands on the Swanscombe peninsula, Kent, A report on behalf of Chris Blandford Associates, August 2016 (**Annex EDP 31**)

3.227 The most important habitat areas for aquatic invertebrates are as follows:

- Botany Marsh – a network of ditches, typically brackish and dominated by reeds. These ditches supported several species of conservation interest and were categorised as being between Fairly High and Very High conservation value. The newly created pond in the east of the marsh had a sufficiently rich faunal assemblage to be categorised as a UK BAP Priority Pond;

- Swanscombe Marsh – a series of wetland areas amongst a network of interconnected ditches to the west (Black Duck Marsh) and an area of reedbed, ditches and ponds to the east (Botany Marsh). Several species of conservation interest were found in the surveyed ditches on Swanscombe Marsh and as such these habitats can be considered as relatively high conservation value. The two wetland areas supported notably rich faunal assemblages with several species of conservation concern; both wetlands were categorised as Very High conservation value. Of the surveyed ponds, three were of the quality necessary for UK BAP Priority Pond status; and

- Waterbodies within the wider Swanscombe area – the Ebbsfleet corridor; the Ebbsfleet Stream and its riparian margins, and two nearby ponds, one balancing pond and one within a disused chalk pit. The Ebbsfleet Stream was categorised as between Moderate and High conservation value; one of the ponds achieved the quality of UK BAP Priority Pond status.

2020 Surveys

3.228 Aquatic invertebrates recorded on the River Ebbsfleet in isolation are considered to be of less than Local importance as they represent only moderate water quality and a heavily modified water course. Full details can be found in **Annex EDP 11** and Figures 12.28 and 12.29 (Document References 6.3.12.28 and 6.3.12.29).

3.229 With respect to standing waterbodies otherwise present across the Project Site, specifically those associated with Black Duck and Botany Marsh, these are considered to be of County to Regional importance for aquatic invertebrates and largely represent poor-good water quality. Overall, 33 species of local interest were identified in addition to 30 Notable and 3 Red data Book species. Detailed survey results and a summary of their overall biodiversity value is provided at **Annex EDP 11**.

Freshwater Fish

Previous Surveys

3.230 A fish survey of the River Ebbsfleet was initially undertaken by Coclough and Coates Aquatic Consultants in 2015 to inform development proposals (see **Annex EDP 33**) during which modest populations of mature roach and perch were captured during electrofishing and fyke netting operations. There was no evidence of active recruitment to either of these populations.

3.231 This was in addition to a fish survey of waterbodies across Swanscombe Marshes in August 2015. Three-spined stickleback were present in small numbers, in isolated locations in the eastern complex of Swanscombe Marshes and on the bottom edge of Botany Marshes. No fish were captured anywhere in the western complex of Swanscombe Marshes despite suitable conditions. No fish were recovered from the fyke nets set out in these marshes either. Overall, survey effort identified a poor head of fish within waterbodies comprising Swanscombe marshes, likely attributed to poor water quality and anaerobic bed conditions in addition to saline intrusion and unstable water levels observed during 2015.

2020 Surveys

3.232 Further fish surveys of waterbodies comprising Swanscombe Marshes (where access was available) confirmed the continued absence of a significant fish assemblage. No fish were captured at any of the survey sites or observed during survey effort whilst the ditch network across Botany Marsh was predominantly dry. Although no fish were caught or observed during the surveys it may be possible fish are present within the drains and lakes. The survey sites were very overgrown with large amounts of macrophyte in channel or covering the surface limiting the efficacy of some methods (surface macrophyte limits visibility while dense macrophyte both limits visibility and restricts access). However, it is unlikely that fish are present in large numbers or indeed a wide range of species.

3.233 At the time of survey, it was noted that P3 is likely subject to intermittment saline intrusion whilst a large blue green algae bloom was evident within the lake indicating poor water quality and further reducing the suitability of this waterbody to support a fish assemblage.

3.234 Particulary given limitations to survey effort, it is assumed that several of the wet drains and ponds have potential to support some fish species, such as three spined stickleback as previously recorded during 2015. However,_comparable to previous fish surveys of the Swanscombe Marshes during 2015 a significant fish

assemblage is considered absent and likely attributed to poor water quality, anerobic bed conditions in addition to saline intrusion.

3.235 With respect to the River Ebbsfleet, fish populations are considered to be constrained by the availability of suitable habitat whilst the presence of significant culverts at both the upstream and downstream extent of the River Ebbsfleet are considered a significant barrier to the fish movement and migration. As such, a freshwater fish community within waterbodies across the Project Site are considered to be of no more than Site importance. Further details can be found at **Annexes EDP 32**, **33** and **34**.

3.236 The freshwater fish assemblage is not an IEF as the value is considered likely to be at a Site level only however, the assemblage will inform a 'no deteroration assessment' of on-site waterbodies. Therefore, due to consultation responses from the Environment Agency, the freshwater fish assemblage will be taken forward and considered within the EcIA.

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Section 4
Summary of Findings

4.1 Based on the baseline investigations described above, the IEFs pertinent to an EcIA in respect of the Proposed Development at the Project Site are listed in **Table EDP 4.1**.

Table EDP 4.1: Important Ecological Features to be Considered Within the EcIA.

Important Ecological Feature	Key Attributes	Nature Conservation Value
Designations		
Thames Estuary and Marshes SPA/Ramsar (includes Mucking Flats and Marshes SSSI)	Extensive intertidal mudflats with saltmarsh and channel systems. Internationally important assemblage of birds and wintering populations of many wader species.	International
Medway Estuary and Marshes SPA/Ramsar/SSSI	Single tidal system with the Swale and joins the southern part of the Thames Estuary between the Isle of Grain and Sheerness. Internationally importance of assemblage of birds and wintering populations of many wader species.	International
Darenth Woods SSSI	Some of the most valuable areas of ancient semi-natural woodland in north-west Kent with rare woodland types.	National
Inner Thames Marshes SSSI	Largest remaining expanse of wetland bordering the upper reaches of the Thames Estuary. Diverse bird interest especially the variety of breeding birds and the numbers of wintering wildfowl, waders, finches and birds of prey.	National
South Thames Estuary and Marshes SSSI	Extensive mosaic of grazing marsh, saltmarsh, mudflats and shingle characteristic of the estuarine habitats of the north Kent marshes. Freshwater pools and some areas of woodland provide additional variety and complement the estuarine habitats. Supports outstanding numbers of waterfowl, total counts regularly over 20,000.	National
West Thurrock Lagoon and Marshes SSSI	One of the most important sites for wintering waders and wildfowl on the Inner Thames Estuary. Extensive intertidal mudflats together with a large and secure high tide roost, attracts waders in nationally important numbers, with significant populations of other bird species. The adjacent Stone Ness saltmarsh is noted for the size and character of its high marsh plant community.	National
Shorne and Ashenbank Woods SSSI	A complex of ancient and plantation woodland that includes a variety of stand-types associated with Tertiary gravels, clays and sands. Supports a diverse invertebrate fauna, especially its Coleoptera (beetles), Hemiptera (true bugs), and Odonata (dragonflies).	National

Important Ecological Feature	Key Attributes	Nature Conservation Value
Cobhan Woods SSSI	Woodland and old parkland representative of woods in North Kent which occur in part on acidic Thanet Sands and in part on chalk soils. An outstanding assemblage of plants is present. Also of importance for breeding birds.	National
Great Cabbles Wood SSSI	Representative of woods on North West Kent Tertiary sediments. Most of the woodland is mixed coppice under oak standards, with sweetchestnut as the dominant species. A number of scarce plants occur, including ladyorchid (*Orchis purpurea*) and man orchid (*Aceras anthropophorum*).	National
Botany Marshes LWS	Reedbed and potential for ditch & grazing marsh restoration. Reedbed and grazing marsh are of principal importance in England. Also supports three species of reptile, water vole, otter and is of value to birds.	County
Ebbsfleet Marshes, Northfleet LWS	Range of habitats including reedbed, calcareous stream, lake, scrub, woodland, calcareous and neutral grassland. Protected species have been recorded including reptiles and great crested newts.	County
Alkerden Lane Pit LWS	Contains nationally scarce plants and Kent's largest population of green-flowered helleborine (*Epipactis phyllanthes*). Also contains round leaved wintergreen (*Pyrola rotundifolia*) and several species of nationally rare and scarce invertebrates.	County
Tilbury Marshes LWS	Diverse saltmarsh flora. Good grazing-marsh flora. An important invertebrate habitat destroyed by development, but some of the key species may survive on these remaining fragments.	County
Habitats/Flora		
Rare plants	Populations of 13 nationally scarce species were found in 2016. Eight were refound in 2020.	National
Broad leaved semi natural woodland	Woodland with good canopy species and ground flora species diversity. Connects to other woodlands in wider area. – Meets criteria for Priority habitat[51].	Local
Scrub	Extensive mature and colonising scrub forming a corridor of woody habitats between the A2 and the River Thames.	Local
Semi-improved grassland	Including areas of species-poor semi-improved grassland and areas of semi-improved neutral, and calacareous grassland (with relict areas of more species-rich grassland of NVC MG1d and CG2 but not extensive or fine examples).	Local to District
Coastal/Floodplain Grazing Marsh	Botany Marsh West - Priority Habitat[52] coastal/floodplain grazing marsh but a species poor example. Would qualify as a LWS.	District

51 UK Biodiversity Action Plan Priority Habitat Descriptions Lowland Mixed Deciduous Woodland From: UK Biodiversity Action Plan; Priority Habitat Descriptions. BRIG (ed. Ant Maddock) 2008

52 UK Biodiversity Action Plan Priority Habitat Descriptions Coastal and Floodplain Grazing Marsh From: UK Biodiversity Action Plan; Priority Habitat Descriptions. BRIG (ed. Ant Maddock) 2008

Important Ecological Feature	Key Attributes	Nature Conservation Value
Open Mosaic on Previously Developed Land	Discrete areas within the Kent Project Site that fulfil the Priority Habitat description[53].	District
Waterbodies (ponds, standing water and ditches)	Extensive ditch network around the peninsula with associated ponds. Ditch network forms part of a large marsh area including Botany Marshes LWS and adjacent grazing marsh and is considered of district level. Some ponds, within Broadness Grassland particularly, are contaminated by leachate from the nearby cement production facility and are of negligible ecological value.	District
Swamp (reedbed)	Three main areas in Black Duck Marsh, CTRL Wetland and Botany Marsh, the latter of which is partially designated as a LWS. The other areas could qualify as LWSs and all qualify as Priority habitat[54].	County
River Ebbsfleet	Acts as a wildlife corridor and is linked to reed bed and woodland habitats. Moderate water quality.	Local
Species		
Wintering waterfowl and wading bird assemblage	Supports many of the species associated with the nearby SPA/Ramsars.	International
Wintering terrestrial bird assemblage	28 species of conservation concern recorded in low to moderate numbers.	County
Breeding bird assemblage	91 species recorded of which 29 were listed on the Amber list of Birds of Conservation Concern and 17 on the Red list.	Regional
Pochard breeding population	Possibly breeding with 7-10 pairs present, which would equate to between 0.99% and 1.4% of the national breeding population.	National
Bat assemblage	Assemblage of at least eight species, potentially up to 10 including one Kent Biodiversity Action Plan (BAP) species. However, the activity is predominantly of common pipistrelle (*Pipistrellus pipistrellus*) bats. Two building confirmed as transitional summer roosts for low numbers of common and widespread species. Other buildings with high, moderate and low bat roost potential are present, including some that could not be fully surveyed due to access restrictions. No tree roosts confirmed but nine trees with high bat roost potential are present.	District

53 UK Biodiversity Action Plan Priority Habitat Descriptions Open Mosaic Habitats on Previously Developed Land From: UK Biodiversity Action Plan; Priority Habitat Descriptions. BRIG (ed. Ant Maddock) 2008

54 UK Biodiversity Action Plan Priority Habitat Descriptions Reedbed From: UK Biodiversity Action Plan; Priority Habitat Descriptions. BRIG (ed. Ant Maddock) 2008

Important Ecological Feature	Key Attributes	Nature Conservation Value
Dormouse	Confirmed breeding population within the Kent Project Site. Considered to be using the Kent Project Site for dispersal, foraging and breeding. Likely to be a meta population with that close to the Bluewater shopping centre.	District
Otter	Confirmed present within Blackduck Marsh and assumed present in low numbers on the suitable habitat throughout the ditch network, reedbeds, marshes and on the River Ebbsfleet.	Local
Water vole	Latrines and feeding sign found in Botany Marsh East and West, on Black Duck Marsh and in the Channel Tunnel Rail Link (CTRL) wetland – likely breeding and therefore qualifies as LWS.	Local to District
Harvest mouse	Present on the peninsula especially in Broadness grassland and on Botany Marsh and so would qualify the Project Site as a LWS.	Local
Amphibian assemblage	Likely to support four species and meet criteria for LWS selection.	Local to District
Reptile assemblage	Reptile populations present within seven separate areas across the Kent Project Site due to geographical separation. Two large/exceptional, two medium/good and three small/low populations of common lizard supported. One large/exceptional and three small/low populations of grass snake supported. One medium/exceptional, one medium/good and two small/low populations of slow worm supported. Many parts of the Kent Project site meet criteria for LWS selection.	District
Invertebrate assemblage	Assemblage comprising a total of 1,446 species recorded in 2020 including 204 species of recognised conservation status in the UK.	National

Annex EDP 1
Habitat Descriptions and Illustrative Photographs

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A1.1 This annex describes the habitats within the Project Site by area. The areas referred to are shown on Figure 12.1 (Document Reference 6.3.12.1) and the broad habitat distributions across the Project Site is shown on Figure 12.4 (Document Reference 6.3.12.4).

A1.2 The Extended Phase 1 Habitat Survey was undertaken by an ecologist experienced with this type of survey in May 2020, then verified by an independent specialist botanist with over 30 years of experience of botanical survey in the UK in June 2020.

A1.3 Following the Phase 1 survey, eight distinct areas of the Kent Project Site were identified as having the potential to support plant communities of botanical value. These areas were initially proposed for National Vegetation Classification (NVC) survey, but when subject to detailed botanical assessment most were found to be of low botanical diversity and thus no NVC was conducted over them. Three of the eight areas were found to be of sufficient botanical value to warrant NVC survey (the results of which are found in **Tables EDP A1.1** to **A1.4**); the remaining five areas were subject to DAFOR survey only (the results of which are found in **Tables EDP A1.5** to **A1.10**).

A1.4 No further botanical surveys were deemed necessary on the Essex Project Site due to the lack of natural habitats.

A1.5 The NVC methodology was that described within British Plant Communities Volume 3: Grasslands and montane communities, Ed J.S.Rodwell 1992 (1998 edition). Homogenous stands of vegetation were sought and $2m^2$ quadrats thrown within those stands. All vascular plant species within the quadrats were recorded according to the NVC methodology where the relative abundance of each species is allotted a score on the Domin scale between 1-10; where 1 equals very few individuals and 10 equals 91-100% of the vegetation. The quadrat data was then compared to the keys within British Plant Communities Volume 2 to determine the best approximation to the NVC community/sub-community.

A1.6 With the DAFOR methodology each plant species was accorded a code relative to its frequency within the site:

D = Dominant

A = Abundant

F = Frequent

O = Occasional and

R = Rare.

A1.7 Where a plant species has a localised distribution within a stand which differs from its overall distribution in that stand, the letter L is used to identify this localised variance. For example, a plant which is rare (R) in the wider stand being recorded but has a localised occurrence as Frequent in one or more areas of that stand it is recorded as R/LF.

Nationally Scarce Plant Species Survey

A1.8 The CBA 2016 report detailed the Nationally Scarce plant species recorded over the survey site during their survey, as well as existing from recent records prior to their survey, and provided clear maps identifying the locations where those species were found.

A1.9 The Nationally scarce species recorded by CBA are as follows:

- Yellow vetchling (*Lathyrus aphaca*);
- Bithynian vetch (*Vicia bithynica*);
- Man orchid (*Orchis anthropophora*);
- Divided sedge (*Carex divisa*);
- Hairy vetchling (*Lathyrus hirsutus*);
- Brackish water-crowfoot (*Ranunculus baudotii*);
- Sickle clover (*Medicago sativa* ssp. *falcata*);
- Borrers saltmarsh grass (*Puccinellia fasciculate*);
- Stiff saltmarsh grass (*Puccinellia rupestris*);
- Round-leaved wintergreen (*Pyrola rotundifolia* ssp. *Maritima*); and
- Slender Hare's-ear (*Bupleurum tenuissimum*).

A1.10 Eight of the 13 nationally scarce species recorded over the terrestrial habitats on the Kent Project Site were relocated during the 2020 NVC survey. Of these, most

displayed some variance in their 2020 distributions compared with their distributions recorded in the 2016 CBA report[1].

Yellow Vetchling

A1.11 Yellow vetchling was recorded over very considerable areas in the northern half of the Kent Project Site in 2016, predominantly adjacent to tracks. It was also recorded as small, localised populations elsewhere at that date.

A1.12 In 2020 it was found that yellow vetchling populations on the sea walls; in a large area to the east of the derelict jetty, along a track running parallel to the shoreline up to the creek and in the northern centre of the Kent Project Site, either could not be re-found or comprised only small numbers of individual plants. It would thus appear that those populations have either experienced a very considerable decline or are within a period of scarcity as part of a wider cycle of abundance and scarcity; a process which is not uncommon amongst some species of plant and often caused by climatic factors, predation by invertebrates, or pathogens. It is possible that relatively frequent cutting of vegetation on the sea banks since 2016 may have caused this species to be lost from that location.

A1.13 New populations of this plant were identified in the north-east of the Kent Project Site where it was locally frequent and widely distributed, and along the main north-south access track running through the centre of the site. In addition, this species was found to be present in small numbers where scrub clearance work had taken place in the Botany Marsh East Nature Reserve and to the north of the linear waterbody in the centre.

Bithynian Vetch

A1.14 Bithynian vetch in part demonstrated little change with regard to its distribution between 2016 and 2020, as it is still abundant on the easternmost of the sea banks. However, in 2016 it was also recorded extensively over an area in the north-east of the Kent Project Site, and as a small population in the northern centre of the Kent Project Site. It was not recorded in either of those locations in 2020, nor anywhere else on the Kent Project Site.

Man Orchid

A1.15 Man orchid could not be relocated in 2020 despite a sustained survey effort.

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[1] Chris Bladford Associates, London Resort Company Holdings (LRCH) Ltd. London Paramount Entertainment Resort Phase I and Botanical Survey Report, February 2016 (**Annex EDP 14**)

Divided Sedge

A1.16 Divided sedge was recorded as locally abundant in the part of Botany Marsh East Nature Reserve known as the Playing Field in 2016. However, its distribution appeared to have contracted significantly since 2016. The contraction in area appeared to be as a result of tall fescue (*Festuca arundinacea*) expanding over parts of the Playing Field.

A1.17 In 2016 this species was also recorded as a small population on the eastern side of the easternmost sea bank; it was not relocated there in 2020.

Hairy Vetchling

A1.18 Hairy vetchling in 2016 was recorded only in the north-eastern centre of the Kent Project Site, where it appears to have been extensive, and along the main path through the Botany Marsh East Nature Reserve. In 2020 it was found to be present in relatively large numbers in the north-east of the Kent Project Site (an area where it was not previously recorded) and in an area immediately to the south-west of where its core population was recorded in 2016. However, in 2020 it was present only at very low frequency in that former core area. This species is still present, albeit sporadically, along the main path through the Botany Marsh East Nature Reserve.

Brackish Water-crowfoot

A1.19 Brackish water-crowfoot was recorded in Botany Marsh West in 2020. The extensive populations in the south-eastern centre of the Kent Project Site were not verifiable in 2020 due to that area having become an extensive reedbed with a relatively high-water table and as such offered hazardous survey conditions.

A1.20 The third area where this species was recorded in 2016 was extensively along the eastern boundary ditch of the Botany Marsh East Nature Reserve. In 2020 this ditch was for the most part full of common reed (*Phragmites australis*) and thus offered poor conditions for brackish water-crowfoot which requires open water with little shading. A section of this ditch had been subject to some mechanical clearance and re-profiling immediately prior to the 2020 survey but the clearance works had been too recent for this species to have had an opportunity to germinate.

A1.21 A fourth, small population was recorded in the centre of an open area in the north-western centre of the Kent Project Site in 2016. However, this population was not relocated in 2020.

Sickle Clover

A1.22 Sickle clover was recorded as only one plant in 2020, to the immediate south of the old jetty area on the north-western edge of the Kent Project Site. This is a sub-species of the plant which is most commonly recorded as lucerne (*Medicago sativa sativa*) and the two sub-species frequently hybridise to produce another sub-species (*Medicago sativa falcata*). In 2016 sickle clover was recorded along the sea banks and along tracks to the north-east and east of the sea banks; it was in this area (north of the sea banks) where sickle clover was recorded in 2020.

A1.23 It is possible that pure sickle clover has been mostly lost from the Kent Project Site through hybridisation with Lucerne. However, it is to be noted that sickle clover can most reliably be identified from its seedpods and that at the time of the 2020 survey very few plants of Medicago sativa had seed pods which were sufficiently mature enough to allow for accurate identification. It is to be noted, however, that sickle medick also typically has yellow flowers and yellow-flowered *Medicago sativa* were very rare here in 2020.

Borrer's Saltmarsh Grass

A1.24 Borrer's saltmarsh grass was recorded in 2020 in several locations along the track which runs along the eastern edge of the creek in the north of the Kent Project Site. This was where it was recorded in the 2016 CBA report. This is typically a saltmarsh species and may well be present in other coastal parts of the Kent Project Site. A separate NVC survey of the saltmarsh is included within the Marine Ecology and Biodiversity Chapter of the Environmental Statement (Chapter 12; Document Reference 6.1.12).

Stiff Saltmarsh Grass

A1.25 Stiff saltmarsh grass was recorded in one location in the 2016 CBA report, the same general location as the Borrer's saltmarsh-grass. The continued presence of this species in that location was confirmed in 2020.

Round-leaved Wintergreen

A1.26 In 2020, round-leaved wintergreen was found to be present as a single population on the bank of an old tramway/railway leading to the disused jetty. This population is found within light silver birch (*Betula pendula*)/bramble (*Rubus fruticosus* agg.) woodland and covers an area of approximately three square metres.

Slender Hare's-ear

A1.27 Slender Hare's-ear was recorded in the CBA 2016 report from two locations: the northern edge of Botany Marsh; and an adjacent area along the banks of the adjacent stream. These two adjacent areas have upper saltmarsh vegetation and slender hare's-ear is a species largely associated with that habitat. Slender hare'-ear is a cryptic grass-like herb which is very hard to identify when it is not in fruit; it fruits in late Summer and Autumn when the fruits make the plant slightly less cryptic. Although a search was made for it in 2020 and this plant was not recorded, however, this is to be expected and it is possible that a survey in these two small areas of saltmarsh between mid-August and early October would be more productive.

Additional Species Not Previously Recorded

A1.28 In addition, a further two nationally scarce species have been recorded from the survey site but in locations which lie outside this survey's boundaries (golden samphire *Inula crithmoides* and annual beard-grass *Polypogon monspiliensis*).

Evaluation

A1.29 Collectively, these populations of nationally scarce plant species are considered to be of National importance and are shown on Figure 12.5 (Document Reference 6.3.12.5). No one particular area of the Kent Project Site has enough populations of these nationally scarce plants to quality as a Local Wildlife Site (LWS) under the vascular plant criteria.

Habitat Descriptions

Essex Project Site

Port of Tilbury

A1.30 The majority of the Essex Project Site is hard standing. However, the road verges, ditches and green areas surrounding the hard-standing hold some ecological value.

A1.31 The hard standing shows some signs of deterioration, with patches of ephemeral vegetation and plants typical of rough and disturbed ground growing around its peripheries, including hoary mustard (*Hirschfeldia incana*), buddleia (*Buddleja davidii*), smooth hawk's-beard (*Crepis capillaris*), wall barley (*Hordeum murinum*), ribwort plantain (*Plantago lanceolate*), scentless chamomile (*Tripleurospermum inodorum*), herb Robert (*Geranium robertianum*), black medick (*Medicago lupulina*), Oxford ragwort (*Senecio squalidus),* mugwort

(*Artemisia vulgaris*), greater burdock (*Arctium lappa*), annual mercury (*Mercurialis annua*) and common mallow (*Malva neglecta*).

A1.32 The two areas running parallel to the A1089 running south along the western edge of the Essex Project Site are dominated by scrub. The roadside ditch is mostly dry and edged by bramble (*Rubus fruticosus*) but contains some branched bur-reed (*Sparganium erectum*) and is also surrounded by false-oat, nettle (*Urtica dioica*) and curled dock (*Rumex crispus*) in places. The eastern strip of scrub is mature and includes a number of woody species, such as apple (*Malus domestica*), blackthorn (*Prunus spinosa*), buddleia, ash (Fraxinus excelsior), sycamore (*Acer pseudoplanatus*), dog rose (*Rosa canina*), elder (*Sambucus nigra*) and hawthorn (*Crataegus monogyna*). It is edged by rough grass with small numbers of forb species. Species include cock's-foot (*Dactylis glomerata*), false oat, oxford ragwort, ribwort plantain, ivy (*Hedera helix*), red valerian (*Centranthus ruber*) and purple toadflax (*Linaria purpurea*). The northern end of this scrub band has been cleared to facilitate roadworks.

A1.33 The road verges, which loop round the northern edge of the A1089 and Fort Road, are characterised by well, but infrequently, managed grass with occasional shrubs and some species of rough ground. Species recorded include red fescue (*Festica rubra*), cock's-foot, perennial rye (*Lolium perenne*), barren brome (*Bromus sterilis*), soft brome (*Bromus hordeaceus*), creeping cinquefoil (*Potentilla reptans*), yarrow (*Achillea millefolium*), goat's-beard (*Aruncus dioicus*), ribwort plantain, rough hawkbit (*Leontodon hispidus*), red campion (*Silene dioica*), common mouse-ear (*Cerastium fontanum*), hoary mustard, common mallow, dove's-foot cranesbill (*Geranium mole*), white valerian (*Valeriana officinalis* L.), smooth sow-thistle (*Sonchus oleraceus*), bulbous buttercup (*Ranunculus bulbosus*) and beaked hawk's-beard (*Crepis vesicaria*).

A1.34 The sea-wall supports a small range of additional species, including ox-eye daisy (*Leucanthemum vulgare*), tufted vetch (*Vicia cracca*) and bird's-foot trefoil (*Lotus corniculatus*) and occasional woody scrub including hazel (*Corylus avellana*), hawthorn, field maple (*Acer campestre*), willow (*Salix sp.*) and elder.

A1.35 The habitats around the Asda roundabout were dominated by species of disturbed ground, including mugwort, cleavers (*Gallium aparine*), nettle, hedge bindweed (*Calystegia sepium*), greater burdock, white valerian, hoary mustard, hemlock (*Conium maculatum*) and false-oat. The centre of the roundabout is mowed regularly and lawn daisy (*Bellis perennis*) are common within the lawns, which are surrounded by ornamental and native trees and shrubs, including silver birch (*Betula pendula*), willow and cherry (*Prunus avium*). The area between the two A1089 carriageways leading north contains a small amount of more species-rich grassland, which has species including lesser trefoil (*Trifolium dubium*), ox-eye daisy, common vetch (*Vicia sativa*), bulbous buttercup, white and red clover

(*Trifolium repens* and *T. pratense*), meadow vetchling (*Lathyrus pratensis*) and bird's-foot trefoil.

A1.36 All of the grassland and scrub habitats in the Essex Project Site are considered to be of Site level value only due to their limited extent, relatively low species diversity, and isolation.

Kent Project Site

Swanscombe Peninsula

A1.37 The edges of Swanscombe Peninsula contain salt marsh habitat. Further detail on this habitat type can be found in Chapter 13 of the Environmental Statement (Document Reference 6.1.13).

A1.38 The peninsula is dominated by scrub and rough grassland habitats (**Image EDP A1.1**), although some nationally rare and scarce species have been identified, as described above.

Image EDP A1.1: Typical scrub/rough grassland mosaic on Swanscombe Peninsula.

A1.39 Although forb diversity within any one area is relatively low, some species groups are well represented, with various species of legume being particularly prominent, including everlasting sweet-pea (*Lathyrus latifolius*), sand Lucerne (*Medicago sativa nothossp*), hop trefoil (*Trifolium campestre*), bird's-foot trefoil, narrow-leaved bird's-foot trefoil (*Lotustenuis*), smooth tare (*Vicia tetrasperma*), grass vetchling (*Lathyrus nissolia*), hairy vetch (*Vicia villosa*) and yellow vetchling (*Lathyrus aphaca*).

A1.40 A thin band of saltmarsh edges the peninsula, most prevalent in the south-west and around the creek on Broadness Point. Small lengths of saltmarsh are also present inland: between the sea banks in the south-west; and along the northern edge of Botany Marsh leading onto the banks of the Ebbsfleet. This is described in Chapter 13 of the Environmental Statement (Document 6.1.13) which detail intertidal and marine habitat and species interest.

Broadness Grassland (formerly Broadness Salt Marsh)

A1.41 Broadness Grassland is a largely unmanaged area of rough, poor semi-improved grassland and scrub which has colonised following the deposition of large amounts of industrial and landfill waste across former saltmarsh. The habitat in this area is a matrix of more open, rough grasslands through to dense scrub. The grassland is dominated by false oat grass (*Arrhenatherum elatius*), common (*Elymus repens*) and sea couch grass (*Elytrigia atherica*), with other maritime species present including sea beet (*Beta vulgaris subsp. Maritima*) and abundant sand lucerne along the managed pathways. Other species are fairly limited in the north of the area but include nettle.

A1.42 The southern half of Broadness Point is slightly more diverse, although it appears that in the intervening eight years since the Phase 1 and botanical survey undertaken by CBA, the grassland has built up significant thatch and some more forb-rich areas have been lost to coarse grasses and scrub encroachment. Some pyramidal orchids (*Anacamptis pyramidalis*) were recorded along the tracks crossing the peninsula and man orchid (*Orchis anthropophora*), bee orchid (*Ophrys apifera*) and common spotted orchid (*Dactylorhiza fuchsia*) have previously been recorded here but were not recorded in 2020.

A1.43 A small area in the south of Broadness grasslands was subject to a NVC survey as shown as **TN3** on Figure 12.4 (Document Reference 6.3.12.4) and pictured in **Image EDP A1.2**. This grassland is notable for the large number of leguminous species recorded including the largest and most extensive populations of the nationally scarce yellow vetchling and hairy vetchling (*Lathyrus hirsutus*) recorded during this survey. Dominated by false oat-grass this is an **MG1d** *Arrhenatherum elatius* grassland *Pastinaca sativa* sub-community.

Image EDP A1.2: NVC survey area in the south-east of the Broadness Grassland survey area.

A1.44 A number of man-made ponds are present in this Broadness Grassland area, some of which are used as leachate treatment lagoons for the nearby cement works and have a pH of up to 13. As such, they have little to no ecological value.

A1.45 The species-poor, semi-improved grassland/scrub mosaic is considered to be of Local value due to the habitat's extent and structure, but lack of botanical diversity. The area marked as **TN3** on Figure 12.4 (Document Reference 6.3.12.4) is considered to be of District importance due to its populations of Nationally Scarce species and its increased botanical diversity.

Botany Marsh East

A1.46 Botany Marsh east is former grazing marsh, which was ungrazed for a number of years. It is currently managed as a nature reserve by the landowner following the advice of the Kent Wildlife Trust. The management regime includes rotational scrub and reed cutting, alongside rotational dredging of ditches. It is designated as a LWS.

A1.47 This management regime has resulted in a mosaic of reedbed, dry grassland, dense scrub and wet ditches. The publicly accessible grassland in the centre of the reserve appears to be former amenity grassland established over an area of relict grazing marsh.

A1.48 This small area of unmanaged grassland has two distinct plant communities and is shown as **TN4** on Figure 12.4 (Document Reference 6.3.12.4) and pictured in

Image EDP A1.3: a community dominated by tall fescue (*Festuca arundinacea)* in the north and south-west, and a finer grassland in the remainder of the field where creeping bent (*Agrostis stolonifera*) is dominant, and meadow barley (*Hordeum secalinum*), Yorkshire fog (*Holcus lanatus*), red fescue, and smooth meadow grass (*Poa pratensis*) frequent and occasionally locally abundant. Grass vetchling is locally common but otherwise this field is herb-poor although small numbers of hairy buttercup (*Ranunculus sardous;* a species strongly associated with floodplain coastal grazing marsh) were recorded. However, of greatest interest here is a very large population of divided sedge (*Carex divisa*; a nationally scarce species largely restricted to unimproved coastal grazing marshes). It is apparent that in the parts of the field where tall fescue is abundant there is no divided sedge and thus it is likely that as tall fescue expands across this field (although native it is an aggressive invasive species) it has caused the localised extinction of divided sedge.

Image EDP A1.3: Former amenity grassland established over grazing marsh, now supporting substantial populations of divided sedge.

A1.49 Areas of grassland across the rest of the reserve are richer and include a range of seasonally inundated patches and dry banks. Species recorded include ox-eye daisy, red campion, ragged robin (*Lychnis flos-cuculi*), yellow rattle (*Rhinanthus minor*), common knapweed (*Centaurea nigra*), common vetch (*Vicia sativa*), tall fescue, bird's-foot trefoil, red clover, bulbous buttercup and perforate St. John's wort (*Hypericum perforatum*). Scrub is dominated by hawthorn but also includes willow and broom (*Sarothamnus scoparius*).

A1.50 In the south-east of the Botany Marsh East Nature reserve there are relict areas of grassland amongst scrub which are dominated by common grass species such as red fescue, creeping bent, false oat-grass, cocksfoot, and smooth meadow-grass

along with some tall fescue and meadow barley. This area is shown as **TN5** on Figure 12.4 (Document Reference 6.3.12.4).

A1.51 Herbs are generally uncommon here but amongst others include ox-eye daisy, wild carrot, perforate St John's-wort, bird's-foot trefoil and a small quantity of ragged robin (*Silene flos-cuculi*).

A1.52 The reedbed in this area is considered to be of County value due to its status as a Priority Habitat and Kent BAP habitat.

A1.53 The scrub is considered to be of Local level value only, due to a lack of diversity in structure and species.

A1.54 The ditch and pond network are considered to be of County value due to their ability to support protected species and their connection with the wider landscape, including the grazing marsh to the west.

A1.55 The former sports field grassland is considered to be of District value due to the presence of large numbers of nationally scarce species.

Botany Marsh West

A1.56 Botany Marsh West is still under management as a grazing marsh and comprises a large open expanse of grass, divided by wet ditches and containing scattered scrapes and ephemeral ponds. This qualifies it as the priority habitat 'coastal/floodplain grazing marsh', however, it is not a particularly fine example of this type of habitat with the grassland diversity being low. This area would, however, qualify as a LWS in Kent on criteria GN3:

'Neutral grassland sites which do not meet the criteria for unimproved grassland may be selected as Local Wildlife Sites where they form all or part of an extensive area of grazing marsh important for breeding or wintering birds, OR where the grassland does not consist of sown grassland AND it supports:

- *One or more scarce species of terrestrial or aquatic invertebrates;*

OR

- *An important network of wet dykes.*

Where a Local Wildlife Site is selected for its wet dykes, the dykes should qualify as Wildlife Sites in their own right.'[2]

[2] Local Wildlife Sites in Kent, Criteria for Selection and Delineation Version 1.5, Kent Wildlife Trust 2015

A1.57 The fields on this site (with the possible exception of Field 4) were all subject to cultivation from at least the 1940s until the 1990s. This will have destroyed any traditional coastal grazing marsh sward that was here with the result that the present sward will be less than 30 years old and more impoverished than would be expected given the current grazing regime and apparent low-intensity management. The area is divided roughly into six field parcels that support species poor semi imprioved grassland (**Image EDP A1.4**) with a notable abundance of hairy buttercup (*Ranunculus sardous*) and occasional occurance of hairy vetch (*Lathyrus hirsutus*).

Image EDP A1.4: Typical view of the sward within Botany Marsh West.

A1.58 There are shallow water bodies within some field parcels with a wide draw-down zone around them. These scrapes are open to livestock grazing the fields and thus experience a significant degree of pounding; much bare mud is apparent (**Image EDP A1.5**). Within the waterbodies themselves vegetation is typically impoverished and sparse. Only one has a sufficient depth of water to support an aquatic/emergent plant community where brackish water-crowfoot (*Ranunculus Baudotii*), common spike-rush (*Eleocharis palustris*), pink water-speedwell (*Veronica catenate*), with some sea club-rush (*Bolboscheonus maritimus*) are present in varying quantities.

Image EDP A1.5: Typical scrape on Botany Marsh West.

A1.59 There are ditches within Botany Marsh West and at the junctions of most of the ditches there are pond-like features here called ditch ponds. All ditches are unfenced and open to livestock. There is some variation in the dimensions but typically they are between 1.5m and 2.5m deep and 1.5-2m across at bank top; most are steep-sided and there is no evidence of management, e.g. re-profiling or excavation of silt.

A1.60 In the southern half of the site, the ditches were largely dry at the time of survey although small patches of mud were recorded. These southern ditches are species-poor and largely full of reed although some spear-leaved orache (*Atriplex patula*), red goosefoot (*Chenopodium rubrum*) and celery-leaved buttercup (*Ranunculus scleratus*) were occasionally recorded. A very small population of brackish water-crowfoot is recorded one ditch (see Figure 12.5, Document Reference 6.3.12.5).

A1.61 In the northern two thirds of the survey site the ditches held water; the depth of water increasing towards the north. Reed fills most of these northern ditches too but there is a significantly greater plant species diversity here. Celery-leaved buttercup and pink water-speedwell are frequent throughout the northern ditches but never in abundance.

A1.62 It is in the ditch ponds that the greatest botanical interest is recorded with areas of Brackish water-crowfoot, common water-plantain (*Alisma plantago-aquatica*), common spike-rush, pink water-speedwell, and sea club-rush.

A1.63 On the northern edge of Botany Marsh West, leading upwards along the stream, is saltmarsh vegetation. Slender hare's-ear (*Bupleurum tenuissimum*), a species with a strong association with upper saltmarsh habitat was recorded, and sea club-rush (*Bolboschoenus maritimus*) is plentiful, along with sea couch (*Elytrigia atherica*) along the banks of the stream forming the eastern boundary of the north-east tip.

A1.64 This area has been valued as of District importance as a precaution, due to its likelihood of qualifying as a Priority Habitat, and its ability to support protected species.

Black Duck Marsh

A1.65 Black Duck Marsh forms a large area of reedbed in the south-west of the peninsula (**Image EDP A1.6**). It is surrounded by deep, wet ditches and is shielded from the remainder of the peninsula by bands of scrub/immature woodland. The northern half of the marsh appears to be drier and contains scattered scrub. The southern half contains a large body of open water. This area measures approximately 19 hectares (ha) and so would qualify as a LWS on criteria FE1:

'All areas of reedbed, tall swamp vegetation, or fen habitat of 1 ha of more in extent should be selected as Local Wildlife Sites, including those with habitats which have been damaged but are capable of being restored.'[3].

A1.66 The sea wall running along the marsh's north-western edge is moderately species-rich, although it is mown regularly so its value is reduced. Species recorded include hedge bedstraw (*Galium mollugo*), bird's-foot trefoil, red clover, yellow vetchling, grass vetchling, ribwort plantain, marjoram (*Origanum majorana*), ox-eye daisy and meadow vetchling.

A1.67 A small area of salt marsh exists between the two existing sea walls (**Image EDP A1.7**), although this area is no longer regularly inundated due to the presence of the outer wall and is managed for amenity value at its southern extent. Slender hare's-ear (*Bupleurum tenuissimum*), a species with a strong association with upper saltmarsh habitat, was recorded here.

[3] Local Wildlife Sites in Kent, Criteria for Selection and Delineation Version 1.5, Kent Wildlife Trust 2015

Image EDP A1.6: The large reedbed at Black Duck Marsh with open water in the centre – looking north-east.

Image EDP A1.7: Saltmarsh adjacent to Black Duck Marsh – looking south-west.

A1.68 In the northern tip of the Black Duck Marsh targeted survey area is a small area of unmanaged calcareous grassland dominated by red fescue (*Festuca rubra*) with large but localised populations of ox-eye daisy (*Leucanthemum vulgare*) and kidney vetch (*Anthylis vulneraria*); glaucous sedge (*Carex flacca*) is also locally common. This calcareous grassland was too small and lacking in heterogeneity to conduct an NVC survey. This is shown as **TN6** on Figure 12.4 (Document Reference 6.3.12.4).

A1.69 There is a small area of shallow, open water in the south-eastern corner of the marsh. This area was formerly recorded as marshy grassland but was wet well into June 2020 after a very dry Spring, suggesting that the water table has risen in the

past eight years. The area currently forms a series of ponds dominated by rushes, with narrow scrubby banks running through the centre.

A1.70 Immediately west of Black Duck Marsh is a thin strip of saltmarsh vegetation along the interface with the estuary.

A1.71 The reedbed is considered to be of County level importance due to its status as a Priority Habitat and Kent BAP habitat, its extent and its position along the Thames Estuary.

A1.72 The calcareous grassland and sea-wall grassland are considered to be of Local value only due to their limited extent and unfavourable management.

Swamp South East of Black Duck Marsh

A1.73 This is a small area of swamp habitat with associated semi-improved grassland and scattered scrub along with a significant area of bare concrete situated on the south-eastern edge of the Black Duck Marsh.

A1.74 The swamp is largely species-poor and dominated by greater reed-mace (*Typha latifolia*) but with common reed locally common. Common stonewort (*Chara vulgaris*) is also abundant here but was recorded in areas that were largely desiccated by the time of survey.

A1.75 Several plant species of note were recorded here: brookweed (*Samolus valerandi*); sea rush (*Juncus maritimus*); common club-rush (*Schoenoplectus lacustris*); blue fleabane (Erigeron acer); and eyebright (*Euphrasia* sp). No Nationally Rare or Nationally Scarce species were recorded, although blue fleabane has declined in distribution and abundance in south-eastern England in recent decades.

Main Access Track, Tunnel Section Storage and Adjacent Ephemeral Habitat

A1.76 The track runs to the east of Black Duck Marsh north to the edge of Broadness Grassland. The verges of the track are rough grassland and scattered scrub with poor species diversity, although yellow vetchling is occasionally recorded here. As the track passes the central ridge, the track passes a large area of former hard standing. This area, along with the area directly to the east of the security hut on Manor Way currently being used as storage for sections of tunnel, is slowly being colonised by vegetation and could currently be described as the priority habitat: '*open mosaic habitats on previously developed land*'. Some more florally diverse areas exist, particularly along the banks surrounding the former hard standing. Species found here include hoary ragwort (*Jacobaea erucifolia*), bulbous buttercup, wild carrot (*Daucus carota*), yellow vetchling, ox-eye daisy, red valerian, hairy vetch and red clover.

A1.77 These areas fulfil the criteria set out in the Priority Habitat descriptions for habitats of this type[4], and are therefore considered to be of District level value.

North-east Tip

A1.78 The north-east tip is one of the most open areas of the peninsula, with just a small amount of scattered scrub around its northern edge. The tip is a disused landfill site and therefore forms a small hill, which is a high point within the peninsula. It is surrounded by reed-filled, wet ditches to the north, east and west and by reedbed associated with the former sewage works to the south.

A1.79 The poor semi-improved grassland is dominated by common couch and false-oat grass, with occasional ox-eye daisy, mugwort, teasel (*Dipsacus fullonum*), colt's-foot (*Tussilago farfara*), sand lucerne, bird's-foot trefoil and tufted vetch. Yellow vetchling is present along the track ringing the 'pit'.

A1.80 A colony of giant hogweed (*Heracleum mantegazzianum*) is present within scrub along the north-eastern edge of the tip.

A1.81 A small area of salt-marsh was also identified during the botanical survey, which recorded the presence of plentiful sea club-rush (*Bolboschoenus maritimus)* and sea couch (*Elytrigia atherica*).

A1.82 The poor semi-improved grassland/scrub mosaic here is considered to be of Local level value only.

Channel Tunnel Rail Link (CTRL) Wetland and Former Sewage Works

A1.83 A large area of relatively dry reedbed with willow scrub and areas of open water, the area surrounds the HS1 tunnel portal under the Thames and encompasses the entirety of the former sewage works located just to its north. The reedbed is a Priority Habitat and Kent BAP habitat and is therefore considered to be valuable at the County level. This reedbed area would qualify as a LWS under criteria FE1[49].

Land to the North of Tiltman Avenue

A1.84 The southern half of this area is rough, calcareous semi-improved grassland with scattered scrub. Further north, this turns to dense scrub and eventually immature woodland. The grassland community on the verge appears to have been deliberately sown as it is not only dominated by an unusual variety of red fescue (*Festuca rubra*) but it also has a predominance of unusually vigorous varieties of salad burnet (*Sanguisorba minor*) and common bird's-foot trefoil

[4] UK Biodiversity Action Plan Priority Habitat Descriptions Open Mosaic Habitats on Previously Developed Land From: UK Biodiversity Action Plan; Priority Habitat Descriptions. BRIG (ed. Ant Maddock) 2008.

(*Lotus corniculatus*) such as are frequently encountered in swards established by sowing a "wild seed mix". Wild seed mixes, especially where not designed specifically for nature conservation works, often contain varieties of native plants of continental European origin or from parent stock cultivated in plant nurseries and typically displaying greater vigour than wild stock.

A1.85 This sward was subject to a detailed NVC survey[5] but did not key out as any recognisable NVC community and thus gives additional weight to the suspicion that this is a sown wild-flower mix with cheap commercial grass varieties predominating. The area under NVC survey is shown as **TN1** on Figure 12.4 (Document Reference 6.3.12.4) and is considered to be of Local level only value due to its establishment through the sowing of a seed mix.

South-west Tip

A1.86 The central ridge is dominated by hawthorn, rose and dogwood scrub, with some more open false-oat, poor semi-improved grassland present across the top of the ridge.

A1.87 The main drain runs adjacent to the ridge, along its eastern edge. The drain is slow moving and flanked by common reeds, willow scrub, gypsywort (*Lycopus europaeus*), bittersweet (*Solanum dulcamara*) and great willowherb (*Epilobium hirsutum*). It drains in its north into a leachate contaminated pond. The pond does not have appear to have much aquatic vegetation apart from a line of reeds along its eastern edge.

A1.88 The aquatic habitats within this area are considered to be of Local value only due to their contamination and therefore poor water quality.

A1.89 The scrub and grassland mosaic is considered to be of Local level value only due to lack of species diversity but as part of a large habitat network.

Manor Way Industrial Estate

A1.90 The industrial estate is mostly hard standing, with intact and derelict buildings surrounded by industrial yards and chalk cliffs to the south. Some areas of dense scrub exist along the edges of the estate, and buddleia is abundant along Manor Way itself. The habitats in this area are considered to be of Site level value.

[5] British Plant Communities Volume 3: Grasslands and montane communities Ed J.S.Rodwell 1992 (1998 edition)

Craylands Pit

A1.91 Craylands pit is a disused chalk pit, which has partly been left to be colonised by vegetation. Its western end slopes downwards to the gateway onto Craylands Lane. At the top of the slope is a band of bramble, rose (*Rosa sp*.), hawthorn, dogwood (*Cornus sp*.), buddleia and sycamore scrub with some wildflowers at its base, including ox-eye daisy, bird's-foot trefoil, kidney vetch (*Anthyllis vulneraria*), red clover, everlasting sweet-pea, wild carrot, red valerian and perforate St. John's wort. Immediately to the east of there is a depression leading to a gated tunnel through the chalk ridge. This depression contains dense scrub and rough grassland.

A1.92 The main body of the pit is characterised by a matrix of sparsely vegetated chalk substrate, more mature rough grassland and scattered scrub on an unimproved soil. The more open areas are botanically richer, including colt's-foot, salad burnet, red clover, ox-eye daisy, ribwort plantain, marjoram, wild carrot, sainfoin and abundant kidney vetch. Small amounts of knapweed and yellow rattle are also present. The dominant grass species are false-oat and red fescue.

A1.93 The floor of Craylands Pit was subject to a detailed NVC survey as shown as **TN2** on Figure 12.4 (Document Reference 6.3.12.4) and pictured in **Image EDP A1.8**. There are two distinct communities here: NVC2a is found around the edges of the pit and is what appears to be a self-sown semi-natural grassland demonstrating a mild calcareous affinity; whilst NVC2b comprises numerous narrow bands of an apparently sown calcareous sward. The bands within NVC2b were clearly made by agricultural or horticultural equipment and are small shallow furrows or drill lines supporting a skeletal soil and a species-poor calcareous sward dominated by common bird's-foot trefoil, wild carrot (*Daucus carota*), and locally by kidney vetch (*Anthyllis vulneraria*). It is possible that the area now covered by NVC2b may have had a species-poor self-sown sward, which was cleared to allow for a herb-dominated mix to be sown; alternatively it may have been a compacted mineral surface with very little natural regeneration thus necessitating the clearance, drilling and sowing. Given that the edge of NVC2b is often very sharply demarcated, it is possible that the former option is most likely and that a self-sown turf was stripped.

Image EDP A1.8: Craylands Pit NVC2b community – sown grassland in furrows.

A1.94 The best approximation of NVC2a is to the **MG1d** *Arrhenatherum elatius* grassland *Pastinaca sativa* sub-community, although wild parsnip (*Pastinaca sativa*) is lacking here. Whilst this grassland community is a criterion for Site's of Special Scientific Interest (SSSI) selection[6], it must exceed 5ha or be of exceptionally high quality to be of National Importance.

A1.95 NVC2b has no satisfactory association with any NVC community or sub-community but bears some resemblance to a highly modified and grass-poor **CG2** *Festuca ovina- Avenula pratensis* grassland.

A1.96 Scrub habitat is most prevalent around the edges of the pit, both at the top and base of the chalk cliffs. Species include willow, hawthorn, poplar (*Populus sp*.) and buddleia.

A1.97 A track leads to a second tunnel through the northern cliff. The slopes leading down to this tunnel have a higher forb coverage, with mostly the same species being present, with the addition of yarrow, great knapweed (*Centaurea scabiosa*) and meadow buttercup (*Ranunculus acris*).

A1.98 Whilst the pit contains two grassland communities that fit the Priority Habitat description for lowland calcareous grassland (CG2)[7] and lowland meadows

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7 UK Biodiversity Action Plan Priority Habitat Descriptions Lowland Calcareous Grassland From: UK Biodiversity Action Plan; Priority Habitat Descriptions. BRIG (ed. Ant Maddock) 2008.

(MG1d)[8], they are not particularly fine examples. The MG1d grassland is considered to be valued at the District level value due to its limited extent, and the other grassland and scrub communities are considered to be of Local value only.

Bamber Pit

A1.99 The northern half of Bamber Pit has been used historically as landfill, and as a result is at a much higher elevation than the rest of the pit. Apart from maintained pathways, this area is impenetrable due to dense hawthorn, dogwood, elder and buddleia scrub. The area around the gate is more open and contains wall barley, barren brome, nettle, curled dock, false oat, soft brome, cock's-foot and fat-hen (*Chenopodium album*). Small amounts of pink sorrel (*Oxalis articulate*) and comfrey (*Symphytum officinale*) were recorded further along the track.

A1.100 The remainder of the pit is at a significantly lower elevation and comprises a matrix of ephemeral vegetation, scattered scrub and small pockets of poor semi-improved grassland. The slope leading to the south-eastern corner of the pit contains an area of grassland with species including white valerian, teasel, creeping cinquefoil, knapweed, common ragwort, ribwort plantain, common vetch, marjoram, perforate St. John's wort, cut-leaved cranesbill (Geranium dissectum), forget-me-not (Myosotis sp.), ox-eye daisy and common mallow, although dominated by false-oat grass.

A1.101 A large pond/small lake exists at the base of the pit (**Image EDP A1.9**), which is surrounded by dense scrub and populated by large carp. The lake is used recreationally by members of the public who have broken into the area, and as a result is heavily polluted by litter. The only aquatic species noted during the Phase 1 survey were white water lily (*Nymphaea alba*).

[8] UK Biodiversity Action Plan Priority Habitat Descriptions Lowland Meadows From: UK Biodiversity Action Plan; Priority Habitat Descriptions. BRIG (ed. Ant Maddock) 2008.

Image EDP A1.9: The lake at Bamber Pit.

A1.102 Two areas of grassland were subject to a detailed botanical survey. The northernmost area (**TN7** on Figure 12.4 (Document Reference 6.3.12.4)) covers a small area and is notably species-poor; intensive grazing by rabbits (*Oryctolagus cuniculus*) keeps the sward short and is likely to influence species composition as unpalatable species will dominate. Creeping cinquefoil (*Potentilla reptans*) is dominant here but false oat-grass, cocksfoot (*Dactylis glomerata*), and annual meadow-grass (*Poa annua*) are frequent.

A1.103 The southernmost of the two small grassland areas (**TN8** on Figure 12.4 (Document Reference 6.3.12.4)) is larger and slightly more species-rich, although no species of any note were recorded. False oat-grass, cocksfoot, annual meadow-grass and creeping cinquefoil are again the most common species recorded.

A1.104 The grassland and scrub habitats in Bamber Pit are considered to be of Local level value only.

A1.105 The pond is considered to be of Local level value due to its Status as a Priority Habitat, but despite its heavy pollution and the presence of non-native fish (carp (*Cyprinus carpio*)).

Sportsground

A1.106 This area is another former chalk pit, although at a later successional stage than Craylands Pit. The eastern end of the pit is adjacent to the HS1 railway and is an open, scattered hawthorn scrub/rough false-oat and cock's-foot poor semi-improved grassland mosaic. False oat-grass is dominant here but common couch (*Elytrigia repens*), cocksfoot, creeping cinquefoil, and field bindweed (*Convolvulus arvensis*) are all frequent. Grass vetchling (*Lathyus nissolia*) is locally abundant and ribwort (*Plantago lanceolata*) common. The western end and much

of the southern boundary of the pit is wooded as shown in **Image EDP A1.10**, and between is an area of dense bramble scrub, which has engulfed a small building.

Image EDP A1.10: The Western end and much of the southern boundary of Craylands Pit is Wooded.

A1.107 The woodland is considered to be of Local level value due its status as a Priority Habitat, but limited extent, structure and diversity.

A1.108 The scrub and grassland mosaic are considered to be of no more than Local level value.

Former Landfill

A1.109 The main body of the landfill is managed, open, poor semi-improved grassland (**Image EDP A1.11**). This is fairly rough in character, although contains higher forb diversity in some areas. This grassland includes species such as cock's-foot, soft brome, Yorkshire fog, rough meadow-grass, rough chervil (*Chaerophyllum temulum*), wild carrot, bristly ox-tongue (*Helminthotheca echioides*), smooth sow-thistle, creeping thistle, ribwort plantain, creeping cinquefoil and bird's-foot trefoil. Higher diversity areas also include common vetch, red clover, yarrow, yellow toadflax, goat's-beard, white valerian and hedgerow cranesbill (*Geranium pyrenaicum*). Some pyramidal and bee orchids were present around the southern edge of the landfill.

A1.110 Two areas of scrub are present in the east of the Former Landfill, these are ringed by ditches and contain a mix of hawthorn, crab-apple (*Malus Sylvestris*), blackthorn, dog rose, dogwood, gorse (*Ulex europaeus*), broom, bramble and buddleia. Further scrub is present along the eastern boundary, thickening into the north-eastern corner, where a small section of the original pit is present (Bamber Pit South). This area is unmanaged and dominated by false-oat grass and scrub,

but also contains hairy vetch and other forb species, plus some ox-eye daisy and teasel.

A1.111 The western edge of the landfill is bordered by a band of off-site woodland and bramble scrub. The scrub and grassland habitats within this area are considered to be of no more than Local level value.

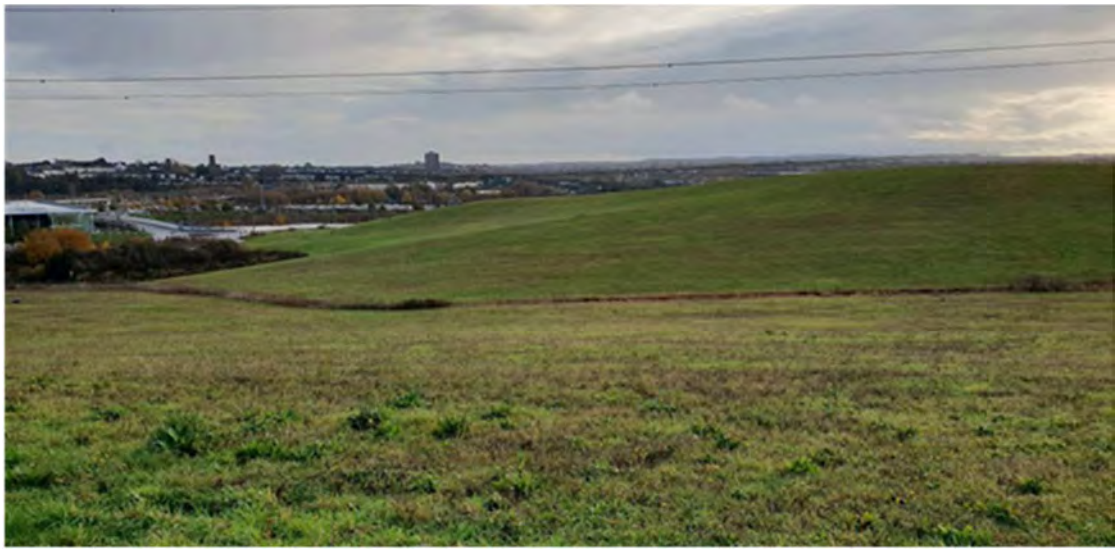

Image EDP A1.11: Open poor semi-improved grassland on the former landfill.

Station Quarter South and River Ebbsfleet

A1.112 The River Ebbsfleet, which is described in **Annex EDP 11**, forms the eastern edge of this survey area. The river corridor is flanked by alder (*Alnus glutinosa*) and willow dominated wet woodland to the west, which then gives way to dense, then scattered scrub and finally open false-oat grassland. Teasel is abundant in this area, and bramble scrub is the dominant habitat in the south and east. Three ponds are present in the north, one natural and one drainage feature and an inline pool associated with the river.

A1.113 The scrub is made up of willow, hawthorn and dog rose, with occasional cherry, hazel, dogwood, field maple, silver birch, oak (*Quercus sp.*) and elder.

A1.114 The poor semi-improved grassland is varied in length due to grazing by rabbits, although none is species-rich. Species present include hemlock (*Conium maculatum*), teasel, crown vetch (*Securigera varia*), creeping thistle, spear thistle, dove's-foot cranesbill, weld (*Reseda luteola*), meadow buttercup, broad-leaved dock (*Rumex obtusifolius*), curled dock, cut-leaved cranesbill, creeping cinquefoil, yellow-wort (*Blackstonia perfoliate*), hoary cress (*Lepidium draba*), colt's-foot, white campion, ground ivy (*Glechoma hederacea*), black medick, common vetch, great willowherb, nettle and field forget-me-not (*Myosotis arvensis*). The grassland/scrub mosaic habitats here are considered to

be of Local value due to their structural diversity and extent, despite their relatively low floral diversity.

Station Quarter North

A1.115 Most of the area of Station Quarter North is taken by car parking and associated landscape planting (in the form of dense, immature tree planting along the roadside). The remaining semi-natural vegetation to the south of the car park is open to the east and scrubby to the west (**Image EDP A1.12**). The eastern, semi-improved grassland includes species such as tall fescue, red fescue, soft brome, barren brome, Yorkshire fog, mugwort, perforate St. John's Wort, crown vetch, creeping thistle, ox-eye daisy, bladder campion (*Silene vulgaris*), ragwort, yellow vetchling, grass vetchling, rough hawk's-beard, red clover and hogweed (*Heracleum sphondylium*). The scrub comprises a mix of blackthorn, dogwood, grey poplar (*Populus x canescens*), hawthorn, rose, cherry, buddleia, grey willow (*Salix cinerea*), broom, oak, hazel, alder, field maple and silver birch. The grassland and scrub habitats here are considered to be of Site value only due to their limited extent.

Image EDP A1.12: Scrub in Station Quarter.

Land along Thames Way and A2260, Northfleet

A1.116 This land follows the route of the River Ebbsfleet and the adjacent Thames Way road, which links Ebbsfleet International station with Northfleet. It is formed of four distinct parcels, three of which, to the east of the road, are dominated by reedbed and willow woodland. A small area of Japanese knotweed (*Fallopia japonica*) is present along the public right of way to the north of Sawyer's Lake.

A1.117 The area between the A2260 and International Way is rough semi-improved grassland, dominated by false-oat grass, with barren brome, Yorkshire fog, ox-eye daisy, crown vetch and white valerian. There is some scattered dog rose and hawthorn.

A1.118 The road verges along Thames Way are scrubby with some finer patches of grassland with species including ox-eye daisy, crown vetch, common vetch, red fescue, false-oat and rough hawk's-beard.

A1.119 The area west of Thames Way, north of the railway, is dominated by buddleia scrub, with willow scrub and reedbed along the river channel. To the north of this is a more open area with ruderal and scrub species, including wild raspberry (*Rubus occidentalis*), hemlock, bramble, white valerian, creeping thistle and areas of almost exclusively creeping cinquefoil.

A1.120 The scrub and grassland habitats in these areas are considered to be of Local value, and the reedbed of County value due to its status as a Priority Habitat and Kent BAP habitat.

A2 Corridor

A1.121 The A2 corridor comprises a small strip of poor semi-improved grassland along the side of the A2 dual carriageway, with a band of woodland to the north. The grassland contains many species of rough/disturbed land and is dominated by false-oat and barren brome. Amongst the other species present are hawk's-beard spp., ox-eye daisy, goat's-beard, wild carrot, common mallow, wall barley, rough hawkbit, crown vetch, yarrow, ragwort and teasel. To the north is a steep drop into a former quarry, which is presently being developed for housing. The woodland along the slope is diverse in woody species, including dogwood, hawthorn, ash, guelder rose (*Viburnum opulus*), field maple, hazel, birch, elm (*Ulmus* sp.), holly, hornbeam (*Carpinus* sp.), wild cherry, apple, sweet chestnut (*Castanea sativa*), Norway maple (*Acer platanoides*), white poplar (*Populus alba*), dog rose, rowan (*Sorbus aucuparia*), turkey oak (*Quercus cerris*), honeysuckle (*Lonicera* sp.), alder, old man's beard and oak.

A1.122 Further to the west, the woodland rises, widens and becomes more natural in character, dominated by oak, with occasional sweet chestnut, gorse, field maple, birch and honeysuckle. Here the ground flora is reasonably diverse and includes wood sage (*Teucrium scorodonia*), wood spurge (*Euphorbia amygdaloides*), St. John's wort, bramble, dog mercury (*Mercurialis perennis*), wood-rush (*Luzula sylvatica*), wood false-brome (*Brachypodium sylvaticum*), wood avens (*Geum urbanum*), false-fox sedge (*Carex otrubae*) and wood speedwell (*Veronica montana*). The habitats in this area are considered to be of less than local value with the exception of the natural woodland to the west which is

considered to be of Local value due to its connectivity with other woodland, its status as a Priority Habitat and Kent BAP habitat, and the presence of dormouse.

Invasive Species

A1.123 A number of Invasive non-native plant species were recorded on the Kent Project Site in 2012 and 2015 including giant hogweed (*Heracleum Mantegazzianum*), Japanese knotweed (*Fallopia japonica*), wall cotoneaster (*Cotoneaster horizontalis*), Himalayan balsam (*Impatiens glandulifera*) and buddleia (*Buddleja davidii*). A dedicated update survey took place in October 2020 to try to locate the previously mapped locations but most could not be found due to the extensive scrub colonisation of most areas of the Kent Project Site.

A1.124 Giant hogweed has been found in the north-east tip (mapped as TN9). Japanese knotweed has been found along the River Ebbsfleet corridor and dead stems of this species were found on Broadness Grassland on the peninsula (mapped as TN10). Wall cotoneaster has been found on the main access track next to the southeast corner of Black Duck Marsh (mapped as TN11). All target notes are shown on Figure 12.4 (Document Reference 6.3.12.4). Buddleia is present throughout much of the Kent Project Site and on the Essex Project Site.

NVC Tables for Locations within Targeted Survey Areas

Northern Verge of Tiltman Avenue (Shown as TN1 on Figure 12.5; Document Reference 6.3.12.5)

Table EDP A1.1: NVC1 - Does not key out to any satisfactory NVC community (most probably a recently sown commercial wildflower seed mix).

Common Name	Scientific Name	NVC Quadrat				DOMIN
		1	2	3	4	
Yarrow	*Achillea millefolium*		3		1	II (1-3)
False oat-grass	*Arrhenatherum elatius*		1	2	1	III (1-2)
Barren brome	*Bromopsis sterilis*	4	5	5	5	IV (4-5)
Black knapweed	*Centaurea nigra*	1		3		II (1-3)
Common mouse-ear	*Cerastium fontanum*			1	3	II (1-3)
Creeping thistle	*Cirsium arvense*	2				I (2)
Wild carrot	*Daucus carota*	4	4	4		III (4)
Sea couch	*Elytrigia aetherica*		2	3	2	III (2-3)
Red fescue	*Festuca rubra*	8	8	6	7	IV (6-8)
Fennel	*Foeniculum vulgare*				1	I (1)
Hedge bedstraw	*Galium mollugo*	3	5	7	6	IV (3-7)
Lady's bedstraw	*Galium verum*	5		6	5	III (5-6)

Common Name	Scientific Name	NVC Quadrat				DOMIN
		1	2	3	4	
Hogweed	*Heracleum sphondylium*			1		I (1)
Hoary mustard	*Hirschfeldia incana*	2	1			II (1-2)
Yorkshire fog	*Holcus lanatus*	6	3	6	7	IV (3-7)
Perforate St John's-wort	*Hypericum perforatum*			2	2	II (2)
Grass vetchling	*Lathyrus nissolia*		1	4		II (1-4)
Ox-eye daisy	*Leucanthemum vulgare*		4		1	II (1-4)
Bird's-foot trefoil	*Lotus corniculatus*	5	7	3	5	IV (3-7)
Black medick	*Medicago lupulina*	2	6	3		III (2-6)
Lucerne	*Medicago sativa ssp. sativa*	1	1		1	III (1)
Lemon balm	*Melissa officinalis*		1			I (1)
Sainfoin	*Onobrychis viciifolia*			1	1	II (1)
Timothy	*Phelum pratense*				2	I (2)
Hawkweed ox-tongue	*Picris hieracioides*	4			3	II (3-4)
Ribwort	*Plantago lanceolata*	1	5	5	3	IV (1-5)
Flattened meadow-grass	*Poa compressa*			4		I (4)
Creeping cinquefoil	*Potentilla reptans*	6	4	6	5	IV (4-6)
Greek dock	*Rumex cristatus*		2			I (2)
Salad burnet	*Sanguisorba minor*	5	3	5	5	IV (3-5)
Common ragwort	*Senecio jacobaea*	2				I (2)
Goatsbeard	*Tragopogon pratense*			2		I (2)
Squirreltail fescue	*Vulpia bromoides*			3	5	II (3-5)

Craylands Pit Natural Grassland (Shown as TN2 on Figure 12.4 (Document Reference 6.3.12.4))

Table EDP A1.2: NVC2a - **MG1d** *Arrhenatherum elatius* grassland *Pastinaca sativa* sub-community.

Common Name	Scientific Name	NVC Quadrats					DOMIN
		1	2	3	4	5	
Yarrow	*Achillea millefolium*		3	2	2		III (2-3)
Common bent	*Agrostis capillaris*	5	2	6		3	IV (2-6)
Pyramidal orchid	*Anacamptis pyramidalis*				2		I (2)
Kidney vetch	*Anthyllis vulneraria*		3			7	II (3-7)

Common Name	Scientific Name	NVC Quadrats					DOMIN
		1	2	3	4	5	
False oat-grass	*Arrhenatherum elatius*	5	7	7	6	6	V (5-7)
Silver birch seedlings	*Betula pendula*	1	3	1		1	IV (1-3)
Yellow-wort	*Blackstonia perfoliata*	1					I (1)
Smooth brome	*Bromus hordaceus*			3		4	II (3-4)
Buddleia seedling	*Buddleia davidii*	1	1	1			III (1)
Common mouse-ear	*Cerastium fontanum*	2	2		2		III (2)
Wild clematis	*Clematis vitalba*		4				I (4)
Hawthorn seedling	*Crataegus monogyna*				2		I (2)
Beaked hawksbeard	*Crepis vesicaria*			3		1	II (1-3)
Cocksfoot	*Dactylis glomerata*	1	4	2	3		IV (1-4)
Wild carrot	*Daucus carota*	3		2		3	III (2-3)
Tall fescue	*Festuca arundinacea*		4				I (4)
Red fescue	*Festuca rubra*	5	7	2	6	6	V (2-7)
(Commercial fescue variety)	*Festuca sp.*			6			I (6)
Hedge bedstraw	*Galium mollugo*	3					I (3)
Perforate St John's-wort	*Hypericum perforatum*	2	1				II (1-2)
Ox-eye daisy	*Leucanthemum vulgare*		5	5	3	3	IV (3-5)
Perennial rye-grass	*Lolium perenne*	3			3	4	III (3-4)
Bird's-foot trefoil	*Lotus corniculatus*			6	1	1	III (1-6)
Narrow-leaved bird's-foot trefoil	*Lotus glaber*	2				3	II (2-3)
Black medick	*Medicago lupulina*		1	1			II (1)
Melilot species	*Melilotus sp.*	3			2		II (1-3)
Sainfoin	*Onobrychis viciifolia*		1	1			II (1)
Wild marjoram	*Origanum vulgare*			2			I (2)
Hawkweed ox-tongue	*Picris hieracioides*	2	2	1			III (1-2)
Ribwort	*Plantago lanceolata*	1	4			2	III (1-4)
Creeping cinquefoil	*Potentilla reptans*			6	5		II (5-6)
Self-heal	*Prunella vulgaris*	4				1	II (1-4)
Willow seedlings	*Salix spp.*		4	3			II (3-4)

Common Name	Scientific Name	NVC Quadrats					DOMIN
		1	2	3	4	5	
Salad burnet	*Sanguisorba minor*				2		I (2)
Hop trefoil	*Trifolium campestre*		3	1	2		III (1-3)
Red clover	*Trifolium pratense*	5	2	4			III (2-5)
Yellow oat-grass	*Trisetum flavescens*				2	2	II (2)
Coltsfoot	*Tussilago farfara*					3	I (3)
Common vetch	*Vicia sativa*			2		3	II (2-3)

Craylands Pit – Possibly Seeded Area (Shown as TN2 on Figure 12.4 (Document Reference 6.3.12.4))

Table EDP A1.3: NVC2b - No satisfactory association with any NVC community or sub-community but bears some resemblance to a highly modified and grass-poor **CG2** *Festuca ovina- Avenula pratensis* grassland.

Common Name	Scientific Name	NVC Quadrats					DOMIN
		1	2	3	4	5	
Common bent	*Agrostis capillaris*				1	3	II (1-3)
Kidney vetch	*Anthyllis vulneraria*	5		3	5	8	IV (3-8)
False oat-grass	*Arrhenatherum elatius*	2			1	1	III (1-2)
Yellow-wort	*Blackstonia perfoliata*		3			2	II (2-3)
Smooth brome	*Bromus hordaceus*			1		1	II (1)
Black knapweed	*Centaurea nigra*	2					I (2)
Common centaury	*Centaurium erythrea*			2			I (2)
Beaked hawksbeard	*Crepis vesicaria*	1	1				II (1)
Cocksfoot	*Dactylis glomerata*		2	2		1	III (1-2)
Common spotted orchid	*Dactylorhiza fuchsii*		3		1		II (1-3)
Wild carrot	*Daucus carota*	3	6	5	5	7	V (3-7)
Red fescue	*Festuca rubra*		1		2		II (1-2)
Perforate St John's-wort	*Hypericum perforatum*				4	1	II (1-4)
Ox-eye daisy	*Leucanthemum vulgare*	4		2	1	5	IV (1-5)
Bird's-foot trefoil	*Lotus corniculatus*	7		6	6	7	IV (6-7)

Common Name	Scientific Name	NVC Quadrats					DOMIN
		1	2	3	4	5	
Narrow-leaved bird's-foot trefoil	*Lotus glaber*		3				I (3)
Black medick	*Medicago lupulina*		2	4			II (2-4)
Melilot species	*Melilotus sp.*	5	5			3	III (3-5)
Mouse-ear hawkweed	*Pilosella officinarum*				6		I (6)
Ribwort	*Plantago lanceolata*	3	6	2	4	2	V (2-6)
Salad burnet	*Sanguisorba minor*		2		3	2	III (2-3)
Red clover	*Trifolium pratense*	4					I (4)
Coltsfoot	*Tussilago farfara*				5		I (5)
Bare ground		6	6	3	6	5	V (3-6)

Area in the South-east of Broadness Grassland (shown as TN3 on Figure 12.4 (Document Reference 6.3.12.4))

Table EDP A1.4: NVC3 - **MG1d** *Arrhenatherum elatius* grassland *Pastinaca sativa* sub-community.

Common Name	Scientific Name	NVC Quadrats					DOMIN
		1	2	3	4	5	
Yarrow	*Achillea millefolium*			1	2		II (1-2)
Pyramidal orchid	*Anacamptis pyramidalis*		1				I (1)
False oat-grass	*Arrhenatherum elatius*	8	8	9	7	9	V (7-9)
Yellow-wort	*Blackstonia perfoliata*	1			1		II (1)
Common mouse-ear	*Cerastium fontanum*	1	2			1	III (1-2)
Creeping thistle	*Cirsium arvense*	4		4	1	2	IV (1-4)
Hemlock	*Conium maculatum*				1		I (1)
Dogwood	*Cornus sanguineus*		1	1			II (1)
Beaked hawksbeard	*Crepis vesicaria*	2			2		II (2)
Cocksfoot	*Dactylis glomerata*	3	1		3	1	IV (1-3)
Wild carrot	*Daucus carota*		4	3	1	1	IV (1-4)
Perennial wall-rocket	*Diplotaxis tenuis*	1					I (1)
Common teasel	*Dipsacus fullonum*		1			2	II (1-2)
Sea couch	*Elytrigia aetherica*	6	5	7	5	3	V (3-7)
Goosegrass	*Galium aparine*	2			3	2	III (2-3)

Common Name	Scientific Name	NVC Quadrats					DOMIN
		1	2	3	4	5	
Hogweed	*Heracleum sphondylium*				1	2	II (1-2)
Perforate St John's-wort	*Hypericum perforatum*				3		I (3)
Ploughman's spikenard	*Inula conyzae*	2				1	II (1-2)
Prickly lettuce	*Lactuca seriola*		1			3	II (1-3)
Great lettuce	*Lactuca virosa*			1			I (1)
Yellow vetchlingling	*Lathyrus aphaca*	4	5	4		4	IV (4-5)
Hairy vetch ling	*Lathyrus hirsutus*	3	3	3	4	1	V (1-4)
Broad-leaved everlasting-pea	*Lathyrus latifolius*				3		I (3)
Grass vetchling	*Lathyrus nissolia*	4	1		6		III (1-6)
Hoary cress	*Lepidium draba*			2			I (2)
Ox-eye daisy	*Leucanthemum vulgare*		2		2	2	III (2)
Common toadflax	*Linaria vulgaris*				1		I (1)
Bird's-foot trefoil	*Lotus corniculatus*				3		I (3)
Narrow-leaved bird's-foot trefoil	*Lotus glaber*	4					I (4)
Common mallow	*Malva sylvestris*			3	1	1	III (1-3)
Black medick	*Medicago lupulina*	6	5	5			III (5-6)
Wild parsnip	*Pastinaca sativa*				3	4	II (3-4)
Hawkweed ox-tongue	*Picris hieracioides*			6	3	3	III (3-6)
Ribwort	*Plantago lanceolata*	4				2	II (2-4)
Smooth meadow-grass	Poa palustris	2	4	3	1	3	V (1-4)
Bastard cabbage	Rapistrum rugosum			2			I (2)
Bramble	Rubus fruticosus ag..				2	1	II (1-2)
Curled dock	Rumex crispus	1	1				II (1)
Greek dock	Rumex cristatus	1					I (1)
Hoary ragwort	Senecio erucifolius		2				I (2)
Oxford ragwort	Senecio squalidus	2	2			3	III (2-3)
White campion	Silene latifolia				1		I (1)
Stone parsley	Sison amomum			2			I (2)
Alexanders	Smyrnium olusatrum					2	I (2)
Goatsbeard	Tragopogon pratense			2			I (2)
Hop trefoil	Trifolium campestre				3	3	II (3)

Common Name	Scientific Name	NVC Quadrats					DOMIN
		1	2	3	4	5	
Yellow oat-grass	Trisetum flavescens			2			I I(2)
Nettle	Urtica dioica		4				I (4)
Tufted vetch	Vicia cracca	1		1	3		III (1-3)
Smooth tare	Vicia tetrasperma	3			5	4	III (3-5)

DAFOR Tables (For Locations Within Targeted Survey Areas Not Suitable for NVC Survey)

Table EDPA1.5: Disused Chalk Pits (Shown as **TN7** and **TN8** on **Figure 12.4 (Document Reference 6.3.12.4)**).

Common Name	Scientific Name	Pit Name and DAFOR		
		Sports Ground	Bamber Pit 1 (TN7)	Bamber Pit 2 (TN8)
Yarrow	*Achillea millefolium*	O		O
Pyramidal orchid	*Anacamptis pyramidalis*	R		
False oat-grass	*Arrhenatherum elatius*	D	F	F/LA
Mugwort	*Artemesia vulgaris*	R		
Black horehound	*Ballota nigra*	R		
Barren brome	*Bromopsis sterilis*	R		
Black knapweed	*Centaurea nigra*			O
Creeping thistle	*Cirsium arvense*	O		
Field bindweed	*Convolvulus arvensis*	F		
Beaked hawksbeard	*Crepis vesicaria*	O/LF		
Cocksfoot	*Dactylis glomerata*	F	F	F/LA
Wild carrot	*Daucus carota*	O/LF		
Perennial wall-rocket	*Diplotaxis tenuifolia*			O/LF
Common teasel	*Dipsacus fullonum*	R	F	O
Sea couch	*Elytrigia atherica*	R/LO		
Common couch	*Elytrigia repens*	F		
Red fescue	*Festuca rubra*			O/LF
Fennel	*Foeniculum vulgare*	R		
Hedge bedstraw	*Galium mollugo*	O		
Cut-leaved cranesbill	*Geranium dissectum*	O		O/LF
Dovesfoot cranesbill	*Geranium molle*			R
Hogweed	*Heracleum sphondylium*	R		

Common Name	Scientific Name	Pit Name and DAFOR		
		Sports Ground	Bamber Pit 1 (TN7)	Bamber Pit 2 (TN8)
Hoary mustard	*Hirschfeldia incana*		O	O/LF
Yorkshire fog	*Holcus lanatus*		R	O
Perforate St John's-wort	*Hypericum perforatum*	R	R	F
Ploughman's spikenard	*Inula conyzae*			R
Meadow vetchling	*Lathtyrus pratensis*	R		
Grass vetchling	*Lathyrus nissolia*	O/LA		
Hoary cress	*Lepidium draba*	R		O/LF
Ox-eye daisy	*Leucanthemum vulgare*	R/LO		
Common toadflax	*Linaria vulgaris*	R/LF		
Common bird's-foot trefoil	*Lotus corniculatus*			O
Common mallow	*Malva sylvestris*	R	R	O
Lucerne	*Medicago sativa sp. sativa*	R		
Marjoram	*Origanum vulgare*			R
Hawkweed oxtongue	*Picris hieracioides*	R		
Ribwort	*Plantago lanceolata*	O/LF	O	O
Annual meadow-grass	*Poa annua*		F	F
Smooth meadow-grass	*Poa pratensis*	F	R	
Creeping cinquefoil	*Potentilla reptans*	F/LA	D	F/LA
Celery-leaved buttercup	*Ranunculus scleratus*	R		
Dog rose	*Rosa arvensis agg.*			R
Bramble	*Rubus fruticosus agg.*			R
Greek dock	*Rumex cristatus*	R	R	
Hoary ragwort	*Senecio erucifolia*	R		
White campion	*Silene latifolia*			R
Prickly sow-thistle	*Sonchus asper*			R
Dandelion	*Taraxacum officinale agg.*	R		
Goatsbeard	*Tragopogon pratense*	O		
Red clover	*Trifolium pratense*	R		

Common Name	Scientific Name	Pit Name and DAFOR		
		Sports Ground	Bamber Pit 1 (TN7)	Bamber Pit 2 (TN8)
Germander speedwell	*Veronica chamaedrys*			R
Tufted vetch	*Vicia cracca*	O		
Common vetch	*Vicia sativa*			R
Smooth tare	*Vicia tetrapserma*	O		

Table EDPA1.6: Calcareous Grassland at the Northern Tip of Black Duck Marsh (Shown as **TN6** on **Figure 12.4 (Document Reference 6.3.12.4)**)

Common Name	Scientific Name	DAFOR
Kidney vetch	*Anthyllis vulneraria*	F/LD
False oat-grass	*Arrhenatherum elatius*	O
Silver birch whip	*Betula pendula*	R
Yellow-wort	*Blackstonia perfoliate*	R
Glaucous sedge	*Carex flacca*	O/LF
Black knapweed	*Centaurea nigra*	R
Hawthorn whip	*Crataegus monogyna*	R
Beaked hawksbeard	*Crepis vesicaria*	R
Cocksfoot	*Dactylis glomerata*	O
Wild carrot	*Daucus carota*	O
Sea couch	*Elytrigia atherica*	F
Common couch	*Elytrigia repens*	R
Meadow fescue	*Festuca pratensis*	R
Red fescue	*Festuca rubra*	A
Cut-leaved cranesbill	*Geranium dissectum*	R
Yorkshire fog	*Holcus lanatus*	O
Perforate St John's-wort	*Hypericum perforatum*	R
Ox-eye daisy	*Leucanthemum vulgare*	O
Common bird's-foot trefoil	*Lotus corniculatus*	O
Narrow-leaved bird's-foot trefoil	*Lotus glaber*	F
Black medick	*Medicago lupulina*	O
Lucerne	*Medicago sativa sp. sativa*	O/LA
Marjoram	*Origanum vulgare*	R
Hawkweed oxtongue	*Picris hieracioides*	R
Ribwort	*Plantago lanceolata*	R
Annual meadow-grass	*Poa annua*	O
Smooth meadow-grass	*Poa pratensis*	R
Creeping cinquefoil	*Potentilla reptans*	O
Meadow buttercup	*Ranunculus acris*	R

Common Name	Scientific Name	DAFOR
Willow whip	*Salix spp*	R
Red clover	*Trifolium pratense*	O
Common vetch	*Vicia sativa*	R
Smooth tare	*Vicia tetrapserma*	R

Table EDPA1.7: Playing Field in Botany Marsh East (Shown as **TN4** on **Figure 12.4 (Document Reference 6.3.12.4)**).

Common name	Scientific name	DAFOR
Creeping bent	*Agrostis stolonifera*	A/LD
Meadow foxtail	*Alopecurus pratensis*	O
False oat-grass	*Arrhenatherum elatius*	R
Divided sedge	*Carex divisa*	F/LA
Black knapweed	*Centaurea nigra*	R
Crested dog's-tail	*Cynosurus cristatus*	O
Cocksfoot	*Dactylis glomerata*	R
Sea couch	*Elytrigia atherica*	O/LF
Common couch	*Elytrigia repens*	O
Tall fescue	*Festuca arundinacea*	A/LD
Red fescue	*Festuca rubra*	O/LF
Hogweed	*Heracleum sphondylium*	R
Yorkshire fog	*Holcus lanatus*	F
Meadow barley	*Hordeum secalinum*	F/LA
Hairy vetchling	*Lathyrus hirsuta*	O
Grass vetchling	*Lathyrus nissolia*	O
Perennial rye-grass	*Loilum perenne*	O/LF
Common bird's-foot trefoil	*Lotus corniculatus*	R
Hawkweed oxtongue	*Picris hieracioides*	O/LF
Ribwort	*Plantago lanceolata*	R
Annual meadow-grass	*Poa annua*	R
Smooth meadow-grass	*Poa pratensis*	F
Creeping cinquefoil	*Potentilla reptans*	O
Hairy buttercup	*Ranunculus sardous*	R
Celery-leaved buttercup	*Ranunculus scleratus*	R
Hoary ragwort	*Senecio erucifolia*	R
Oxford ragwort	*Snecio squalidus*	R
Red clover	*Trifolium pratense*	O
White clover	*Trifolium repens*	R
Common vetch	*Vicia sativa*	R
Smooth tare	*Vicia tetrapserma*	R

Table EDPA1.8: Relict Grassland in South-east of Botany Marsh East (Shown as **TN5** on **Figure 12.4 (Document Reference 6.3.12.4)**).

Common Name	Scientific Name	DAFOR
Yarrow	*Achillea millefolium*	R
Creeping bent	*Agrostis stolonifera*	F
False oat-grass	*Arrhenatherum elatius*	A
Mugwort	*Artemesia vulgaris*	R
Black knapweed	*Centaurea nigra*	O
Creeping thistle	*Cirsium arvense*	O
Beaked hawksbeard	*Crepis vesicaria*	O
Cocksfoot	*Dactylis glomerata*	F
Wild carrot	*Daucus carota*	F
Perennial wall-rocket	*Diplotaxis tenuifolia*	R
Common teasel	*Dipsacus fullonum*	R/LO
Sea couch	*Elytrigia atherica*	O
Common couch	*Elytrigia repens*	O
Tall fescue	*Festuca arundinacea*	F
Red fescue	*Festuca rubra*	R/LO
Hedge bedstraw	*Galium mollugo*	R
Cut-leaved cranesbill	*Geranium dissectum*	R
Dovesfoot cranesbill	*Geranium molle*	R
Yorkshire fog	*Holcus lanatus*	A
Meadow barley	*Hordeum secalinum*	O/LF
Perforate St John's-wort	*Hypericum perforatum*	O
Meadow vetchling	*Lathtyrus pratensis*	R
Yellow vetchling	*Lathyrus aphaca*	R
Grass vetchling	*Lathyrus nissolia*	R
Ox-eye daisy	*Leucanthemum vulgare*	O
Common toadflax	*Linaria vulgaris*	R
Common bird's-foot trefoil	*Lotus corniculatus*	F
Lucerne	*Medicago sativa sp. sativa*	R
Hawkweed oxtongue	*Picris hieracioides*	O
Ribwort	*Plantago lanceolata*	F
Annual meadow-grass	*Poa annua*	F
Smooth meadow-grass	*Poa pratensis*	F
Creeping cinquefoil	*Potentilla reptans*	F/LA
Yellow rattle	*Rhinanthus minor*	R/LO
Dog rose	*Rosa arvensis agg.*	R
Bramble	*Rubus fruticosus agg.*	O/LF
Hoary ragwort	*Senecio erucifolia*	R
Red campion	*Silene dioica*	R/LO
Ragged robin	*Silene flos-cuculi*	R
Dandelion	*Taraxacum officinale agg.*	R

Common Name	Scientific Name	DAFOR
Red clover	*Trifolium pratense*	F
White clover	*Trifolium repens*	O
Common vetch	*Vicia sativa*	O
Tufted vetch	*Vicia cracca*	R/LO

List of Plant Species Recorded from Botany Marsh West

Table EDPA1.9: List of Plant Species Recorded from Botany Marsh West

Common name	Scientific name	DAFOR	Notes
Yarrow	*Achillea millefolium*	R	Mainly in Field 4
Common bent	*Agrostis capillaris*	F	In the drier parts of the sward
Creeping bent	*Agrostis stolonifera*	A / LD	Throughout the site
Common water-plantain	*Alisma plantago-aquatica*	O / LF	Mainly in Ditches 4, 6 and 7 and in Ditch-ponds 2 and 4.
Grass-leaved orache	*Atriplex littoralis*	O / LF	Occasional in draw-down areas.
Spear-leaved orache	*Atriplex prostrata*	F	Frequent in draw-down areas; occasional on ditch banks
Sea club-rush	*Bolboschoenus maritimus*	F / LA	In all fields but locally distributed; can be abundant in sections of wet ditch.
Soft brome	*Bromus hordaceus*	R / LO	Mainly in Field 4
False fox sedge	*Carex otrubae*	R	Mainly on the banks of Ditch 5
Fat hen	*Chenopodium album*	O / LF	Frequent in draw-down areas; occasional on ditch banks
Red goosefoot	*Chenopodium rubrum*	O / LF	Frequent in draw-down areas; occasional on ditch banks
Creeping thistle	*Cirsium arvense*	O	Most common in Field 4
Spear thistle	*Cirsium vulgare*	R	Scattered throughout
Cocksfoot	*Dactylis glomerata*	O	Mainly in Field 4
Wild carrot	*Daucus carota*	R / LO	In Field 4
Common spike-rush	*Eleocharis palustris*	R / LF	Mainly in Ditches 4, 6 and 7 and in Ditch-ponds 2 and 4.

Common name	Scientific name	DAFOR	Notes
Sea couch	*Elytrigia aetherica*	O / LF	Throughout all the grasslands
Common couch	*Elytrigia repens*	O / LF	Throughout all the grasslands
Goat's rue	*Galega officinalis*	R / LO	Along the southern edges of Fields 1 and 2
Yorkshire fog	*Holcus lanatus*	F	Throughout all the grasslands
Common cats-'ear	*Hypocharis radicata*	R	Scattered throughout the grassland
Hard rush	*Juncus inflexus*	R	Scattered throughout the grassland
Hairy vetch	*Lathyrus hirsutus*	R	Along field edges and on ditch banks
Grass vetchling	*Lathyrus nissolia*	R	Along field edges and on ditch banks
Ivy-leaved duckweed	*Lemna trisulca*	R / LO	Only recorded from Ditch 5
Lesser hawkbit	*Leontodon saxatilis*	R	Occasional on drier ditch banks in the north of the site
Perennial rye-grass	*Lolium perenne*	F	Common throughout the grasslands.
Common bird's-foot trefoil	*Lotus corniculatus*	O	Scattered throughout the grasslands
Narrow-leaved bird's-foot trefoil	*Lotus glaber*	R	Mainly on ditch banks
Scentless mayweed	*Matricaria recutita*	R	Mainly in the drier parts of the draw-down areas
Black medick	*Medicago lupulina*	R	Mainly in field edges.
Timothy	*Phleum pratense*	R	Only in Field 1 –possibly derived from supplementary feeding
Common reed	*Phragmites australis*	A	Dominant in the ditches; abundant as a constituent of the grassland swards but there heavily grazed.
Hawkweed ox-tongue	*Picris hieracioides*	R / LO	Mainly in Field 4
Ribwort	*Plantago lanceolata*	O	Scattered throughout the grassland

Common name	Scientific name	DAFOR	Notes
Greater plantain	*Plantago major intermedia*	O / LA	Abundant in draw-down areas.
Greater plantain	*Plantago major major*	O / LF	Occasional in the fields, particularly in the south.
Smooth meadow-grass	*Poa pratensis*	O / LF	Mainly recorded in Field 4.
Rough meadow-grass	*Poa trivialis*	A	Throughout all the grasslands
Common knotgrass	*Polygonum aviculare*	O	In the draw-down areas and other bare and disturbed soils.
Lesser pondweed	*Potamogeton pusillus*	R / LD	Only recorded in the water trough in Field 2
Fleabane	*Pulicaria dysenterica*	R	Mainly in Fields 4 and 5
Brackish water-crowfoot	*Ranunculus baudotii*	R / LA	Nationally Scarce. Common to abundant in ditches and ditch-ponds in the north of the site.
Hairy buttercup	*Ranunculus sardous*	O	Scattered throughout all six fields
Celery-leaved buttercup	*Ranunculus scleratus*	R	Along ditch banks and in ditch-ponds
Creeping yellow-cress	*Rorippa sylvestris*	O	In the draw-down areas
Clustered dock	*Rumex conglomeratus*	O / LA	Predominantly as tightly-grazed plants in the draw-down areas
Curled dock	*Rumex crispus*	O / LA	Predominantly as tightly-grazed plants in the draw-down areas
Hoary ragwort	*Senecio erucifolius*	R	In Field 4
Common ragwort	*Senecio jacobaea*	R	Scattered throughout the grasslands
Groundsel	*Senecio vulgaris*	R	Mainly in the drier parts of the draw-down areas
Dandelion	*Taraxacum officinale agg.*	O	Scattered throughout the grasslands and in the drier parts of the draw-down areas.
Upright hedge parsley	*Torilis japonica*	R / LO	Occasional in Field 4

Common name	Scientific name	DAFOR	Notes
Hop trefoil	*Trifolium campestre*	R	Occasional in Field 1
Lesser trefoil	*Trifolium dubium*	R	Scattered through the grasslands
Red clover	*Trifolium pratense*	R / LO	Mainly in Field 4
White clover	*Trifolium repens*	O / LF	Locally common in the grasslands.
Nettle	*Urtica dioica*	R	Mainly around ditch-pond 4.
Pink water-speedwell	*Veronica catenata*	R / LF	Recorded most commonly in ditches and ditch-ponds in the northern half of the site; rare in the drier ditches and ditch-ponds in the south of the site.
Hairy tare	*Vicia hirsuta*	R	On ditch banks

Plant Species Recorded from Swamp South-East of Black Duck Marsh

Table EDPA1.10: List of Plant Species Recorded from Swamp Sotuh-east of Black Duck Marsh

Common name	Scientific name	Habitat and DAFOR		
		Dense Swamp	Marginal	Bund
Common bent	*Agrostis capillaris*			O
Creeping bent	*Agostis stolonifera*	O	O	
Common water-plantain	*Alisma plantago-aquatica*		R	
False oat-grass	*Arrhenatherum elatius*			F
Mugwort	*Artemesia vulgaris*			O
Silver birch	*Betula pendula*			O
Sea club-rush	*Bolboschoenus maritimus*	R	O	
Water starwort	*Callitriche sp.*	F		
False fox sedge	*Carex otrubae*	R	O	R
Common stonewort	*Chara vulgaris*	D	A	
Dogwood	*Cornus sanguinea*			R
Cocksfoot	*Dactylis glomerata*			O
Wild carrot	*Daucus carota*			R
Common teasel	*Dipsacus fullonum*			R
Sea couch	*Elytrigia aetherica*			O
Great willowherb	*Epilobium hirsutum*	R	O	O
Hoary willowherb	*Epilobium parviflorum*		R	

Common name	Scientific name	Habitat and DAFOR		
		Dense Swamp	Marginal	Bund
Blue fleabane	*Erigeron acer*			R
Eyebright	*Euphrasia sp.*			R
Yorkshire fog	*Holcus lanatus*			F
Perforate St John's-wort	*Hypericum perforatum*			F
Jointed rush	*Juncus articulatus*	O	O	
Hard rush	*Juncus inflexus*	O	O	
Sea rush	*Juncus maritimus*		R	
Sweet pea	*Lathyrus odoratus*			R
Lesser duckweed	*Lemna minor*	O		
Common toadflax	*Linaria vulgaris*			O
Common bird's-foot trefoil	*Lotus corniculatus*		R	F
Narrow-leaved bird's-foot trefoil	*Lotus glaber*			O
Gipsywort	*Lycopus europaeus*	O	O	
White melilot	*Melilotus albus*			F
Red bartsia	*Odontites vernus*			R
Common reed	*Phragmites australis*	F	F	
Mouse-ear hawkweed	*Pilosella officinarum*			R / LO
Ribwort	*Plantago lanceolata*			O
Creeping cinquefoil	*Potentilla reptans*			F
Celery-leaved buttercup	*Ranunculus scleratus*		R	
Dog rose	*Rosa canina agg.*			O
Bramble	*Rubus fruticous agg.*			F
Clustered dock	*Rumex conglomeratus*		R	O
Curled dock	*Rumex crispus*			R
Grey willow	*Salix cinerea*	F		
Brooklime	*Samolus valerandi*		R	
Common ragwort	*Senecio jacobaea*			O
Hop trefoil	*Trifolium campestre*			R
White clover	*Trifolium repens*			F
Greater reed-mace	*Typha latifolia*	D	F	
Pink water-speedwell	*Veronica catenata*	R	R	
Smooth tare	*Vicia tetrasperma*			F

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Annex EDP 2
River Ebbsfleet Surveys
River Corridor Survey and River Habitat Survey

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A2.1 The River Ebbsfleet flows south to north from the southern boundary of the Kent Project Site, downstream of the A2 dual carriageway and continues north of Ebbsfleet International Station where it is culverted under existing development at Northfleet before discharging into the tidal River Thames. In respect of the nature and extent of Proposed Development and impacts to water quality potentially arising, detailed surveys have been undertaken to establish the baseline for the river corridor, particularly with respect to aquatic biological communities and water quality, the results of which are presented below and at **Annex EDP 11**. The current reported status of the waterbody in the context of the Water Framework Directive (WFD) (2000/60/EC) has further been considered and informed by a desk-based assessment.

Methodology

Desk Study

A2.2 A request was submitted to the Environment Agency (EA) for any aquatic survey data for the River Ebbsfleet within the Project Site. This was in addition to a review of online data sets held by the Environment Agency including archived water quality data[1]; and a review of existing ecological survey reports for the River Ebbsfleet where available.

River Corridor Survey

A2.3 To establish a detailed baseline for the River Ebbsfleet watercourse and associated riparian habitats, an approximate 2km stretch from its upstream extent at Springhead Garden Centre (OS Grid Reference TQ 617 727), to its downstream extent north of Ebbsfleet International Station (OS Grid Reference TQ 614 744), was surveyed in accordance with standard River Corridor Survey (RSC) methodology[2]. Upstream and downstream of these locations, the River Ebbsfleet is culverted under existing development.

A2.4 The River Corridor Survey is a standardised approach to characterising the physical and ecological features of a watercourse. Originally developed as a conservation tool, it has previously been used to classify the conservation resource of aquatic habitats, to highlight important features requiring protection and to identify opportunities to rehabilitate damaged habitats.

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1 https://environment.data.gov.uk/water-quality/view/explore?search=&area=10-38&samplingPointType.group=&samplingPointStatus%5B%5D=open&loc=561064%2C174349&_limit=500

2 National Rivers Authority (1992). *River Corridor* Surveys. *Conservation Technical Handbook Number 1*. NRA, Bristol.

A2.5 The River Corridor Survey was undertaken by a suitably qualified EDP ecologist on 18 May 2020 during which the weather was 20°C and dry with no recent rainfall in the past seven days.

A2.6 To aid an assessment of the watercourse, the River Ebbsfleet, within the Kent Project Site, was subdivided into three survey sections, each circa 500 metres in length with each section broadly representative of different habitat types across the catchment, as illustrated at Figure 12.6 (Document Reference 6.3.12.6). For each survey section, the River Corridor Survey included an assessment of four definable zones, with mapping of key features and habitats:

- Aquatic zone - plant communities, flow and current features, substrate and physical features;
- Marginal zone - plant communities, substrate and physical features;
- Bank zone - tree species, other plant communities, physical features; and
- Adjacent land zone - habitat types, land use.

A2.7 During the survey, at least 1 representative cross section was drawn for each 500 metre stretch to indicate:

- Width of the water filled channel;
- Depth of water;
- Bank height, slope and width;
- Flood bank height and width where appropriate;
- Water level relative to the top of the bank; and
- Land use to a minimum of 50 metres either side of the river.

A2.8 An assessment of land use within 50 metres of the river corridor was undertaken in accordance with Phase I Habitat Survey Guidelines. Phase 1 Habitat Survey (JNCC, 2010) is a standard technique for obtaining baseline ecological information for large areas of land in which the main vegetation types present within the survey area are mapped using a standard set of habitat categories.

Limitations

A2.9 Dense vegetation and expansive areas of wetland/reedbeds limited access to several sections of the River Ebbsfleet such that a thorough inspection of the watercourse and associated marginal and bankside habitats was not possible. Given the uniformity of the watercourse and habitats surveyed, however, this is not considered to affect the outcome of an assessment and survey data collected has allowed a suitable assessment of aquatic and riparian habitats across the survey area.

River Habitat Survey

A2.10 A River Habitat Survey[3] of the River Ebbsfleet was also undertaken in tandem with the RCS on 18 May 2020, in accordance with methodologies established by the Environment Agency, to provide further contextual information. The survey was undertaken by an ecologist with prior experience in undertaking RHS. As dense vegetation and expansive areas of wetland/reedbeds limited access to several sections of the River Ebbsfleet, a River Habitat Survey was confined to two 500m sections of the watercourse as illustrated within Figure 12.7 (Document Reference 6.3.12.7). Observations of the physical characteristics of the watercourse were made at ten equally spaced spot-checks along each stretch, and information on valley form and land-use in the river corridor are noted.

A2.11 The survey data was then inputted into Rapid 3.0 software[4] which calculates Habitat Modification Scores (HMS) and Habitat Quality Assessment (HQA) for each surveyed section. The HMS score provides a measure of the diversity and 'naturalness' of the physical habitat structure (1 - near natural; 5 = severely modified) and is thus an indicator of artificial modification to river channel morphology. HQA scores are, in contrast, determined by the presence and extent of habitat features of interest to wildlife recorded during the survey.

Results

Desk Study

A2.12 There are no Environment Agency monitoring stations along the River Ebbsfleet and no historical data with respect to chemical and biological water quality data. This is with the exception of a single fish survey undertaken by the Environment Agency during 2007 (adjacent to Ebbsfleet International Station) during which no fish were captured.

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3 C. M. Drake, D. A. Lott, K. N. A Alexander & J. Webb (2007) *Surveying terrestrial and freshwater invertebrates for conservation evaluation*. Natural England Research Report NERR005.

4 Davy-Bowker, J., Davies, C.E., Dean, H.J. and Murphy, J.F. (2017) RAPID 3.0 © Data Entry System Right/Copyright NERC - Centre for Ecology Hydrology. All rights reserved.

A2.13 A fish survey of the River Ebbsfleet was initially undertaken by Coclough and Coates Aquatic Consultants in 2015 to inform development proposals (see **Annex EDP 33**). The River Ebbsfleet from Springhead Nurseries downstream to the crossing point of the North Kent railway line at Northfleet was subject to a visual survey whilst electrofishing and fyke nets were deployed at two locations close to the A226 Thames Way/A2260 junction.

A2.14 Modest populations of mature roach (*Rutilus rutilus*) and perch (*Purca fluviatilis*) were captured during electrofishing and fyke netting operations. There was no evidence of active recruitment to either of these populations. Three-spined stickleback (*Gasterosteus aculestus*) were common or abundant at all sites fished and were observed at a number not fished. Nine-spine sticklebacks (*Pungitius pungitius*) were also found in both electrofishing and fyke netting operations.

Background to River Ebbsfleet WFD Classification

A2.15 The Water Framework Directive (WFD) was adopted and came into force in December 2000. The WFD establishes a legislative framework for the protection of surface waters (including rivers, lakes, transitional waters, and coastal waters) and groundwater throughout the EU. The Water Framework Directive requires all natural waterbodies to achieve good 'status' by 2027; the status of a waterbody being a function of its chemical, ecological and physical (hydromorphological) condition based on a number of 'supporting elements'. These are reported within River Basin Management Plans (RBMP) specific to each river basin district, alongside the current status of each watercourse, the predicted status for 2021, and the overall status objective to be achieved by 2027.

A2.16 The River Ebbsfleet is located within the Thames River basin district, the first cycle River Basin Management Plan[5] (RMBP) for which identifies the objectives and measures required to improve the status of surface and ground waterbodies within the catchment.

A2.17 The River Ebbsfleet (WFD Waterbody GB106040024190) was previously identified as a Heavily Modified Waterbody (HMWB) under the WFD until 2015. At this time, the River Ebbsfleet was considered to be at 'moderate ecological' potential with an objective to reach good potential by 2027. The waterbody's chemical status did not require assessment whilst supporting conditions for quantity and dynamics of flow supports 'good' status. Ecological potential is instead defined by the following mitigation measures:

- Retain marginal aquatic and riparian habitats; and

[5] https://www.gov.uk/government/collections/river-basin-management-plans-2015#thames-river-basin-district-rbmp:-2015

- Increase in-channel morphological diversity.

A2.18 Justification for not achieving 'good' potential by 2015 is, however, attributed to being disproportionately expensive and technically unfeasible.

A2.19 Following progression of the second cycle River Basin Management Plans, however, the River Ebbsfleet has been 'de-classified' and no longer subject to assessment or management under the WFD with no subsequent classification of its current ecological potential.

River Corridor Survey

A2.20 Key features identified during the course of the River Corridor Survey are illustrated at Figure 12.6 (Document Reference 6.3.12.6). In addition, detailed descriptions of the survey length, together with illustrative photographs, are provided below.

Section 1 (TQ 617 727 to TQ 616 732)

A2.21 Section 1 (**Image EDP A2.1**) encompasses a circa 500 metre stretch of the River Ebbsfleet the upstream extent of which is located at Springhead Garden Centre. Upstream of this location the River Ebbsfleet is culverted under existing development. Here, the watercourse is characterised by a straightened/realigned and uniform channel approximately 2m wide with average water depth circa 0.4m.

Image EDP A2.1: Section 1, adjacent to Springhead Nurseries looking upstream.

A2.22 The channel exhibits a relatively smooth flow throughout the survey section, although a pool was noted at its upstream extent (downstream of the culvert), whilst ponded areas were recorded at its downstream extent. Here, the watercourse spills out across areas of wet woodland dominated by goat willow. During the course of the survey, however, water flow at the upstream extent would increase sporadically indicating presence of an outfall discharging into the watercourse beneath the culvert.

A2.23 The channel substrate is largely dominated by gravels/pebbles with pockets of accumulated silt and sand. although cobbles account for circa 40% at its upstream extent. In the upper sections, submerged floating sweet grass was frequently recorded in addition to pockets of fool's water cress within the margins. Further downstream, emergent macrophytes become more dominant and largely obscure the channel substrate. The downstream section, however, flows through wet woodland and, therefore, is subject to heavy shading. Access to the watercourse was limited here such that a detailed survey of the watercourse was not undertaken. However, where visible and coinciding with breaks in the woodland canopy, a macrophyte community appeared limited to marginal stands of reed canary grass and greater willowherb with submerged water starwort.

A2.24 The banks of the watercourse, particularly adjacent to Springhead Nurseries, are typically steeply sloping and circa 3-4m high. Sections of the left-hand bank,

immediately adjacent to Springhead Nurseries have been reinforced at the toe whilst concrete abutments are associated with the culvert and road bridge recorded within this section. Bank side and bank top vegetation is dominated by a tall ruderal and grassland community. Common nettle is dominant whilst wild angelica is particularly abundant. False oat-grass, barren brome, cleaver, hogweed and elder and willow saplings were also present. Further downstream, the banks of the watercourse become shallower and less distinguished from the surrounding bank top habitat, dominated by common nettle with occurrences of dense bramble scrub.

A2.25 With respect to habitats within 50m of the watercourse, a linear belt of woodland is present within 50m of the right bank, contiguous with boundaries of a public footpath and railway line further east. Land adjacent to the left-hand bank is, in contrast, dominated by buildings and hardstanding associated with Springhead Nurseries although the watercourse does flow through semi-natural habitats comprising dense scrub, tall ruderal vegetation and woodland further downstream.

Section 2 (TQ 616 7322 to TQ 617 737)

A2.26 There was limited access to Section 2 (**Image EDP A2.2**) due to prevalence of dense scrub and wetland habitats combined with presence of an active construction site along part of the survey stretch, such that the results of a survey are based on discrete locations along the watercourse.

A2.27 The upstream extent of the survey area is characterised by a relatively deep pool, circa 10m wide and up to 1m deep located immediately upstream of a railway bridge. The channel substrate is again dominated by gravel/pebbles with occasional cobbles, although a layer of overlying silt has settled across the substrate. This silt is up to circa 20cm deep, due to the absence of any water flow with sub-layer notably deoxygenated. The right-hand bank top is contiguous with the water's edge and the watercourse tops its banks during periods of heavy rainfall. Beneath the water's surface the right-hand bank gently slopes away from a public footpath into deeper water at the centre of the pool. The bank here is reinforced with steel mesh netting. A submerged macrophyte community appears to be limited to water starwort which is present in some abundance. Marginal vegetation, meanwhile, is represented by reed canary grass with occurrences of greater willowherb along the left-hand bank but is largely absent along the right-hand bank where overhanging scrub comprising bramble, willow and hawthorn is more proliferate.

A2.28 A presumably man-made ponded area is similarly present downstream of the railway bridge, with steep sided banks circa 6m high bordering a public footpath. An outfall was recorded along the left-hand bank at this location but was closed with no discharge recorded at the time of the survey. Here, there is limited open water with the majority of the channel dominated by reed canary-grass and occasional yellow iris.

Image EDP A2.2: Section 2, downstream of railway bridge.

A2.29 Further downstream the watercourse widens significantly (circa 25m wide) and encompasses areas of swamp dominated by reed canary grass. The channel of the River Ebbsfleet here is indistinguishable from the swamp and areas of open water. At the time of survey, construction works were ongoing in the area limiting access to this section of the watercourse and comprised the construction of a bridge spanning across the watercourse (**Image EDP A2.3**), further modifying and reinforcing this section of the River Ebbsfleet and its banks. Indeed, the apparent widening of the channel and large expanses of open area appear to be a result of removal of associated wetland habitat to facilitate construction. Land adjacent to the left-hand bank comprises the footprint of a new residential estate and associated vegetation and flood defences whilst the right-hand bank borders a railway line, and main, single carriageway road. As such sections of the right-hand bank are artificial in nature.

Image EDP A2.3: Section 2 - New construction spanning across River Ebbsfleet and associated wetland habitat.

A2.30 Further downstream the open water channel narrows to a 3m wide watercourse flowing through vegetated swamp dominated by reed canary grass and border by scrub and woodland.

Section 3

A2.31 The upper extent of Section 3 (**Image EDP A2.4**) of the River Ebbsfleet is culverted under Thames Way, a busy, single carriageway road and again under a single vehicular track leading to Blue Lake. Immediately upstream and downstream of the watercourse, the watercourse deepens into a pool, with no water flow and heavily shaded by adjacent woodland dominated by willow. As such, channel substrate is obscured by a layer of silt and detritus, the latter comprising leaf litter from overhanging trees. In channel vegetation is limited to patches of fool's water cress and water starwort whilst the bankside margins are dominated by reed canary grass. Further downstream, the watercourse is again representative of a re-aligned stream circa 4m wide and 0.6m deep with a channel substrate dominated by pebbles/gravel with a deep silt layer. The channel is overgrown with bur-reed with occasional yellow iris and water plantain. Bank top vegetation comprises a line of trees associated with wet willow woodland. As such, several fallen logs and young trees were recorded spanning across the channel. Sections of the bank toe are reinforced within stone. An area swamp lies to the north whilst a native hedgerow,

which marks the boundary between the woodland and Thames Way, is located to the south.

Image EDP A2.4: Section 3 flowing parallel to Thames Way.

A2.32 Further north, the watercourse flows beneath a railway bridge before culverted under Thames Way. Here, the bank top and bankside vegetation is less proliferate whilst the watercourse only supports scattered pockets of vegetation with much litter recorded in the channel.

A2.33 The lower section of the River Ebbsfleet (**Image EDP A2.5**) flows east to west through an area of scrub and wet willow woodland between Thames Way and Ebbsfleet International Station, before entering a culvert which travels under Northfleet town towards the River Thames. Access here was very limited due to dense scrub and woodland cover. Open sections of the watercourse were however characterised by a 2m wide and 0.4m deep channel with vertical earth banks dominated by sedge with occasional reed canary grass, bulrush and bramble scrub.

Image EDP A2.5: Section 3 adjacent to Ebbsfleet International Station.

River Habitat Survey

A2.34 The results are shown in **Table EDP 2.1**. The River Ebbsfleet is a realigned/straightened and heavily modified watercourse, relatively uniform in appearance and structure with limited in channel diversity, as evidenced by the findings of survey effort. Following completion of the River Habitat Survey and analysis of data using Rapid 3.0 software[6], Section 1 has an HMS of 1624 which puts it in HMS Class 5, representative of severely modified watercourses. Section 2 has an HMA of 880 (HMS class 4) representative of a significantly modified watercourse.

A2.35 The HQA scores for section 1 and section 2 are 45 and 42 respectively and thus are broadly comparable in terms of score and habitat features including bankside vegetation, presence of in channel vegetation, and overhanging trees.

Table EDP A2.1: River Habitat Survey Results.

Survey Reach	HMS Score	HMS Class	HQA Score
Section 1	1625	5	45
Section 2	880	4	42

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Annex EDP 3
Wintering Bird Survey
(edp5988_r003)

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The London Resort

Wintering Bird Baseline Report

Prepared by:
The Environmental Dimension Partnership Ltd

On behalf of:
The London Resort Company Holdings Ltd

December 2020
Report Reference
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Contents

Annexes

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	Author	**Formatted**	**Peer Review**	**Proofed by/Date**
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r003a	-	FD	-	FJ 130520
r003b	-	-	-	JM 150620
r003c	-	-	-	FD 221020
r003d_DRAFT	EWa	CL		
r003e				DK161220

Executive Summary

S1 This Wintering Bird Baseline Report has been prepared by The Environmental Dimension Partnership (EDP) on behalf of The London Resort Company Holdings Ltd. It sets out the results of recent and historic wintering bird surveys regarding the proposed London Resort entertainment resort development at Swanscombe Peninsula and the surrounding landscape ('the Kent Project Site').

S2 EDP has undertaken a desk study and comprehensive suite of Phase 2 surveys for wintering birds on-site and along the Thames Estuary during 2019/20. This baseline work augments previous surveys undertaken by other consultants in 2012/2013.

S3 The international statutory designation Thames Estuary and Marshes Ramsar site is located 4.8km from the Kent Project Site and the Special Protection Area (SPA) is located 6.0km from the Kent Project Site. The Medway Estuary and Marshes Ramsar/SPA is located 16.4km from the Kent Project Site. Additionally, West Thurrock Lagoon and Marshes Site of Special Scientific Interest (SSSI), which is a statutory designation of national value, is located approximately 870m to the north-west of the Kent Project Site, north of the River Thames.

S4 In summary, the reasons for designations are, in part, for internationally and nationally important populations/assemblages of overwintering waders and wildfowl.

Wintering Wader/Wildfowl Assemblage

S5 A combined total of up to 44 species were recorded during 2012/13 and 2019/20 intertidal and high tide surveys. Of the 30 Ramsar/SPA/SSSI qualifying species mentioned in the designation citations, a total of 22 have been recorded during the surveys undertaken during 2012/13 and 2019/20 at either low or high tide. Of the 22 Ramsar/SPA qualifying species which have stated peak population counts, EDP recorded an overall total of 12 over the course of the 2019/20 high and low tide surveys, with the numbers recorded during surveys at either low or high tide between 0.07% and 8.66% of the peak population counts stated in the citations.

S6 Given the presence of significant numbers of species important to various internationally and nationally important sites for birds in the local area, the diversity and abundance of species recorded during core count surveys are valued as functionally linked resources, to an assemblage important at the International level. The assemblage recorded using the Kent Project Site is likely to form a constituent part of the nearby SPA/Ramsar/SSSI populations, particularly with regard to wildfowl.

S7 The northern tip (between the harbour and metal jetty) and along the north-western edge (around the existing pier) of the peninsula in particular, should be considered as important roosting areas for a significant proportion of an internationally important assemblage of wildfowl/waders.

S8 The species assemblage recorded utilising the Kent Project Site are not recorded in numbers that would be regarded as important at the International or National level in their own right. Therefore, although the Kent Project Site itself is not regarded to have value at the International level, it is important to consider the assemblage of estuarine wintering wader and wildfowl as having value of International importance.

S9 Given the presence of multiple designations for wintering bird interest within the local area, it is not possible to identify a single designation to which the Kent Project Site wintering bird assemblage is functionally linked. It is likely that wader/wildfowl populations present are part of a wider meta-population that may at some time use any or all such designations along the wider Thames System.

Inland Wintering Bird Assemblage

S10 Of the 30 Ramsar/SPA/SSSI qualifying species mentioned in the designation citations, 15 (i.e. 50%) were recorded throughout the Kent Project Site during 2019/20. Of the twenty-two Ramsar/SPA qualifying species which have stated peak population counts, nine were recorded on site, with peak numbers recorded 0.05–15% of the peak population counts stated in the citations. Two distinct areas within the Kent Project Site that appear to be 'functionally linked' directly to the estuary, and therefore to nearby Ramsar/SPA/SSSI designations, are Botany Marsh and Black Duck Marsh, which are locally important areas at dawn (rest)/high tide (refuge) for small numbers of several target species.

S11 In EDP's opinion, although the site itself is not regarded to have value at the International level, the wintering wader/wildfowl assemblage present within inland areas of the Kent Project Site itself, given their status as functionally linked to the estuary assemblage, must be valued at the International level for nature conservation value. This is a precautionary evaluation based on peak counts during desk study information and survey data from 2012/2013 and 2019/2020. In addition, and in EDP's opinion, the surveys have confirmed that the vast majority of the Kent Project Site (excluding those areas mentioned above) is not 'functionally linked' to any of the Ramsar/SPA/SSSI designations identified during the desk study.

S12 Twenty-eight additional terrestrial species (non-wader, non-wildfowl species) of conservation concern were also recorded in generally low to moderate numbers, typically relating to individuals or small flocks of each species recorded on one or two survey visits, but also including a high diversity and reasonable numbers of several Schedule 1 Birds and Birds of Conservation Concern.

S13 Therefore, in EDP's opinion, the wintering bird assemblage (terrestrial species only) present within the Kent Project Site is of County Importance.

Section 1
Introduction, Purpose and Context

1.1 This Wintering Bird Baseline Report (WBBR) has been prepared by The Environmental Dimension Partnership (EDP) on behalf of The London Resort Company Holdings Ltd (hereafter referred to as 'the Applicant'). It sets out the results of recent and historic winter bird surveys regarding a proposed world class destination entertainment resort and associated infrastructure at land on Swanscombe Peninsula, the Ebbsfleet Valley and A2 Corridor, hereafter referred to as 'the Kent Project Site'.

1.2 EDP is an independent environmental planning consultancy with offices in Cirencester, Cheltenham, and Cardiff. The practice provides advice to private and public-sector clients throughout the UK in the fields of landscape, ecology, archaeology, cultural heritage, arboriculture, rights of way and master planning. Details of the practice can be obtained at our website (www.edp-uk.co.uk).

Site Context

1.3 The Project Site lies approximately 30 km east-south-east of central London on the south and north banks of the River Thames, in the counties of Kent and Essex. On the south side of the Thames, the Kent Project Site occupies much of the Swanscombe Peninsula, formed by a meander in the river, and the DCO Application includes a corridor for transport connections extending generally southwards to the A2(T) trunk road. On the northern side of the river the Kent Project Site includes areas of land east of the A1089 Ferry Road and the Tilbury Ferry Terminal, which currently provides passenger services across the river to Gravesend and incorporates the London International Cruise Terminal.

1.4 For clarity, this WBBR reports on surveys undertaken of the section of the Kent Project Site to the south of the Thames only, centred approximately at OS grid reference TQ 60937 74673. The boundaries of the Kent Project Site are shown on **Figure 12.30** (Document reference: 6.3.12.30). This area is amongst the only remaining semi-natural greenspace along the Thames Corridor and is therefore considered to hold the potential to support significant assemblages of over-wintering birds.

1.5 The portion of the Project Site within Essex does not support significant intertidal habitat, being centred on the existing Tilbury Port. The Essex Project Site is therefore not considered to have the potential to support significant wader or waterfowl populations and no survey was considered necessary.

1.6 The Thames Estuary and Marshes Ramsar/SPA and Medway Estuary and Marshes Ramsar/SPA, which are statutory designations of international/European value, are located within approximately 6.0km and 16.4km of the Kent Project Site, respectively. Additionally, West Thurrock Lagoon and Marshes SSSI, which is a statutory designation of national value, is located approximately 880m to the north-west of the Kent Project Site, north of the River Thames.

1.7 The character of the Kent Project Site is a mixture of rough grassland, scrub, marsh and open water vegetation associated with the flood plains of the peninsula transitioning into a series of industrial and urbanised landscapes surrounded by rough grassland, scrub and disused quarries. The presence of industrial waste, particularly in the form of leachates from the cement production process are considered to limit the value of many waterbodies within the Kent Project Site.

1.8 The Kent Project Site is to be the subject of a Development Consent Order (DCO) application in relation to a Nationally Significant Infrastructure Project (NSIP) including the construction of an entertainment resort, new road infrastructure, dock and support facilities and extensions to the existing dock infrastructure at Tilbury.

Scope of Report

1.9 This report describes the current wintering ornithological interest within and around the Kent Project Site, which has been identified through desk- and field-based investigations. The purpose of this report is to establish the wintering ornithological baseline upon which decision making can be made regarding the Kent Project Site, emerging design for the Kent Project Site, and assessment of effects, in the context of the nearby international and national statutory designations.

1.10 The remainder of this report is structured as follows:

- **Section 2** summarises existing data, collected through desk-based study and through previous surveys undertaken by consultants in relation to the Kent Project Site;

- **Section 3** details the methodology employed in determining the baseline wintering ornithological conditions within the Kent Project Site and adjacent land (with further details provided within appendices and on figures where appropriate);

- **Section 4** details the baseline wintering ornithological conditions (with further details also provided within appendices and on figures where appropriate) and identifies and evaluates any pertinent ecological features/receptors; and

- **Section 5** summarises the baseline wintering ornithological interest within the Kent Project Site and adjacent land and highlights the key considerations influencing the promotion of the Kent Project Site.

Section 2
Desk Study and Existing Survey Results

Desk Study

2.1 The desk study is an important element of undertaking an initial appraisal of a site proposed for development, enabling the initial collation and review of contextual information such as designations, together with known records of protected and priority species.

2.2 The desk study involved collating biodiversity information from the following sources:

- The British Trust for Ornithology (BTO) Wetland Bird Survey (WeBS) Core Count data for the Thames Estuary;
- Kent and Medway Biological Records Centre (KMBRC);
- Essex Field Club (EFC); and
- Multi-Agency Geographic Information for the Countryside (MAGIC) website[1].

2.3 The desk study was undertaken during April 2020 and involved obtaining the following information:

- International and national statutory designations considered to be important for overwintering birds (15km radius around the Project Site);
- Non-statutory local sites (2km radius);
- WeBS Core Count data for the Thames Estuary; and
- All other protected/notable bird records (2km radius).

2.4 The search areas described above are considered to be sufficient to cover the potential zone of influence[2] of the Kent Project Site in relation to designations, habitats and species.

Desk Study Results

Designations

2.5 The Kent Project Site lies within the potential zone of influence of a number of designations, the most pertinent of which are the Thames Estuary and

[1] Multi-Agency Geographic Information for the Countryside website (http://magic.defra.gov.uk/)
[2] Zone of Influence – the areas and resources that may be affected by the proposed development.

Marshes Ramsar/SPA and their component SSSIs (South Thames Estuary and Marshes SSSI and Mucking Flats and Marshes SSSI). At its closest point the Thames Estuary and Marshes Ramsar/SPA is located approximately 4.8/6.0km, respectively to the east of the Kent Project Site, where the main development is proposed. Additionally, West Thurrock Lagoon and Marshes SSSI which is also partly designated for its ornithological interest is located approximately 880m to the north-west of the Kent Project Site, on the northern banks of the River Thames. Furthermore, Medway Estuary and Marshes Ramsar/SPA is located approximately 16.4km to the south-east of the Kent Project Site. Several other statutory designations considered to be important ornithologically also exist within 10 and 15km of the Kent Project Site (see **Figure 12.31,** Document reference: 6.3.12.31).

2.6 A summary of the ornithological interest (reason for designation in whole or in part) for the Thames Estuary and Marshes Ramsar/SPA and associated SSSIs is provided below.

2.7 The Thames Estuary and Marshes Ramsar is designated in part for the following ornithological interest:

- Ramsar Criterion 5 (assemblages of international importance; species with peak winter counts): 45,118 waterfowl (5 year peak mean 1998/99-2002/03);

- Ramsar Criterion 6 (species/populations occurring at levels of international importance; species with peak counts in spring/autumn):

    - Black-tailed godwit (*Limosa limosa islandica*), (Iceland/W Europe (1640 individuals; 4.5% of the population) (5 year peak mean 1998/99-2002/03).

- Ramsar Criterion 6 (species/populations occurring at levels of international importance; species with peak counts in winter):

    - Dunlin (*Calidris alpina alpina*), (western Siberia/western Europe) 15,171 individuals representing an average of 1.1% of the population - 5 year peak mean for 1998/99 to 2002/03; and

    - Knot (*Calidris canutus islandica*), (western and southern Africa) 7279 individuals representing an average of 1.6% of the population - 5 year peak mean for 1998/9 to 2002/3.

2.8 The Thames Estuary and Marshes SPA is designated in part for the following ornithological interest:

- Qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance over winter of:

    - Avocet (*Recurvirostra avosetta)*, (283 individuals representing at least 28.3% of the wintering population in Great Britain (5 year peak mean 1993/93 - 1997/98); and

- Hen Harrier (*Circus cyaneus*), (7 individuals representing at least 1% of the population in Great Britain) (5 year peak mean for 1993/94 to 1997/98).

- Also qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species:

  - Over winter: Dunlin (northern Siberia/Europe/western Africa) 29,646 individuals representing 2.1% of the population - 5 peak mean for 1993/94 to 1997/98;

  - Over winter: Knot (north-eastern Canada/ Greenland/Iceland/north-western Europe) 4,848 individuals representing 1.4% of the population - 5 year peak mean for 1993/94 to 1997/98;

  - Over winter: Black-tailed godwit (*Limosa limosa islandica*) (Iceland - breeding) 1,699 individuals representing 2.4% of the population - 5 peak mean for 1993/94 to 1997/98;

  - Over winter: Grey plover (*Pluvialis squatarola*) (eastern Atlantic - wintering) 2,593 individuals representing 1.7% of the population - 5 year peak mean for 1993/94 to 1997/98;

  - Over winter: Common redshank (*Tringa totanus*) - (eastern Atlantic - wintering) 3,251 individuals representing 2.2% of the population - 5 year peak mean for 1993/94 to 1997/98; and

  - On passage: Ringed plover (*Charadrius hiaticula*) (Europe/northern Africa - wintering) 1,324 individuals representing 2.6% of the population - 5 year peak mean for 1993/94 to 1997/98.

- Assemblage qualification: A wetland of international importance. The area qualifies under Article 4.2 of the Directive (79/409/EEC) by:

  - Regularly supporting at least 20,000 waterfowl; and

  - Over winter the area regularly supports: 75,019 waterfowl (5 year peak mean 1991/92-1995/96). Including: avocet, grey plover, knot, dunlin, black-tailed godwit and redshank.

2.9 The South Thames Estuary and Marshes SSSI is designated in part for the following ornithological interest:

- >20,000 non-breeding waterbirds;

- Internationally important numbers of:

  - Redshank;

  - Knot; and
  - Dunlin.

- Nationally important populations of non-breeding birds:
  - Avocet;
  - Ringed plover;
  - European white-fronted goose (*Anser albifrons* spp *albifrons*);
  - Shelduck (*Tadorna tadorna*);
  - Gadwall (*Anas Strepera*);
  - Teal (*Anas crecca*);
  - Pintail (*Anas acuta*);
  - Shoveler (*Anas clypeata*);
  - Grey plover;
  - Curlew (*Numenius arquata*); and
  - Black-tailed godwit.

2.10 The Mucking Flats and Marshes SSSI is part-designated for the following ornithological interest:

- >20,000 non-breeding waterbirds;
- Internationally important numbers of ringed plover;
- Nationally important populations of non-breeding birds:
  - Shelduck;
  - Grey plover;
  - Dunlin;
  - Black-tailed godwit; and
  - Redshank.

- Avocet also occur, sometimes in nationally important numbers.

2.11 In addition to Thames Estuary and Marshes Ramsar/SPA, Medway Estuary and Marshes Ramsar/SPA is located approximately 16.4km to the south-east of the Kent Project Site. A summary of the ornithological interest (reason for designation in whole or in part) for this designation is provided below.

2.12 The Medway Estuary and Marshes Ramsar is designated in part for the following ornithological interest:

- Ramsar Criterion 5 (assemblages of international importance): 65,496 waterfowl (5 year peak mean 1991/92-1995/96);

- Ramsar Criterion 6 (species/populations occurring at levels of international importance - as identified at designation):

    - Dark-bellied brent goose (*Branta bernicla bernicla*), (western Siberia/ western Europe) 3,205 individuals representing an average of 1.1% of the population - 5 year peak mean for 1991/92-1995/96;

    - Dunlin (northern Siberia/Europe/ western Africa) 25,936 individuals representing an average of 1.9% of the population - 5 year peak mean for 1991/92-1995/96;

    - Grey plover (eastern Atlantic - wintering) 3,406 individuals representing 1.9% of the population - 5 year peak mean for 1991/92-1995/96;

    - Knot (north-eastern Canada/Greenland/Iceland/north-western Europe) 541 individuals representing 0.2% of the population - 5 year peak mean for 1991/92-1995/96;

    - Pintail (north-western Europe) 697 individuals representing 1.2% of the population - 5 year peak mean for 1991/92-1995/96;

    - Common redshank (eastern Atlantic - wintering) 3,690 individuals representing 2.1% of the population - 5 year peak mean for 1991/92-1995/96;

    - Ringed plover (Europe/Northern Africa - wintering) 768 individuals representing 1.6% of the population - 5 year peak mean for 1991/92-1995/96; and

    - Shelduck (north-western Europe) 4,465 individuals representing 1.5% of the population - 5 year peak mean for 1991/92-1995/96.

- Ramsar Criterion 6 (species/populations occurring at levels of international importance – as identified post-designation):

- Black-tailed godwit (Iceland (breeding)) 957 individuals representing an average of 1.5% of the population - 5 year peak mean for 1991/92-1995/96.

- Species listed in the designation as occurring at levels of national importance during the winter:

  - Avocet (western Europe/western Mediterranean) 314 individuals representing an average of 24.7% of the GB population - 5 year peak mean for 1991/92-1995/96);

  - Cormorant (*Phalacrocorax carbo*) (north-western Europe) 231 individuals representing an average of 1.8% of the GB population - 5 year peak mean for 1991/92-1995/96;

  - Curlew (Europe (breeding)) 1,900 individuals representing an average of 1.7% of the GB population - 5 year peak mean for 1991/92-1995/96;

  - Greenshank (*Tringa nebularia)* (Europe/western Africa) 10 individuals representing an average of 2.6% of the GB population - 5 year peak mean for 1991/92-1995/96;

  - Little grebe (*Tachybaptus ruficollis)* (western Palearctic) 53 individuals representing an average of 1.6% of the GB population - 5 year peak mean for 1991/92-1995/96;

  - Oystercatcher (*Haematopus ostralegus)* (Europe/north-western Africa) 3,672 individuals representing an average of 1% of the GB population - 5 year peak mean for 1991/92-1995/96;

  - Spotted redshank (Europe/western Africa) 19 individuals representing an average of 15.8% of the GB population - 5 year peak mean for 1991/92-1995/96;

  - Teal (north-western Europe) 1,824 individuals representing an average of 1.3% of the GB population - 5 year peak mean for 1991/92-1995/96; and

  - Wigeon (*Anas penelope)* (western Siberia/north-western/north-eastern Europe) 4,346 individuals representing an average of 1.6% of the GB population - 5 year peak mean for 1991/92-1995/96.

2.13 The Medway Estuary and Marshes SPA is designated in part for the following ornithological interest:

- Qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance over winter of:

- Avocet (western Europe/western Mediterranean) 314 individuals representing an average of 24.7% of the GB population - 5 year peak mean for 1991/92-1995/96); and

- Bewick's swan (*Cygnus columbianus bewickii)* 16 individuals representing an average of 0.2% of the GB population - 5 year peak mean for 1991/92-1995/96).

- Also qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of following species over winter:

  - Black-tailed godwit (Iceland (breeding)) 957 individuals representing an average of 1.5% of the population - 5 year peak mean for 1991/92-1995/96;

  - Common redshank (eastern Atlantic - wintering) 3,690 individuals representing 2.1% of the population - 5 year peak mean for 1991/92-1995/96;

  - Curlew (Europe (breeding)) 1,900 individuals representing an average of 1.7% of the GB population - 5 year peak mean for 1991/92-1995/96;

  - Dark-bellied brent goose (*Branta bernicla bernicla*), (western Siberia/western Europe) 3,205 individuals representing an average of 1.1% of the population - 5 year peak mean for 1991/92-1995/96;

  - Dunlin (northern Siberia/Europe/western Africa) 25,936 individuals representing an average of 1.9% of the population - 5 year peak mean for 1991/92-1995/96;

  - Greenshank (*Tringa nebularia)* (Europe/western Africa) 10 individuals representing an average of 2.6% of the GB population – No count period specified;

  - Grey plover (eastern Atlantic - wintering) 3,406 individuals representing 1.9% of the population - 5 year peak mean for 1991/92-1995/96;

  - Knot (north-eastern Canada/Greenland/Iceland/north-western Europe) 541 individuals representing 0.2% of the population - 5 year peak mean for 1991/92-1995/96;

  - Oystercatcher (Europe/north-western Africa) 3,672 individuals representing an average of 1% of the GB population - 5 year peak mean for 1991/92-1995/96;

  - Pintail (north-western Europe) 697 individuals representing 1.2% of the population - 5 year peak mean for 1991/92-1995/96;

  - Ringed plover (Europe/northern Africa - wintering) 768 individuals representing 1.6% of the population - 5 year peak mean for 1991/92-1995/96;

- Shelduck (north-western Europe) 4,465 individuals representing 1.5% of the population - 5 year peak mean for 1991/92-1995/96;
- Shoveler (*Anas clypeata*) (north-western/central Europe) 76 individuals representing 0.8% of the population - 5 year peak mean for 1991/92-1995/96;
- Teal (north-western Europe) 1,824 individuals representing an average of 1.3% of the GB population - 5 year peak mean for 1991/92-1995/96;
- Turnstone (*Arenaria interpres*) (western Palearctic (wintering)) 561 individuals representing 0.9% of the population - 5 year peak mean for 1991/92-1995/96; and
- Wigeon (western Siberia/north-western/north-eastern Europe) 4,346 individuals representing an average of 1.6% of the GB population - 5 year peak mean for 1991/92-1995/96.

- Assemblage qualification: A wetland of international importance. The area qualifies under Article 4.2 of the Directive (79/409/EEC) by:
  - Regularly supporting at least 20,000 waterfowl; and
  - Over winter the area regularly supports: 65,496 waterfowl (5 year peak mean 1991/92-1995/96). Including red-throated diver (*Gavia stellata*), great crested grebe, cormorant, Bewick's swan, dark-bellied brent goose, shelduck, wigeon, teal, mallard, pintail, shoveler, pochard (*Aythya farina*), oystercatcher, avocet, ringed plover, grey plover, lapwing, knot, dunlin, black-tailed godwit, curlew, redshank, greenshank and turnstone.

2.14 In addition to the international statutory and component national statutory designations listed above, West Thurrock Lagoon and Marshes SSSI is located approximately 880m to the north-west of the Kent Project Site on the northern banks of the River Thames. This SSSI is designated in part for the following ornithological interest:

- An important high tide roost for overwintering waders and wildfowl;
- Roosts comprising locally important numbers of:
  - Teal;
  - Snipe; and
  - Grey heron.
- Large areas of reedbeds occur supporting reed warbler, sedge warblers and bearded tits; and

- The area supports a large intertidal feeding area that is also regularly used as a low tide roost by migrant common, black and Arctic terns.

2.15 In addition to the above designations, the desk study revealed several national statutory designations considered to be important for overwintering birds beyond 5km and within 15km of the Kent Project Site, as illustrated within **Figure 12.31** (Document reference: 6.3.12.31). These include Inner Thames Marshes SSSI, Ingrebourne Marshes SSSI, Vange and Fobbing Marshes SSSI, Pitsea Marsh SSSI, Holehaven Creek SSSI and Holborough to Burham Marshes SSSI.

2.16 A summary of those target species listed above is provided below within **Table EDP 2.1**.

Table EDP 2.1: Summary of Target Species.

Target Species
Thames Estuary and Marshes Ramsar/SPA/SSSI
Avocet [283]
Black-tailed godwit [1640]
Common redshank [3251]
Curlew
Dunlin [15171]
European white-fronted goose
Gadwall
Grey plover [2593]
Hen harrier [7]
Knot [7279]
Pintail
Ringed plover [1324]
Shelduck
Shoveler
Teal
Medway Estuary and Marshes Ramsar/SPA
Avocet [314]
Bewick's swan [16]
Black-tailed godwit [957]
Common redshank [3690]
Cormorant [231]
Curlew [1900]
Dark-bellied brent goose [3205]
Dunlin [25936]
Great crested grebe
Greenshank [10]
Grey heron
Grey plover [3406]
Knot [541]
Lapwing
Little Grebe [53]
Mallard
Oystercatcher [3672]
Pintail [697]

Target Species	
Pochard	
Ringed plover [768]	
Shelduck [4465]	
Shoveler [76]	
Spotted redshank [19]	
Teal [1824]	
Turnstone [561]	
Wigeon [4346]	
West Thurrock Lagoon and Marshes SSSI	
Grey Heron	
Snipe	
Teal	
Overall Total No. of Target Species	**30**

Notes:

- Species in bold are Ramsar/SPA/SSSI qualifying species for which population counts are specifically mentioned in the designation citations (highest winter peak count from the citations is provided in brackets in the table).
- Species in italics are those additional species that contribute to the wintering bird assemblage mentioned in the Ramsar/SPA/SSSI citations, but for which no population counts are mentioned in the designation citations.

Wetland Bird Survey Data

2.17 Wetland Bird Survey (WeBS) data covering the zones listed in **Table EDP 2.2** were provided by the British Trust for Ornithology (BTO) on 20 April 2020. The data was provided in two custom consolidations, allowing for the comparison of the survey area and the wider Thames Estuary. It is important to note that WeBS data for the Kent Project Site itself covers part of the north-western edge of Swanscombe Peninsula only. No WeBS data for the remainder of the survey area currently exists.

2.18 A small number of gaps exist in the WeBS data, including the eastern part of the peninsula, as noted above. Other data gaps include the developed coastline around Northfleet and Gravesend and the northern bank of the Thames between Tilbury Port and East Tilbury Radio Tower. This is not considered a limitation, given the developed nature of most of these areas. The area of undeveloped foreshore east of Tilbury, however, was covered by surveys to inform the Tilbury2 DCO, which can be found in Appendix 10.I and Figure 10.12 to the Tilbury2 Environmental Statement, included as **Annex EDP 1** to this report, a summary of which is included under **Previous Surveys** below.

Table EDP 2.2: Location Codes for WeBS Data.

WeBS Code	Name	Consolidation
22920	River Thames - QEII Bridge (Dartford) to Swanscombe	Kent Project Site (part of)
25901	Thames Estuary	Wider Thames Estuary

2.19 A summary of species mentioned in the designations for the SPA/Ramsar/SSSI within the two consolidations is provided in **Table EDP 2.3**. The data for the Kent Project Site did not have recent coverage, so species totals are given as a mean peak count by WeBS

period 2003-2008, whereas totals for the wider Thames Estuary are given as a mean peak count by WeBS period 2014-2018. A table including all species is included in **Annex EDP 1**.

Table EDP 2.3: Summary of WeBS Data Relating to Qualifying and Noteworthy Species for the SPA/Ramsar/SSSI.

Target Species	WeBS Data			
	Kent Project Site (Part of) Mean Peak	Wider Estuary Mean Peak	Total Mean Peak	% of Total within Kent Project Site
Thames Estuary and Marshes Ramsar/SPA/SSSI				
Avocet	-	3,177	3,177	0
Black-tailed godwit	29	5,960	5,960	0.49
Common redshank	175	2,403	2,403	7.28
Curlew	5	3,425	3,425	0.12
Dunlin	166	27,630	27,630	0.6
European white-fronted goose	-	13	13	0
Gadwall	9	435	435	1.15
Grey plover	(4)	3,059	3,059	0.13
Hen harrier	-	-	-	-
Knot	-	22,362	22,362	0
Pintail	-	141	141	0
Ringed plover	28	767	767	3.65
Shelduck	13	1,479	1,479	0.88
Shoveler	5	803	803	0.62
Teal	40	4,069	4,069	0.98
Medway Estuary and Marshes Ramsar/SPA				
Avocet	-	3,177	3,177	0
Bewick's swan	-	10	10	0
Black-tailed godwit	29	5,960	5,960	0.49
Common redshank	175	2,403	2,403	7.28
Cormorant	43	257	257	16.73
Curlew	5	3,425	3,425	0.12
Dark-bellied brent goose	3	15,365	15,365	0.02
Dunlin	166	27,630	27,630	0.6
Great crested grebe	-	189	189	0
Greenshank	-	86	86	0
Grey heron	10	71	71	14.08
Grey plover	(4)	3059	3059	0.13
Knot	-	22,362	22,362	0
Lapwing	81	9,862	9,862	0.82
Little Grebe	3	388	388	0.77
Mallard	70	1,144	1,144	6.12
Oystercatcher	4	16,557	16,557	0.02
Pintail	-	141	141	0
Pochard	(1)	587	587	0.17
Ringed plover	28	767	767	3.65
Shelduck	13	1,479	1,479	0.88
Shoveler	5	803	803	0.62
Spotted redshank	-	7	7	0

Target Species	WeBS Data			
	Kent Project Site (Part of) Mean Peak	Wider Estuary Mean Peak	Total Mean Peak	% of Total within Kent Project Site
Teal	40	4,069	4,069	0.98
Turnstone	4	630	630	0.63
Wigeon	-	7,163	7,163	0
West Thurrock Lagoon and Marshes SSSI				
Grey Heron	10	71	71	14.08
Snipe	5	114	114	4.39
Teal	40	4,069	4,069	0.98

Notes:

- Values in round brackets represent the peak count of that species due to only being seen on one occasion.

2.20 The WeBS data is also provided in full in **Annex EDP 2**.

Data from KMBRC

2.21 A large number of records were returned by KMBRC for the Kent Project Site itself, including numerous species of wildfowl and waders. A summary of bird species records provided by KMBRC is included within **Annex EDP 3**.

2.22 A summary of those species returned within the data search which are also listed within the citations for nearby designations as described above are provided in **Table EDP 2.4** below. It is important to note that the number of records associated with those species returned by KMBRC do not represent individuals. As such, no comparison should be made between the number of records and peak population counts as provided within the citations for each designated site. Instead, the table below provides an insight into the number of target species likely to be present within the Kent Project Site and their apparent frequency within the Kent Project Site relative to each other.

2.23 In addition to those target species listed within **Table EDP 2.4**, small numbers of winter migrants associated with terrestrial habitats were returned, including waxwing (brambling (*Fringilla montifringilla*), fieldfare (*Turdus pilaris*), redwing (*Turdus iliacus*), lesser redpoll (*Acanthis cabaret*), merlin (*Falco columbarius*) and great grey shrike (*Lanius excubitor*), as well as resident species of conservation concern, such as reed bunting (*Emberiza schoeniclus*), yellowhammer (*Emberiza citrinella*), linnet (*Linaria cannabina*), skylark (*Alauda arvensis*) and meadow pipit (*Anthus pratensis*).

Table EDP 2.4: Summary of Bird Species Records Returned by KMBRC.

Target Species	Present within KMBRC Bird Data Records? (Number of Records)
Thames Estuary and Marshes Ramsar/SPA/SSSI	
Avocet [283]	Yes (75)
Black-tailed godwit [1640]	Yes (139)
Common redshank [3251]	Yes (279)
Curlew	Yes (156)

Target Species	Present within KMBRC Bird Data Records? (Number of Records)
Dunlin [15171]	Yes (173)
European white-fronted goose	No
Gadwall	Yes (147)
Grey plover [2593]	Yes (51)
Hen harrier [7]	Yes (2)
Knot [7279]	Yes (5)
Pintail	Yes (10)
Ringed plover [1324]	Yes (151)
Shelduck	Yes (228)
Shoveler	Yes (87)
Teal	Yes (216)
Total No. of Target Species Recorded	**14**
Medway Estuary and Marshes Ramsar/SPA	
Avocet [314]	Yes (75)
Bewick's swan [16]	No
Black-tailed godwit [957]	Yes (139)
Common redshank [3690]	Yes (279)
Cormorant [231]	Yes (261)
Curlew [1900]	Yes (156)
Dark-bellied brent goose [3205]	Yes (27)
Dunlin [25936]	Yes (173)
Great crested grebe	Yes (56)
Greenshank [10]	Yes (9)
Grey heron	Yes (278)
Grey plover [3406]	Yes (51)
Knot [541]	Yes (5)
Lapwing	Yes (266)
Little Grebe [53]	Yes (135)
Mallard	Yes (332)
Oystercatcher [3672]	Yes (190)
Pintail [697]	Yes (10)
Pochard	Yes (24)
Ringed plover [768]	Yes (151)
Shelduck [4465]	Yes (228)
Shoveler [76]	Yes (87)
Spotted redshank [19]	Yes (1)
Teal [1824]	Yes (216)
Turnstone [561]	Yes (166)
Wigeon [4346]	Yes (39)
Total No. of Target Species Recorded	**25**
West Thurrock Lagoon and Marshes SSSI	
Grey Heron	Yes (278)
Snipe	Yes (103)
Teal	Yes (216)

Target Species	Present within KMBRC Bird Data Records? (Number of Records)
Total No. of Target Species Recorded	**3**
Overall Total No. of Target Species Recorded	**28**

Notes:

- Species in bold are Ramsar/SPA/SSSI qualifying species for which population counts are specifically mentioned in the designation citations (highest winter peak count from the citations is provided in brackets in the table).
- Species in italics are those additional species that contribute to the wintering bird assemblage mentioned in the Ramsar/SPA/SSSI citations, but for which no population counts are mentioned in the designation citations.
- Values in round brackets are the number of records for that species held by KMBRC.

Data from Essex Field Club

2.24 Essex Field Club (EFC) returned numerous bird species records to the north of the Kent Project Site, including several species of wildfowl and wading birds. The vast majority of records are associated with the River Thames and nearby estuarine habitats, including West Thurrock lagoon and Marshes SSSI and Rainham Marshes nature reserve.

2.25 Several records for wildfowl species included within the amber list of birds of conservation concern (BoCC4) were returned during the desk study including teal, mallard, wigeon, pintail, shoveler, shelduck and gadwall. Several records for pochard and scaup (*Aythya marila*), which are included within the BoCC4 Red List, were also retrieved during the desk study. The majority of the wildlfowl records are associated with West Thurrock lagoon and Marshes SSSI and Rainham Marshes nature reserve, which are located 1km and 6km to the north-east of the Kent Project Site respectively.

2.26 In addition to the wildfowl, numerous wading birds of conservation concern were returned during the desk study, several of which are included within the Red List of conservation concern including lapwing, curlew, ringed plover, ruff (*Philomachus pugnax*), black-tailed godwit and whimbrel, all of which are predominantly associated with Tilbury, West Thurrock and Rainham Marshes.

2.27 Several notable terrestrial (non-wildfowl and non-waders) birds of conservation concern were also returned during the desk study including numerous records for both wintering marsh harrier (*Circus aeruginosus*) and hen harrier at Tilbury and West Thurrock Marshes. Several other records for winter migrants were returned for the same areas including large flocks of fieldfare and redwing.

Local Bird Recorder Data

2.28 A data enquiry email was sent to the local bird group (Kent Ornithological Society) on 05 April 2020; however, it was confirmed by the group that such data is held by Kent Biological Records Centre, which EDP obtained through KMBRC as described above.

Previous Surveys

2.29 As noted above, a suite of wintering bird surveys was undertaken as part of the Tilbury2 DCO application, on land just to the east of the Essex Project Site. Full results can be found within **Annex EDP 1**, which is summarised in **Table EDP 2.5** below.

Table EDP 2.5: Summary of Wintering Bird Survey Results.

Species	Monthly Peak Count							Maximum	Mean
	18/11/16	16/12/16	26/01/17	22/02/17	16/03/17	19/09/17	10/10/17		
Avocet	1	-	12	-	-	-	-	**12**	**1.86**
Black-headed gull	149	41	34	284	264	387	207	**387**	**195.14**
Black-tailed godwit	-	-	-	-	-	4	-	**4**	**4**
Common gull	-	4	1	4	-	-	-	**4**	**3**
Cormorant	-	-	-	1	-	-	1	**1**	**1**
Common sandpiper	-	-	-	-	-	1	-	**1**	**1**
Curlew	19	32	11	2	21	-	2	**32**	**14.5**
Dunlin	13	-	56	-	-	33	3	**56**	**26.25**
Little egret	-	2	-	-	-	-	-	**2**	**2**
Gadwall	-	8	54	40	-	-	-	**54**	**34**
Great black-backed gull	-	1	-	-	-	-	3	**3**	**2**
Grey plover	8	-	2	-	-	-	-	**8**	**5**
Grey heron	-	-	-	-	-	1	-	**1**	**1**
Herring gull	-	-	-	1	2	1	-	**2**	**1.33**
Lapwing	13	9	7	-	-	-	-	**13**	**9.67**
Lesser black-backed gull	1	-	-	-	-	-	-	**1**	**1**
Little gull	-	-	-	-	-	1	-	**1**	**1**
Mallard	130	30	68	65	14	55	66	**130**	**61.14**
Mute swan	-	-	3	-	-	-	-	**3**	**3**
Oystercatcher	-	-	-	1	6	1	-	**6**	**2.67**
Redshank	16	29	21	5		1	1	**29**	**12.17**
Ringed plover	5	-	-	-	-	10	44	**44**	**19.67**
Shelduck	4	-	10	-	15	-	4	**15**	**8.25**
Teal	108	159	161	170	31	-	-	**170**	**125.8**
Turnstone	-	8	1	-	-	-	-	**8**	**4.5**
Total	**467**	**323**	**441**	**573**	**353**	**495**	**331**	573	426.14

CBA Surveys

2.30 A range of surveys were also undertaken by Chris Blandford Associates (CBA) in the winter of 2012/13 at the Kent Project Site, full details of which are included in **Annex EDP 4**.

2.31 Two types of survey were undertaken – intertidal (low tide) surveys and high tide surveys. Low tide and high tide surveys were undertaken on a monthly basis covering a survey area which comprises much of Swanscombe Peninsula and estuary frontage. During each high tide survey, CBA recorded birds along the estuary frontage as well as those seen on Swanscombe Peninsula. Similarly, EDP recorded birds located away from the estuary during the high tide surveys, but covered a much larger inland survey area in order to determine whether suitable habitat within the whole of the Kent Project Site is 'functionally linked' to the nearby designations, and also to assess if the flocks of birds that feed on the mud banks moved inland to roost when high tides concealed their feeding grounds.

2.32 **Table EDP 2.6** and **2.7** give a summary of the results of their surveys, undertaken between September 2012 and March 2013.

Table EDP 2.6: Summary of CBA High Tide Survey Results.

Species	Monthly Peak Count							Maximum	Mean
	27/09/12	17/10/12	02/11/12	17/12/12	01/02/13	22/02/13	25/03/13		
Black-headed gull	9	6	82	115	526	399	633	**633**	**253**
Common gull	-	-	2	-	7	7	33	**33**	**12.25**
Coot	4	2	-	-	2	-	1	**4**	**2.25**
Cormorant	12	22	15	-	21	9	14	**22**	**15.5**
Gadwall	-	-	-	45	105	97	49	**105**	**74**
Great black-backed gull	2	-	-	-	-	-	-	**2**	**-**
Great crested grebe	-	-	-	1	-	-	-	**1**	**-**
Grey heron	1	1	3	-	-	1	-	**3**	**1.5**
Greylag goose	-	-	-	-	-	41	-	**41**	**-**
Grey plover	-	-	-	-	-	-	1	**1**	**-**
Herring gull	-	-	3	-	27	13	14	**27**	**14.25**
Lapwing	9	5	29	230	146	12	10	**230**	**63**
Lesser black-backed gull	3	-	-	-	2	1	10	**10**	**4**
Little egret	-	3	-	-	-	-	-	**3**	**-**
Little grebe	-	-	1	-	-	-	-	**1**	**-**
Mallard	40	76	56	36	87	27	23	**87**	**49**
Marsh harrier	-	-	-	-	-	1	-	**1**	**-**

Species	Monthly Peak Count							Maximum	Mean
	27/09/12	17/10/12	02/11/12	17/12/12	01/02/13	22/02/13	25/03/13		
Moorhen	-	3	1	-	2	-	2	**3**	**2**
Oystercatcher	-	-	-	-	5	-	2	**5**	**3.5**
Peregrine	-	-	-	-	1	-	-	**1**	**-**
Redshank	-	-	-	-	33	60	60	**60**	**51**
Shelduck	-	-	-	-	1	5	2	**5**	**2.6**
Shoveler	-	-	-	-	6	-	-	**6**	**-**
Teal	-	12	30	128	190	123	176	**190**	**109.8**
Tufted duck	-	-	-	-	4	-	-	**4**	**-**
Turnstone	-	-	-	-	6	-	18	**18**	**12**
Wigeon	-	-	-	-	4	-	-	**4**	**-**
Total	**80**	**130**	**222**	**555**	**1,175**	**796**	**1,048**	**1,175**	**572**

Table EDP 2.7: Summary of CBA Intertidal (low tide) Survey Results.

Species	Monthly Peak Count							Maximum	Mean
	04/10/12	19/10/12	01/11/12	17/12/12	25/01/13	18/02/13	22/03/13		
Black-headed gull	86	100	167	59	290	136	222	**290**	**151.4**
Carrion crow	-	-	-	-	-	1	-	**1**	**-**
Common gull	-	1	6	1	11	1	9	**11**	**4.83**
Coot	2	1	1	-	-	-	2	**2**	**1.5**
Cormorant	3	15	4	2	26	10	6	**26**	**9.4**
Curlew	2	6	2	-	-	-	-	**6**	**3.33**
Gadwall	-	-	-	61	115	126	32	**126**	**83.5**
Great crested grebe	-	-	1	-	1	-	-	**1**	**-**
Grey heron	3	4	2	-	1	-	-	**4**	**2.5**
Grey plover	-	-	-	-	5	-	-	**5**	**-**
Herring gull	37	44	12	-	-	18	1	**44**	**22.4**
Kestrel	2	-	-	-	-	-	-	**2**	**-**
Knot	-	-	-	-	2	-	-	**2**	**-**
Lapwing	1	-	42	90	33	14	1	**90**	**30.16**
Lesser black-backed gull	28	6	5	1	1	-	3	**28**	**7.33**
Little grebe	1	1	-	-	-	-	-	**1**	**1**
Mallard	34	54	80	32	68	34	16	**80**	**45.4**
Moorhen	2	2	1	-	-	-	1	**2**	**1.5**
Oystercatcher	-	-	-	-	-	2	-	**2**	**-**
Peregrine	-	1	-	-	1	-	-	**1**	**1**
Redshank	-	5	10	67	-	68	18	**68**	**33.6**
Shelduck	-	-	-	-	8	1	2	**8**	**3.66**

Species	Monthly Peak Count							Maximum	Mean
	04/10/12	19/10/12	01/11/12	17/12/12	25/01/13	18/02/13	22/03/13		
Shoveler	-	1	-	-	-	2	-	**2**	**1.5**
Snipe	-	-	-	-	4	-	-	**4**	**-**
Teal	26	8	33	61	150	128	56	**150**	**66**
Turnstone	-	-	8	13	2	16	13	**16**	**10.4**
Total	**227**	**249**	**374**	**387**	**718**	**557**	**382**	**718**	**413**

2.33 CBA did not include land to the south of Swanscombe Peninsula within their survey area. Additionally, CBA did not undertake a targeted wintering bird survey of the Kent Project Site, including vantage point surveys.

Section 3
EDP Methodology (Recent Baseline Investigations)

3.1 This section of the report summarises the methodologies employed in determining the latest baseline wintering ornithological conditions within and around the Kent Project Site by EDP. The investigations have been undertaken by appropriately experienced surveyors using relevant best practice methodologies wherever possible.

Core Counts (Estuary) – Winter Intertidal (Low Tide) Surveys

3.2 In order to establish usage by waterfowl and waders, intertidal (low tide) surveys were undertaken monthly between November 2019 and March 2020. Intertidal surveys along the edge of Swanscombe Peninsula were undertaken monthly from a combination of formal and informal footpaths and divided into nine core count sectors, as shown in **Figure 12.30** (Document reference: 6.3.12.30). To provide an indication of the spatial distribution of birds off the Swanscombe Peninsula, the core count sectors were based on permanent features where possible with the aid of GPS also used to help locate sector boundaries, ensuring accurate repeat visits.

3.3 Target species for the survey were wintering waders and wildfowl, principally those associated with nearby SPA/Ramsar/SSSI designations, as listed within **Section 2** of this report.

3.4 Each survey visit commenced approximately one hour before low tide and comprised two hourly counts, one either side of low tide, when intertidal sediment was exposed. The surveyor recorded the number of waterfowl and waders within each sector, along with notes on bird behaviour e.g. roosting or foraging activity. Other relevant information, such as disturbance to birds from human recreation was also recorded. Surveyors used binoculars and telescopes.

3.5 Weather conditions during each survey visit are given in **Table EDP 3.1** below. Full results are provided in **Annex EDP 5**, with a summary in **Section 4**.

Table EDP 3.1: Weather Conditions during Intertidal (Low Tide) Surveys.

Date	Low Tide Time	Low Tide Water Level	Weather Summary
28/11/2019	08:06	0.53m	8°C, visibility moderate, intermittent showers, wind 4-5
17/12/2019	10:21	0.59m	7°C, visibility good, wind 2–3
20/01/2020	14:50	0.97m	6°C, visibility good, wind 1–2
26/02/2020	08:49	0.53m	4°C, visibility good, wind 3-4
30/03/2020	10:51	0.91m	6°C, visibility good, wind 2-3

Limitations

3.6 Surveys were undertaken across a range of weather conditions, wind speeds and

temperatures at the estuary. As a natural consequence of certain survey events being undertaken in inclement weather at an estuarine location, visibility was not always 'good'. However, visibility never obscured the estuary completely, meaning that all birds would be recorded where present. This meant that the surveys provide a good representation of bird counts across different weather conditions and this is therefore considered to add robustness to the survey results rather than be a limitation.

3.7 There was potential for double counting as birds moved between survey segments due to the use of two surveyors, but surveyors remained in phone contact to discuss bird movements during the survey to try and minimise the potential for this, and results have been interpreted with this possibility in mind. EDP therefore considers that this is not a significant limitation to the survey.

3.8 For project of this size, two years of breeding bird data is often required. However, the 2019/2020 surveys are supplemented by a suite of 'baseline' surveys completed by Chris Blandford Associates (CBA) during 2012/2013. Therefore, two seasons of bird survey data is to be submitted along with the DCO application, albeit not in consecutive years.

3.9 In addition, the wetland habitats within the Kent Project Site have not changed significantly in the intervening years between the 2012/2013 baseline surveys and the recent 2019/2020 surveys, and the data collected is more or less consistent across that time period. As set out below, the wintering wader/wildfowl assemblage using the Kent Project Site has been valued at the International level owing to its association with the nearby Ramsar and SPAs. The assemblage has therefore been valued at the highest level, and data from additional surveys will not affect this valuation or significantly alter the impact assessment and mitigation measures being developed.

Core Counts (Estuary) – Winter High Tide Surveys

3.10 Monthly high tide surveys were undertaken along the edge of the Swanscombe Peninsula between November 2019 and March 2020 using the same core count sectors as the intertidal surveys, as shown on **Figure 12.30** (Document reference: 6.3.12.30).

3.11 In order to determine whether land within the Kent Project Site is 'functionally linked' to the nearby designations, the Kent Project Site was also surveyed during high tides to assess if the flocks of birds that feed on the mud banks moved inland to roost when high tides concealed their feeding grounds. The inland survey included a roving transect by car and foot across the Kent Project Site, with a particular focus on vantage points and higher quality foraging and refuge habitats (e.g. marsh and flooded pasture). Surveyors used binoculars and telescopes.

3.12 Both the estuary and Kent Project Site were counted simultaneously, allowing for observations to be made of any significant bird movements between the two. Each survey visit commenced approximately one hour before high tide and comprised two hourly

counts, one either side of high tide. During this time, two surveyors covered the estuary and one the Kent Project Site itself.

3.13 Weather conditions during each survey visit are given in **Table EDP 3.2** below. Full results are provided in **Annex EDP 6**, with a summary in **Section 4**.

Table EDP 3.2: Weather Conditions during High Tide Surveys.

Date	High Tide Time	High Tide Water Level	Weather Summary
26/11/2019	12:16	6.55m	11°C, drizzle, visibility moderate, wind 4
12/12/2019	12:46	6.31m	7°C, drizzle, visibility moderate, wind 2–3
22/01/2020	10:55	5.80m	7°C, visibility good, wind 1-2
24/02/2020	13:42	6.27m	8°C, visibility good, wind 3-4
23/03/2020	12:46	6.18m	9°C, visibility good, wind 3

Limitations

3.14 See paragraphs 3.6 and 3.7.

On-site Winter Bird Survey

3.15 Due to the proximity of the River Thames and wider Thames Estuary to the Kent Project Site, EDP considers it is likely that waders and wildfowl may use parts of the Kent Project Site on occasion, particularly with respect to Swanscombe Peninsula which comprises a mosaic of scrub, farmland and wetland habitat with mudflats also present along the peninsula edge. As such, it was considered by EDP that the Kent Project Site has potential to support notable assemblages of overwintering bird species of conservation concern[3] (Red and Amber Listed). Therefore, a wintering bird survey (WBS) was undertaken to identify whether any notable species populations occur during the winter months, targeting those species of conservation concern.

3.16 Surveys were conducted by experienced surveyors on a monthly basis, involving thirteen surveys over five months extending from November 2019 to March 2020 inclusive. A limitation with surveying birds on farmland, as well as other habitats, in winter is that birds vary in detectability. This is typically a function of the species size, species behaviour (including 'flushing' distance, flocking behaviour and crypticity), foraging ecology and field characteristics (including vegetation density and height, and area of the field)[4]. As such, a simple 'field perimeter' based count can miss significant numbers of birds, particularly where the field vegetation is tall or dense. Therefore, the survey methodology involved walking within a maximum approximate distance of 75m of all suitable habitats for the target species where possible. However, there was some

[3] Eaton, M.A., Aebischer, N.J., Brown, A.F., Hearn, R..D., Lock, L.., Musgrove, A.J., Noble, D.G., Stroud, D.A. and Gregory, R..D. (2015). *Birds of Conservation Concern 4: the population status of birds in the UK, Channel Islands and Isle of Man*. British Birds, Vol. 108, 708-746.

[4] Atkinson, P.W., Fuller, R.A., Gillings, S. & Vickery, J.A. (2006). Counting birds on farmland habitats in winter. *Bird Study*, 53:3, 303-309.

variation to this methodology, at the discretion of the surveyor, according to the nature of the habitat present and the influence this had on bird detectability (e.g. height of grassland), and where access was not possible (e.g. reedbed habitat). Each surveyor recorded Amber and Red list species encountered, along with any notable behaviour.

3.17 Each survey visit was carried out by three experienced surveyors to allow full coverage of the Kent Project Site within an appropriate time scale. Generally, winter bird surveys were completed over three days during each survey visit, to allow full coverage of the Kent Project Site within daylight hours, with the exception of the March 2020, where the entire Site was covered during a single full day of surveying due to longer daylight hours and each surveyor having use of their own transport due to compliance with Covid-19 guidance[5] at the time. Surveyors used binoculars and telescopes.

3.18 Survey visits were largely completed on calm days with good visibility and avoiding periods of prolonged heavy rain. It is therefore considered that the results provide a representative overview of the wintering bird interest at the Kent Project Site and have not been limited by seasonal or climatic factors. The dates and timings of the survey visits (each of which took one day to complete), and the weather conditions encountered, are summarised at **Table EDP 3.3**.

Table EDP 3.3: Date, Timing and Weather Conditions during the WBS Visits

Month	Date(s)	Time	Weather Summary
November	25/11/2019	12:00-14:00	11°C, visibility good, light drizzle, wind 4
	26/11/2019	10:00-11:00, 13:30-14:30	11-13°C, visibility good, wind 4-3
	27/11/2019	10:00-15:30	10-12°C, visibility good, light intermittent drizzle, wind 2
December	11/12/2019	12:00-14:30	7-9°C, visibility good, wind 3
	12/12/2019	10:00-11:30, 14:00-14:30	6-9°C, visibility good, wind 5
	16/12/2019	11:00-14:30	9°C, visibility moderate, wind 3
January	20/01/2020	12:00-13:50	5-8°C, visibility excellent, wind 1
	21/01/2020	10:30-13:00	4-7°C, visibility moderate/good, low-lying fog cleared quickly, wind 2
	22/01/2020	12:00-15:00	6-8°C, visibility moderate, wind 2
February	24/02/2020	10:45-12:35	11°C, visibility moderate/poor, light rain wind 5
	25/02/2020	10:00-15:00	7-9°C, visibility good, wind 4
	26/02/2020	10:00-11:00	7°C, visibility good, wind 5
March	21/02/2019	09:00-11:00, 14:00-17:15	9°C, visibility good, wind 3

3.19 The surveys were completed at different times of day. However, the first and last hours of daylight were not surveyed to avoid counting when birds are moving between foraging and roosting habitats. Registrations of target bird species were recorded and assigned to

[5] https://cieem.net/wp-content/uploads/2020/03/CIEEM-COVID-19-Advice-March2020-FINAL.pdf

the location where they were first detected (if flushed). Flying birds were only recorded if they were clearly associated with the Kent Project Site (e.g. just flushed or about to land).

3.20 Following completion of the WBS, an average (mean) count and maximum count of each species of conservation concern (Red and Amber listed) was calculated for the survey area. Means are only provided where a species was recorded on more than one survey. The assemblage of birds recorded on site were also compared against national conservation priorities (*Birds of Conservation Concern Report*, UK Biodiversity Action Plan and Section 41 [S41] of the Natural Environment and Rural Communities [NERC] Act 2006). Based on these comparisons, an assessment can be made of the importance of the wintering bird species within the Kent Project Site, both with regard to each species, and the overall assemblage.

3.21 The full results of the winter bird surveys are given in **Annex EDP 7** of this report, visualised on **Figures 12.32-12.36** (Document reference: 6.3.12.32 to 6.3.12.36 inclusive) and summarised in **Section 4**.

Limitations

3.22 It is considered that 'double counting' could affect results, particularly with the whole area search approach where birds could be flushed from one area to another. With reference to Wilson *et al*. (1996)[6], although this source of error cannot be eliminated, it can be minimised by taking account (namely through the detailed recording of bird movements on site plans) of birds flushed to fields yet to be counted. In addition, the three surveyors remained in contact by phone to highlight any notable species or groups that may be moving into adjacent count areas to reduce the risks of double counting. Where it is considered that double counting has occurred, this is highlighted within the results.

3.23 Due to access restrictions, some parts of the Kent Project Site were not surveyed during the first survey visit. The areas affected were concentrated around Ebbsfleet International Station and its associated infrastructure. Furthermore, it was not possible to survey the majority of Bamber Pit due to the presence of a steep muddy slope leading into the southern half of the area. Access was possible when ground conditions were appropriate and calling or singing birds were recorded where noted.

3.24 Internal access to the areas of Botany Marsh not forming part of the Kent Wildlife Trust reserve (i.e. the cattle-grazed areas to the west) was not granted for any of the surveys, although it was possible to view the area from vantage points to the west, east and north, meaning that it was possible to build a comprehensive idea of the species assemblage using the land over winter.

3.25 The surveys were not limited by seasonal nor climatic factors and were undertaken during optimal months. The surveys are therefore considered a robust and reliable basis for decision making.

[6] Wilson, J.D., Taylor, R. & Muirhead, L.B. (1996) Field use by farmland birds in winter: an analysis of field type preferences using re-sampling methods. Bird Study, 43, 320–332

Dusk and Dawn Vantage Point Surveys

3.26 As a further means of determining the importance of the Kent Project Site to wintering birds and land 'functionally linked' to the nearby Ramsar/SPA/SSSI designations, vantage point surveys were undertaken monthly between November 2019 and March 2020. A combination of two and three surveyors were positioned at predetermined points, as shown on **Figures 12.37-12.41** (Document reference: 6.3.12.37 to 6.3.12.41 inclusive), overlooking Swanscombe Peninsula, as well as rough grassland to the south of the Kent Project Site and its immediate surroundings. Binoculars and telescopes were used to record any bird movement potentially associated with the estuary, noting down the species, number of birds and their activities, e.g. flight path and roosting and foraging locations.

3.27 Dawn surveys commenced approximately one hour before sunrise and ended one hour after sunrise, and dusk surveys commenced approximately one hour before sunset and ended approximately one hour after sunset. The surveys were timed so that they were undertaken at high and low tide, and a variety of tidal ranges in between, thereby allowing for a full picture of how the Kent Project Site is used by those target species of the nearby SPA/Ramsar/SSSI designations.

3.28 Weather conditions during the surveys are listed below in **Table EDP 3.4**

Table EDP 3.4: Date, Timing and Weather Conditions During the Vantage Point Surveys.

Month	Vantage Point (VP) Number	Dawn Survey Date	Dusk Survey Date	Sunrise/ Sunset Time	Weather Summary
November	VP1	26/11/2019	25/11/2019	07:33/ 15:58	9/12°C, visibility good, wind 4/2
	VP2	26/11/2019	25/11/2019	07:33/ 15:58	9/12°C, visibility good, wind 4/2
	VP3	26/11/2019	25/11/2019	07:33/ 15:58	9/12°C, visibility good, wind 4/2
	VP4	27/11/2019	26/11/2019	07:35/ 15:57	9–13°C, light drizzle during dawn survey with moderate visibility, dusk survey visibility good, wind 2/3
	VP5	27/11/2019	26/11/2019	07:35/ 15:57	9–13°C, light drizzle during dawn survey with moderate visibility, dusk survey visibility good, wind 2/3
December	VP1	12/12/2019	11/12/2019	07:54/ 15:49	4/7°C, visibility good, wind 3/2
	VP2	12/12/2019	11/12/2019	07:54/ 15:49	4/7°C, visibility good, wind 3/2
	VP3	12/12/2019	11/12/2019	07:54/	4/7°C, visibility good,

Month	Vantage Point (VP) Number	Dawn Survey Date	Dusk Survey Date	Sunrise/ Sunset Time	Weather Summary
				15:49	wind 3/2
	VP4	17/12/2019	16/12/2019	07:58/ 15:50	6/8˚C, visibility good, wind 1/2
	VP5	17/12/2019	16/12/2019	07:58/ 15:50	6/8°C, visibility good, wind 1/2

Month	Vantage Point (VP) Number	Dawn Survey Date	Dusk Survey Date	Sunrise/ Sunset Time	Weather Summary
January	VP1	21/01/2020	22/01/2020	07:52/ 16:29	-4/8°C, visibility good during dawn survey, drizzle and moderate visibility during dusk survey, wind 1/2
	VP2	21/01/2020	22/01/2020	07:52/ 16:29	-4/8°C, visibility good during dawn survey, drizzle and moderate visibility during dusk survey, wind 1/2
	VP3	21/01/2020	22/01/2020	07:52/ 16:29	-4/8°C, visibility good during dawn survey, drizzle and moderate visibility during dusk survey, wind 1/2
	VP4	22/01/2020	21/01/2020	07:51/ 16:28	4/5°C, visibility good, wind 1/2
	VP5	22/01/2020	21/01/2020	07:51/ 16:28	4/5°C, visibility good, wind 1/2
February	VP1	26/02/2020	25/02/2020	06:51/ 17:30	2/4°C, visibility good during dawn, heavy rain showers and moderate visibility during dusk, wind 5/5
	VP2	26/02/2020	25/02/2020	06:51/ 17:30	2/4°C, visibility good during dawn, heavy rain showers and moderate visibility during dusk, wind 5/5
	VP3	26/02/2020	25/02/2020	06:51/ 17:30	2/4°C, visibility good during dawn, heavy rain showers and moderate visibility during dusk, wind 5/5
	VP4	25/02/2020	24/02/2020	06:53/ 17:29	5/9°C, visibility good, wind 3/5
	VP5	25/02/2020	24/02/2020	06:53/ 17:29	5/9°C, visibility good, wind 3/5
March	VP1	***Covid-19****	23/03/2020	18:17	8°C, visibility good, wind 3
	VP2	***Covid-19****	23/03/2020	18:17	8°C, visibility good, wind 3
	VP3	***Covid-19****	23/03/2020	18:17	8°C, visibility good, wind 3
	VP4	***Covid-19****	***Covid-19****	N/A	N/A
	VP5	***Covid-19****	***Covid-19****	N/A	N/A

***Covid-19**: Due to the Covid-19 pandemic and subsequent government and CIEEM advice[7] at the time, Vantage Points 1-3 were not subject to a dawn survey and Vantage points 4-5 were not subject to either a dawn or dusk survey during March.

Limitations

3.29 Due to the Covid-19 pandemic at the time of the final survey visit during March 2020, it was decided by EDP that, in line with government and Institute of Ecology and Environmental Management (CIEEM) advice[8], surveyors were unable to safely carry out a dawn survey of Vantage Points 1-3 as well as a dawn and dusk survey of Vantage Points 4-5, given the excessive hours and distance of travel required to get to Site when avoiding an overnight stay. Given the numerous Vantage Point Surveys undertaken between November 2019 and February 2020 and the nature of the results, EDP considers that the reduced Vantage Point Survey effort undertaken during March 2020 does not affect the overall baseline conditions described within this report.

3.30 Unsuitable weather conditions and site access protocols meant that a limited number of surveys started slightly later than intended. This is not considered to have affected the results of the survey significantly, since those related to dawn surveys when surveyors were in place before light levels were sufficient to enable views across the Kent Project Site. Furthermore, undertaking surveys during a range of weather conditions is considered to provide a more accurate representation of how the Kent Project Site may be utilised by birds. The surveys are therefore considered a robust and reliable basis for decision making.

3.31 There was potential for double counting of bird movement by both surveyors, but surveyors remained in phone contact to discuss bird movements during the survey to try and minimise the potential for this. EDP considers that this is not a significant limitation to the survey.

[7] https://cieem.net/wp-content/uploads/2020/03/CIEEM-COVID-19-Advice-March2020-FINAL.pdf
[8] https://cieem.net/wp-content/uploads/2020/03/CIEEM-COVID-19-Advice-March2020-FINAL.pdf

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Section 4
Combined Survey Results (Baseline Conditions)

4.1 This section of the Report summarises the baseline wintering ornithological conditions determined through the course of field-based investigations undertaken by EDP during 2019/20, as described in **Section 3**, and previous surveys undertaken by CBA, as described in **Section 2**.

4.2 Further technical details of the results are, where appropriate, provided within appendices and on figures to the rear of this report.

Core Counts (Estuary) – Intertidal (Low Tide) Surveys

4.3 Full results of the intertidal surveys can be found in **Annex EDP 5**.

4.4 The species assemblage recorded during intertidal surveys were broadly similar to those recorded by CBA during the winter of 2012/13 and the overall combined results of the intertidal surveys are in line with what might be expected given the context of bird records for the area. However, there were notable species assemblage differences recorded by EDP and CBA, with several target species recorded by EDP that were not recorded by CBA during 2012/13 and several target species recorded by CBA that were not recorded by EDP during 2019/20. For example, the following species were recorded by CBA during 2012/13 but were not recorded during 2019/20 intertidal surveys undertaken by EDP: grey plover, knot, shoveler, great crested grebe, little grebe and snipe. Likewise, the following species were recorded by EDP during the intertidal surveys during 2019/20 but were not recorded by CBA during 2012/13: avocet, black-tailed godwit, dunlin and wigeon.

4.5 The mean and peak counts recorded by EDP and CBA were broadly similar; however, there were notable differences for several species including gadwall, teal and lapwing with mean and peak counts for these species noticeably higher during 2012/13 than 2019/20.

4.6 A summary comparison of each target species recorded by CBA in 2012/13 and EDP in 2019/20 is provided in **Table EDP 4.1**.

4.7 A combined total of 44 species were recorded during 2012/13 and 2019/20. Of the 30 Ramsar/SPA/SSSI qualifying species mentioned in the designation citations, a combined total of 22 were recorded during 2012/13 and 2019/20. Of the 22 Ramsar/SPA/SSSI qualifying species which have stated peak population counts, 11 were recorded by EDP with individual numbers recorded during 2019/20 surveys up to 4.76% (cormorant) of the peak population counts stated in the citations.

4.8 It should be noted that the peak count in **Table EDP 4.1** refers to only one survey event; on all other occasions, the counts were consistently lower.

Table EDP 4.1: Comparison of Winter Intertidal Survey Results Between 2012/13 and 2019/20.

Species	EDP 2019/2020 Results		CBA 2012/2013 Results	
	Maximum	Average	Maximum	Average
Thames Estuary and Marshes Ramsar/SPA/SSSI				
Avocet [283]	2 (0.70%)	-	-	-
Black-tailed godwit [1640]	33 (2.00%)	-	-	-
Common redshank [3251]	57 (1.75%)	36	68 (2.09%)	34
Curlew	2	1	6	3
Dunlin [15171]	18 (0.12%)	-	-	-
European white-fronted goose	-	-	-	-
Gadwall	40	22	126	84
Grey plover [2593]	-	-	5 (0.19%)	-
Hen harrier [7]	-	-	-	-
Knot [7279]	-	-	2 (0.03%)	-
Pintail	-	-	-	-
Ringed plover [1324]	-	-	-	-
Shelduck	9	6	8	4
Shoveler	-	-	2	2
Teal	68	25	150	66
Total No. of Target Species Recorded	**11**			
Medway Estuary and Marshes Ramsar/SPA				
Avocet [314]	2 (0.64%)	-	-	-
Bewick's swan [16]	-	-	-	-
Black-tailed godwit [957]	33 (3.45%)	-	-	-
Common redshank [3690]	57 (1.54%)	36	68 (1.84%)	34
Cormorant [231]	11 (4.76%)	7	26 (11.26%)	9
Curlew [1900]	2 (0.11%)	1	6 (0.32%)	3
Dark-bellied brent goose [3205]	-	-	-	-
Dunlin [25936]	18 (0.07%)	-	-	-
Great crested grebe	-	-	1	1
Greenshank [10]	-	-	-	-
Grey heron	3	3	4	3
Grey plover [3406]	-	-	5 (0.15%)	-
Knot [541]	-	-	2 (0.37%)	-
Lapwing	18	10	90	30
Little Grebe [53]	-	-	1 (1.89%)	1
Mallard	80	40	80	45
Oystercatcher [3672]	8 (0.22%)	6	2 (0.05%)	-
Pintail [697]	-	-	-	-
Pochard	-	-	-	-
Ringed plover [768]	-	-	-	-
Shelduck [4465]	9 (0.20%)	6	8 (0.18%)	4
Shoveler [76]	-	-	2 (2.63%)	2
Spotted redshank [19]	-	-	-	-
Teal [1824]	68 (3.73%)	25	150 (8.22%)	66
Turnstone [561]	7 (1.25%)	4	16 (2.85%)	10
Wigeon [4346]	41 (0.94%)	18	-	-

Species	EDP 2019/2020 Results		CBA 2012/2013 Results	
	Maximum	Average	Maximum	Average
Total No. of Target Species Recorded	**19**			
West Thurrock Lagoon and Marshes SSSI				
Grey Heron	3	3	4	3
Snipe	-	-	4	-
Teal	68	25	150	66
Total No. of Target Species Recorded	**3**			
Overall Total No. of Target Species Recorded	**22**			

Notes:

- Species in bold are Ramsar/SPA qualifying species for which population counts are specifically mentioned in the designation citations (highest winter peak count from the citations is provided in brackets in the table).
- Species in italics are those additional species that contribute to the wintering bird assemblage mentioned in the SPA/SSSI citations, but for which no population counts are mentioned in the designation citations.
- Values in round brackets are a % of the population sizes provided in the designation citations.

4.9 Throughout the 2019/20 intertidal surveys each sector was utilised by bird species on at least one occasion; however, it was evident that some sectors, such as 6 and 7, supported higher species richness and abundance while others such as sectors 8 and 9 were noticeably lower with these sectors dominated by gull species and often returning no records. Wading birds showed a preference for the northern tip and north-western edge of the peninsula where mudflats are exposed more often with sectors 2, 4 and 7 supporting the majority of wading birds recorded during low tide surveys. Conversely, gulls, particularly black-headed gulls, were less selective being recorded in all sectors. Wildfowl, including mallard, teal and wigeon exhibited some preference for the northern/north-west edge of the peninsula with sectors 4, 5, 6 and 7 supporting the majority of records.

4.10 Several target species were recorded on only one occasion with small flocks of dunlin (18) and black-tailed godwit (33) recorded during November 2019 and two avocet recorded during February 2020.

4.11 Numbers of birds recorded was highest within the months of November to February, with a noticeable drop in abundance for many species in March. This trend was particularly noticeable with regards to gadwall, mallard, teal and redshank, which were recorded in relatively high numbers until March when they were present as individuals and small flocks or absent as was the case for teal. However, shelduck, common gull and herring gull were recorded in increased abundance during February and March.

4.12 Skylark (*Alauda arvensis*), meadow pipit (*Anthus pratensis*) and stonechat (*Saxicola rubicola*) were not consistently recorded throughout the survey period, but were frequently encountered within scrub along the river corridor during all surveys.

4.13 Peak counts for the majority species recorded were higher during 2003-08 WeBS surveys than during EDP's 2019/20 intertidal surveys, with notable differences in peak counts for several species including black-tailed godwit, redshank, dunlin, cormorant, curlew, heron, lapwing and shelduck. Additionally, several species recorded during WeBS surveys of the survey area (part of) were not recorded during EDP's 2019/20 intertidal surveys including grey plover, ringed plover, shoveler, dark-bellied brent goose, little grebe, pochard and snipe. Shoveler and snipe, however, were recorded during EDP's high tide surveys. Likewise, both avocet and wigeon were recorded during EDP's intertidal surveys but were not recorded during WeBS surveys. **Table EDP 4.2** shows a comparison of EDP's 2019/20 results with 2003-08 WeBS surveys covering part of the survey area to the north-west of the peninsula and the wider Thames Estuary.

Table EDP 4.2: Comparison of Intertidal Survey Results with WeBS data.

Target Species	EDP Data	WeBS Data	
	2019/20 Peak Count (% of Wider Estuary in Brackets)	WeBS Peak – Part of Survey Area (% of Wider Estuary in Brackets)	WeBS Peak – Wider Thames Estuary
Thames Estuary and Marshes Ramsar/SPA/SSSI			
Avocet	2 (0.06)	-	3177
Black-tailed godwit	33 (0.58)	75 (1.32)	5960
Common redshank	57 (2.37)	361 (15)	2403
Curlew	2 (0.06)	11 (0.32)	3425
Dunlin	18 (0.07)	344 (1.25)	27630
European white-fronted goose	-	-	13
Gadwall	40 (9.2)	19 (4.37)	435
Grey plover	-	4 (0.13)	3059
Hen harrier	-	-	-
Knot	-	-	22362
Pintail	-	-	141
Ringed plover	-	40 (5.22)	767
Shelduck	9 (0.61)	19 (1.28)	1479
Shoveler	-	8 (1)	803
Teal	68 (1.67)	70 (1.72)	4069
Medway Estuary and Marshes Ramsar/SPA			
Avocet	2	-	3177
Bewick's swan	-	-	10
Black-tailed godwit	33 (0.58)	75 (1.32)	5960
Common redshank	57 (2.37)	361 (15)	2403
Cormorant	11 (4.28)	53 (20.62)	257
Curlew	2 (0.06)	11 (0.32)	3425
Dark-bellied brent goose	-	5 (0.03)	15365
Dunlin	18 (0.07)	344 (1.25)	27630
Great crested grebe	-	-	189
Greenshank	-	-	86
Grey heron	3 (4.23)	20 (28.71)	71
Grey plover	-	4 (0.13)	3059
Knot	-	-	22362
Lapwing	18 (0.18)	115 (1.17)	9862

Target Species	EDP Data	WeBS Data	
	2019/20 Peak Count (% of Wider Estuary in Brackets)	WeBS Peak – Part of Survey Area (% of Wider Estuary in Brackets)	WeBS Peak – Wider Thames Estuary
Little Grebe	-	7 (1.8)	388
Mallard	80 (6.99)	80 (6.99)	1144
Oystercatcher	8 (0.05)	4 (0.02)	16557
Pintail	-	-	141
Pochard	-	1 (0.17)	587
Ringed plover	-	40 (5.22)	767
Shelduck	9 (0.61)	19 (1.28)	1479
Shoveler	-	8 (1)	803
Spotted redshank	-	-	7
Teal	68 (1.67)	70 (1.72)	4069
Turnstone	7 (1.11)	6 (0.95)	630
Wigeon	41 (0.57)	-	7163
West Thurrock Lagoon and Marshes SSSI			
Grey Heron	3 (4.23)	20 (28.71)	71
Snipe	-	10 (8.77)	114
Teal	68 (1.67)	70 (1.72)	4069

4.14 Overall, although the proportion of wildfowl and waders present during EDP's intertidal surveys in relation to the Thames Estuary are reasonably low; however, both mallard and gadwall were particularly abundant within the survey area comprising 9.2% and 6.99% of the Thames Estuary mean peak count, respectively. As for the 2003/08 WeBS survey data which covers part of the Kent Project Site, grey heron and cormorant were notably abundant representing 28.71% and 20.62% of the Thames Estuary mean peak count. However, in comparison, the peak count of grey heron and cormorant during EDP's 2019/20 intertidal surveys represented only 4.23 and 4.28% of the Thames Estuary mean peak count. The peak count of 20 grey heron at the Kent Project Site during 2003/08 WeBS surveys is likely to be due to the presence of a heron located on Black Duck Marsh.

Core Counts (Estuary) – High Tide Surveys

4.15 Full results of the high tide surveys can be found in **Annex EDP 6**.

4.16 The results of the 2019/20 surveys were again broadly similar to those recorded by CBA during 2012/13, although those target species that were recorded by both EDP and CBA were generally higher in abundance during 2012/13, with the exception of mallard. Additionally, as was the case during intertidal surveys, there were notable species assemblage differences recorded by EDP and CBA with several target species recorded by EDP that were not recorded by CBA during 2012/13 and several target species recorded by CBA that were not recorded by EDP during 2019/20. For example, the following target species were recorded by CBA during 2012/13 but were not recorded during 2019/20 high tide surveys undertaken by EDP: grey plover, great crested grebe,

little grebe and turnstone. Likewise, the following target species were recorded by EDP during the high tide surveys during 2019/20 but were not recorded by CBA during 2012/13: avocet, curlew and snipe.

4.17 The mean and peak counts recorded by EDP and CBA were again broadly similar, with less variation compared to intertidal surveys. However, there were some notable differences with mean and peak counts with lapwing noticeably higher during 2012/13 than 2019/20.

4.18 A summary comparison of each target species recorded by CBA in 2012/13 and EDP in 2019/20 is provided in **Table EDP 4.3**.

4.19 A combined total of 42 species were recorded during 2012/13 and 2019/20. Of the 30 Ramsar/SPA/SSSI qualifying species mentioned in the designation citations, a combined total of 18 were recorded during 2012/13 and 2019/20. Of the 22 Ramsar/SPA/SSSI qualifying species which have stated peak population counts, 9 were recorded by EDP with individual numbers recorded during 2019/20 surveys up to 8.66% (teal) of the peak population counts stated in the citations.

4.20 It should be noted that the peak count in **Table EDP 4.3** refers to only one survey event; on all other occasions, the counts were consistently lower.

Table EDP 4.3: Comparison of Winter High Tide Survey Results Between 2012/13 and 2019/20.

Species	EDP 2019/2020 Results		CBA 2012/2013 Results	
	Maximum	Average	Maximum	Average
Thames Estuary and Marshes Ramsar/SPA/SSSI				
Avocet [283]	5 (1.77%)	-	-	-
Black-tailed godwit [1640]	-	-	-	-
Common redshank [3251]	54 (1.66%)	29	60 (1.85%)	51
Curlew	3	2	-	-
Dunlin [15171]	-	-	-	-
European white-fronted goose	-	-	-	-
Gadwall	85	48	105	74
Grey plover [2593]	-	-	1 (0.04%)	-
Hen harrier [7]	-	-	-	-
Knot [7279]	-	-	-	-
Pintail	-	-	-	-
Ringed plover [1324]	-	-	-	-
Shelduck	4	-	5	3
Shoveler	1	-	6	-
Teal	158	81	190	110
Total No. of Target Species Recorded	**8**			
Medway Estuary and Marshes Ramsar/SPA				
Avocet [314]	5 (1.59%)	-	-	-
Bewick's swan [16]	-	-	-	-
Black-tailed godwit [957]	-	-	-	-
Common redshank [3690]	54 (1.46%)	29	60 (1.63%)	51

Species	EDP 2019/2020 Results		CBA 2012/2013 Results	
	Maximum	Average	Maximum	Average
Cormorant [231]	15 (6.49%)	8	22 (9.52%)	16
Curlew [1900]	3 (0.16%)	2	-	-
Dark-bellied brent goose [3205]	-	-	-	-
Dunlin [25936]	-	-	-	-
Great crested grebe	-	-	1	-
Greenshank [10]	-	-	-	-
Grey heron	3	2	3	2
Grey plover [3406]	-	-	1 (0.03%)	-
Knot [541]	-	-	-	-
Lapwing	38	12	230	63
Little Grebe [53]	-	-	1 (1.89%)	-
Mallard	193	91	87	49
Oystercatcher [3672]	3 (0.08%)	-	5 (0.14%)	4
Pintail [697]	-	-	-	-
Pochard	-	-	-	-
Ringed plover [768]	-	-	-	-
Shelduck [4465]	4 (0.09%)	-	5 (0.11%)	3
Shoveler [76]	1 (1.32%)	-	6 (7.89%)	-
Spotted redshank [19]	-	-	-	-
Teal [1824]	158 (8.66%)	81	190 (10.42%)	110
Turnstone [561]	-	-	18 (3.21%)	12
Wigeon [4346]	3 (0.07%)	-	4 (0.09%)	-
Total No. of Target Species Recorded	**16**			
West Thurrock Lagoon and Marshes SSSI				
Grey Heron	3	2	3	2
Snipe	2	2	-	-
Teal	158	81	190	110
Total No. of Target Species Recorded	**3**			
Overall Total No. of Target Species Recorded	**18**			

Notes:

- Species in bold are Ramsar/SPA qualifying species for which population counts are specifically mentioned in the designation citations (highest peak count from the citations is provided in brackets in the table).
- Species in italics are those additional species that contribute to the wintering bird assemblage mentioned in the SPA/SSSI citations, but for which no population counts are mentioned in the designation citations.
- Values in round brackets are a % of the population sizes provided in the designation citations.

4.21 Species diversity was reduced across most of the survey compared to low tide with fewer species overall and therefore fewer target species recorded; however, wildfowl and gulls (particularly black-headed gulls) were noticeably higher in abundance during high tide. Generally, sectors 8 and 9 had very few birds with most activity concentrated off the northern tip and north-western edge of the peninsula.

4.22 Throughout the 2019/20 high tide surveys birds were seen to utilise each sector on at least one occasion. However, a similar trend to the intertidal surveys was seen where it was evident that some sectors, particularly sectors 5, 6 and 7, supported higher species richness and abundance. Other sectors on the other hand, most notably sector 9, supported far fewer species with the occasional wildfowl and low numbers of gulls recorded.

4.23 Wading birds again showed a preference for the northern tip and north-western edge of the peninsula where some saltmarsh and mudflat habitat often remain exposed during high tide. Redshank was frequent along the estuary frontage over the entire survey effort although was notably higher in numbers at high tide with the metal jetty off the northern tip of the peninsula being a preferred roosting area. Likewise, the jetty itself was often used as a resting area for black-headed gulls, great black-backed gulls and cormorant.

4.24 The existing pier extending from the west of the peninsula forms a sheltered 'bay', which was consistently used by flocks of wildfowl throughout the winter, including gadwall, teal, wigeon and mallard.

4.25 Numbers of each species were fairly consistent throughout the winter for most species, although there was a noticeable drop in abundance for several wildfowl and waders during March, with lapwing absent or present in very low numbers in late winter.

4.26 Within the Kent Project Site, gulls were particularly prevalent, with lesser black-backed gull, herring gull, black-headed gull and common gull all recorded in small numbers. Additionally, greylag geese were frequently recorded in double figures within the fields at Botany Marsh to the east of the peninsula. As for waders, small numbers of lapwing were also recorded at Botany Marsh and small numbers of snipe were recorded within the landfill and rough grassland fields to the north and south of Ebbsfleet International. It is possible that snipe were under-recorded due to their cryptic nature and tendency to flush very late.

4.27 Wildfowl, including mallard, shelduck, and shoveler were also recorded to utilise Botany Marsh on at least one occasion during 2019/20 high tide surveys. A small pond located within the north-east corner of the rough grassland field, located to the immediate south of the A2260 road, also supported small numbers of wildfowl with shoveler, mallard and little grebe all recorded on at least one occasion.

4.28 A male marsh harrier was seen each month over the reedbeds throughout the peninsula with a female also recorded later in the winter.

4.29 As with CBA's intertidal surveys, peak counts for several of the species recorded were higher during 2003/08 WeBS surveys than during EDP's 2019/20 intertidal surveys, with notable differences in peak counts for several species including redshank, cormorant, curlew, heron, lapwing, shelduck and snipe. Conversely, peak counts for mallard and teal were significantly higher during EDP's high tide surveys than during 2003/08 WeBS surveys. Several species recorded during the WeBS surveys of the survey area (part of) were not recorded during EDP's 2019/20 high tide surveys including black-tailed godwit,

dunlin, grey plover, ringed plover, dark-bellied brent goose, little grebe, pochard and turnstone. Black-tailed godwit, dunlin and turnstone were, however, recorded during EDP's intertidal surveys. Likewise, both avocet and wigeon were recorded during both EDP's intertidal and high tide surveys but were not recorded during 2003/08 WeBS surveys. **Table EDP 4.4** shows a comparison of 2019/20 results with WeBS surveys of the same area (part of) and wider Thames Estuary.

Table EDP 4.4: Comparison of High Tide Survey Results with WeBS data.

Target Species	EDP Data	WeBS Data	
	2019/20 Peak Count (% of Wider Estuary in Brackets)	WeBS Peak – Part of Survey Area (% of Wider Estuary in Brackets)	WeBS Peak – Wider Thames Estuary
Thames Estuary and Marshes Ramsar/SPA/SSSI			
Avocet	5 (0.16)	-	3177
Black-tailed godwit	-	75 (1.32)	5960
Common redshank	54 (2.25)	361 (15)	2403
Curlew	3 (0.09)	11 (0.32)	3425
Dunlin	-	344 (1.25)	27630
European white-fronted goose	-	-	13
Gadwall	85 (19.54)	19 (4.37)	435
Grey plover	-	4 (0.13)	3059
Hen harrier	-	-	-
Knot	-	-	22362
Pintail	-	-	141
Ringed plover	-	40 (5.22)	767
Shelduck	4 (0.27)	19 (1.28)	1479
Shoveler	1 (0.12)	8 (1)	803
Teal	158 (3.88)	70 (1.72)	4069
Medway Estuary and Marshes Ramsar/SPA			
Avocet	5 (0.16)	-	3177
Bewick's swan	-	-	10
Black-tailed godwit	-	75 (1.32)	5960
Common redshank	54 (2.25)	361 (15)	2403
Cormorant	15 (5.84)	53 (20.62)	257
Curlew	3 (0.09)	11 (0.32)	3425
Dark-bellied brent goose	-	5 (0.03)	15365
Dunlin	-	344 (1.25)	27630
Great crested grebe	-	-	189
Greenshank	-	-	86
Grey heron	3 (4.23)	20 (28.71)	71
Grey plover	-	4 (0.13)	3059
Knot	-	-	22362
Lapwing	38 (0.39)	115 (1.17)	9862
Little Grebe	-	7 (1.8)	388
Mallard	193 (16.87)	80 (6.99)	1144
Oystercatcher	3 (0.02)	4 (0.02)	16557
Pintail	-	-	141
Pochard	-	1 (0.17)	587

Target Species	EDP Data	WeBS Data	
	2019/20 Peak Count (% of Wider Estuary in Brackets)	WeBS Peak – Part of Survey Area (% of Wider Estuary in Brackets)	WeBS Peak – Wider Thames Estuary
Ringed plover	-	40 (5.22)	767
Shelduck	4 (0.27)	19 (1.28)	1479
Shoveler	1 (0.12)	8 (1)	803
Spotted redshank	-	-	7
Teal	158 (3.88)	70 (1.72)	4069
Turnstone	-	6 (0.95)	630
Wigeon	3 (0.04)	-	7163
West Thurrock Lagoon and Marshes SSSI			
Grey Heron	3 (4.23)	20 (28.71)	71
Snipe	2 (1.75)	10 (8.77)	114
Teal	158 (3.88)	70 (1.72)	4069

4.30 Overall, although the proportion of wildfowl and waders present during EDP's high tide surveys in relation to the Thames Estuary are reasonably low, several wildfowl species were found to be relatively abundant within the survey area including gadwall, mallard and teal which have at some point represented 19.54%, 16.87% and 3.88% of the Thames Estuary mean counts respectively. Other species found to be relatively abundant during EDP's high tide surveys include redshank, cormorant and grey heron representing between 2.25% and 5.84% of the mean counts for the wider Thames Estuary. Historic WeBS data for part of the survey area demonstrates similar proportions with the exception of grey heron, cormorant, redshank and snipe, which represented 28.71%, 20.62%, 15% and 8.77% of the wider Thames Estuary mean peak counts.

On-site Wintering Bird Surveys

4.31 Full results of the wintering bird surveys can be found in **Annex EDP 7** and shown on **Figures 12.32-12.36** (Document reference: 6.3.12.32 to 6.3.12.16 inclusive).

4.32 A total of 81 species were recorded throughout the 5 monthly survey visits, of which 40 (i.e. 49%) are considered to be of conservation concern (16 are listed on the Red list; 24 are on the Amber List of Birds of Conservation Concern (BoCC4)). In addition, bearded tit, Cetti's warbler and Dartford warbler, which are no longer considered to be of conservation concern due to population increases but benefit from legal protection under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended), making it an offence to intentionally or recklessly disturb these species at, on or near an 'active' nest, were also recorded. The remaining 38 species are either on the Green List or have no status (i.e. are not native to the UK).

4.33 **Tables EDP 4.5** and **4.6** show a summary of Ramsar/SPA/SSSI qualifying species and species of conservation concern recorded within the Kent Project Site along with peak and mean counts.

4.34 Of the 30 Ramsar/SPA/SSSI qualifying species mentioned in the designation citations, 15 (i.e. 50%) were recorded during the 2019/20 winter bird surveys. Of the 22 Ramsar/SPA qualifying species which have stated peak population counts, 9 were recorded during the winter bird surveys, with peak numbers recorded 0.05–15% of the peak population counts stated in the citations; typically relating to individuals or small flocks of each species recorded on one or more survey visits.

4.35 28 additional terrestrial species (non-wader, non-wildfowl species) of conservation concern were also recorded in generally low to moderate numbers, typically relating to individuals or small flocks of each species recorded on one or two survey visits, but also including reasonable numbers of species such as dunnock and Cetti's warbler.

Table EDP 4.5: On-site Wintering Bird Survey Results 2018/19 (Target SPA/Ramsar Species).

Target Species	EDP 2019/2020 Results	
	Maximum	Average
Thames Estuary and Marshes Ramsar/SPA/SSSI		
Avocet [283]	-	-
Black-tailed godwit [1640]	23 (1.4%)	-
Common redshank [3251]	2 (0.06%)	-
Curlew	-	-
Dunlin [15171]	-	-
European white-fronted goose	-	-
Gadwall	32	14
Grey plover [2593]	-	-
Hen harrier [7]	-	-
Knot [7279]	-	-
Pintail	-	-
Ringed plover [1324]	-	-
Shelduck	15	15
Shoveler	6	4
Teal	56	22
Total No. of Target Species Recorded	**6**	
Medway Estuary and Marshes Ramsar/SPA		
Avocet [314]	-	-
Bewick's swan [16]	-	-
Black-tailed godwit [957]	23 (2.4%)	-
Common redshank [3690]	2 (0.05%)	-
Cormorant [231]	9 (3.9%)	5
Curlew [1900]	-	-
Dark-bellied brent goose [3205]	-	-
Dunlin [25936]	-	-
Great crested grebe	-	-
Greenshank [10]	-	-
Grey heron	6	2
Grey plover [3406]	-	-
Knot [541]	-	-
Lapwing	3	2

Target Species	EDP 2019/2020 Results	
	Maximum	Average
Little Grebe [53]	8 (15%)	5
Mallard	160	59
Oystercatcher [3672]	2 (0.05%)	-
Pintail [697]	-	-
Pochard	2	-
Ringed plover [768]	-	-
Shelduck [4465]	15 (0.34%)	15
Shoveler [76]	6 (8%)	4
Spotted redshank [19]	-	-
Teal [1824]	56 (3.1%)	22
Turnstone [561]	-	-
Wigeon [4346]	6 (0.14%)	4
Total No. of Target Species Recorded	**13**	
West Thurrock Lagoon and Marshes SSSI		
Grey Heron	6	2
Snipe	11	7
Teal	56	22
Total No. of Target Species Recorded	**3**	
Overall Total No. of Target Species Recorded	**15**	

Table EDP 4.6: On-site Wintering Bird Survey Results 2018/19 (Non-target Species).

Species	Protection/UK Nature Conservation Status*	Maximum	Mean
Bearded tit	Schedule 1	6	-
Black-headed gull	Amber	144	70
Bullfinch	Amber, S41 NERC	2	1
Cetti's warbler	Schedule 1	34	24
Common gull	Amber	1	-
Dartford warbler	Schedule 1	1	-
Dunnock	Amber, S41 NERC	34	26
Fieldfare	Red, Schedule 1	71	40
Great black-backed gull	Amber	5	3
Grey partridge	Red, S41 NERC	1	-
Grey wagtail	Red	4	-
Herring gull	Red, S41 NERC	6	3
House sparrow	Red, S41 NERC	4	-
Kestrel	Amber	5	3
Lesser black-backed gull	Amber	3	2
Lesser redpoll	Red, S41 NERC	2	-
Linnet	Red, S41 NERC	17	12
Marsh harrier	Amber, Schedule 1	5	3
Marsh tit	Red, S41 NERC	1	1
Meadow pipit	Amber	26	11
Redwing	Red	45	33
Reed bunting	Amber, S41 NERC	5	3

Species	Protection/UK Nature Conservation Status*	Maximum	Mean
Skylark	Red, S41 NERC	17	7
Snipe	Amber	11	7
Song Thrush	Red, S41 NERC	11	5
Starling	Red	44	25
Stock dove	Amber	1	-
Woodcock	Red	1	-

* Amber or Red refers to the status of birds listed on the BTO Birds of Conservation Concern 4 list; S41 NERC refers to those species listed on the Habitats and Species of Principal Importance for Nature Conservation (also known as 'Priority Species') – a list that is required to be in operation under Section 41 of the Natural Environment and Rural Communities Act 2006 (as amended), and to which Local Planning Authorities must have due regard when exercising their biodiversity functions. Schedule 1 refers to those birds listed under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended), making it an offence to intentionally or recklessly disturb these species at, on or near an 'active' nest.

4.36 The majority of species recorded were distributed across the peninsula reflecting the use of reedbed, scrub, pasture as well as wetland habitat along the estuary front. Cetti's warbler was particularly well represented on the peninsula with a mean peak count of 24 recorded over the 5 monthly survey visits. However, it is considered likely that this is an over-estimation of the Kent Project Site's total population due to the difficulty of 'triangulating' individuals singing from reedbed and dense scrub. Other species commonly encountered on the peninsula include dunnock, redwing, fieldfare and gulls, notably black-headed gull.

4.37 Species distribution across the peninsula was widespread; however, areas such as Botany Marsh were preferred by several species including greylag goose, shoveler, mallard, lapwing and shelduck, particularly during high tide.

4.38 Other notable species recorded on the peninsula include Dartford warbler and marsh harrier, both of which were recorded in low numbers. Dartford warbler was recorded on a single occasion during January 2020, while marsh harrier was seen on all but one of the five monthly winter bird survey visits. It is important to note that the maximum (5) and average (3) peak counts for marsh harrier are likely registrations of this species representing a total of two individuals, with a max total of only two individuals (a single male and female) seen at any one time. Recorded birds were principally associated with the interior of the peninsula, with evidence of both the male and female using the reedbeds at Black Duck Marsh, Botany Marsh and the reedbed to the east of the HS1 tunnel portal. The species was confirmed as roosting in the centre of Black Duck Marsh. Likewise, the maximum (5) and mean (3) peak counts for kestrel (*Falco tinnunculus*) are also likely to be registrations of this species representing two individuals, with a single male or female seen at any one time.

4.39 Further south, inland from the peninsula, overall species diversity decreased; however, some species of conservation concern including dunnock, song thrush, snipe and skylark were just as abundant or even more abundant than on the peninsula itself. Species

recorded inland that were not recorded on the peninsula include those such as woodcock (*Scolopax rusticola*), grey partridge (*Perdix perdix*) and house sparrow.

Vantage Point Surveys

4.40 Full results of the vantage point surveys are illustrated on **Figures 12.37-12.41** (Document reference: 6.3.12.37 to 6.3.12.41 inclusive).

4.41 Records from the vantage point surveys predominantly related to gull flyovers, with small flocks of common, black-headed, lesser black-backed, great black-backed gull and herring gull. Flocks were predominantly seen to fly over the Kent Project Site, not coming into land. Small numbers of wildfowl were also observed to fly over the Kent Project Site including gadwall, shelduck, teal and mallard to roost within the large, open waterbody in the centre of Black Duck Marsh. Several species of wader were also observed flying over the Kent Project Site on several occasions, most notably double figure flocks of lapwing.

4.42 Species regularly observed coming into land include double figure flocks of greylag geese landing at Botany Marsh.

4.43 As for raptors, a marsh harrier was observed moving through the peninsula on several occasions and also seen going down to roost within the reedbeds at Black Duck Marsh. The marsh harrier was seen descending into the reedbed shortly after sunset in the same location on multiple occasions over the winter survey period. Additionally, a kestrel was seen on occasion moving through the peninsula and attempting to forage and a barn owl (*Tyto alba*) was seen near Vantage Point 1 moving through the peninsula and again near Manor Way Road whilst leaving the Kent Project Site following a dusk vantage point survey of the peninsula.

4.44 Most of the remainder of records made were of terrestrial species, the most pertinent of which was a modest flock of starling seen using the pylons north of Botany Marsh before going down to roost within the reedbed below. Other notable terrestrial species recorded include a c.150 mixed flock of redwing and fieldfare as well as several smaller flocks for these species moving through the peninsula.

Section 5
Summary of Findings and Discussion

5.1 The nature conservation valuation system used in this section to evaluate features (based upon CIEEM, 2018[9]) is as follows: International/European > National > County > District > Local > 'Site' > negligible.

5.2 'Functionally linked' land refers to land outside the Ramsar/SPA/SSSI that supports Ramsar/SPA/SSSI qualifying species, and therefore provides a function linked to the Ramsar/SPA/SSSI.

Estuarine Wintering Wader/Wildfowl Assemblage (Core Count Zones 1 to 9)

5.3 The core areas in which Ramsar/SPA/SSSI qualifying species were regularly recorded generally relate to the northern tip and north-western edge of the peninsula where opportunities to roost in the form of a jetty and pier exist, along with a constant exposure of at least some mudflat habitat during both high and low tide, with sectors 5, 6 and 7 being particularly well utilised by those wildfowl and waders which were recorded.

5.4 A combined total of up to 44 species were recorded during 2012/13 and 2019/20 intertidal and high tide surveys. Of the 30 Ramsar/SPA/SSSI qualifying species mentioned in the designation citations, a total of twenty-two have been recorded during the surveys undertaken during 2012/13 and 2019/20 at either low or high tide. Of the 22 Ramsar/SPA qualifying species which have stated peak population counts, EDP recorded an overall total of 12 over the course of the 2019/20 high and low tide surveys. Of these species, teal and cormorant were recorded in significant numbers with their peak counts during the high tide survey being 8.66% and 6.49% of the quoted populations within the citations, respectively. A peak count of 33 black-tailed godwit seen on one occasion during the November 2019 intertidal survey also represents up to 3.45% of the quoted population counts.

5.5 Given the diversity of species present which are associated with various internationally and nationally important sites for birds in the local area, the wintering wader/ wildfowl assemblage is valued as important at the International level. The assemblage recorded using the Kent Project Site is likely to form a constituent part of the nearby SPA/Ramsar/SSSI populations, particularly with regard to wildfowl. A number of species, notably gadwall, mallard and teal which represented 19.54%, 16.87% and 3.88% of the Thames Estuary mean counts as indicated by WeBS data. Several species of waders were also recorded during high and low tide with redshank numbers representing up to 2.37% of the Thames Estuary mean peak count and up to 1.75% of the population count within the citation for the nearby designations. Redshank in

[9] CIEEM (2018*). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine*. Chartered Institute for Ecology and Environmental Management, Winchester.

particular displayed a preference for the northern tip of the peninsula with the metal jetty and surrounding area often being used as a roost during high tide.

5.6 Given these species prevalence around the northern tip (between the harbour and metal jetty) and along the north-western edge (around the existing pier) of the peninsula in particular, these areas should be considered as important roosting areas for a significant proportion of an internationally important assemblage of wildfowl/waders. The species assemblage recorded utilising the Kent Project Site are not recorded in numbers that would be regarded as important at the international or national level in their own right. Therefore, although the site itself is not regarded to have value at the international level, it is important to consider the assemblage of estuarine wintering wader and wildfowl as having value of International importance.

5.7 Given the presence of multiple designations for wintering bird interest within the local area, it is not possible to identify a single designation to which the Kent Project Site wintering bird assemblage is functionally linked. It is likely that wader/wildfowl populations present are part of a wider meta-population that may at some time use any or all such designations along the wider Thames System.

Inland Wintering Bird Assemblage

5.8 Of the 30 Ramsar/SPA/SSSI qualifying species mentioned in the designation citations, 15 (i.e. 50%) were recorded throughout the Kent Project Site during 2019/20. Of the 22 Ramsar/SPA qualifying species which have stated peak population counts, 9 were recorded on the Kent Project Site, with peak numbers recorded 0.05–15% of the peak population counts stated in the citations, with the most notable being little grebe (15%), shoveler (8%), cormorant (3.9%), teal (3.1%) and black-tailed godwit (2.4%). Cormorant, teal and black-tailed godwit were principally associated with the estuary front, however, whilst little grebe and shoveler were present throughout suitable habitat within the Kent Project Site, most notably Black Duck Marsh and Botany Marsh.

5.9 Twenty-eight additional terrestrial species (non-wader, non-wildfowl species) of conservation concern were also recorded in generally low to moderate numbers, typically relating to individuals or small flocks of each species recorded on one or two survey visits, but also including reasonable numbers of species such as dunnock and Cetti's warbler. Additionally, a maximum of two marsh harriers were seen on several occasions, principally associated with the peninsula with evidence of both the male and female using the reedbeds at Black Duck Marsh and within the centre of the peninsula to roost.

5.10 Two distinct areas within the Kent Project Site appear to be 'functionally linked' directly to the estuary, and therefore to nearby Ramsar/SPA/SSSI designations, are Botany Marsh and Black Duck Marsh, which are locally important areas at dawn (rest)/high tide (refuge) for small numbers of lapwing, shoveler, shelduck and mallard as well as for other species of conservation concern including greylag geese. As noted above, given the presence of multiple designations for wintering bird interest within the local area, it is not possible to identify which designation the Kent Project Site is functionally linked to and it must be

assumed that the wader/wildfowl populations present are part of a wider meta-population that may at some time use any or all such designations.

5.11 In EDP's opinion, although the Kent Project Site itself is not regarded to have value at the international level, the wintering wader/wildfowl assemblage present within inland areas of the Kent Project Site itself, given their status as functionally linked to the estuary assemblage, must be valued at the International level for nature conservation value. This is a precautionary evaluation based on peak counts during desk study information and survey data from 2012/13 and 2019/20. In addition, and in EDP's opinion, the surveys have confirmed that the vast majority of the Kent Project Site (excluding those areas mentioned above) is not 'functionally linked' to any of the Ramsar/SPA/SSSI designations identified above.

5.12 As noted above, the remainder of the Kent Project Site, particularly areas of Manor Way Industrial Estate, the various chalk pits and landfill sites, and the Ebbsfleet Valley, is not considered to be functionally linked to any designated sites. This is consistent with the lack of suitable wetland habitat, prevalence of woody/scrubby habitats and increased levels of urbanisation/disturbance south of the peninsula.

5.13 As for terrestrial species (non-wader and non-wildfowl), it is considered that that the diversity and abundance of over-wintering birds within the Kent Project Site is relatively high, with a significant diversity of Schedule 1 birds recorded on the Kent Project Site, including a roosting pair of marsh harrier and modest population of Cetti's warbler. Additionally, several birds of conservation concern, including modest populations of dunnock, skylark, starling and snipe were also recorded.

5.14 Therefore, in EDP's opinion, the wintering bird assemblage (terrestrial species only) present on site is of County Importance.

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Annex EDP 1
Tilbury2 Wintering Bird Survey Results by Compartment (2016-17)
Document Ref: Appendix 10.1 and Figure 10.12

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PORT OF
TILBURY
LONDON

PLANNING ACT 2008

INFRASTRUCTURE PLANNING
(APPLICATIONS: PRESCRIBED FORMS AND PROCEDURE) REGULATIONS 2009

PROPOSED PORT TERMINAL AT FORMER TILBURY POWER STATION

TILBURY2

WINTERING BIRD SURVEY RESULTS BY COMPARTMENT (2016-17)

DOCUMENT REF: APPENDIX 10.I

TILBURY2

Appendix 10.I: Breakdown of the number of individual birds encountered during the 2016-17 surveys within each compartment in the survey area (see Figure 10.12).

Compartment and species	18/11/2016	16/12/2016	26/01/2017	22/02/2017	16/03/2017	19/09/2017	10/10/2017
IT1							
Avocet			1				
Black-headed gull	10	5	4	210	42	66	27
Common gull			1	4			
Curlew			8	2	1		
Dunlin			36				
Herring Gull				1	2		
Lapwing			7				
Lesser black-backed gull	1						
Mute swan			3				
Oystercatcher					2		
Redshank	2	2	7	5			
Teal			2				
Notes			#	$			
IT2							
Black-headed gull	4	1				14	3
Curlew	1						
Lapwing	13						
Redshank	2	5					
Teal			1				
Turnstone		4					
				No birds	No birds		
IT3							
Black-headed gull		3					5
Curlew	5						
Gadwall			2				
Lapwing		9					
Mallard			5				
Oystercatcher						1	
Redshank	2	3					
Teal		3	14				
Turnstone		4					
				No birds	No birds		

Compartment and species	18/11/2016	16/12/2016	26/01/2017	22/02/2017	16/03/2017	19/09/2017	10/10/2017
IT4							
Avocet	1		11				
Black-headed gull	12	8	30		13		3
Curlew		1					
Dunlin			19				
Gadwall			23	40			
Mallard			3	4		14	
Redshank	1	7	12				
Shelduck	4		1		5		4
Teal		14	101	126	16		
IT5							
Black-headed gull						62	
Cormorant							1
Gadwall			20				
Herring gull						1	
Mallard	72	4			2	36	66
Redshank	7	7				1	1
Teal	49	7	27		5		
IT6							
Black-headed gull	9			74	29	56	48
Common sandpiper						1	
Curlew		2	2				
Gadwall			9				
Little gull						1	
Mallard	20	14	50	31	2		
Oystercatcher				1	1		
Redshank		1	1				
Teal	1	1	13	4	4		
IT7							
Black-headed gull	54	3			118	70	90
Common gull		1					
Cormorant				1			
Curlew	1	1	1		3		1
Dunlin			1				
Grey plover			2				
Mallard			10	28	10		
Shelduck			9		1		
Teal		5	8	22	4		

Compartment and species	18/11/2016	16/12/2016	26/01/2017	22/02/2017	16/03/2017	19/09/2017	10/10/2017
Turnstone			1				
IT8							
Black-headed gull	38	3			62	20	31
Black-tailed godwit						4	
Common gull		3					
Curlew	12	28			17		1
Dunlin	13					33	3
Great black-backed gull		1					3
Grey heron						1	
Grey plover	8						
Little egret		2					
Mallard		2		2			
Oystercatcher					3		
Redshank	2	4	1				
Ringed plover	5					10	44
Shelduck					9		
Teal		85			2		
E1							
No birds recorded							
E2							
No birds recorded							
E3							
No birds recorded							
E4							
No birds recorded							
E5							
Black-headed gull	22					55	
Gadwall		8					
Mallard	38	6				5	
Teal	59	40					
E6							
Black-headed gull						44	

Compartment and species	18/11/2016	16/12/2016	26/01/2017	22/02/2017	16/03/2017	19/09/2017	10/10/2017
E7							
Black-headed gull		18					
Mallard		4					
E8							
No birds recorded							
J1							
Black-headed gull		35	5				
Common gull			1				
Cormorant			1				1
Great black-backed gull			1				
J2							
Common gull			1				
Mallard		3				20	6
J2a							
Cormorant				1		1	
Mallard			12	14	10		
Oystercatcher				1			
J3							
Black-headed gull			1			69	
M1							
Black-headed gull			21		4		
Coot			4	2			
Gadwall		6	2				
Kingfisher						1	
Little egret						1	
Little Grebe	18	24	13	14	8	20	8
Mallard		7					
Mute swan		2					
Oystercatcher						1	
Pochard			2				
Redshank			1				
Teal		2				2	

Compartment and species	18/11/2016	16/12/2016	26/01/2017	22/02/2017	16/03/2017	19/09/2017	10/10/2017
M2							
Black-headed gull		4		4			
Canada goose			3	2			
Dunlin			2				
Gadwall			3				
Grey heron							1
Lapwing	2	154	16				
Little egret						4	
Mallard	4	9	1	6	7		
Moorhen	1						
Mute swan	4				2		
Pied wagtail				1			
Shelduck			3	1			
Shoveler			12				
Teal	16	37	38	19	12		
F1							
Lapwing			6				
F2							
Mallard		4					
F3							
Lapwing			3				
Mallard				5			
F4							
No birds							
F5							
Black-headed gull					10		
Little egret						1	
Little grebe			2				
Mallard					4		
Teal					4		
Snipe			1				
Sewage Treatment Works							
Black-headed gull	40	15	115	9	30	17	40
Moorhen					1		

Compartment and species	18/11/2016	16/12/2016	26/01/2017	22/02/2017	16/03/2017	19/09/2017	10/10/2017
Other Species (along footpath)							
Species	18/11/2016	16/12/2016	26/01/2017	22/02/2017	16/03/2017	19/09/2017	10/10/2017
Blackbird			1				
Blue tit						p	
Carrion crow							
Collared dove			1	1	1		
Dunnock		p	3		1	p	
Feral pigeon		p	3			p	p
Goldfinch	p	p		2		p	
Grey Wagtail	p	p	1				
Kestrel			1			2	1
Linnet	p		25	8	1	62	24
Magpie				2		p	
Meadow pipit	p	p		2	1		10
Pied wagtail	p	p				p	3
Robin				1		p	
Song thrush		p	1				
Starling		p				p	
Stonechat	2	1				2	2
Swallow						p	
Wren			2	1	1		1
Fields (F1-F5)							
Species	18/11/2016	16/12/2016	26/01/2017	22/02/2017	16/03/2017	19/09/2017	10/10/2017
Blackbird			1				
Carrion crow			1				
Dunnock			1			1	
Goldfinch						p	
Great Tit	2						
Kestrel							
Linnet	c.5	p				3	
Magpie	3	p	3	7	11		4
Meadow pipit						14	
Mistle thrush							1
Pied wagtail	c.3				3		
Skylark		1					

Compartment and species	18/11/2016	16/12/2016	26/01/2017	22/02/2017	16/03/2017	19/09/2017	10/10/2017
Song thrush			1				
Sparrowhawk	1						
Starling				35		330	
Woodpigeon			196	233	4		
Yellow wagtail						2	

IT= Inter-tidal

E= Estuary

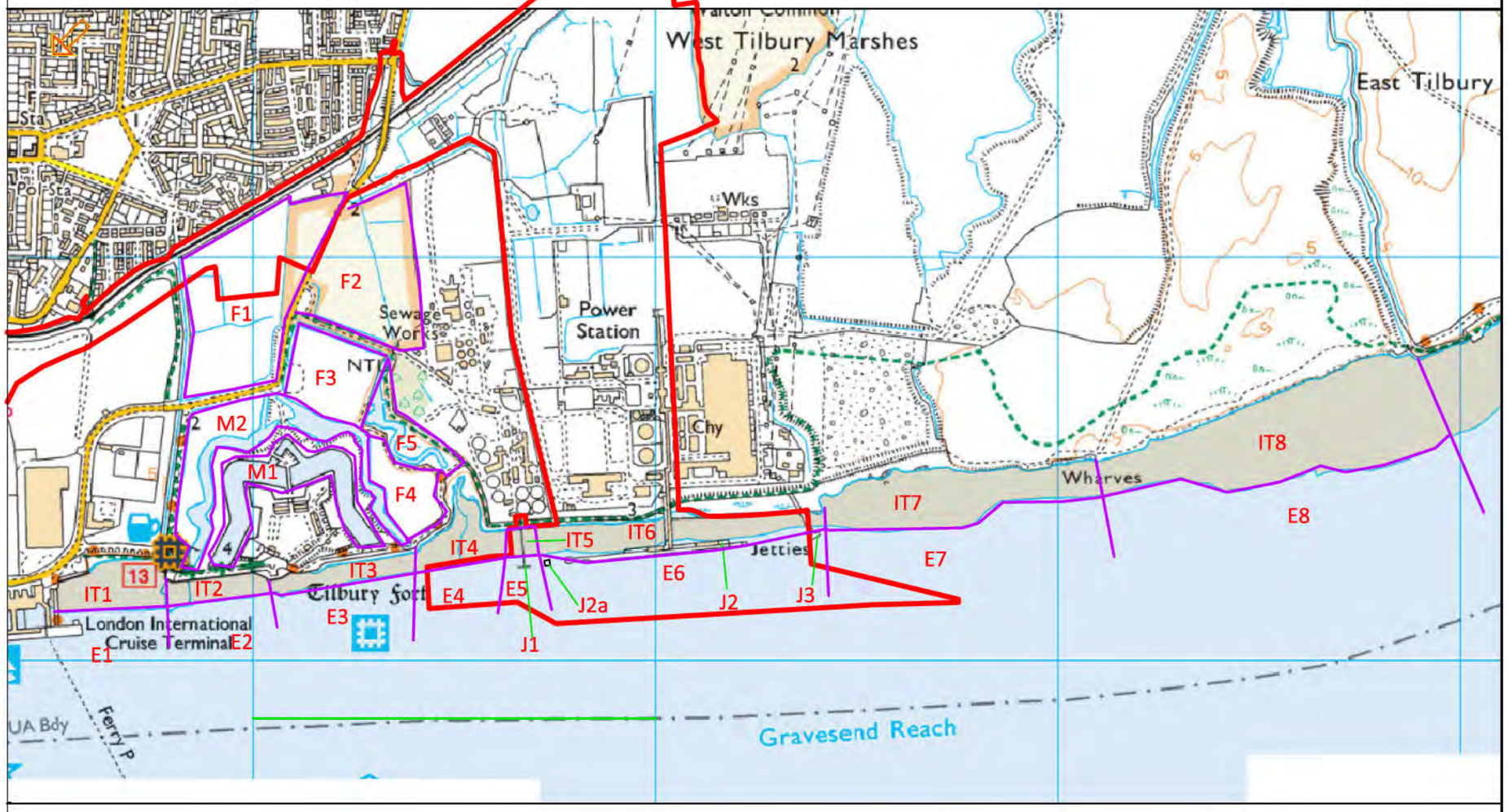
F= Field (common land)

M= Moat (Tilbury Fort)

J= Jetty/Pier

All birds except swans on the only small area of remaining exposed mud- near to fort car park

$ All birds on the only small area of remaining exposed mud- near to fort car park



ORDER LIMITS

BIRD SURVEY COMPARTMENT BOUNDARIES (WITH REFERENCE CODE*)

* IT= INTER-TIDAL
E= ESTUARY
J= JETTY
F= FIELD
M= MOAT

REV	DATE	DESCRIPTION

DRAWING TITLE

WINTERING BIRD SURVEY COMPARTMENTS 2016/17

SCALE	DRAWN	
1:12500 @ A3		BC
DATE	CHECKED	
OCT 2017		RR

FIG. 10.12

TILBURY2

Annex EDP 2
Summary of WeBS Data

Species	Study Area (part of) Mean Peak Count	Wider Thames Estuary Mean Peak	Total Mean Peak	% of Total within Study Area
Arctic tern	-	-	-	0
Avocet	-	3177	3177	0
Aythya hybrid	-	1	1	0
Baillon's crake	-	-	-	0
Bar-headed goose	-	1	1	0
Barnacle goose	-	3	3	0
Bar-tailed godwit	28.5	4868	4868	0.6
Bewick's swan	-	10	10	0
Bittern	-	1	1	0
Black swan	-	2	2	0
Black tern	-	3	3	0
Black-headed gull	-	6467	6467	0
Black-necked grebe	-	2	2	0
Black-tailed godwit	-	5960	5960	0
Black-throated diver	-	1	1	0
Black-winged stilt	-	4	4	0
Brent goose (*Black Brant - nigricans*)	-	2	2	0
Brent goose (*Dark-bellied - bernicla*)	3	15365	15365	0.02
Brent goose (*Svalbard Light-bellied*)	-	2	2	0
Canada goose	3.6	1185	1185	0.34
Canada x greylag goose	-	1	1	0
Caspian gull	-	2	2	0
Cattle egret	-	3	3	0
Common gull	3	1994	1994	0.15
Common sandpiper	-	19	19	0
Common scoter	-	25	25	0
Common tern	-	89	89	0
Common/Arctic tern	-	-	-	0
Coot	4.8	2278	2278	0.22
Cormorant	42.8	257	257	16.73
Curlew	5	3425	3425	0.15
Curlew sandpiper	-	11	11	0
Domestic greylag goose	-	1	1	0
Domestic mallard	2	181	181	1.1
Dunlin	166	27630	27630	0.6
Egyptian goose	-	7	7	0
Eider (except Shetland)	-	6	6	0
Ferruginous duck	-	1	1	0
Gadwall	9	435	435	2.07
Garganey	-	2	2	0

Species	Study Area (part of) Mean Peak Count	Wider Thames Estuary Mean Peak	Total Mean Peak	% of Total within Study Area
Glaucous gull	-	-	-	0
Glossy ibis	-	1	1	0
Golden plover	-	4612	4612	0
Goldeneye	3	25	25	12
Goosander	-	2	2	0
Great black-backed gull	7	511	511	1.37
Great crested grebe	-	189	189	0
Great northern diver	-	-	-	0
Great white egret	-	1	1	0
Green sandpiper	-	25	25	0
Greenshank	-	86	86	0
Grey heron	10	71	71	14.08
Grey phalarope	-	1	1	0
Grey plover	4	3059	3059	0.13
Greylag goose (British/Irish)	3	811	811	0.37
Herring gull	6	1862	1862	0.32
Hybrid duck	-	1	1	0
Iceland gull	-	1	1	0
Jack snipe	-	4	4	0
Kingfisher	1	8	8	12.5
Kittiwake	-	14	14	0
Knot	-	22362	22362	0
Lapwing	81	9862	9862	0.82
Lesser black-backed gull	4	162	162	3.09
Lesser white-fronted goose	-	1	1	0
Lesser yellowlegs	-	-	-	0
Little egret	2	369	369	0.54
Little grebe	3	388	388	0.77
Little gull	-	2	2	0
Little ringed plover	-	10	10	0
Little stint	-	4	4	0
Little tern	-	17	17	0
Long-tailed duck	-	1	1	0
Mallard	70	1144	1144	6.12
Mandarin duck	-	1	1	0
Marsh sandpiper	-	-	-	0
Mediterranean gull	1	74	74	1.35
Moorhen	4	182	182	2.2
Muscovy duck	-	-	-	0
Mute swan	4	179	179	2.23
Night heron	-	-	-	0
Oystercatcher	4	16557	16557	0.02
Pink-footed goose	-	2	2	0
Pintail	-	141	141	0
Pochard	1	587	587	0.17
Purple heron	-	-	-	0
Purple sandpiper	-	-	-	0

Species	Study Area (part of) Mean Peak Count	Wider Thames Estuary Mean Peak	Total Mean Peak	% of Total within Study Area
Red-breasted merganser	-	8	8	0
Red-crested pochard	-	1	1	0
Red-necked grebe	-	2	2	0
Redshank	175	2403	2403	7.28
Red-throated diver	-	18	18	0
Ring-billed gull	-	-	-	0
Ringed plover	28	767	767	3.65
Ring-necked duck	-	1	1	0
Ruddy duck	-	-	-	0
Ruddy shelduck	-	-	-	0
Ruff	-	10	10	0
Sanderling	-	1188	1188	0
Sandwich tern	-	10	10	0
Scaup	-	3	3	0
Shag	-	1	1	0
Shelduck	13	1479	1479	0.88
Shoveler	5	803	803	0.62
Slavonian grebe	-	1	1	0
Smew	-	-	-	0
Snipe	5	114	114	4.39
Snow goose	-	1	1	0
Spoonbill	-	4	4	0
Spotted redshank	-	7	7	0
Spotted sandpiper	-	-	-	0
Teal	40	4069	4069	0.98
Tufted duck	6	690	690	0.87
Tundra bean goose	-	-	-	0
Turnstone	4	630	630	0.63
Unidentified diver	-	-	-	0
Unidentified gull	-	1687	1687	0
Unidentified large gull	-	20	20	0
Unidentified wader	-	1	1	0
Velvet scoter	-	4	4	0
Water rail	5	14	14	35.71
Whimbrel	1	27	27	3.7
White-cheeked pintail	-	1	1	0
White-fronted goose (*European - albifron*	-	13	13	0
White-fronted goose (*Greenland – flaviro*)	-	1	1	0
White-winged black tern	-	-	-	0
Whooper swan	-	1	1	0
Wigeon	-	7163	7163	0
Wood duck	-	-	-	0
Wood sandpiper	-	2	2	0
Woodcock	-	2	2	0
Yellow-legged gull	7	24	24	29.17

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Annex EDP 3
Summary of KMBRC Bird Data Return related to the Kent Project Site

Species	Apparent Frequency within the Site
Arctic skua	Rare vagrant
Arctic tern	Occasional, mostly passage
Avocet	Fairly common
Barn owl	Rare Uncommon
Bar-tailed godwit	Uncommon
Bearded tit	Fairly common
Bittern	Rare vagrant
Black redstart	Uncommon
Black swan	Fairly common
Black tern	Rare vagrant
Blackbird	Very common
Blackcap	Very common
Black-headed gull	Common
Black-headed weaver	Single record from 1983
Black-necked grebe	Single record from 2014
Black-tailed godwit	Reasonably common
Blue tit	Common
Bluethroat	Single record from 1960
Brambling	Rare
Brent goose	Uncommon
Bridled tern	Single record from 1991
Budgerigar	Rare
Bullfinch	Reasonably uncommon
Buzzard	Reasonably common
Canada goose	Common
Carrion crow	Very common
Caspian gull	Uncommon
Cattle egret	Single record from 2016
Cetti's warbler	Very common
Chaffinch	Very common
Chiffchaff	Very common
Chiloe wigeon	Rare
Coal tit	Uncommon
Collared dove	Very common
Common crossbill	Rare
Common eider	Rare vagrant
Common gull	Fairly common
Common redpoll	Single record from 2011
Common sandpiper	Common during passage
Common scoter	Rare
Common tern	Fairly common
Coot	Common
Cormorant	Very common
Corn bunting	Uncommon

Species	Apparent Frequency within the Site
Corncrake	Single record from 1976
Cuckoo	Common
Curlew	Common
Curlew sandpiper	Rare, during passage
Dartford warbler	Rare
Dunlin	Common
Dunnock	Common
Egyptian goose	Rare (introduced non-native)
Eleonora's falcon	Single record from 2009
Falcated duck	Uncommon
Feral pigeon	Common
Fieldfare	Fairly common
Firecrest	Rare
Fulmar	Rare
Gadwall	Fairly common
Gannet	Rare
Garden warbler	Uncommon
Garganey	Rare, most recent record from 1995
Glaucous gull	Rare
Glossy ibis	Single record from 1974
Goldcrest	Reasonably common
Goldeneye	Rare
Goldfinch	Common
Goosander	Rare
Grasshopper warbler	Uncommon
Great black-backed gull	Fairly common
Great crested grebe	Fairly uncommon
Great grey shrike	Rare
Great northern diver	Rare
Great skua	Rare vagrant
Great spotted woodpecker	Reasonably common
Great tit	Common
Great white egret	Single record in 2014
Green sandpiper	Fairly common during passage
Green woodpecker	Common
Greenfinch	Common
Greenshank	Uncommon
Grey heron	Very common
Grey partridge	Uncommon
Grey plover	Uncommon
Grey wagtail	Common
Greylag goose	Fairly common
Guillemot	Rare vagrant
Hawfinch	Rare
Hen harrier	Rare
Herring gull	Common
Hobby	Fairly uncommon
Honey buzzard	Rare
Hooded crow	Rare

Species	Apparent Frequency within the Site
House martin	Common
House sparrow	Common
Iceland gull	Single record from 2014
Jack snipe	Common
Jackdaw	Fairly common
Jay	Fairly common
Kestrel	Common
Kingfisher	Reasonably common
Kittiwake	Uncommon
Knot	Rare
Lapland bunting	Single record from 1987
Lapwing	Common
Leach's petrel	Rare vagrant
Lesser black-backed gull	Fairly common
Lesser redpoll	Uncommon
Lesser spotted woodpecker	Rare
Lesser whitethroat	Fairly common
Linnet	Common
Little egret	Reasonably common
Little grebe	Common
Little gull	Fairly uncommon
Little owl	Rare
Little ringed plover	Fairly uncommon
Little stint	Rare, during passage
Little tern	Rare vagrant
Little-ringed plover	uncommon
Long-eared owl	Rare
Long-tailed tit	Common
Magpie	Very common
Mallard	Very common
Manx shearwater	Rare vagrant
Marsh harrier	Fairly common
Marsh sandpiper	Single record from 1963
Marsh tit	Rare
Meadow pipit	Common
Mediterranean gull	Fairly common
Merlin	Rare
Mistle thrush	Common
Monatgu's harrier	Single record from 2016
Moorhen	Very common
Mute swan	Very common
Nightingale	Fairly uncommon
Nightjar	Single record from 1968
Nutcracker	Single record from 1963
Nuthatch	Rare
Oystercatcher	Common
Penduline tit	Rare
Peregrine	Fairly common
Pheasant	Common

Species	Apparent Frequency within the Site
Pied flycatcher	Single record from 2015
Pied wagtail	Common
Pink-footed goose	Rare
Pintail	Rare
Pochard	Uncommon
Puffin	Single record from 1983
Quail	Rare
Raven	Common
Razorbill	Rare
Red kite	Uncommon
Red-breasted goose	Rare vagrant
Red-breasted merganser	Rare
Red-crested pochard	Rare
Red-legged partridge	Uncommon
Red-necked grebe	Rare vagrant
Redshank	Very common
Redstart	Rare
Red-throated diver	Rare
Redwing	Fairly common
Reed bunting	Common
Reed warbler	Common
Richard's pipit	Single record from 1972
Ring ouzel	Rare
Ringed plover	Common
Ring-necked parakeet	Fairly common
Robin	Very common
Rock pipit	Common
Rook	Uncommon
Roseate tern	Single record from 2012
Ruddy duck	Rare (introduced non-native species)
Ruddy shelduck	Rare (introduced non-native species)
Ruff	Rare
Sabine's gull	Rare
Sand martin	Common
Sanderling	Rare
Sandwich tern	Fairly uncommon
Scandinavian rock pipit	Uncommon
Scaup	Uncommon
Sedge warbler	Fairly common
Shag	Rare
Shelduck	Very common
Short-eared owl	Uncommon
Shoveler	Fairly common
Siskin	Uncommon
Skylark	Common
Slavonian grebe	Rare vagrant
Smew	Rare
Snipe	Reasonably common
Snow bunting	Rare

Species	Apparent Frequency within the Site
Snow goose	Single record from 1980
Song thrush	Common
Sparrowhawk	Common
Speckled teal	Rare
Spoonbill	Single record from 2017
Spotted crake	Single record from 1992
Spotted flycatcher	Uncommon
Spotted redshank	Single record from 2007
Starling	Very common
Stock dove	Common
Stonechat	Very common
Stone-curlew	Rare vagrant
Storm petrel	Rare vagrant
Swallow	Common
Swift	Common
Tawny owl	Rare
Teal	Common
Tree creeper	Rare
Tree pipit	Rare
Tree sparrow	Rare
Tufted duck	Common
Turnstone	Common
Turtle dove	Uncommon
Water pipit	Fairly uncommon
Water rail	Fairly common
Waxwing	Fairly common
Wheatear	Fairly common
Whimbrel	Fairly uncommon
Whinchat	Fairly uncommon
White wagtail	Rare
White-fronted goose	Single record from 1994
Whitethroat	Common
White-wing black tern	Single record from 1991
Whooper swan	Single record in 1970
Wigeon	Fairly uncommon
Willow warbler	Fairly common
Woodcock	Rare
Woodlark	Rare
Woodpigeon	Very common
Wren	Common
Yellow wagtail	Reasonably common
Yellowhammer	Uncommon
Yellow-legged gull	Common

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Annex EDP 4
Results of CBA Surveys

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CHRIS BLANDFORD ASSOCIATES

cba

London Resort Company Holdings (LRCH) Ltd.

London Paramount

2012/13 Wintering Birds Survey Report

November 2013

CHRIS BLANDFORD ASSOCIATES
landscape | environment | heritage

London Resort Company Holdings (LRCH) Ltd.

London Paramount

2012/13 Wintering Birds Survey Report

Approved	[redacted]
	Bill Wadsworth
Position	Senior Associate (Ecology)
Date	30th November 2013
Revision	Final

CONTENTS

1.0 INTRODUCTION

1.1 General

1.1.1 Chris Blandford Associates (CBA) has been appointed by London Resort Company Holdings (LRCH) Ltd. to undertake a series of ecological surveys to inform the Environmental Impact Assessment for the proposed London Paramount development at Swanscombe, North Kent.

1.1.2 This report details the results of the wintering bird surveys undertaken between September 2012 and March 2013.

1.2 Scope

1.2.1 The aims of the wintering bird survey were to:

- Determine the level of use of the survey area by wintering birds and particularly by those species listed in the citations for the nearby SPA and SSSIs (discussed below).

1.3 Survey Limitations

1.3.1 Due to bad weather during January and taking into account suitable tide times and sunrise/sunset times, the earliest the January high tide survey could be undertaken was 1st February 2013. Other than this, there were no limitations to completing the survey.

1.4 Key Findings

1.4.1 The total number of birds recorded during high tide counts ranged between 80 and 1175 with a mean abundance of 572. During low tide counts, abundance ranged between 227 and 718 with a mean abundance of 412. It was considered that the bird numbers were generally at their peak between December and March.

1.4.2 In determining the conservation value of the Site, the results of the surveys were reviewed in relation to the criteria used for the designation of Local Wildlife Sites within Kent for wintering birds. In comparing the survey results with the criteria, none of the thresholds are met. The total number of wetland species recorded is 32 (the threshold is for at least 60 wintering bird species or at least 100 passage bird species) and even including other non-wetland birds including the passerines that are present within the wider site, these thresholds would not be met. Four Kent RDB3 species were recorded but three of these are listed as KRDB3 species

due to their breeding status rather than numbers in winter. Only one species recorded, knot, is a KRDB3 species due to its wintering bird status.

2.0 METHODOLOGY

2.1 Legislative Context

2.1.1 The West Thurrock Lagoon and Marshes SSSI is designated for its wintering wader and wildfowl assemblage for which the area is considered to be one of the most important sites along the Inner Thames Estuary. At its closest point the SSSI is some 1.5km to the west of the Site. The SSSI has extensive mudflats as well as large and secure high tide roosts. Large reed beds are also present which support reed and sedge warblers and breeding populations of bearded tit. Locally important numbers of **teal**, **snipe** and **grey heron** roost in the SSSI

2.1.2 The nearest SPA is the Thames Estuary Marshes SPA/Ramsar, which is approximately 7km east of the Site. The SPA is made up of the South Thames Estuary & Marshes SSSI (south bank of the Thames) and Mucking Flats & Marshes SSSI (north side of the Thames). This site qualifies under **Article 4.1** of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:

Over winter:

- Avocet *Recurvirostra avosetta*, 276 individuals representing at least 21.7% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6)
- Hen Harrier *Circus cyaneus*, 7 individuals representing at least 0.9% of the wintering population in Great Britain (5 year mean 93/4-97/8)

2.1.3 This Site also qualifies under **Article 4.2** of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species:

On passage:

- Ringed plover *Charadrius hiaticula*, 559 individuals representing at least 1.1% of the Europe/Northern Africa - wintering population (5 year peak mean 1991/2 - 1995/6)

Over winter:

- Ringed plover *Charadrius hiaticula*, 541 individuals representing at least 1.1% of the wintering Europe/Northern Africa - wintering population (5 year peak mean 1991/2 - 1995/6)

Assemblage qualification: A wetland of international importance.

2.1.4 The area qualifies under **Article 4.2** of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl. Over winter, the area regularly supports 33,433 individual waterfowl (5 year peak mean 1991/2 - 1995/6) including redshank *Tringa totanus*, black-tailed godwit *Limosa limosa islandica*, dunlin *Calidris alpina alpina*, lapwing *Vanellus vanellus*, grey plover *Pluvialis squatarola*, shoveler *Anas clypeata*, pintail *Anas acuta*, gadwall *Anas strepera*, shelduck *Tadorna tadorna*, white-fronted goose *Anser albifrons albifrons*, little grebe

Tachybaptus ruficollis, ringed plover *Charadrius hiaticula*, avocet *Recurvirostra avosetta* and whimbrel *Numenius phaeopus*.

2.1.5 The Inner Thames Marshes SSSI is some 6km to the west of the Site. It is designated for the numbers of wintering wildfowl, waders and birds of prey with wintering teal populations reaching levels of international importance.

2.2 Wintering Bird Methodology

2.2.1 Wintering bird surveys were undertaken between September 2012 and March 2013 inclusive. Both high tide and low tide counts were undertaken each month. The surveys were undertaken whenever possible close to the dates for the WEBS data survey dates taken from the British Trust for Ornithology website. The survey dates were dependent on weather and tides. Two surveyors covered the survey area and long range radios were used to try and ensure that double counting of birds did not occur. Binoculars were used by all surveyors with Swarovski and Viking telescopes also used. The surveys aimed to cover all areas that could be directly or indirectly impacted, in terms of their bird interest, by the Project. The locations of surveyed areas and habitats are illustrated in Figure 1.

2.2.2 The surveys were undertaken on the following dates:

High Tide

- 27th September 2012
- 17th October 2012
- 2nd November 2012
- 17th December 2012
- 1st February 2013 (Jan high tide survey delayed due to bad weather on previous survey)
- 22nd February 2013
- 25th March 2013

Low Tide

- 4th October 2012 (September low tide survey delayed due to bad weather on previous survey)
- 19th October 2012
- 1st November 2012
- 17th December 2012
- 25th January 2013
- 18th February 2013
- 22nd March 2013

2.3 Evaluation Methodology

2.3.1 The conservation importance of the breeding and wintering bird populations were determined using the criteria specified below:

(a) the presence of wintering and/or breeding bird populations of significant national and regional conservation importance (>1% of the national or regional resource (using population estimates of WeBS thresholds for wintering waterfowl))
(b) the presence of wintering and/or breeding species of recognised international conservation importance i.e. species listed on Annex I of EC Directive 79/409/EEC on the Conservation of Wild Birds 1979 and species forming part of the qualifying interest of an SPA
(c) the presence of breeding species of recognised national conservation importance i.e. species listed on Schedule 1 of the Wildlife and Countryside Act 1981
(d) the presence of Birds of Conservation Concern (BoCC) red and amber list species (Gregory *et al* 2002).
(e) the presence of species identified as Priority Species in the UK Biodiversity Action Plan

2.3.2 The criteria used for the designation of Local Wildlife Sites (previously known as SINCs or County Wildlife Sites) in Kent (Kent Wildlife Trust, 2005) were used to assess the local importance of the Site for wintering birds. The criteria are designed to be applied to areas of habitat that are discrete and homogenous (i.e. splitting habitats such as woodland and arable rather than considering the two habitats as one site) and are as follows:

"A site should be selected as a Wildlife Site if it can be considered as a single, identifiable unit (as explained above) in terms of its bird fauna and where:

- *It is occupied regularly by at least 2.5% of the county population of any one or more bird species, based on the most recent and authoritative data; or*
- *It holds three or more Kent Red Data Book 3 (KRDB3) species at the appropriate time of year (normally this should not include a combination of breeding and wintering species); or*
- *It holds one of the five largest colonies of colonial seabirds (with the exception of herring gull and black-headed gull), grey heron, little egret or sand martin; or*
- *It has been recorded as being regularly used in recent years by at least 60 wintering bird species; or*
- *It has been recorded as being regularly used in recent years by at least 100 passage bird species."*

Table 1 Examples of evaluation criteria

Value	Examples of Valuation Criteria
International Importance	• High importance and rarity, international scale and limited potential for substitution; • A internationally designated site (Special Area of Conservation SAC, Special Protection Areas SPA); • Presence of Internationally rare species;
National Importance	• High importance and rarity, national scale, or regional scale with limited potential for substitution; • A nationally designated site (Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs) etc.;
Regional Importance	• High or medium importance and rarity, local or regional scale, and limited potential for substitution; or, • Any regularly occurring, locally significant population of a Nationally Scarce species or in a Regional BAP or relevant Natural Area on account of its regional rarity or localisation.

Value	Examples of Valuation Criteria
County Importance	• High or medium importance and rarity, local or regional scale, and limited potential for substitution. A site designated as being of County Importance i.e. Local Wildlife Site (LWS); • A viable area of Key Habitat identified in the County BAP; • Any regularly occurring locally significant population of a species which is listed on account of its regional rarity or localisation.
Local Importance	• Low or medium importance and rarity, local scale. • Any regularly occurring, locally significant population of a species listed as being Locally Scarce. • Areas of habitat identified as being of Local Value in the relevant Natural Area profile.
Parish Importance	• Low or medium importance and rarity, local scale; • Areas of habitat considered to appreciably enrich the habitat resource within the context of the Parish or Neighbourhood;
Negligible Importance	• Very low importance and rarity, local scale; • Sites or areas, which support few or no habitats, communities or species populations of nature conservation interest.

3.0 RESULTS

3.1 General

3.1.1 Total counts of all species made in the Survey Area at high and low tides are given in **Tables 2** and **3** respectively. Mapped distributions of these are presented in **Figures 1** to **14**. The species codes given are those employed by the British Trust for Ornithology and are given in **Appendix I** with a list of common and scientific names of all species recorded given in **Appendix II**.

3.1.2 A total of 31 species were recorded during the high and low tide visits between 24th November 2011 and 12th March 2012. These were all waterfowl or birds of prey. Smaller bird species were recorded using the survey area which were recorded including reed bunting, redwing, fieldfare, meadow pipit and skylark, however, these were not included within the over bird counts. Surveys were split into High and Low tides with 26 species recorded at low tide and 28 at high tide. Species richness at a single survey visit varied between 10 and 16 species at low tide and six and 19 species at high tide. The greatest diversity was recorded during the January surveys (although the high tide count was on 1st February)

3.2 Species of Interest

3.2.1 The following species are of particular interest as they are included within the closest designated sites. Species of SPA interest are shown in green on **Figures 1-14**.

Thames Estuary Marshes SPA/Ramsar citation

Ringed Plover

3.2.2 No ringed plover were recorded during the surveys.

West Thurrock Lagoon and Marshes SSSI

Teal

3.2.8 Teal were recorded regularly throughout the surveys. The numbers of teal increased from the beginning of the season where 30 or fewer were recorded in September to November inclusive to a peak of 190 recorded during the January high tide survey. The majority of teal were recorded at the northern end of the western side of the peninsula between the jetty and the tip of the peninsula.

Snipe

3.2.9 Snipe were only recorded once when 4 were recorded during the January low tide survey all on the mud flats or on the salt marsh at the north-western tip of the peninsula.

Grey Heron

3.2.10 This species was recorded regularly but in low numbers with a maximum of 4 recorded during the low tide survey in October.

4.0 EVALUATION

4.1 Wintering Birds

4.1.1 Wintering bird surveys were undertaken between September 2012 and March 2013 and both high and low tide surveys were undertaken each month. Due to bad weather on the January date and taking into account suitable tide times and sunrise/sunset times, the earliest the January high tide survey could be undertaken was 1st February 2013.

4.1.2 In general, the assemblage during high and low tides were similar with the numbers and distribution across the survey area changing. Species that occurred at low tide that were not recorded at high tide included snipe, knot, kestrel and curlew whilst those that were recorded at high tide but not at low tide were little egret, tufted duck, greater black-backed gull and marsh harrier.

4.1.3 During low tide the birds were spread widely across the mudflats of the survey area, particularly to the west of the peninsula down to the jetty. The number and diversity of birds was reduced where the area of mudflat and saltmarsh is smaller along the eastern side of the peninsula.

4.1.4 The total number of birds recorded during high tide counts ranged between 80 and 1175 with a mean abundance of 572. During low tide counts, abundance ranged between 227 and 718 with a mean abundance of 412. It was considered that the bird numbers were generally at their peak between December and March.

4.1.5 The most significant increase in numbers was seen with the black-headed gulls, which were recorded at high tide in low numbers (9, 6, 82 and 115), until January 2013 when 526 were recorded, the majority of these in the fields of Botany Marshes. Similarly larger numbers of this species were recorded in February (399) and March (633) when large flocks of gulls were recorded in these fields or flying at the peninsula. Generally smaller numbers of black headed gulls were recorded at low tide with a peak of 290 recorded in January.

4.1.6 The numbers of gadwall recorded increased during the latter part of the winter survey with none recorded until the December survey when 45 were recorded. The peak count of gadwall was 126 recorded during the February low tide survey. Similarly the numbers of teal also increased from the beginning of the season to a peak of 190 recorded during the January high tide survey. Wigeon and tufted duck were only recorded during the January high tide survey.

4.1.7 The majority of birds recorded were waterfowl with fewer waders recorded. The waders that were recorded included snipe (max 4), turnstone (max 16), redshank (max 68), curlew (max 6), knot (2), lapwing (230), grey plover (1) and oystercatcher (3). Lapwing was generally recorded during every month although in higher numbers at high tide with the pier to the west of the peninsula being a favoured roosting area.

Other Species

4.1.8 In addition to the waders and waterfowl other birds were noted in the salt marsh, with skylark regularly recorded. Stonechat, whinchat and wheatear were recorded during the September survey, whilst Cetti's warbler was recorded in September – November inclusive. Flocks of starling were recorded generally in the north and associated with one of the towers, the pylons or the piers.

Birds of Prey

4.1.9 Peregrine and kestrel were both recorded. Peregrine were recorded during the October and January surveys in the vicinity of the survey area. Kestrel were recorded prior to the survey starting or after the survey ended in other parts of the Site as well as during the survey around the water's edge or Botany Marshes. A single marsh harrier was recorded during the February high tide survey over Botany Marshes.

4.2 Evaluation

4.2.1 Reviewing the criteria used for the designation of Local Wildlife Sites within Kent for wintering birds, and comparing with the survey data, none of the thresholds are met. The total number of wetland species recorded is 32 (the threshold is for at least 60 wintering bird species or at least 100 passage bird species) and even including other non-wetland birds including the passerines that are present within the wider site, these thresholds would not be met. Four Kent RDB3 species were recorded but three of these are listed as KRDB3 species due to their breeding status rather than numbers in winter. Only one species recorded, knot, is a KRDB3 species due to its wintering bird status.

4.2.2 The Inner Thames Marshes SSSI is some 6km to the west of the Site. It is designated for the numbers of wintering wildfowl, with wintering teal populations reaching levels of international importance. Similarly teal are noted as being a significant feature of the West Thurrock Lagoon and Marshes SSSI which is part of the Thames Estuary Marshes SPA/Ramsar. No information regarding the numbers of teal recorded is provided within the SSSI citation for these sites. However information produced about Rainham Marshes RSPB reserve which includes Aveley and Wennington Marshes, a substantial part of the Inner Thames Marshes SSSI, record up to 3,500 teal (www.wildessex.net).

4.2.3 The SSSI selection criteria for non-breeding populations of birds is for a site which regularly contain 1% or more of the total British non-breeding population of any species at any season The British wintering population of teal based on WEBS counts is 210 thousand individuals in 2004/05 - 2008/09 (BTO website). The peak count at the subject site was 190 which accounts for 0.09% of the British wintering population and approximately 5.4% of the numbers recorded at Rainham Marshes.

TABLES

Table 2. London Paramount - Estuarine Bird Monitoring: High tide waterfowl counts made during winter 2012/13.

Species	Date						
	27/9/12	**17/10/12**	**2/11/12**	**17/12/12**	**01/02/13**	**22/2/13**	**25/3/13**
Black-headed gull	9	6	82	115	526	399	633
Common gull			2				
Coot	4	2			2		1
Cormorant	12	22	15		21	9	14
Common gull					*7*	*7*	33
Gadwall				45	105	97	49
Greater black backed gull	2						
Great crested grebe				1			
Grey heron	1	1	3			1	
Greylag goose						41	
Grey plover							1
Herring gull			3		27	13	14
Lapwing	9	5	29	230	146	12	10
Lesser black-backed gull	3				2	1	10
Little egret		3					
Little grebe			1				
Mallard	40	76	56	36	87	27	23
Marsh harrier						1	
Moorhen		3	1		2		2
Oystercatcher					5		2
Peregrine					1		
Redshank					33	60	60
Shelduck					1	5	2
Shoveller					6		
Teal		12	30	128	190	123	176
Tufted duck					4		
Turnstone					6		18
Wigeon					4		
Total	**80**	**130**	**222**	**555**	**1175**	**796**	**1048**
Species richness	**8**	**9**	**10**	**6**	**19**	**14**	**16**
28	**4006**				Mean spp richness		**11.7143**
					mean abundance		572.286
Linnet							
Meadow pipit							
Pheasant							
Reed bunting							
Skylark							
Starling							

Note: Italicised species were recorded at low tide only (see Table 2).

Table 3. Project C - Estuarine Bird Monitoring: Low tide waterfowl and raptor counts made during winter 2012/13.

Species	Date						
	4/10/12	**19/10/12**	**1/11/12**	**17/12/12**	**25/1/13**	**18/2/13**	**22/3/13**
Black-headed gull	86	100	167	59	290	136	222
Carrion crow						1	
Coot	2	1	1				2
Common gull		1	6	1	11	1	9
Cormorant	3	15	4	2	26	10	6
Curlew	2	6	2				
Gadwall				61	115	126	32
Great crested grebe			1		1		
Grey heron	3	4	2		1		
Grey plover					5		
Herring gull	37	44	12			18	1
Kestrel	2						
Knot					2		
Lapwing	1		42	90	33	14	1
Lesser black-backed gull	28	6	5	1	1		3
Little grebe	1	1					
Mallard	34	54	80	32	68	34	16
Moorhen	2	2	1				1
Oystercatcher						2	
Peregrine		1			1		
Redshank		5	10	67		68	18
Shelduck					8	1	2
Shoveler		1				2	
Snipe					4		
Teal	26	8	33	61	150	128	56
Turnstone			8	13	2	16	13
Total	**227**	**249**	**374**	**387**	**718**	**557**	**382**
Species Richness	13	15	15	10	16	14	14

26	2894	Mean spp richness	13.85714
		mean abundance	413.4286

Carrion Crow							
Fieldfare							
Redwing							
Reed bunting							
Skylark							

Note: Italicised species were recorded at high tide only (see Table 1).

Table 4: Summary of Bird Surveys

	Parameter	2012/13
High Tide	Maximum Species Richness	19 (February)
	Minimum Species Richness	6 (December)
	Mean Species Richness	11.7
	Total Species Richness	28
	Maximum Abundance	1175
	Minimum Abundance	80
	Mean Abundance	572
	Total Abundance	4006

	Parameter	2011/2012
Low Tide	Maximum Species Richness	16 (January)
	Minimum Species Richness	10 (december)
	Mean Species Richness	13.71
	Total Species Richness	29
	Maximum Abundance	718
	Minimum Abundance	227
	Mean Abundance	412.7
	Total Abundance	2889

FIGURES

KEY

BTO SPECIES CODES

AV	Avocet
BG	Brent Goose
BA	Bar-tailed Godwit
BH	Black-headed Gull
BW	Black-tailed Godwit
C.	Carrion Crow
CA	Cormorant
CG	Canada Goose
CO	Coot
CM	Common Gull
CS	Common Sandpiper
CU	Curlew
DN	Dunlin
ET	Little Egret
FF	Fieldfare
GA	Gadwall
GK	Greenshank
GB	Great Black-backed Gull
G.	Green Woodpecker
GP	Golden Plover
GV	Grey Plover
H.	Grey Heron
HG	Herring Gull
K.	Kestrel
KN	Knot
L.	Lapwing
LB	Lesser Back-backed Gull
LG	Little Grebe
LI	Linnet
MA	Mallard
MP	Meadow Pipit
MH	Moorhen
OC	Oystercatcher
PE	Peregrine
PH	Pheasant
RB	Reed Bunting
RK	Redshank
RP	Ringed Plover
S.	Skylark
SE	Short-eared Owl
SH	Sparrowhawk
SN	Snipe
SU	Shelduck
SV	Shoveler
SC	Stonechat
T.	Teal
TT	Turnstone
W.	Wheatear
WA	Water Rail
WN	Wigeon

revision	description	date	checked by

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Project:
London Paramount - Wintering Bird Survey

Title:
South Area - September Low Tide

status		drawing no.		
		Figure 1		
scale	size	date	drawn	checked
NTS	**A3**	**21-10-2013**	**APW**	**HL**

CAD filename
Figure_1.dwg

KEY

BTO SPECIES CODES

AV	Avocet
BG	Brent Goose
BA	Bar-tailed Godwit
BH	Black-headed Gull
BW	Black-tailed Godwit
C.	Carrion Crow
CA	Cormorant
CG	Canada Goose
CO	Coot
CM	Common Gull
CS	Common Sandpiper
CU	Curlew
DN	Dunlin
ET	Little Egret
FF	Fieldfare
GA	Gadwall
GK	Greenshank
GB	Great Black-backed Gull
G.	Green Woodpecker
GP	Golden Plover
GV	Grey Plover
H.	Grey Heron
HG	Herring Gull
K.	Kestrel
KN	Knot
L.	Lapwing
LB	Lesser Back-backed Gull
LG	Little Grebe
LI	Linnet
MA	Mallard
MP	Meadow Pipit
MH	Moorhen
OC	Oystercatcher
PE	Peregrine
PH	Pheasant
RB	Reed Bunting
RK	Redshank
RP	Ringed Plover
S.	Skylark
SE	Short-eared Owl
SH	Sparrowhawk
SN	Snipe
SU	Shelduck
SV	Shoveler
SC	Stonechat
T.	Teal
TT	Turnstone
W.	Wheatear
WA	Water Rail
WN	Wigeon

revision	description	date	checked by

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Project:
London Paramount - Wintering Bird Survey

Title:
North Area - September Low Tide

status		drawing no.		
		Figure 1		
scale	size	date	drawn	checked
NTS	**A3**	**21-10-2013**	**APW**	**HL**

CAD filename
Figure_1.dwg

KEY

BTO SPECIES CODES

AV	Avocet
BG	Brent Goose
BA	Bar-tailed Godwit
BH	Black-headed Gull
BW	Black-tailed Godwit
C.	Carrion Crow
CA	Cormorant
CG	Canada Goose
CO	Coot
CM	Common Gull
CS	Common Sandpiper
CU	Curlew
DN	Dunlin
ET	Little Egret
FF	Fieldfare
GA	Gadwall
GK	Greenshank
GB	Great Black-backed Gull
G.	Green Woodpecker
GP	Golden Plover
GV	Grey Plover
H.	Grey Heron
HG	Herring Gull
K.	Kestrel
KN	Knot
L.	Lapwing
LB	Lesser Back-backed Gull
LG	Little Grebe
LI	Linnet
MA	Mallard
MP	Meadow Pipit
MH	Moorhen
OC	Oystercatcher
PE	Peregrine
PH	Pheasant
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RK	Redshank
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S.	Skylark
SE	Short-eared Owl
SH	Sparrowhawk
SN	Snipe
SU	Shelduck
SV	Shoveler
SC	Stonechat
T.	Teal
TT	Turnstone
W.	Wheatear
WA	Water Rail
WN	Wigeon

revision	description	date	checked by

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Project:

London Paramount - Wintering Bird Survey

Title:

South Area - September High Tide

status		drawing no.		
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NTS	A3	21-10-2013	APW	HL

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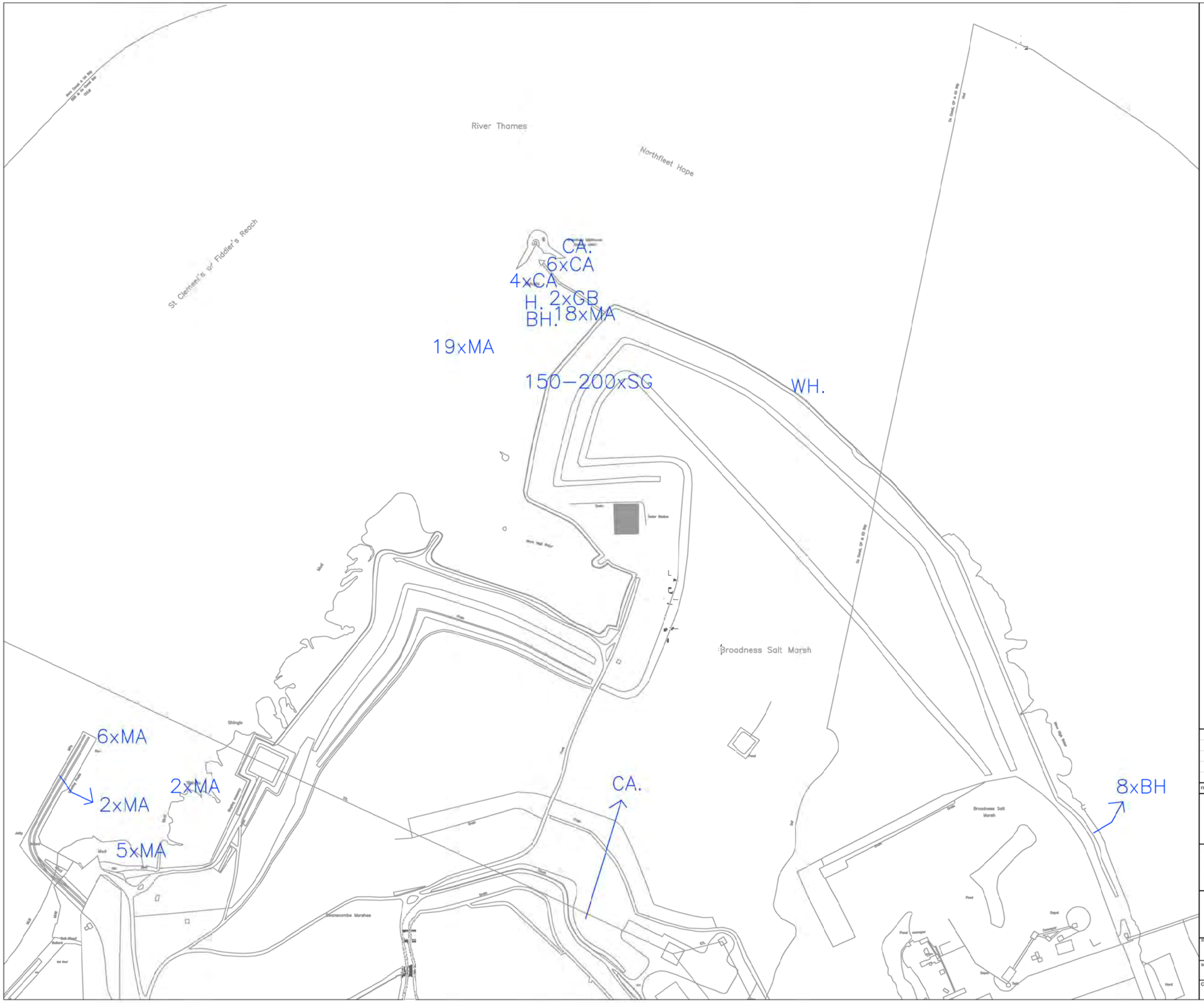
Figure_1.dwg



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Project:
London Paramount - Wintering Bird Survey

Title:
North Area - September High Tide

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Project:
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South Area - October Low Tide

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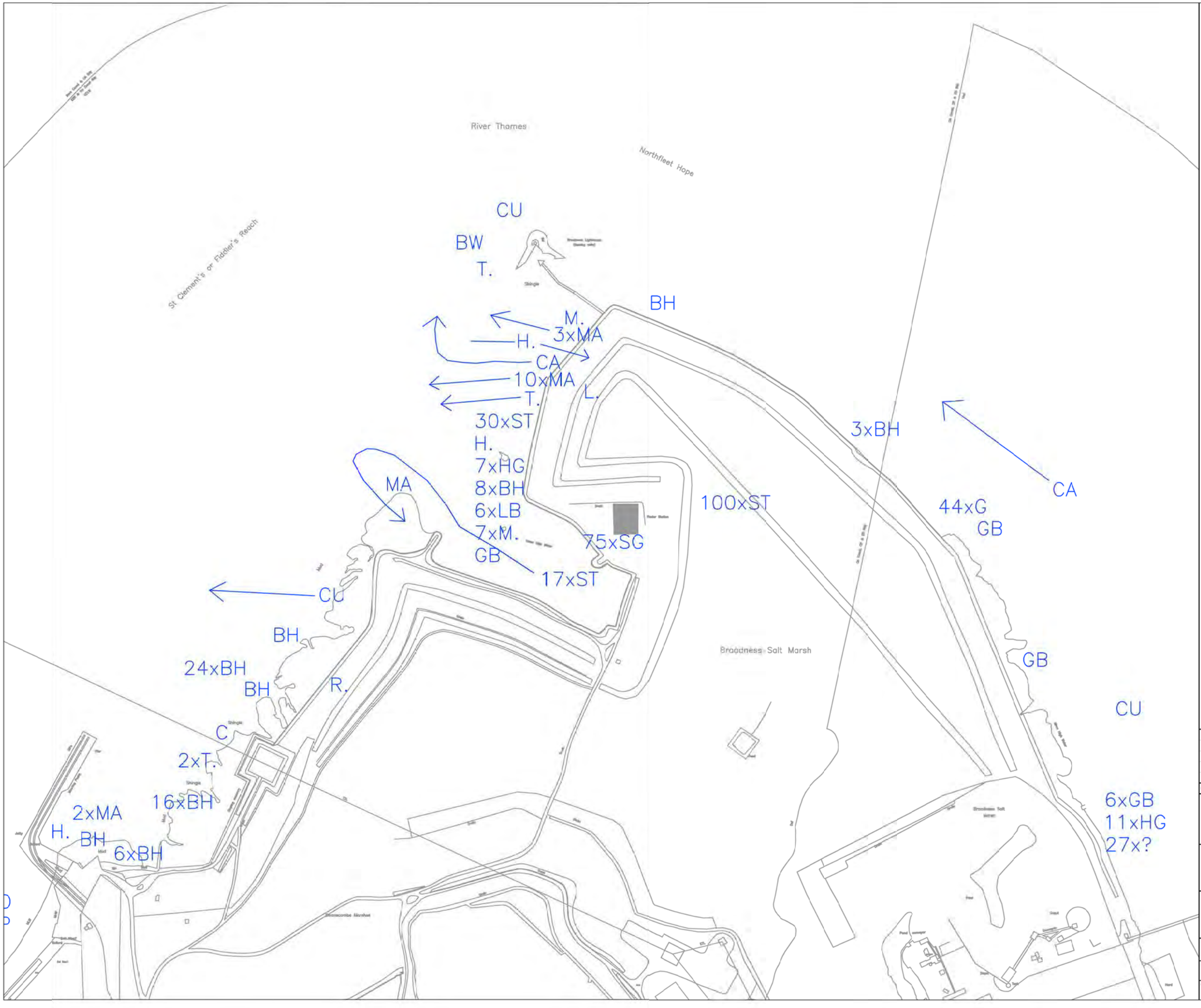

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Project:
London Paramount - Wintering Bird Survey

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North Area - October Low Tide

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Project:
London Paramount - Wintering Bird Survey

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South Area - October High Tide

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Project:
London Paramount - Wintering Bird Survey

Title:
North Area - October High Tide

status		drawing no.		
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scale	size	date	drawn	checked
NTS	**A3**	**21-10-2013**	**APW**	**HL**

CAD filename
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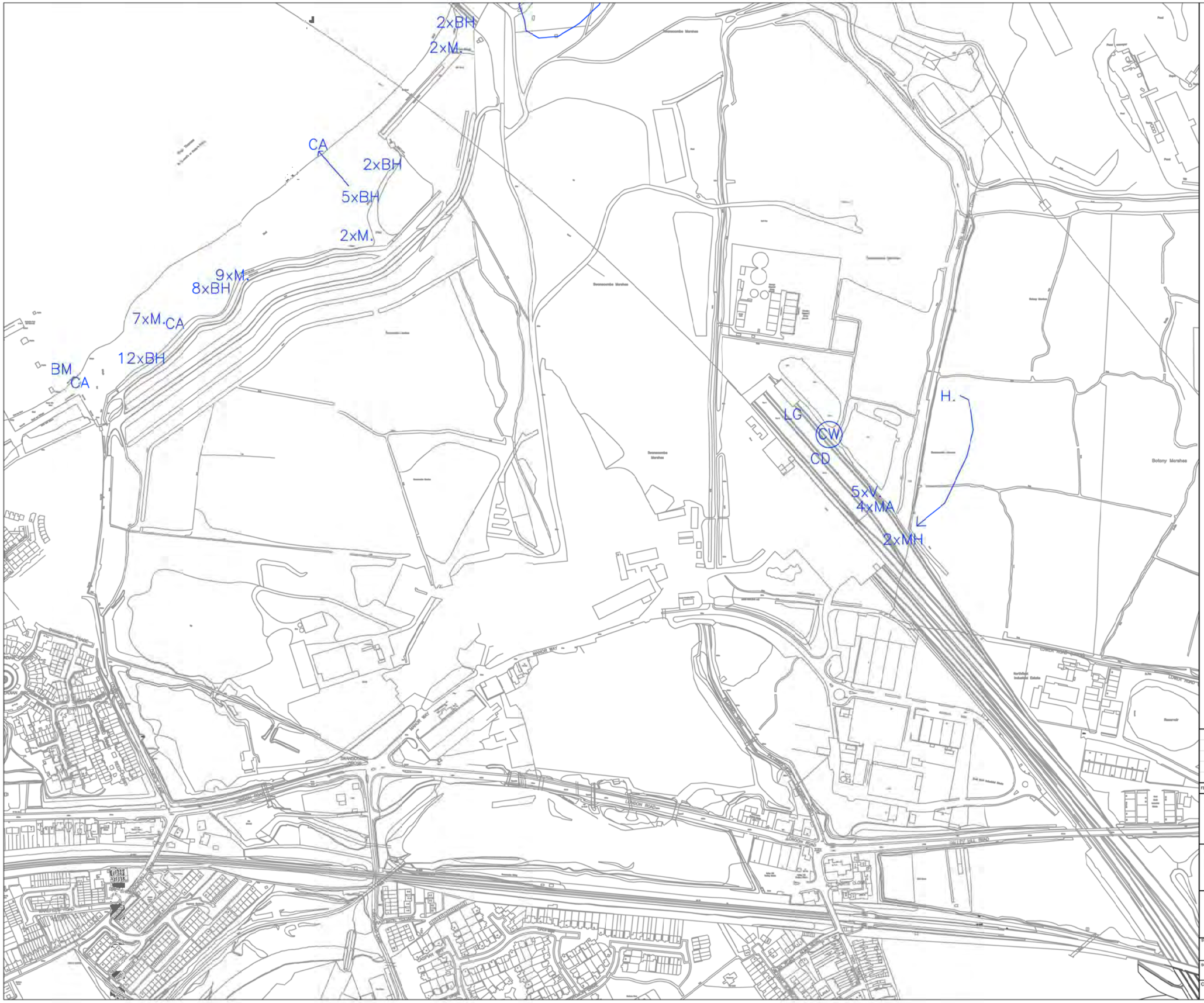

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Project:
London Paramount - Wintering Bird Survey

Title:
South Area - October 19th Low Tide

status		drawing no.		
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scale	size	date	drawn	checked
NTS	**A3**	**21-10-2013**	**APW**	**HL**

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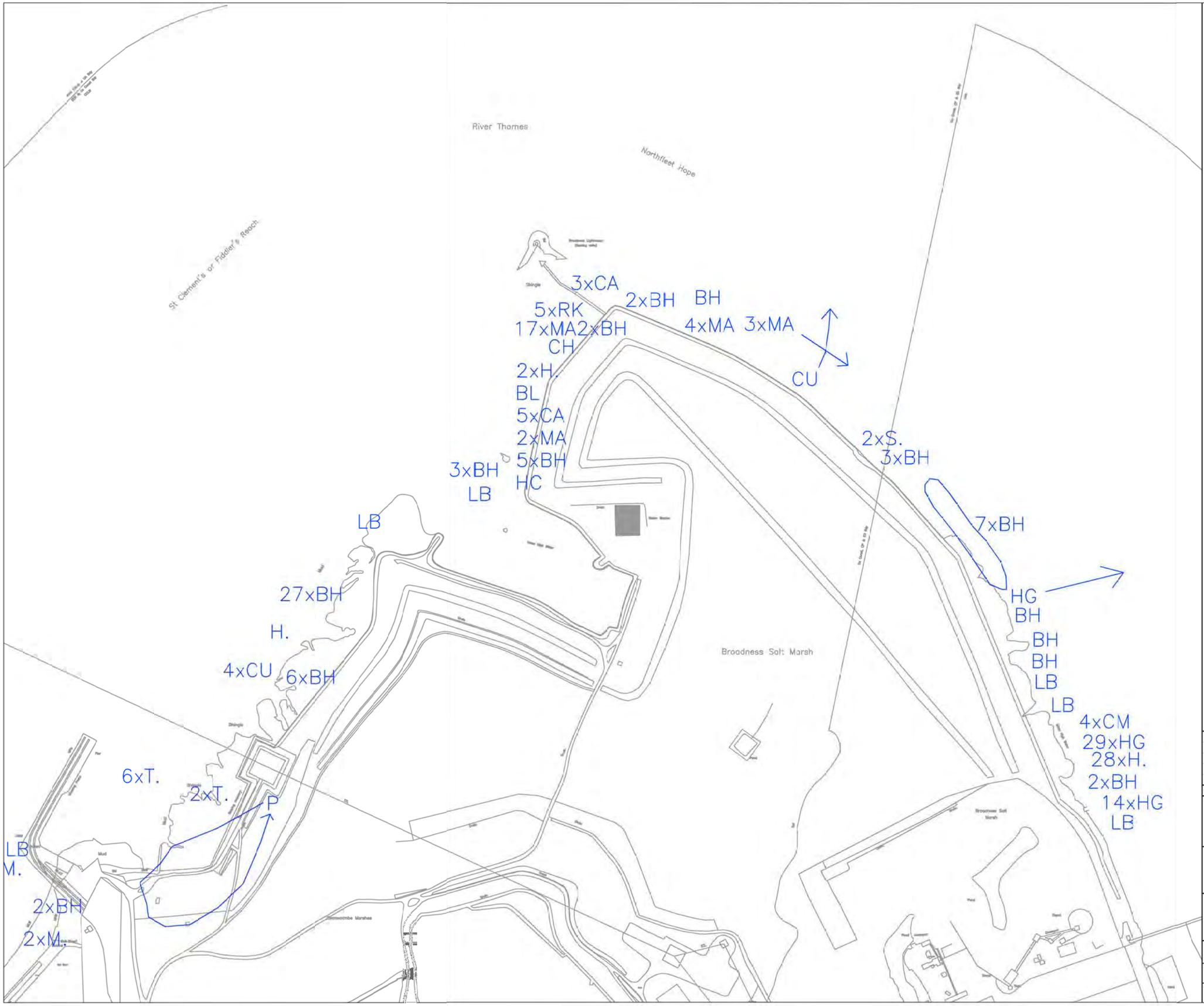

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Project:
London Paramount - Wintering Bird Survey

Title:
North Area - October 19th Low Tide

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NTS	A3	21-10-2013	APW	HL

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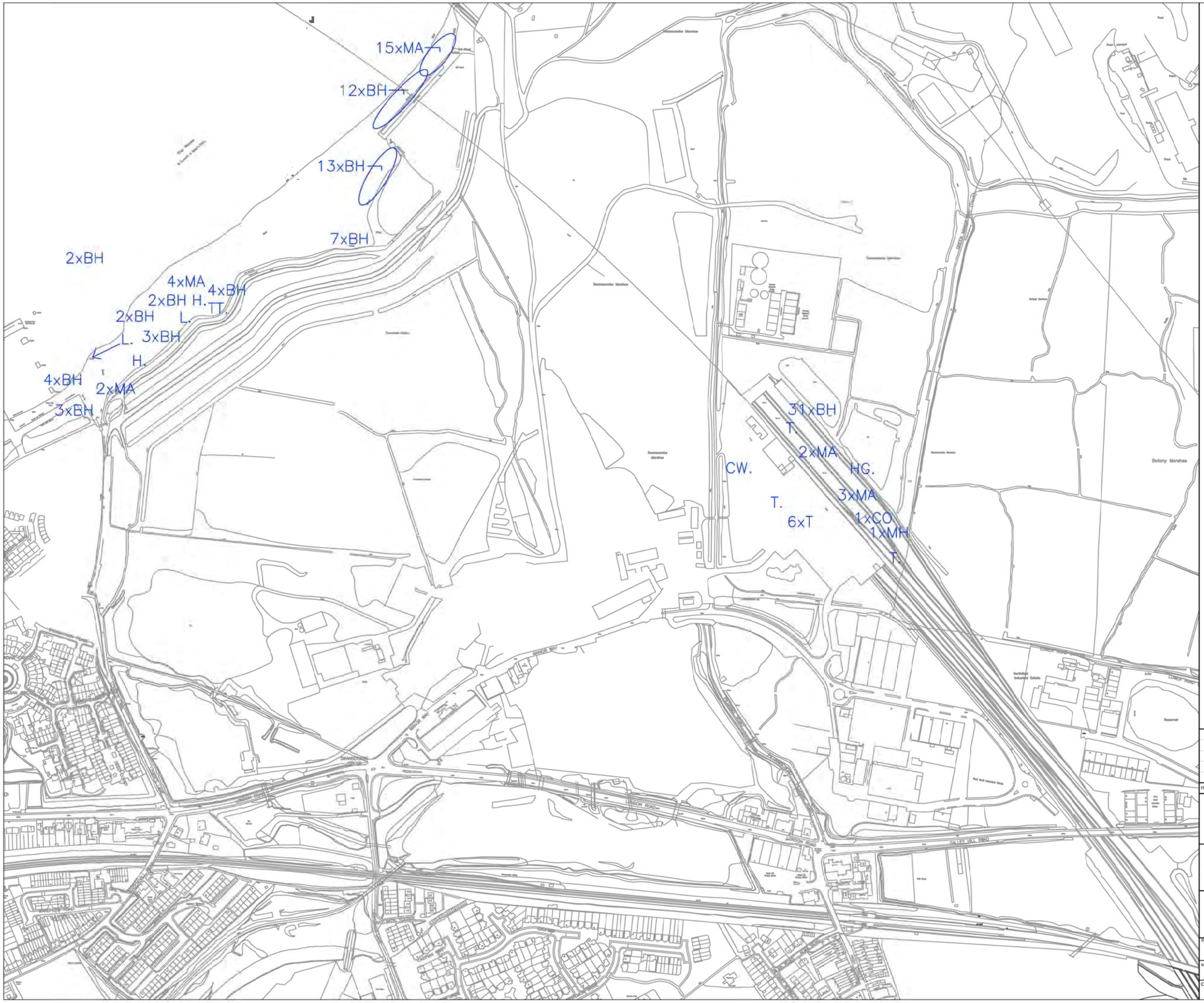

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Project:
London Paramount - Wintering Bird Survey

Title:
South Area - November Low Tide

status		drawing no.		
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Project:
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North Area - November Low Tide

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BH
BH
8xMA
16xT.
T
9xMA
LG
MH
80xBH
3xHG
2xCG

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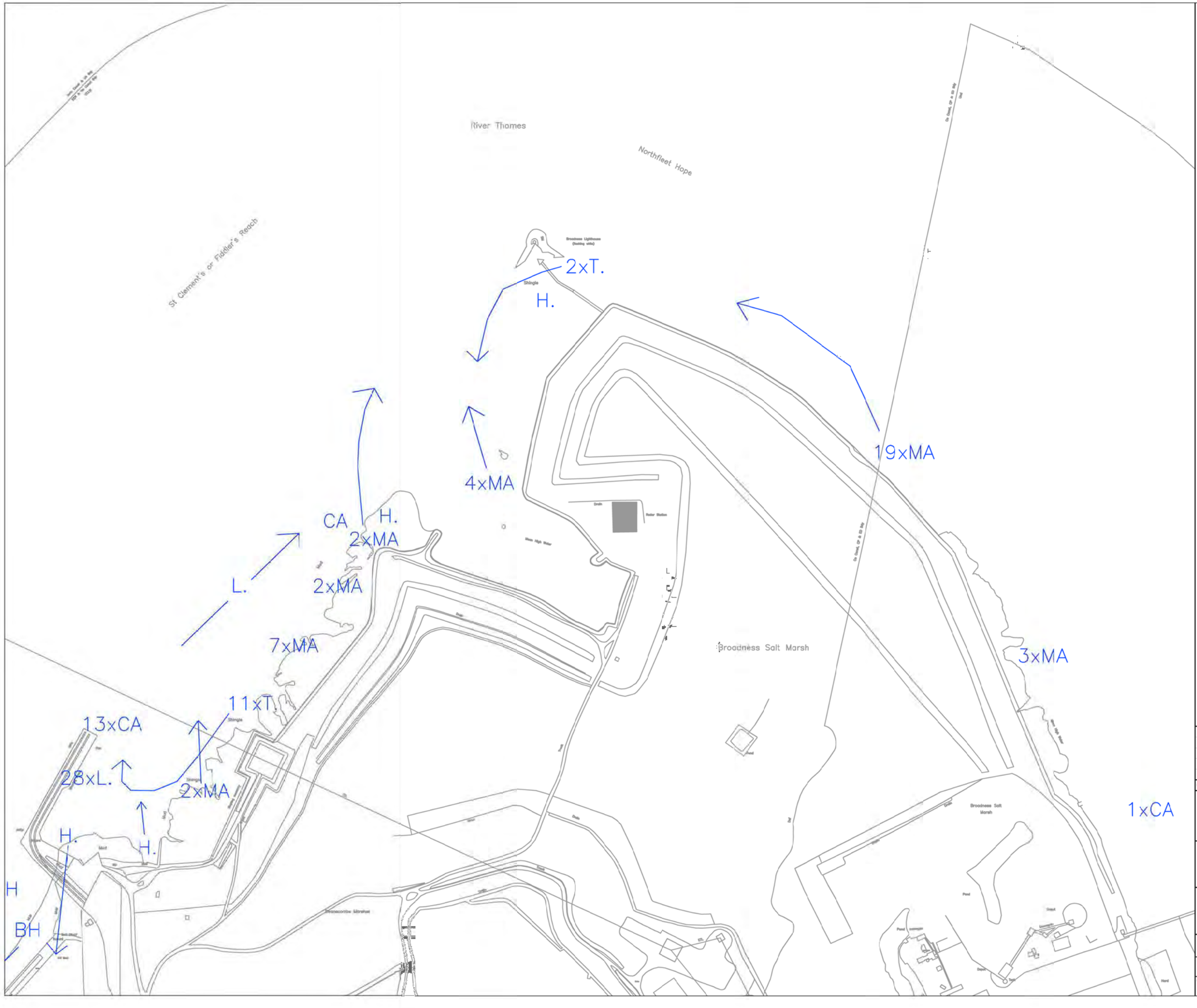

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LB	Lesser Back-backed Gull
LG	Little Grebe
LI	Linnet
MA	Mallard
MP	Meadow Pipit
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SC	Stonechat
T.	Teal
TT	Turnstone
W.	Wheatear
WA	Water Rail
WN	Wigeon

revision	description	date	checked by

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Project:
London Paramount - Wintering Bird Survey

Title:
South Area - December Low Tide

status	drawing no.			
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scale NTS	size A3	date 21-10-2013	drawn APW	checked HL

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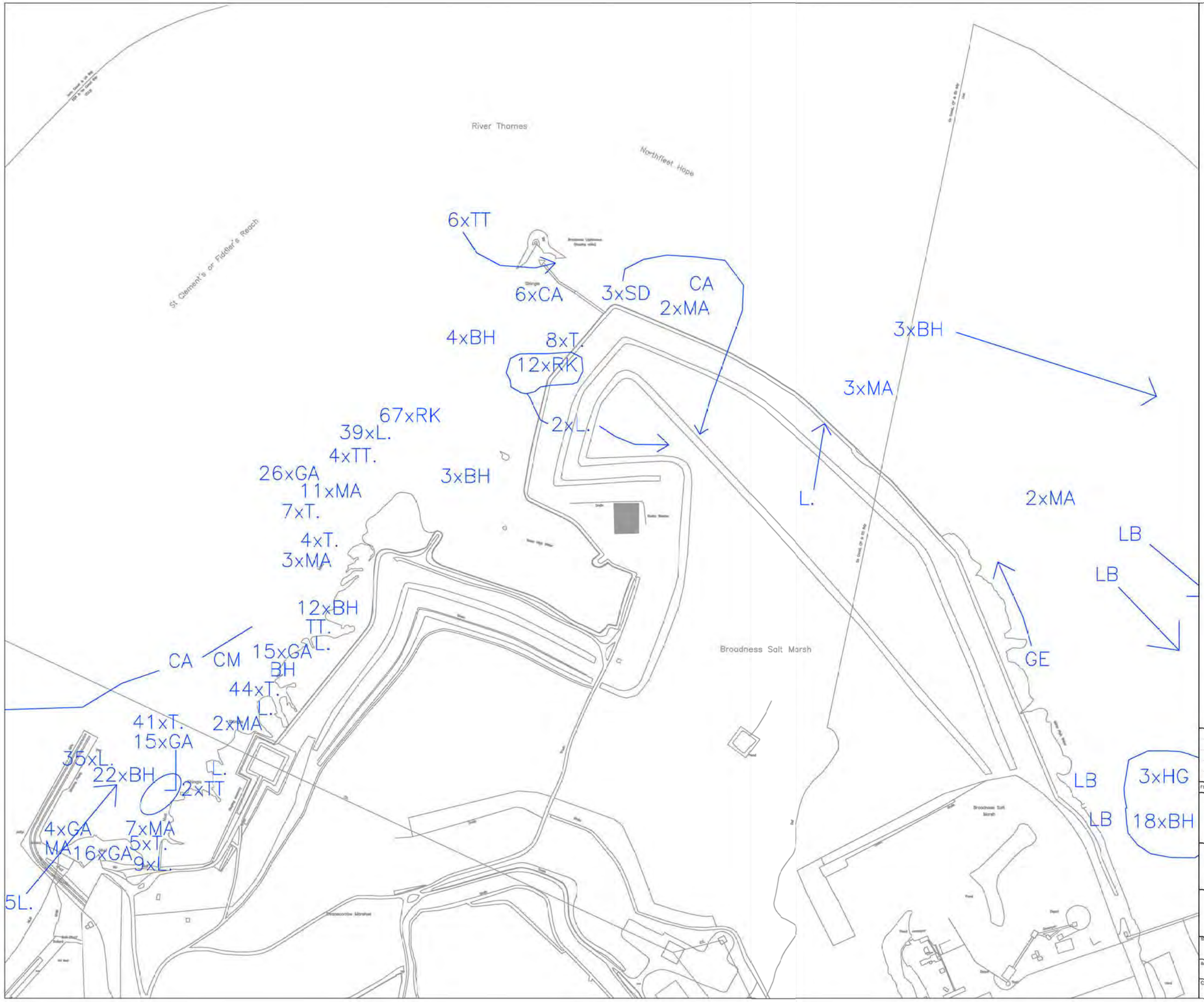

KEY

BTO SPECIES CODES

AV	Avocet
BG	Brent Goose
BA	Bar-tailed Godwit
BH	Black-headed Gull
BW	Black-tailed Godwit
C.	Carrion Crow
CA	Cormorant
CG	Canada Goose
CO	Coot
CM	Common Gull
CS	Common Sandpiper
CU	Curlew
DN	Dunlin
ET	Little Egret
FF	Fieldfare
GA	Gadwall
GK	Greenshank
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Project:
London Paramount - Wintering Bird Survey

Title:
North Area - December Low Tide

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NTS	A3	21-10-2013	APW	HL

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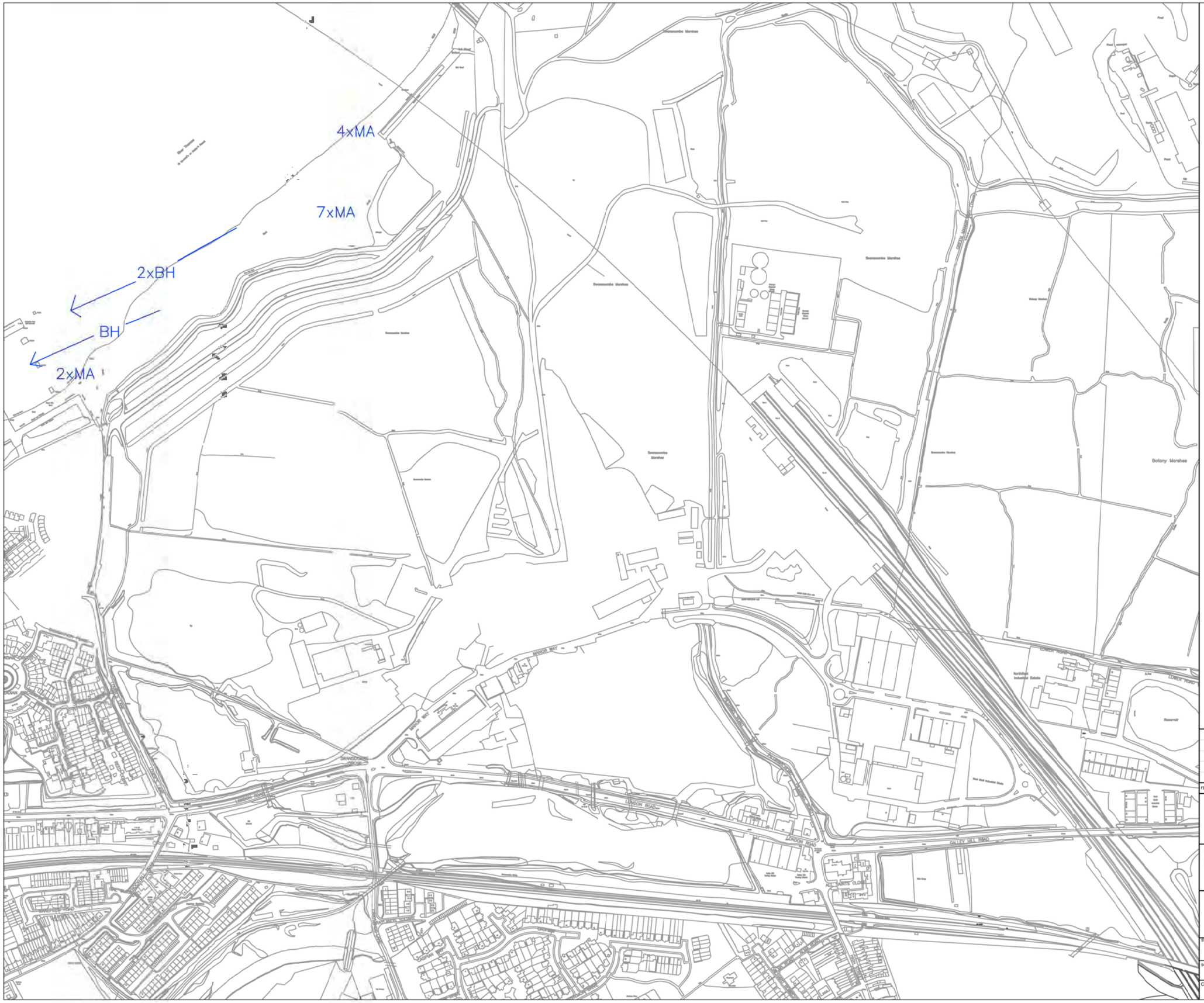

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Project:
London Paramount - Wintering Bird Survey

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South Area - December High Tide

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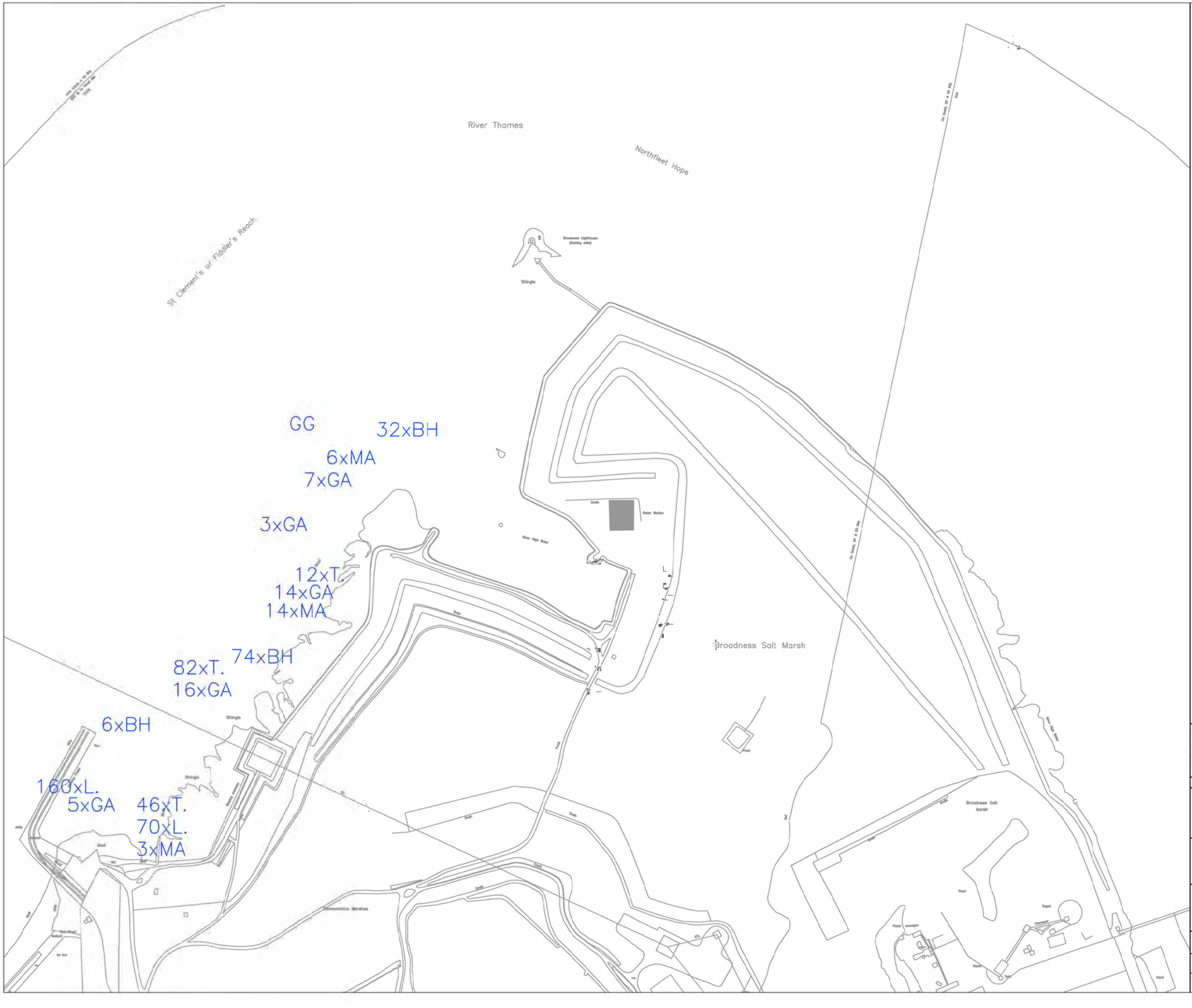

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Project:
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South Area - January Low Tide

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CAD filename
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16xMA
2xTT
4xMA
3xRK
CR
OC
3xMA
27xST
4xTU
2xMA
2xCO
2xMH
2xSV
17xBH
2xL.
11xHG
230xBH
4xCM
81xBH
2xHG
CM

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London Paramount - Wintering Bird Survey

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South Area - January High Tide

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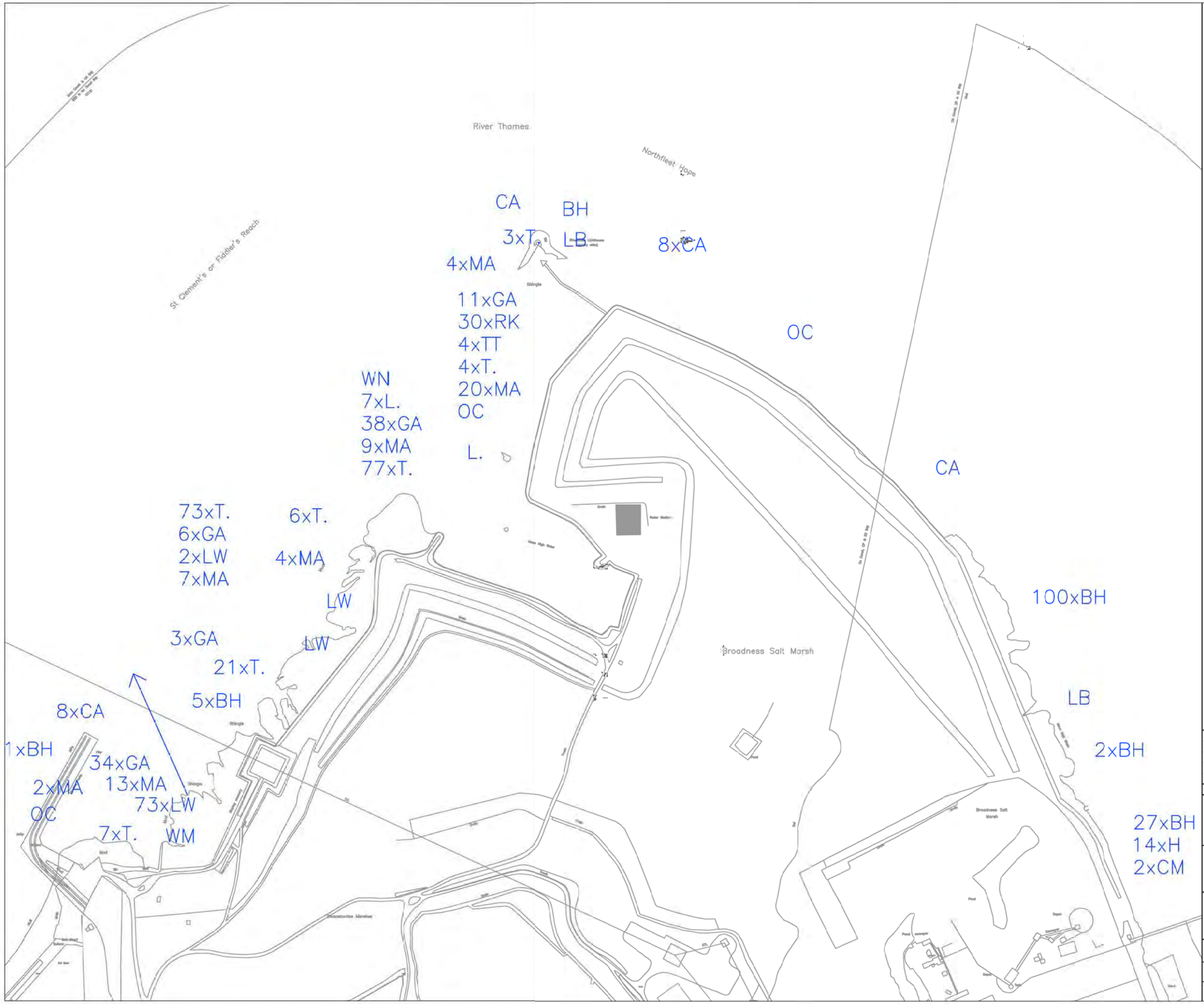

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Project:
London Paramount - Wintering Bird Survey

Title:
North Area - January High Tide

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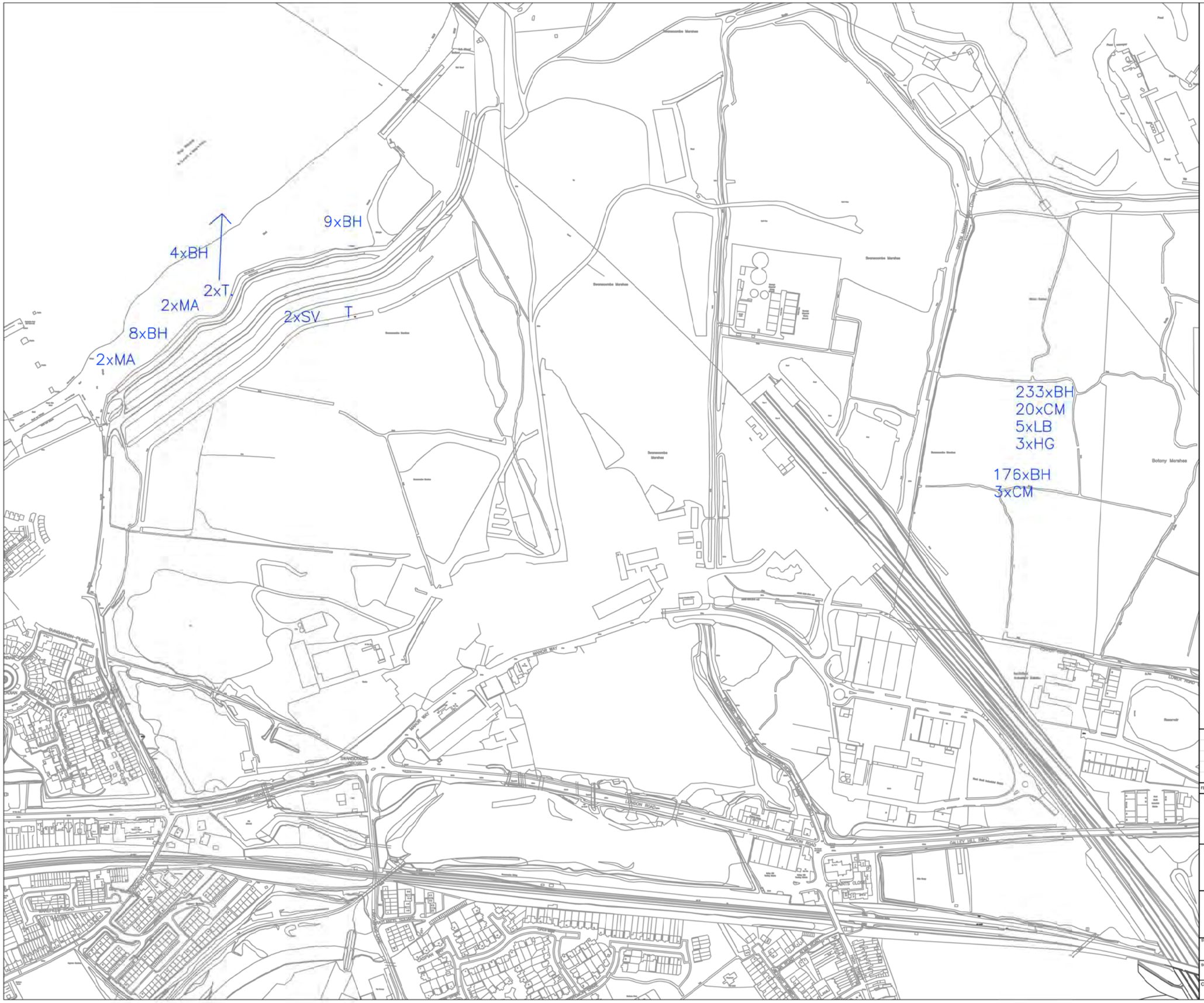

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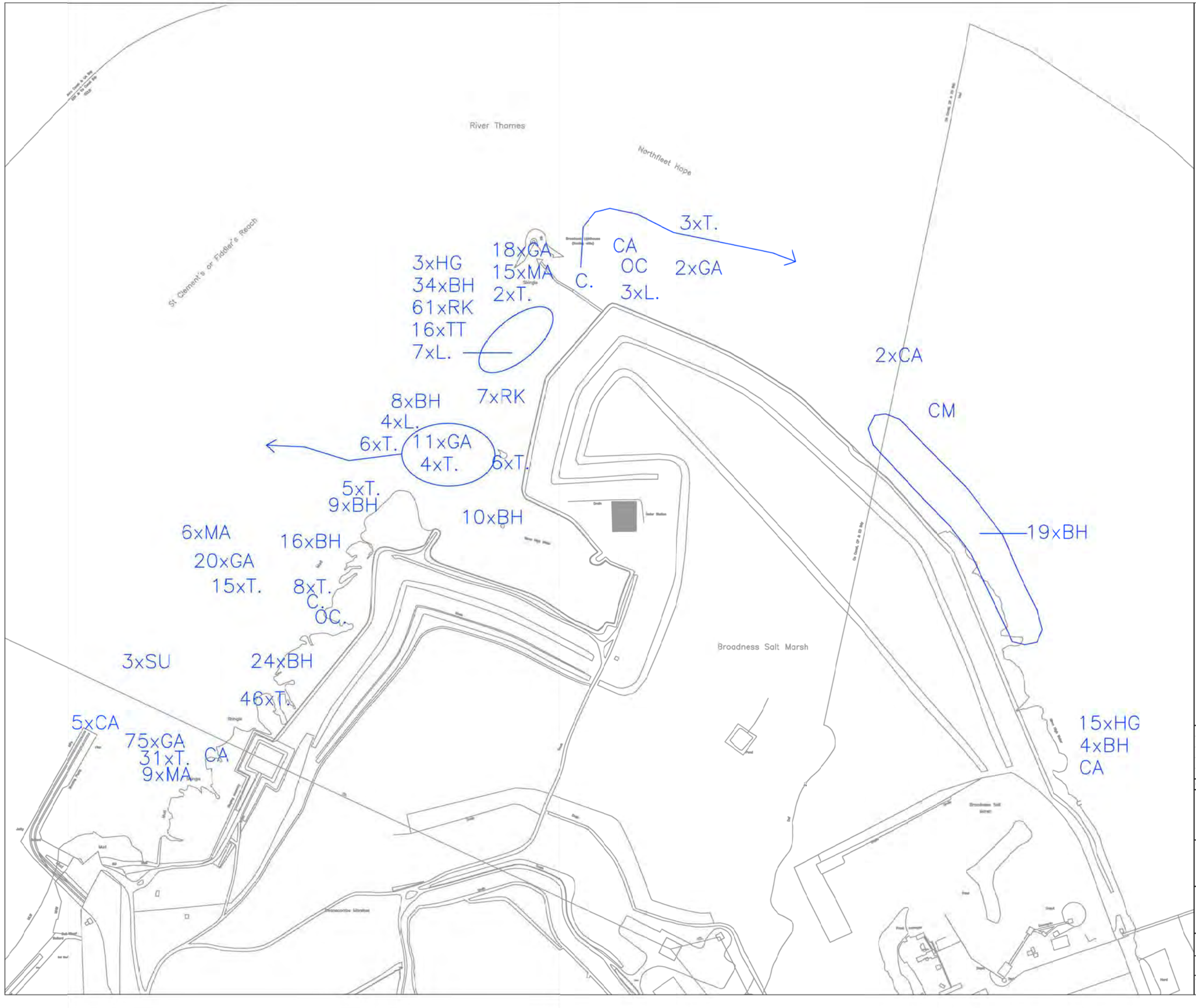

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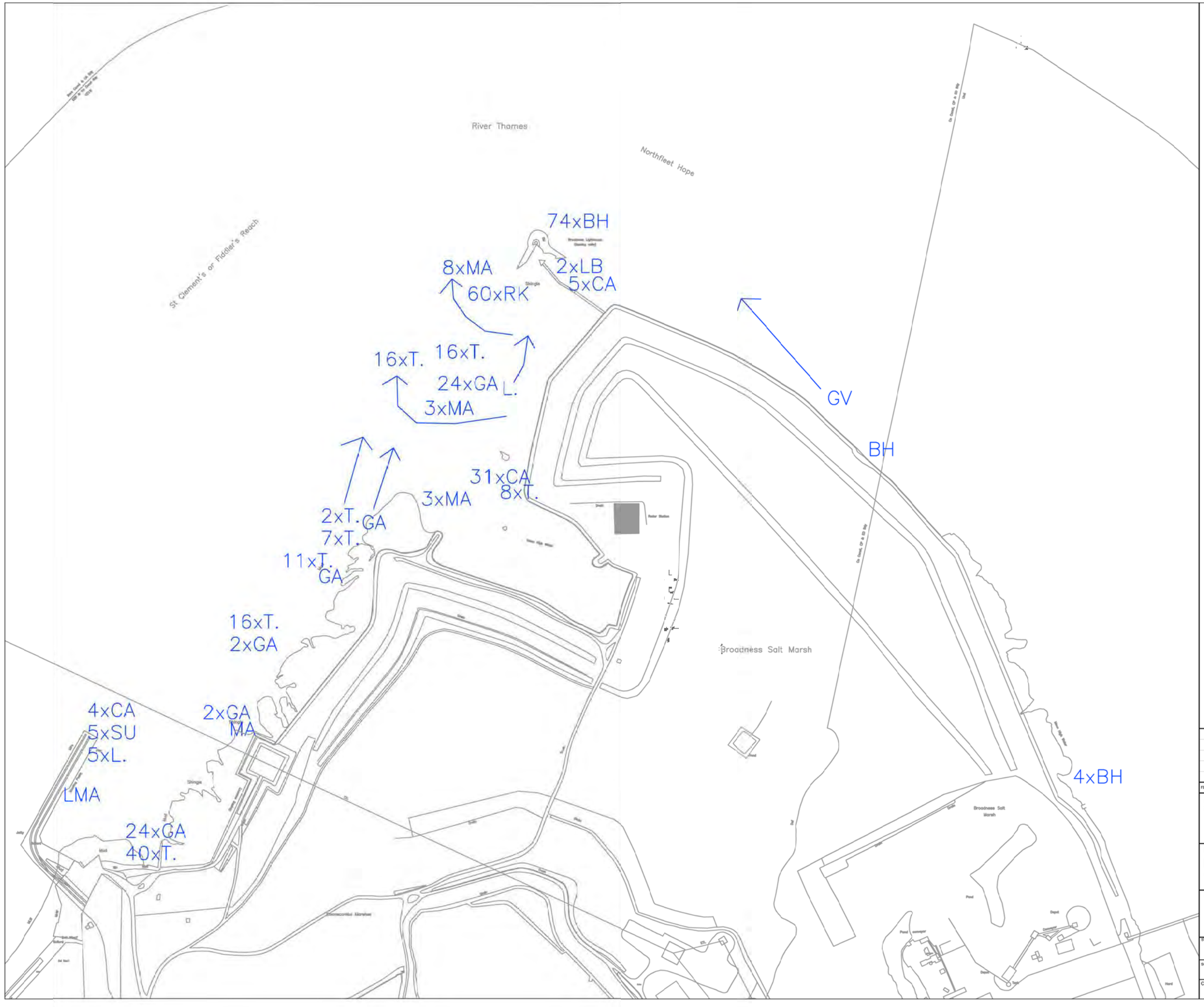

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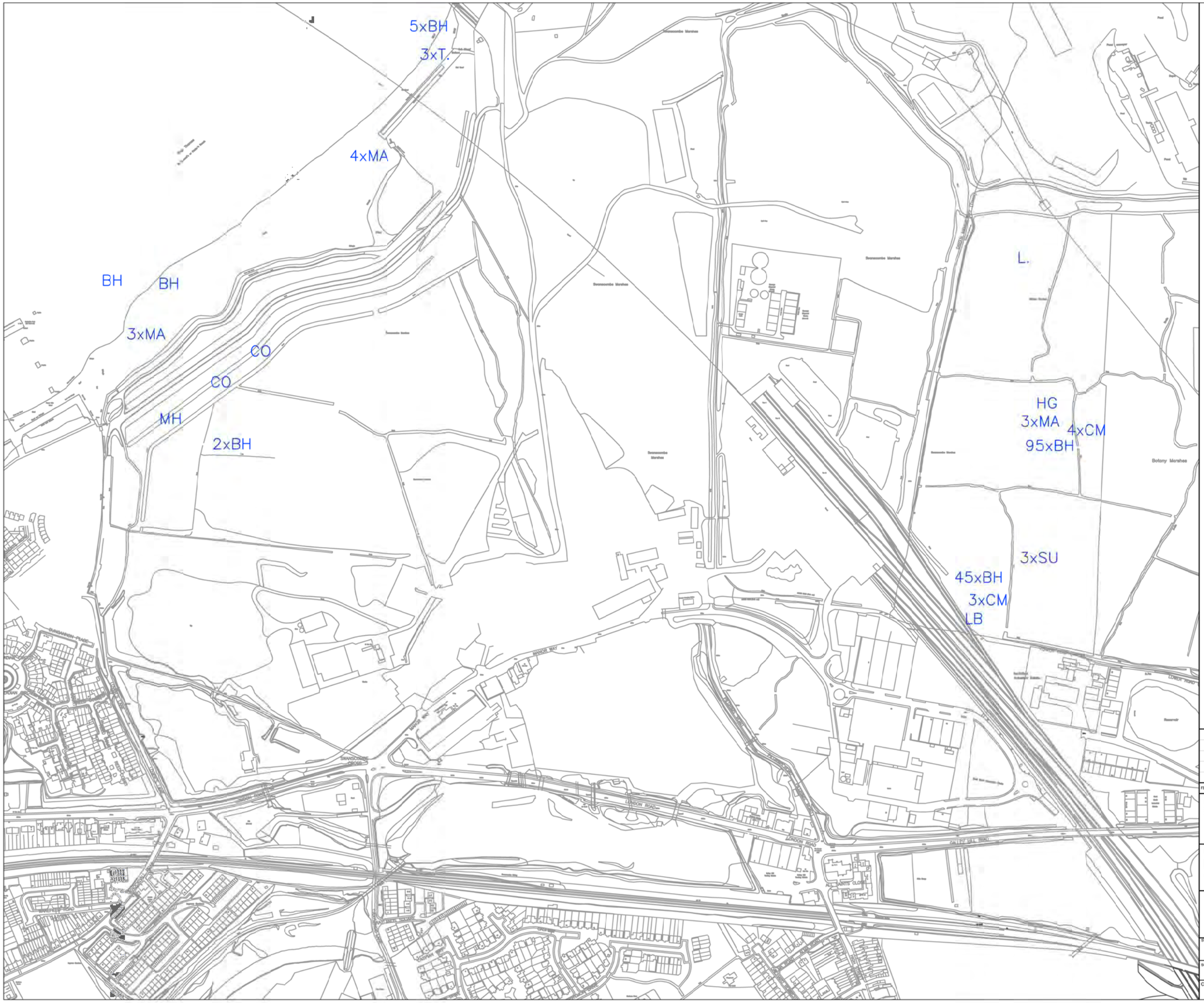

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SH	Sparrowhawk
SN	Snipe
SU	Shelduck
SV	Shoveler
SC	Stonechat
T.	Teal
TT	Turnstone
W.	Wheatear
WA	Water Rail
WN	Wigeon

revision	description	date	checked by

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Project:
London Paramount - Wintering Bird Survey

Title:
South Area - March Low Tide

status		drawing no.		
		Figure 1		
scale	size	date	drawn	checked
NTS	A3	21-10-2013	APW	HL

CAD filename
Figure_1.dwg

KEY

BTO SPECIES CODES

AV	Avocet
BG	Brent Goose
BA	Bar-tailed Godwit
BH	Black-headed Gull
BW	Black-tailed Godwit
C.	Carrion Crow
CA	Cormorant
CG	Canada Goose
CO	Coot
CM	Common Gull
CS	Common Sandpiper
CU	Curlew
DN	Dunlin
ET	Little Egret
FF	Fieldfare
GA	Gadwall
GK	Greenshank
GB	Great Black-backed Gull
G.	Green Woodpecker
GP	Golden Plover
GV	Grey Plover
H.	Grey Heron
HG	Herring Gull
K.	Kestrel
KN	Knot
L.	Lapwing
LB	Lesser Back-backed Gull
LG	Little Grebe
LI	Linnet
MA	Mallard
MP	Meadow Pipit
MH	Moorhen
OC	Oystercatcher
PE	Peregrine
PH	Pheasant
RB	Reed Bunting
RK	Redshank
RP	Ringed Plover
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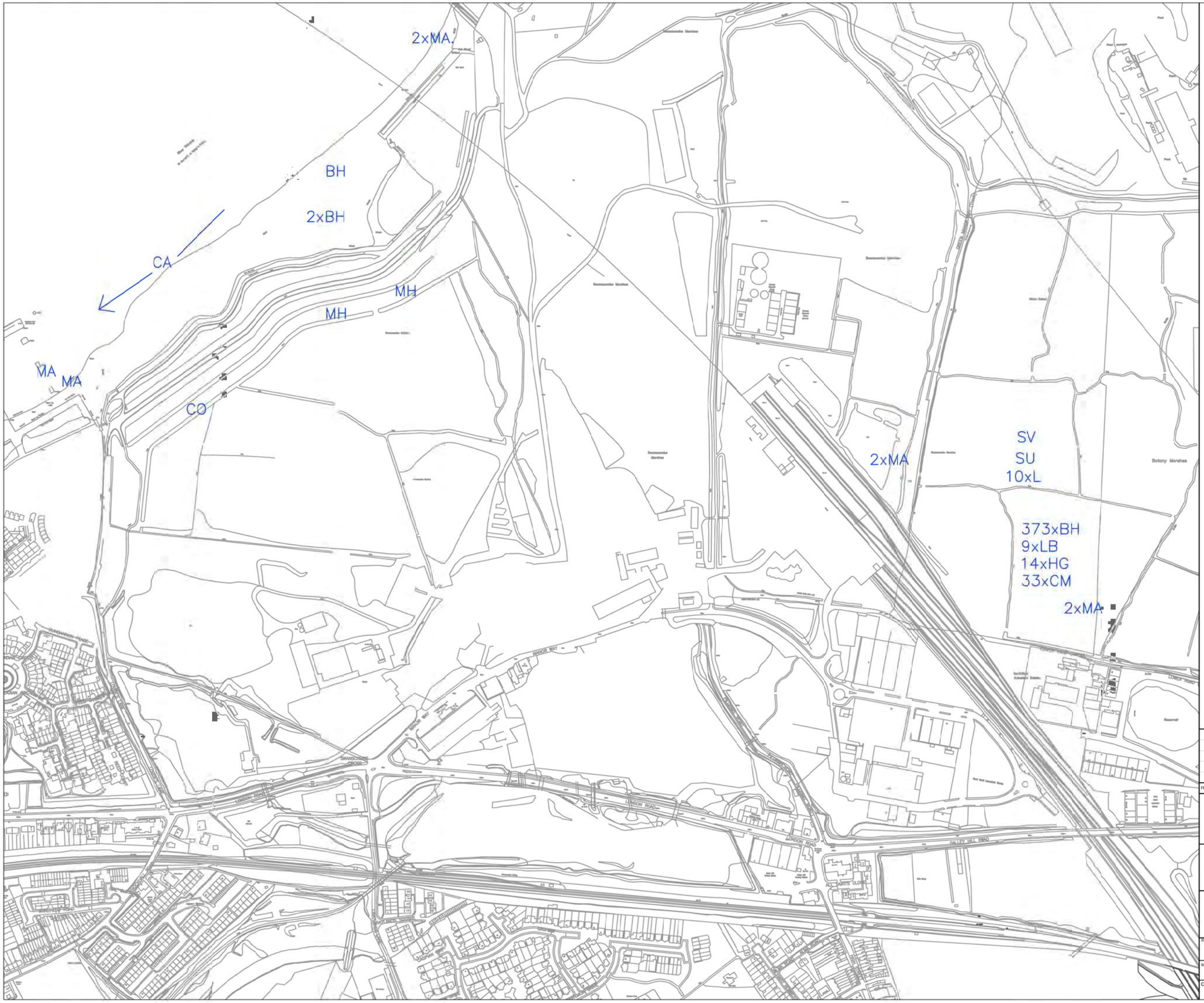
Project:
London Paramount - Wintering Bird Survey

Title:
North Area - March Low Tide

status		drawing no.			
		Figure 1			
scale	size	date		drawn	checked
NTS	**A3**	**21-10-2013**		**APW**	**HL**

CAD filename
Figure_1.dwg



KEY

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K.	Kestrel
KN	Knot
L.	Lapwing
LB	Lesser Back-backed Gull
LG	Little Grebe
LI	Linnet
MA	Mallard
MP	Meadow Pipit
MH	Moorhen
OC	Oystercatcher
PE	Peregrine
PH	Pheasant
RB	Reed Bunting
RK	Redshank
RP	Ringed Plover
S.	Skylark
SE	Short-eared Owl
SH	Sparrowhawk
SN	Snipe
SU	Shelduck
SV	Shoveler
SC	Stonechat
T.	Teal
TT	Turnstone
W.	Wheatear
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revision	description	date	checked by

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Project:
London Paramount - Wintering Bird Survey

Title:
South Area - March High Tide

status		drawing no.		
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scale	size	date	drawn	checked
NTS	A3	21-10-2013	APW	HL

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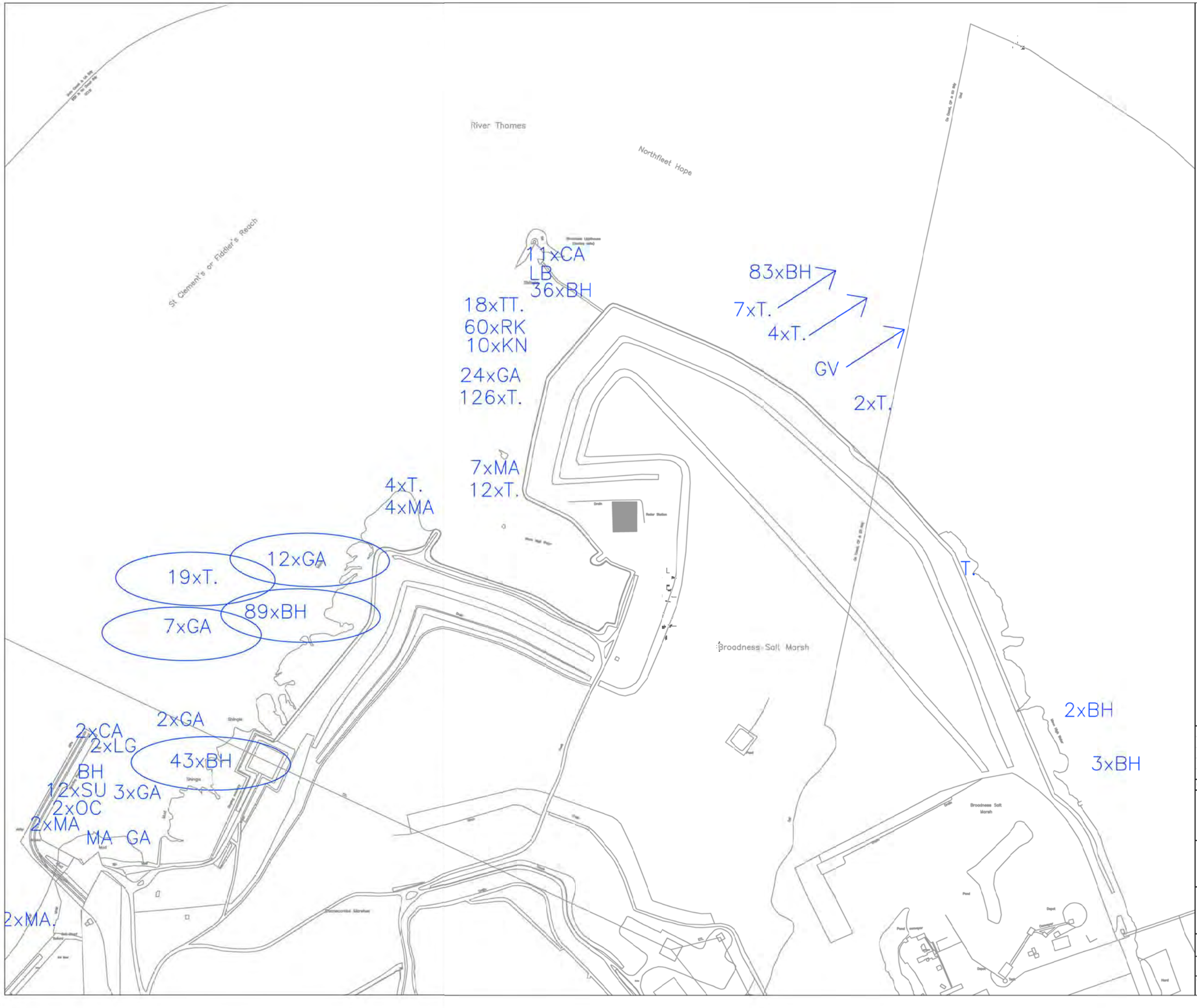
Figure_1.dwg



KEY

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MA	Mallard
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MH	Moorhen
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RK	Redshank
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S.	Skylark
SE	Short-eared Owl
SH	Sparrowhawk
SN	Snipe
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SV	Shoveler
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T.	Teal
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revision	description	date	checked by

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Project:
London Paramount - Wintering Bird Survey

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North Area - March High Tide

status		drawing no.			
		Figure 1			
scale	size	date		drawn	checked
NTS	**A3**	**21-10-2013**		**APW**	**HL**

CAD filename
Figure_1.dwg

APPENDICES

BTO SPECIES CODES

AC	Arctic Skua	GA	Gadwall	LE	Long-eared Owl	SM	Sand Martin
AE	Arctic Tern	GX	Gannet	LT	Long-tailed Tit	SS	Sanderling
AV	Avocet	GW	Garden Warbler	MG	Magpie	TE	Sandwich Tern
BO	Barn Owl	GY	Garganey	MA	Mallard	VI	Savi's Warbler
BY	Barnacle Goose	GC	Goldcrest	MN	Mandarin Duck	SQ	Scarlet Rosefinch
BA	Bar-tailed Godwit	EA	Golden Eagle	MX	Manx Shearwater	SP	Scaup
BR	Bearded Tit	OL	Golden Oriole	MR	Marsh Harrier	CY	Scottish Crossbill
BS	Berwick's Swan	GF	Golden Pheasant	MT	Marsh Tit	SW	Sedge Warbler
BI	Bittern	GP	Golden Plover	MW	Marsh Warbler	NS	Serin
BK	Black Grouse	GN	Goldeneye	MP	Meadow Pipit	SA	Shag
TY	Black Guillemot	GO	Goldfinch	MU	Mediterranean Gull	SU	Shelduck
BX	Black Redstart	GD	Goosander	ML	Merlin	SX	Shorelark
BJ	Black Tern	GI	Goshawk	M.	Mistle Thrush	SE	Short-eared Owl
B.	Blackbird	GH	Grasshopper Warbler	MO	Montagu's Harrier	SV	Shoveler
BC	Blackcap	GB	Great Black-backed Gull	MH	Moorhen	SK	Siskin
BH	Black-headed Gull	GG	Great Crested Grebe	MS	Mute Swan	S.	Skylark
BN	Black-necked Grebe	ND	Great Northern Diver	N.	Nightingale	SZ	Slavonian Grebe
BW	Black-tailed Godwit	NX	Great Skua	NJ	Nightjar	SN	Snipe
BV	Black-throated Diver	GS	Great Spotted Woodpecker	NH	Nuthatch	SB	Snow Bunting
BT	Blue Tit	GT	Great Tit	OP	Osprey	ST	Song Thrush
BU	Bluethroat	GE	Green Sandpiper	OC	Oystercatcher	SH	Sparrowhawk
BL	Brambling	G.	Green Woodpecker	PX	Peafowl/Peacock	AK	Spotted Crake
BG	Brent Goose	GR	Greenfinch	PE	Peregrine	SF	Spotted Flycatcher
BF	Bullfinch	GK	Greenshank	PH	Pheasant	DR	Spotted Redshank
BZ	Buzzard	H.	Grey Heron	PF	Pied Flycatcher	SG	Starling
CG	Canada Goose	P.	Grey Partridge	PW	Pied Wagtail	SD	Stock Dove
CP	Capercaillie	GV	Grey Plover	PG	Pink-footed Goose	SC	Stonechat
C.	Carrion Crow	GL	Grey Wagtail	PT	Pintail	TN	Stone-curlew
CW	Cetti's Warbler	GJ	Greylag Goose	PO	Pochard	TM	Storm Petrel
CH	Chaffinch	GU	Guillemot	PM	Ptarmigan	SL	Swallow
CC	Chiffchaff	FW	Guineafowl (Helmeted)	PU	Puffin	SI	Swift
CF	Chough	HF	Hawfinch	PS	Purple Sandpiper	TO	Tawny Owl
CL	Cirl Bunting	HH	Hen Harrier	Q.	Quail	T.	Teal
CT	Coal Tit	HG	Herring Gull	RN	Raven	TK	Temminck's Stint
CD	Collared Dove	HY	Hobby	RA	Razorbill	TP	Tree Pipit
CM	Common Gull	HZ	Honey Buzzard	RG	Red Grouse	TS	Tree Sparrow
CS	Common Sandpiper	HC	Hooded Crow	KT	Red Kite	TC	Treecreeper
CX	Common Scoter	HP	Hoopoe	ED	Red-backed Shrike	TU	Tufted Duck
CN	Common Tern	HM	House Martin	RM	Red-breasted Merganser	TT	Turnstone
CO	Coot	HS	House Sparrow	RQ	Red-crested Pochard	TD	Turtle Dove
CA	Cormorant	JD	Jackdaw	FV	Red-footed Falcon	TW	Twite
CB	Corn Bunting	J.	Jay	RL	Red-legged Partridge	WA	Water Rail
CE	Corncrake	K.	Kestrel	NK	Red-necked Phalarope	W.	Wheatear
CI	Crested Tit	KF	Kingfisher	LR	Redpoll (Lesser)	WM	Whimbrel
CR	Crossbill (Common)	KI	Kittiwake	RK	Redshank	WC	Whinchat
CK	Cuckoo	KN	Knot	RT	Redstart	WG	White-fronted Goose
CU	Curlew	LM	Lady Amherst's Pheasant	RH	Red-throated Diver	WH	Whitethroat
DW	Dartford Warbler	LA	Lapland Bunting	RE	Redwing	WS	Whooper Swan
DI	Dipper	L.	Lapwing	RB	Reed Bunting	WN	Wigeon
DO	Dotterel	TL	Leach's Petrel	RW	Reed Warbler	WT	Willow Tit
DN	Dunlin	LB	Lesser Black-backed Gull	RZ	Ring Ouzel	WW	Willow Warbler
D.	Dunnock	LS	Lesser Spotted Woodpecker	RP	Ringed Plover	OD	Wood Sandpiper
EG	Egyptian Goose	LW	Lesser Whitethroat	RI	Ring-necked Parakeet	WO	Wood Warbler
E.	Eider	LI	Linnet	R.	Robin	WK	Woodcock
FP	Feral Pigeon	ET	Little Egret	DV	Rock Dove (not feral)	WL	Woodlark
ZL	Feral/hybrid goose	LG	Little Grebe	RC	Rock Pipit	WP	Woodpigeon
ZF	Feral/hybrid mallard type	LU	Little Gull	RO	Rook	WR	Wren
FF	Fieldfare	LO	Little Owl	RS	Roseate Tern	WY	Wryneck
FC	Firecrest	LP	Little Ringed Plover	RY	Ruddy Duck	YW	Yellow Wagtail
F.	Fulmar	AF	Little Tern	RU	Ruff	Y.	Yellowhammer

If you are not submitting your data electronically using BBS-Online, please return your Field Recording Sheets to your Regional Organiser with your other BBS forms. If you would like to submit your results on BBS-Online, please inform your RO, then visit www.bto.org/bbs.

Appendix II: Species List

Common Name	Scientific Name
Black-headed gull	*Chroicocephalus ridibundus*
Carrion crow	*Corvus corone*
Common gull	*Larus canus*
Coot	*Fulica atra*
Cormorant	*Phalacrocorax carbo*
Curlew	*Numenius arquata*
Gadwall	*Anas strepera*
Great black-backed gull	*Larus marinus*
Great crested grebe	*Podiceps cristatus*
Grey heron	*Ardea cinerea*
Greylag goose	*Anser anser*
Grey plover	*Pluvialis squatarola*
Herring gull	*Larus argentatus*
Kestrel	*Falco tinnunculus*
Knot	*Calidris canuta*
Lapwing	*Vanellus vanellus*
Lesser black-backed gull	*Larus fuscus*
Little egret	*Egretta garzetta*
Little grebe	*Tachybaptus ruficollis*
Mallard	*Anas platyrhynchos*
Marsh harrier	*Circus aeruginosus*
Moorhen	*Gallinula chloropus*
Oystercatcher	*Haematopus ostralegus*
Peregrine	*Falco peregrinus*
Redshank	*Tringa totanus*
Shellduck	*Tadorna tadorna*
Shoveler	*Anas clypeata*
Snipe	*Gallinago gallinago*
Teal	*Anas crecca*
Tufted duck	*Aythya fuligula*
Turnstone	*Streptopelia turtur*
Wigeon	*Anas penelope*

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Directors C J Blandford BA DipLD MLA FLI • M E Antonia BSc EnvSci RSA DipPA • D Watkins BSc MSc AMIEnvSci

Annex EDP 5
Results of EDP Intertidal (Low Tide) Surveys

Table EDP A5.1: Survey Results – November 2019

Species	Sector Peak									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Total**
Black-headed gull	24	23	24	-	9	11	45	1	-	**137**
Black-tailed godwit	-	3	-	30	-	-	-	-	-	**33**
Canada goose	-	1	-	-	-	-	-	-	-	**1**
Cormorant	2	-	-	-	2	2	2	-	-	**8**
Curlew	-	-	-	-	-	1	1	-	-	**2**
Dunlin	-	18	-	-	-	-	-	-	-	**18**
Gadwall	2	8	-	4	1	-	-	-	-	**15**
Great black-backed gull	1	-	-	-	3	1	1	-	-	**6**
Grey heron	-	-	-	-	-	-	2	-	-	**2**
Greylag goose	-	4	-	-	-	-	-	-	-	**4**
Herring gull	3	-	-	-	-	1	-	-	-	**4**
Lapwing	-	18	-	-	-	-	-	-	-	**18**
Lesser black-backed gull	3	2	3	-	-	1	-	-	-	**9**
Little egret	-	1	-	-	-	1	-	-	-	**2**
Mallard	3	5	2	2	5	27	17	4	-	**65**
Redshank	-	-	-	-	-	-	57	-	-	**57**
Starling	-	-	-	-	-	-	2	-	-	**2**
Teal	-	-	-	24	11	18	15	-	-	**68**

Table EDP A5.2: Survey Results – December 2019

Species	Sector Peak									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Total**
Black-headed gull	8	7	8	15	15	13	2	9	-	**77**
Cormorant	-	-	-	-	1	1	3	-	-	**5**
Curlew	-	-	-	-	-	-	1	-	-	**1**
Gadwall	4	2	9	9	-	-	-	-	-	**24**
Great black-backed gull	-	-	1	1	-	-	1	-	-	**3**
Green sandpiper	-	-	-	-	1	-	-	-	-	**1**
Little egret	-	-	-	-	-	-	1	-	-	**1**
Mallard	4	-	2	21	23	27	3	-	-	**80**

Species	Sector Peak									
	1	2	3	4	5	6	7	8	9	Total
Meadow pipit	-	-	-	-	-	-	-	2	-	**2**
Redshank	-	-	-	-	1	-	30	-	-	**31**
Reed bunting	-	-	-	-	-	-	-	1	-	**1**
Teal	-	-	-	-	1	-	-	-	-	**1**
Turnstone	-	-	-	-	-	-	1	-	-	**1**
Wigeon	-	-	-	-	4	29	8	-	-	**41**
Yellowhammer	-	-	-	-	-	-	-	1	-	**1**

Table EDP A5.3: Survey Results – January 2020

Species	Sector Peak									
	1	2	3	4	5	6	7	8	9	Total
Black-headed gull	9	4	2	42	40	60	8	7	15	**187**
Canada goose	2	-	-	-	-	-	-	-	-	**2**
Cormorant	1	-	-	-	-	4	6	-	-	**11**
Curlew	-	-	-	-	-	1	-	-	-	**1**
Gadwall	6	4	7	7	-	14	2	-	-	**40**
Great black-backed gull	-	-	-	1	-	1	1	1	1	**5**
Herring gull	-	2	2	-	-	-	-	-	-	**4**
Lapwing	-	2	1	-	-	-	2	-	-	**5**
Lesser black-backed gull	3	2	-	-	-	-	-	-	-	**5**
Linnet	-	-	-	-	-	-	2	-	-	**2**
Mallard	3	-	6	3	2	7	3	-	-	**24**
Meadow pipit	-	-	-	-	-	-	2	-	-	**2**
Redshank	3	-	-	-	-	-	45	-	-	**48**
Shelduck	-	-	-	4	-	2	1	-	-	**7**
Teal	-	-	-	10	2	6	-	-	-	**18**
Wigeon	-	-	-	-	-	-	12	-	-	**12**

Table EDP A5.4: Survey Results – February 2020

Species	Sector Peak									
	1	2	3	4	5	6	7	8	9	Total
Avocet	-	-	-	1	-	-	1	-	-	**2**
Black-headed gull	45	16	5	21	12	90	67	13	4	**273**
Canada goose	6	-	-	-	-	-	-	-	-	**6**
Cetti's warbler	-	-	1	-	-	-	-	-	-	**1**

Species	Sector Peak									
	1	2	3	4	5	6	7	8	9	Total
Common gull	-	-	-	-	1	5	-	-	-	**6**
Cormorant	-	-	-	-	-	-	5	-	-	**5**
Gadwall	4	4		10			11			**29**
Great black-backed gull	-	-	2	-	1	-	-	-	-	**3**
Grey heron	2	-	-	-	-	-	-	1	-	**3**
Herring gull	-	4	-	-	-	-	13	-	5	**22**
Lapwing	-	-	-	-	-	-	8	-	-	**8**
Lesser black-backed gull	1	-	-	2	-	-	4	-	-	**7**
Mallard	2	-	-	4	1	2	8	-	-	**17**
Meadow pipit	-	1	-	-	-	-	-	-	-	**1**
Mute swan	-	-	-	-	-	1	-	-	1	**2**
Oystercatcher	2	-	-	2	-	2	2	-	-	**8**
Reed bunting	-	-	2	-	-	-	-	-	-	**2**
Shelduck	-	2	-	1	3	1	-	1	1	**9**
Skylark	-	1	1	-	-	-	-	-	-	**2**
Stonechat	-	-	1	-	-	-	-	-	-	**1**
Teal	1	-	-	9	1	-	-	-	-	**11**
Wigeon	-	-	-	-	-	1	-	-	-	**1**

Table EDP A5.5: Survey Results – March 2020

Species	Sector Peak									
	1	2	3	4	5	6	7	8	9	Total
Black-headed gull	1	8	8	8	13	30	-	3	-	**71**
Canada goose	3	-	-	-	-	-	-	-	-	**3**
Common gull	-	-	-	-	-	10	10	-	-	**20**
Cormorant	-	-	1	-	1	-	5	-	-	**7**
Gadwall	-	-	-	-	1	-	-	-	-	**1**
Greylag goose	-	1	-	-	-	-	-	-	-	**1**
Herring gull	-	-	-	-	1	-	8	1	-	**10**
Lesser black-backed gull	-	-	-	-	-	1	-	-	-	**1**
Little egret	-	-	-	-	-	-	1	-	-	**1**
Mallard	-	4	1	1	-	4	2	-	-	**12**
Oystercatcher	-	2	-	-	-	1	-	-	-	**3**
Redshank	-	-	-	-	-	-	7	-	-	**7**
Shelduck	-	-	2	1	-	-	-	-	-	**3**

Species	Sector Peak									
	1	2	3	4	5	6	7	8	9	Total
Starling	-	-	6	-	-	-	-	-	-	**6**
Teal	-	-	-	4	-	-	-	-	-	**4**
Turnstone							7			**7**

Table EDP A5.6: Monthly Total Peak Count for Winter Intertidal Surveys

Species	Monthly Peak Count					Maximum	Average
	November 2019	December 2019	January 2020	February 2020	March 2020		
Avocet	-	-	-	2	-	2	-
Black-headed gull	137	77	187	273	71	273	149
Black-tailed godwit	33	-	-	-	-	33	-
Canada goose	1	-	2	6	3	6	3
Cetti's warbler	-	-	-	1	-	1	-
Common gull	-	-	-	6	20	20	13
Cormorant	8	5	11	5	7	11	7
Curlew	2	1	1	-	-	2	1
Dunlin	18	-	-	-	-	18	-
Gadwall	15	24	40	29	1	40	22
Great black-backed gull	6	3	5	3	-	6	4
Green sandpiper	-	1	-	-	-	1	-
Grey heron	2	-	-	3	-	3	3
Greylag goose	4	-	-	-	1	4	3
Herring gull	4	-	4	22	10	22	10
Lapwing	18	-	5	8	-	18	10
Lesser black-backed gull	9	-	5	7	1	9	6
Linnet	-	-	2	-	-	2	-
Little egret	2	1	-	-	1	2	1
Mallard	65	80	24	17	12	80	40
Meadow pipit	-	2	2	1	-	2	2
Mute swan	-	-	-	2	-	2	-
Oystercatcher	-	-	-	8	3	8	6
Redshank	57	31	48	-	7	57	36
Reed bunting	-	1	-	2	-	2	2
Shelduck	-	-	7	9	3	9	6
Skylark	-	-	-	2	-	2	-
Starling	2	-	-	-	6	6	4
Stonechat	-	-	-	1	-	1	-
Teal	68	1	18	11	-	68	25
Turnstone	-	1	-	-	7	7	4
Wigeon	-	41	12	-	1	41	18
Yellowhammer	-	1	-	-	-	1	-

Annex EDP 6
Results of EDP High Tide Surveys

Table EDP A6.1: Survey Results – November 2019.

Species	Sector Peak									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Total**
Black-headed gull	2	3	5	2	10	2	45	2	-	**71**
Cormorant	1	-	-	4	1	1	2	-	-	**9**
Curlew	-	-	-	1	-	-	1	-	-	**1**
Gadwall	-	14	-	-	-	-	-	-	-	**14**
Great black-backed gull	2	1	1	-	-	-	1	-	-	**5**
Grey heron	-	-	-	1	-	-	2	-	-	**3**
Lapwing	-	-	2	-	-	-	-	-	-	**2**
Lesser black-backed gull	-	-	-	-	-	-	-	1	-	**1**
Little egret	1	-	-	-	-	-	-	-	-	**1**
Mallard	-	1	-	43	76	18	17	-	-	**155**
Redshank	-	-	-	-	-	-	54	-	-	**54**
Teal	-	-	-	-	-	6	152	-	-	**158**
Wigeon	-	-	-	-	3	-	-	-	-	**3**

Table EDP A6.2: Survey Results – December 2019.

Species	Sector Peak									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Total**
Black-headed gull	3	-	3	13	53	11	51	15	14	**163**
Cetti's warbler	1	2	-	-	-	-	-	-	-	**3**
Common gull	-	-	1	-	-	-	-	-	1	**2**
Cormorant	-	-	-	-	1	1	2	-	-	**4**
Curlew	-	-	-	-	1	-	-	-	-	**1**
Dunnock	-	-	-	1	-	-	-	-	-	**1**
Fieldfare	-	-	5	-	-	-	-	-	-	**5**
Gadwall	2	5	-	-	26	2	10	2	-	**47**
Great black-backed gull	1	1	-	-	-	-	-	-	-	**2**
Grey heron	-	-	-	-	1	-	-	-	-	**1**
Herring gull	2	-	-	-	-	-	-	-	1	**3**
Lapwing	-	-	2	1	-	-	-	-	-	**3**
Lesser black-backed gull	-	-	-	-	-	-	-	1	2	**3**
Mallard	2	7	-	-	88	17	54	22	3	**193**
Redshank	-	-	-	-	-	-	3	1	-	**4**

Species	Sector Peak									
	1	2	3	4	5	6	7	8	9	Total
Redwing	-	-	10	-	-	-	-	-	-	**10**
Starling	1	-	2	-	-	-	-	-	-	**3**
Stonechat	-	-	-	-	-	1	-	-	-	**1**
Teal	-	-	-	-	57	9	32	21	-	**119**

Table EDP A6.3: Survey Results – January 2020.

Species	Sector Peak									
	1	2	3	4	5	6	7	8	9	Total
Black-headed gull	150	6	40	3	60	150	164	29	3	**605**
Cormorant	-	-	-	1	-	2	12	-	-	**15**
Curlew	-	-	-	-	-	-	3	-	-	**3**
Gadwall	5	10	-	4	11	14	19	1	-	**64**
Great black-backed gull	2	-	-	-	-	-	-	-	-	**2**
Grey heron	-	1	-	-	-	-	-	-	-	**1**
Greylag goose	1	-	-	-	-	-	-	-	-	**1**
Herring gull	-	-	-	-	6	-	2	-	2	**10**
Lapwing	-	-	32	3	-	3	-	-	-	**38**
Lesser black-backed gull	-	-	-	-	1	-	6	-	-	**7**
Little egret	1	-	-	-	-	-	-	-	-	**1**
Mallard	10	15	-	-	-	10	23	2	-	**60**
Meadow pipit	-	2	-	-	-	-	-	-	-	**2**
Redshank	-	-	-	-	-	-	37	-	-	**37**
Shelduck	-	-	-	1	3		-	-	-	**4**
Shoveler	-	1	-	-	-	-	-	-	-	**1**
Snipe	-	-	-	-	1	-	-	1	-	**2**
Stonechat	-	1	2	-	-	-	-	-	-	**3**
Teal	1	4	5	-	20	4	35	-	-	**69**

Table EDP A6.4: Survey Results – February 2020.

Species	Sector Peak									
	1	2	3	4	5	6	7	8	9	Total
Avocet	-	-	-	2	-	2	-	1	-	**5**
Black-headed gull	5	120	-	2	40	14	12	7	-	**200**
Cormorant	-	-	-	-	1	-	-	-	-	**1**
Gadwall	-	12	1	4	18	14	34	2	-	**85**
Great black-backed gull	-	-	-	-	-	-	1	-	-	**1**
Herring gull	-	1	-	-	-	-	-	-	-	**1**
Lapwing	-	-	5	-	-	-	-	-	-	**5**
Mallard	4	6	4	-	2	8	12	-	2	**38**
Meadow	1	2	-	-	1	-	-	-	-	**4**

Species	Sector Peak									
	1	2	3	4	5	6	7	8	9	Total
pipit										
Redshank	-	-	-	-	-	-	9	23	-	**32**
Reed bunting	-	1	-	-	-	-	-	-	-	**1**
Snipe	-	-	1	-	-	-	-	-	-	**1**
Starling	6	-	-	-	-	-	-	-	-	**6**
Stonechat	1	-	2	-	-	-	-	-	-	**3**
Teal	-	-	-	12	17	3	2	-	-	**34**

Table EDP A6.5: Survey Results – March 2020.

Species	Sector Peak									
	1	2	3	4	5	6	7	8	9	Total
Black-headed gull	7	2	-	17	64	20	3	3	5	**121**
Canada goose	-	2	-	-	-	-	-	-	-	**2**
Cormorant	-	-	-	-	2	-	8	-	-	**10**
Gadwall	-	8	-	7	4	-	9	-	-	**28**
Grey heron	1	-	-	-	-	-	-	-	-	**1**
Greylag goose	-	-	4	-	-	-	-	-	-	**4**
Herring gull	1	-	-	-	-	-	1	-	-	**2**
Kestrel	-	1	-	-	-	-	-	-	-	**1**
Mallard	2	2	1	2	-	4	-	-	-	**11**
Marsh harrier	-	2	-	-	-	-	-	-	-	**2**
Meadow pipit	-	2	-	-	-	-	-	-	-	**2**
Mute swan	-	-	1	-	-	-	-	-	-	**1**
Oystercatcher	-	-	-	-	-	1	-	2	-	**3**
Redshank	-	-	-	-	-	-	18	-	-	**18**
Skylark	-	2	-	-	-	-	-	-	-	**2**
Starling	-	-	4	-	-	-	-	-	-	**4**
Teal	-	-	-	3	2	8	12	-	-	**25**

Table EDP A6.6: Monthly Total Peak Count for High Tide Surveys.

Species	Monthly Peak Count					Maximum	Average
	November 2019	December 2019	January 2020	February 2020	March 2020		
Avocet	-	-	-	5	-	5	-
Black-headed gull	71	163	605	200	121	605	232
Canada goose	-	-	-	-	2	2	-
Cetti's warbler	-	3	-	-	-	3	-
Common gull	-	2	-	-	-	2	-
Cormorant	9	4	15	1	10	15	8
Curlew	1	1	3	-	-	3	2
Dunnock	-	1	-	-	-	1	-
Fieldfare	-	5	-	-	-	5	-
Gadwall	14	47	64	85	28	85	48
Great black-backed gull	5	2	2	1	-	5	3
Grey heron	3	1	1	-	1	3	2
Greylag goose	-	-	1	-	4	4	3
Herring gull	-	3	10	1	2	10	4
Kestrel	-	-	-	-	1	1	-
Lapwing	2	3	38	5	-	38	12
Lesser black-backed gull	1	3	7	-	-	7	4
Little egret	1	-	1	-	-	1	1
Mallard	155	193	60	38	11	193	91
Marsh harrier	-	-	-	-	2	2	-
Meadow pipit	-	-	2	4	2	4	23
Mute swan	-	-	-	-	1	1	-
Oystercatcher	-	-	-	-	3	3	-
Redshank	54	4	37	32	18	54	29
Redwing	-	10	-	-	-	10	-
Reed bunting	-	-	-	1	-	1	-
Shelduck	-	-	4	-	-	4	-
Shoveler	-	-	1	-	-	1	-
Skylark	-	-	-	-	2	2	-
Snipe	-	-	2	1	-	2	2
Starling	-	3	-	6	4	6	4
Stonechat	-	1	3	3	-	3	2
Teal	158	119	69	34	25	158	81
Wigeon	3	-	-	-	-	3	-

Annex EDP 7
Results of EDP Winter Bird Surveys

Table EDP A7.1: Winter Bird Survey Results, Schedule 1 and Red and Amber status only (totals marked with * are likely to be slightly higher than actual populations due to over-counting).

Species	Protection/UK Status/Country Status	On-site Distribution	2019/20 Population Within Site	
			Mean WBS Count	Maximum WBS Count
Bearded tit	Schedule 1	Six individuals recorded on a single occasion during the fifth survey visit within the reedbeds of Black Duck Marsh.	-	6
Black-headed gull	Amber status	Both small and large flocks seen across the Kent Project Site on four survey visits.	70	144
Black-tailed godwit	Red status Section 41 NERC	Two small flocks seen along the estuary frontage during the first survey visit.	-	23
Bullfinch	Amber status Section 41 NERC	Small numbers seen throughout the Kent Project Site during four survey visits.	1	2
Cetti's warbler	Schedule 1	Numerous individuals recorded singing from reedbeds throughout the Kent Project Site on all survey sites. Most frequently encountered on the peninsula where individuals were largely recorded singing from within the reedbeds but also from within the abundance of scrub habitat. The cryptic nature of the species means that registrations are generally only made when song is heard, and given the species preferred, wetland habitat, means that triangulation can be difficult. Therefore, one bird may be recorded from multiple locations and result in more than one added to the count.	24*	34*
Common gull	Amber status	Single individual recorded within the centre of the Kent Project Site during the first survey visit.	-	1
Cormorant	Amber status	Small numbers of individuals recorded along the estuary frontage on all five survey visits.	5	9

Species	Protection/UK Status/Country Status	On-site Distribution	2019/20 Population Within Site	
			Mean WBS Count	Maximum WBS Count
Dunnock	Amber status Section 41 NERC	Reasonable numbers found throughout the Kent Project Site on all survey visits. Abundant suitable habitat throughout Site.	26	34
Dartford warbler	Schedule 1	Single individual recorded during the third survey visit atop scrub on the eastern edge of the peninsula, north of Botany Marsh.	-	1
Fieldfare	Red status Schedule 1	Small numbers seen throughout the Kent Project Site during the first four survey visits, with numbers gradually decreasing until none were recorded during the fifth survey visit. Flocks predominantly recorded on the peninsula.	40	71
Gadwall	Amber status	Small flocks recorded along the estuary frontage during all five survey visits.	14	32
Green sandpiper	Amber status Schedule 1	Single individual flushed from the edge of a drainage outlet during first survey visit.	-	1
Great black-backed gull	Amber status	Small numbers seen throughout the Kent Project Site over five survey visits.	3	5
Greylag goose	Amber status	Regularly encountered on the peninsula over five survey visits, particularly within the fields at Botany Marsh.	30	61
Grey partridge	Red status Section 41 NERC	A single bird was flushed from vegetation within the landfill area, north of Ebbsfleet International.	-	1
Grey wagtail	Red status	Four individuals seen throughout the peninsula during the first survey visit.	-	4
Herring gull	Red status Section 41 NERC	Small numbers seen throughout the Kent Project Site over five survey visits	3	6
House sparrow	Red status Section 41 NERC	Four individuals seen close to existing residential development within the centre of the Kent Project Site during the third survey visit.	-	4

Species	Protection/UK Status/Country Status	On-site Distribution	2019/20 Population Within Site	
			Mean WBS Count	Maximum WBS Count
Kestrel	Amber status	At least one individual seen during all five survey visits, with a max total of 5 registrations during December. It is likely that these registrations represent two individuals with both a male and female recorded over the five survey visits and only one individual seen at any one time.	3*	5*
Lapwing	Red status Section 41 NERC	Individuals seen mainly at Botany Marshes and along the estuary frontage during four of the five visits.	2	3
Lesser black-backed gull	Amber status	Individuals seen along the estuary frontage during December and February 2020.	2	3
Linnet	Red status	Small numbers seen throughout the Kent Project Site during four of the five survey visits with several singing individuals encountered during March 2020.	12	17
Lesser redpoll	Red status Section 41 NERC	Two individuals seen on the peninsula during the second survey visit.	-	2
Mallard	Amber status	Seen regularly in medium-sized flocks along the estuary frontage as well as smaller flocks and individuals seen on on-site drainage ditches and ponds.	59	160
Marsh harrier	Amber status Schedule 1	At least one individual seen during all visits other than December. A max total of 5 registrations were made during March with an overall average of 3. However, these registrations are likely to represent two individuals with a max total of only two individuals (a single male and female) seen at any one time. Recorded birds were predominantly associated with the peninsula with evidence of both the male and female using the reedbeds at Black Duck and Botany Marshes, and within the centre of the peninsula to roost.	3*	5*
Marsh tit	Red status Section 41 NERC	Individuals seen on two separate occasions during December and January 2020.	1	1

Species	Protection/UK Status/Country Status	On-site Distribution	2019/20 Population Within Site	
			Mean WBS Count	Maximum WBS Count
Meadow pipit	Amber status	Seen regularly in small flocks across the Kent Project Site.	11	26
Mute swan	Amber status	Individuals recorded at Black Duck Marsh on three of the five survey visits.	1	2
Oystercatcher	Amber status	Two individuals seen along the estuary frontage on the fifth survey visit.	-	2
Pochard	Red status	Two individuals seen at Black Duck Marshes during the first survey visit.	-	2
Redshank	Amber status	Two individuals seen along the estuary frontage on the first survey visit.	-	2
Redwing	Red status Schedule 1	Varying flock sizes recorded throughout the Kent Project Site on all surveys except the final survey visit in March	33	45
Reed bunting	Amber status Section 41 NERC	Individuals recorded throughout the peninsula during four of the five survey visits.	3	5
Shelduck	Amber status	Small flocks recorded during February and March 2020, mostly associated with Botany Marsh.	15	15
Shoveler	Amber status	Two individuals recorded on a pond located to the south of the Kent Project Site during the first survey visit and a further six individuals recorded at Botany Marsh during February 2020.	4	6
Skylark	Red status Section 41 NERC	Small numbers seen on all survey visits towards the peninsula and within the rough grassland fields surrounding Ebbsfleet International, particularly within the former landfill site.	7	17
Snipe	Amber status	Small numbers flushed from the grassland fields and capped landfill to the north and south of Ebbsfleet International during January, February and March 2020.	7	11
Song thrush	Red status Section 41 NERC	Several individuals recorded throughout the Kent Project Site over the five survey visits.	5	11

Species	Protection/UK Status/Country Status	On-site Distribution	2019/20 Population Within Site	
			Mean WBS Count	Maximum WBS Count
Starling	Red status	Varying flock sizes throughout site on four of the five survey visits.	25	44
Stock dove	Amber status	Single individual seen on the peninsula during December 2020.	-	1
Teal	Amber status	Small flocks seen along the estuary frontage on four of the five survey visits.	22	56
Wigeon	Amber status	Small flocks seen along the estuary frontage on two of the five survey visits.	4	6
Woodcock	Red status	Single individual flushed from an area of wet woodland and rough grassland within Station Quarter (south of the A2260).	-	1

Table EDP A7.2: List of Green Status or Unlisted Species Recorded During Winter Bird Surveys

Common Name	Scientific Name
Blackbird	*Turdus merula*
Blue tit	*Cyanistes caeruleus*
Buzzard	*Buteo buteo*
Canada goose	*Branta canadensis*
Carrion crow	*Corvus corone*
Chaffinch	*Fringilla coelebs*
Chiffchaff	*Phylloscopus collybita*
Coal tit	*Periparus ater*
Collared dove	*Streptopelia decaocto*
Coot	*Fulica atra*
Goldcrest	*Regulus regulus*
Goldfinch	*Carduelis carduelis*
Great spotted woodpecker	*Dendrocopos major*
Great tit	*Parus major*
Green woodpecker	*Picus viridis*
Greenfinch	*Chloris chloris*
Grey heron	*Ardea cinerea*
Jackdaw	*Coloeus monedula*
Jay	*Garrulus glandarius*
Long-tailed tit	*Aegithalos caudatus*
Little egret	*Egretta garzetta*
Little grebe	*Tachybaptus ruficollis*
Magpie	*Pica pica*
Moorhen	*Gallinula chloropus*
Nuthatch	*Sitta europaea*
Pheasant	*Phasianus colchicus*
Pied wagtail	*Motacilla alba yarrellii*
Raven	*Corvus corax*
Red-legged partridge	*Alectoris rufa*
Ringed-necked parakeet	*Psittacula krameri*
Robin	*Erithacus rubecula*
Rock pipit	*Anthus petrosus*
Siskin	*Spinus spinus*
Sparrowhawk	*Accipiter nisus*
Stonechat	*Saxicola torquata*
Treecreeper	*Certhia familiaris*
Tufted duck	*Aythya fuligula*
Water rail	*Rallus aquaticus*
Wood pigeon	*Columba palumbus*
Wren	*Troglodytes troglodytes*

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Annex EDP 4
Breeding and Passage Bird Surveys

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Methodology

Breeding birds

A4.1 The breeding bird survey (BBS) was undertaken with reference to standard methodology, entailing a modified Common Bird Census (CBC) 'territory mapping' approach[1]. Due to the complexity of habitats within the Kent Project Site and the variety of potential species supported, this involved one survey visit per month to each area of the Kent Project Site between April and July (i.e. at the height of the breeding bird season for lowland Britain). No surveys were deemed necessary at the Essex Project Site due to the lack of suitable habitat to support breeding birds.

A4.2 The Kent Project Site was split into five sections and surveyed by a single, experienced surveyor. The sections were designed to limit double counting by incorporating adjacent similar habitats within single sections where possible.

A4.3 Following best practice, the survey visits were timed to start around first light, to coincide with the period of peak activity for birds, most particularly passerine songbird species. Survey visits involving the Manor Way industrial estate began an hour before sunrise to record black redstart (*Phoenicurus ochruros*), potentially present. Surveys were also undertaken during suitable weather conditions, i.e. days/periods with strong winds and heavy or persistent rain were generally avoided. It is therefore considered that the results are not significantly limited by seasonal or climatic factors.

A4.4 Species specific surveys for spotted crake (*Porzana porzana*) were also undertaken after an individual of this species was recorded during another survey. This survey was undertaken at night between 23:00 and 03:00 on 19 June 2020 by two surveyors and involved a targeted survey of wetland habitat using sound recording equipment.

A4.5 The dates and timings of the survey visits and the weather conditions encountered are summarised in **Table EDP A4.1**.

Table EDP A4.1: Date, Timing and Weather Conditions during the Breeding Bird Survey Visits.

Survey	Date	Start/Finish Time	Precipitation	Wind (kph)	Visibility
1	14.04.20	04:50-09:26	None	Up to 11	Excellent
	16.04.20	04:38-09:41	None	Up to 5	Very good
	19.04.20	04:32-09:31	None	None	Excellent
	30.04.20	03:55-08:40	None	Up to 20	Excellent
2	06.05.20	04:10-08:39	None	Up to 15	Excellent

[1] British Trust for Ornithology, Common Bird Census. www.bto.org.

Survey	Date	Start/Finish Time	Precipitation	Wind (kph)	Visibility
	08.05.20	03:52-09:02	None	None	Excellent
	20.05.20	03:34-07:42	None	None	Excellent
	27.05.20	03:23-08:43	None	None	Excellent
3	05.06.20	03:01-08:22	Rain for 5 min	Up to 20	Very good
	09.06.20	03:27-08:28	None	None	Excellent
	11.06.20	03:14-07:48	None	Up to 13	Excellent
	26.06.20	03:28-07:35	Rain for 1 hour	Light	Excellent
4	01.07.20	03:20-08:30	None	Up to 20	Excellent
	06.07.20	03:40-08:30	None	Up to 30	Excellent
	08.07.20	03:40-08:30	Light rain	Up to 15	Good
	10.07.20	03:50-08:45	Drizzle	Up to 19	Good
Spotted Crake	19.06.2020	22:41-03:09	None	Light	Good

A4.6 The survey methodology involved walking to within c.50m of all parts of the Kent Project Site, where possible, and recording all birds listed within the Birds of Conservation Concern (BoCC) report[2] and their activity status, with a particular emphasis placed upon those elements considered to relate to, or be indicative of, breeding. This ensured that the survey identified all birds using the margins of the Kent Project Site, as well as those in the interior. Following the completion of the survey, the breeding status of each bird species identified will be determined according to the nature and frequency of the behavioural elements recorded, as set out overleaf in **Table EDP A4.2**.

Table EDP A4.2: Summary of Field Evidence Used to Determine Breeding Bird Status.

Status	European Bird Census Council (EBCC) Criteria for Categorisation of Breeding Status
Confirmed	• Distraction-display or injury feigning; • Used nest or eggshells found (occupied or laid within period of survey); • Recently fledged young (nidicolous *species*) or downy young (nidifugous species); • Adults entering or leaving nest-site in circumstances indicating occupied nest (including high nest or nest-holes, the contents of which cannot be seen) or adult seen incubating; • Adult carrying faecal sac or food for young; • Nest containing eggs; or • Nest with young seen or heard.

[2] Eaton, M.A., Aebischer, N.J., Brown, A.F., Hearn, R.D., Lock, L., Musgrove, A.J., Noble, D.G., Stroud, D.A. and Gregory, R.D. (2015). *Birds of Conservation Concern 4: the population status of birds in the UK, Channel Islands and Isle of Man*. British Birds, Vol. 108, 708-746.

Status	European Bird Census Council (EBCC) Criteria for Categorisation of Breeding Status
Probable	• Pair observed in suitable nesting habitat in breeding season; • Permanent territory presumed through registration of territorial behaviour (song, etc.) on at least two different days a week or more apart at the same place; • Courtship and display; • Visiting a probable nest site; • Agitated behaviour or anxiety calls from adults; • Brood patch on adult examined in the hand; or • Nest building or excavating nest-hole.
Possible	• Species observed in breeding season in possible nesting habitat; or • Singing male(s) present (or breeding calls heard) in breeding season.
Non-breeder	• Feeding birds only; • Birds flying over only; or • Lack of suitable breeding habitat.

A4.7 To provide further detail with regard to the total assemblage of bird species present within the Kent Project Site, a list of all other bird species recorded (i.e. those that are not considered to be of conservation concern) was made for each survey visit.

A4.8 The BBS was carried out by experienced ornithologists, at an appropriate time of year for the locality, and in suitable weather conditions. It is therefore considered that the results provide a representative overview of the breeding bird interest at the Kent Project Site.

A4.9 An assessment of the individual bird species recorded, as well as the overall assemblage, was subsequently made with reference to the national and local conservation status of the different breeding species recorded according to the Birds of Conservation Concern report.

Passage Birds

A4.10 Passage bird surveys were undertaken along the estuary front only, at the Kent Project Site, during the daytime in April, September and October. Passage surveys comprise two surveys per month: one focussed on High Tide; and the other focussed on Low Tide. Each visit consisted of core counts for one hour before peak tide to one hour after. No surveys were deemed necessary at the Essex Project Site due to the lack of suitable habitat.

A4.11 The dates and timings of the survey visits and the weather conditions encountered are summarised in **Table EDP A4.3**.

Table EDP A4.3: Date, Timing and Weather Conditions during the Passage Bird Survey Visits.

Date	Tidal State and Time	Start/Finish Time	Cloud (Octas)	Wind (Beaufort)	Visibility and General Conditions
15/04/20	LT 12:53	11:53–13:53	1	2 NE	17°C, Dry, Excellent visibility
21/04/20	HT 13:25	12:25-14:25	0	5 NE	14°C, Dry, Very good visibility
02/09/20	LT 08:15	07:15-09:15	1	0	14°C, Dry, Excellent visibility
21/09/20	HT 16:38	15:38-17:38	0	1 SW	21°C, Dry, Excellent visibility
08/10/20	LT 11:13	10:13-12:13	8	5 SW	16°C, Showers, Good visibility
20/10/20	HT 16:18	15:18-17:18	5	2 S	17°C, Dry, Excellent visibility

Limitations

Landowner permission to access Botany Marsh West was not granted until mid-July 2020. Therefore, the breeding bird surveys did not cover this area. There is some possibility that some species occupying the interior of the fields, such as snipe or skylark, may have gone unrecorded resulting in numbers of pairs being underestimated but this has been taken into account as part of the assessment process.

Results

Breeding Birds

A4.12 KMBRC returned numerous bird records for the Kent Project Site, 89 of which have been confirmed to have bred on at least one occasion. Of those 89, 37 are considered to be BoCC[3] with 21 (24%) within the Red List[4] and 16 (18%) within the Amber List[5]. The remaining 52 species are not considered to be of conservation

[3] Eaton MA, Aebischer NJ, Brown AF, Hearn RD, Lock L, Musgrove AJ, Noble DG, Stroud DA and Gregory RD (2015) Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 108, 708–746.

[4] Red list criteria includes:
Species is globally threatened.
Historical population decline in UK during 1800–1995.
Severe (at least 50%) decline in UK breeding population over last 25 years, or longer-term period (the entire period used for assessments since the first BoCC review, starting in 1969).
Severe (at least 50%) contraction of UK breeding range over last 25 years, or the longer-term period.

[5] Birds in the amber list will be subject to at least one of the relevant factors listed below:
Species with unfavourable conservation status in Europe (SPEC = Species of European Conservation Concern).
Historical population decline during 1800–1995, but recovering; population size has more than doubled over last 25 years.
Moderate (25-50%) decline in UK breeding population over last 25 years, or the longer-term period.
Moderate (25-50%) contraction of UK breeding range over last 25 years, or the longer-term period.
Moderate (25-50%) decline in UK non-breeding population over last 25 years, or the longer-term period.
Rare breeder; 1–300 breeding pairs in UK.

concern. The majority of those Red and Amber list species records relate to terrestrial species; however, several wildfowl and waders have also been confirmed to have bred including, redshank (*Tringa totanus*), mute swan (*Cygnus olor*), greylag goose (*Anser anser*), shelduck (*Tadorna tadorna*), mallard (*Anas platyrhynchos*), shoveler (*Spatula clypeata*) and oystercatcher (*Haematopus ostralegus*).

A4.13 Essex Field Club (EFC) returned records of 187 bird species, 72 of which were breeding records. The record resolution was too low to ascertain a distance from either Project Site.

A4.14 **Table EDP A4.4** gives the full results of the breeding bird surveys in 2020, including an estimation of the number of pairs considered to be breeding within the Kent Project Site. The results are also illustrated on Figures 12.8 to 12.11 (Document References 6.3.12.8 and 6.3.12.11).

Rare non-breeders; less than 900 individuals.
Localised; at least 50% of UK breeding or non-breeding population in 10 or fewer sites, but not applied to rare breeders or non-breeders.
Internationally important; at least 20% of European breeding or non-breeding population in UK (NW European and East Atlantic Flyway populations used for non-breeding wildfowl and waders respectively).

Table EDP A4.4. Full Results of the 2020 Breeding Bird Survey (Schedule 1 species shown in bold).

Common Name	Scientific Name	Conservation Status (IUCN[6] & BoCC)	NERC Species	EBBC Status	Notes/areas recorded	Min pairs	Max pairs
Red-legged Partridge	*Alectoris rufa*	Introduced		Probable	Low numbers recorded in April and May.	4	5
Pheasant	*Phasianus colchicus*	Introduced		Probable	Recorded on every survey.	12	19
Canada Goose	*Branta canadensis*	Introduced		Probable	Recorded in April, May and June.	1	4
Greylag Goose	*Anser anser*	Amber list		Confirmed	Recorded on all surveys. Juveniles recorded in June. Botany Marsh West, Estuary, Black Duck Marsh.	2	16
Mute Swan	*Cygnus olor*	Amber list		Probable	Pair displaying in April and May. Black Duck Marsh.	1	1
Shelduck	*Tadorna tadorna*	Amber list		Probable	Recorded April to June, with birds displaying in April. Botany Marsh West, Estuary.	8	11
Shoveler	*Spatula clypeata*	Amber list		Possible	Low numbers recorded in April and May. Black Duck Marsh, Botany Marsh West.	1	4
Gadwall	*Mareca strepera*	Amber list		Probable	Recorded April to June, with birds displaying in April. CTRL Wetland, Black Duck Marsh, Botany Marsh West, Estuary.	3	6
Mallard	*Anas platyrhynchos*	Amber list		Confirmed	Recorded on all surveys. Juveniles recorded in June. Estuary, Black Duck Marsh, CTRL Wetland, River Ebbsfleet, main drain, Botany Marsh West.	14	17
Teal	*Anas crecca*	Amber list		Possible	One bird recorded in Botany Marsh West in April.	-	1
Pochard	*Aythya ferina*	Vulnerable & Red list		Probable	Recorded in the marshes April to June. Displaying observed. Black Duck Marsh, Pond P3.	7	10
Tufted Duck	*Aythya fuligula*	Green list		Probable	Low numbers recorded every survey.	5	10
Swift	*Apus apus*	Amber list		Possible	Recorded May to July. Suitable nesting habitat in the Industrial area. Black Duck Marsh, Craylands Pit, Bamber Pit.	1	1
Cuckoo	*Cuculus canorus*	Red list	Yes	Probable	Recorded April to June. Peninsula, Ebbsfleet Valley, Former Northfleet Landfill.	4	4
Feral Pigeon	*Columba livia*	Green list		Confirmed	Small numbers recorded in April. Nesting recorded.	1	2

[6] Vulnerable, Endangered or Critically Endangered

Common Name	Scientific Name	Conservation Status (IUCN[6] & BoCC)	NERC Species	EBBC Status	Notes/areas recorded	Min pairs	Max pairs
Stock Dove	*Columba oenas*	Amber list		Probable	Small numbers recorded on all surveys. Bamber Pit, Craylands Pit, Sportsground.	5	10
Woodpigeon	*Columba palumbus*	Green list		Probable	Recorded during all surveys.	27	63
Collared Dove	*Streptopelia decaocto*	Green list		Probable	Recorded on all visits.	8	16
Water Rail	*Rallus aquaticus*	Green list		Probable	Low numbers recorded on all surveys.	7	16
Spotted Crake	***Porzana porzana***	**Amber list**		**Possible**	**Single bird observed in June. Black Duck Marsh.**	**-**	**1**
Moorhen	*Gallinula chloropus*	Green list		Probable	Recorded on all visits.	15	22
Coot	*Fulica atra*	Green list		Confirmed	Recorded during every survey. Juveniles recorded in July.	14	15
Little Grebe	*Tachybaptus ruficollis*	Green list		Confirmed	Recorded on all surveys. Juveniles recorded in June and July.	7	11
Great Crested Grebe	*Podiceps cristatus*	Green list		Non breeding	Single bird recorded in July.	-	-
Oystercatcher	*Haematopus ostralegus*	Amber list		Confirmed	Recorded in May, June and July. Juvenile recorded in July. Estuary.	1	2
Lapwing	*Vanellus vanellus*	Red list	Yes	Possible	Displaying bird recorded in May. Botany Marsh West.	1	1
Little Ringed Plover	***Charadrius dubius***	**Green list**		**Possible**	**A pair was recorded displaying in April.**	**1**	**1**
Whimbrel	***Numenius phaeopus***	**Red list**		**Non breeding**	**Single bird recorded on the northern edge of the peninsula in May.**	**-**	**-**
Redshank	*Tringa totanus*	Amber list		Non breeding	Heard calling Black Duck Marsh in June only.	-	-
Greenshank	***Tringa nebularia***	**Amber list**		**Non breeding**	**Recorded in May feeding in Botany Marsh West section.**	**-**	**-**
Black-headed Gull	*Chroicocephalus ridibundus*	Amber list		Non breeding	Flying over only. Estuary, Ebbsfleet Valley, Botany Marsh West.	-	-
Mediterranean Gull	***Ichthyaetus melanocephalus***	**Amber list**		**Non breeding**	**Flyover only. Black Duck Marsh, Bamber Pit, Botany Marsh West.**	**-**	**-**
Common Gull	*Larus canus*	Amber list		Non breeding	Fly over only. Estuary.	-	-

Common Name	Scientific Name	Conservation Status (IUCN[6] & BoCC)	NERC Species	EBBC Status	Notes/areas recorded	Min pairs	Max pairs
Great Black-backed Gull	*Larus marinus*	Amber list		Non breeding	Flyover only. Estuary.	-	-
Herring Gull	*Larus argentatus*	Red list	Yes	Non breeding	Recorded flying over only. Estuary.	-	-
Yellow-legged Gull	*Larus michahellis*	Amber list		Non breeding	One recorded in June. Estuary.	-	-
Lesser Black-backed Gull	*Larus fuscus*	Amber list		Non breeding	Low numbers recorded on all surveys. Botany Marsh West.	-	-
Little Tern	***Sternula albifrons***	**Amber list**		**Non breeding**	**One flew over in July. Botany Marsh West.**	**-**	**-**
Common Tern	*Sterna hirundo*	Amber list		Non breeding	Two birds flew over in May. Estuary.	-	-
Cormorant	*Phalacrocorax carbo*	Green list		Non breeding	Recorded in April, June and July. Flyovers or foraging/resting in the marshes.	-	-
Grey Heron	*Ardea cinerea*	Green list		Confirmed	Recorded on all surveys. Juveniles recorded in May and July.	3	3
Little Egret	*Egretta garzetta*	Green list		Non breeding	Low numbers recorded in April to June.	-	-
Sparrowhawk	*Accipiter nisus*	Green list		Possible	Small numbers recorded on every survey.	1	2
Marsh Harrier	***Circus aeruginosus***	**Amber list**		**Probable**	**Recorded on all surveys. Black Duck Marsh.**	**1**	**1**
Buzzard	*Buteo buteo*	Green list		Possible	Low numbers recorded on all visits.	1	2
Barn Owl	***Tyto alba***	**Green List**		**Possible**	**Single bird recorded foraging in the southern part of the site in July.**	**0**	**1**
Long-eared Owl	*Asio otus*	Green list		Possible	Single bird recorded in April.	-	1
Kingfisher	***Alcedo atthis***	**Amber list**		**Possible**	**Pair recorded in May in the Ebbsfleet car park 2 area. Possibly nesting off site.**	**1**	**1**
Great Spotted Woodpecker	*Dendrocopos major*	Green list		Possible	Low numbers recorded in April and July.	1	1
Green Woodpecker	*Picus viridis*	Green list		Confirmed	Low numbers recorded on all visits. Juvenile recorded in July.	2	4

Common Name	Scientific Name	Conservation Status (IUCN[6] & BoCC)	NERC Species	EBBC Status	Notes/areas recorded	Min pairs	Max pairs
Kestrel	*Falco tinnunculus*	Amber list		Probable	Low numbers of hunting birds recorded during every survey. Ebbsfleet Valley, Peninsula.	1	3
Peregrine	***Falco peregrinus***	**Green list**		**Possible**	**Recorded in April displaying and in June.**	**1**	**1**
Ring-necked Parakeet	*Psittacula krameri*	Introduced		Probable	Low numbers recorded on all surveys.	1	4
Jay	*Garrulus glandarius*	Green list		Confirmed	Small numbers recorded in April, May and June. Recorded carrying nesting material in April.	2	5
Magpie	*Pica pica*	Green list		Confirmed	Recorded on all survey visits. Active nesting, adults carrying food and fledged juveniles all recorded.	11	20
Jackdaw	*Corvus monedula*	Green list		Confirmed	Small numbers in April, May and July. Nesting recorded.	1	2
Rook	*Corvus frugilegus*	Green list		Non breeding	Flyover only.	-	-
Carrion Crow	*Corvus corone*	Green list		Confirmed	Recorded on every survey. Juveniles recorded in July.	8	11
Raven	*Corvus corax*	Green list		Confirmed	Recorded in May to July. Juveniles recorded in June.	-	1
Blue Tit	*Cyanistes caeruleus*	Green list		Confirmed	Recorded on every survey. Juveniles recorded in May and June.	17	34
Great Tit	*Parus major*	Green list		Confirmed	Recorded on all surveys. Juveniles recorded in June.	14	37
Bearded Tit	***Panurus biarmicus***	**Green list**		**Confirmed**	**Recorded in the Swanscombe Marshes East and West sections April to June. Juvenile recorded in June.**	**3**	**5**
Skylark	*Alauda arvensis*	Red list	Yes	Probable	Singing males on every survey. Former Northfleet Landfill, NE Tip, Station Quarter.	9	13
Sand Martin	*Riparia riparia*	Green list		Non breeding	Recorded foraging over the site in May and June.	-	-
Swallow	*Hirundo rustica*	Green list		Non breeding	Small numbers recorded flying over in April and May.	-	-
House Martin	*Delichon urbicum*	Amber list		Non breeding	Foraging over the site in May. Black Duck Marsh.	-	-

Common Name	Scientific Name	Conservation Status (IUCN[6] & BoCC)	NERC Species	EBBC Status	Notes/areas recorded	Min pairs	Max pairs
Cetti's Warbler	***Cettia cetti***	**Green list**		**Confirmed**	**Common across the site, more so in the marsh areas. Juveniles recorded in June and July.**	**51**	**87**
Long-tailed Tit	*Aegithalos caudatus*	Green list		Confirmed	Recorded on all surveys. Nest recorded in April and juveniles recorded in May and June.	9	15
Willow Warbler	*Phylloscopus trochilus*	Amber list		Possible	Singing males recorded in April and June. Botany Marsh East.	-	1
Chiffchaff	*Phylloscopus collybita*	Green list		Confirmed	Recorded on every survey. Adults seen carrying food in June and juveniles recorded in July.	43	73
Sedge Warbler	*Acrocephalus schoenobaenus*	Green list		Confirmed	Recorded on all surveys. Juveniles recorded in June.	9	20
Reed Warbler	*Acrocephalus scirpaceus*	Green list		Confirmed	Common across the site and recorded on every survey. Juveniles recorded in July.	70	133
Grasshopper Warbler	*Locustella naevia*	Red list	Yes	Probable	Males singing recorded on all visits. Broadness, NE Tip, SW Tip.	12	15
Blackcap	*Sylvia atricapilla*	Green list		Confirmed	Common across the site and recorded on every survey. Juveniles recorded in June.	57	113
Garden Warbler	*Sylvia borin*	Green list		Probable	Single male recorded singing at Bamber Pit in May and June.	1	1
Lesser Whitethroat	*Sylvia curruca*	Green list		Confirmed	Recorded on all surveys. Juvenile recorded in July.	10	16
Whitethroat	*Sylvia communis*	Green list		Confirmed	Common across the site. Juveniles recorded in June and July.	85	130
Goldcrest	*Regulus regulus*	Green list		Possible	Single bird recorded in July. Unlikely to have bred on site.	-	-
Wren	*Troglodytes troglodytes*	Green list		Confirmed	Common across the site and recorded on every survey. Juveniles recorded in June.	87	155
Starling	*Sturnus vulgaris*	Red list	Yes	Possible	Recorded on every survey. Black Duck Marsh, Ebbsfleet Valley, Botany Marsh East.	3	5
Blackbird	*Turdus merula*	Green list		Confirmed	Common across the site and recorded on every survey. Adults distressed near nest and carrying food.	61	116

Common Name	Scientific Name	Conservation Status (IUCN[6] & BoCC)	NERC Species	EBBC Status	Notes/areas recorded	Min pairs	Max pairs
Redwing	***Turdus iliacus***	**Red list**		**Non breeding**	**One recorded in April. Ebbsfleet Valley.**	-	-
Song Thrush	*Turdus philomelos*	Red list	Yes	Confirmed	Recorded on all surveys. Adults recorded carrying food in May and June. All areas.	9	67
Mistle Thrush	*Turdus viscivorus*	Red list		Confirmed	Low numbers recorded on all surveys. Juvenile recorded in June. Manor Way, Stanhope Road, Station Quarter, Botany Marsh.	3	3
Robin	*Erithacus rubecula*	Green list		Confirmed	Common across the site and recorded on all surveys. Juveniles recorded in June.	47	103
Nightingale	*Luscinia megarhynchos*	Red list		Probable	Male birds on territory recorded singing in April and May. Broadness, Botany Marsh East, Bamber Pit.	3	4
Black Redstart	***Phoenicurus ochruros***	**Red list**		**Non breeding**	**A male was recorded singing off-site in the CEMEX plant to the east of the DCO boundary. Known to be nesting east of the site.**	-	-
Wheatear	*Oenanthe oenanthe*	Green list		Non breeding	Single bird recorded in April.	-	-
House Sparrow	*Passer domesticus*	Red list	Yes	Probable	Low numbers recorded April to June. Northfleet Industrial Estate, Stanhope Road (off-site).	5	8
Dunnock	*Prunella modularis*	Amber list	Yes	Confirmed	Common across the site. Juveniles recorded in June and July. All areas.	45	84
Yellow Wagtail	*Motacilla flava*	Red list	Yes	Possible	Single bird recorded in June. Estuary.	-	1
Grey Wagtail	*Motacilla cinerea*	Red list		Confirmed	Recorded in April, May and July. Adults recorded carrying food. West of Manor Way Industrial Estate.	1	1
Pied Wagtail	*Motacilla alba*	Green list		Possible	Low numbers recorded on all surveys.	-	1
Chaffinch	*Fringilla coelebs*	Green list		Probable	Recorded across the site in April to June.	19	36
Bullfinch	*Pyrrhula pyrrhula*	Amber list	Yes	Probable	Recorded April to July. Bamber Pit, Sportsground, Ebbsfleet Valley, Botany Marsh East, Main Access Track.	3	5
Greenfinch	*Chloris chloris*	Green list		Confirmed	Recorded on every survey. Juvenile recorded in July.	11	23

Common Name	Scientific Name	Conservation Status (IUCN[6] & BoCC)	NERC Species	EBBC Status	Notes/areas recorded	Min pairs	Max pairs
Linnet	*Linaria cannabina*	Red list	Yes	Confirmed	Recorded during every survey. Juveniles recorded in July. All areas.	10	39
Goldfinch	*Carduelis carduelis*	Green list		Probable	Recorded on every survey across the site.	24	60
Reed Bunting	*Emberiza schoeniclus*	Amber list	Yes	Probable	Low numbers recorded on all surveys. Peninsula.	7	14

Passage Birds

A4.15 The results of the passage bird surveys are included in **Tables EDP A4.5** to **A4.10** below.

A4.16 Thirty-seven species were recorded during the passage surveys, with ten of those not being species directly associated with the wetland habitat. Abundance and diversity were significantly reduced from that found along the estuary front throughout winter, with the most abundant birds being black-headed gulls and mallard. Three Peregrines were recorded flying over on 15 April.

A4.17 Ringed plover (*Charadrius hiaticula*), Dunlin (*Calidris alpina*) and Redshank (*Tringa totanus*) were recorded and are species listed as a qualifying feature of the Thames Estuary and Marshes SPA.

A4.18 One Ringed Plover was recorded during the 21 April high tide survey and twelve were recorded during the 2 September low tide survey. The Thames Estuary and Marshes SPA supported 2.6% of the European/North African wintering population according to the 1993/4-1997/8 peak mean of 1,324 individuals (English Nature (EN), 2000), allowing the site to qualify for classification as an SPA. The numbers recorded during the surveys constitute 0.9% of the SPA population and is not significant.

A4.19 Two Dunlin were recorded during the 2 September low tide survey. The Thames Estuary and Marshes SPA supported 2.1% of the North Siberian/ European/ West African population according to the 1993/4-1997/8 peak mean of 29,646 individuals (English Nature (EN), 2000). The numbers recorded during the surveys are not significant.

A4.20 Fourteen Redshank were recorded during the 8 October low tide survey and one during the 20 October high tide survey. The Thames Estuary and Marshes SPA supported 2.2% of the Eastern Atlantic wintering population according to the 1993/4-1997/8 peak mean of 3,251 individuals (English Nature (EN), 2000). The numbers recorded during the surveys constitute a peak of 0.4% of the SPA population and is not significant.

Table EDP A4.5: Low Tide Survey Results – 15 April 2020

Species	Sector Peak									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Total**
Black-headed gull	7	11	6	9	9	1	5	9	3	**60**
Carrion crow	2	-	-	-	-	-	-	-	-	**2**
Common gull	-	1	-	-	-	-	-	-	-	**1**
Common sandpiper	-	-	-	-	-	1	-	-	-	**1**
Cormorant	-	-	1	2	1	5	-	-	-	**9**

Species	Sector Peak									
	1	2	3	4	5	6	7	8	9	Total
Curlew	-	-	-	-	-	1	-	-	-	**1**
Peregrine	-	-	-	3	-	-	-	-	-	**3**
Great black-backed gull	1	-	-	-	-	3	1	-	-	**5**
Gadwall	-	-	-	-	-	1	-	-	-	**1**
Herring gull	-	1	1	-	-	-	1	-	-	**3**
House martin	2	-	-	-	-	-	-	-	-	**2**
Lesser black-backed gull	-	-	1	-	-	-	-	-	-	**1**
Mallard	-	4	1	2	1	1	-	-	19	**28**
Mediterranean gull	3	2	7	-	4	-	-	-	-	**16**
Oystercatcher	-	4	-	-	3	-	2	-	-	**9**
Pheasant	-	-	-	-	-	-	1	-	-	**1**
Shelduck	-	-	-	2	1	10	-	-	-	**13**
Yellow-legged gull	-	-	-	-	-	-	-	-	1	**1**

Table EDP A4.6: Low tide Survey Results – 2 September 2020

Species	Sector Peak									
	1	2	3	4	5	6	7	8	9	Total
Black-headed Gull	23	49	11	55	17	8	-	11	10	**184**
Common Gull	1	-	-	-	1	-	-	-	1	**3**
Common Sandpiper	-	-	-	6	-	-	-	-	-	**6**
Cormorant	-	-	1	3	1	-	2	-	-	**7**
Curlew	-	-	-	1	1	-	-	-	-	**2**
Dunlin	-	-	-	-	-	-	2	-	-	**2**
Great Black-backed Gull	-	-	-	1	1	1	1	1	1	**6**
Heron	-	-	-	-	-	-	1	-	-	**1**
Herring Gull	-	2	-	-	-	-	-	-	1	**3**
Lesser Black-backed Gull	-	-	-	-	-	-	-	-	3	**3**
Little Egret	-	-	-	-	-	-	-	-	1	**1**
Mallard	-	4	-	4	-	1	2	-	-	**11**
Mute Swan	4	-	-	1	4	-	-	-	-	**9**
Ringed Plover	-	-	-	-	-	-	12	-	-	**12**
Teal	-	-	-	1	-	4	-	-	-	**5**

Table EDP A4.7: Low Tide Survey Results – 8 October 2020

Species	Sector Peak									
	1	2	3	4	5	6	7	8	9	Total
Black-headed Gull	14	13	7	26	5	11	-	4	23	**103**
Common Gull	-	1	-	1	2	-	-	-	-	**4**
Cormorant	-	-	-	-	-	3	-	-	-	**3**
Curlew	-	-	-	-	-	1	1	-	-	**2**

Species	Sector Peak									
	1	2	3	4	5	6	7	8	9	Total
Gadwall	-	2	-	-	-	2	-	-	-	**4**
Great Black-backed Gull	1	-	-	1	-	-	1	3	1	**7**
Greylag Goose	-	-	-	1	-	-	-	-	-	**1**
Herring Gull	1	-	3	1	-	1	-	1	8	**15**
Lapwing	-	8	-	-	-	-	-	-	-	**8**
Lesser Black-backed Gull	-	1	-	-	-	-	-	-	-	**1**
Little Egret	-	-	1	-	-	1	-	-	-	**2**
Mallard	-	11	2	-	-	30	7	-	-	**50**
Redshank	-	-	-	-	-	14	-	-	-	**14**
Teal	-	-	-	-	-	3	-	-	-	**3**
Wader sp.	-	-	-	-	-	1	-	-	-	**1**

Table EDP A4.8: High Tide Survey Results – 21 April 2020

Species	Sector Peak									
	1	2	3	4	5	6	7	8	9	Total
Black-headed gull	36	38	13		47	5	11	13	16	**179**
Canada goose	2	1	-	-	-	-	-	-	-	**3**
Common gull	-	-	-	-	-	3	-	1	-	**4**
Common sandpiper	-	-	-	-	3	-	-	-	-	**3**
Common tern	-	-	-	-	1	-	–	-	-	**1**
Cormorant	-	-	-	-	-	3	1	-	1	**5**
Dunlin	1	-	-	-	-	-	-	-	-	**1**
Gadwall	-	-	-	-	-	2	-	-	-	**2**
Great black-backed gull	1	2	-	1	-	-	1	-	-	**5**
Greylag goose	-	1	-	-	1	-	-	-	-	**2**
Herring gull	1	-	1	-	1	-	-	1	-	**4**
Little egret	-	-	-	-	1	-	-	-	-	**1**
Mallard	2	-	-	4	38	2	2	-	-	**48**
Mediterranean Gull	1	-	-	-	-	1	1	-	-	**3**
Oystercatcher	-	-	-	-	-	2	-	-	1	**3**
Ringed plover	-	-	-	-	1	-	-	-	-	**1**
Shelduck	-	-	-	4	1	-	-	-	2	**7**
Swallow	-	1	-	-	-	-	-	-	-	**1**

Table EDP A4.9: High Tide Survey Results – 21 September 2020

Species	Sector Peak									
	1	2	3	4	5	6	7	8	9	Total
Black-headed Gull	14	9	11	1	43	1	24	2	4	**109**
Common Gull	1	-	-	1	-	-	-	-	-	**2**
Common Sandpiper	-	-	-	3	1	-	-	1	-	**5**
Common Snipe	-	-	-	-	-	-	1	-	-	**1**
Common Tern	-	-	-	-	-	-	-	2	-	**2**
Cormorant	-	-	-	-	-	-	11	-	-	**11**
Gadwall	-	-	-	2	-	2	-	-	-	**4**
Great Black-backed Gull	-	1	-	-	-	-	-	-	-	**1**
Great Creasted Grebe	-	-	-	1	-	-	1	-	-	**2**
Heron	-	-	-	-	1	-	1	-	-	**2**
Herring Gull	2	-	-	3	-	-	-	-	-	**5**
Lesser Black-backed Gull	10	-	1	2	5	-	-	2	2	**22**
Mallard	-	-	-	7	-	-	35	13	-	**55**
Mediterranean Gull	-	-	-	-	4	-	-	-	-	**4**
Teal	-	-	-	-	-	-	2	-	-	**2**

Table EDP A4.10: High Tide Survey Results – 20 October 2020

Species	Sector Peak									
	1	2	3	4	5	6	7	8	9	Total
Black-headed Gull	6	2	2	6	6	1	8	23	17	**71**
Common Gull	1		3	1	1			3	7	**16**
Common Sandpiper				1						**1**
Common Snipe		1								**1**
Cormorant					2		1			**3**
Great Black-backed Gull			1			2	1	1	3	**8**
Herring Gull		4	1	9	1			1	2	**18**
Lapwing		9								**9**
Lesser Black-backed Gull	1					1			5	**7**
Little Egret						1				**1**
Magpie			2							**2**
Mallard					16	2	38	6		**62**
Meadow Pipit			2	4					7	**13**
Redshank							1			**1**
Reed Bunting								1		**1**
Rock Pipit						1				**1**
Stonechat							2			**2**
Teal					2	1		22		**25**

Annex EDP 5
Bat Surveys

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Methodology

A5.1 During the Extended Phase 1 survey, areas of woodland, scrub, grassland and aquatic habitats were identified as having the potential to support foraging and commuting bats. In addition, a number of mature trees and a variety of buildings present within the Kent Project Site were considered to have the potential to support roosting bat species.

A5.2 The following surveys for bats were therefore undertaken, with reference to national best practice guidelines[1], including investigations of:

1. Bat Roosting:
    (a) Daytime inspections of trees for bat roosting potential;
    (b) Daytime inspections of buildings for bat roosting potential;
    (c) Day time inspections of tunnels for bat roosting/swarming and hibernation potential;
    (d) Dusk and dawn emergence and re-entry surveys of buildings and tunnels – to be completed; and
    (e) Autumn swarming surveys of tunnels.
2. Bat foraging/commuting activity:
    (a) Manual transect surveys; and
    (b) Automated detector surveys.

Bat Roosting- Trees

Preliminary Ground-level Roost Assessment

A5.3 To determine the potential impacts of the proposed development on bats potentially roosting within trees across the Kent Project Site, all suitable trees were subject to a visual assessment with reference to current best practice guidance.

A5.4 The survey involved a visual assessment of all trees for the presence of, or potential to support, roosting bats. The survey was undertaken on 04 June 2020 by a Natural

[1] Collins, J (ed) (2016) *Bat Surveys for professional ecologists: Good Practice Guidelines*. (3rd edn) Bat Conservation Trust, London

England (NE) bat licensed ecologist. The trees were searched as thoroughly as possible from ground level, with all elevations covered where accessibility allowed.

A5.5 Suitable features for roosting bats searched for during the assessment included:

- Loss/peeling/fissured bark;
- Natural holes e.g. rot holes and holes from fallen limbs;
- Woodpecker holes;
- Cracks/splits or hollow tree trunks/limbs; and
- Thick-stemmed ivy.

A5.6 Signs of roosting bats searched for included:

- Bat/s roosting *in situ*;
- Bat droppings within or beneath a feature;
- Staining around or beneath a feature;
- Oily marks (staining) around roost access points;
- Audible squeaking from the roost;
- Large/regularly used roosts or regularly used sites may produce an odour; and
- Flies around the roost, attracted by the smell of guano.

A5.7 Based upon the results of the visual assessment and features/evidence identified, the following ratings for trees were used during the assessment:

- Known or confirmed roost – European Protected Species (EPS) licence required for works to tree to be completed lawfully;
- High potential – Tree supports one or more features that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time;
- Moderate potential – Tree supports one or more features that could be used by bats but are unlikely to support a roost type of high conservation status;

- Low potential – Tree supports one or more features that could be used by individual bats opportunistically, or is of sufficient size and age to contain such features; and

- Negligible potential – Negligible features likely to support roosting bats.

Limitations

A5.8 It should be noted that this type of assessment is based on features visible from ground level and is not considered to be a definitive bat roosting survey. Additional survey work may therefore be required to establish if any bats are roosting within the trees that have potential and are to be subject to felling/tree surgery, and, if present, to establish the species, number and roost type/status.

A5.9 The western end of woodland **W16** (Figure 12.12; Document Reference 6.3.12.12) was difficult to access due to the presence of thick scrub, marshland and fencing surrounding, with uneven ground throughout the woodland parcel to the east. Therefore, there are a small number of trees at the western end of woodland **W16** for which a ground-level assessment was not possible. Trees within the western end of woodland **W16** appear to be semi-mature and therefore less likely to have features suitable to support roosting bats, although this cannot be ruled out. Removal of trees within this western half of the woodland would need to be supervised by a licenced bat worker, who will be able to check for the presence of trees with potential roosting features at the same time as vegetation is cleared, making access possible.

Presence/Absence Surveys

A5.10 Upon completion of the preliminary tree roost assessment, 19 trees were considered to have potential to support roosting bats; 15 trees with high potential, two with moderate potential and two with low potential. Of these 19 trees, 16 were considered likely to be impacted by the proposals and so were subject to aerial climbing inspections.

A5.11 In line with best practice guidelines, an aerial climbing inspection was undertaken of all trees initially identified from ground level as having moderate or high roosting potential and likely to be impacted by the proposals. The purpose of the aerial inspection was to comprehensively assess all accessible potential roost features at height, to more fully determine the suitability of each tree to support roosting bats, in addition to searching for visible evidence of bat use not otherwise visible from the ground.

A5.12 The initial aerial inspection was undertaken by a suitably experienced and qualified bat licensed ecologist and assistant from Aether Ecology on behalf of EDP, using a

mixture of tree climbing equipment and ladders to access potential roost features. An endoscope (RIDGID Seesnake with 15mm and 5mm diameter head and six-foot extension), torches and mirrors were utilised, where necessary, to inspect potential roosting features. This survey took place over 06, 07 and 21 August 2020. A second aerial inspection for the identified high and moderate roosting potential trees was undertaken on 27 and 28 August 2020 and a third for the high potential trees was undertaken on 09 and 10 September 2020.

A5.13 Details of each potential roosting feature were recorded including the type of feature, location within the tree, height and orientation of feature, notes relating to the feature including any evidence of bats and the potential of each feature to support roosting bats (confirmed roost, high, moderate, low or negligible potential). The locations of the trees and their roost potential grading following the first aerial inspection is shown on Figure 12.12 (Document Reference 6.3.12.12). As the proposals develop, should it become apparent that any further trees with roost potential will be impacted, they will be subject to aerial surveys as necessary.

Bat Roost Assessment – Buildings

Rapid Assessment

A5.14 A high-level "rapid assessment" of all buildings within the Kent Project Site, where access was possible, was undertaken on 01 May 2020. The purpose of this survey was to determine whether any buildings could be ruled out as having negligible potential to support roosting bats, in order to focus the efforts of the external and internal inspections described below. The assessment was undertaken by two Natural England licensed bat workers. The locations of buildings surveyed is illustrated on Figure 12.13 (Document Reference 6.3.12.13).

External and Internal Inspections

A5.15 Further external assessments of buildings which were not ruled out during the rapid assessment were undertaken on 07 July 2020, 15 July 2020 and 17 July 2020. The assessment was undertaken by two experienced ecologists and Natural England licensed bat workers.

A5.16 All external features considered potentially suitable for bats were assessed, using a high-powered torch, from all aspects, where accessibility allowed. Suitable roost features in buildings include:

- Cracks/crevices in stone/brickwork/timber;
- Missing/broken/raised roof/ridge/hanging tiles;

- Loose/lifted lead flashing/bitumen felt;
- Loft voids (particularly if relatively undisturbed, potential bat access points present, clear flight space with simple truss formation, roof lining and insulation present);
- Gaps in soffits, barge boards or fascias; and
- Cavity walls with potential bat access.

A5.17 Signs of bat activity searched for include:

- Bats present (live, dead or skeletons);
- Droppings;
- Feeding remains, such as clusters of moth/butterfly wings and beetle wingcases;
- Urine staining below a potential access point/feature;
- Oily marks (staining) around potential roost access point/feature;
- Audible squeaking from behind roofing felt or timber boarding (particularly on a warm summer afternoon); and
- Large/regularly used roosts may produce an odour.

A5.18 On this basis, the buildings assessed were assigned a rating of potential suitability for roosting bats, from negligible to confirmed roost, as follows:

- Known or confirmed roost – where evidence of bats found;
- High potential – Multiple highly suitable features capable of supporting larger roosts;
- Medium potential – Definite bat roosting potential with fewer suitable features than high potential;
- Low potential – The building supports features that have limited potential for roosting bats; and
- Negligible potential – No potential features to support roosting bats.

Limitations

A5.19 Access permission was not granted to all buildings for the preliminary roost assessment for bats, and some were inaccessible due to dense scrub. In light of the 'lockdown' and social distancing measures imposed as a result of the COVID-19 virus global pandemic, internal access was not possible to all buildings. For those 26 buildings that could not be surveyed, highlighted as 'needs further assessment' on Figure 12.13 (Document reference: 6.3.12.13), a precautionary approach to the assessment of potential effects upon them has been undertaken as advised by Natural England in their Discretionary Advice Service letter of 9th October 2020 (copy of which is enclosed as Annex EDP 13 to the EMMF (Document reference: 6.2.12.3). Furthermore, in the unlikely event that roosting bats are present (considered unlikely based on the overwhelming majority of buildings being of negligible bat roost potential and the relative lack of confirmed roosts), precautionary mitigation measures are detailed within the 'Bat Mitigation Strategy' enclosed within the Ecological Mitigation and Management Framework (Document reference: 6.2.12.3)

Emergence/Re-entry Surveys

A5.20 Those 23 buildings considered to have low moderate or higher bat roosting potential were then subject to emergence/re-entry surveys. In accordance with best practice guidelines, surveys were spread over the course of the active bat season and completed within the optimal survey months of April to September inclusive and the level of survey was thus:

- Low potential = one survey visit, May to August;
- Medium potential = two survey visits, May to September with at least one survey between May and August; and
- High potential = three survey visits, May to September with at least two surveys between May and August.

A5.21 Full details including the survey type, date, timing, and weather conditions during each of the building emergence/re-entry surveys undertaken is given in **Table EDP A5.1**.

Table EDP A5.1. Date, timing and weather conditions of bat emergence/re-entry surveys.

Survey Date	Survey Time	Sunrise/ Sunset Time	Weather Conditions			
			Temp (°C)	Cloud (%)	Rain	Wind (Beaufort Scale
Building 67						
14.07.20	20:50 – 22:40	21:10	20-18	70-90	Nil	2
28.07.20	20:37 – 22:22	20:52	20-17	5	Nil	2
27.08.20	04:34 – 06:19	06:04	14-13	100	Nil	0
Building 265						
20.07.20	20:52 – 21:07	22:37	20-16	0	Nil	1-2
03.08.20	20:20 – 22:10	20:42	21-19	90-80	Light rain during first 10 minutes	3-2
15.09.20	05:04 – 06:34	06:24	15-16	100	Nil	0
Building 32						
27.07.20	20:39 – 22:24	20:54	20	80	Nil	4-3
17.09.20	05:08 – 06:38	06:38	14	40	Nil	2-1
Building 46						
16.07.20	20:53 – 22:38	21:08	23-22	90	Nil	2-1
31.07.20	03:51 – 05:36	05:21	20-19	0	Nil	0
Building 71						
16.07.20	20:53 – 22:38	21:08	22-24	90-100	Nil	2-1
31.07.20	03:51 – 05:36	05:21	20-19	0	Nil	0
Building 136						
22.07.20	20:46 – 22:31	21:01	23-20	10-0	Nil	1-3
03.09.20	04:45 – 06:15	06:15	17	95	Nil	1
Building 146						
27.07.20	20:39 – 22:24	20:54	20	80	Nil	4-3
21.08.20	04:25 – 06:10	05:55	20-21	5-90	Nil	4
Building 220						
22.07.20	20:46 – 22:31	21:01	22-20	10-0	Nil	3-1
07.08.20	04:03 – 05:48	05:33	16-18	0	Nil	0

Survey Date	Survey Time	Sunrise/ Sunset Time	Weather Conditions			
			Temp (°C)	Cloud (%)	Rain	Wind (Beaufort Scale
Building 22						
16.07.20	20:52 – 22:37	21:07	22-21	85-95	Nil	1
Building 45						
14.07.20	20:50 – 22:40	21:10	20-18	70-90	Nil	2
Building 52						
02.09.20	19:26 – 21:11	19:41	16-15	95	Drizzle before start	0-1
Building 53						
02.09.20	19:26 – 21:11	19:41	16-15	95	Drizzle before start	0-1
Building 84						
14.07.20	20:50 – 22:40	21:10	20-18	70-90	Nil	2

A5.22 No safe access was possible for emergence and re-entry surveyors on Building 266 (high), instead four static detectors were positioned internally. These were deployed for an entire night on three occasions alongside Building 265 surveys.

A5.23 Building 78 was assessed as having low suitability to support roosting bats, however, the opportunities present consist of gaps in mortar and brickwork of two single-skin brick gable ends to a warehouse building. Due to the location of other buildings and height of the features It is not possible to position a surveyor for emergence and re-entry surveys. The gable ends should, however, be subject to an endoscope inspection by a licensed bat ecologist prior to demolition instead.

A5.24 Emergence/re-entry surveys will be completed by experienced bat surveyors around the buildings considered to have bat roost potential following the internal inspections.

A5.25 For emergence surveys, the building aspects with the most access points were watched from 15 minutes before sunset to catch early emerging species such as common pipistrelle until two hours after sun set to ensure emergence times for all bat species were covered. For re-entry surveys, the same aspect of the building was watched from two hours before sunrise until sunrise. All bats were recorded with emphasis on those observed emerging and re-entering. Time and location on the building of the emergence/re-entry as well as species and number of bats from that location was recorded.

A5.26 Emergence-re-entry surveys were conducted using Elekon batlogger M with a built in GPS unit. Bats were identified on the basis of their characteristic echolocation

calls, which were recorded and analysed using computer sonogram analysis (BatSound) to confirm species identification. Species of myotid bat and long-eared bat are difficult to tell apart solely from their echolocation calls and were therefore grouped as such.

Limitations

A5.27 There have been no limitations to the emergence and re-entry surveys undertaken to date.

A5.28 Buildings 79, 80, 85 and 102 were assessed as having moderate potential from the public highway but no emergence/re-entry surveys have taken place as access was not granted.

A5.29 Buildings 135, 137,138 and 140 were assessed as having low potential from the public highway. Further emergence and re-entry surveys are not scheduled as landowner access was refused.

A5.30 As described above in relation to limitations for the preliminary roost assessment of buildings, where there is a lack of information/ confidence in survey results a precautionary approach to interpreting survey findings, assessment of potential impacts and mitigation measures has been adopted, as advised by Natural England in their Discretionary Advice Service letter of 9th October 2020 (copy of which is enclosed as Annex EDP 13 to the EMMF (Document reference: 6.2.12.3).

Bat Roost Assessment – Tunnels

Preliminary Roost Assessment

A5.31 A preliminary roost assessment of the tunnels within the Kent Project Site was conducted by a Natural England bat licenced ecologist on 04 August 2020. The tunnel locations can be found on Figure 12.13 (Document Reference 6.3.12.13). This inspection investigated their potential for summer roosting, autumn swarming and winter hibernation.

Summer Roosting Surveys

A5.32 Of the 10 tunnels inspected, 10 were considered to have some summer roosting potential. Those tunnels considered to have summer roosting potential were then subject to survey emergence/re-entry surveys following the same level of survey effort as for buildings.

A5.33 Full details including the survey type, date, timing, and weather conditions during each of the building emergence/re-entry surveys undertaken is given in **Table EDP A5.2**.

Table EDP A5.2. Date, timing and weather conditions of summer roosting surveys on tunnels

Survey Date	Survey Time	Sunrise/ Sunset Time	Weather Conditions			
			Temp (°C)	Cloud (%)	Rain	Wind (Beaufort Scale
Tunnels TU/011, TU/012, TU/013, TU/013a, TU/014						
26.08.20	19:42-21:27	19:57	19	80	Nil	0
Tunnels TU/007, TU/016, TU/018						
28.08.20	04:35-06:20	06:05	14	75	Light shower at 05:35	0
Tunnels TU/007, TU/016						
10.09.20	19:08-21:53	19:23	21-12	10-20	Nil	0

Autumn Swarming Surveys

A5.34 Of the 10 tunnels inspected, nine were considered to have some autumn swarming potential. Static bat detectors which automatically trigger and record bat echolocation calls were/will be deployed on the following dates:

- 27.08.20 – 01.09.20;
- 22.09.20 – 27.09.20; and
- 14.10.20 – 19.10.20.

<u>Limitations</u>

A5.35 Tunnels TU/014A and TU/015 were not surveyed beyond their initial inspection due to health and safety constraints relating to access and night-time surveys. As such no summer roosting or autumn swarming surveys have been undertaken on these tunnels. However, as these tunnels will not be subject to direct impacts as a result of the Proposed Development, a precautionary approach to assessment has been taken. In addition, there was no access for an autumn swarming survey on TU/012 in August due to positioning of the boarding across the entrance, this was later moved to allow access for the microphone. Given access constraints to the tunnels it is not always possible to position statics during the autumn swarming surveys to ensure only bats from within the tunnel are recorded. As such a number of recordings may be made from foraging bats outside the tunnel entrances.

Investigations of Bat Foraging/Commuting Activity

Manual Transect Surveys

A5.36 Manual transect surveys were undertaken across all areas of suitable habitat within the Kent Project Site to identify areas of bat foraging activity and commuting routes used by bats. Surveys were spread over the course of the active bat season and completed each month from May to September 2020 in accordance with recognised survey guidance for a site with 'moderate suitability for bats'[2].

A5.37 Full details including the survey type, date, timing, and weather conditions during each of the transect surveys undertaken is given in **Table EDP A5.3**.

Table EDP A5.3: Date, timing and weather conditions of bat activity transect surveys.

Survey Date	Dusk/-Dawn	Survey Time	Sunrise/-Sunset Time	Weather Conditions			
				Temp (°C)	Cloud (%)	Rain	Wind (Beaufort Scale)
18.05.20	Dusk	20:49-22:56	20:49	18-20	40-50	Nil	1-3
23.06.20	Dusk	21:20-23:20	21:20	19-21	5-10	Nil	1-2
21.07.20	Dusk	21:03-23:06	21:03	15-16	5-10	Nil	1-2
17.08.20	Dusk	20:16-22:16	20:16	17-18	25-40	Nil	2-3
18.08.20	Dawn	03:50-05:50	05:50	17-18	60-80	Nil	1
16.09.20	Dusk	19:07 – 21:07	19:07	18-19	10	Nil	3-4

A5.38 Manual transect surveys were completed by experienced bat surveyors across six transect survey routes in May 2020. Transect 2 walked during May 2020 was subsequently divided into transect 2 and 7 for June as illustrated on Figure 12.14 (Document Reference 6.3.12.14). This was then reduced back to one transect from July onwards as security issues meant that access to Bamber Pit was no longer possible.

A5.39 Transect routes were designed to cover all potential foraging or commuting habitat on the Kent Project Site. Transect routes were walked at a slow pace with 'pacing points' to ensure an even speed throughout the transect. All bats were recorded and their behaviour marked on survey maps characterise the value of the Kent Project Site and its component habitats to foraging and commuting bats.

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2 Table 4.1 in: Collins, J (ed) (2016) Bat Surveys for professional ecologists: Good Practice Guidelines. (3rd edn) Bat Conservation Trust, London

A5.40 Activity surveys were conducted using Elekon batlogger M with a built in GPS unit. Observations of the time, location, and activity of all bats seen or heard were noted. Bats were identified on the basis of their characteristic echolocation calls, which were recorded and analysed using computer sonogram analysis (BatSound) to confirm species identification. Species of myotid bat and long-eared bat are difficult to tell apart solely from their echolocation calls and were therefore grouped as such.

A5.41 There is currently no requirement, or agreed survey methodology, for completion of winter foraging surveys within the Bat Conservation Trust (BCT) guidelines[3], and such surveys were not considered necessary to inform the Ecological Impact Assessment (EcIA) presented in Chapter 12: Terrestrial and freshwater ecology and biodiversity (Document reference 6.1.12) of the Environmental Statement, and were not requested by consultees during the Environmental Information Assessment (EIA) Scoping Opinion received in July 2020 or through the Preliminary Environmental Information Report (PEIR) consultation in July 2020. Nevertheless, the potential for the Kent Project Site to be used for winter foraging, on warmer nights, given the habitats present and the proximity to the River Thames, as identified by Natural England through their Discretionary Advice Service letter of 9th October 2020 (copy of which is enclosed as Annex EDP 13 to the EMMF (Document reference: 6.2.12.3)), has been considered. On a precautionary basis, the potential effects of the Proposed Development on potential winter foraging habitats is included within the EcIA in Chapter 12: Terrestrial and freshwater ecology and biodiversity (Document reference 6.1.12).

Limitations

A5.42 Weather conditions on each visit were optimum for bat surveys, being relatively warm with light to medium winds and no rain. The surveys are therefore not considered to be seasonally or climatically constrained.

A5.43 The bat detector used on Transect 4 in May did not record any bats. However, the surveyor only reported a single bat pass (detected visually) throughout the survey and so it is not thought that this equipment failure has any significant impact of the results.

A5.44 Due to access and security issues, bat transects could not take place in Bamber Pit in July and August 2020. However, the remainder of the Kent Project Site was surveyed, including areas close to Bamber pit, and Bamber pit was surveyed in May, June and September 2020. It is considered unlikely that the overall value of the bat assemblage in Bamber Pit and the Kent Project Site as a whole has been underestimated as a result of missing the July and August 2020 survey.

[3] Collins, J. (ed) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London.

Automatic Detector Surveys

A5.45 In accordance with recognised survey guidelines, to supplement the bat transect survey data, bat activity within the Kent Project Site was also sampled using static bat detectors which automatically trigger and record bat echolocation calls. This survey method has been used during the months of May, June July and August and September 2020 on the following dates:

- 18.05.2020-22.05.2020;
- 23.06.2020-27.06.2020;
- 22.07.2020-26.07.2020;
- 18.08.2020-22.08.2020; and
- 16.09.2020-21.09.2020.

A5.46 For a site with moderate suitability for bats, two static detectors per transect are recommended for deployment across a site. Therefore, Anabat Express Bat Detectors were deployed in 12 different locations over the Kent Project Site in May, (1, 2, 3, 4, 5, 6, 7, 8, 10, 12, 13 and 14) as shown on Figure 12.14 (Document Reference 6.3.12.14). The Anabats were fixed in secure locations, with an external microphone attached 1.5m above ground, and directed away from the tree, approximately 45° to the hedgerow, to maximise detection sensitivity.

A5.47 With addition of a seventh transect route in June, the Anabat locations were increased accordingly, and additional detectors were deployed to ensure full coverage of the Kent Project Site. For June, July, August and September Anabats were deployed in 16 locations (with the addition of 9, 11, 15 and 16), thus going over the recommended amount for fuller coverage of the Kent Project Site. These 16 locations remained despite the return to six transects after June.

A5.48 With the access restrictions to Bamber Pit from August, position 11 could not be used for the August surveys. **Table EDP A5.4** lists the position number from Figure 12.14 (Document Reference 6.3.12.14) and the corresponding Kent Project Site areas from Figure 12.1 (Document Reference 6.3.12.1).

Table EDP A5.4: Anabat position numbers and Project Site locations.

Position Number (Figure 12.14)	Project Site Area (Figure 12.1)
1	Peninsula (north)
2	Peninsula (north)
3	Peninsula (north)
4	NE Tip

Position Number (Figure 12.14)	Project Site Area (Figure 12.1)
5	Botany Marshes
6	Botany Marshes
7	Edge of Black Duck Marsh
8	North of Tiltman Avenue
9	Craylands Pit
10	Bamber Pit
11	Bamber Pit
12	Former landfill
13	Station Quarter North
14	Station Quarter South
15	A2 corridor
16	A2 Corridor

A5.49 The echolocation calls recorded by the Anabats were filtered for noise files (i.e. sound files created when noise triggers the Anabat to record) and then specifically for each of the UK's bat species using Analook software filter function. The parameters for the noise filter are based on that proposed by Chris Corben and Kim Livengood[4] and are provided in **Table EDP A5.5**. All files passing the various filters were checked manually using sonogram analysis (AnalookW) in accordance with published parameters[5] to confirm the species identification of each bat call.

Table EDP A5.5: Filtration values used by Analook software to remove noise files.

Filter	Smoothness	Frequency (Fc (kHz))		Duration (ms)	
		Min	Max	Min	Max
Noise filter	50	15	120	2	50

Limitations

A5.50 None of the automatic detector surveys so far are considered to have been constrained by unseasonably cold conditions.

A5.51 As with the transect survey limitations discussed above, static detector deployment could not take place in Bamber Pit in July and August. However, the remainder of the locations across the Kent Project Site used, including areas close to Bamber pit, and Bamber pit itself was surveyed in May, June and September. It is considered unlikely that the overall value of the bat assemblage has been underestimated as a result of missing the July and August surveys in the Bamber Pit locations.

4 Taken from Making an Antinoise Filter presentation from 2010 Annual Bat Conference

5 Russ (2012). *British Bat Calls, a guide to species identification*. Pelagic Publishing, Exeter

A5.52 In addition, the identification of calls and species using Analook software is dependent upon the quality of the recording made which can be influenced by the following factors, which may limit levels of activity and species recorded:

- Weather conditions – rainfall and wind;
- Distance of bat from Anabat;
- Presence of obstructions through which the noise must pass, i.e. trees; and
- Proximity of other noise sources such as roads.

A5.53 In relation to this, the Anabat at location 10 during May recorded a large amount of noise files. This was likely due to its proximity to the railway line. This may have resulted in some bat calls being missed in May at this location. It was moved for subsequent recording periods. Due to the number of other Anabat locations and months of recording, this one location on one month is unlikely to impact the overall conclusions.

Results

Bat Roost Assessment – Trees

Preliminary Ground-level Roost Assessment

A5.54 During the visual assessment for roosting bats on 04 June 2020, no bats or evidence of bats was found from ground level. However, a total of 19 trees were identified as offering potential to support roosting bats. Fifteen trees were identified as having high potential, two with moderate potential and two as low potential. Details are provided in **Table EDP A5.5** and the locations of these trees are illustrated on Figure 12.12 (Document Reference 6.3.12.12).

Presence/absence Surveys

A5.55 All aerial inspections have taken place on the trees identified as having roost potential. The results of the inspections (if different to the preliminary ground level assessment) are also provided in **Table EDP A5.6**. An additional tree (G120n) with moderate potential was added following the initial aerial survey, four trees were down graded in potential and two trees were upgraded. No evidence of bats was seen on any survey. One of the trees marked ‘wasp’ in the table below contained a wasps nest and could not be safely inspected without harm to the surveyor.

Table EDP A5.6: Results of Roost Assessment of Trees. (Modifications from the aerial inspections in **bold**).

Tree ID	Species	Features Identified	Bat Roost Potential from PRA	Bat Roost Potential from Aerial Inspection
W16a	Sycamore	Multiple limb cavities on north aspect of semi-mature tree in poor condition	High	N/A - wasp
W16b	Ash	Woodpecker hole on north aspect at 8m. **Bees present and top part of tree has snapped off opening hollow to the air. Unlikely to be suitable.**	High	**Moderate**
W16c	Beech	Dead tree with four woodpecker holes	High	**Low**
G120a	Cherry	Hollow stem with multiple cavities, woodpecker holes and flaking bark on north aspect. **Most woodpecker holes are test holes and do not lead anywhere.**	High	**Moderate**
G120b	Cherry	Multi-stemmed tree with woodpecker holes on various aspects	High	High
G120c	Cherry	Multi-stemmed tree with woodpecker holes on west aspect	High	High
G120d	Willow	Hazard beam on vertical limb at 2m	Low	N/A
G120e	Willow	Three potential roost features – cavity, woodpecker hole and knot hole	High	**Low**
G120f	Willow	Woodpecker hole on west aspect at 3m	High	High
G120g	Willow	Woodpecker holes on various aspects	High	**Moderate**
G120h	Oak	Woodpecker holes on various aspects	High	High
G120i	Oak	Woodpecker holes on various aspects	High	High
G120j	Oak	Hollow trunk with cavity leading in at 1m on west aspect. Two potential roost features – a tear out and a stem cavity	Moderate	**High**
G120k	Elder	Semi-mature tree in poor condition, with hollow stem at 0.5m, and split limbs with flaking bark on multiple aspects. Lots of hollowing and cavities	Moderate	**High**
G120l	Beech	Fallen tree with split in stem	Low	N/A
G120m	Blackthorn	Three woodpecker holes on west aspect at varying heights	High	High

Tree ID	Species	Features Identified	Bat Roost Potential from PRA	Bat Roost Potential from Aerial Inspection
G120n	**Willow sp.**	**Woodpeckers holes on eastern side of stem**	**N/A**	**Moderate**
G121a	Silver birch	Hollow stem with multiple cavities on various aspects	High	**Low**
G121b	Goat willow	Woodpecker hole on west aspect at 5m	High	**Moderate**
G121c	Poplar	Two woodpecker holes on west aspect at 3m and 4m	High	**Low**

Bat Roost Assessment - Buildings

Rapid Assessment

A5.56 A total of 166 buildings are present within the DCO boundary. Of these, 117 buildings were assessed as having negligible potential to support roosting bats due to their construction or are no longer present. These buildings were therefore not subject to any further level of survey.

A5.57 A total of 23 buildings were found to have potential to support roosting bats during the assessment, with 10 assessed as having Low potential, 10 assessed as having Moderate potential and three assessed as having High potential. There are 26 buildings that could not be adequately assessed at the present time due to access restrictions. Locations and gradings of the buildings is shown on Figure 12.13 (Document Reference 6.3.12.13), details of potential roosting features in the 23 buildings with potential is included below in **Table EDP A5.7**.

Table EDP A5.7. Features of the 23 Buildings with Bat Roost Potential

Building No. (Figure 12.13)	Potential Roost Features	Suitability
B67	Gaps around roof joists, sarking board with areas missing, gaps in mortar between blockwork.	High
B265	Tilbury Riverside Arts Activity Centre. Missing roof tiles and gaps at eaves. Potential access into roof void. No internal assessment of roof void undertaken.	High
B266	London International Cruise Terminal. Original early 20th century station buildings enclosed by new roof structure access possible through broken external windows around incomplete boarding. Further surveys undertaken using static detectors overnight on two occasions as no suitable locations for surveyors externally.	High
B32	Southern Water building. Gaps beneath tiles and around eaves.	Moderate
B46	Industrial building in use occasionally as workshop. Windows sealed with blocks, with gaps around edges, access around doors. No internal access to confirm internal roosting opportunities.	Moderate
B71	Gaps beneath roof tiles and within soffit boxes. Potential access into roof void. No internal assessment of roof void undertaken.	Moderate
B79	Workshop building with cracks in mortar and gaps beneath ridge and at the eaves. Rapid assessment from public highway only.	Moderate
B80	Workshop building with cracks in mortar and gaps beneath ridge tiles and at the eaves. Rapid assessment from public highway only.	Moderate

Building No. (Figure 12.13)	Potential Roost Features	Suitability
B85	Workshop building with cracks in mortar and gaps beneath ridge. Rapid assessment from public highway only.	Moderate
B102	Disused industrial building with boarded windows and gaps in brickwork. Rapid assessment from public highway only. No access for further surveys.	Moderate
B136	Workshop building with boarded windows, gaps in brickwork, beneath ridge tiles and at the eaves.	Moderate
B146	George and Dragon Pub Disused pub with gaps beneath tiles to the rear of the building and potential gaps around fascia boards. Rapid assessment from public highway only.	Moderate
B220	Residential house with gaps at eaves and lifted tiles on roof. Potential access into roof void. No internal assessment of roof void undertaken.	Moderate
B22	Disused structure on the peninsular with crack in brickwork.	Low
B45	Aces's café Gaps beneath corrugated roof sheets and fascia boards.	Low
B52	Electrical substation with open front. Rapid assessment from public highway only.	Low
B53	Electrical substation with cracks in brickwork. Rapid assessment from public highway only.	Low
B78	Brick gable ends of in use industrial buildings with cracks in brickwork. No suitable positions for further surveys, endoscope inspection required prior to demolition.	Low
B84	Disused industrial building with potential access to internal voids. Internal assessment found roosting potential limited to a small portion of eaves storage and beneath corrugated roof sheets.	Low
B135	Modern commercial units, Multiple roof structures with fascia boards and soffit boxes. Rapid assessment from public highway only. Access refused for further surveys.	Low
B137	Modern commercial units, Multiple roof structures with fascia boards and soffit boxes. Rapid assessment from public highway only. Access refused for further surveys.	Low
B138	Modern commercial units, Multiple roof structures with fascia boards and soffit boxes. Rapid assessment from public highway only. Access refused for further surveys.	Low
B140	Modern commercial units, Multiple roof structures with fascia boards and soffit boxes. Rapid assessment from public highway only. Access refused for further surveys.	Low

Emergence-re-entry Surveys

A5.58 An individual soprano pipistrelle was recorded entering B67 during the survey on 27 August 2020. An individual common pipistrelle was recorded entering B32 on 17 September 2020. It is considered B67 and B32 each support a summer day roost for individual bats and it is likely the buildings are only occasionally used as other surveys on the buildings recorded no bats emerging.

A5.59 No emergences or re-entries have been detected from any other buildings surveyed so far.

Bat Roost Assessment – Tunnels

Preliminary Roost Assessment

A5.60 The assessment of roosting potential undertaken in August 2020 noted suitability for roosting, swarming and hibernating bats. In some instances, full internal inspection has not been possible for health and safety reasons surrounding accessing confined spaces and due to structural instability. Where full internal access has not been possible, the assessment has been undertaken at the tunnel entrance(s) and a precautionary assessment undertaken. Full details of the tunnels and their suitability are included below in **Table EDP A5.8**.

Table EDP A5.8. Features of the 10 Tunnels with Bat Roost Potential

Tunnel No. (Figure 12. 13)	Potential Roost Features	Potential for Summer Roosting	Potential for Autumn Swarming	Potential for Hibernation
TU/007	Deep cracks in the brickwork around the eastern entrance. Several cracks that extended both up and down, suitable for crevice-dwelling bat species. Several hibernating butterflies and butterfly remains	Moderate	Moderate	Moderate
TU/011	No features observed from tunnel entrance, precautionary assessment.	Low	Moderate	Low
TU/012	Large room with potential for hanging bats. Very few crevices.	Low	Moderate	Low
TU/013	No features observed from tunnel entrance, precautionary assessment.	Low	Moderate	Low
TU/013A	No features observed from tunnel entrance, precautionary assessment.	Low	Low	Low
TU/014	No features observed from tunnel entrance, precautionary assessment.	Low	Low	Low

Tunnel No. (Figure 12. 13)	Potential Roost Features	Potential for Summer Roosting	Potential for Autumn Swarming	Potential for Hibernation
TU/014A	No features observed from tunnel entrance, precautionary assessment. Inspected ¾ of the tunnel due to health and safety issues. Collapsed at one end with several crevices and a few crevices that aren't too deep throughout the tunnel.	Low	Low	Low
TU/015	No features observed from tunnel entrance, precautionary assessment. Open at both ends, unstable environment for hibernation.	Low	Low	Negligible
TU/016	Large cracks in brickwork around entrance. No other features observed, precautionary assessment. Unstable environment for hibernation.	Moderate	Moderate	Negligible, except for single crack at entrance with low potential
TU/018	No features observed from tunnel entrance, precautionary assessment.	Low	Negligible	Low

Summer Roosting Surveys

A5.61 No emergences or re-entries were recording during the surveys.

Autumn Swarming Surveys

A5.62 Static detectors deployed at the entrance of the tunnels in August and September recorded low levels of bat activity. Due to access constraints for health and safety reasons it was not always possible to position statics so that recordings were from solely within the tunnels themselves. As such it is difficult to determine absolutely whether behaviour can be attributed to autumn swarming or general foraging. The acoustic surveys undertaken were aiming to identify repeated peaks of activity between 2-5 hours after sunset indicative of swarming behaviour.

A5.63 A number of the tunnels returned no records of bats or low numbers of recordings of an assemblage typical of the area including common pipistrelle, soprano pipistrelle, noctule, long-eared bat and Myotis bats. Of the tunnels surveyed tunnel T7 and tunnel T16 recorded larger than average numbers of Myotis sp. calls. There were 14 *Myotis* recordings made between midnight and 1am on 25 September at tunnel T7 but no bats were recorded at tunnel T7 during the August or October deployments.

A5.64 There were 42 Myotis recordings made between 10.30pm and midnight on 1 September were made at the south end of T16. Conversely, there were no *Myotis* calls recorded at the northern end of T16 during this time, nor was there a distinct, repeated peak of activity within the target period in August or October.

A5.65 The results do not indicate autumn swarming behaviour by any species at the tunnels surveyed.

Winter Hibernation Surveys

A5.66 The Proposed Development will not result in any direct impacts upon those tunnels described within **Table EDP A5.8** with the exception of tunnels TU/016 and TU/018 which will be used for access between the transport interchange and staff accommodation.

Overall Evaluation of the Roosting Bat Assemblage

A5.67 Using the techniques for valuing bats in ECIA[6] and based on the results of the surveys and assessment of the conservation status of the bat species present, the roosting bat assemblage is considered to be of Local level importance.

Investigations of Bat Foraging/Commuting Activity

Manual Transect Surveys

A5.68 Activity on the manual transect surveys in all months was generally low. At least seven species were recorded with the potential for nine species recorded as the Myotis species is potentially, natterers (*Myotis nattereri*), Brandt's (*Myotis brandti*) or Daubenton's (*Myotis daubentonii*) bat.

<u>Activity per Species</u>

A5.69 Activity recorded on the transect surveys was predominantly of common pipistrelle. This species was recorded in all areas and all months. Soprano pipistrelle and noctule were also recorded in all months and in most areas of the Kent Project Site but at a much lower level. Soprano pipistrelle activity was noticeably absent from station quarter north and the former landfill.

A5.70 Other species recorded include *Myotis* species, Leiser's bat, long-eared species and serotine. *Myotis* species was only recorded on the A2 corridor and Bamber pit and was not detected at all on the June transects. Leisler's bat was only recorded in May and was only found along the River Ebbsfleet corridor. Serotine was only

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6 Table 2 in: CIEEM 2010, Valuing Bats in Ecological Impact Assessment, Stephanie Wray CEnv FIEEM, David Wells CEnv MIEEM, Emma Long MIEEM and Tony Mitchell-Jones MIEEM

recorded in May and July and only found along the River Ebbsfleet and A2 corridor. Long-eared species was only detected in July along the A2 corridor. All bat activity per month can be found on Figure 12.15 (Document Reference 6.3.12.15) and the distribution of each species across the Kent Project Site can be found on Figure 12.16 (Document Reference 6.3.12.16).

A5.71 The timing of the first or last bat for each transect can be found in **Table EDP A5.9**. This shows that it is unlikely that any of the bats detected are roosting nearby. Pipistrelle species and noctule are early emerging species, leaving roosts close to sunset and returning close to sunrise. In May the first bats were seen 30 to 57 minutes after sunset. In June, it was 22 min to 1 hour, in July, 16 minutes to 34 minutes, in August, 22 to 49 minutes after sunset or 40 minutes to 1 hour 21 minutes before sunrise and in September 48-61 minutes after sunrise. The exception to this in September is on transect 6 where a *Myotis* species was detected only six minutes after sunset.

Table EDP A5.9: First and last bats recorded on the Manual Transect Surveys

Transect Number	Time	Species	Notes
18.05.20 – Dusk (Sunset 20:49)			
1	21:28	Common pipistrelle	First bat
2	21:46	Common pipistrelle	First bat
3	21:27	Noctule	First bat
4	21:37	Common pipistrelle	Only bat seen - Foraging
5	21:24	Common pipistrelle	First bat
6	21:19	Soprano pipistrelle	First bat
23.6.20 – Dusk (Sunset 21:20)			
1	21:42	Common pipistrelle	First bat
2	21:46	Soprano pipistrelle	First bat
3	21:45	Common pipistrelle	First bat
4	21:55	Common pipistrelle	First bat
5	22:09	Common pipistrelle	First bat
6	21:43	Common pipistrelle	First bat
7	22:20	Common pipistrelle	First bat
21.07.20 – Dusk (Sunset 21:03)			
1	21:40	Common pipistrelle	First bat
2	21:19	Noctule	First bat
3	21:50	Common pipistrelle	First bat
4	21:52	Common pipistrelle	First bat
5	21:58	Common pipistrelle	First bat
6	21:37	Common pipistrelle	First bat
17.08.20 – Dusk (Sunset 20:16)			
1	20:38	Common pipistrelle	First bat
2	20:54	Common pipistrelle	First bat
3	20:46	Common pipistrelle	First bat
4	20:56	Common pipistrelle	First bat
5	21:05	Common pipistrelle	First bat
6	20:50	Common pipistrelle	First bat

Transect Number	Time	Species	Notes
18.08.20 – Dawn (Sunrise 05:50)			
1	04:34	Common pipistrelle	Last bat
2	04:39	Common pipistrelle	Last bat
3	05:05	Common pipistrelle	Last bat
4	04:29	Common pipistrelle	Last bat
5	05:04	Soprano pipistrelle	Last bat
6	05:10	Common pipistrelle	Last bat
16.09.20 – Dusk (Sunset 19:07)			
1	20:08	*Myotis* sp.	First bat
2	19:51	Noctule	First bat
3	20:22	Common pipistrelle	First bat
4	19:55	Common pipistrelle	First bat
5	20:08	Common pipistrelle	First bat
6	19:13	*Myotis* sp.	First bat

Activity per Area

A5.72 Bat activity was concentrated around Botany Marshes, the NE tip, the River Ebbsfleet corridor and the A2 corridor. The activity around Botany Marshes and NE tip was predominantly pipistrelle species whereas the activity along the A2 corridor and the River Ebbsfleet was much more diverse and included the Leisler's, serotine, Myotis and long- eared species. All areas had low levels of noctule activity.

Automated Detector Surveys

A5.73 The automated detectors have recorded activity from at least eight bat species; common pipistrelle, soprano pipistrelle, noctule, Myotis species, Leisler's bat, Serotine bat, Long-eared species and Nathusius pipistrelle. The latter is an addition from the species detected on the manual transect surveys.

A5.74 As with the manual transect surveys, **Table EDP A5.10** shows that activity was predominantly (82.6-94.3%) by common pipistrelle with the next highest species activity from noctule (1.4-12%), soprano pipistrelle (0.2-7%) and *Myotis* species (0.7-1.2%). All other species accounted for less than 1% of activity each month.

Table EDP A5.10: Monthly Summary of Automated Detector Surveys

Survey Month	Species	No. Registrations Recorded	% Of Total
May	Common pipistrelle	13004	89.4
	Long eared Bat	22	0.2
	Myotis sp.	146	1.0
	Nathusius pipistrelle	36	0.2
	Noctule	917	6.3
	Soprano pipistrelle	301	2.1
	Serotine	11	0.1
	Leisler	102	0.7
	Total	**14539**	**100**
June	Common pipistrelle	7398	82.6
	Long eared Bat	10	0.1
	Myotis sp.	69	0.8
	Nathusius pipistrelle	2	0.0
	Noctule	1071	12.0
	Soprano pipistrelle	384	4.3
	Serotine	14	0.2
	Leisler	4	0.0
	Total	**8952**	**100**
July	Common pipistrelle	9080	86.2
	Long eared Bat	14	0.1
	Myotis sp.	77	0.7
	Nathusius pipistrelle	2	<0.1
	Noctule	484	4.6
	Soprano pipistrelle	739	7.0
	Serotine	83	0.8
	Leisler	40	0.4
	Nyctalus species	9	0.1
	Total	**10528**	**100**
August	Common Pipistrelle	7135	94.3
	Soprano pipistrelle	207	2.7
	Long Eared Bat	6	0.1
	Myotis	94	1.2
	Nathusius pipistrelle	1	0.0
	Noctule	108	1.4
	Serotine	19	0.3
	Total	**7570**	**100**
September	Common Pipistrelle	5864	72.4
	Soprano pipistrelle	679	8.4
	Long Eared Bat	7	0.1
	Myotis	768	9.5
	Nathusius pipistrelle	20	0.2
	Noctule	758	9.4
	Serotine	8	0.0
	Total	**8104**	**100**

Activity per Species

A5.75 **Table EDP A5.11** shows the total registrations for each species at each location as well as the number of months it was detected there. Figure 12.17 (Document Reference 6.3.12.17) is a heat map to visually show the level of activity per species at each detector location.

A5.76 Common pipistrelle registrations were by far the highest and this species was recorded on all months at all locations. Soprano pipistrelle was recorded in all months at all locations but at a much lower level, although registrations of this species were remarkably low in the former landfill area and station quarter north (in accordance with the with transect surveys).

A5.77 *Myotis* species was recorded everywhere but activity was higher on positions 4 and 8 which corresponds to land north of Tiltman Avenue and the NE tip. The Myotis species could potentially have been Brandt's, Natterer's or Daubenton's bats as records of these species were returned during the desk study.

A5.78 Noctule were recorded everywhere across the Kent Project Site but concentrations were particularly high in locations, 7, 8, 9, 10 and 11 which corresponds to Black Duck Marsh, land north of Tiltman Avenue, Craylands Pit and Bamber Pit.

A5.79 Nathusius pipistrelle was detected at low levels across all areas of the Kent Project site with slightly higher levels of activity in the sportsground and land north of Tiltman Avenue.

A5.80 Serotine, Leisler's and long-eared species were also detected across all areas of the Kent Project Site with no specific areas that they were not detected in, but slightly higher levels of activity in the NE tip.

Activity per Area

A5.81 **Table EDP A5.12** shows the total number of bat registrations per location as well as the average number of species detected at that location.

A5.82 Total amount of activity was lowest in A2 corridor and highest in Botany Marshes, Black Duck Marsh, Peninsula North and the NE tip. This is not surprising as the grassland and wetland habitat on these high activity areas provides food foraging habitat for bats. Land north of Tiltman Avenue recorded the highest average number of species.

A5.83 Activity was generally lower in the southern areas of the of Kent Project Site; areas from Bamber pit and below. Bamber Pit and the Former landfill also have the lowest average species. This should be interpreted with caution though as access was

restricted in Bamber Pit and thus detectors were not deployed here as often. The southern part of the Kent Project Site is more built up with carparking areas, roads and railways and so the lower level of activity in these areas is not surprising.

Table EDP A5.11. Total registrations for each species at each location and the number of months it was detected there.

Position Number (Figure 12.14)	Project Area (Figure 12.1)	C.pip		S.pip		Myotis		Noctule		Nathusius		Leisler's		Serotine		Long-eared	
		Tot reg	No. months	Tot reg	No. months	Tot reg	No. months	Tot reg	No. months	Tot reg	No. months	Tot reg	No. months	Tot reg	No. months	Tot reg	No. months
1	Peninsula (north)	1567	5/5	78	5/5	11	5/5	27	5/5	1	1/5	0	0/5	7	1/5	2	2/5
2	Peninsula (north)	4002	5/5	215	5/5	33	5/5	42	5/5	3	2/5	5	2/5	12	3/5	2	2/5
3	Peninsula (north)	1540	5/5	15	3/5	8	8/8	27	4/5	3	2/5	1	1/5	2	2/5	0	0
4	NE Tip	6595	5/5	670	5/5	595	5/5	125	4/5	4	2/5	92	1/5	42	3/5	7	3/5
5	Botany Marshes	6367	5/5	263	5/5	44	5/5	103	4/5	1	1/5	3	1/5	6	1/5	0	0/5
6	Botany Marshes	9025	5/5	85	4/5	24	3/5	106	5/5	4	2/5	0	0/5	1	1/5	4	2/5
7	Edge of Black Duck Marsh	5274	5/5	233	5/5	37	4/5	798	5/5	1	1/5	0	0	3	2/5	2	1/5
8	North of Tiltman Avenue	2252	3/3	169	3/3	199	3/3	590	3/3	16	3/3	3	1/3	8	2/3	30	3/3
9	Craylands Pit	618	4/4	43	4/4	93	4/4	500	4/4	0	0/4	1	1/4	24	3/4	3	2/4
10	Sports ground	661	4/5	1	1/5	1	1/5	442	3/5	21	1/5	0	0/5	2	1/5	0	0/5
11	Bamber Pit	151	2/2	0	0	2	1/2	195	2/2	0	0	2	1/2	3	2/2	1	1/2
12	Former landfill	1154	5/5	7	2/5	5	3/5	41	5/5	1	1/5	0	0/5	3	2/5	0	0/5
13	Station Quarter North	432	5/5	10	4/5	3	2/5	78	4/5	3	2/5	12	3/5	5	3/5	3	1/5

Position Number (Figure 12.14)	Project Area (Figure 12.1)	C.pip		S.pip		Myotis		Noctule		Nathusius		Leisler's		Serotine		Long-eared	
		Tot reg	No. months	Tot reg	No. months	Tot reg	No. months	Tot reg	No. months	Tot reg	No. months	Tot reg	No. months	Tot reg	No. months	Tot reg	No. months
14	Station Quarter South	2237	5/5	27	5/5	31	3/5	146	5/5	2	2/5	25	1/5	5	3/5	2	2/5
15	A2 corridor	715	4/4	16	3/4	5	3/4	78	4/4	1	1/4	0	0/4	7	3/4	1	1/4
16	A2 Corridor	68	4/4	475	4/4	91	4/4	44	4/4	1	1/4	2	2/4	5	2/4	0	0/4

Table EDP A5.12: Total bat registrations and average number of species at each Anabat Location.

Position (Figure 12.14)	Project Site Area (Figure 12.1)	Total Registrations	Average Number of Species	Average Number of Species
1	Peninsula (north)	1692	4.9	4.9
2	Peninsula (north)	4318	5.5	
3	Peninsula (north)	1596	4.25	
4	NE Tip	8117	5.75	5.75
5	Botany Marshes	6788	4.25	4.8
6	Botany Marshes	9249	3.5	
7	Edge of Black Duck Marsh	6348	4.75	4.75
8	North of Tiltman Avenue	3087	7	7
9	Craylands Pit	1282	5.65	5.65
10	Bamber Pit	1137	1.75	3.1
11	Bamber Pit	355	4.5	
12	Former landfill	1211	3.75	3.75
13	Station Quarter North	546	3.9	4.7
14	Station Quarter South	2475	5.5	
15	A2 corridor	823	4.85	5
16	A2 Corridor	686	5.15	

A5.84 The results of the automated detector surveys for May, June, July, August and September are given in **Tables EDP A5.14** to **A5.18**.

Evaluation of Overall Bat Assemblage

A5.85 The diversity of bat species recorded at the Project Site is high but common and widespread generalist species, such as common pipistrelle bats account for the vast majority of activity. Unsurprisingly, due to the higher quality foraging habitat, areas in the North of the Kent Project site have a higher value for bats, especially the rarer species. The NE tip had especially high recordings of Myotis, Serotine and Leislers bats.

A5.86 **Table EDP A5.13** below lists the bat species present (or potentially present) on the Kent Project Site along with their UK, Kent and Project Site distributions. A number of bat species considered rarer in the UK and rare, scarce or declining in Kent were recorded using the Project Site in low numbers including Nathusius' pipistrelle, Leislers, Serotine and noctule bats. Serotine bats are declining in Kent and consequently a BAP species. There is also the potential for the *Myotis* species recorded to be Brandt's or Natterer's bat which are rarer in the UK and rare or scarce in Kent.

Table EDP A5.13: The UK, Kent and Project Site distributions of Bat species using (or potentially using) the Kent Project Site.

Bat Species	Distribution in UK[7]	Distribution in Kent[8]	Distribution on Kent Project Site
Common pipistrelle	Common	Common	Regularly recorded High levels All areas
Soprano pipistrelle	Common	Common	Regularly recorded Moderate levels All areas
Brown Long eared	Common	Common	Irregularly recorded Low levels (but low detectability) All areas
Brandt's	Rarer	Rare	Myotis recorded in low numbers. Regularly recorded in areas on Peninsula (north) Irregularly recorded on southern areas
Natterers	Rarer	Scarce	
Daubentons	Rarer	Common around water	
Noctule	Rarer	Uncommon, declining	Regularly recorded Moderate levels All areas
Leislers	Rarer	Scarce	Irregularly recorded Low levels All areas (patchier than serotine)
Serotine	Rarer	Widespread but declining, BAP	Irregularly recorded Low levels All areas
Nathusius pipistrelle	Rarer	Scarce	Irregularly recorded Low levels All areas

A5.87 Using the techniques for valuing bats in ECIA[79], the overall bat assemblage, taking into consideration the presence of rare and uncommon species (albeit only present in low numbers), is considered to be of District level value.

7 Common = over 100,000. Rarer = 10,000-100,000 taken from: CIEEM 2010, Valuing Bats in Ecological Impact Assessment, Stephanie Wray CEnv FIEEM, David Wells CEnv MIEEM, Emma Long MIEEM and Tony Mitchell-Jones MIEEM

8 http://www.kentbatgroup.org.uk/bats-in-kent/

Table EDP A5.14: Detailed Results from the May Anabat Recording Period

Anabat Location	Date	Registrations per Night for Each Species Recorded								Total
		Common pipistrelle	Soprano pipistrelle	Leislers	Long-eared	*Myotis* sp.	Nathusius pipistrelle	Noctule	Serotine	
1	18/05	95	2	-	-	1	-	-	-	**98**
	19/05	63	7	-	-	-	-	9	-	**79**
	20/05	239	-	-	-	-	-	2	-	**241**
	21/05	191	4	-	-	-	-	1	-	**196**
	22/05	7	-	-	-	-	-	-	-	**7**
	Total	**595**	**13**	**0**	**0**	**1**	**0**	**12**	**0**	**621**
2	18/05	198	4	-	-	4	-	1	-	**207**
	19/05	81	6	1	-	1	-	11	-	**100**
	20/05	186	11	-	-	-	-	6	1	**204**
	21/05	261	9	3	-	-	1	1	-	**275**
	22/05	13	-	-	-	-	-	2	-	**15**
	Total	**739**	**30**	**4**	**0**	**5**	**1**	**21**	**1**	**801**
3	18/05	320	1	-	-	-	-	7	-	**328**
	19/05	177	1	1	-	1	-	6	-	**186**
	20/05	383	5	-	-	-	-	-	-	**388**
	21/05	344	5	-	-	3	-	2	-	**354**
	22/05	81	-	-	-	-	-	-	-	**81**
	Total	**1305**	**12**	**1**	**0**	**4**	**0**	**15**	**0**	**1337**
4	18/05	429	25	2	-	11	-	-	1	**468**
	19/05	223	24	88	-	7	2	-	4	**348**
	20/05	431	27	-	-	10	-	-	1	**469**
	21/05	590	27	2	-	4	1	-	2	**626**
	22/05	664	20	-	-	3	-	-	-	**687**
	Total	**2337**	**123**	**92**	**0**	**35**	**3**	**0**	**8**	**2598**

Anabat Location	Date	Registrations per Night for Each Species Recorded								Total
		Common pipistrelle	Soprano pipistrelle	Leislers	Long-eared	*Myotis* sp.	Nathusius pipistrelle	Noctule	Serotine	
5	18/05	227	4	1	-	2	-	12	-	**246**
	19/05	105	5	1	-		1	11	-	**123**
	20/05	262	8	-	-	-	-	4	-	**274**
	21/05	230	2	1	-	-	-	5	-	**238**
	22/05	112	2	-	-	-	-	-	-	**114**
	Total	**936**	**21**	**3**	**0**	**2**	**1**	**32**	**0**	**995**
6	18/05	502	4	-	-	1	1	1	-	**509**
	19/05	474	1	-	-	-	2	73	-	**550**
	20/05	378	2	-	-	-	-	2	-	**382**
	21/05	272	7	-	-	-	-	3	-	**282**
	22/05	255	2	-	-	-	-		-	**257**
	Total	**1881**	**16**	**0**	**0**	**1**	**3**	**79**	**0**	**1980**
7	18/05	1110	19	-	-	3	-	43	-	**1175**
	19/05	114	1	-	-	1	-	50	-	**166**
	20/05	160	2	-	-	2	-	33	-	**197**
	21/05	180	1	-	-	1	-	85	-	**267**
	22/05	1130	11	-	-	2	-	91	-	**1234**
	Total	**2694**	**34**	**0**	**0**	**9**	**0**	**302**	**0**	**3039**
8	18/05	347	9	-	6	10	2	107	-	**481**
	19/05	169	12	-	2	9	2	101	-	**295**
	20/05	227	8	-	5	22	-	54	-	**316**
	21/05	335	14	-	2	26	1	38	-	**416**
	22/05	58	5	-	7	17	-	12	-	**99**
	Total	**1136**	**48**	**0**	**22**	**84**	**5**	**312**	**0**	**1607**

Anabat Location	Date	Registrations per Night for Each Species Recorded								Total
		Common pipistrelle	Soprano pipistrelle	Leislers	Long-eared	*Myotis* sp.	Nathusius pipistrelle	Noctule	Serotine	
10	18/05	17	-	-	-	-	-	5	-	**22**
	19/05	315	-	-	-	-	18	21	-	**354**
	20/05	44	-	-	-	-	-	4	-	**48**
	21/05	80	-	-	-	-	3	18	-	**101**
	22/05	86	-	-	-	-	-	5	-	**91**
	Total	**542**	**0**	**0**	**0**	**0**	**21**	**53**	**0**	**616**
12	18/05	166	-	-	-	-	-	1	-	**167**
	19/05	114	-	-	-	-	-	4	-	**118**
	20/05	110	-	-	-	1	-	5	-	**116**
	21/05	205	-	-	-	-	-	6	-	**211**
	22/05	57	1	-	-	-	-	-	-	**58**
	Total	**652**	**1**	**0**	**0**	**1**	**0**	**16**	**0**	**670**
13	18/05	13	1	-	-	-	-	9	-	**23**
	19/05	32	-	1	-	-	1	20	1	**55**
	20/05	19	-	1	-	-	1	8	1	**30**
	21/05	9	1	-	-	-	-	6	-	**16**
	22/05	6	-	-	-	-	-	2	-	**8**
	Total	**79**	**2**	**2**	**0**	**0**	**2**	**45**	**2**	**132**
14	18/05	6	-	-	-	1	-	2	-	**9**
	19/05	5	1	-	-	-	-	8	-	**14**
	20/05	3	-	-	-	-	-	10	-	**13**
	21/05	81	-	-	-	3	-	9	-	**93**
	22/05	13	-	-	-	-	-	1	-	**14**
	Total	**108**	**1**	**0**	**0**	**4**	**0**	**30**	**0**	**143**

Table EDP A5.15: Detailed Results from the June Anabat Recording Period

Anabat Location	Date	Registrations per night for Each Species Recorded								Total
		Common pipistrelle	Soprano pipistrelle	Leisler's	Long-eared	*Myotis* sp.	Nathusius pipistrelle	Noctule	Serotine	
1	23/06	38	5	-	-	1	-	1	-	**45**
	24/06	105	13	-	-	1	-	2	-	**121**
	25/06	265	9	-	-	-	-	-	-	**274**
	26/06	32	1	-	-	-	-	2	-	**35**
	27/06	1	-	-	-	-	-	-	-	**1**
	Total	**441**	**28**	**0**	**0**	**2**	**0**	**5**	**0**	**476**
2	23/06	357	10	-	1	1	-	1	-	**370**
	24/06	183	10	-	-	-	-	-	-	**193**
	25/06	146	4	-	-	-	-	-	-	**150**
	26/06	331	8	-	-	-	-	-	-	**339**
	27/06	88	1	-	-	-	-	-	1	**90**
	Total	**1105**	**33**	**0**	**1**	**1**	**0**	**1**	**1**	**1142**
3	23/06	33	-	-	-	-	-	-	-	**33**
	24/06	22	1	-	-	-	-	1	-	**24**
	25/06	22	-	-	-	-	-	2	-	**24**
	26/06	9	-	-	-	-	-	-	-	**9**
	27/06	-	-	-	-	-	-	-	-	**0**
	Total	**86**	**1**	**0**	**0**	**0**	**0**	**3**	**0**	**90**
4	23/06	26	12	-	-	-	-	4	-	**42**
	24/06	34	5	-	-	1	-	3	-	**43**
	25/06	48	9	-	-	2	-	6	-	**65**
	26/06	254	26	-	2	3	-	25	-	**310**
	27/06	406	93	-	2	5	-	5	-	**511**
	Total	**768**	**145**	**0**	**4**	**11**	**0**	**43**	**0**	**971**

Anabat Location	Date	Registrations per night for Each Species Recorded								Total
		Common pipistrelle	Soprano pipistrelle	Leisler's	Long-eared	*Myotis* sp.	Nathusius pipistrelle	Noctule	Serotine	
5	23/06	777	89	-	-	1	-	2	-	**869**
	24/06	737	16	-	-	1	-	5	-	**759**
	25/06	642	26	-	-	1	-	4	-	**673**
	26/06	84	1	-	-	1	-	2	-	**88**
	27/06	33		-	-	-	-	-	-	**33**
	Total	**2273**	**132**	**0**	**0**	**4**	**0**	**13**	**0**	**2422**
6	23/06	371	3	-	1	17	1	2	-	**395**
	24/06	324	-	-	-	4	-	3	-	**331**
	25/06	190	9	-	-	-	-	4	-	**203**
	26/06	211	1	-	-	1	-	1	-	**214**
	27/06	258	4	-	-	-	-	-	-	**262**
	Total	**1354**	**17**	**0**	**1**	**22**	**1**	**10**	**0**	**1405**
7	23/06	79	1	-	-	-	-	-	-	**80**
	24/06	41		-	-	-	-	1	-	**42**
	25/06	17	1	-	-	-	-	-	-	**18**
	26/06	27	1	-	-	-	-	-	-	**28**
	27/06	72	5	-	-	-	-	3	-	**80**
	Total	**236**	**8**	**0**	**0**	**0**	**0**	**4**	**0**	**248**
8	**Detector Fault**									
9	23/06	17	-	-	-	2	-	61	-	**80**
	24/06	14	-	-	1	5	-	94	1	**115**
	25/06	17	2	-	-	5	-	77	1	**102**
	26/06	29	-	-	-	3	-	147	2	**181**
	27/06	7	-	1	-	3	-	21	-	**32**
	Total	**84**	**2**	**1**	**1**	**18**	**0**	**400**	**4**	**510**

Anabat Location	Date	Registrations per night for Each Species Recorded								Total
		Common pipistrelle	Soprano pipistrelle	Leisler's	Long-eared	*Myotis* sp.	Nathusius pipistrelle	Noctule	Serotine	
10	23/06	6	-	-	-	-	-	47	-	**53**
	24/06	1	-	-	-	1	-	39	1	**42**
	25/06	2	-	-	-	-	-	66	-	**68**
	26/06	19	1	-	-	-	-	124	1	**145**
	27/06	20	-	-	-	-	-	91	-	**111**
	Total	**48**	**1**	**0**	**0**	**1**	**0**	**367**	**2**	**419**
11	23/06	12	-	1	-	-	-	10	0	**23**
	24/06	11	-	-	-	-	-	7	1	**19**
	25/06	5	-	1	-	2	-	46	0	**54**
	26/06	23	-	-	-	-	-	94	0	**117**
	27/06	7	-	-	-	-	-	17	0	**24**
	Total	**58**	**0**	**2**	**0**	**2**	**0**	**174**	**1**	**237**
12	23/06	5	-	-	-	-	-	1	-	**6**
	24/06	8	-	-	-	-	-	3	-	**11**
	25/06	10	-	-	-	-	-	1	-	**11**
	26/06	37	-	-	-	3	-	3	-	**43**
	27/06	1	-	-	-	-	-	-	-	**1**
	Total	**61**	**0**	**0**	**0**	**3**	**0**	**8**	**0**	**72**
13	23/06	22	2	-	-	-		-	-	**24**
	24/06	8		-	-	-	-	-	-	**8**
	25/06	14	1	-	1	1	-	-	-	**17**
	26/06	69	3	-	1	1	-	-	1	**75**
	27/06	1		-	1	-	-	-	-	**2**
	Total	**114**	**6**	**0**	**3**	**2**	**0**	**0**	**1**	**126**

Anabat Location	Date	Registrations per night for Each Species Recorded								Total
		Common pipistrelle	Soprano pipistrelle	Leisler's	Long-eared	*Myotis* sp.	Nathusius pipistrelle	Noctule	Serotine	
14	23/06	67	-	-	-	-	1	2	-	**70**
	24/06	50	2	-	-	-	-	-	-	**52**
	25/06	38	-	-	-	-	-	5	1	**44**
	26/06	60	1	-	-	-	-	2	-	**63**
	27/06	3	-	-	-	-	-	-	-	**3**
	Total	**218**	**3**	**0**	**0**	**0**	**1**	**9**	**1**	**232**
15	23/06	123	1	-	-	-	-	2	-	**126**
	24/06	219	1	-	-	1	-	5	-	**226**
	25/06	148	3	-	-	-	-	4	-	**155**
	26/06	23	-	-	-	-	-	4	-	**27**
	27/06	9	–	-	-	-	-	3	1	**13**
	Total	**522**	**5**	**0**	**0**	**1**	**0**	**18**	**1**	**547**
16	23/06	8	-	-	-	2	-	3	2	**15**
	24/06	6	1	-	-	-	-	4	-	**11**
	25/06	6	-	-	-	-	-	1	-	**7**
	26/06	10	2	1	-	-	-	7	-	**20**
	27/06	-	-	-	-	-	-	1	-	**1**
	Total	**30**	**3**	**1**	**0**	**2**	**0**	**16**	**2**	**54**

Table EDP A5.16: Detailed Results from the July Anabat Recording Period

Anabat Location	Date	Registrations per Night for Each Species Recorded									Total
		Common pipistrelle	Soprano pipistrelle	Leisler's	Long-eared	*Myotis* sp.	Nathusius pipistrelle	Noctule	Serotine	*Nyctalus* sp.	
1	22/07	33	5	-	-	2	-	1	-	-	**41**
	23/07	16	2	-	1	1	-	1	-	-	**21**
	24/07	84	4	-	-	-	-	1	-	-	**89**
	25/07	114	3	-	-	-	-	1	-	-	**118**
	26/07	18	2	-	-	-	-		7	-	**27**
	Total	**265**	**16**	**0**	**1**	**3**	**0**	**4**	**7**	**0**	**296**
2	22/07	175	33	-	-	1	-	4	1	-	**214**
	23/07	247	38	-	-	1	-	5	4	-	**295**
	24/07	699	28	1	1	12	-	1	2	-	**744**
	25/07	587	28	-	-	4	-	-	3	-	**622**
	26/07	191	6	-	-		-	1	-	-	**198**
	Total	**1899**	**133**	**1**	**1**	**18**	**0**	**11**	**10**	**0**	**2073**
3	22/07	24	-	-	-	-	-	1	1	-	**26**
	23/07	18	1	-	-	1	-	1	-	-	**21**
	24/07	20	1	-	-	-	-	2	-	-	**23**
	25/07	15	-	-	-	-	-	2	-	-	**17**
	26/07	4	-	-	-	-	-	1	-	-	**5**
	Total	**81**	**2**	**0**	**0**	**1**	**0**	**7**	**1**	**0**	**92**
4	22/07	253	47	-	-	5	-	18	2	-	**325**
	23/07	326	82	-	-	4	-	17	2	-	**431**
	24/07	307	79	-	-	2	-	4	16	-	**408**
	25/07	177	48	-	-	3	-	4	6	-	**238**
	26/07	191	29	-	-	-	-	3	-	-	**223**
	Total	**1254**	**285**	**0**	**0**	**14**	**0**	**46**	**26**	**0**	**1625**

Anabat Location	Date	Registrations per Night for Each Species Recorded									Total
		Common pipistrelle	Soprano pipistrelle	Leisler's	Long-eared	*Myotis* sp.	Nathusius pipistrelle	Noctule	Serotine	*Nyctalus* sp.	
5	22/07	689	11	-	-	-	-	2	-	-	**702**
	23/07	219	10	-	-	-	-	1	-	-	**230**
	24/07	287	1	-	-	2	-	6	-	-	**296**
	25/07	379	37	-	-	1	-	41	6	-	**464**
	26/07	66	3	-	-	-	-	-	-	-	**69**
	Total	**1640**	**62**	**0**	**0**	**3**	**0**	**50**	**6**	**0**	**1761**
6	22/07	246	4	-	-	-	-	2	-	-	**252**
	23/07	380	7	-	1	1	-	-	-	-	**389**
	24/07	262	5	-	1	-	-	2	-	-	**270**
	25/07	479	5	-	1	-	-	2	-	-	**487**
	26/07	416	1	-	-	-	-	2	-	-	**419**
	Total	**1783**	**22**	**0**	**3**	**1**	**0**	**8**	**0**	**0**	**1817**
7	22/07	197	24	-	1	2	-	20	-	-	**244**
	23/07	189	20	-	-	1	-	27	-	-	**237**
	24/07	222	25	-	-	-	-	41	-	-	**288**
	25/07	367	30	-	1	-	-	27	1	-	**426**
	26/07	176	19	-	-	-	-	18	-	-	**213**
	Total	**1151**	**118**	**0**	**2**	**3**	**0**	**133**	**1**	**0**	**1408**
8	22/07	27	17	-	1	5	1	7	-	-	**58**
	23/07	22	14	2	3	1	-	7	-	-	**49**
	24/07	23	13	1	-	3	-	4	1	-	**45**
	25/07	14	6	-	-	2	-	2	1	-	**25**
	26/07	18	5	-	2	2	1	5	-	-	**33**
	Total	**104**	**55**	**3**	**6**	**13**	**2**	**25**	**2**	**0**	**210**

Anabat Location	Date	Registrations per Night for Each Species Recorded									Total
		Common pipistrelle	Soprano pipistrelle	Leisler's	Long-eared	*Myotis* sp.	Nathusius pipistrelle	Noctule	Serotine	*Nyctalus* sp.	
9	22/07	51	4	-	-	8	-	8	2	-	**73**
	23/07	42	3	-	-	4	-	2	6	-	**57**
	24/07	53	10	-	-	2	-	3	-	-	**68**
	25/07	46	5	-	-	1	-	5	7	-	**64**
	26/07	54	4	-	-	4	-	5	4	-	**71**
	Total	**246**	**26**	**0**	**0**	**19**	**0**	**23**	**19**	**0**	**333**
10	22/07	11	-	-	-	-	-	7	-	6	**24**
	23/07	15	-	-	-	-	-	5	-	-	**20**
	24/07	24	-	-	-	-	-	7	-	3	**34**
	25/07	10	-	-	-	-	-	1	-	-	**11**
	26/07	8	-	-	-	-	-	2	-	-	**10**
	Total	**68**	**0**	**0**	**0**	**0**	**0**	**22**	**0**	**9**	**99**
11	22/07	30	-	-	1	-	-	8	-	-	**39**
	23/07	25	-	-	-	-	-	5	1	-	**31**
	24/07	22	-	-	-	-	-	5	1	-	**28**
	25/07	16	-	-	-	-	-	3	-	-	**19**
	26/07		-	-	-	-	-	-	-	-	**0**
	Total	**93**	**0**	**0**	**1**	**0**	**0**	**21**	**2**	**0**	**117**
12	22/07	24	-	-	-	-	-	3	2	-	**29**
	23/07	16	-	-	-	-	-	-	-	-	**16**
	24/07	11	-	-	-	-	-	4	-	-	**15**
	25/07	21	-	-	-	-	-	3	-	-	**24**
	26/07	6	-	-	-	-	-	-	-	-	**6**
	Total	**78**	**0**	**0**	**0**	**0**	**0**	**10**	**2**	**0**	**90**

Anabat Location	Date	Registrations per Night for Each Species Recorded									Total
		Common pipistrelle	Soprano pipistrelle	Leisler's	Long-eared	*Myotis* sp.	Nathusius pipistrelle	Noctule	Serotine	*Nyctalus* sp.	
13	22/07	20	-	6	-	-	-	2	1	-	**29**
	23/07	18	-	-	-	-	-	8	-	-	**26**
	24/07	29	-	3	-	-	-	3	-	-	**35**
	25/07	2	1	-	-	-	-	-	-	-	**3**
	26/07	6	-	1	-	-	-	4	-	-	**11**
	Total	**75**	**1**	**10**	**0**	**0**	**0**	**17**	**1**	**0**	**104**
14	22/07	84	3	3	-	-	-	5	-	-	**95**
	23/07	72	6	6	-	-	-	23	1	-	**108**
	24/07	35	4	8	-	-	-	36	-	-	**83**
	25/07	17	3	6	-	-	-	8	2	-	**36**
	26/07	39	-	2	-	-	-	4	-	-	**45**
	Total	**247**	**16**	**25**	**0**	**0**	**0**	**76**	**3**	**0**	**367**
15	22/07	29	-	-	-	-	-	5	2	-	**36**
	23/07	17	-	-	-	-	-	8		-	**25**
	24/07	19	-	-	-	-	-	3	-	-	**22**
	25/07	14	-	-	-	-	-	5	1	-	**20**
	26/07	10	-	-	-	-	-	8	-	-	**18**
	Total	**89**	**0**	**0**	**0**	**0**	**0**	**29**	**3**	**0**	**121**
16	22/07	3	-	-	-	-	-	-	-	-	**3**
	23/07	1	2	1	-	-	-	-	-	-	**4**
	24/07	-	1	-	-	1	-	-	-	-	**2**
	25/07	2	-	-	-	-	-	-	-	-	**2**
	26/07	1	-	-	-	1	-	2	-	-	**4**
	Total	**7**	**3**	**1**	**0**	**2**	**0**	**2**	**0**	**0**	**15**

Table EDP A5.17. Detailed Results from the August Anabat Recording Period.

Anabat Location	Date	Registrations per Night for Each Species Recorded								Total
		Common pipistrelle	Soprano pipistrelle	Leisler's	Long-eared	*Myotis* sp.	Nathusius pipistrelle	Noctule	Serotine	
1	18/08	86	5	-	-	1	-	-	-	**92**
	19/08	47	5	-	1	-	-	1	-	**54**
	20/08	80	6	-	-	1	-	1	-	**88**
	21/08	31	2	-	-	2	-	-	-	**35**
	22/08	2	1	-	-	-	-	-	-	**3**
	Total	**246**	**19**	**0**	**1**	**4**	**0**	**2**	**0**	**272**
2	18/08	62	2	-	-	-	-	1	-	**65**
	19/08	108	3	-	-	1	-	1	-	**113**
	20/08	6	1	-	-	-	-	1	-	**8**
	21/08	4	-	-	-	-	-		-	**4**
	22/08	-	-	-	-	-	-	1	-	**1**
	Total	**180**	**6**	**0**	**0**	**1**	**0**	**4**	**0**	**191**
3	18/08	13	-	-	-	-	-	-	-	**13**
	19/08	8	-	-	-	1	-	-	-	**9**
	20/08	7	-	-	-	-	-	-	-	**7**
	21/08	1	-	-	-	-	-	-	-	**1**
	22/08	-	-	-	-	-	1	-	-	**1**
	Total	**29**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**31**
4	18/08	121	15	-	1	8	-	1	1	**147**
	19/08	148	2	-	1	2	-	6	2	**161**
	20/08	349	17	-	-	7	-	-	4	**377**
	21/08	205	4	-	-	3	-	-	-	**212**
	22/08	17	3	-	1	10	-	-	1	**32**
	Total	**840**	**41**	**0**	**3**	**30**	**0**	**7**	**8**	**929**

Anabat Location	Date	Registrations per Night for Each Species Recorded								Total
		Common pipistrelle	Soprano pipistrelle	Leisler's	Long-eared	*Myotis* sp.	Nathusius pipistrelle	Noctule	Serotine	
5	18/08	22	-	-	-	2	-	-	-	**24**
	19/08	197	5	-	-	15	-	-	-	**217**
	20/08	124	11	-	-	-	-	-	-	**135**
	21/08	39	1	-	-	15	-	-	-	**55**
	22/08	31	1	-	-	1	-	-	-	**33**
	Total	**413**	**18**	**0**	**0**	**33**	**0**	**0**	**0**	**464**
6	18/08	64	2	-	-	-	-	-	-	**66**
	19/08	415	7	-	-	-	-	-	-	**422**
	20/08	1045	10	-	-	-	-	4	1	**1060**
	21/08	890	6	-	-	-	-	1	-	**897**
	22/08	253	5	-	-	-	-	-	-	**258**
	Total	**2667**	**30**	**0**	**0**	**0**	**0**	**5**	**1**	**2703**
7	18/08	222	13	-	-	4	-	3	-	**242**
	19/08	37	2	-	-	3	-	2	1	**45**
	20/08	270	8	-	-	3	-	1	-	**282**
	21/08	273	11	-	-	2	-	-	-	**286**
	22/08	146	21	-	-	1	-	-	1	**169**
	Total	**948**	**55**	**0**	**0**	**13**	**0**	**6**	**2**	**1024**
8	**Detector Fault**									
9	18/08	12	1	-	-	1	-	-	-	**14**
	19/08	21	-	-	-	-	-	7	-	**28**
	20/08	15	2	-	-	-	-	19	-	**36**
	21/08	-	-	-	-	-	-	-	-	**0**
	22/08	-	-	-	-	-	-	-	-	**0**
	Total	**48**	**3**	**0**	**0**	**1**	**0**	**26**	**0**	**78**

Anabat Location	Date	Registrations per Night for Each Species Recorded								Total
		Common pipistrelle	Soprano pipistrelle	Leisler's	Long-eared	*Myotis* sp.	Nathusius pipistrelle	Noctule	Serotine	
10	**Only noise detected**									
12	18/08	29	2	-	-	-	-	1	-	**32**
	19/08	38	-	-	-	-	-	1	-	**39**
	20/08	30	2	-	-	-	-	1	-	**33**
	21/08	24	1	-	-	-	-	-	1	**26**
	22/08	80	1	-	-	-	-	-	-	**81**
	Total	**201**	**6**	**0**	**0**	**0**	**0**	**3**	**1**	**211**
13	18/08	4	-	-	-	-	-	4	-	**8**
	19/08	2	-	-	-	-	-	3	-	**5**
	20/08	8	1	-	-	-	-	2	-	**11**
	21/08	1	-	-	-	-	-	-	-	**1**
	22/08	1	-	-	-	-	-	3	-	**4**
	Total	**16**	**1**	**0**	**0**	**0**	**0**	**12**	**0**	**29**
14	18/08	128	-	-	-	-	-	1	-	**129**
	19/08	91	1	-	-	3	-	1	-	**96**
	20/08	259	3	-	1	1	-	-	-	**264**
	21/08	558	1	-	-	3	-	2	1	**565**
	22/08	426	-	-	-	2	-	-	-	**428**
	Total	**1462**	**5**	**0**	**1**	**9**	**0**	**4**	**1**	**1482**
15	18/08	5	-	-	-	-	-	1	1	**7**
	19/08	7	1	-	-	-	-	4	1	**13**
	20/08	19	1	-	-	1	-	6	-	**27**
	21/08	21	1	-	1	-	-	9	-	**32**
	22/08	17	1	-	-	-	-	4	1	**23**
	Total	**69**	**4**	**0**	**1**	**1**	**0**	**24**	**3**	**102**

Anabat Location	Date	Registrations per Night for Each Species Recorded								Total
		Common pipistrelle	Soprano pipistrelle	Leisler's	Long-eared	*Myotis* sp.	Nathusius pipistrelle	Noctule	Serotine	
16	18/08	5	3	-	-	-	-	-	1	**9**
	19/08	2	4	-	-	1	-	6	1	**14**
	20/08	4	5	-	-	-	-	5	-	**14**
	21/08	1	4	-	-	-	-	2	-	**7**
	22/08	1	3	-	-	-	-	2	1	**7**
	Total	**13**	**19**	**0**	**0**	**1**	**0**	**15**	**3**	**51**

Table EDP A5.18. Detailed Results from the September Anabat Recording Period

Anabat Location	Date	Registrations per Night for Each Species Recorded								Total
		Common pipistrelle	Soprano pipistrelle	Leisler's	Long-eared	*Myotis* sp.	Nathusius pipistrelle	Noctule	Serotine	
1	16/09	2	1	-	-	-	-	-	-	**3**
	17/09	9	-	-	-	-	-	-	-	**9**
	18/09	1	-	-	-	1	-	-	-	**2**
	19/09	3	-	-	-	-	-	4	-	**7**
	20/09	5	-	-	-	-	1	-	-	**6**
	Total	**20**	**1**	**0**	**0**	**1**	**1**	**4**	**0**	**27**
2	16/09	7	1	-	-	1	1	3	-	**13**
	17/09	14	2	-	-	2	1	-	-	**19**
	18/09	17	3	-	-	-	-	-	-	**20**
	19/09	22	5	-	-	3	-	2	-	**32**
	20/09	22	2	-	-	2	-	-	-	**26**
	Total	**82**	**13**	**0**	**0**	**8**	**2**	**5**	**0**	**110**

Anabat Location	Date	Registrations per Night for Each Species Recorded								Total
		Common pipistrelle	Soprano pipistrelle	Leisler's	Long-eared	*Myotis* sp.	Nathusius pipistrelle	Noctule	Serotine	
3	16/09	1	-	-	-		-	1	-	**2**
	17/09	2	-	-	-	-	1	-	-	**3**
	18/09	20	-	-	-	1	1	-	1	**23**
	19/09	11	-	-	-	-	-	-	-	**11**
	20/09	5	-	-	-	1	-	1	-	**7**
	Total	**39**	**0**	**0**	**0**	**2**	**2**	**2**	**1**	**46**
4	16/09	1060	69	-	-	102	-	3	-	**1234**
	17/09	64	-	-	-	109	-	1	-	**174**
	18/09	147	3	-	-	83	-	3	-	**236**
	19/09	92	3	-	2	82	-	8	-	**187**
	20/09	33	1	-	-	99	1	14	-	**148**
	Total	**1396**	**76**	**0**	**2**	**475**	**1**	**29**	**0**	**1979**
5	16/09	19	1	-	-	-	-	1	-	**21**
	17/09	137	-	-	-	1	-	-	-	**138**
	18/09	302	-	-	-	-	-	-	-	**302**
	19/09	224	13	-	-	-	-	2	-	**239**
	20/09	423	16	-	-	1	-	5	-	**445**
	Total	**1105**	**30**	**0**	**0-**	**2**	**0**	**8**	**0**	**1145**
6	16/09	115	-	-	-	-	-	2	-	**117**
	17/09	163	-	-	-	-	-	-	-	**163**
	18/09	265	-	-	-	-	-	-	-	**265**
	19/09	375	-	-	-	-	-	-	-	**375**
	20/09	422	-	-	-	-	-	2	-	**424**
	Total	**1340**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**1344**

Anabat Location	Date	Registrations per Night for Each Species Recorded								Total
		Common pipistrelle	Soprano pipistrelle	Leisler's	Long-eared	*Myotis* sp.	Nathusius pipistrelle	Noctule	Serotine	
7	16/09	58	11	-	-	4	-	110	-	**183**
	17/09	22	-	-	-	1	-	68	-	**91**
	18/09	33	3	-	-	1	1	63	-	**101**
	19/09	65	3	-	-	4	-	58	-	**130**
	20/09	67	1	-	-	2	-	54	-	**124**
	Total	**245**	**18**	**0**	**0**	**12**	**1**	**353**	**0**	**629**
8	16/09	297	23	-	-	13	1	160	1	**495**
	17/09	101	8	-	1	17	-	17	3	**147**
	18/09	136	13	-	-	20	-	37	2	**208**
	19/09	184	11	-	-	25	3	11	-	**234**
	20/09	114	11	-	1	27	5	28	-	**186**
	Total	**832**	**66**	**0**	**2**	**102**	**9**	**253**	**6**	**1270**
9	16/09	72	2	-	-	36	-	12	-	**122**
	17/09	44	1	-	-	5	-	7	-	**57**
	18/09	64	2	-	-	12	-	6	-	**84**
	19/09	40	3	-	1	-	-	14	-	**58**
	20/09	17	4	-	1	2	-	12	1	**37**
	Total	**237**	**12**	**0**	**2**	**55**	**0**	**51**	**1**	**358**
10	16/09	1	-	-	-	-	-	-	-	**1**
	17/09	-	-	-	-	-	-	-	-	**-**
	18/09	2	-	-	-	-	-	-	-	**2**
	19/09	-	-	-	-	-	-	-	-	**-**
	20/09	-	-	-	-	-	-	-	-	**-**
	Total	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**
11	**No bats detected**									

Anabat Location	Date	Registrations per Night for Each Species Recorded								Total
		Common pipistrelle	Soprano pipistrelle	Leisler's	Long-eared	*Myotis* sp.	Nathusius pipistrelle	Noctule	Serotine	
12	16/09	9	-	-	-	-	-	1	-	**10**
	17/09	22	-	-	-	-	-	-	-	**22**
	18/09	46	-	-	-	1	-	1	-	**48**
	19/09	50	-	-	-	-	-	-	-	**50**
	20/09	35	-	-	-	-	1	2	-	**38**
	Total	**162**	**0**	**0**	**0**	**1**	**1**	**4**	**0**	**168**
13	16/09	-	-	-	-	-	-	-	-	
	17/09	1	-	-	-	-	-	-	-	**1**
	18/09	4	2	-	-	1	-	-	-	**7**
	19/09	71	2	-	-	1	-	-	-	**74**
	20/09	72	-	-	-	1	-	-	-	**73**
	Total	**148**	**4**	**0**	**0**	**3**	**0**	**0**	**0**	**155**
14	16/09	80	-	-	-	2	-	19	-	**101**
	17/09	26	1	-	-	5	1	1	-	**34**
	18/09	24	1	-	1	6	-	5	-	**37**
	19/09	38	-	-	-	1	-	1	-	**40**
	20/09	34	-	-	-	4	-	1	-	**39**
	Total	**202**	**2**	**0**	**1**	**18**	**1**	**27**	**0**	**251**
15	16/09	5	2	-	-	-	1	3	-	**11**
	17/09	11	2	-	-	-	-	1	-	**14**
	18/09	5	-	-	-	-	-	-	-	**5**
	19/09	6	2	-	-	-	-	3	-	**11**
	20/09	8	1	-	-	3	-	-	-	**12**
	Total	**35**	**7**	**0**	**0**	**3**	**1**	**7**	**0**	**53**

Anabat Location	Date	Registrations per Night for Each Species Recorded								Total
		Common pipistrelle	Soprano pipistrelle	Leisler's	Long-eared	*Myotis* sp.	Nathusius pipistrelle	Noctule	Serotine	
16	16/09	4	45	-	-	2	1	2	-	**54**
	17/09	-	36	-	-	2	-	2	-	**40**
	18/09	3	49	-	-	5	-	2	-	**59**
	19/09	2	185	-	-	24	-	3	-	**214**
	20/09	9	135	-	-	53	-	2	-	**199**
	Total	**18**	**450**	**0**	**0**	**86**	**1**	**11**	**0**	**566**

Annex EDP 6
Dormouse Survey

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Methodology

A6.1 An assessment of habitat suitability and local records concluded that the likelihood of dormice being present within the Kent Project Site was high. Therefore, to determine the presence within the Kent Project Site a presence/absence survey was undertaken. No surveys were deemed necessary at the Essex Project Site due to the lack of suitable habitat.

A6.2 A presence/absence survey for dormice was carried out using dormouse nest tubes in accordance with the current industry standard survey guidance[1]. These tubes are made from black plastic sheet, 5×5cm in cross section and 25cm long, sealed at one end, with a plywood tray inside. They are then suspended under horizontal limbs to resemble a hollow branch. The tubes are then inspected for the presence of dormice and also for signs of recently constructed dormouse nests.

A6.3 A total of 284 nest tubes were deployed within the woodland and scrub habitats with the most potential across the Kent Project site on 08 April 2020, the locations of which are displayed on Figure 12.18 (Document Reference 6.3.12.18). The tubes will then be checked four times between May and October. The provisional dates of the completed and planned checks are displayed in **Table EDP A6.1**. From September, to extend the coverage of the Kent Project Site, to include Broadness Grasslands, Land north of Tilman Avenue, NE Tip and Botany Marsh East, a further 217 tubes were deployed which will be checked three times between September and November.

Table EDP A6.1: Dates of dormouse checks.

Deployment 1 Check Number	Date
1	19.05.20
2	20.08.20
3	24.09.20
4	22.10.20
Deployment 2 Check Number	
1	23.09.20
2	21.10.20
3	24.11.20

A6.4 In accordance with best practice guidance, whereby the index of probability in detecting dormice presence within nest tubes is calculated according to set scores given for each of the different months in which tubes are deployed (during which a minimum of fifty nest tubes are deployed), the total survey effort employed on the Kent Project Site is considered to be sufficient to determine presence or absence. As illustrated in **Table EDP A6.2**, the combined survey effort score is calculated to be 142, which far exceeds the minimum survey effort score of 20 recommended

[1] Bright, P., Morris, P. and Mitchell-Jones, T. (2006). *The Dormouse Conservation Handbook: 2nd Edition*. English Nature, Peterborough.

by Chanin and Woods (2003) for a thorough dormouse survey through which absence may be assumed if no evidence of dormice is found.

Table EDP A6.2: Dormouse Survey Effort Scores.

Month	Index of Probability for 50 tubes	Index of probability Weighted for Number of Tubes in Deployment 1	Index of probability Weighted for Number of Tubes in Deployment 2
April	1	5.68	-
May	4	22.72	-
June	2	11.36	-
July	2	11.36	-
August	5	28.4	-
September	7	39.76	30.38
October	2	11.36	8.68
November	2	11.36	8.68
Total Survey Effort Score		**142**	**47.74**

Limitations

A6.5 All dormouse checks have been, or are planned to be, conducted within the optimum recognised survey period.

Results

A6.6 The results of the dormouse surveys each month are shown on Figure 12.19 (Document Reference 6.3.12.19). During the deployment of the nest tubes in April 2020, three individual dormice were found in old nest tubes found within immature plantation woodland in the southeast corner of the former landfill. The nest tubes had remained on the Kent Project Site from previous surveys.

May

A6.7 Following this, during the May survey visit, six individual dormice were found within the Former Landfill, including two individuals within the same nest tube and one next to it in the south-east corner; a further two individuals along the southern boundary; and an individual dormouse towards the southern end of the western boundary. A small number of dormouse nests were also found along the northern, western and south-western boundary. Within Bamber Pit, a single adult dormouse was found, along with a dormouse nest in a separate tube. Finally, a single adult dormouse was found on the northern edge of Blackduck Marsh. A total of eight dormice were found across the Kent Project Site.

August

A6.8 During the August survey visit, an adult dormouse was recorded in a tube, and an adult dormouse and six juveniles in a tube, within the former sportsground. Within the former landfill, an adult dormouse with four juveniles and another adult dormouse with three juveniles were found in nest tubes as well as 2 adult dormice within woody habitats around the former landfill. A number of dormouse nests were found within the former landfill, sportsground, station quarter north, station quarter south and within scrub habitats around the edge of Blackduck Marsh. Six adult and 13 juvenile dormice were found.

September

A6.9 Within the September survey, 11 adults (including a lactating female, one with three pinks and one with a juvenile) were found in the former landfill area as well as one juvenile. In Bamber Pit, seven adult dormice (including one with a juvenile) were found. In the sports ground, one adult with a single juvenile and another juvenile were found. On the eastern edge of Black Duck Marsh, one adult was found. In station quarter south four adults (including one with a juvenile and one with seven juveniles) were found. Multiple dormouse and wood mouse nests were recorded throughout all areas.

A6.10 During the first check of the extra tubes deployed in September, two adult dormice were found with nests in tubes; one in broadness grasslands and one on the eastern edge of Botany Marsh. Therefore, in September across all tubes, a total of 26 adult and 15 juvenile dormice were found across the Kent Project Site.

October

A6.11 During the October surveys, on the northern half of the Kent Project Site, three adult dormice and three nests were found on Broadness grasslands on the peninsula. One adult and four nests were found on the eastern edge of Black Duck Marsh and two adults and two nests were found in the eastern edge of Botany Marsh.

A6.12 On the southern half of the Kent project Site, in the sports ground, two adults and eight nests were found. In Bamber Pit, one adult and five juveniles in separate tubes were found. In addition, an adult with four juveniles was found in a tube and another tube with an adult and a juvenile was found. 10 nests were also found here. In the former landfill, five adults in separate tubes were found as well as a juvenile in a tube and another tube with an adult and a juvenile in. 19 nests were also found here. Two nests were found in station quarter north and five nests were found in addition to 2 adults in separate tubes in station quarter south.

A6.13 A nest was also found along the footpath between Craylands pit and Northfleet Industrial estate. This is likely to be the only bit of linking habitat between the foraging areas in the north of the Kent Project Site and the breeding and foraging areas in the south of the Kent Project site.

November

A6.14 During the November surveys, on the northern half of the Kent Project Site, one adult dormouse and two nests were found on Broadness grasslands on the peninsula. Six nests were found on the eastern edge of Black Duck Marsh, one adult and four nests were found in the eastern edge of Botany Marsh and a nest was found on the main access track.

A6.15 On the southern half of the Kent project Site, in the sports ground, 10 nests were found. In Bamber Pit, 15 nests were found. In the former landfill, two adults in separate tubes were found (one torpid) as well as a juvenile in a tube and another tube with an adult and a juvenile in. 23 nests were also found here. Two nests were found in station quarter north and three nests were found in addition to one adult in a separate tube in station quarter south.

A6.16 The nest remained along the footpath between Craylands pit and Northfleet Industrial estate.

Overall

A6.17 Dormouse activity is greatest within the Former Landfill with a majority of nests, adults and juveniles found there. Breeding has been confirmed (through the presence of adults with juveniles) in the Sportsground, Bamber Pit in the Former Landfill and in Station Quarter South.

A6.18 Adults have been found on the Former Landfill, Sportsground, around Black Duck Marsh, in Bamber pit, on Botany Marsh East, on Broadness Grasslands and in Station Quarter South. Nests have been found in the Former Landfill, Bamber Pit, Sports Ground, around Black Duck Marsh, Station Quarter North and South and around the SW Tip and Main Access Track.

A6.19 The dormouse and nest counts of each check of deployment 1 and deployment 2 are shown below in **Tables EDP A6.3** and **A6.4**, respectively.

Table EDP A6.3: Dormouse and nest counts for deployment 1

Area (Figure 12.1; Document Reference 6.3.12.1))	Dormouse count					Nest count				
	May	Aug	Sep	Oct	Nov	May	Aug	Sep	Oct	Nov
Main access track/SW tip	-	-	-	-	-	-	-	2	-	1
Black Duck Marsh	1A	-	1A	1A	-	-	4	11	2	6
Sports Ground	6A	1A 1A w/6J	1A w/1J 1J	2A	-	3	1	5	8	10
Bamber Pit	1A	-	6A 1A w/1J	1A 1A w/4J 1A w/1J 5J	-	1	-	3	10	15
Former Landfill	-	1A w/4J 1A w/3J 2A	1A (lactating) 1A w/3P 1A w/1J 8 A	5 A 1 A w/1J 1 J	2A 1A w/1J 1J	-	15	13	19	23
Station Quarter North	-	-	-	-	-	-	2	2	2	2
Station Quarter South	-	-	1A w/1J 1A w/7J 2A	2A	1	-	1	3	5	3

Note: w/ = with, A = adult, J = juvenile, P = pink

Table EDPA6.4. Dormouse and Nest Counts for Deployment 2

Area (Figure 12.1; Document Reference 6.3.12.1))	Dormouse count			Nest count		
	Sep	Oct	Nov	Sep	Oct	Nov
Broadness Grassland	1A	3A	1A	-	3	2
NE Tip	-	-	-	-	-	1
Botany Marsh East	1A	2A	1A	-	2	4
Land north of Tiltman Ave	-	-	-	-	-	-

Note: A = adult

A6.20 A summary of dormouse evidence at the Kent Project Site is shown in Figure 12.20 (Document Reference 6.3.12.20). This species is considered likely to be using the woodland and scrub habitats within the Kent Project Site for breeding, foraging, refuge and dispersal. Breeding is confirmed/considered very likely within the southern half of the site in Station Quarter South, former landfill, Bamber Pit and the Sports ground. The northern half of the Kent Project Site; in the areas of Botany Marsh, Black Duck Marsh, NE tip and Broadness Grassland, only adults and nests have been found. Breeding is not thought to be occurring in these areas, they are likely used for foraging in the summer months.

A6.21 It is considered that the Kent Project Site supports suitable foraging habitat for dormouse across the Swanscombe Peninsula, alongside some, albeit sub-optimal breeding/hibernation habitat within the Sportsground, former Landfill, Bamber Pit and Station Quarter South. The Kent Project Site is therefore considered of importance to the local dormouse population at the District level.

Annex EDP 7
Water Vole Survey

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Methodology

A7.1 There are a number of ditches within the Kent Project Site and the River Ebbsfleet that hold suitable habitat for water vole (*Arvicola amphibius*). There is no suitable habitats within the Essex Project Site.

A7.2 Suitable Habitat for water voles includes:

- Water more than 50cm deep and relatively stable;
- Muddy bottom;
- Static or slow flowing water;
- Earth banks of >45° (for burrowing);
- Dense vegetation cover on the banks of a good mix of grasses and herbs for summer food and cover and some berry bearing bushes, tubers and trees for autumn and winter food;
- Emergent, in-channel vegetation; and
- 1-2m wide.

A7.3 A water vole survey was carried out on these ditches on 25 June and 18 August 2020 to determine presence or absence. Due to health and safety constraints, the standard survey methodology, which involves searching the banks of each ditch for evidence of water voles, was not possible. Therefore, as per best practice guidelines[1] in these situations, 193 Styrofoam mats were deployed on 02 and 10 June 2020 within the most suitable and accessible ditches and in the River Ebbsfleet to act as artificial latrine sites.

A7.4 These 'rafts' are constructed from a buoyant material approximately 60x30cm. They are situated within vegetation at the toe of the bank at a density of approximately one every 10m and tethered in place. The most obvious field sign for water vole is their latrines (piles of droppings) which are used by individuals to mark territories and thus 'obvious' and open places (such as artificial rafts) are often chosen as latrine sites. The locations of the rafts deployed in the Kent Project Site can be found on Figure 12.21 (Document Reference 6.3.12.21).

[1] Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016), Water Vole Mitigation Handbook (Mammal Society Mitigation Guidance Series). Eds Fiona Matthews and Paul Channin. Mammal Society, London.

A7.5 Access to the interior of Botany Marshes (D19 to 24) was granted in July. This part of the Marsh had easier access to the banks of the ditches and so a standard water vole survey was undertaken on these ditches on 28 July and 29 September.

A7.6 Other evidence for the presence of water voles includes:

- Feeding signs (neat piles of short pieces of vegetation cut at a 45° angle);
- Burrows;
- Footprints and pathways; and
- Actual sightings.

Limitations

A7.7 The optimal period for water vole survey is during the breeding season (Mid-April to end of September) so the surveys undertaken at the Kent Project Site are not considered to be limited by season.

A7.8 A significant number of rafts have been deployed and will remain in place throughout the water vole breeding season, however, at the time of the second survey visit on 18 August 2020, vegetation had become so dense that rafts were difficult to find (**Image EDP A7.1**).

Image EDP A7.1: Dense vegetation making water vole latrine rafts difficult to find in August 2020.

A7.9 Given this constraint, an update survey was completed on 29 September during which all rafts were located. September is an optimal time for water vole surveys, identifying field signs when the population is at its highest and covering the greatest extent. Therefore, the reduced August survey effort is not considered to be a constraint.

A7.10 It was not possible to survey all of the ditches in Botany Marsh East due to dredging work taking place over the course of the Summer. This meant that many ditches were unsuitable already due to scraped sides or sides that would be scraped by the next survey.

A7.11 Deployment of rafts was not possible across the majority of the reedbed habitat due to the presence of Schedule 1 nesting birds limiting access. Water vole have been recorded using reedbeds, and it therefore must be assumed that they are present in reedbeds within the Kent Project Site.

Results

Water Vole

A7.12 During the June raft survey, water vole latrines and feeding signs were found in Botany Marsh East and West, as shown on Figure 12.21 (Document Reference 6.3.12.21) and **Image EDP A7.2**. This indicates that Botany Marsh has a breeding population.

A7.13 The August check of the latrine rafts returned no sightings of water vole nor any sign. However, many of the rafts were difficult to locate in dense vegetation. Absence at this time is not confirmed due to these significant limitations.

Image EDP A7.2: Feeding pile and latrine found during the raft survey on Botany Marsh East in June 2020

A7.14 A single latrine was found in the central area (D12) during the additional September survey and a single latrine was found in Black Duck Marsh on 08 September 2020.

A7.15 All water vole sign and sightings are displayed on Figure 12.21 (Document Reference 6.3.12.21).

A7.16 Breeding water vole are present in three areas of the Kent Project Site; Botany Marsh, the CTRL wetland area and Black Duck Marsh. Those on Black Duck Marsh are isolated due to the lack of water courses to and from this marsh but those on

the CTRL and Botany Marsh are linked. Overall, the population on the Kent Project Site is considered to be of District level value.

Otter

A7.17 An otter was sighted in Black Duck Marsh during the March winter bird survey but no other otter sign has been found in any other surveys. No holts or resting places have been found. The otter siting is shown on Figure 12.22 (Document Reference 6.3.12.22).

A7.18 No sign of otter or water vole was found during the standard surveys of the internal ditches of Botany Marsh (D19 to 24) on 28 July and 29 September with full visibility and accessibility.

A7.19 As an Otter was sited within Blackduck Marsh, although it could have been an individual passing through, it has been assumed Otter are present in low numbers on the suitable habitat throughout the ditch network with a population assumed to be of local value.

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Annex EDP 8
Great Crested Newt Survey

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Methodology

A8.1 There are several ponds and ditches on both the Kent Project Site and the Essex Project Site and within 250m of both Project Sites. For the purpose of this report, the ponds have been numbered as **P1** to **P33** and ditches as **D1** to **D43** and their locations are shown on Figure 12.24 (Document Reference 6.3.12.24).

Environmental DNA (eDNA) Sampling

A8.2 A total of eight ponds and 21 ditches were tested for Great Crested Newt (GCN) eDNA. Environmental DNA (eDNA) testing was formally approved by Natural England in spring 2014 and can remove the need for the time-consuming standard survey procedures if the results are negative.

A8.3 The ponds and ditches were subject to eDNA testing during the 2020 breeding season in accordance with the Technical Advice Note for field and laboratory sampling of GCN eDNA (WC1067)[1]. Using sampling kits supplied by SureScreen, this technique involved the collection of 20 No. 40ml water samples from locations spread around the perimeter of the pond/ditch, which are then combined and decanted into six sample tubes and forwarded to the SureScreen laboratory to be analysed.

Limitations

A8.4 Some ponds and ditches could not be surveyed for reasons explained in **Table EDP A8.1**. Despite the lack of survey on some water bodies, the complete set of negative results from the other waterbodies and the results from the previous surveys conducted on the Kent Project Site in 2012 and 2015, mean it is not considered likely that a survey of these water bodies would have resulted in a different conclusion.

Results

A8.5 A total of 36 records of GCN were returned during the desk study. Of these, only 3 were recent (last 10 years) and none of these were from within the Project Site. No GCN were recorded on the Kent Project Site in the 2012 and 2015 surveys.

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[1] Biggs J, Ewald N, Valentini A, Gaboriaud C, Griffiths RA, Foster J, Wilkinson J, Arnett A, Williams P and Dunn F 2014. Analytical and methodological development for improved surveillance of the Great Crested Newt. Appendix 5. Technical advice note for field and laboratory sampling of great crested newt (Triturus cristatus) environmental DNA. Freshwater Habitats Trust, Oxford.

eDNA Surveys

A8.6 The eDNA results from all surveyed waterbodies were returned negative. No further surveys were considered necessary. Great Crested Newt are not considered to be present within the Project Site.

Table EDP A8.1: Great Crested Newt Survey Schedule.

On/Off-site	Location	Pond No.	Surveyed?	Reasons for Scoping Out	eDNA Result
On-site	Black duck marsh	D1	N	Inaccessible due to scrub cover. Unsuitable for GCN (v. shallow water, 100% shade, no aquatic vegetation). Schedule 1 birds in marsh	
On-site	Central peninsula	D10	Y		**Negative**
On-site	Central peninsula	D11	Y		**Negative**
On-site	Central peninsula	D12	Y		**Negative**
On-site	Central peninsula	D13	N	Dry	
On-site	Broadness grasslands	D14	N	Dry	
On-site	Central peninsula	D15	N	Dry	
On-site	Broadness grasslands	D16	N	No Access - fenced	
On-site	Botany Marshes Nature Reserve	D17	Y		**Negative**
On-site	Botany Marsh	D18	Y		**Negative**
On-site	Botany Marsh	D19	Y		**Negative**
On-site	Black duck marsh	D2	N	Inaccessible due to steep banks and scrub cover. (limited suitability for GCN where seen - shallow water, no aquatic vegetation). Schedule 1 birds in marsh	
On-site	Botany Marsh	D20	Y		**Negative**
On-site	Botany Marsh	D21	Y		**Negative**
On-site	Botany Marshes Nature Reserve	D22	Y		**Negative**
On-site	Botany Marsh	D23	Y		**Negative**
On-site	Botany Marsh	D24	Y		**Negative**
On-site	Botany Marshes Nature Reserve	D25	Y		**Negative**
On-site	Botany Marshes Nature Reserve	D26	Y		**Negative**
On-site	Botany Marshes Nature Reserve	D27	N	No longer exists - large reedbed in place with no obvious waterbody	
On-site	Botany Marshes Nature Reserve	D28	Y		**Negative**
On-site	Botany Marshes Nature Reserve	D29	Y		**Negative**
On-site	Black duck marsh	D3	N	Inaccessible due to scrub cover and adjacent marsh. Schedule 1 birds in marsh	
On-site	Botany Marshes Nature Reserve	D30	Y		**Negative**
On-site	Botany Marshes Nature Reserve	D31	Y		**Negative**
Off-site	Industrial estate to east	D32	N	Lead contamination	
On-site	Land around Thames Way	D33	N	Part of river Ebbsfleet. Flowing water. GCN highly unlikely to be present	

On/Off-site	Location	Pond No.	Surveyed?	Reasons for Scoping Out	eDNA Result
On-site	Land around Thames Way	D34	N	Part of R. Ebbsfleet. Separated from main development by B255. Potential for highway improvement works to result in habitat loss, subject to extent of works.	
On-site	Station Quarter South	D35	N	Part of R. Ebbsfleet. Flowing water. GCN highly unlikely to be present	
On-site	A2 Corridor	D36	N	Unaffected by development proposals, subject to nature/ extent of highway improvement works	
On-site	A2 Corridor	D37	N	GCN considered unlikely to be present. Isolated field drain on the edge of intensive arable field. Nearest pond with no barriers 700m SE.	
Offsite	A2 Corridor	D38	N	GCN considered unlikely to be present. Ditch isolated by HS1 and New Barn Lane	
On-site	Essex Project Site	D39	N	Ditch no longer exists	
On-site	Black duck marsh	D4	N	Inaccessible due to D5 and surrounding marsh. Schedule 1 birds in marsh	
On-site	Essex Project Site	D40	Y		**Negative**
On-site	Essex Project Site	D41	N	Ditch inaccessible due to H&S	
Off-site	Adjacent to Essex Project Site	D42	Y		**Negative**
On-site	Black duck marsh	D5	Y		**Negative**
On-site	Black duck marsh	D6	N	Inaccessible due to D5 and surrounding marsh	
On-site	Black duck marsh	D7	N	Inaccessible due to D5 and surrounding marsh	
On-site	Black duck marsh	D8	N	Inaccessible due to D5 and surrounding marsh	
On-site	Black duck marsh	D9	Y		**Negative**
On-site	Broadness grasslands	P1	N	Leachate treatment lagoon. Highly alkaline due to leachate contamination	
On-site	Central peninsula	P10	N	Inaccessible, possibly dry, within reedbed	
Off-site	Industrial estate to east	P11	N	Lead contamination	
On-site	Central peninsula	P12	N	No water accessible within reedbed and scrub	
On-site	Botany Marsh	P13	N	Inaccessible	
On-site	Bamber Pit	P14 (former quarry lake)	N	Inaccessible. Very deep water and steep sides. <5% of shoreline accessible. Large shoals of fish observed in lake. GCN highly unlikely to be present in significant numbers due to fish predation.	
On-site	Land around Thames Way	P15	Y		**Negative**

On/Off-site	Location	Pond No.	Surveyed?	Reasons for Scoping Out	eDNA Result
Offsite	Land around Thames Way	P16 (Sawyers Lake)	N	Heavily stocked with fish for commercial fishing. GCN highly unlikely to be present	
On-site	Station Quarter South	P17	Y		**Negative**
On-site	Station Quarter South	P18	N	Could not access through fence	
Offsite	Future Redrow development land	P19	Y		**Negative**
On-site	Broadness grasslands	P2	N	Leachate treatment lagoon. Highly alkaline due to leachate contamination	
Offsite	A2 Corridor (south)	P20	N	A2 Corridor (not affected by proposals)	
Offsite	A2 Corridor (south)	P21	N	A2 Corridor (not affected by proposals)	
Offsite	A2 Corridor (south)	P22	N	Isolated pond in intensive arable field. Pond not affected by proposals, and c. 230m from site boundary.	
Offsite	Ebbsfleet Garden City	P23	N	A2 Corridor (not affected by proposals)	
Offsite	Ebbsfleet Garden City	P24	N	A2 Corridor (not affected by proposals)	
Offsite	Ebbsfleet Garden City	P25	N	A2 Corridor (not affected by proposals)	
Offsite	Ebbsfleet Garden City	P26	N	A2 Corridor (not affected by proposals)	
Offsite	Ebbsfleet Garden City	P27	N	A2 Corridor (not affected by proposals)	
Offsite	A2 Corridor (north)	P28	N	A2 Corridor (not affected by proposals)	
Offsite	Bluewater shopping centre	P29	N	Unaffected by development proposals, subject to nature/ extent of highway improvement works	
On-site	Central peninsula	P3	Y		**Negative**
Offsite	A2 Corridor (north)	P30	N	A2 Corridor (not affected by proposals)	
Offsite	A2 Corridor (south)	P31	N	Isolated pond set in intensive arable landscape, with low/negligible quality habitat connecting it to site boundary	
Offsite	Castle Hill Garden City Park	P32	Y		**Negative**
Offsite	Castle Hill Garden City Park	P33	Y		**Negative**
On-site	Central peninsula	P4	N	Leachate treatment lagoon. Highly alkaline due to leachate contamination	
Offsite	Industrial estate to east	P5	Y		**Negative**
On-site	Central peninsula	P6	N	Dry	
Offsite	Industrial estate to east	P7	N	Lead contamination	
On-site	Black duck marsh	P8	Y		**Negative**

On/Off-site	Location	Pond No.	Surveyed?	Reasons for Scoping Out	eDNA Result
On-site	Central peninsula	P9	N	No water accessible within reedbed	

Annex EDP 9
Reptile Survey

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Methodology

A9.1 To confirm the presence of reptiles from within the Kent Project Site, a reptile survey, following best practice guidance[1], was undertaken. The Kent Project Site supports suitable habitat for a range of common and widespread British reptile species; marsh habitat, reed bed, woodland, scrub, brownfield habitat and various grassland types including calcareous grassland. The total area of suitable habitat amounts to approximately 173 hectares. However, approximately 35 hectares of this is reed bed that could not be surveyed for health and safety reasons and due to the presence of Schedule 1 nesting birds, so the surveyed area amounted to approximately 139 hectares. A total of 1142 artificial refugia were used, resulting in a density of 8.2 refugia/hectare, which is within the minimum requirements cited in Froglife guidance as 'between five and ten refuges per hectare'.

A9.2 No surveys were conducted at the Essex Project Site due to the lack of suitable habitat.

A9.3 The refugia comprised 50cm^2 sheets of roofing felt. They were placed across the Kent Project Site on 14 and 29 April 2020 as illustrated on Figure 12.25 (Document Reference 6.3.12.25). These refugia were left undisturbed *in situ* for over ten days prior to the commencement of seven survey visits. Some refugia were deployed on 12 June 2020 to replace those destroyed during maintenance of the Kent Project Site. Additional refugia were deployed around the northern and western edge of Botany Marsh, and within Botany Marsh East.

A9.4 Due to access and security issues, the reptile refugia within Bamber pit were not checked after the second survey visit in May, until these issues were resolved in September, with the remaining visits then completed in September. A total of seven survey visits were able to be conducted. Reptile surveys were therefore completed within the recognised survey period, and reptiles were found during the visits, thus confirming presence within these areas of the Kent Project Site. The reptile refugia within and around Botany Marsh were all checked in September 2020, which is considered an optimal month for recording reptiles.

A9.5 All survey dates and the areas that these dates correspond are listed in **Table EDP A9.2**.

A9.6 In addition to this, in early spring, a direct observation survey for adders was conducted on 23 March 2020. This involved a slow walkover of all areas of suitable habitat focussing on potential hibernation features[2].

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1 Froglife (1999) Reptile survey: an introduction to planning, conducting and interpreting surveys for snake and lizard conservation. Froglife Advice Sheet 10, Froglife, Halesworth; DMRB (2005) *Nature conservation advice in relation to reptiles and roads. Volume 10, Section 4, Part 7, HA/116/05.* DMRB

2 Natural England Technical Information Note TIN102, Reptile mitigation guidelines (withdrawn)

A9.7 During each survey visit, artificial refugia were individually checked by experienced Ecologists with any reptiles observed recorded, along with notes on their life stage (adult/juvenile) and sex where possible. A peak count of the total number of individuals of a particular species was recorded. Peak counts were then used to estimate approximate population size for each reptile species recorded. Estimates of population size followed the approach given in the withdrawn draft reptile mitigation guidelines[3]. These are also compared to the Kent Local Wildlife Selection Criteria[4] population sizes for reptiles. Both are summarised in **Table EDP A9.1**.

Table EDP A9.1: Population size class estimates.

Species	Population Size Class Category					
	Reptile Mitigation Guidelines			Kent LWS Selection Criteria		
	Small	Medium	Large	Low	Good	Exceptional
Slow worm	<10	10–40	>40	<5	5-20	>20
Common lizard	<5	5–20	>20	<5	5-20	>20
Grass snake	<5	5–10	>10	<5	5-10	>10
Adder	<5	5–10	>10	<5	5-10	>10

A9.8 Detailed weather conditions recorded during each survey visit are summarised in **Table EDP A9.2**.

Table EDP A9.2: Date, Timing and Weather Conditions of Reptile Survey Visits.

Visit Date	Visit Number	Start Time	Air Temp Range (°C)	Wind Speed (Beaufort)	Cloud Cover (%)	Rain
26/05/20	Whole site 1 Bamber Pit 1 (no botany marsh)	08:30	18-22	1-3	10-25	Nil
29/06/20	Whole site 2 Bamber Pit 2 (no botany marsh)	09:20	16-17	4-6	80-90	Nil
07/07/20	Whole Site 3 (no botany marsh or Bamber Pit)	09:00	18-20	2-3	30-40	Nil
04/08/20	Whole Site 4 (no botany marsh or Bamber Pit)	08:00	19-20	2-3	20-30	Nil
02/09/20	Whole Site 5 Botany Marsh 1	09:15	13-18	1	5-70	Nil
08/09/20	Botany Marsh 2	15:00	18-20	0	60-80	Nil
15/09/20	Botany Marsh 3	07:40	16	0	40-100	Nil
16/09/20	Bamber Pit 3	15:00	23	2	50	Nil
17/09/20	Whole Site 6 Botany Marsh 4	08:30	14-17	2-4	20-30	Nil

[3] Natural England (2011) *Natural England Technical Information Note TIN102 Reptile Mitigation Guidelines.* WITHDRAWN

[4] Kent Wildlife Trust (2015) 'Local Wildlife Sites in Kent. Criteria for Selection and Delineation', Version 1.5 August 2015.

Visit Date	Visit Number	Start Time	Air Temp Range (°C)	Wind Speed (Beaufort)	Cloud Cover (%)	Rain
22/09/20	Bamber Pit 4 Whole Site 7 Botany Marsh 5	13:30 08:05	20 12-18	1-2 1-2	5-10 0-20	Nil Nil
24/09/20	Bamber Pit 5	11:00	13	3	60-80	Nil
28/09/20	Bamber Pit 6 Botany Marsh 6	11:00 12:20	15-16 15-16	0-1 2-3	20-80 30-40	Nil Nil
29/09/20	Bamber Pit 7 Botany Marsh 7	09:00 12:10	15 16	0-2 0-2	75-90 95-100	Nil Nil

Limitations

A9.9 The surveys so far have not been constrained by weather and took place in suitable conditions. All surveys are planned within the optimal surveying period.

A9.10 Several of the refugia within the top of the Peninsula were damaged or lost through vegetation management meaning a full refugia check in this area could not be completed in May. These refugia were replaced in June 2020.

Results

A9.11 Reptile survey results are shown on Figure 12.26 (Document Reference 6.3.12.26). Populations of grass snake, common lizard and slow worm have been recorded on the Kent Project Site with males, females (including some gravid) and juveniles all recorded.

A9.12 All areas on the Swanscombe peninsula; Blackduck Marsh, Botany Marsh, Broadness Grassland, CTRL wetland, NE tip and SW tip, are considered to be linked enough for reptile to be able to move between these areas. Therefore, these areas are grouped together for peak counts and referred to as 'Swanscombe peninsula'.

A9.13 Due to topographical barriers or roads and other built up areas forming barriers to reptile movement, it is thought that the reptile present within Bamber Pit, the Sports Ground, the former landfill, station quarter north and station quarter south cannot disperse from these areas are thus separate, isolated populations. Therefore, the peak counts of these areas are all considered separately. **Table EDP A9.3** displays the peak counts of each separate reptile population within the Kent Project Site. Population size classes are derived from the size classes drawn up by Kent Reptile and Amphibian Group, as provided in the Kent LWS selection criteria.

Kent Selection Criteria

A9.14 Population counts of exceptional, good and low score 3, 2 and 1 points, respectively within the Kent LWS selection criteria. The points scored for each area is also displayed in **Table EDP A9.3**.

Table EDP A9.3: Peak counts and the corresponding points scored for each individual reptile population within the Kent Project Site

Kent Project Site Area (Figure 12.1; Document Reference 6.3.12.1)	**Peak survey count (Population size class (Kent LWS selection criteria)[5])**		
	Slow worm	**Common lizard**	**Grass snake**
Swanscombe Peninsula	-	21 (Exceptional)	11 (Exceptional)
Craylands Pit	39 (Exceptional)	5 (Good)	-
Bamber Pit	14 (Good)	3 (Low)	1 (Low)
Sports Ground	-	2 (Low)	-
Landfill	2 (Low)	9 (Good)	1 (Low)
Station Quarter North	-	1 (Low)	-
Station Quarter South	3 (Low)	23 (Exceptional)	2 (Low)

A9.15 According to the Kent LWS selection criteria for reptiles[79], "*Sites should be selected as Local Wildlife Sites where the site:*

- *Supports three or more reptile species;*
- *Supports two snake species;*
- *Supports an exceptional population of one species;*
- *Supports an assemblage of species scoring at least 4 points using the system set out above; or*
- *Supports a 'good' or 'exceptional' population of adder."*

A9.16 There is an exceptional population of grass snake on the peninsula, exceptional populations of common lizard on the peninsula and station quarter south and an exceptional population of slow worm in Craylands Pit.

[5] Kent Wildlife Trust (2015) 'Local Wildlife Sites in Kent. Criteria for Selection and Delineation', Version 1.5 August 2015.

A9.17 All areas of the Kent Project Site, with the exception of the Sports Ground and Station quarter north would qualify as a LWS on reptile criteria.

A9.18 Figure 12.26 (Document Reference 6.3.12.26) shows the results of all of the 2020 reptile surveys from all areas.

Evaluation

A9.19 The reptile population within the Kent Project Site is considered likely to be of at least district value and will be taken forward as an IEF. Reptiles are not considered to be present on the Essex Project Site due to the paucity of suitable habitat.

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Annex EDP 10
Terrestrial Invertebrate Surveys

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Aims and Objectives

Aim

A10.1 The main aim of the survey was to establish the conservation value of terrestrial and aquatic invertebrate assemblages occurring within an extensive network of sites containing post-industrial, grassland scrub, Open Mosaic Habitat (OMH), wetland and coastal saltmarsh habitats present within the Project Site. Findings are used to assess the conservation value of the invertebrate assemblages present.

Objectives

- To undertake detailed invertebrate surveys within habitat prioritised during a scoping study conducted during April 2020; and

- To analyse invertebrate data using Pantheon and produce a report including findings/species lists and an evaluation of key assemblages and species in terms of their conservation value.

Methodology

Sample Dates

A10.2 An initial scoping survey was undertaken between the 14 and 22nd April, 2020.

A10.3 Following the scoping study, detailed terrestrial invertebrate sampling for most of the sites selected during the scoping study was conducted over four discrete visits including:

1) 18-20 May 2020;

2) 15-17 June 2020;

3) 13-15 July 2020; and

4) 17-19 August 2020.

A10.4 Aquatic invertebrate sampling was undertaken on the following dates:

1) 02 June 2020;

2) 14 July 2020 (including additional boat surveys of Area 4 Black Duck Marsh and Area 6b STW wetland);

3) 28 July 2020 (Area 7 Botany Marsh (west) only); and

4) 10 August 2020.

A10.5 Pitfall and Malaise traps operated on some sites, were usually set on the final day of survey. The trap contents were typically retrieved following 14 days of operation.

Survey Conditions

A10.6 The majority of site visits coincided with periods of consistently warm, dry and sunny weather, ideal for invertebrate sampling. Whilst the weather was variable over both June and August survey events, with intermittent thunderstorms (June only) and showers; the weather was generally warm, still and humid, allowing all sampling to be conducted successfully.

Survey Compartments

A10.7 Sampling has been undertaken in all sampling areas based on results of the scoping survey undertaken in April 2020. These areas largely cover the same footprint as the area surveyed during the 2015 London Resort invertebrate surveys undertaken on behalf of Chris Blandford Associates. However, there are some differences in the division of sampling compartment boundaries between the 2015 and current survey. In addition, a different site numbering system has been used in 2020. The location/division of the 2020 sample sites is shown on **Figures EDP A10.1** and **A10.2**.

A10.8 It is acknowledged that Natural England prefer survey boundaries and numbering systems to be consistent between projects conducted within the same footprint. However, to avoid confusion, due to the number of surveyors and specialist entomologists working on the project, a decision was made to continue with the current numbering and site boundary system for the duration of the fieldwork. Where possible, site names and survey units have been streamlined for consistency with the system used by EDP for the purpose of the ecology survey as a whole.

Survey Modifications (Following May Survey)

A10.9 Following the May sampling event, on account of its relatively small size and unexceptional grassland and scrub habitat, it was decided that no further sampling would be undertaken in Area 19 - Tilbury Docks, Essex. The habitat

selected tentatively within the scoping study, comprised a short stretch of road verge grassland and scrub habitat around TQ 64582 75464. Thus, no further sampling was undertaken within the Essex Project Site, with all remaining sample areas being located in the Kent Project Site.

A10.10 However, an area not included within the initial May survey, comprising the seawall grassland habitat at the western edge of the Swanscombe Peninsula centroid grid reference (TQ 59815 75687), was added to the survey in June. This compartment has been temporarily named 'Seawall' (Area 1a) and the boundary of this habitat is consistent with the compartment sampled in 2016.

Figure EDP A10.1: Terrestrial invertebrate sample areas (north)

Figure EDP A10.2: Terrestrial invertebrate sample areas (south)

A10.11 In order to survey the more remote, open water parts of Areas 4 Black Duck Marsh and 6b STW wetland for aquatic sampling, boat surveys were conducted on the 14 July and 10 August.

A10.12 Due to access permission constraints, it was not possible to survey one site, Area 7 Botany Marsh (west) during the early part of the survey. However, following access permission being granted in late July, both terrestrial and aquatic samples were collected on the 28 July 2020. Following this, terrestrial and aquatic sampling was undertaken for Area 7 alongside the other work during August 2020.

Sampling Protocol

Terrestrial Invertebrate Sampling

A10.13 Sampling was undertaken in representative habitats prioritised within the Habitat Scoping project and followed standard methods outlined in NERR005 (Drake et al, 2006). The survey aimed to characterise assemblages within the identified habitats; however, some pragmatism was exercised where large areas of similar habitat is encountered within a site. A sufficient number of samples from each of the target habitats within each of the 16 sites sampled fully during 2020, were collected to enable a robust analysis and evaluation using Pantheon.

A10.14 However, to ensure sites were sampled robustly in terms of coverage verses a conventional Common Standards Monitioring condition assessment approach, there was a degree of variability in both method and number of samples collected. Results of Pantheon analysis, for some of the more heavily sampled sites, were therefore viewed with a moderate, rather than a high, confidence level during the evaluation process. Survey methods and number of samples per site are tabulated for each site within the mini-report section.

A10.15 Direct methods included timed 10-minute sweep sampling; two-minute vacuum sampling; beating samples (typically 20 minutes per survey) and direct searching. In addition, pan-traps were operated over the duration of each sampling period. Ten traps comprising yellow bowls half-filled with water and a small amount of detergent (washing up liquid) were deployed on most sites. These were set at the outset of each sampling event and collected on the final day (giving a trapping period of between 24 and 48 hours).

A10.16 During each sampling event, pitfall traps were deployed in clusters of 10 in sites 1,2,3,4,6b and 8. The traps were protected by lids constructed from weighted hardboard or plywood, to minimise inundation from rainwater. Malaise traps were also deployed at the margins of inaccessible wetland areas including sites

4,6b and 8. Both pitfall traps and malaise trap samples were collected after a period of approximately 14 days after deployment, to prevent undue deterioration of specimens.

A10.17 Pan trapping and malaise trapping[1] were used to ensure coverage of species not easily obtainable by direct capture methods. In Chris Blandford Associates (2012a), pitfall trapping was cited as being an important capture method for Distinguished Jumping Spider *Sitticus ditinguendus*.

A10.18 In addition to pitfall trapping within Areas 2, 3 and 6 in habitat potentially suitable to support Distinguished Jumping Spider, transects of low density aggregate blocks, spaced around two metres apart were located within suitable habitat within these sites, including locations within which the spider was historically recorded.

A10.19 In total, 35 blocks were set out in seven groups, each comprising five blocks. These were located as follows:

- 2 sets of 5 blocks at TQ 60434 75792;
- 1 set of 5 blocks at TQ 60257 75859;
- 1 set of 5 blocks at TQ 60191 75827;
- 1 set of 5 blocks at TQ 60061 76009;
- 1 set of 5 blocks at TQ 60041 76075; and
- 1 set of 5 blocks at TQ 60656 75992.

A10.20 However, these blocks were not deployed until 07 July 2020. This resulted from a rather belated request from Natural England. The blocks were subsequently inspected during the remaining two terrestrial survey events. However, no Sitticus distinguendus specimens were recorded from either the pitfall samples, inspection of the aggregate blocks or any other sampling method.

A10.21 On all four survey events, sampling was undertaken by two, two person teams. One team included Dr Ross Piper (FRES) and Calum Urquhart (BSc hons.), the other was led by Jon Mellings (BSc hons; MCIEEM) with James Darke (BSc hons.; MCIEEM). For the final part of the project James Darke returned to his ecological

[1] Malaise traps were used in previous surveys by Chris Blandford Associates to collect specimens from wetland habitats not easily sampled by direct capture methods. Malaise traps are extremely efficient at capturing lareg numbers of insects, not easily obtained by other methods. These would need to be purchased for the purpose of the project; however, due to the current COVID pandemic, it may be difficult to obtain malaise traps as they are typically supplied on demand. If this is the case, an alternative capture method may be used in place.

work following COVID-19 (Furlough) and was replaced at short-notice by Chris Down (MA).

Aquatic invertebrate sampling

A10.22 Aquatic sampling was, for the most part, undertaken by Toby Abrehart of Abrehart Ecology Ltd, a small consultancy specialising in aquatic ecology. However, following permission to survey Area 7 Botany Marsh (West) in late July 2020, aquatic samples were collected from this site by Jon Mellings, assisted by Chris Down.

A10.23 On all occasions sampling was undertaken using the standard three-minute sweep method described in Murray-Bligh (1999). The samples collected by Jon Mellings were preserved and subsequently graded and sorted (using standard Endecotts test sieves). Specimens were then sent to Abrehart Ecology for identification.

A10.24 A separate aquatic invertebrate report was commissioned following discussion between EDP, Abrehart Ecology and Jon Mellings. Therefore, the precise details of aquatic sampling methods, detailed descriptions of survey sites and fauna are kept to a minimum within this report, which should be read in conjunction with the aquatic invertebrate report produced by Abrehart Ecology.

A10.25 However, in line with the original project remit, all 2020 species-level data derived from aquatic sampling was amalgamated with the 2020 terrestrial survey data for analysis using Pantheon. Importantly, conservation assessments of aquatic assemblages using Pantheon may differ from those resulting from the approach of Abrehart Ecology (or any third party aquatic-based agent).

A10.26 Assessment of 'wetland' fauna in Pantheon takes into account both pure aquatic species and the larval stage of species found on and beneath the water (collected using standard aquatic approaches), as well as species classed within wetland assemblages normally collected only using terrestrial sampling methods of wetland margins).

A10.27 Through terrestrial sampling, hygrophilous species such as ground beetles and rove beetles associated with wetland margins, as well as semi-amphibious species such as shore bugs (saldidae) and adults of two-winged flies (Diptera) may be sampled. Such species are less likely to be collected using standard aquatic techniques.

Species Identification

A10.28 Following each sampling event, terrestrial invertebrate samples were sorted to order level either for identification in-house, or for deployment to specialist taxonomists for identification. Taxon specialists who contributed significantly to the identification of specimens for the purpose of the 2020 survey included: Dr Tony Irwin (Diptera); Matthew Harrow (Diptera); Dr Tristan Bantock (Hemiptera); Dr Ross Piper (Hymenoptera and Coleoptera); Calum Urquhart (Coleoptera, Hymenoptera and Hemiptera); Steve Lane (Coleoptera and some Hemiptera); Tim Strudwick (aculeate Hymenoptera); Toby Abrehart (aquatic invertebrates) and Jon Mellings (Araneae, as well as other taxa not covered elsewhere and obvious specimens of a wide range of taxa removed during the sorting stage).

A10.29 Where considered necessary, specimens were sent for verification to authorities such as Mark Gurney (weevils) and Max Barclay (NHM) and Dmitri Telnov for verification.

Data Analysis

Pantheon Analysis

A10.30 Datasets including species lists collected using both terrestrial and aquatic sampling methods were input into the online Pantheon analytical resource.

A10.31 Pantheon is recommended by Natural England as a means of standardising assessment of invertebrate assemblages in terms of conservation value and as it enables invertebrate assemblages to be evaluated in relation to habitat affinity, it is invaluable in identifying targets for invertebrate-specific habitat creation and management.

Pantheon/ISIS Assemblage Hierarchy

A10.32 For the purpose of this report, results from three hierarchical levels recognised within the Pantheon output are defined as follows (from Webb et al, 2017):

- Broad Biotope Level - Broad Biotopes are a useful way to split sample data into something manageable whilst retaining a strong ecological grounding. They include tree-associated, open, wetland and coastal habitats. Species can occur in more than one broad biotope. This occurs when the same habitat has been typed into two divisions. A good example is wet woodland, which is found in both the tree-associated and wetlands;

- Habitat Level – Habitats are a mid-level category within the hierarchy and often readily identifiable and recognisable by conservation workers

(e.g. saltmarsh). Some are identified as broad habitats in the UK but most are new terms used to refer to a series of resources or a series of broad habitat types; and

- Specific Assemblage Types (SATs) - are characterised by ecologically restricted species and were generally only expressed in lists from sites with conservation value. This classification is particularly useful for identifying assemblages of higher conservation value and is, therefore, the most important metric in assessment of a site's invertebrate conservation value.

A10.33 Pantheon results tables are included in each of the mini-site reports, apart from Area 19, which was not surveyed beyond the initial sampling visit.

Species Quality Index (SQI)

A10.34 In addition to the Pantheon analysis, data was analysed on a sub-site by site level using a version of the Species Quality Index (SQI) used in Harvey (2014) which is based on the method described in Ball (1986).

A10.35 All species recorded from a site are scored according to conservation status. The scores are then added together and divided by the total number of species in the list (including both scoring and non-scoring species). The resultant SQI score provides a means for appraising the overall conservation value of a site, but, unlike Pantheon/ISIS, does not take into account the variation in rarity values of assemblages found in different habitats.

A10.36 In theory, if the number of recorded species for a site is reasonably robust, SQI scores should be comparable between sites with a different number of recorded species. However, the SQI becomes more robust with an increased number of species. A lower threshold of around 40 species is required for robust analysis using SQI.

A10.37 SQI analysis was undertaken by scoring all species listed for each site according to status as set out in **Table EDP A10.1.**

Table EDP A10.1 Scoring according to species conservation status used in SQI analysis

Conservation status	Scoring
RDB species	100 points
Notable – Na species[2]	50 points
Notable – Nb species	40 points
Notable – N species	40 points

[2] The old system of notable a and notable b is no longer used as a status classification, all former 'notable' species are now classed uniformly as 'nationally scarce'. However, for the purpose of analysis, former notable a and b species, which still retain nationally scarce status were scored using this system, to be consistent with the approach used in Harvey (2014) which conforms to the requirements of the Essex Standard.

Conservation status	Scoring
Local species	20 points
Common species	No score
Status not formally known	No score

A10.38 According to Harvey (2014) 'In the bulk of the Essex[3] countryside a "good" invertebrate site might have an SQI value of at least 5.00 after moderate recording coverage. An "excellent" site might have a value of 7.50 and any site with an SQI value approaching 10.00 is almost certainly of national significance.'

Limitations

A10.39 In general, a timed, Pantheon/ISIS-compliant sampling regime was followed during the survey, with timed samples being collected using standard methods. However, to gain a more in-depth understanding of the site's invertebrate fauna, a greater number of samples were collected than is required for standard Common Standards Monitoring condition assessment. As such the dataset should be considered to be semi-ISIS compliant. As such, output based on favourable condition thresholds should be considered to be of medium, rather than high confidence.

A10.40 No moth trapping was undertaken during the survey. It was felt that sufficient sampling effort was possible from sampling directly and this seems to be substantiated by the findings of the survey. Furthermore, overnight moth trapping would have involved overnight stays at the site which was problematic during 2020 due to the COVID-19 pandemic. However, overnight moth-trapping methods using mercury vapour and/or actinic are the only meaningful method for sampling night-flying moths and the data colllected is useful especially in appraising inaccessible tree-associated assemblages in Pantheon.

A10.41 No sampling permission was granted for Area 7 Botany Marsh (west) until late July 2020. Therefore, whilst a sufficient number of samples was collected over the two available late-July and mid-August survey windows to enable robust analysis using Pantheon for this site, earlier late spring and mid-summer survey opportunities were missed. However, the resulting survey data appears to have achieved satisfactory coverage of the key species assemblages for Area 7.

A10.42 Another constraint relating to Area 7 was that it was not possible to operate pan or pitfall traps in this area due to livestock grazing. In addition to Area 7, due to the extent of human activity including dog walking in Areas 1a on the Swanscombe Peninsula and Area 16 the Triangle inland, no pan-traps were

[3] The use of an overarching SQI is a prerequisite in assessment of invertebrate assemblages in Essex, using the 'Invertebrate standard advice for Essex' (Natural England, 2014). South Essex, is known to support invertebrate assemblages of elevated conservation value compared with most UK counties; however, this is based largely on the importance of OMH habitats bordering the Thames for invertebrates and invertebrate assemblages recorded from the Kent side can be seen as being of similar conservation value as the Essex assemblages.

deployed in these areas. However, as for Area 7, a sufficient number of samples were collected from enough habitat substrates to enable meaningful assessment of these sites to be undertaken.

A10.43 Another site Area 12 Bamber Pit was granted access permission during the first three sampling events, but this permission was withdrawn on safety grounds at the time of the final, August survey. Since a further set of samples was required from this site for robust Pantheon analysis, data collected from Area 13a Bamber Pit (south) collected during the August survey was added to the Area 12 dataset. This was considered a reasonable solution as the site was not only connected to Area 12, but also supported habitat of similar composition and structure to that of Area 12. However, Area 13a, being also contiguous to and accessible via Area 13 Former Landfill, had previously been sampled as a sub-site of Area 13 and consequently, the pre-August data collected from Area 13a was amalgamated and analysed alongside the data for Area 13 Former Landfill.

Results

Survey Results - Overview

A10.44 The detailed survey results are presented further below in a series of mini site reports. Each of these includes a detailed description of the surveyed area in terms of habitat and invertebrate assemblages recorded, as well as an evaluation and conclusion. The conclusion sections provide an assessment of the overall conservation value of each site as a whole, and in relation to key assemblages supported on the sites based on Pantheon analysis.

A10.45 The other major components of this Annex include a table showing all species (so far)[4] recorded from the 2020 dataset (**Table EDP A10.5**, at the rear of this Annex). In addition, **Table EDP A10.6** (also at the rear of this Annex) shows all species of recognised conservation status recorded from the survey area during the 2020 survey.

A10.46 Habitats sampled during the 2020 survey, included semi-improved grassland and scrub, ephemeral short perennial habitat, semi-natural broadleaved woodland, saltmarsh and inland wetland habitat including reedswamp, marshy grassland and open water. Due to the post-industrial history of much of the survey area, extensive areas comprising both grassland and scrub mosaic habitat and more obvious, early successional disturbance habitat are classifiable as s41 priority habitat 'Open mosaic habitat on previously developed

[4] At the time of writing the full list of two-winged fly (Diptera) derived from the 2020 survey is not available. This will be provided to the client once it has been received from the specialist whose progress has been delayed due to health reasons

land', (OMH). The habitat within each of the 17 sub-units surveyed during 2020 is described in detail within its respective mini-report.

Species Recorded and Species Taxon Deployment

A10.47 From the 2020 survey, a total of 1,446 invertebrate species have, so far, been recorded from the combined London Resort survey areas. Of these, 1,304 were from specimens collected and recorded during terrestrial surveys, whilst 142 were recorded from the aquatic only sampling of waterbodies within the combined survey areas.

A10.48 **Chart EDP A10.1** shows a representation of the number of species identified per taxonomic order, based on the overall 2020 terrestrial survey data. The chart shows a fairly typical deployment of species between the main represented orders. However, beetles (Coleoptera) were particularly well represented in comparision to the other particularly large order of two-winged flies (Diptera). Whilst 221 two-winged flies were recorded, this number is likely to increase when the remaining, currently unidentified diptera data are added to the dataset.

A10.49 Another insect order under-represented within the dataset is the butterflies and moths (Lepidoptera). Whilst it is considered likely that the butterfly element of this dataset was well recorded during the 2020 survey, night-flying moths are generally poorly recorded if overnight moth trapping is not undertaken, using mercury vapour and/or actinic trapping methods. Overnight moth trapping was not undertaken during the current survey as described in the 'Limitations' section above. Certain other taxa, most noticeably slugs and snails (Gastropoda) and centipedes and millipedes (Myriopoda) were only incidentally recorded during the terrestrial component of the survey and certain insect orders such as river-flies (Ephemeroptera, Trichoptera, Plecoptera) were not covered by the terrestrial element of the survey.

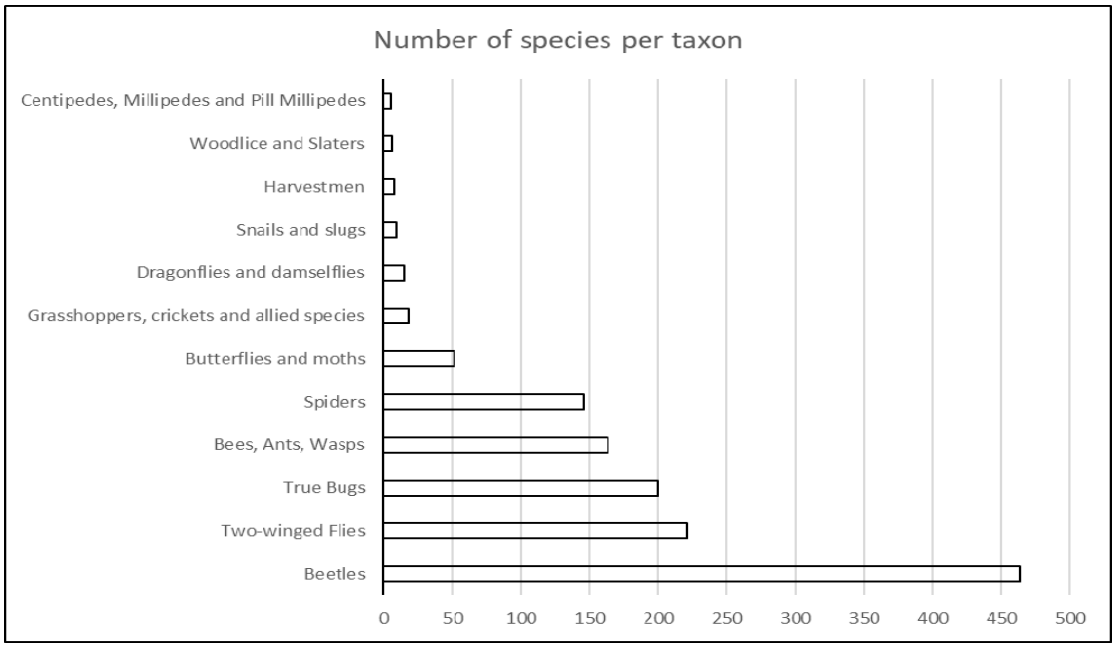

Chart EDP A10.1: Breakdown of species per higher taxon collected from 2020 terrestrial sample data only

Status Reviews and Changes in Uk Species Status

A10.50 It should be noted that since the 2012 and 2015 surveys were completed, a number of status reviews have been published relating to a range of UK invertebrate taxa. Within these reviews, species have mainly been downgraded from previous status, due to an increase in records; whilst others have been upgraded, due to a recorded decline. In addition, species have been assessed mainly on post-2001 IUCN criteria, which usually combines a rarity status with a threat status. Also, species classed in the former Notable A and B categories are now given a uniform Nationally Scarce status, which may also carry a threat status of either 'Least Concern' or occasionally 'Near Threatened'.

A10.51 Changes resulting from status reviews are regularly updated in the Pantheon database. Changes of species status mean that the overall number, or proportion of species of recognised conservation status cannot be reliably used as a means of comparison between 2012 and 2015 reports and those of 2020. In addition, neither of the previous reports used Pantheon or any of the trial versions of Invertebrate Species-habitat Information System (ISIS) for analytical purposes.

Species of Recognised Conservation Status Recorded on a Whole Site Basis

A10.52 From combined 2020 terrestrial and aquatic datasets, 204 species of recognised conservation status were recorded, representing over 14 percent of the total number of recorded species. The number of species attributed to each of the categories is as set out in **Table EDP A10.2**.

Table EDP A10.2 Species of recognised conservation status recorded in 2020

UK status category	Number of species
s41 (priority species)	10
s41 (research only species)	2
Nationally Rare (Endangered) post-2001 IUCN criteria	1
RDB1 'Endangered' (pre 1994 criteria)	1
Nationally Rare (Vulnerable) post-2001 IUCN criteria	2
RDB2 'Vulnerable' (pre 1994 criteria)	2
Nationally Rare (Near Threatened) post-2001 IUCN criteria	3
RDB3 'Rare' (pre 1994 criteria)	17
Nationally Rare only (post-2001 IUCN criteria)	2
Nationally Scarce and Near Threatened (post-2001 IUCN criteria)	4
Near Threatened only (post-2001 IUCN criteria)	3
RDBK/DD (pre 1994 and post-2001 IUCN criteria)	5
Nationally Scarce (Includes species still classed in pre-1994 Notable A and B categories as well as species classed NS under post-2001 criteria)	159

A10.53 In addition, a number of species only recently known from the UK were also recorded. Examples include the jumping spider *Macaroeris nidicolens*, the weevil *Larinus turbinatus*, Variable Nomad Bee *Nomada zonata* and a jewel wasp *Hedychrum nobile*, to name a few. Also certain, species previously known only as rare migrants to the UK have only recently recorded as being resident in certain areas. An example recorded during the 2020 survey was the Southern Migrant Hawker *Aeshna affinis*, recorded in Areas 7 and 8 during the survey.

A10.54 Another species *Pseudisobrachium subcyaneum*, a species of bethylid wasp with very few UK records is considered to be very rare in the UK, but has no formal conservation status.

Species Not Previously Recorded from the Uk

A10.55 During the 2020 survey of the Swanscombe Peninsula, two species were recorded for the first time in the UK. Both species, which included an aderid beetle *Anidorus sanguinolentus* and a leafhopper *Macrosteles sardus*, were recorded from Area 8 Botany Marsh (East).

A10.56 A specimen of *Anidorus sanguinolentus* collected during the survey was tentatively identified by Calum Urquhart, who sent the specimen to Max Barclay at the Natural History Museum London. The species was subsequently confirmed by coleoptera specialist Dmitri Telnov. The other was a leafhopper *Macrosteles sardus*, which was identified from 2020 samples by Hemiptera specialist Tristan Bantock. Dr Bantock identified the majority of Hemiptera specimens from the 2020 samples. These species are described in more detail in **Table EDP A10.6**.

Species Deployment by Broad Habitat

A10.57 By analysing the whole 2020 dataset including both terrestrial and aquatic records using Pantheon, it is possible to understand the overall species deployment on a broad-biotope level – see **Table EDP A10.3**.

Table EDP A10.3 Overall species deployment by broad biotope

Broad biotope	Total number of species	Pantheon SQI score	Species of recognised conservation status
Open habitats	783	147	112
Wetland	257	149	35
Tree-associated	175	145	23
Coastal	61	305	33

A10.58 As expected, the number of species attributed to the 'Open habitats' assemblage at biotope level was by far the most strongly represented in terms of the overall number of species attributed to this assemblage. Interestingly, however, whilst only 142 species were actually recorded from combined 2020 aquatic surveys, a much greater number of 257 species are attributed to 'Wetland' in Pantheon. This illustrates the importance of terrestrial sampling of wetland edge habitats, above the water-line, in contributing to 'wetland' assemblages as a whole.

A10.59 As may be expected, the 'Open habitats' assemblages on the broad-biotope level were found to support, by far the largest number of species of recognised conservation importance. However, in terms of SQI at this level, 'Open habitats', 'Wetland' and 'Tree-associated' assemblages all recorded similar scores, these all indicating assemblages of high conservation value at this level, which by nature includes a higher proportion of habitat generalists than the progressively more specialised, habitat-level and Specific Assemblage Types (SATs).

A10.60 Whilst, as expected, far fewer species were attributed to the 'Coastal' biotope-level assemblage, more than half the species tagged to this assemblage are of recognised conservation status, resulting in the extremely high SQI score of 305.

A10.61 An independent SQI score of 11.9 was calculated for the whole site using a method used by Harvey (2014), descibed in Ball (1986).

A10.62 According to Harvey (2014) *'In the bulk of the Essex*[5] *countryside a "good" invertebrate site might have an SQI value of at least 5.00 after moderate recording coverage. An "excellent" site might have a value of 7.50 and any site*

[5] The use of an overarching SQI is a prerequisite in assessment of invertebrate assemblages in Essex, using the 'Invertebrate standard advice for Essex' (Natural England, 2014). South Essex, is known to support invertebrate assemblages of elevated conservation value compared with most UK counties; however, this is based largely on the importance of OMH habitats bordering the Thames for invertebrates and invertebrate assemblages recorded from the Kent side can be seen as being of similar conservation value as the Essex assemblages.

with an SQI value approaching 10.00 is almost certainly of national significance.'

Survey Results – Sample Site Reports

A10.63 In the following section, stand alone site reports for each of the 2020 areas selected for detailed survey are presented. Each report includes a habitat description, tables showing survey methods, species of recognised conservation status recorded and Pantheon results. Results are discussed and evaluated in relation to Pantheon output with reference to species of recognised conservation status.

A10.64 For each site a Species Quality Index (SQI) score independently calculated based on methods used by Harvey (2014), descibed in Ball (1986), is also included. This approach is based on recommendations outlined in 'Invertebrate standard advice for Essex' (Natural England, 2014). Whilst this is not a prerequisite for assessing invertebrate assemblages in Kent, an overarching SQI score can provide a useful means of assessing the overall conservation value of a site, whilst the Pantheon-based ISIS analysis places an emphasis on the relative value of invertebrate assemblages associated with habitat and resource-based features.

Area 1: Swanscombe Saltmarsh

Centroid grid reference(s): TQ 59921 75814; TQ 60384 76477; TQ 60973 76511

Overall area: Approximately 7.5 hectares

Designations on site: None

S41 habitats present: Coastal saltmarsh

Habitat Description

A10.65 Area 1 comprised a more or less continuous stretch of coastal saltmarsh habitat, extending from around TQ 61125 76201 east, to the pier at around TQ 60114 76104 westward. Further west, there was an additional block of saltmarsh between TQ 59952 75864 and TQ 59886 75732; this patch being around 140 metres long, extending outwards from the upper shore for a distance of around 75 metres at its widest point.

A10.66 The widest areas of saltmarsh within the more extensive eastern section was around 50 metres, occurring at the northwest extremity of the Peninsula and within the small creek around TQ 60587 76432. The saltmarsh east of the northernmost point of the Peninsula generally extended around 20 metres seawards.

A10.67 The uppermost extent of the saltmarsh was bounded by a shallow, 1m high cliff, marking the division between saltmarsh and the upper dry grassland habitat of Area 2. Structurally, the succession from the upper to lower saltmarsh was not particularly distinct, and the majority of habitat was typical of mid-saltmarsh.

A10.68 There was often a narrow strip of drier habitat around the strandline and features such as shallow, brackish pools. These appeared to be subject to inundation only during higher spring tide events, often featuring raised banks of saltmarsh separated by small channels. Towards the east of the saltmarsh area, were localised areas of beach-like sand, containing strandline vegetation, establishing a mosaic habitat in combination with saltmarsh and some very localised shingle patches.

A10.69 The saltmarsh vegetation was generally consistent throughout the area, the only deviation from typical saltmarsh vegetation occurring around TQ 60214 76167, where there was a small, brackish *Phragmites australis* reedbed at the upper limit of the intertidal area. There were also occasional Sea Club-rush *Bolboschoenus maritimus* stands, which were distinct from the prevailing saltmarsh.

A10.70 The upper extent of the saltmarsh general supported species such as Common Saltmarsh Grass *Puccinella maritima* and Sea Couch *Elytrigia atherica,* with Common Reed*,* Common Scurvygrass *Cochlearia officinalis,* Sea Beet *Beta vulgaris* and other species including Alexanders *Smyrnium olusatrum* and Hoary Cress *Lepidium draba*, often occurring at the grassland margin between Areas 1 and 2*.*

A10.71 The mid saltmarsh zone supported typical saltmarsh species including Sea Aster *Aster tripolium*, Sea Plantain *Plantago maritima,* Sea Purslane *Atriplex portulacoides*, sea spurreys *Spergularia* spp. and Sea Club-rush. As is typical for saltmarshes, the outer saltmarsh was colonised by cord grasses *Spartina* spp.

A10.72 The area supported representative habitat with varying microtopography and some habitat heterogeneity, which, coupled with some of the inland habitat, provided potentially valuable habitat for typical invertebrates of saltmarsh and brackish pools.

A10.73 Connectivity: Area 1 comprised the entire length of saltmarsh occurring within the survey area of Swanscombe Peninsula. The saltmarsh was contiguous with the upper grassland and scrub habitat of Area 2 for much of its length and provided habitat for specialist invertebrates, some of which may also persist within brackish and other wetland compartments, such as Areas 4,6b,7 and 8, inland of the sea defence.

A10.74 The overall extent of saltmarsh within Thames Estuary has been significantly reduced due to reclamation for industry and coastal development. However, according to Natural England's habitat inventory, there are still representative pockets of saltmarsh of various size and extent, dotted along both on the north Kent and south Essex shoreline of the estuary. Depsite being disjunct from other saltmarsh habitat patches, Swanscombe saltmarshes provide important linkage between saltmarsh fragments occurring both to the east and west of the estuary, as well as those on the northern shore in Essex. The movement of specialist invertebrates associated with saltmarsh, is dependent to some extent, on the proximity of suitable habitat patches within the wider coastal biotope.

A10.75 Substrate: Chalk sedimentary bedrock (Lewes Nodular Chalk Formation; Seaford Chalk Formation and Newhaven Chalk Formation) with alluvium, clay, silt, sand and peat sedimentary superficial deposits.

A10.76 Wetness: Saltmarsh is by nature subject to regular tidal inundation. The brackish pools at the upper margin of the saltmarsh were evidently subject to periodic tidal inundation, but possibly only at periods of extreme high tide. Larvae of diptera species such as the Flecked General *Stratiomys singularior* develop in brackish pools such as that recorded around TQ 61064 76248, at the eastern edge of the saltmarsh.

A10.77 Structure: The structure of Area 1 was subject to the dynamic cycle of coastal erosion and sediment deposition typical of estuarine saltmarsh habitat. The upper limits of the saltmarsh were frequently separated from the margin of inland grassland by a shallow cliff, and the different vegetation patches were often shelved at different levels within a small area, with narrow, silted runnels and patches of periodically dry, exposed silt between them.

A10.78 The vegetation structure also provided structural variation, with low growing vegetation and taller stands of Sea Club-rush and Common Reed. There were extensive litter layers on parts of the site; decaying vegetable matter providing habitat for specialist invertebrates such as shoreflies, predatory beetles and ground bugs adapted for intertidal situations.

Invertebrate Survey Dates:

- Terrestrial surveys were conducted in Area 1 on the following dates: 18-20/05/2020; 16/06/2020; 13-14/07/2020 and 18-19/08/20.

- Aquatic (brackish water) surveys were conducted on the following date: 2/06/2020.

Table EDP A10.4: Number of Samples per Substrate.

	Area 1 – Saltmarsh (upper to mid)	**Area 1 – brackish pools**	**Total**
Sweep	8		8
Vacuum	8		8
Pan traps (cluster of 10)	4		4
Pitfall traps (cluster of 10)	6		6
Aquatic (3 minute sweep)		1	1

***Total Number of Species Recorded*:**

- Combined terrestrial and aquatic sample data = 306;

- Terrestrial data only = 304[6]; and

- Aquatic (brackish pool) data only = 2[7].

6 Note: Terrestrial and aquatic data may not add up to the combined figure, as there may be overlap between species recorded both in terrestrial and aquatic samples

7 Species list small, as many of the contributing species were not recorded to species-level and therefore, not used for conservation evaluation, also sample was collected from brackish habitat

A10.79 A comparison of the relative number of species recorded from each of the major taxons is included in the following graph (includes species collected using both terrestrial and aquatic sampling methods):

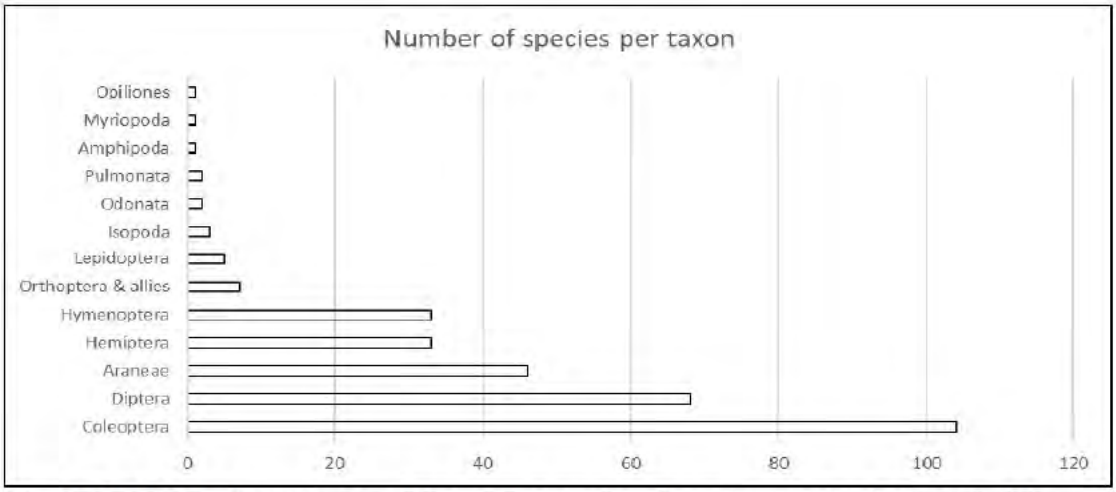

Chart EDP A10.2: A comparison of the relative number of species recorded from each of the major taxons.

Table EDP A10.5: Species of Recognised Conservation Recorded from Area 1.

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
Duffey's Bell-head Spider	*Praestigia duffeyi*	Linyphiidae	Araneae	s41 'priority species'; 'Endangered' post-2001 IUCN criteria; Nationally Rare	Endangered
A malachite beetle	*Axinotarsus pulicarius*	Malachiidae	Coleoptera	Nationally Rare	VU
Beewolf	*Philanthus triangulum*	Crabronidae	Hymenoptera	Nationally Vulnerable (RDB2 pre-1994)	LC
An anthicid beetle	*Cyclodinus salinus*	Anthicidae	Coleoptera	Nationally Rare	LC
A weevil	*Cosmobaris scolopacea*	Curculionidae	Coleoptera	RDB3 'Rare' (pre-1994)	
A tephritid fly	*Myopites eximius*	Tephritidae	Diptera	RDB3 'Rare' (pre-1994 criteria)	
A mirid bug	*Lygus pratensis*	Miridae	Hemiptera	RDB3 'Rare' (pre-1994 criteria)	LC
Squat Furrow Bee	*Lasioglossum pauperatum*	Halictidae	Hymenoptera	RDB3 'Rare' (pre-1994 criteria)	
An anthomyiid fly	*Botanophila depressa*	Anthomyiidae	Diptera	pNearThreatened	
Saltmarsh Short-spur	*Anisodactylus poeciloides*	Carabidae	Coleoptera	S41 Priority species; Nationally Scarce	LC
A weevil	*Lixus scabricollis*	Curculionidae	Coleoptera	RDBK (insufficiently known - pre-1994 criteria)	

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
A dictynid spider	*Argenna patula*	Dictynidae	Araneae	Nationally Scarce	LC
A linyphiid spider	*Hypomma fulvum*	Linyphiidae	Araneae	Nationally Scarce	LC
A running crab spider	*Thanatus striatus*	Philodromidae	Araneae	Nationally Scarce	LC
A jumping spider	*Synageles venator*	Salticidae	Araneae	Nationally Scarce	LC
A comb-footed spider	*Enoplognatha mordax*	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
An anthicid beetle	*Cyclodinus constrictus*	Anthicidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Agonum nigrum*	Carabidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Bembidion iricolor*	Carabidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Bembidion normannum*	Carabidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Bembidion octomaculatum*	Carabidae	Coleoptera	Nationally Scarce	LC
Bombadier beetle	*Brachinus crepitans*	Carabidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Calathus ambiguus*	Carabidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Dyschirius nitidus*	Carabidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Dyschirius salinus*	Carabidae	Coleoptera	Nationally Scarce	LC
A longhorn beetle	*Gracilia minuta*	Cerambycidae	Coleoptera	Nationally Scarce	LC
A tortoise beetle	*Cassida nobilis*	Chrysomelidae	Coleoptera	Nationally Scarce	LC
A leaf beetle	*Cryptocephalus hypochaeridis*	Chrysomelidae	Coleoptera	Nationally Scarce	LC
A flea beetle	*Phyllotreta cruciferae*	Chrysomelidae	Coleoptera	Nationally Scarce	LC
A carrion beetle	*Nicrophorus interruptus*	Silphidae	Coleoptera	Nationally Scarce	LC
A chloropid fly	*Trachysiphonella scutellata*	Chloropidae	Diptera	Nationally Scarce	
A long-legged fly	*Sciapus laetus*	Dolichopodidae	Diptera	Nationally Scarce	LC
A fanniid fly	*Fannia lucidula*	Fanniidae	Diptera	Nationally Scarce	
A leafhopper	*Aphrodes aestuarina*	Cicadellidae	Hemiptera	Nationally Scarce	LC
A lacehopper	*Pentastiridius leporinus*	Cixiidae	Hemiptera	Nationally Scarce	LC
Hawk'sbeard Mining Bee	*Andrena fulvago*	Andrenidae	Hymenoptera	Nationally Scarce	LC
A chalcidoid wasp	*Chalcis sispes*	Chalcididae	Hymenoptera	Nationally Scarce	
A solitary wasp	*Nysson trimaculatus*	Crabronidae	Hymenoptera	Nationally Scarce	

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
Pantaloon Bee	*Dasypoda hirtipes*	Melittidae	Hymenoptera	Nationally Scarce	LC
A chloropid fly	*Dicraeus scibilis*	Chloropidae	Diptera	pNationally Scarce	
A chloropid fly	*Trachysiphonella ruficeps*	Chloropidae	Diptera	pNationally Scarce	
A muscid fly	*Coenosia atra*	Muscidae	Diptera	pNationally Scarce	
A ulidiid fly	*Melieria picta*	Ulidiidae	Diptera	pNationally Scarce	
Brown-banded Carder Bee	*Bombus humilis*	Apidae	Hymenoptera	S41 Priority species	
Small Heath	*Coenonympha pamphilus*	Nymphalidae	Lepidoptera	S41 Priority species	NT

A10.80 SQI Score for Area 1:

- Combined terrestrial and aquatic sample data = 13.5 (298 contributing species); and
- Terrestrial data only = 13.3 (296 contributing species).

Pantheon Output Tables for Area 1

Table EDP A10.6: Habitats & resources: broad biotopes

Broad biotopei	No. of species	% representation	SQI	Conservation statusi	Species with conservation status
open habitatsi	177	4	132	8 NSi; 2 Section 41 Priority Species; 2 [Nb]; 1 [Na]; 2 [RDB 3]; 3 pNS; 1 [RDB 2]; 1 NRi; 1 VUi; 1 NTi; 1 Nbi	21
coastali	38	8	329	1 [RDB K]; 2 NRi; 11 NSi; 2 [RDB 3]; 1 ENi; 2 Nbi; 2 Section 41 Priority Species; 1 RDB 3i; 1 pNS	19
wetlandi	34	1	134	1 pNS; 3 NSi	4
tree-associatedi	8	<1	240	1 [Nb]; 1 RDB 2i	2
shaded woodland floori	1	33	100		

Table EDP A10.7: Habitats & resources: habitats

Broad biotopei	Habitati	No. of species	% representation	Conservation statusi	SQI	Species with conservation status
open habitatsi	tall sward & scrubi	113	4	3 NSi; 1 Section 41 Priority Species; 1 pNS; 1 NRi; 1 VUi; 1 Nbi	123	7

Broad biotope	Habitat	No. of species	% representation	Conservation status	SQI	Species with conservation status
open habitats	short sward & bare ground	57	4	5 NS; 2 [Nb]; 1 [Na]; 1 NT; 1 Section 41 Priority Species; 1 [RDB 3]; 1 pNS; 1 [RDB 2]	148	12
coastal	saltmarsh	35	12	10 NS; 2 Section 41 Priority Species; 1 pNS; 2 [RDB 3]; 1 RDB 3; 2 NR; 2 Nb; 1 EN	331	17
wetland	peatland	20	2	2 NS	127	2
wetland	marshland	15	2	1 NS	120	1
coastal	brackish pools & ditches	7	6	1 NS	138	1
tree-associated	shaded woodland floor	6	<1	1 [Nb]	100	1
coastal	sandy beach	3	3	1 [RDB K]; 1 NS	300	2
coastal	rocky shore	2	6	1 [RDB 3]; 1 RDB 3	450	1
tree-associated	decaying wood	2	<1	1 RDB 2	800	1
wetland	running water	1	<1		100	
coastal	saline lagoon	1	3		100	

Table EDP A10.8: Habitats & resources: ISIS specific assemblage types

Broad biotope	Habitat	SAT	No. of species	% representation	SQI	Conservation status	Species with conservation status	Code	Reported condition
coastal	saltmarsh	saltmarsh & transitional brackish marsh	16	15	494	2 NR; 1 EN; 1 RDB 3; 7 NS; 1 Nb; 2 Section 41 Priority Species; 2 [RDB 3]; 1 pNS	13	M311	Favourable
open habitats		rich flower resource	16	7	138	1 [Na]; 2 [Nb]; 1 [RDB 3];	5	F002	Favourable

Broad biotopei	Habitati	SAT	No. of species	% representation	SQI	Conservation statusi	Species with conservation status	Code	Reported conditioni
						1 Section 41 Priority Species			
open habitatsi	short sward & bare groundi	bare sand & chalki	14	3	207	1 [Nb]; 3 NSi; 1 pNS	5	F111	Unfavourable (14 of 19 species)
open habitatsi	short sward & bare groundi	open short swardi	6	3	150	1 Section 41 Priority Species; 1 NSi; 1 NTi	2	F112	Unfavourable (6 of 13 species)
open habitatsi		scrub edgei	5	2	100			F001	Unfavourable (5 of 11 species)
open habitatsi		scrub-heath & moorlandi	5	1	100	1 [RDB 3]	1	F003	Unfavourable (5 of 9 species)
wetlandi	peatlandi	reed-fen & poolsi	2	2	250	1 NSi	1	W314	Unfavourable (2 of 11 species)
tree-associatedi	decaying woodi	bark & sapwood decayi	1	<1	800	1 RDB 2i	1	A212	Unfavourable (1 of 19 species)

Site-Specific Limitations

A10.81 Area 1 was subject to the following sampling limitations/constraints:

- At the time of writing, whilst a reasonable number of species have been identified some diptera records for Area 1 may require adding once available. The absence of these records may influence the Pantheon and SQI output;
- Aquatic samples were species-poor possibly due to dried out habitat; and
- The deployment of pitfall traps was limited by tidal inundation.

Discussion/Evaluation – Area 1

A10.82 The Area 1 Swanscombe saltmarsh survey area comprised mainly the middle and upper zones of saltmarsh habitat. The area supported representative saltmarsh habitat both structurally and in terms of vegetation. The saltmarsh varied both in terms of the extent of seaward projection from the shore and degree of tidal inundation. The upper shore is likely only to receive occasional inundation. The upper shore occasionally included small, sandy, beach-like zones around the strandline and ephemeral brackish pools were also present in this upper zone, particularly towards the eastern extremity of the site.

A10.83 During the 2020 survey a total of 305 species were recorded from Area 1, of which, 47 species are of recognised conservation status in the UK. These included four species classed as 'Species of principal importance' under section 41 of the NERC Act (2006); as well as, three species classed as Nationally Rare under post-2001 IUCN criteria.

A10.84 Of these, one also has a threat status of 'Endangered', one is classed as 'Vulnerable' and one has a threat status of 'Least Concern' under post-2001 IUCN criteria. Two other species are afforded a threat status of 'Near Threatened' under post-2001 IUCN criteria only.

A10.85 Species with pre-1994 RDB status (not assessed using post-2001 criteria) included one species classed as Nationally Vulnerable (RDB2), four species classed as Nationally Rare (RDB3) and one species classed as 'Insufficiently known' RBDK. In addition, 35 species currently classed as Nationally Scarce in the UK (including both post-2001 Nationally Scarce and pre-1994 Notable A and B species and species provisionally listed as Nationally Scarce in recent status reviews).

A10.86 S41 species of particular note recorded from Area 1 included the Nationally Rare and 'Endangered' Duffey's Bell-head Spider *Praestigia duffeyi,* Saltmarsh Short-spur *Anisodactylus poeciloides and* Brown-banded Carder Bee *Bombus humilis.*

A10.87 Both Duffey's Bell-head Spider and the Saltmarsh Short-spur (a species of ground beetle) are associated with coastal saltmarsh and brackish marshes. Duffey's Bell-head Spider spider occurs in litter or on mud beneath saltmarsh vegetation, including, *according* to Harvey *et al* (2002) '*Halimone*, *Phragmites* and other vegetation', whilst the Saltmarsh Short-spur is found in 'saltmarshes, salt-pans and brackish ditches at the margins of grazing levels'. (Hyman and Parsons, 1992).

A10.88 Brown-banded Carder Bee is a flagship species of OMH and herb-rich, Thames terrace grasslands in the Thames corridor, but also forages on saltmarsh where it occurs.

A10.89 All three of these species were given s41 'Species of principal importance' status, due to occurring mainly in areas of the UK threatened by development.

A10.90 Stand-out non-s41 rarities recorded from Area 1, included a malachite beetle *Axinotarsus pulicarius,* classed as Nationally Rare and 'Vulnerable' under post-2001 IUCN criteria, a Nationally Rare ant-like flower beetle *Cyclodinus salinus* and Nationally Rare (RDB3) species including a weevil *Cosmobaris scolopacea* and a picture-winged fly *Myopites eximius.*

A10.91 All four of these species have very localised and strongly coastal distributions in the UK and are largely restricted to the Thames corridor in the UK. *Axinotarsus pulicarius* is known only from a handful of sites nationally and according to Alexander (2014), 'The larvae are believed to develop in the stems, or at the roots of plants, in areas of damp grassland and coastal shingle.'

A10.92 The three species *Cyclodinus salinus, Cosmobaris scolopacea* and *Myopites eximius* have strong saltmarsh affinities; although *C. salinus* is associated primarily with sandy habitats. According to Duff (2016), the weevil *Cosmobaris scolopacea* is found only in saltmarshes, where it feeds on Sea-purslane Atriplex *portulacoides*, and possibly also Grass-leaved Orache *A. littoralis*. Myopites eximius is a species of picture-winged fly, which according to White (1988), 'induces a gall in the capitulum of Golden Samphire *Inula crithmoides*'.

A10.93 From Pantheon analysis undertaken for Area 1, the vast majority of species (177) were attributed to 'Open habitats' on a broad biotope level, whilst 38 species were ascribed to the 'Coastal' assemblage, 34 to 'Wetland' and eight to the 'Tree associated' assemblage. Importantly, the total number of species listed in the resource Pantheon for 'Open habitat' is a much larger resource than for 'Coastal' species. However, whilst the number of 'Coastal' species attributed to the Area 1 Pantheon output seems comparatively small, this was represented by eight percent of the total available number of species attributed to 'Coastal' in Pantheon. In comparison, the 177 species attributed to 'Open habitats', comprised only four percent of the total species pool attributed to this group in Pantheon.

A10.94 At a habitat level, 113 species were attributed to the 'Tall sward and scrub' assemblage, with 57 species being attributed to the 'Short sward and bare ground' assemblage and 35 species were attributed to the 'Saltmarsh' assemblage. Again, whilst this number seems proporitionally small compared to the overall deployment, the figure of 35 is proportionately large, representing 12 percent of all UK saltmarsh species attributed in Pantheon, compared to the four percent represented within the outputs for the 'Tall sward and scrub' and 'Short sward and bare ground' assemblages.

A10.95 Wetland assemblages including ‘Peatland’ and ‘Marshland’ were also attributed with a significant number of species at habitat-level; these assemblages being attributed with 20 and 15 species, respectively.

A10.96 Importantly, the relative rarity values of assemblages can be seen at habitat-level, by examination of asssemblage-specific Species Quality Index (SQI) scores in the Pantheon output. For ‘Saltmarsh’ an extremely high SQI score of 331 was recorded, compared to a relatively high SQI of 148 for ‘Short sward and bare ground assemblage’ and relatively modest score of 123 registered for ‘Tall sward and scrub’.

A10.97 The score of 331 for ‘Saltmarsh’ reflected the large proportion of species of recognised conservation status attributed to this assemblage. In total, 17 species, or almost half of the 35 species attributed to the ‘Saltmarsh’ assemblage, are currently classed as nationally scarce or rarer in the UK. The s41 Duffey's Bell-head Spider *Praestigia duffeyi* and Saltmarsh Short-spur *Anisodactylus poeciloides,* as well as the three nationally rare species *Cyclodinus salinus, Cosmobaris scolopacea* and *Myopites eximius,* mentioned previously, were attributed to the ‘Saltmarsh’ assemablage at habitat-level.

A10.98 This trend was strongly replicated at Specific Assemblage Type (SAT) level, the most important level for assessing conservation value of a site. For Area 1, the M311 ‘Saltmarsh and transitional brackish marsh’ SAT was one of two assemblages, (the other being the resource-based F002 ‘Rich flower resource’ SAT), which achieved a score exceeding its corresponding Favourable Condition (FC) threshold in Pantheon. At this level, the species score of 16 was well in excess of the threshold score of 9 set in Pantheon for this assemblage.

A10.99 Importantly, of the 16 species ascribed to the M311 ‘Saltmarsh and transitional brackish marsh’ SAT, 13 were species of recognised conservation status in the UK. Consequently, the SQI score recorded for this assemblage was 494, an exceptionally high score.

A10.100 At this level, the assemblage was attributed with rarities including the aforementioned Duffey's Bell-head Spider and Saltmarsh Short-spur*, Cyclodinus salinus, Cosmobaris scolopacea* and *Myopites eximius.,* Additionally, nationally scarce species, included another ant-like flower beetle *Cyclodinus constrictus;* two ground beetles *Bembidion iricolor* and *B. normannum;* a long-legged fly *Sciapus laetus,* a picture-winged fly *Melieria picta,* a leafhopper *Aphrodes aestuarina,* a comb-footed spider *Enoplognatha mordax* and a saltmarsh snail - the Dun Sentinel *Assiminea grayana.*

A10.101 In addition to the saltmarsh-specific assemblages, the value of *the* saltmarsh habitat as a foraging resource for bees and other species was illustrated by the

F002 ‘Rich-flower resource’ SAT. This assemblage also supported sufficient species to exceed its FC threshold following Pantheon analysis of Area 1 data.

A10.102 Of the 16 bee species[8] attributed to the F002, resource-based[9] SAT, species of recognised conservation status included s41 Brown-banded Carder Bee *Bombus humilis*, the Nationally Rare (RDB3) Squat Furrow Bee *Lasioglossum pauperatum*, Hawk’s-beard Mining Bee *Andrena fulvago* and Pantaloon Bee *Dasypoda hirtipes.* These species are all mainly associated with Open Mosaic Habitat on previously developed land (OMH) and Thames terrace grassland in the Thames corridor area. Saltmarsh provides an important supplementary resource for these species. One species, well-known from the Thames corridor saltmarsh, the Sea Aster Bee *Colletes halophilus* was not recorded during the 2020 survey. However, this species has previously been recorded from the site.

A10.103 Whilst none of the other recorded assemblages were attributed with sufficient species to exceed their corresponding FC targets, the species score of 14 attributed to F111 ‘Bare sand and chalk’ indicated that this assemblage was reasonably well represented within Area 1. Furthermore, five nationally scarce species were attributed to F111; three of these species including a jumping spider *Synageles venator*, the Bombardier Beetle *Brachinus crepitans*, and the Pantaloon Bee *Dasypoda hirtipes* were well recorded within other sites within the Swanscombe survey area. However, *Calathus ambiguus*, a ground beetle associated with sparsely vegetated sandy and chalky habitats, was only recorded from Area 1 during the survey. *Trachysiphonella ruficeps*, a chloropid fly associated with dry grassland and heathland (Falk *et al*, 2016), was also attributed to the ‘Bare sand and chalk’ SAT.

A10.104 Several other species of conservation value recorded within the Area 1 Swanscombe saltmarsh, not recorded elsewhere on site included wetland associated ground beetles *Agonum nigrum* and *Bembidion octomaculatum*. The former is often associated with estuarine wetlands and saltmarshes as well as freshwater habitats (Hyman and Parsons, 1992), whilst the latter, according to Hyman and Parsons (1992), is sometimes recorded from the seashore as well as more typical wetland pool margins.

A10.105 Somewhat anomalously for a saltmarsh site, the Basket Longhorn Beetle *Gracilia minuta,* a species normally associated with woodland and scrub habitats, was recorded from Area 1. This species listed as RDB2 ‘Vulnerable’ in Hyman and Parsons (1992) until recently, now downgraded to Nationally Scarce in a review by Alexander (2019), was also recorded from the wooded

[8] The F002 assemblage is comprised entirely of bee species in Pantheon.
[9] Unlike habitat-specific SATs, resource-based SATs in Pantheon relate to usage of a resource rather than a tangible habitat. Therefore, whilst F002 – Rich flower resource indicates that a site may have a valuable resource of nectaring plants, these herbs could occur in any flower-rich habitat, or could cut across several closely juxtaposed habitats.

margin of Black Duck Marsh. The beetle is named 'Basket Longhorn' due to having been recorded to emerge from wickerwork.

A10.106 Using a method used by Harvey (2014), described in Ball (1986), a site-level SQI score of 13.5 was calculated for the invertebrate fauna of the Area 1 Swanscombe saltmarsh site as a whole. According to Harvey (2014)[10] an SQI value approaching 10.00 is 'almost certainly of national significance.'

A10.107 This score, together with the exceptionally high Pantheon scores achieved at both habitat-level and SAT level for saltmarsh assemblages recorded from Area 1, clearly indicate the site to support invertebrate assemblages on both a whole site and assemblage-specific level of national importance.

Conclusion

A10.108 The Area 1 survey area comprised the entirity of the estuarine saltmarsh habitat lining the coastal fringe of the Swanscombe Peninsula. Although the resource was decidedly narrow in places, the habitat was structurally and floristically diverse, and there were representative bands of upper, mid and lower saltmarsh, as well as some sandy upper shore, and brackish pool habitat around the strandline.

A10.109 From Pantheon analysis of the Area 1, 2020 survey data, saltmarsh invertebrate assemblages represented both as 'Saltmarsh' at habitat-level and as M311 'Saltmarsh and transitional brackish marsh', at SAT level, exhibited SQI scores indicative of extremely high rarity value. This being due to the number of species of recognised conservation status, including Nationally Endangered, Vulnerable, Rare and Scarce species, two of which were also afforded 'Species of principal importance' under section 41 of the NERC Act (2006), attributed to these assemblages.

A10.110 In addition to the saltmarsh assemblage, the site was found to support a F002 'Rich flower resource' assemblage, which, not only exceeded its Favourable Condition threshold in Pantheon, but also comprised species of recognised conservation status. These include additional Nationally Rare and Scarce species, as well as the s41 'priority species', the Brown-banded Carder Bee *Bombus humilis*; highlighting the value of saltmarsh as an important foraging habitat for bees.

A10.111 Both the Pantheon output scores for saltmarsh invertebrate assemblages, together with an independently calculated SQI score of 13.5, for Area 1,

[10] Harvey based his evaluation on invertebrate fauna in Essex, the Kent fauna within the Swanscombe part of the Thames corridor is comparable with this standard.

conclusively indicate the site as supporting invertebrate assemblages of National Importance, both on a habitat-specific, and whole site level.

Area 1a: Swanscombe Sea Defence Bank

Centroid grid reference: TQ 59743 75671

Overall area: 3.7 hectares

Designations on site: None

S41 habitats present: None

Habitat Description

A10.112 Area 1A comprised a man-made, grassy, sea-defence bank which was around 250 metres long and around 60 metres wide for much of its length. The bank was raised to, at most 10 metres above the elevation of the prevailing landscape and was generally evenly contoured. The seaward and landward-facing slopes were moderately steep, the landward-facing slope was of southeast to southerly aspect, potentially providing a sheltered microclimate for more thermophilic grassland invertebrates. The central ridge of the bank was sunken in places, providing a shallow, linear depression which supported some seasonally drying brackish wetland habitat.

A10.113 The sward within the SI grassland habitat was relatively uniform, due to management by mowing. However, this was relatively herb-rich, with a similar flora to other SI grassland habitats within the survey area. Plant species included Narrow-leaved Bird's-foot Trefoil *Lotus tenuis*, Black Medick *Medicago lupulina*, Red Clover *Trifolium pratense,* White Clover *T. repens,* Ribwort Plantain *Plantago lanceolata* Red Bartsia *Odontites vernus* and yellow composites including Common Cat's-ear *Hypocaeris radicata.*

A10.114 Connectivity: Area 1A occupies the western shoreline of Swanscombe Peninsula, running parallel to the northwest margin of the wetland and reedswamp habitat of Black Duck Marsh (Area 4) and connects to herb-rich OMH habitat Area 3 and saltmarsh (Area 1) to the north. This juxtapositon provides habitat variation of benefit to both specialist coastal grassland invertebrates and habitat generalists. The habitat links with the more extensive, albeit less managed, coastal grassland and scrub mosaic of Area 2, as well as other herb-rich habitats elsewhere on the Swanscombe Peninsula and inland. Sea defence banks are recognised as providing valuable forage in the Thames corridor, providing a surrogate to the now much reduced, Thames

terrace grassland resource, which supported comparable flora for foraging bees and habitat for other characteristic coastal grassland species.

A10.115 Substrate: Chalk sedimentary bedrock (Lewes Nodular Chalk Formation; Seaford Chalk Formation and Newhaven Chalk Formation) with alluvium, clay, silt, sand and peat sedimentary superficial deposits.

A10.116 Wetness: Although the habitat in Area 1A was predominately free-draining, comprising dry grassland habitat; around TQ 59662 75590, a depression running along the centre of the bank, lengthwise, provided some ephemeral brackish/wetland habitat. The habitat was also in close proximity to brackish saltmarsh habitat and inland brackish/freshwater habitat within Area 4 Black Duck Marsh.

A10.117 Structure: Area 1A provided structural diversity and shelter due to its raised topography, with slopes of southerly aspect. The bank was also relatively sinuous along its length and the sunken central depression provided additional microtopographical variation. Due to management by mowing, the sward was relatively uniform; there was however, a small amount of low Bramble *Rubus fruticosus* agg. and Hawthorn *Crataegus monogyna* scrub on the bank, which provided additional structural vegetation. The grassland architecture also developed during the middle part of the season; however, this had been mown just before the site was sampled on 13th July, which is likely to have influenced the species diversity of the sample at this time.

Invertebrate Survey Dates

A10.118 The site was surveyed on three occasions including: 16/06/2020[11]; 13/07/20 and 18-19/08/20.

Table EDP A10.9: Number of samples per substrate.

	Area 1A – Sea defence SI grassland	Total
Sweep	4	4
Vacuum	4	4

A10.119 Total number of species recorded: 157

A10.120 A comparison of the relative number of species recorded from each of the major taxons is included in the following graph.

[11] Note: Area 1A was added as a sample site in its own right after the initial May survey had been conducted. Therefore, two sets of samples were collected on 16/6/20, with a single set of samples being collected during the subsequent two visits.

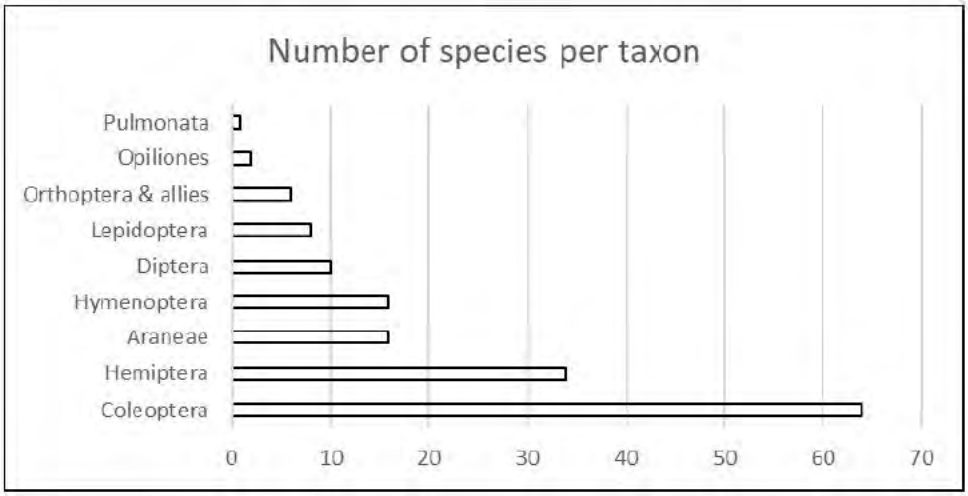

Chart EDP A10.3: A comparison of the relative number of species recorded from each of the major taxons

Table EDP A10.10: Species of recognised conservation recorded from Area 1A.

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
A mirid bug	*Lygus pratensis*	Miridae	Hemiptera	RDB3 'Rare' (pre-1994 criteria)	LC
A shining flower beetle	*Olibrus flavicornis*	Phalacridae	Coleoptera	Red Data Book-insufficiently known	DD
A comb-footed spider	*Kochiura aulica*	Theridiidae	Araneae	Nationally Scarce	LC
A weevil	*Diplapion stolidum*	Apionidae	Coleoptera	Nationally Scarce	
An apionid weevil	*Protapion filirostre*	Apionidae	Coleoptera	Nationally Scarce	LC
A leaf beetle	*Cryptocephalus hypochaeridis*	Chrysomelidae	Coleoptera	Nationally Scarce	LC
Adonis Ladybird	*Hippodamia variegata*	Coccinellidae	Coleoptera	Nationally Scarce	LC
Broad-headed Bug	*Alydus calcaratus*	Alydidae	Hemiptera	Nationally Scarce	LC
Slender-horned Leatherbug	*Ceraleptus lividus*	Coreidae	Hemiptera	Nationally Scarce	LC
A planthopper	*Asiraca clavicornis*	Delphacidae	Hemiptera	Nationally Scarce	LC
Scarce Tortiose Shieldbug	*Eurygaster maura*	Scutelleridae	Hemiptera	Nationally Scarce	LC
Four-banded Flower Bee	*Anthophora quadrimaculata*	Apidae	Hymenoptera	Nationally Scarce	LC
A solitary wasp	*Nysson trimaculatus*	Crabronidae	Hymenoptera	Nationally Scarce	
Pantaloon Bee	*Dasypoda hirtipes*	Melittidae	Hymenoptera	Nationally Scarce	LC
Red Bartsia Bee	*Melitta tricincta*	Melittidae	Hymenoptera	Nationally Scarce	LC
Long-legged Tabby	*Synaphe punctalis*	Pyralidae	Lepidoptera	Nationally Scarce	LC

A10.121 SQI score for Area 1A: 7.7

Pantheon Output Tables for Area 1A

Table EDP A10.11: Habitats & resources: broad biotopes

Broad biotope	No. of species	% representation	SQI	Conservation status	Species with conservation status
open habitats	125	3	122	5 NS; 4 Nb; 3 [Nb]; 1 [RDB 3]; 1 RDB 3	14
wetland	6	<1	100		
tree-associated	3	<1	100	1 [Nb]	1
coastal	2	<1	100		

Table EDP A10.12: Habitats & resources: habitats

Broad biotope	Habitat	No. of species	% representation	Conservation status	SQI	Species with conservation status
open habitats	tall sward & scrub	91	3	2 [Nb]; 1 RDB 3	100	3
open habitats	short sward & bare ground	29	2	2 [Nb]; 1 RDB 3; 4 NS; 4 Nb	186	11
wetland	peatland	4	<1		100	
wetland	marshland	3	<1		100	
tree-associated	shaded woodland floor	3	<1	1 [Nb]	100	1
coastal	saltmarsh	2	<1		100	
coastal	brackish pools & ditches	2	2		100	

Table EDP A10.13: Habitats & resources: ISIS specific assemblage types

Broad biotope	Habitat	SAT	No. of species	% representation	SQI	Conservation status	Species with conservation status	Code	Reported condition
open habitats		rich flower resource	9	4	133	2 [Nb]; 1 Nb; 1 RDB 3	4	F002	Unfavourable (9 of 15 species)
open	short	open	9	4		2 NS; 2 Nb;	5	F112	Unfavourab

Broad biotopei	Habitati	SAT	No. of speciess	% representation	SQI	Conservation statusi	Species with conservation status	Code	Reported conditioni
habitatsi	sward & bare groundi	short swardi			233	1 [Nb]			le (9 of 13 species)
open habitatsi	short sward & bare groundi	bare sand & chalki	6	1	200	1 [Nb]; 1 Nbi; 1 NSi	3	F111	Unfavourable (6 of 19 species)
open habitatsi		scrub edgei	5	2	100			F001	Unfavourable (5 of 11 species)
open habitatsi		scrub-heath & moorlandi	5	1	160	1 [RDB 3]; 1 NSi	2	F003	Unfavourable (5 of 9 species)
wetlandi	peatlandi	reed-fen & poolsi	1	<1	100			W314	Unfavourable (1 of 11 species)

Site-specific Limitations

A10.122 Area 1A, was subject to the following sampling limitations/constraints:

- No initial May survey was undertaken on this site – partly due to the high volume of public, including dog-walkers, using the area in view of COVID-19 restrictions. The site was also scoped following being mowed early in the season and considered to be of relatively limited potential for invertebrates at this time;
- The site was subject to mowing; this had occurred just before the July site visit, potentially compromising the diversity of species sampled during this visit;
- Due to the public usage of the area for dog-walking, no water traps were deployed in Area 1A during the survey; and
- No aquatic sampling was undertaken of the wetland feature due to seasonal drying.

Discussion/Evaluation – Area 1A

A10.123 Compared to the other grassland habitat occupying the coastal defence bank in Area 2, the habitat in Area 1A was subject to frequent public recreational

use, due to being in close proximity to human habitation. The habitat was also subject to periodic mowing, giving the sward a somewhat uniform, amenity grassland impression. However, this was deceptive, as the habitat supported a reasonably diverse and herb-rich sward, of a composition comparable to other grassland habitats on the peninsula.

A10.124 Area 1A received less comprehensive surveying attention to comparable habitat such as Areas 2 and 3. Due to its use as a popular public recreation and dog-walking area, the site was not sampled initially due to health and safety concerns relating to the COVID-19 pandemic, and for similar reasons, when the site was sampled in early June, no pan traps or other remote methods were deployed. However, a sufficient resolution of timed sweep and vacuum sampling was deployed over subsequent visits to enable robust Pantheon analysis to be undertaken.

A10.125 During the 2020 survey a total of 157 species were recorded from Area 1A, of which 16 species are of recognised conservation status in the UK. These included one species classed as Nationally Rare (RDB3) based on pre-1994 criteria, one species classed as 'Insufficiently known' RBDK and 15 species currently classed as Nationally Scarce in the UK. Where applicable, these species are listed in relation to the attributed Pantheon assemblages to which they are attributed, below.

A10.126 From Pantheon analysis undertaken for Area 1A, the vast majority of species (125) were attributed to 'Open habitats' on a broad biotope level, whilst only six species were ascribed to the 'Wetland' assemblage, three to 'Tree associated' and two to the 'Coastal' assemblage. This broad-biotope deployment accurately reflected the level of targeted sampling. All but one of the species of recognised conservation status recorded from Area 1A were attributed to the 'Open habitats' assemblage.

A10.127 At a habitat level, 91 species were attributed to the 'Tall sward and scrub' assemblage, with 29 species being ascribed to 'Short sward and bare ground'. The remaining assemblages at habitat-level, were made up of only four species or fewer. However, despite comprising only one third of the amount of species, than were attributed to 'Tall sward and scrub', 'Short sward and bare ground' was attributed with more than three times as many species of recognised conservation status, with 11 compared to the 3 ascribed to 'Tall sward and scrub'.

A10.128 The high proportion of rarities attributed to 'Short sward and bare ground' was reflected in the high SQI score attained from Pantheon analysis of 186, compared to the SQI of only 100 recorded for the 'Tall sward and scrub' assemblage.

A10.129 For Area 1A, whilst none of the recorded SATs achieved FC status, the best represented assemblages, at this level followed a similar pattern as most other grassland sites in the area. The largest number of species were attributed to the F001 'Rich flower resource' and the F111 'Bare sand and chalk' SATs, both with a species score of nine, followed by the other nested 'Short sward and bare ground' assemblage, F112 'Open short sward', with six species.

A10.130 Species of recognised conservation status attributed to 'Tall sward and scrub' for Area 1A included the Red Bartsia Bee *Melitta trincincta,* a nationally scarce species which was recorded only in Area 1A during the 2020 survey. The species is mainly associated with calcareous grassland habitats. It nests in exposed, compacted soils overlying chalk (Edwards, 1998). Interestingly, the Blunthorn Nomad Bee *Nomada flavopicta*, a known cleptoparasite of *Melitta* spp., was recorded during the 2020 survey from nearby Areas 2 on the peninsula and from Area 11, inland. This may suggest that *M. tricincta*, or other species of the genus also occurred on these sites, but remained undetected.

A10.131 Red Bartsia Bee was also attributed to the 'Short sward and bare ground' assemblage, presumably due to a dual association with taller sward foraging habitats and a need for compacted bare-ground for nesting. Uncommon species only attributed at habitat-level to 'Short sward and bare ground' included the nationally scarce Slender-horned Leatherbug *Ceraleptus lividus*, which was also recorded from several other sites during the 2020 survey and the Four-banded Flower Bee *Anthophora quadrimaculata.* This species, according to Edwards (2006) is found as frequently in gardens as any other habitat, where it forages on labiates including mints, but also lavender. It nests mainly in the ground, in sandy banks and cliffs.

A10.132 At a SAT level, uncommon species attributed to the F111 'Bare sand and chalk' assemblage, included the afforementioned Red Bartsia Bee, as well as two nationally scarce beetles, an apionid weevil *Protapion filirostre* and a pot beetle *Cryptocephalus hypochaeridis* and bugs including the Scarce Tortoise Shieldbug *Eurygaster maura* and a planthopper *Asiraca clavicornis.* With the exception of the Red Bartsia Bee, these species were recorded from several other grassland and OMH sites during the survey.

A10.133 Species of recognised conservation status attributed to the F112 'Open short sward' SAT level assemblage for Area 1A included a nationally scarce apionid weevil *Diplapion stolidum,* which was only recorded from this site during the 2020 survey, as well as two well recorded species; the nationally scarce alydid bug species *Alydus calcaratus* and Pantaloon Bee *Dasypoda hirtipes,* both of which are typical species of Thames corridor OMH sites. *D. stolidum* is a species of field margins, disturbed ground, roadside verges and grassland

where it is associated with Oxeye Daisy *Chrysanthemum leucanthemum* and according to Hyman and Parsons (1992), possibly also Scentless Mayweed *Tripleurospermum inodorum*. The larvae are thought to develop in the stems and rootstocks of the foodplants.

A10.134 Two additional nationally scarce species recorded from the 2020 survey, included Long-legged Tabby *Synaphe punctalis,* a micromoth associated with coastal habitats, such as shingle as well as chalky habitats, which was recorded only from Area 1A. The second was *Kochiura aulica*, a species of comb-footed spider which was recorded from most sites during the 2020 survey. Although this species is, like the bug *Alydus calcaratus,* associated with lowland heathland in the UK, it is also well recorded from brownfield sites in the Thames corridor. The male spider has distinctive palps and is easily recognised.

A10.135 The non-Pantheon SQI score recorded for Area 1A was 7.7. According to Harvey (2014)[12] an SQI value of 7.5 indicates an 'excellent' site for invertebrates, whilst one approaching 10.00 is 'almost certainly of national significance.'

Conclusion

A10.136 Area 1A did not receive the level of sampling attention invested on larger sites such as Area 2, which supported comparable grassland, despite being subject to less intense management. However, the site was sampled sufficiently robustly to enable Pantheon analysis of grassland assemblages. Furthermore, results showed the site to support broadly similar assemblages to sites of similar composition within the Swanscombe Peninsula and inland. Whilst for Area 1A data, SAT assemblages did not achieve scores which exceeded their respective FC targets in Pantheon, a particularly high SQI score[13] of 186 was recorded for the habitat-level 'Short sward and bare ground' assemblage.

A10.137 The site was found to support 16 species of recognised conservation, a high number in view of the limited sampling effort. Whilst the majority of RDB and nationally scarce species recorded from Area 1A, were recorded from other sites in the survey area, three species, the Red Bartsia Bee *Melitta tricincta,* an apionid weevil *Diplapion stolidum* and a micromoth the Long-legged Tabby *Synaphe punctalis,* were only recorded from this site during 2020. The independent SQI score of 7.7 indicated an 'excellent' site for invertebrates. On its own merits, Area 1A does not warrant National Significance for

[12] Harvey based his evaluation on invertebrate fauna in Essex, the Kent fauna within the Swanscombe part of the Thames corridor is comparable with this standard.

[13] In pre-Pantheon versions of the Invertebrate Species-habitat Information System (ISIS), FC scores were ascribed, not only at SAT level, but also at habitat-level (then called Broad Assemblage Type). The predecessor of the 'Short sward and bare ground' assemblage, called 'Unshaded early successional mosaic', had a favourable condition threshold score of 160.

invertebrates, but can be considered either as contributing to the overall National Significance of the Swanscombe Peninsula as a whole, or as a site of Regional invertebrate importance as a stand-alone site.

Area 2: Swanscombe Coastal Grassland and Scrub

Centroid grid reference: TQ 60730 76240

Overall area: 42 hectares

Designations on site: None

S41 habitats present: Open mosaic habitat on previously developed land

Habitat Description

A10.138 Area 2 formed an extensive band of, predominately, rough grassland and scrub mosaic habitat between the upper saltmarsh and the northern margins of the inland areas of Swanscombe Peninsula. The topography of this area was varied, with the sea-defence bank being particularly prominent towards the site's eastern extremity and there were numerous banks, ditches and areas of uneven ground throughout. The northern margin of Area 2 was contiguous with the upper margin of the saltmarsh and therefore, was more or less parallel to the spring-tide strandline, with strandline debris and some brackish influence in this zone, although the elevation of the boundary of Area 2 in relation to the upper saltmarsh varied according to location.

A10.139 Besides the grassland and scrub mosaic, there were areas of more typical OMH, including a patch of sparsely vegetated disturbance habitat around TQ 60773 76378 and around the base of a large pylon at TQ 60740 75995. The latter of these was the location of a previous record of Distinguished Jumping Spider *Sitticus distinguendus*. Consequently, pitfall traps were deployed in this area alongside a transect of low-density concrete blocks as refugia for surveying the spider.

A10.140 Several waterbodies were present in Area 2, including open water lagoons P1 and P2 immediately above the saltmarsh, and P4 north of the sea-defence further inland. These were almost entirely unvegetated, man-made leachate pools, which were said to be of extremely high pH. There were also engineered drainage ditches including D14 and D15 close to and hydrologically linked to P4, dried out at the time of survey, with a shingle substrate. A further ditch (D16) immediately to the seaward side of the sea defence at the eastern extremity of the site, formed a more vegetated pond-like feature.

A10.141 D16 was the only area to receive aquatic sampling attention within Area 2 during the 2020 survey. The man-made lagoons P1 and P2, were gently shelving, with shore-like margins, which may provide habitat for hygrophilous and brackish associated invertebrate species, such as ground beetles (Carabidae) and rove beetles (Staphylinidae) in particular. Whilst these edges were not surveyed during 2020, a number of species representative of such habitat were recorded from comparable habitat within the Swanscombe Peninsula as a whole during 2020.

A10.142 Much of the grassland habitat within Area 2 was tussocky and the degree of herb-richness varied somewhat. Common Couch *Elytrigia repens*, was often dominant within the sward, with a range of other grasses including Cock's-foot *Dactylis glomerata,* Creeping Bent *Agrostis stolonifera,* Yorkshire Fog *Holcus lanatus,* Red Fescue *Festuca rubra,* Smooth-stalked Meadow Grass *Poa pratensis,* Perennial Rye Grass *Lolium perenne* and Tall Fescue *Festuca arundinacea*. More saline associated Common Saltmarsh Grass *Puccinellia maritima* occurred occasionally, adjacent to more brackish, periodically-inundated habitat closest to the saltmarsh. Common Reed *Phragmites australis* occurred locally at the edges of waterbodies and occasionally on the sea defence bank in areas of drainage impedence.

A10.143 Herbs recorded during the scoping study included umbellifers such as Wild Carrot *Daucus carota,* Hogweed *Heracleum sphondylium,* Hemlock *Conium* maculatum*,* Cow Parsley *Anthriscus sylvestris* and Fennel *Foeniculum vulgare;* leguminous species including Common Vetch *Vicia sativa,* Tufted Vetch *V. cracca,* Meadow Vetchling *Lathyrus pratensis*, Common Bird's-foot Trefoil *Lotus corniculatus,* Narrow-leaved Bird's-foot Trefoil *L. tenuis*, Red Clover *Trifolium pratense,* White Clover *Trifolium repens,* Goat's Rue *Galega officinalis,* Lucerne *Medicago sativa,* Black Medick *Medicago lupulina* and Spotted Medick *M. arabica;* composites including Yarrow *Achillea millefolium,* Common Cat's-ear *Hypochaeris radicata,* Ox-eye Daisy *Chrysanthemum leucantheum,* Common Ragwort *Senecio jacobaea*, Dandelion *Taraxacum officinale* agg. Bristly Ox-tongue *Picris echioides* and Creeping Thistle *Cirsium arvense* with other herbs including Ribwort Plantain *Plantago lanceolata,* Hoary Cress *Lepidium draba,* Wild Marjoram *Origanum vulgare,* Cut-leaved Crane's-bill *Geranium dissectum*, Mugwort *Artemisia vulgare*, Teasel *Dipsacus fullonum*, Viper's Bugloss *Echium vulgare,* Sea Beet *Beta vulgaris*, Broad-leaved Dock *Rumex obtusifolius,* Lesser Stitchwort *Stellaria graminea,* White Dead-nettle *Lamium album,* Red Dead-nettle *L. purpurea,* Ground Ivy *Glechoma hederacea*, Cleavers *Galium aparine* and Crosswort *Cruciata laevipes*.

A10.144 The more sparsely vegetated OMH included Spotted Medick, Common Vetch, Common Cat's-ear, Bristly Ox-tongue, Ploughman's Spikenard *Inula conyzae*, Viper's Bugloss, Goat's Rue and other species.

A10.145 The commonest components of the scrub habitat within Area 2 included Bramble *Rubus fruticosus* agg., Hawthorn *Crataegus monogyna,* Blackthorn *Prunus spinosa,* Dogwood *Cornus sanguinea,* Grey Willow *Salix cinerea*, Dog Rose *Rosa canina* (agg.) and the non-native Buddleia *Buddleja davidii.* These species were scattered throughout the grassland, forming dense, continuous stands in some areas. The mosaic of scrub and grassland provided some sheltered, structurally diverse scrub edge habitat. Other, less frequently recorded scub species included cultivated apple *Malus domesticus* and plum *Prunus domestica*.

A10.146 Connectivity: Area 2 comprised an extensive area of coastal grassland and scrub mosaic, OMH and wetland habitat representative of the Swanscombe Peninsula and the associated corridor of sites. Area 2 is contguous with the upper margin of the saltmarsh and provides a transition from this habitat to drier grassland. The area is also contiguous to inner areas of OMH (Area 3); similar grassland and scrub mosaic habitat (Areas, 5 and 6a) and coastal grazing marsh (Areas 7 and 8). On a landscape scale, Area 2 is representative of grassland, scrub and OMH habitat found within the Thames corridor, some of which provides an important resource for coastal and OMH associated invertebrate species.

A10.147 Substrate: Chalk sedimentary bedrock (Lewes Nodular Chalk Formation; Seaford Chalk Formation and Newhaven Chalk Formation) with alluvium, clay, silt, sand and peat sedimentary superficial deposits.

A10.148 Wetness: Area 2 included several engineered open water areas, with associated ditches. These waterbodies were generally poorly vegetated and their viability for aquatic invertebrates compromised by extreme alkalinity and leachates. The was also somewhat brackish wetted habitat and there were localised areas of evident drainage impedence, juxtaposed with much drier habitat within Area 2 as a whole. Such conditions are important for specialist coastal species requiring mosaics of wet/brackish and dry habitat in close proximity to one another. Area 2 also provided edge habitat to temporary saline pools at the top of the saltmarsh and was close to the more extensive, seasonally inundated grazing marshes in Areas 7 and 8.

A10.149 Structure: Area 2 was topographically diverse, both in terms of the sea defence banks, but also due to the varied uneven microtopography of the flatter areas. The grassland and scrub mosaic provided structural diviersity important for scrub-edge and open grassland species, whilst there were resources of

sparsely vegetated bare ground disturbance habitat, providing structural resource of benefit to species associated with more arid, bare ground conditions.

Invertebrate Survey Dates:

- Terrestrial surveys were conducted in Area 2 on the following dates: 18-20/05/2020; 15-17/06/2020; 13-14/07/2020 and 18-19/08/20; and

- Aquatic surveys were conducted on the following date: 2/06/2020.

Table EDP A10.14: Number of samples per substrate.

	Area 2 – Grassland and Scrub	Area 5 - Wetland	Total
Sweep	4		4
Vacuum	4		4
Beating	4		4
Pan traps (cluster of 10)	4		4
Pitfall traps (cluster of 10)	3		3
Aquatic (3 minute sweep)		1	1

Total Number of Species Recorded:

- Combined terrestrial and aquatic sample data = 361;

- Terrestrial data only = 350[14]; and

- Aquatic data only = 9[15].

A10.150 A comparison of the relative number of species recorded from each of the major taxons is included in the following graph (includes species collected using both terrestrial and aquatic sampling methods):

[14] Note: Terrestrial and aquatic data may not add up to the combined figure, as there may be overlap between species recorded both in terrestrial and aquatic samples

[15] Species list small, as many of the contributing species were not recorded to species-level and therefore, not used for conservation evaluation

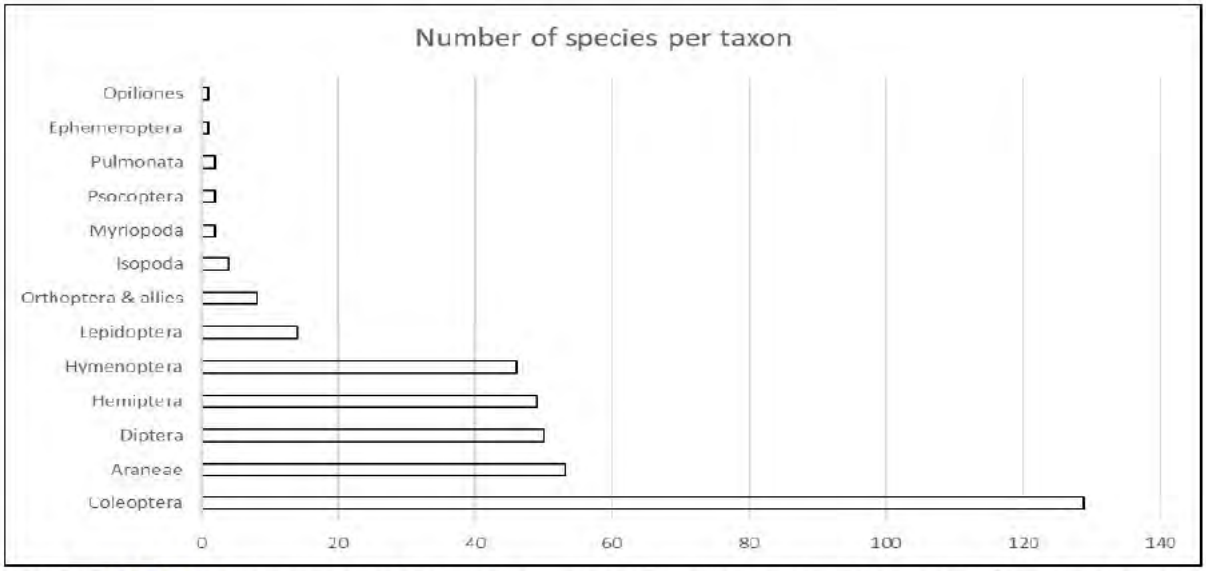

Chart EDP A10.4: A comparison of the relative number of species recorded from each of the major taxons

Table EDP A10.15: Species of Recognised Conservation Recorded from Area 2.

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
A ground beetle	*Amara spreta*	Carabidae	Coleoptera	Nationally Rare	NT
A tachinid fly	*Cistogaster globosa*	Tachinidae	Diptera	RDB2 (check)	
Beewolf	*Philanthus triangulum*	Crabronidae	Hymenoptera	Nationally Vulnerable (RDB2 pre-1994)	LC
A mirid bug	*Lygus pratensis*	Miridae	Hemiptera	RDB3 pre-1994 criteria	LC
Squat Furrow Bee	*Lasioglossum pauperatum*	Halictidae	Hymenoptera	RDB3 pre-1994 criteria	
A bethylid wasp	*Pseudisobrachium subcyaneum*	Bethylidae	Hymenoptera	Rare	
A shining flower beetle	*Olibrus flavicornis*	Phalacridae	Coleoptera	Red Data Book-insufficiently known	DD
A gnaphosid spider	*Zelotes electus*	Gnaphosidae	Araneae	Nationally Scarce	LC
A running crab spider	*Thanatus striatus*	Philodromidae	Araneae	Nationally Scarce	LC
A jumping spider	*Ballus chalybeius*	Salticidae	Araneae	Nationally Scarce	LC
A jumping spider	*Sibianor aurocinctus*	Salticidae	Araneae	Nationally Scarce	LC
A jumping spider	*Synageles venator*	Salticidae	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	*Cyclodinus constrictus*	Anthicidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Amara montivaga*	Carabidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Bembidion normannum*	Carabidae	Coleoptera	Nationally Scarce	LC

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
Bombadier beetle	*Brachinus crepitans*	Carabidae	Coleoptera	Nationally Scarce	LC
A leaf beetle	*Cryptocephalus hypochaeridis*	Chrysomelidae	Coleoptera	Nationally Scarce	LC
Adonis Ladybird	*Hippodamia variegata*	Coccinellidae	Coleoptera	Nationally Scarce	LC
A weevil	*Glocianus punctiger*	Curculionidae	Coleoptera	Nationally Scarce	
A weevil	*Liparus coronatus*	Curculionidae	Coleoptera	Nationally Scarce	
A weevil	*Tanymecus palliatus*	Curculionidae	Coleoptera	Nationally Scarce	
A weevil	*Tychius squamulatus*	Curculionidae	Coleoptera	Nationally Scarce	
A crawling water beetle	*Peltodytes caesus*	Haliplidae	Coleoptera	Nationally Scarce	LC
A hydraenid beetle	*Ochthebius viridis*	Hydraenidae	Coleoptera	Nationally Scarce	LC
A rove beetle	*Bledius tricornis*	Staphylinidae	Coleoptera	Nationally Scarce	
A chloropid fly	*Trachysiphonella scutellata*	Chloropidae	Diptera	Nationally Scarce	
A tephritid fly	*Merzomyia westermanni*	Tephritidae	Diptera	Nationally Scarce	
Broad-headed Bug	*Alydus calcaratus*	Alydidae	Hemiptera	Nationally Scarce	LC
Slender-horned Leatherbug	*Ceraleptus lividus*	Coreidae	Hemiptera	Nationally Scarce	LC
A planthopper	*Asiraca clavicornis*	Delphacidae	Hemiptera	Nationally Scarce	LC
A ground bug	*Megalonotus antennatus*	Lygaeidae	Hemiptera	Nationally Scarce	LC
Blunthorn Nomad Bee	*Nomada flavopicta*	Apidae	Hymenoptera	Nationally Scarce	
A solitary wasp	*Nysson trimaculatus*	Crabronidae	Hymenoptera	Nationally Scarce	
A myrmicine ant	*Myrmica schencki*	Formicidae	Hymenoptera	Nationally Scarce	LC
Pantaloon Bee	*Dasypoda hirtipes*	Melittidae	Hymenoptera	Nationally Scarce	LC
A spider-hunting wasp	*Priocnemis cordivalvata*	Pompilidae	Hymenoptera	Nationally Scarce	
A flesh fly	*Blaesoxipha plumicornis*	Sarcophagidae	Diptera	pNationally Scarce	
A flesh fly	*Sarcophaga subulata*	Sarcophagidae	Diptera	pNationally Scarce	
A flesh fly	*Sarcophila latifrons*	Sarcophagidae	Diptera	pNationally Scarce	
Brown-banded Carder Bee	*Bombus humilis*	Apidae	Hymenoptera	S41 Priority species	
Cinnabar	*Tyria jacobaeae*	Erebidae	Lepidoptera	S41 research only	LC
A jumping spider	*Macaroeris nidicolens*	Salticidae	Araneae	Recent UK colonist	NA

SQI Score for Area 2:

- Combined terrestrial and aquatic sample data = 8.8 (349 contributing species); and
- Terrestrial data only = 10.5 (341 contributing species).

Pantheon Output Tables for Area 2:

Table EDP A10.15: Habitats & resources: broad biotopes

Broad biotope	No. of species	% representation	SQI	Conservation status	Species with conservation status
open habitats	239	5	136	6 Nb; 2 pNS; 6 [Nb]; 11 NS; 1 NR; 1 NT; 2 [RDB 3]; 1 RDB 3; 1 Section 41 Priority Species - research only; 1 [RDB 2]; 1 [Notable]; 1 Notable; 2 Section 41 Priority Species; 1 pNT	33
tree-associated	42	1	123	2 [Nb]; 1 pNS; 1 NS; 1 New to Britain	5
wetland	25	<1	125	2 NS	2
coastal	8	2	271	3 NS; 1 Nb	4

Table EDP A10.16: Habitats & resources: habitats

Broad biotope	Habitat	No. of species	% representation	Conservation status	SQI	Species with conservation status
open habitats	tall sward & scrub	155	6	1 [Notable]; 1 Notable; 2 [Nb]; 2 Section 41 Priority Species; 3 Nb; 1 pNS; 1 pNT; 1 NS; 1 RDB 3; 1 Section 41 Priority Species - research only	114	11
open habitats	short sward & bare ground	81	6	1 [RDB 2]; 9 NS; 3 Nb; 3 [Nb]; 1 NT; 1 NR; 1 Notable; 1 [Notable]; 1 RDB 3; 1 pNS; 1 [RDB 3]	177	21
tree-associated	arboreal	23	2	1 New to Britain; 1 NS	113	2
wetland	marshland	15	2	1 NS	120	1
tree-associated	shaded woodland floor	10	<1	1 pNS; 2 [Nb]	175	3
tree-associated	decaying wood	10	<1	1 New to Britain	100	1
wetland	peatland	7	<1		100	

Broad biotope	Habitat	No. of species	% representation	Conservation status	SQI	Species with conservation status
coastal	saltmarsh	7	2	3 NS; 1 Nb	271	4
wetland	running water	3	<1	1 NS	200	1
coastal	brackish pools & ditches	2	2	1 NS	250	1
tree-associated	wet woodland	1	<1		100	
wetland	wet woodland	1	<1		100	
open habitats	upland	1	<1		100	

Table EDP A10.17: Habitats & resources: ISIS specific assemblage types

Broad biotope	Habitat	SAT	No. of species	% representation	SQI	Conservation status	Species with conservation status	Code	Reported condition
open habitats		rich flower resource	19	8	116	3 [Nb]; 1 Section 41 Priority Species; 1 [RDB 3]; 1 RDB 3	6	F002	Favourable
open habitats	short sward & bare ground	bare sand & chalk	18	4	282	6 NS; 1 NT; 1 NR; 1 [Nb]; 1 pNS	9	F111	Unfavourable (18 of 19 species)
open habitats	short sward & bare ground	open short sward	14	7	192	1 NS; 2 Nb	3	F112	Favourable
open habitats		scrub edge	10	4	130	1 [Nb]	1	F001	Unfavourable (10 of 11 species)
tree-associated	decaying wood	bark & sapwood decay	7	1	100			A212	Unfavourable (7 of 19 species)
open habitats		scrub-heath & moorland	7	2	15	1 NS; 1 [RDB 3]	2	F003	Unfavourable (7 of 9 species)

Broad biotopei	Habitati	SAT	No. of species	% representation	SQI	Conservation statusi	Species with conservation status	Code	Reported conditioni
		i			0				
coastali	saltmarshi	saltmarsh & transitional brackish marshi	2	2	400	2 NSi	2	M311	Unfavourable (2 of 9 species)
wetlandi	marshlandi	open water on disturbed mineral sediments i	1	2	400	1 NSi	1	W211	Unfavourable (1 of 6 species)

Site-Specific Limitations

A10.151 Area 2 was subject to the following sampling limitations/constraints:

- At the time of writing, some diptera records of the site were unavailable. The absence of these records may influence the Pantheon and SQI output; and
- Some of the waterbodies within Area 2 were considered to be too caustic to sample, due to extremely high pH.

Discussion/Evaluation - Area 2:

A10.152 At 42 hectares, Area 2 was the largest habitat sub-unit surveyed during the 2020 invertebrate survey. The site comprised the bulk of coastal grassland and scrub mosaic habitat immediately south of the saltmarsh (Area 1). The site supported habitat representative of rough grassland and scrub mosaic occupying sea defence banks within the wider Thames corridor. The grassland and scrub mosaic provided structurally diverse habitat on uneven ground with varied macro and micro topography. However, whilst there were locally herb-rich areas, large tracts of the grassland habitat were somewhat rank. There were localised areas of more sparsely vegetated, but herb-rich disturbance habitat, as well as various man-made leachate pools. These pools were said to be of extreme alkalinity and there was little sign of invertebrate activity within them.

A10.153 During the 2020 survey, from combined terrestrial and aquatic sampling, a total of 361 species were recorded from Area 2, of which only nine species were derived from sampling of aquatic habitat. In total, 43 of the recorded species were of recognised conservation status in the UK. These included three species classed as 'Species of principal importance' under section 41 of the NERC Act (2006); two species classed as Nationally Vulnerable (RDB2) based on pre-1994 criteria; one species included in the Nationally Rare and Near Threatened categories based on post-2001 IUCN criteria; two Nationally Rare (RDB3) species based on pre-1994 criteria; one species classed as 'Insufficiently known' RBDK and 34 species currently classed as and including species which have been proposed as Nationally Scarce in the UK.

A10.154 Two s41 species of note were recorded for Area 2, a weevil *Glocianus punctiger,* which occurs in grasslands and waste places, where it is associated with Dandelion *Taraxacum officinale* (Morris,2008); and the Brown-banded Carder Bee *Bombus humilis,* a flagship species of OMH and herb-rich Thames terrace grasslands in the Thames corridor. The third s41 species was the relatively common, but declining, Cinnabar *Tyria jacobaea.* This day-flying moth is often found in OMH and grassland habitats supporting its larval foodplants which include Ragwort *Senecio jacobaea*. Another s41 species, the extremely rare Distinguished Jumping Spider Spider *Sitticus distinguendus* was not recorded from historically recorded locations during the 2020 survey; however, the continued presence of the species on site cannot be discounted and available search time was limited due to the main survey remit, to assess invertebrate assemblages.

A10.155 Although the Beewolf *Philanthus triangulum*, is still classed as RDB2 in the UK, this species is overdue for status review, being much commoner than formerly; *Cistogaster globosa,* a tachinid fly which predates Bishop's Mitre Shieldbug *Aelia acuminata*, is due to be downgraded from RDB1 to RDB2 Vulnerable; however, the species appears to have been recorded more frequently in recent years, suggesting that its status may require further revision.

A10.156 In real terms, the rarest species recorded from Area 2 may include the *Amara spreta,* a species of ground beetle associated mainly with sand dunes and dry, sandy habitats on the coast, a species which was afforded Nationally Rare (Near Threatened) status in a status review by Telfer (2016); *Pseudisobrachium subcyaneum* a very rare species of bethylid wasp, which has in recent times, been recorded in the UK only from a handful of sites in south Essex. The species has been associated with ants including *Ponera coarctata, Tetramorium caespitum* and *Myrmecina graminicola* (Edwards, 1998); of these, both *T. caespitum* and *M. graminicola* were recorded from habitat sub-units 1a and 4 on the Swanscombe Peninsula during the current survey, but may have been overlooked in Area 2.

A10.157 The RDB3 Squat Furrow Bee *Lasioglossum pauperatum*, a species which is very uncommon nationally, but is relatively common on OMH and coastal grasslands in the Thames corridor. Another species of note recorded from Area 2 was *Macaroeris nidicolens*, a species of jumping spider recorded in the UK for the first time in 2002. The spider, which is associated with scrub on brownfield sites, has since been recorded from several sites in the Thames corridor area.

A10.158 From Pantheon analysis undertaken for Area 2, the vast majority of species (239) were attributed to 'Open habitats' on a broad biotope level, whilst 42 species were ascribed to the 'Tree associated' assemblage, 25 to 'Wetland' and eight to the 'Coastal' assemblage. This broad-biotope deployment accurately reflected the habitats present on site and level of targeted sampling.

A10.159 At a habitat level, 155 species were attributed to the 'Tall sward and scrub' assemblage, with 81 species being attributed to the 'Short sward and bare ground assemblage'. As is commonly the case with grassland and scrub mosaic sites, the greater overall number of species was attributed to 'Tall sward and scrub'. However, the deployment in terms of percentage representation for both 'Tall sward and scrub' and 'Short sward and bare ground' was equal, each being represented by six percent of its respective national species pool[16]. Furthermore, in terms of rarity, the SQI score registered for the 'Short sward and bare ground' assemblage was 177, indicating a nationally significant assemblage, compared to 114 attributed to 'Tall sward and scrub'. 'Short sward and bare ground' was also the stand out assemblage compared to the less well subscribed, albeit significantly, represented habitat-level assemblages 'Arboreal' with an SQI of 113, from 23 species and 'Marshland' with an SQI of 120 from 15 species.[17]

A10.160 Although 'Tall sward and scrub' did not achieve a high SQI score, this was due largely to the dilution of uncommon species by species which are relatively widespread in the UK. In total, 11 species of recognised conservation status were attributed to this assemblage. These included the s41 and nationally scarce weevil *Glocianus punctiger,* and two other nationally scarce weevil species not mentioned elsewhere in relation to Area 2 including, *Liparis coronatus* and *Tanymecus palliatus*; as well as nationally scarce species including a philodromid spider *Thanatus* striatus*,* two-winged flies including a flesh fly *Blaesoxipha plumicornis* and a tephritid fly *Merzomyia westermanni;* a ground bug *Megalonotus antennatus* and the s41 Brown-banded Carder Bee.

[16] The total number of species attributed to a given assemblage in the Pantheon database – there are proportionally more Tall sward and scrub species than Short sward and bare ground species listed in the Pantheon database
[17] Technically 15 species is just below the threshold for significant SQIs in Pantheon.

A10.161 At Specific Assemblage Type (SAT) level[18], three SATs achieved species scores exceeding their respective Favourable Condition (FC) targets from Pantheon analysis of the Area 2 dataset. These included F111 'Bare sand and chalk' and F112 'Open short sward', both nested within the habitat-level 'Short sward and bare ground' assemblage and a third resource-based SAT, F002 'Rich flower resource'.

A10.162 Both F111 'Bare sand and chalk' and F112 'Open short sward' assemblages were not only attributed by sufficient species to achieve Favourable Condition status, but also achieved high SQI[19] scores. Of the two assemblages, both the highest species and SQI scores (18 and 282 respectively) were achieved for F111 'Bare sand and chalk'; the SQI score is particularly high, reflecting the proportionally high rarity value of the attributed species. A nationally rare ground beetle *Amara spreta* was attributed to this assemblage alongside closely related nationally scarce *A. montivaga* and the Bombardier Beetle *Brachinus crepitans*; and other nationally scarce species including two jumping spiders, *Sibianor aurocinctus* and *Synageles venator*, a gnaphosid spider *Zelotes electus*, a sarcophilid fly *Sarcophila latifrons,* an alydid bug *Alydus calcaratus* and the Pantaloon Bee *Dasypoda hirtipes.* The majority of these species are strongly associated with OMH and herb-rich calcareous grassland habitats within the Thames corridor.

A10.163 Whilst the number of species and SQI score attributed to F112 'Open short sward', was not quite as high as for F111, the recorded scores of 14 species indicate an assemblage of high conservation importance. Nationally scarce species attributed to this assemblage included a pot beetle *Cryptocephalus hypochaeridis* a weevil *Tychius squamalatus* and a planthopper *Asiraca clavicornis*.

A10.164 The remaining SAT achieiving FC status, F002 'Rich flower resource', differed from the other two in being a resource-based SAT, as such the assemblage does not have a strong affinity with a particular habitat, but instead, provides a measure of the value of the flowering resource of a site, irrespective of component habitats. However, the assemblage which is made up entirely of bee species, gives an indication of the diversity of bee species recorded and the value of the SAT is increased by the component species as well as the overall number of attributed species. In the case of Area 2, 19 bee species were attributed to this SAT, this being well above the FC threshold of 14 set within Pantheon. As such the score was not as high as was achieved for sites such as the nearby herb-rich OMH site Area 3.

[18] SAT level is considered to be the most important level for assessing conservation value of a site.
[19] An SQI score in Pantheon is considered robust if it is attributed with 16 or more species

A10.165 Of the species attributed the s41 listed Brown-banded Carder Bee, an RDB3 ground nesting species, the Squat Furrow Bee *Lasioglossum pauperatum,* the nationally scarce Blunthorn Nomad Bee *Nomada flavopicta* (a cleptoparasite in the nests of bees of the genus *Melitta – M. tricincta* was recorded from Area 1a, but not Area 2) and the Pantaloon Bee, which is currently listed as nationally scarce, but is likely to be subject to status revision, due to an increase in records. All these bees are typical OMH and herb-rich grassland species.

A10.166 Of the less well represented assemblages, the 'Tree-associated' biotope-level assemblage with 42 attributed species, is worthy of note and reflected the importance of scrub/woodland habitat within the survey area. Uncommon species attributed to this assemblage included jumping spiders including *Ballus chalybeius*, which is nationally scarce, but is particularly well represented within the Thames corridor brownfield sites and *Macaroeris nidicolens* which was first recorded in the UK in 2002; two nationally scarce aculeates including a solitary wasp *Nysson trimaculatus* and a spider-hunting wasp *Priocnemis cordivalata* and a fleshfly, *Sarcophaga subulata*. The latter three of these species were attributed to the 'Shaded woodland floor' assemblage at habitat-level.

A10.167 Of only eight species attributed to the 'Coastal' biotope-level assemblage for Area 2, four were nationally scarce. These were all beetles, including a ground beetle *Bembidion normannum*, A rove beetle *Bledius tricornis*, an anthicid beetle *Cyclodinus constrictus* and a hydraenid beetle *Ochthebius viridis.* These species were also attributed at habitat-level to 'Saltmarsh' and two *B. normannum* and *Cyclodinus constrictus* were also attributed at SAT level to the M311 'Saltmarsh and transitional brackish marsh' assemblage.

A10.168 Whilst 'Wetland' species at biotope level were better represented than 'Coastal' species, with 25 attributed species, only two species of conservation status were attributed to this classification. These included a nationally scarce ground beetle *Asaphidion flavipes*, also attributed at habitat-level to 'Running water' and a crawling water beetle *Peltodytes caesus*, an aquatic species, which is attributed at habitat-level to 'Marshland'.

A10.169 The non-Pantheon SQI score recorded for Area 2 was 10.5 for terrestrial only data and 8.8 for combined terrestrial and aquatic datasets. The scores indicates a conservation value of national significance of the terrestrial only assemblage (which does include some wetland and coastal species) and a regional significance, if aquatic data is included. According to Harvey (2014)[20] an SQI value approaching 10.00 is 'almost certainly of national significance.'

[20] Harvey based his evaluation on invertebrate fauna in Essex, the Kent fauna within the Swanscombe part of the Thames corridor is comparable with this standard.

Conclusion

A10.170 Like all of the grassland and scrub mosaic and OMH sub-sites in the 2020 survey area, a greater number of species were attributed at habitat-level to the 'Tall sward and scrub' assemblage in Pantheon. However, whilst a number of species (11) of conservation value were attributed to this assemblage for Area 2, the rarity value was diluted in terms of SQI, by the number of more widespread species. In contrast, the SQI score recorded for the 'Short sward and bare ground' assemblage, indicated that this was a stand-out assemblage of National Importance at habitat-level. This trend was also reproduced at SAT level, with both the F111 'Bare sand and chalk' and F112 'Open short sward' assemblages, nested within 'Short sward and bare ground', achieving scores not only exceeding the respective FC thresholds, set in the Pantheon database, but also achieving exceptionally high SQI scores, due to the number of species of elevated conservation status attributed to them.

A10.171 Being a coastal site, directly connected to the upper shores of the saltmarsh, several species of recognised conservation status, which are normally attributed to saltmarsh and saltmarsh transition habitat, were also recorded from Area 2. This demonstrates the importance of the coastal seam of Area 2, as an upper shore transition habitat.

A10.172 Both the findings of Pantheon analysis and the independent SQI score calculated, indicated that Area 2 supported invertebrate assemblages of National Importance, both due to the value of the Short sward and bare ground assemblages, but also on a whole site level. The overall SQI score was somewhat diminished when terrestrial data was combined with data collected from the separately executed aquatic invertebrate survey, suggesting that the aquatic assemblages were not exceptional. However, the brackish water and saltmarsh associated fauna should not be confused with this.

Area 3: Swanscombe Omh

Centroid grid reference: TQ 60140 75901

Overall area: 8.5 hectares

Designations on site: None

S41 habitats present: Open mosaic habitat on previously developed land

Habitat Description

A10.173 Area 3 was defined mainly by the extent of sparsely vegetated OMH which occupied two main areas in the western part of the Swanscombe Peninsula. The largest expanse of habitat was an inland section around TQ 60183 75854 which comprised a fairly extensive, flattish and sparsely vegetated area, over a chalky substrate. The area was defined by partially vegetated trackside boundary banks and ditches to the east and west and there were a number of spoil heaps, comprising rocky and finer calcareous substrates, as well as derelict pill boxes and other manmade structures. Collectively, these features provided varied microhabitat conditions for thermophilic invertebrates. Whilst much of the habitat was arid and free-draining, there were localised wetted areas including a seasonally dried out pond in the centre of the area around TQ 60187 75873.

A10.174 The smaller, coastal section, was adjacent to the pier at TQ 60027 75985. This area was partially demarked by derelict concrete panel walls, which provided additional shelter to the OMH which, again was sparsely vegetated, supporting partially vegetated spoil heaps and a range of refugia of potential value for specialised invertebrates typical of semi-arid OMH conditions. There were areas of partially vegetated pulverised fuel ash (PFA), which formed heaps locally, close to the base of the pylon around TQ 60299 76255. This area was one of the areas where the Distinguished Jumping Spider *Sitticus distinguendus* was recorded during previous surveys. There was also some unusual habitat in this area, which comprised small rocks of consistent size, partially beneath Silver Birch *Betula pendula* dominated scrub woodland.

A10.175 Herb species within these areas included typical OMH legumes such as Narrow-leaved Bird's-foot Trefoil *Lotus tenuis,* Common Bird's-foot Trefoil *Lotus corniculatus,* Black Medick *Medicago lupulina,* clovers *Trifolium* spp. and non-native species including Goat's Rue *Galega officinalis* and Lucerne *Medicago sativa;* as well as, composites including Bristly Ox-tongue *Picris echioides,* Common Ragwort *Senecio jacobaea,*Yarrow *Achillea millefolium* and Rough Hawk's-beard *Crepis biennis;* umbellifers including Wild Carrot *Daucus carota* and Fennel *Foeniculum vulgare* and a variety of typical colonisers of nutrient poor bare ground in calcareous situations such as Ribwort Plantain *Plantago lanceolata*, Selfheal *Prunella vulgaris*, Viper's Bugloss *Echium vulgare,* Yellow Wort *Blackstonia perfoliata* and Common Centaury *Centaurium erythraea* and a variety of other native and introduced herbs and grasses.

A10.176 Bramble *Rubus fruticosus* (agg.) scrub also occurred within these areas, providing localised low growing patches, although these were frequently confined more to the edges of the more open areas. Other scrub species included scattered Silver Birch *Betula pendula,* Grey/Goat Willow *Salix cinerea/caprea,* Dogwood *Cornus sanguineum*, Hawthorn *Crataegus*

monogyna and Dog Rose *Rosa canina* (agg.), these occurring more extensively in bands of scrub/woodland around TQ 60100 75736; TQ 60066 75944 and TQ 60243 76107.

A10.177 The wetter area around TQ 60187 75873, despite being more or less dried out by the May survey, was evident due to scattered Hard Rush *Juncus inflexus* and Reed Canary Grass *Phalaris arundinacea*.

A10.178 Connectivity: Area 3 occupies a central and coastal position within the Swanscombe Peninsula and although the area was distinctive due to being sparsely vegetated and open, the area is not separate in landscape terms from the other habitat areas within the Peninsula, which comprise complementary habitat and generally support flora of a similar composition. The habitat was comparable to OMH in the wider landscape including other important sites, both on the Kent and Essex sides of the Thames. These habitats, together with remnant Thames terrace grasslands, coastal grazing marsh, saltmarsh and drier calcareous grassland and scrub mosaics, provide a nationally important resource for invertebrates.

A10.179 Substrate: Area 3: Chalk sedimentary bedrock (Lewes Nodular Chalk Formation; Seaford Chalk Formation and Newhaven Chalk Formation) with alluvium, clay, silt, sand and peat sedimentary superficial deposits.

A10.180 Wetness: Although the habitat in Area 3 was predominately free-draining and relatively arid; localised wetted areas were present, e.g. a shallow, ephemeral pond at TQ 60187 75873. Although this had dried out during the survey period, there was partially saturated bare mud during the May scoping study and wetland vegetation including *Juncus* spp. in this area. The wetted areas were adjacent to much drier habitat, providing conditions suitable for species requiring both wetland and xerophilic conditions.

A10.181 Structure: Area 3 was a relatively flat, low lying site for the most part. However, a range of raised features including small spoil heeps and boundary ditch/dyke features provided some important microtopography, creating sheltered, sunny microclimatic variation. There was a significant resource of chalky bare ground on the site, resulting from the former concrete industry and man-made features including WW2 pill boxes, inland and concrete walls (close to the pier and pylon), as well as rocks and debris, providing structural features and refugia. The vegetation, including shorter and tall-herb habitat, bramble scrub and taller deciduous scrub/woodland at the sites margins, provided additional structural diversity.

Invertebrate Survey Dates:

A10.182 The site was surveyed on four occasions including: 18-19/05/2020; 15/06/2020; 13/07/20 and 17/08/20

Table EDP A10.18: Number of samples per substrate.

	Area 3 (OMH)	Total
Sweep	4	4
Vacuum	5	5
Beating	4	4
Pan traps	4	4
Pitfall traps	6	6

A10.183 Total number of species recorded: 388

A10.184 A comparison of the relative number of species recorded from each of the major taxons is included in the following graph.

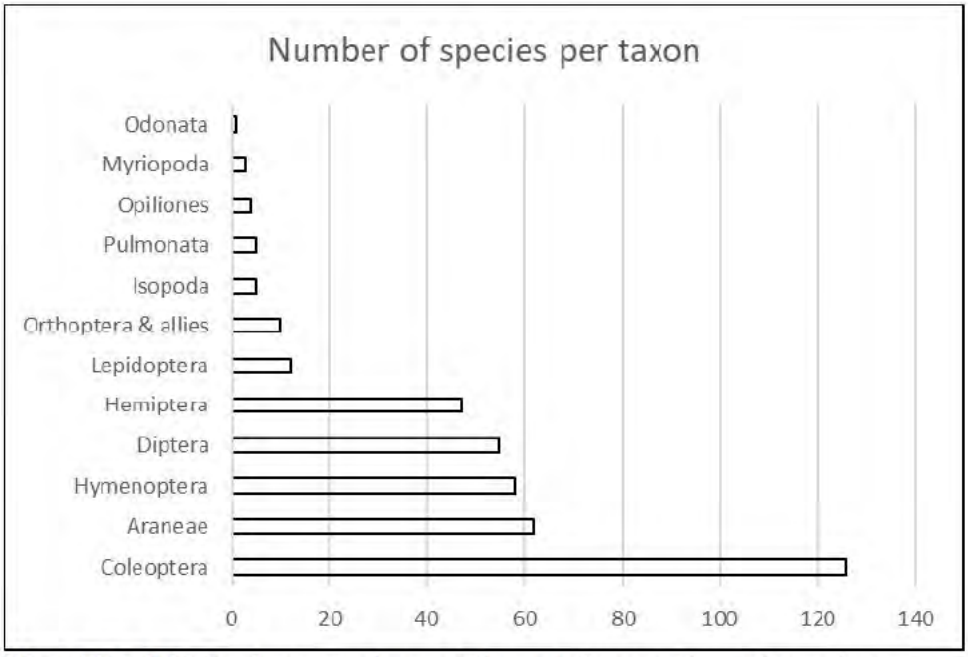

Chart EDP A10.5: A comparison of the relative number of species recorded from each of the major taxons

Table EDP A10.19: Species of recognised conservation recorded from Area 3.

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
Mellet's Downy-Back	*Ophonus melletii*	Carabidae	Coleoptera	S41 Priority species; Nationally Rare; Near Threatened	NT
A mirid bug	*Lygus pratensis*	Miridae	Hemiptera	RDB3 pre-1994 criteria	LC
Blue Carpenter Bee	*Ceratina cyanea*	Apidae	Hymenoptera	RDB3 pre-1994 criteria	LC
A ruby-tailed wasp	*Hedychrum niemelai*	Chrysididae	Hymenoptera	RDB3 pre-1994 criteria	

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
A solitary wasp	*Gorytes laticinctus*	Crabronidae	Hymenoptera	RDB3 pre-1994 criteria	
Squat Furrow Bee	*Lasioglossum pauperatum*	Halictidae	Hymenoptera	RDB3 pre-1994 criteria	
Rough-backed blood bee	*Sphecodes scabricollis*	Halictidae	Hymenoptera	RDB3 pre-1994 criteria	
A weevil	*Smicronyx reichi*	Curculionidae	Coleoptera	[RDB3]	
A shining flower beetle	*Olibrus flavicornis*	Phalacridae	Coleoptera	Red Data Book-insufficiently known	DD
A leafhopper	*Psammotettix alienus*	Cicadellidae	Hemiptera	RDBK 'unknown'	
A gnaphosid spider	*Drassodes pubescens*	Gnaphosidae	Araneae	Nationally Scarce	LC
A linyphiid spider	*Hypomma fulvum*	Linyphiidae	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 jumping spider	*Ballus chalybeius*	Salticidae	Araneae	Nationally Scarce	LC
A jumping spider	*Sibianor aurocinctus*	Salticidae	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 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 leaf beetle	*Cryptocephalus hypochaeridis*	Chrysomelidae	Coleoptera	Nationally Scarce	LC
Adonis Ladybird	*Hippodamia variegata*	Coccinellidae	Coleoptera	Nationally Scarce	LC
A weevil	*Hypera fuscocinerea*	Curculionidae	Coleoptera	Nationally Scarce	
A weevil	*Tychius schneideri*	Curculionidae	Coleoptera	Nationally Scarce	LC
A grooved water scavenger beetle	*Helophorus nubilus*	Helophoridae	Coleoptera	Nationally Scarce	
A mordellid beetle	*Mordellistena neuwaldeggiana*	Mordellidae	Coleoptera	Nationally Scarce	LC
A tumbling flower beetle	*Mordellistena variegata*	Mordellidae	Coleoptera	Nationally Scarce	LC
A chloropid fly	*Trachysiphonella scutellata*	Chloropidae	Diptera	Nationally Scarce	
Broad-headed Bug	*Alydus calcaratus*	Alydidae	Hemiptera	Nationally Scarce	LC
A stilt bug	*Berytinus hirticornis*	Berytidae	Hemiptera	Nationally Scarce	LC
A lacehopper	*Reptalus quinquecostatus*	Cixiidae	Hemiptera	Nationally Scarce	

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
A planthopper	*Asiraca clavicornis*	Delphacidae	Hemiptera	Nationally Scarce	LC
Spined Hylaeus	*Hylaeus cornutus*	Colletidae	Hymenoptera	Nationally Scarce	LC
A solitary wasp	*Nysson trimaculatus*	Crabronidae	Hymenoptera	Nationally Scarce	
Lobe-spurred Furrow Bee	*Lasioglossum pauxillum*	Halictidae	Hymenoptera	Nationally Scarce	LC
A spider-hunting wasp	*Auplopus carbonarius*	Pompilidae	Hymenoptera	Nationally Scarce	LC
A chloropid fly	*Dicraeus scibilis*	Chloropidae	Diptera	pNationally Scarce	
A flesh fly	*Sarcophila latifrons*	Sarcophagidae	Diptera	pNationally Scarce	
A ulidiid fly	*Melieria picta*	Ulidiidae	Diptera	pNationally Scarce	
Small Heath	*Coenonympha pamphilus*	Nymphalidae	Lepidoptera	S41 Priority species	NT
Cinnabar	*Tyria jacobaeae*	Erebidae	Lepidoptera	S41 research only	LC

A10.185 SQI score for Area 3: 11.2

Pantheon Output Tables for Area 3:

Table EDP A10.20: Habitats & resources: broad biotopes

Broad biotopei	No. of species	% representation	SQI	Conservation statusi	Species with conservation status
open habitatsi	277	6	135	7 [RDB 3]; 12 NSi; 5 Nbi; 2 pNS; 2 [Na]; 1 [Nb]; 1 RDB 3i; 1 Section 41 Priority Species - research only; 2 NTi; 2 Section 41 Priority Species; 1 NRi	33
tree-associatedi	34	<1	139	2 NSi; 1 Nbi; 1 [Na]; 1 [Nb]	5
wetlandi	25	<1	113	1 NSi	1
coastali	4	<1	200	1 pNS	1

Table EDP A10.21: Habitats & resources: habitats

Broad biotopei	Habitati	No. of species	% representation	Conservation statusi	SQI	Species with conservation status
open habitatsi	tall sward & scrubi	163	6	3 NSi; 1 pNS; 1 [Nb]; 1 RDB 3i; 1 Section 41 Priority Species - research only; 1 [RDB 3]	109	8
open habitatsi	short sward & bare groundi	110	9	1 RDB 3i; 8 NSi; 5 [RDB 3]; 5 Nbi; 1 pNS; 2 Section 41 Priority Species; 1 NRi; 2 NTi; 1 [Na]	169	23

Broad biotopei	Habitati	No. of species	% representation	Conservation statusi	SQI	Species with conservation status
tree-associatedi	arborealı	19	1	1 NSi	117	1
wetlandi	peatlandi	14	1	1 NSi	121	1
wetlandi	marshlandi	12	1		100	
tree-associatedi	decaying woodi	8	<1	1 [Na]; 1 NSi	175	2
tree-associatedi	shaded woodland floori	7	<1	1 [Nb]; 1 Nbi	160	2
wetlandi	running waterı	5	<1		100	
coastali	saltmarshi	3	1	1 pNS	200	1
coastali	brackish pools & ditchesi	2	2		100	
open habitatsi	upland	1	<1		100	

Table EDP A10.22: Habitats & resources: ISIS specific assemblage types

Broad biotopei	Habitati	SAT	No. of species	% representation	SQI	Conservation statusi	Species with conservation status	Code	Reported conditioni
open habitatsi		rich flower resourcei	31	13	129	2 [Na]; 2 [RDB 3]; 1 RDB 3i	5	F002	Favourable
open habitatsi	short sward & bare groundi	bare sand & chalki	21	5	214	1 pNS; 6 NSi	7	F111	Favourable
open habitatsi	short sward & bare groundi	open short swardi	20	10	216	1 [RDB 3]; 1 NSi; 3 Nbi; 1 NTi; 1 Section 41 Priority Species	6	F112	Favourable
open habitatsi		scrub edgei	16	7	119	1 [Na]	1	F001	Favourable
tree-	decaying	bark &	8	2		1 NSi;	2	A21	Unfavoura

Broad biotopei	Habitati	SAT	No. of speciesi	% representationi	SQIi	Conservation statusi	Species with conservation status	Codei	Reported conditioni
associatedi	woodi	sapwood decayi			175	1 [Na]		2	ble (8 of 19 species)
open habitatsi		scrub-heath & moorlandi	8	2	138	1 [RDB 3]; 1 NSi	2	F003	Unfavourable (8 of 9 species)
coastali	saltmarshi	saltmarsh & transitional brackish marshi	1	<1	400	1 pNS	1	M311	Unfavourable (1 of 9 species)
wetlandi	peatlandi	Sphagnum bogi	1	<1	100			W312	Unfavourable (1 of 8 species)

Site-Specific Limitations

A10.186 Area 3 was subject to the following sampling limitations/constraints:

- At the time of writing, some diptera records of the site were unavailable. The absence of these records may influence the Pantheon and SQI output.

Discussion/Evaluation - Area 3

A10.187 Area 3 occupied the footprint of a former cement works and was distinct compared to other survey areas on the Swanscombe Peninsula, being an extensive area of sparsely vegetated habitat, compared to the denser sward grassland and scrub mosaic habitat characterising most of Areas 2, 5 and 6a. The Area supported areas of diverse microtopography including partially vegetated spoil, with arid free-draining habitat, as well as, localised areas of drainage impedence supporting seasoanlly drying wetland habitat.

A10.188 The habitat conforms strongly to definitions of 'Open mosaic habitat on previously developed land' (OMH) as outlined in JNCC (2010); the site occupying an area greater than 0.25ha; having a known history of disturbance with sustrate having been modified and added to by desposition of spoil; supporting early successional vegetation including stress tolerant species; containing unvegetated substrate, with wetted areas and having a mosaic of scrub, herb rich and bare ground areas.

A10.189 During the 2020 survey a total of 388 species were recorded from Area 3, of which 43 species are of recognised conservation status in the UK. These included three species classed as 'Species of principal importance' under section 41 of the NERC Act (2006), one of which was also classed under post-2001 IUCN criteria as 'Nationally Rare' with a threat status of 'Near Threatened', seven species classed as Nationally Rare (RDB3) based on pre-1994 criteria, two species classed as 'Insufficiently known' RBDK and 30 species currently classed as Nationally Scarce in the UK. In addition, 113 of the species recorded from Area 3 are considered to be of local distribution in the UK.

A10.190 One s41 species of particular note recorded from Area 3 was Mellet's Downy-Back *Ophonus melletii*. This species also being classed as Nationally Rare and Near Threatened in the UK under post-2001 IUCN criteria.

A10.191 Mellet's Downy-Back is a species of ground beetle, which is found mainly in coastal sites with calcareous grassland and on chalky soils, the species was also recorded from Area 11 during the 2020 survey. Other s41 species recorded from Area 3 included Small Heath *Coenonympha pamphilus* (also classed as Near *Threatened* under post-2001 IUCN criteria), a short sward grassland species which is still realtively common and widespread in the UK, but has declined significantly in recent decades and Cinnabar *Tyria jacobaea*, a very common day flying moth associated with ragworts *Senecio* spp. Cinnabar was included in the s41 list as a 'research only' species, also due to a recorded decline in the UK.

A10.192 Nationally rare species recorded from Area 3 included a weevil *Smicronyx reichi* and five aculeate Hymenoptera species such including a solitary wasp *Gorytes laticinctus*, a ruby-tailed wasp *Hedychrum niemelai,* Squat Furrow Bee Lasioglossum *pauperatum*, Rough-backed Blood Bee *Sphecodes scabricollis* and the Little Blue Carpenter *Bee Ceratina cyanea.* A mirid bug *Lygus pratensis* which is still listed as RDB3 despite a considerable range increase, was also recorded from Area 3, as from most other sites in the survey area. Furthermore, other species listed as RDB3 including the weevil *Smicronyx reichi*, the ruby-tailed wasp species *Hedychrum niemelai* and Little Blue Carpenter *Bee Ceratina cyanea,* have all been recorded more frequently in recent years and may be subject to status review to nationally scarce in the near future.

A10.193 From Pantheon analysis undertaken for Area 3, the vast majority of species (227) were attributed to 'Open habitats' on a broad biotope level, whilst 34 species were ascribed to the 'Tree associated' assemblage, 25 to 'Wetland' and four to the 'Coastal' assemblage. This broad-biotope deployment reasonably accurately reflected the habitats present on site and level of

targeted sampling. The 25 species attributed to 'wetland' at a broad biotope level within the 2020 Pantheon output, were all recorded using traditional terrestrial sampling methods. Whilst Area 3 was predominately a dry site, there were small areas of ephemeral wetland habitat and the site bordered the extensive wetland area of Black Duck Marsh (Area 4).

A10.194 In common with most other OMH grassland and scrub mosaic sites recorded during the 2020 survey, the 'Tall sward and scrub' habitat-level assemblage was found to support the largest number of species. However, for Area 3, this dominance was less overwhelming than in most other cases. The number of species attributed to the 'Short sward and bare ground' habitat-level assemblage for the site was 110, this being relatively close to the 163 attributed to 'Tall sward and scrub'. Importantly, the percentage representation[21] of the 'Short sward and bare ground' species pool in Pantheon was nine percent, compared with the six percent representation recorded for 'Tall sward and scrub'. The higher than usual number of 'Short sward and bare ground' species attributed within the Area 3 Pantheon output would be expected due to the general short and sparsely vegetated nature of the habitat as a whole.

A10.195 Importantly the SQI scores recorded for these two habitat-level assemblage differed from a modest 109 for 'Tall sward and scrub', indicating a greater proportion of widespread and common species in relation to rarities, compared to 169 for 'Short sward and bare ground'. A score of 169 would indicate an assemblage close to or of national importance at this level.

A10.196 At the Specific Assemblage Type (SAT) level[22], the two SATs nested within the 'Short sward and bare ground' habitat-level assemblage, namely the F111 'Bare sand and chalk' and F112 'Open short sward' assemblages both achieved species scores exceeding their respective Favourable Condition targets, thus reflecting the importance of these assemblages for the site. SATs exceeding their FC targets can indicate features of national importance, this being reinforced further, when the SATs include species of higher conservation status and achieve high individual SQI scores, as was the case for Area 3.

A10.197 For Area 3, a total of 21 species (compared to a Pantheon FC threshold score of 18) were attributed to F111 'Bare sand and chalk', and for the closely allied F112 'Open short sward' a species score of 20 was recorded, greatly exceeding its corresponding Pantheon FC threshold score of 12. These assemblages both achieved elevated SQI scores of 214 for 'Bare sand and chalk' and 216 for

[21] The total number of species attributed to a given assemblage in the Pantheon database – there are proportionally more Tall sward and scrub species than Short sward and bare ground species listed in the Pantheon database

[22] SATs are considered to be the most important assemblage level in the Pantheon output hierarchy in terms of assessing the invertebrate conservation value of a site. SATs are generally made up of specialist invertebrates with specific habitat affinities, often including rare and uncommon species.

'Open short sward', indicating them to be assemblages of very high conservation value.

A10.198 Species of recognised conservation significance attributed to the F111 'Bare sand and chalk' assemblage included nationally scarce species including three spiders including the wolf spiders (Lycosidae); *Alopecosa cuneata* and *Pardosa agrestis/purbeckensis* and a typical brownfield and Thames terrace grassland jumping spider *Sibianor aurocincta*; two beetles including the Bombardier Beetle *Brachinus* crepitans and another ground beetle *Amara montivaga,* both species which are associated with open ground sites on calcareous soils; a flesh fly *Sarcophila latifrons* associated with coastal grasslands and a alydid bug *Alydus calcaratus,* a species which is associated with inland lowland heathlands, but also occurs in OMH in the Thames corridor.

A10.199 Species of recognised conservation significance attributed to the F112 'Open short sward' assemblage for Area 3 included four beetles, comprising the a weevil *Smicronyx reichi,* currently listed as RDB3, which is associated with Common Centaury *Centaurium erythraea* and possibly Yellow-wort *Blackstonia perfoliata* (both of which were recorded in Area 3) in OMH sites; and nationally scarce species including two additional weevils *Tychius schneideri* and *Protapion filirostre* and a pot beetle *Cryptocephalus hypochaeridis*, which, alongside the similar but slightly commoner *C. aureolus*, was also recorded from several other sites in the survey area. *Asiraca clavicornis,* a distinctive species of planthopper, which is common in the Thames corridor and London area, but rare elsewhere and the relatively common, but declining s41 and 'Near Threatened' Small Heath *Coenonympha pamphilus* were also attributed to this assemblage.

A10.200 Besides, the species of recognised conservation status attributed to the F111 and F112 SAT assemblages, several rarities were attributed in Pantheon level only to the parent habitat-level assemblage 'Short sward and bare ground', these included two RDB3 wasps, including *Gorytes laticinctus* (a solitary species which predates Common Froghopper *Philaenus spumarius* and *Hedychrum niemelai*, a ruby-tailed wasp, which is a brood parasitise of ground-nesting solitary wasps of the genus *Cerceris.* Nationally scarce species attributed to this assemblage at habitat-level only included a zodarid spider *Zodarion italicum,* which was also recorded from several other sites during the survey, a stiltbug *Berytinus hirticornis* and a hyperine weevil *Hypera fuscocinerea.*

A10.201 Whilst the SQI for the habitat-level 'Tall sward and scrub' assemblage (which incidentally lacks nested SAT-level assemblages) was relatively low, a total of six species of recognised conservation status were attributed to this assemblage for Area 3. These included the Little Blue Carpenter Bee *Ceratina*

cyanea (currently RDB3, but likely to be subject to a status revision due to an increase in records); two nationally scarce spiders, including *Drassodes pubescens* a species of gnaphosid spider and a philodromid spider *Thanatus striatus;* beetles including a grooved water-scavenger beetle *Helophorus nubilus* and the Adonis Ladybird *Hippodamia variegata* (a species which is currently listed as nationally scarce, but which is likely to be downgraded due to an increase in records). Also attributed to 'Tall sward and scrub' was a species of chloropid fly *Dicraeus scibilis*, listed as proposed nationally scarce in a review by Falk *et al* (2016), in which it is described as being 'Very localised and infrequently recorded, except on the north Kent Marshes where it is locally frequent'.

A10.202 In addition to the abovementioned SATs, two resource-based SATs, F002 'Rich flower Resource' and F001 'Scrub edge' also achieved species scores exceeding their respective FC thresholds from analysis of the 2020 Area 3 data. The species score for F002 'Rich flower resource' was 31, this being more than double the favorable condition target set in Pantheon for this assemblage of 14. For F001 'Scrub edge', a score of 16, exceeded the target score of 12.

A10.203 whilst the F002 assemblage is generally not considered a reliable means of conservation evaluation, due to representing a diffuse resource rather than a tangible habitat, its value increases where the constituent species include species of elevated conservation status. This assemblage comprises entirely of bees, the diversity of which tends to increase in flower-rich habitats. Species attributed Area 3 included stem-nesting bees including Little Blue Carpenter Bee, mentioned in relation to other SATs and nationally scarce Spined Hylaeus *Hylaeus cornutus;* as well as ground nesting solitary bee species, the RDB3 Squat Furrow Bee *Lasiosglossum pauperatum* and Lobe-spurred Furrow Bee – another species which is due for status revision because of an increase in recent records.

A10.204 In contrast to the F001 assemblage, whilst the F001 scrub edge assemblage achieved a score exceeding its corresponding FC threshold, only one species was attributed to this assemblage in the Pantheon output for Area 3. This species, was the Spined Hylaeus *Hylaeus cornutus,* a species also attributed to the F002 assemblage, due to its requirement for a foraging as well as a nesting resource. *H. cornutus* has been recorded to nest in dead stems of Wild Parsnip *Pastinaca sativa* and in docks *Rumex* spp. However, other stem-nesting species such as the Little Blue Carpenter Bee highlight the requirement of a scrub resource for nesting; this species often nests in the dead stems of Bramble *Rubus fruticosus* (agg).

A10.205 The overall picture gained from Pantheon analysis of Area 3 data indicates that the 'Short sward and bare ground' habitat-level assemblage comprising both F111 'Bare sand and chalk' and F112 'Open short sward' assemblages of national importance; based on a dataset of intermediate compliance, indicating a medium confidence level. However, the overarching whole-site level non-Pantheon SQI score recorded for Area 3 was 11.2. According to Harvey (2014)[23] an SQI value approaching 10.00 is 'almost certainly of national significance.'

Conclusion

A10.206 Whilst the Distinguished Jumping Spider *Sitticus distinguendus* was not recorded from the site during 2020, Area 3 Swanscombe OMH was found to support a large number of species of recognised conservation status in the UK. A number of these species, together with many more local and widespread species recorded from the site, are highly characteristic of OMH within the Thames Corridor area.

A10.207 From Pantheon analysis, the two SATs F111 'Bare sand and chalk' and F112 'Open short sward' both achieved species scores exceeding their respective Favourable Condition thresholds and comprised species of very high collective and individual rarity value. This conservation value was also reflected in the SQI score achieved for the overarching 'Short sward and bare ground' habitat-level assemblage which was attributed with 22 species of recognised conservation status, an exceptionally large number at this level. Two resource-based SAT assemblages; F002 'Rich flower resource' and F001 'Scrub edge' also achieved scores exceeding their respective FC targets and the large number of bee species attributed to the F002 assemblage, highlighted the importance of Area 3 for characteristic brownfield Hymenoptera.

A10.208 Using a method used by Harvey (2014), described in Ball (1986) a site-level SQI score of 11.2 was calculated for the invertebrate fauna of the site as a whole. Considering the representativeness, size and ecological position of Area 3 Swanscombe OMH and its associated habitat and invertebrate fauna, coupled with findings of the 2020 Pantheon analysis and independent SQI score, the site can comfortably be said to support an invertebrate fauna of National Importance.

Area 4: Black Duck Marsh

Centroid grid reference: TQ 59892 75393

[23] Harvey based his evaluation on invertebrate fauna in Essex, the Kent fauna within the Swanscombe part of the Thames corridor is comparable with this standard.

Overall area: 21.3 hectares

Designations on site: None

S41 habitats present: Reedbeds

Habitat Description

A10.209 Area 4 comprised a large area of brackish to freshwater wetland habitat; occupying the southwest corner of the Swanscombe Peninsula survey area. The bulk of the site comprised Common Reed *Phragmites australis* dominated reedswamp; however, there was an extensive area of open water around TQ 59740 75398, which was accessed by boat for the purpose of the aquatic survey work. The site was crossed by several significant, interconnected field drains, there were also open water drains bordering the perimeter of the entire marsh. The peripheries of the site supported significant areas of wet woodland/carr habitat; with Grey Willow *Salix cinerea;* Goat Willow *S. caprea* and other tree/scrub species including birches *Betula* spp. and Alder *Alnus glutinosa*. Scrub and carr also persisted on more elevated banks and scattered within the reed swamp.

A10.210 The southeast corner of the site (around TQ 60089 75426) comprised of additional wetland (including P8), which was included as part of the Black Duck Marsh (Area 4) for the purpose of the current survey. This area may be hydrologically separate from the main area, but supported a structurally diverse range of wetland habitat. This area included inundated hard standing, with ditches and raised banks and wet woodland and scrub habitats. Some of the habitat, including an access track around TQ 60114 75455, was inundated to a depth of around 30 cm during the early part of the field season, supported a range of lesser waterboatmen (Corixidae) and diving beetles (Dytiscidae), at this time.

A10.211 The swamp in this area was generally more diverse than much of the general reedbed, with macrophytes including Greater Reedmace *Typha latifolia*, Reed Canary Grass *Phalaris arundinacea*, Common Spike-rush *Eleocharis palustris* and a water crowfoot *Ranunculus* sp. The open water areas in this compartment were generally shallow, providing potentially significant invertebrate habitat and the structural diversity in the form of raised banks and wooded habitat provided opportunities for wet woodland and wetland edge species. There was also a resource of wood decay habitat and saturated dead wood, with potential to support specialist diptera. The more raised wooded parts of this area supported scrub species including Hawthorn *Crataegus monogyna,* English Elm *Ulmus procera* and Bramble *Rubus fruticosus* (agg.) as

well as birch *Betula* sp., willows *Salix spp*. and taller Lombardy Poplar *Populus nigra var. italica.*

A10.212 In the northeast corner of Black Duck Marsh (TQ 59994 75722), the perimeter drain was relatively open, with stands of macrophytes including Sea Club-rush *Bolboschoenus maritimus*, as well as the ubiquitous Common Reed, possibly indicating brackish influence. A small pond, located at TQ 60033 75762, was also included within the Black Duck Marsh area (subject to aquatic *sampling*). The margins of the pond was gently shelving, with macrophyte vegetation including Greater Reedmace *Typha latifolia* and Reed Canary Grass *Phalaris arundinacea*, as well as Common Reed *Phragmites australis* and Small Sweet-grass *Glyceria declinata*.

A10.213 Connectivity: Black Duck Marsh (Area 4) itself occupies a significant footprint and is integral in connecting and being complementary to, the biodiversity value of the Swanscombe Peninsula. Collectively, areas including Black Duck Marsh, the extensive reedswamp habitat around the former Swanscombe Sewage works (Area 6B), the coastal grazing marshes of Botany Marsh and associated reedswamps (Areas 7 and 8), and other brackish and freshwater habitat scattered throughout the lower lying areas of the Peninsula, form a significant resource of wetland habitat. The habitat contributes on a wider landscape scale to a number of statutory and non-statutory designated sites within the Thames corridor.

A10.214 Substrate: Area 4: Chalk sedimentary bedrock (Lewes Nodular Chalk Formation; Seaford Chalk Formation and Newhaven Chalk Formation) with alluvium, clay, silt, sand and peat sedimentary superficial deposits.

A10.215 Wetness: Area 4 was an extensive wetland site, comprising large areas of reedswamp; open water, marginal swamp communities and wet woodland/carr habitat.

A10.216 Structure: Area 4 supports some of the most structurally diverse habitat within the survey area; with varied (man-made and naturally occurring) topographical features such as banks and habitat areas supporting inundation habitats of various depths. Some of the deeper water areas provide permanent open water habitat, whilst other areas provided seasonally inundated, ephemeral wetlands. Whilst much of the open habitat supported fairly uniform reedswamp habitat, there was a significant resource of carr and scrub habitat throughout the site and a standing and fallen wood decay resource was evident.

Invertebrate Survey Dates:

- Terrestrial surveys were conducted on the following dates: 19/05/2020; 15/06/2020; 13/07/20 and 18-19/08/20 (pitfall traps were set on these dates and collected 14 days later); and

- Aquatic surveys were conducted on the following dates: 2/06/2020; 14/07/20 and 10/08/2020.

Table EDP A10.23: Number of samples per substrate.

	Area 4 – Black Duck Marsh	**Total**
Beating	4	4
Malaise	3	3
Pitfall (cluster of 10)	3	3
Aquatic (3 minute sweep)	7	7

Total Number of Species Recorded:

- Combined terrestrial and aquatic sample data = 265;

- Terrestrial data only = 187; and

- Aquatic data only = 78.

A10.217 A comparison of the relative number of species recorded from each of the major taxons is included in the following graph (includes species collected using both terrestrial and aquatic sampling methods):

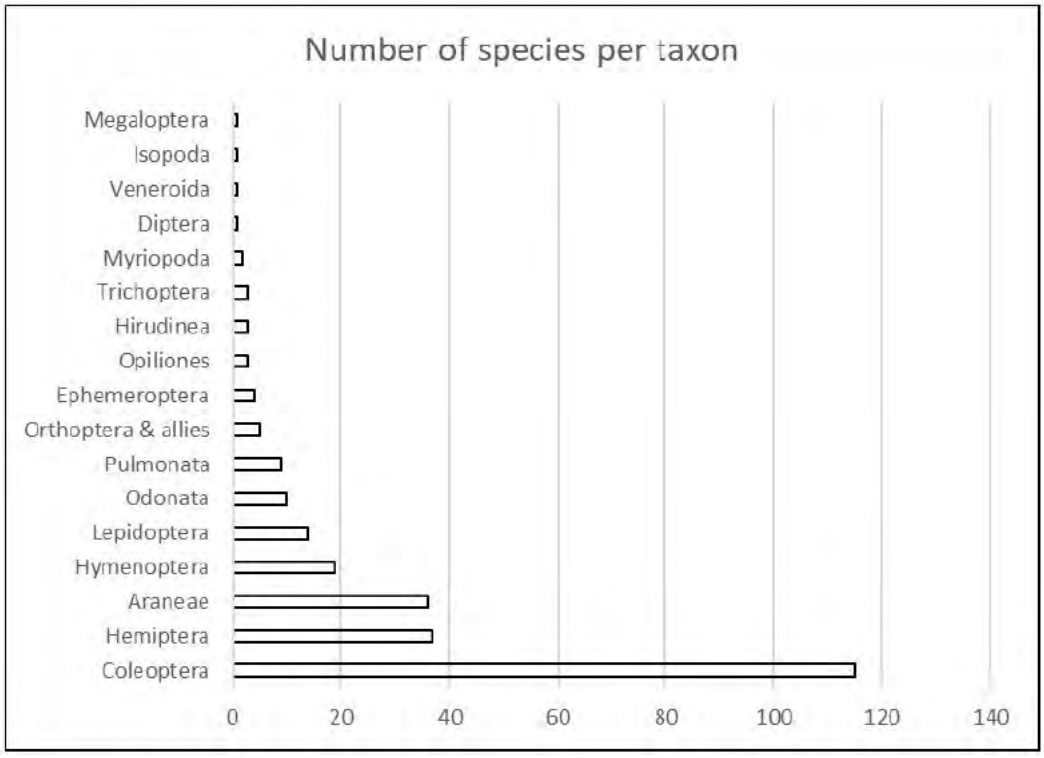

Chart EDP A10.6: A comparison of the relative number of species recorded from each of the major taxons

Table EDP A10.24: Species of recognised conservation recorded from Area 4: (terrestrial and aquatic survey data combined)

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
Mellet's Downy-Back	*Ophonus melletii*	Carabidae	Coleoptera	S41 Priority species; Nationally Rare; Near Threatened	NT
A ladybird beetle	*Clitostethus arcuatus*	Coccinellidae	Coleoptera	Nationally Endangered (RDB1 pre-1994)	
Blue Carpenter Bee	*Ceratina cyanea*	Apidae	Hymenoptera	RDB3 pre-1994 criteria	LC
A ground beetle	*Acupalpus maculatus*	Carabidae	Coleoptera	Nationally Rare (RDB3 pre-1994)	NT
A myrmicine ant	*Myrmica specioides*	Formicidae	Hymenoptera	Nationally Rare (RDB3 pre-1994)	
A malachite beetle	*Cerapheles terminatus*	Malachiidae	Coleoptera	Nationally Rare (RDB3 pre-1994)	LC
A water scavenger beetle	*Hydrochus ignicollis*	Hydrophilidae	Coleoptera	Near Threatened	NT
A shining flower beetle	*Olibrus flavicornis*	Phalacridae	Coleoptera	Red Data Book-insufficiently known	DD
An anthicid beetle	*Cyclodinus constrictus*	Anthicidae	Coleoptera	Nationally Scarce	LC
Four-banded Flower Bee	*Anthophora quadrimaculata*	Apidae	Hymenoptera	Nationally Scarce	LC
A ground beetle	*Badister collaris*	Carabidae	Coleoptera	Nationally Scarce	LC
A longhorn beetle	*Gracilia minuta*	Cerambycidae	Coleoptera	Nationally Scarce	LC
A lacehopper	*Pentastiridius leporinus*	Cixiidae	Hemiptera	Nationally Scarce	LC
A ladybird beetle	*Scymnus limbatus*	Coccinellidae	Coleoptera	Nationally Scarce	LC
A centipede	*Henia vesuviana*	Dignathodontidae	Geophilomorpha	Nationally Scarce	
A diving beetle	*Dytiscus circumcinctus*	Dytiscidae	Coleoptera	Nationally Scarce	LC
A diving beetle	*Graptodytes bilineatus*	Dytiscidae	Coleoptera	Nationally Scarce	LC
A diving beetle	*Rhantus frontalis*	Dytiscidae	Coleoptera	Nationally Scarce	LC
A gnaphosid spider	*Drassodes pubescens*	Gnaphosidae	Araneae	Nationally Scarce	LC
A whirligig beetle	*Gyrinus paykulli*	Gyrinidae	Coleoptera	Nationally Scarce	LC
A crawling water beetle	*Peltodytes caesus*	Haliplidae	Coleoptera	Nationally Scarce	LC
A water scavenger beetle	*Berosus luridus*	Hydrophilidae	Coleoptera	Nationally Scarce	NT
A mordellid beetle	*Mordellistena neuwaldeggiana*	Mordellidae	Coleoptera	Nationally Scarce	LC
A tumbling flower beetle	*Mordellistena variegata*	Mordellidae	Coleoptera	Nationally Scarce	LC
Sandrunner	*Sciocoris cursitans*	Pentatomida	Hemiptera	Nationally Scarce	LC

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
Shieldbug		e			
Rosy-striped Knot-horn	*Oncocera semirubella*	Pyralidae	Lepidoptera	Nationally Scarce	LC
A jumping spider	*Salticus zebraneus*	Salticidae	Araneae	Nationally Scarce	LC
A jumping spider	*Synageles venator*	Salticidae	Araneae	Nationally Scarce	LC
A zodariid spider	*Zodarion italicum*	Zodariidae	Araneae	Nationally Scarce	LC
An erirhinid weevil	*Notaris scirpi*	Erirhinidae	Coleoptera	[Nationaly Scarce B]	

A10.218 SQI score for Area 4: Black Duck Marsh:

- Combined terrestrial and aquatic sample data = 9.8 (258 contributing species); and
- Terrestrial data only = 11.5 (182 contributing species).

Pantheon Output Tables for Area 4: (terrestrial and aquatic survey data combined)

Table EDP A10.25: Habitats & resources: broad biotopes

Broad biotopei	No. of species	% representation	SQI	Conservation statusi	Species with conservation status
wetlandi	97	4	150	8 NSi; 3 NTi; 2 NRi; 1 [Nb]	11
open habitatsi	91	2	143	1 NTi; 4 NSi; 1 NRi; 1 RDB 3i; 1 Section 41 Priority Species; 1 Nbi; 1 [RDB 3]	8
tree-associatedi	40	1	187	3 NSi; 1 Nbi; 1 RDB 1i; 1 RDB 2i	6
coastali	4	<1	250	1 Nbi; 1 NSi	2
shaded woodland floori	1	33	100		

Table EDP A10.26: Habitats & resources: habitats

Broad biotopei	Habitati	No. of species	% representation	Conservation statusi	SQI	Species with conservation status
wetlandi	marshlandi	70	8	4 NSi; 2 NTi; 1 NRi; 1 [Nb]	138	6
open habitatsi	tall sward & scrubi	59	2	1 NSi; 1 [RDB 3]	111	2
tree-associatedi	arborealı	31	2	1 NSi; 1 Nbi; 1 RDB 1i	170	3
open habitatsi	short sward & bare	27	2	1 NTi; 3 NSi; 1 RDB 3i; 1 NRi; 1 Section 41 Priority Species;	207	6

Broad biotope	Habitat	No. of species	% representation	Conservation status	SQI	Species with conservation status
	ground			1 Nb		
wetland	peatland	21	2	1 NR; 4 NS; 1 NT	205	5
tree-associated	decaying wood	8	<1	2 NS; 1 RDB 2	263	3
wetland	lake	8	6	1 NS	138	1
wetland	running water	8	<1		100	
tree-associated	shaded woodland floor	3	<1	1 NS	175	1
tree-associated	wet woodland	3	1	1 NS	200	1
wetland	wet woodland	3	1	1 NS	200	1
coastal	saltmarsh	3	1	1 Nb; 1 NS	300	2
coastal	brackish pools & ditches	2	2		100	
open habitats	upland	1	<1		100	

Table EDP A10.27: Habitats & resources: ISIS specific assemblage types

Broad biotope	Habitat	SAT	No. of species	% representation	SQI	Conservation status	Species with conservation status	Code	Reported condition
wetland	marshland	open water on disturbed mineral sediments	10	25	190	3 NS; 1 NT	3	W211	Favourable
open habitats		rich flower resource	10	4	220	1 [RDB 3]; 1 Nb	2	F002	Unfavourable (10 of 15 species)
open habitats	short sward & bare ground	bare sand & chalk	9	2	211	1 NS; 1 RDB 3	2	F111	Unfavourable (9 of 19 species)

Broad biotopei	Habitati	SAT	No. of speciesi	% representationi	SQIi	Conservation statusi	Species with conservation status	Codei	Reported conditioni
open habitatsi		scrub edgei	8	4	100			F001	Unfavourable (8 of 11 species)
wetlandi	peatlandi	reed-fen & poolsi	5	4	480	3 NSi; 1 NTi; 1 NRi	4	W314	Unfavourable (5 of 11 species)
open habitatsi	short sward & bare groundi	open short swardi	5	2	160	1 NSi	1	F112	Unfavourable (5 of 13 species)
tree-associatedi	decaying woodi	bark & sapwood decayi	5	<1	300	1 NSi; 1 RDB 2i	2	A212	Unfavourable (5 of 19 species)
coastali	saltmarshi	saltmarsh & transitional brackish marshi	1	<1	400	1 NSi	1	M311	Unfavourable (1 of 9 species)
tree-associatedi	decaying woodi	fungal fruiting bodiesi	1	1	100			A213	Unfavourable (1 of 7 species)
open habitatsi		scrub-heath & moorlandi	1	<1	100			F003	Unfavourable (1 of 9 species)
wetlandi	peatlandi	moss & tussock feni	1	2	100			W313	Unfavourable (1 of 6 species)

Site-Specific Limitations

A10.219 Area 4, was subject to the following sampling limitations/constraints:

- Access to central areas of the site were difficult; therefore, terrestrial habitat survey had to be conducted using malaise and pitfall traps at the margin of the site only. However, some aquatic sampling of area was carried out via a boat survey enabling access to the inner wetland habitat; and

- At the time of writing, there was a delay in obtaining identified Diptera data from the current site.

Discussion/Evaluation – Area 4

A10.220 Area 4 supported a large area of Common Reed *Phragmites australis* reedswamp, with an extensive, centrally-placed area of open water and a network of engineered rhynes. Areas of more diverse swamp habitat were recorded in an additional wetland area occupying the southeast corner of the site (including P8), this area was topographically diverse and had formed over areas of manmade hard-standing. There were raised banks and wet woodland/carr habitat in this area. Scrub consisting predominately of Grey Willow *Salix cinerea* also occurred extensively at the peripheries of the larger reedbed. A separate pond in the northeast corner of Area 4 was also surveyed.

A10.221 During the 2020 survey a total of 265 invertebrate species were recorded from Area 4, including 187 species derived from terrestrial survey methods and 78 from aquatic sampling using timed sweeps. In, total 31 species are of recognised conservation status in the UK were recorded from Area 4. These included one species classed as 'Species of principal importance' under section 41 of the NERC Act (2006), this species also being classed as Nationally Rare with a threat status of Near Threatened under post-2001 IUCN criteria. One additional species was also classed as Near Threatened under post-2001 IUCN criteria.

A10.222 In addition, one species RDB1 'Endangered' under pre-1994 criteria was recorded (however, this species has increased in the UK and is likely to be subject to status review); with four species classed as Nationally Rare (RDB3) based on pre-1994 criteria; one species classed as 'Insufficiently known' RBDK and 22 species currently classed as Nationally Scarce in the UK, were recorded. Where applicable, these species are listed in relation to the attributed Pantheon assemblages to which they are attributed, below.

A10.223 From Pantheon analysis undertaken for Area 4, the largest number of species were attributed to the 'Wetland' assemblage at biotope level, with 97 attributed species. In addition, 91 species were attributed to 'Open habitats', 40 to 'Tree associated' and four 'Coastal' species, were recorded. This broad-biotope deployment accurately reflected the level of targeted sampling and also the habitats present.

A10.224 Whilst almost as many species were attributed to 'Open habitats' at this level, these represented only two percent of the overall 'Open habitats' species pool within the Pantheon database; the 'Wetland' pool is significantly smaller and consequently, the 97 species attributed to this assemblage represented four

percent of all species within the database. Despite supporting fewer species, the SQI score for the 'Tree associated' biotope-level assemblage was highest at 187, compared to 150 for 'Wetland' and 143 for 'Open habitats'.

A10.225 At a habitat level, the largest number of species attributed to a single assemblage was 70, attributed to the 'Marshland' assemblage, with 59 species being ascribed to 'Tall sward and scrub', 27 to 'Short sward and bare ground' and the other wetland assemblage 'Peatland' was attributed with 21 species. Other assemblages of note, which were represented at non-significant levels included 'Decaying wood' with eight recognised species and 'Saltmarsh', mentioned here as two of the three species attributed to this assemblage were nationally scarce.

A10.226 In terms of rarity value, whilst 'Marshland' was attributed with six (out of 70) species of recognised conservation status, at 138, the SQI score for this assemblage was considerably lower than for the less well subscribed, albeit, significantly represented habitat-level assemblages 'Short sward and bare ground' and 'Peatland'. The former of these was also attributed with six species of higher conservation value, despite comprising only 27 species and achieved an SQI score of 207. Similarly, of only 21 species attributed to the 'Peatland' assemblage, five were of recognised conservation status and the SQI score recorded for this assemblage in Pantheon, was corresponding high, at 205.

A10.227 In pre-Pantheon ISIS versions, when FC thresholds were set at habitat-level (then called Broad Assemblage Types BATs), the target SQI score for 'Peatland' was 180 and for 'Unshaded early successional mosaic', the predecessor to 'Short sward and bare ground' was 160. Although, the FC approach was removed at habitat level with the advent of Pantheon, it gives an indication of the relative value of assemblages at this level. Following this approach, both 'Short sward and bare ground' and 'Peatland' assemblages can be considered to be both significantly represented and of very high conservation value at this level.

A10.228 Species of conservation value attributed to wetland assemblages in the Pantheon output for Area 4, which were not also represented at SAT level included two hygrophilus ground beetles including the Nationally Rare and 'Near Threatened' Acupalpus maculatus and the nationally scarce Badister collaris both attributed to 'Marshland' as was the weevil Notaris scirpi (this species is likely to be downgraded from its current nationally scarce status). The only uncommon species attributed at habitat-level only to the peatland assemblage was a nationally scarce diving beetle, Rhantus frontalis.

A10.229 At SAT[24] level, one wetland assemblage, the W211 ‘Open water on disturbed mineral sediments’ SAT was reported as being of Favourable Condition for the site. This assemblage, sub-assemblage of the ‘Marshland’ assemblage, was attributed with 10 species, compared to its FC threshold of six.

A10.230 The three species of note attributed to W211 were all aquatic beetles and included *Berosus luridus,* a nationally scarce and ‘Near Threatened’ water-scavenger beetle, which is found in 'lowland ponds and slow drains with a peaty substratum' (Foster, 2010); *Dytiscus circumcinctus,* a large predatory diving beetle, which occurs in 'vegetated, permanent still water in lowland ponds, lakes and drains' (Foster and Friday, 2009) and *Peltodytes caesus*, a crawling water beetle which according to Foster and Friday (2009) is 'Confined to lowland rich fen pools and ditches'.

A10.231 Despite being attributed with relatively few species and falling well below its corresponding FC threshold score of 11 species, another wetland SAT W314 ‘Reedfen and pools’ which is nested in the ‘Peatland’ assemblage was attributed with four rarities, more than any of the other SATs represented within the Pantheon output for Area 4. These species included *Cerapheles terminatus* an extremely rare species of malachite beetle, which appears to have not previously been recorded from the Thames corridor. Duff (2020) states that this species is usually found 'on flowers in meadows and fens'; and three nationally scarce water beetles including; *Hydrochus ignicollis* a water-scavenger beetle, which according to Foster (2010), 'occurs in stagnant, well vegetated pools, often in association with mosses in the margins of pools which dry out;' a diving beetle *Graptodytes bilineatus* which ‘occurs in England mainly in reedbeds, sometimes in brackish water' (Foster and Friday, 2009) and a whirligig beetle *Gyrinus paykulli* which according to Foster and Friday (2009) 'typically skulks in reedbeds and can occur in base-enriched sites'.

A10.232 It is also worth noting that ‘Saltmarsh’ associated rarities including a nationally scarce ant-like flower beetle *Cyclodinus constrictus* and a lacehopper *Pentastiridius leporinus*, were recorded from Area 4, this being indicative of the close proximity of Area 4 to the coast and the brackish nature of the site.

A10.233 Whilst the ‘Tall sward and scrub’ assemblage was the second most strongly attributed assemblage at habitat-level, the recorded SQI score of 111 for this assemblage was modest. Although the assemblage was attributed with two species of recognised conservation status, including the Little Blue Carpenter Bee *Ceratina cyanea* (currently classed as RDB3, but in need of status revision

[24] Specific Assemblage Type (SAT) level is usually considered to be the most important level in the Pantheon hierarchy for assessing the conservation value of a site. SATs are generally composed of habitat specialists, and often include species of higher conservation status.

to nationally scarce) and a nationally scarce gnaphosid spider *Drassodes pubescens*.

A10.234 Despite being represented by just under half the number of species as 'Tall sward and scrub', the 'Short sward and bare ground' assemblage, six of the species attributed to this assemblage were of recognised conservation value. These species were generally better represented in adjacent grassland and scrub mosaic and OMH sites such as Area 3 and 2, but their occurrence in edege habitats of Area 4 illustrates that wetland edge habitats can aslo be important for species generally associated with drier conditions.

A10.235 Species of particular note attributed to 'Short sward and bare ground' included the s41, Nationally Rare and 'Near Threatened' ground beetle Mellet's Downy-Back *Ophonus melletii,* which was also recorded in adjacent Area 3; as well as two nationally scarce spiders *Synageles venator* and *Zodarion italicum*, the Sandrunner Shieldbug *Sciocoris cursitans,* which is more usually associated with xerophilic conditions and the Four-banded Flower Bee *Anthophora quadrimaculata.*

A10.236 Another very rare species, the RDB3 ant species *Myrmica specioides* was also attributed to the 'Short sward and bare ground' assemblage for Area 4. This species is very rare nationally, but has a national stronghold in the Thames corridor. Preferred habitat is described in Collins and Roy eds., 2012 as 'Warm, dry, sunny situations with sparse vegetation'. The insect is said to favour 'coastal south-facing slopes and sand dunes', but 'suitable post-industrial sites' are also cited. The precise origin in Area 4 of *M. specioides* was not recorded; however, the ant is likely to have been recorded from the raised banks towards the southeast corner of the site.

A10.237 Tree-associated assemblages recorded from the Pantheon output for Area 4 at habitat-level included the 'Arboreal' assemblage. 'Arboreal' was both the third most strongly represented assemblage at habitat-level, with 40 attributed species and also recorded a SQI score of 170, this again indicating an assemblage of higher conservation value. The assemblage was attributed with three species of recognised conservation status in the UK, including one species, the Horseshoe Ladybird *Clitostethus arcuatus,* which is currently classed as Nationally Endangered (RDB1) under pre-1994 criteria. This species has mainly been recorded from the Thames corridor and East Anglia in the UK, but an increase in records suggests that the RDB1 status requires revision. Despite this, Horseshoe Ladybird is still decidedly rare in the UK. The insect is associated predominantly with Ivy-covered trees (Duff 2020).

A10.238 The other two uncommon species attributed to the 'Arboreal' assemblage, were both nationally scarce and included the Bordered Scymnus *Scymnus limbatus,*

another species of ladybird, which according to Roy and Brown (2018), is associated with 'deciduous trees in marshy habitats'; and a jumping spider *Salticus zebraneus*, an arboreal species, which has been associated with pine *Pinus* spp. as well as a range of, often mature broadleaved trees especially in ancient woodland and wood pasture habitats.

A10.239 Despite being attributed with relatively few species at habitat-level 'Decaying wood', can be seen as being closely allied to the 'Arboreal' assemblage; furthermore three of the eight species attributed to 'Decaying wood' were of recognised conservation status. These included the jumping spider *Salticus zebraneus* (also ascribed to the 'Arboreal' assemblage), as well as the Basket Longhorn Beetle *Gracilia minuta*, formerly an RDB2 species which was downgraded in a status review by Alexander (2019) and *Mordellistena neuwaldeggiana*, a nationally scarce species of tumbling-flower beetle associated with woodland and wood pasture habitats (Hyman and Parsons, 1992).

A10.240 The non-Pantheon SQI score recorded for Area 4 was 11.5 for species collected using terrestrial sampling methods only and 9.8, based on combined terrestrial and aquatic sample data. According to Harvey (2014)[25] an SQI value of 7.5 indicates an 'excellent' site for invertebrates, whilst one approaching 10.00 is 'almost certainly of national significance.'

Conclusion

A10.241 Overall, as may be expected from a habitat comprising primarily of reedswamp and other wetland habitats, wetland invertebrate assemblages were the best represented assemblages at both broad-biotope and habitat-level for Area 4. This was born out at SAT level, with two of the most strongly represented SATs in terms of rarity for the site included W211 'Open water on disturbed mineral sediments', and W314 'Reedfen and pools'. The W211 SAT was the only assemblage which achieved a species score exceeding its Favourable Condition threshold for Area 4, and also comprised rarities of high conservation value including *Berosus luridus*, *Dytiscus circumcinctus* and *Peltodytes caesus*. However, besides the nationally scarce water beetles including *Hydrochus ignicollis, Gyrinus paykulli* and *Graptodytes bilineatus* attributed to the W314 'Reedfen and pools' SAT, this asssemblage also included an extremely rare malachite beetle *Cerapheles terminatus.*

A10.242 In addition to these, several other species recorded from Area 4 were recorded from the site. These included two Nationally Rare and Near Threatened ground beetles the wetland-associated *Acupalpus maculatus* and the more xerophilic

[25] Harvey based his evaluation on invertebrate fauna in Essex, the Kent fauna within the Swanscombe part of the Thames corridor is comparable with this standard.

s41 'priority species' Mellet's Downy-Back *Ophonus melletii.* The wooded elements of Area 4, including both (arboreal and wood-decay habitats) were also found to support several rarities including the RDB1 'Endangered' (but spreading) Horseshoe Ladybird *Clitostethus arcuatus*, and nationally scarce species including Bordered Scymnus *Scymnus limbatus,* a tumbling-flower beetle *Mordellistena neuwaldeggiana*, Basket Longhorn Beetle *Gracilia minuta* and a jumping spider *Salticus zebraneus*.

A10.243 From Pantheon analysis of 2020 terrestrial and aquatic Invertebrate data from Area 4, Black Duck Marsh, The site can be said to support wetland invertebrate assemblages representative of reedswamp and open water habitats of National significance. The site also supports tree-associated and arboreal, as well as short sward and bare ground assemblages of some significance. The independently calculated SQI scores of 11.5 for species collected using terrestrial sampling methods only and 9.8, based on combined terrestrial and aquatic sample data, indicate that the Area 4 may be considered to support invertebrate assemblages of national importance on a whole site level.

Area 5: Swanscombe Grassland Scrub/Omh/Wetland

Centroid grid reference: TQ 60295 75623

Overall area: 12.9 hectares

Designations on site: None

S41 habitats present: Open mosaic habitat on previously developed land; Reedswamp

Habitat Description

A10.244 Area 5 supported a relatively diverse range of habitats, including fairly herb-rich, dry calcareous grassland and scrub mosaic, areas of dense scrub, OMH and planted wooded areas. Wetland habitat, including a large pond (P3) also occurred towards the north of the site and a wet ditch, with reed-swamp and wet woodland/carr vegetation, bordered the length of the site's eastern boundary.

A10.245 The site was topographically varied, with much of the grassland and scrub/woodland habitat occupying a raised area with a flattish grassland and scrub mosaic habitat at the top, sloping to form southwest, northeast, and northwest facing escarpments. A strip of OMH mainly occupied the

southwestern extremity of Area 5, with similar habitat immediately to the north of the small lake in the northern part of the site.

A10.246 The OMH around TQ 60182 75429 comprised partially-vegetated bare ground with some microtopographic variation and a range of herbs including established non-native Goat's Rue *Galega officinalis* and Lucerne *Medicago sativa,* as well as native species including Common Bird's-foot Trefoil *Lotus corniculatus,* Narrow-leaved Bird's-foot Trefoil *L. tenuis,* Black Medick *Medicago lupulina,* Spotted Medick *M. arabica,* Common Vetch *Vicia sativa,* melilots *Melilotus spp.* Ribwort Plantain *Plantago lanceolata,* Wild Carrot *Daucus carota,* Wild Fennel *Foeniculum vulgare,* Mouse-ear Hawkweed *Pilosella officinarum,* Ox-eye Daisy *Chrysanthemum leucanthemum,* Bristly Ox-tongue *Picris echioides,* Common Cat's-ear *Hypochaeris radicata,* Yarrow *Achillea millefolium,* Dandelion *Taraxacum officinale* (agg.), Colt's-foot *Tussilago farfara,* Viper's Bugloss *Echium vulgare,* Mugwort *Artemisia vulgaris* and Common Mouse-ear *Cerastium fontanum*, and Hedge Bedstraw *Galium mollugo;* with various other herbs and graminoids.

A10.247 A similar range of species occurred on some of the more herb-rich and open grassland areas, towards the north of the site around TQ 60288 75783 and on the upper grassland area around TQ 60272 75659. Tor Grass Brachypodium *pinnatum,* a typical calcareous grassland graminoid was recorded in some areas, alongside more generalist graminoids including Common Couch *Elytrigia repens*, Yorkshire Fog *Holcus lanatus* and Red Fescue *Festuca rubra*.

A10.248 The dominant scrub species within the drier parts of the site was Hawthorn *Crataegus monogyna*, with Silver Birch *Betula pendula* and non-native Buddleia Buddleja *davidii.* Grey and Goat Willow *Salix cinerea* and *S. caprea*, occurring commonly, including within both the raised grassland and the wetter, slope-base carr habitat. Bramble *Rubus fruticosus* (agg.) and Dog Rose *Rosa canina* scrub was also abundant and formed patches in mosaic with the grassland and OMH.

A10.249 Two strips of planted woodland occurred on the site; one occupying the east facing escarpment of the site around TQ 60350 75762 and a second bordering the western margin of the lake around TQ 60325 75874. These areas supported relatively young and heavily shaded aggregations of trees including Sycamore *Acer pseudoplatanus,* Ash *Fraxinus excelsior,* Holme Oak *Quercus ilex,* Field Maple *Acer campestre* and Hawthorn *Crataegus monogyna.* In their current condition, these habitats were of relatively low conservation potential, with little light reaching the herb-poor ground layer and comprising partly of non-native trees of relatively low conservation value to invertebrates. However, these areas contributed to the structural diversity of the site and provide some habitat for arboreal invertebrate assemblages.

A10.250 The large pond/small lake (P3) located towards the northern end of Area 5, provided a reasonably extensive open water area. The western border was wooded and the eastern margin was vegetated with a fringe of Common Reed *Phragmites australis.* The lake itself rather lacked marginal, emergent, floating-leaved or submeregd aquatic macrophyte diversity (during the early May scoping study), but supported extensive, shallow marginal shelves, which had potential to support aquatic invertebrate fauna associated with more calcareous conditions. The ditch bordering the site's eastern boundary (D10) was bordered with Common Reed, but generally appeared eutrophic, with areas of floating filamentous alga, but little other aquatic vegetation, though a water starwort *Callitriche* sp. was recorded locally.

A10.251 Connectivity: Area 5 supports OMH, grassland and scrub mosaic and wetland habitat representative of the Swanscombe Peninsula and the associated corridor of sites, within the survey area to the south. The site is contiguous to similar habitat within Areas 6a and 6b, immediately to the east and to more extensive wetland and OMH habitat areas, contiguous to the site's western and north-western boundaries.

A10.252 Area 5 can, therefore be seen as contributing to overall area of important invertebrate habitats within the immediate landscape.

A10.253 The OMH and grassland and scrub mosaic and wetland habitat types contribute on a wider landscape scale, to the collective network of statutory and non-statutory designated sites within the Thames corridor.

A10.254 Substrate: Area 5: Chalk sedimentary bedrock (Lewes Nodular Chalk Formation; Seaford Chalk Formation and Newhaven Chalk Formation) with alluvium, clay, silt, sand and peat sedimentary superficial deposits.

A10.255 Wetness: Area 5 was bordered to the west by the extensive wetlands of Black Duck Marsh (Area 4) and by similarly extensive wetland habitat within Area 6b, to the east. On a within site level, the lake (P3) and drainage ditch (D10) lie in close proximity to the wetland habitat. There were also wetted areas and seasonally inundated habitat patches at the margins of the OMH in the southwest corner of the site; this adding to the value of this habitat to specialist invertebrates requiring a complex wet and dry habitat mosaic.

A10.256 Structure: Area 5 is a structurally diverse site, both in terms of topography, microtopography and due to the vegetational architecture. There were more sparsely vegetated areas with bare ground and scattered stones and debris as well as grassland habitats of varying sward height and degree of scrub succession. The wetland margins supported Common Reed, which, along with

scrub-species such as Bramble, provides a nesting resource for stem nesting invertebrates. Whilst the planted wooded areas on site were rather uniform and created heavy shade, these features provided some structural variation on a site level.

Invertebrate Survey Dates:

- Terrestrial surveys were conducted at Area 5 on the following dates: 18/05/2020; 15/06/2020; 13/07/2020 and 18/08/20; and

- Aquatic surveys were conducted on the following dates: 2/06/2020 and 10/08/2020.

Table EDP A10.28: Number of samples per substrate.

	Area 5 – grassland and scrub	Area 5 - wetland	Total
Sweep	4		4
Vacuum	4		4
Beating	4		4
Pan traps (cluster of 10)	4		4
Aquatic (3 minute sweep)		2	2

Total Number of Species Recorded:

- Combined terrestrial and aquatic sample data = 318;

- Terrestrial data only = 283[26]; and

- Aquatic data only = 35[27].

A10.257 A comparison of the relative number of species recorded from each of the major taxons is included in the following graph (includes species collected using both terrestrial and aquatic sampling methods).

[26] Note: Terrestrial and aquatic data may not add up to the combined figure, as there may be overlap between species recorded both in terrestrial and aquatic samples

[27] Species list small, as many of the contributing species were not recorded to species-level and therefore, not used for conservation evaluation

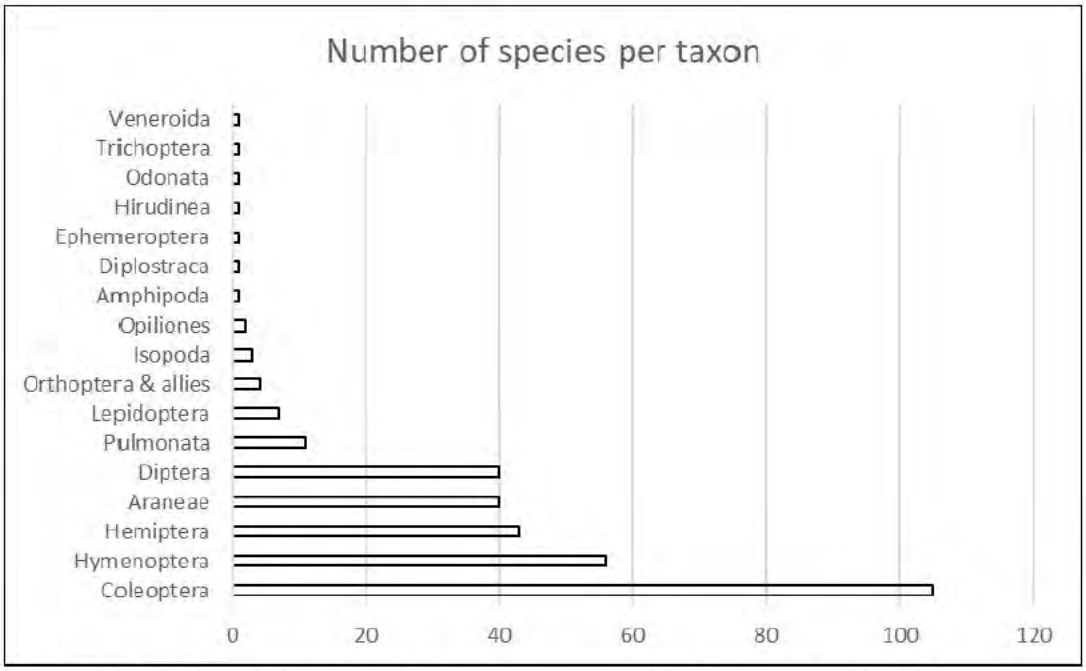

Chart EDP A10.7: A comparison of the relative number of species recorded from each of the major taxons

Table EDP A10.29: Species of recognised conservation recorded from Area 5: Swanscombe grassland and scrub:

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
Beewolf	*Philanthus triangulum*	Crabronidae	Hymenoptera	Nationally Vulnerable (RDB2 pre-1994)	LC
a plant bug	*Lygus pratensis*	Miridae	Hemiptera	RDB3 pre-1994 criteria	LC
Ceratina cyanea	*Ceratina cyanea*	Apidae	Hymenoptera	RDB3 pre-1994 criteria	LC
Squat Furrow Bee	*Lasioglossum pauperatum*	Halictidae	Hymenoptera	RDB3 pre-1994 criteria	
A shining flower beetle	*Olibrus flavicornis*	Phalacridae	Coleoptera	Red Data Book-insufficiently known	DD
A jumping spider	*Ballus chalybeius*	Salticidae	Araneae	Nationally Scarce	LC
A jumping spider	*Sibianor aurocinctus*	Salticidae	Araneae	Nationally Scarce	LC
A comb-footed spider	*Kochiura aulica*	Theridiidae	Araneae	Nationally Scarce	LC
An apionid weevil	*Protapion filirostre*	Apionidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Amara montivaga*	Carabidae	Coleoptera	Nationally Scarce	LC
A leaf beetle	*Cryptocephalus hypochaeridis*	Chrysomelidae	Coleoptera	Nationally Scarce	LC
Adonis Ladybird	*Hippodamia variegata*	Coccinellidae	Coleoptera	Nationally Scarce	LC
A weevil	*Sitona waterhousei*	Curculionidae	Coleoptera	Nationally Scarce	
A crawling water beetle	*Peltodytes caesus*	Haliplidae	Coleoptera	Nationally Scarce	LC
A water scavenger beetle	*Berosus luridus*	Hydrophilidae	Coleoptera	Nationally Scarce	NT
Hop-garden Earwig	*Apterygida media*	Forficulidae	Dermaptera	Nationally Scarce	LC

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
A chloropid fly	*Trachysiphonella scutellata*	Chloropidae	Diptera	Nationally Scarce	
A planthopper	*Asiraca clavicornis*	Delphacidae	Hemiptera	Nationally Scarce	LC
Sandrunner Shieldbug	*Sciocoris cursitans*	Pentatomidae	Hemiptera	Nationally Scarce	LC
Black Mining Bee	*Andrena pilipes*	Andrenidae	Hymenoptera	Nationally Scarce	
Spined Hylaeus	*Hylaeus cornutus*	Colletidae	Hymenoptera	Nationally Scarce	LC
A solitary wasp	*Nysson trimaculatus*	Crabronidae	Hymenoptera	Nationally Scarce	
Lobe-spurred Furrow Bee	*Lasioglossum pauxillum*	Halictidae	Hymenoptera	Nationally Scarce	LC
Little Sickle-jawed Blood Bee	*Sphecodes longulus*	Halictidae	Hymenoptera	Nationally Scarce	LC
Pantaloon Bee	*Dasypoda hirtipes*	Melittidae	Hymenoptera	Nationally Scarce	LC
A flesh fly	*Blaesoxipha plumicornis*	Sarcophagidae	Diptera	pNationally Scarce	
A flesh fly	*Sarcophila latifrons*	Sarcophagidae	Diptera	pNationally Scarce	
Brown-banded Carder Bee	*Bombus humilis*	Apidae	Hymenoptera	S41 Priority species	
A jumping spider	*Macaroeris nidicolens*	Salticidae	Araneae	Recent UK colonist	NA

A10.258 *SQI score for* Area 5*:*

- Combined terrestrial and aquatic sample data = 9.1 (303 contributing species); and
- Terrestrial data only = 9.7 (271 contributing species).

Pantheon Output Tables for Area 5:

Table EDP A10.30: Habitats & resources: broad biotopes

Broad biotope	No. of species	% representation	SQI	Conservation status	Species with conservation status
open habitats	206	5	127	3 [Na]; 4 Nb; 6 NS; 1 Section 41 Priority Species; 3 [RDB 3]; 1 DD; 2 pNS; 2 [Nb]; 1 RDB 3; 1 [RDB 2]; 1 pNT	24
tree-associated	40	1	125	2 NS; 1 New to Britain; 1 [Nb]; 1 [Na]; 1 DD	5
wetland	34	1	118	1 NT; 2 NS	2
coastal	2	<1	250	1 NS	1

Broad biotopei	No. of species	% representation	SQI	Conservation statusi	Species with conservation status
shaded woodland floori	1	33	100		

Table EDP A10.31: Habitats & resources: habitats

Broad biotopei	Habitati	No. of species	% representation	Conservation statusi	SQI	Species with conservation status
open habitatsi	tall sward & scrubi	124	5	1 RDB 3i; 1 NSi; 1 Section 41 Priority Species; 1 pNS; 1 pNT; 1 [Nb]; 1 [RDB 3]	107	6
open habitatsi	short sward & bare groundi	74	6	4 Nbi; 1 DDi; 4 NSi; 2 [Na]; 1 [RDB 3]; 1 [RDB 2]; 1 RDB 3i; 1 [Nb]; 1 pNS	153	16
wetlandi	marshlandi	27	3	2 NSi; 1 NTi	122	2
tree-associatedi	arborealı	21	2	1 NSi; 1 New to Britaini	114	2
tree-associatedi	decaying woodi	12	1	1 DDi; 1 [Na]; 1 NSi; 1 New to Britaini	150	3
tree-associatedi	shaded woodland floori	8	<1	1 [Nb]	100	1
wetlandi	peatlandi	6	<1		100	
wetlandi	running wateri	2	<1		100	
wetlandi	lakei	2	2		100	
coastali	brackish pools & ditchesi	2	2	1 NSi	250	1
coastali	saltmarshi	1	<1	1 NSi	400	1

Table EDP A10.32: Habitats & resources: ISIS specific assemblage types

Broad biotopei	Habitati	SAT	No. of species	% representation	SQI	Conservation statusi	Species with conservation status	Code	Reported conditioni
open habitatsi		rich flower resourcei	33	14	145	1 [Nb]; 2 [Na]; 1 Section	8	F002	Favourable

Broad biotopei	Habitati	SAT	No. of species	% representation	SQI	Conservation statusi	Species with conservation status	Code	Reported conditioni
						41 Priority Species: 1 Nbi; 2 [RDB 3]; 1 RDB 3i			
open habitatsi	short sward & bare groundi	open short swardi	17	8	188	3 Nbi; 1 DDi; 2 NSi	6	F112	Favourable
open habitatsi		scrub edgei	11	5	155	1 NSi; 1 [Na]	2	F001	Favourable
open habitatsi	short sward & bare groundi	bare sand & chalki	11	2	209	1 pNS; 2 NSi; 1 [Nb]	4	F111	Unfavourable (11 of 19 species)
open habitatsi		scrub-heath & moorlandi	10	3	130	1 [RDB 3]; 1 NSi	2	F003	Favourable
tree-associatedi	decaying woodi	bark & sapwood decayi	8	2	138	1 [Na]	1	A212	Unfavourable (8 of 19 species)
wetlandi	marshlandi	open water on disturbed mineral sedimentsi	4	10	250	2 NSi; 1 NTi	2	W211	Unfavourable (4 of 6 species)
wetlandi	peatlandi	Sphagnum bogi	1	<1	100			W312	Unfavourable (1 of 8 species)
tree-associatedi	decaying woodi	fungal fruiting bodiesi	1	1	100			A213	Unfavourable (1 of 7 species)
coastali	saltmarshi	saltmarsh & transitional brackish marshi	1	<1	400	1 NSi	1	M311	Unfavourable (1 of 9 species)
tree-associatedi	decaying woodi	heartwood decayi	1	<1	100			A211	Unfavourable (1 of 6

Site-Specific Limitations

A10.259 Area 5, was subject to the following sampling limitations/constraints:

- At the time of writing, some diptera records of the site were unavailable. The absence of these records may influence the Pantheon and SQI output.

Discussion/Evaluation - Area 5

A10.260 The habitat recorded within Area 5 comprised some of the more herb-rich grassland and scrub mosaic habitat recorded on the Swanscombe Peninsula (although was not as botanically diverse as Area 10 Crayland's Pit, south of the peninsula). Like Area 6a, the grassland and scrub mosaic occupied a raised area and was of similar composition. There were also elements of more sparsely vegetated disturbance habitat more typical of OMH, particularly towards the south and west of the site.

A10.261 The site was structurally and compositionally diverse and supported habitats of calcareous influence typical of the survey area as a whole. These habitats were found to support a diverse invertebrate fauna with a high proportion of species of recognised conservation value, many of which were characteristic of the OMH and herb-rich grassland sites in the wider Thames corridor.

A10.262 During the 2020 survey, from combined terrestrial and aquatic sampling, a total of 283 species were recorded from Area 5, of which only 35 species were derived from sampling of aquatic habitat. In total, 29 of the recorded species were of recognised conservation status in the UK. These included one species classed as 'Species of principal importance' under section 41 of the NERC Act (2006); one species classed as Nationally Vulnerable (RDB2) based on pre-1994 criteria; three Nationally Rare (RDB3) species based on pre-1994 criteria; one species classed as 'Insufficiently known' RBDK and 22 species currently classed as and including species which have been proposed as Nationally Scarce in the UK.

A10.263 The only s41 species recorded from Area 5 during the 2020 survey was the Brown-banded Carder Bee *Bombus humilis,* a flagship species of OMH and herb-rich Thames terrace grasslands in the Thames corridor. The extremely rare Distinguished Jumping Spider Spider *Sitticus distinguendus* was not recorded from historically recorded locations during the 2020 survey; however, the continued presence of the species on site cannot be discounted and available search time was limited due to the main survey remit, to assess invertebrate assemblages.

A10.264 However, besides the species of recognised conservation status recorded from Area 5 from 2020 survey data, another species of jumping spider *Macaroeris nidicolens* was recorded.

A10.265 *Macaroeris nidicolens* is a distinctive species of jumping spider which was first recorded in the UK in 2002. The species is currently almost restricted to the Thames corridor area, having been recorded from coastal sites on both Essex and Kent sites of the estuary. There are a number of records from Essex immediately north of the Swanscombe Peninsula. In Europe, the spider is associated with arboreal habitats, including on the branches and trunks of trees (Roberts, 1997) and in the UK it has been recorded from scrub on brownfield land including gorse *Ulex* spp., Wild Privet *Ligustrum vulgare* and Hawthorn *Crataegus monogyna.*

A10.266 From Pantheon analysis undertaken for Area 5, the vast majority of species (206) were attributed to 'Open habitats' on a broad biotope level, whilst 40 species were ascribed to the 'Tree associated' assemblage, 34 to 'Wetland' and two to the 'Coastal' assemblage. This broad-biotope deployment reasonably accurately reflected the habitats present on site and level of targeted sampling.

A10.267 At a habitat level, 127 species were attributed to the 'Tall sward and scrub' assemblage, with 74 species being attributed to the 'Short sward and bare ground assemblage'. As is commonly the case with grassland and scrub mosaic sites, the greater overall number of species was attributed to 'Tall sward and scrub'. However, in terms of rarity, the SQI score registered for the 'Short sward and bare ground' assemblage was 153, indicating an assemblage of high conservation value, compared to 107 attributed to 'Tall sward and scrub'. At this level 'Short sward and bare ground' was also the stand out assemblage compared to the less well subscribed, albeit significantly, represented habitat-level assemblages 'Marshland' with an SQI of 122, from 23 species and 'Arboreal' with an SQI of 114 from 21 species.[28]

A10.268 Although 'Tall sward and scrub' did not achieve a high SQI score, this was due largely to the dilution of uncommon species by species which are relatively widespread in the UK. In total, six species of recognised conservation status were attributed to this assemblage. These included the s41 Brown-banded Carder Bee *Bombus humilis,* the RDB3 Little Blue Carpenter Bee *Ceratina cyanea*[29]*,* a nationally scarce and 'Near Threatened' flesh fly *Blaesoxipha plumicornis,* and nationally scarce only species including Hop-garden Earwig *Apterygida media* and Adonis Ladybird *Hippodamia variegata.*[30]

[28] Technically 15 species is just below the threshold for significant SQIs in Pantheon.

[29] This species is still scarce in the UK, but is likely to have its status revised above RDB3 due to a recorded increase in records.

[30] Adonis Ladybird is another species likely to have its status reviewed due to a recorded increase in UK records.

A10.269 At Specific Assemblage Type (SAT) level[31], four SATs achieved *species* scores exceeding their respective Favourable Condition (FC) targets from Pantheon analysis of the Area 5 dataset. These included F112 'Open short sward', nested within the habitat-level 'Short sward and bare ground' assemblage and three resource-based SATs; F002 'Rich flower resource'; F001 'Scrub edge' and F003 'Scrub heath and moorland'. The latter F003 assemblage is something of a red herring, as several typical heathland species often also occur in OMH and other coastal habitats in the Thames corridor.

A10.270 The F112 'Open short sward' assemblage was not only attributed by sufficient species to achieve Favourable Condition status, but also achieved a high SQI[32] score and was attributed with six species of recognised conservation status. The closely related F111 'Bare sand and chalk' SAT, which was often expressed more strongly in OMH or early successional habitat in the wider 2020 survey area, was somewhat less well expressed than F112 within the Area 5 Pantheon output. However, whilst F111 was not attributed with sufficient species to achieve FC status, it was reasonably well expressed with four species of recognised conservation status.

A10.271 All but one species of conservation status attributed to the F112 'Open short sward' SAT, are currently classed as nationally scarce in the UK. These included three beetles, a pot beetle *Cryptocephalus hypochaeridis,* a *Medicago* associated apionid weevil *Protapion filirostre* and a pea weevil *Sitona waterhousei* which is associated with bird's-foot trefoils *Lotus* spp. and two hemipteran bugs, the Sandrunner Shieldbug *Sciocoris cursitans* and a planthopper *Asiraca clavicornis*. The remaining species listed in the 'species with conservation status' section of the Pantheon output for F112 was the Striped Snail *Cernuella virgata,* a species found exclusively on calcareous grassland sites in the UK. It is listed as 'Insufficiently known' Data Deficient category in the Pantheon output, but appears to be well-distributed in the UK.

A10.272 Species of conservation status attributed to the F111 assemblage from the Panthon output included a jumping spider *Sibianor aurocinctus*, a ground beetle *Amara montivaga*, a carrion-associated flesh fly *Sarcophila latifrons* and the Pantaloon Bee *Dasypoda hirtipes*.

A10.273 All species listed for both F112 and F111 SATs are typical species of OMH and calcareous grassland habitats within the Thames corridor. Both assemblages are nested within the F1 'Short sward and bare ground' assemblages in Pantheon and therefore, species attributed to both assemblage are typically associated with drier sparsely vegetated habitats or short sward grasslands,

[31] SAT level is considered to be the most important level for assessing conservation value of a site.
[32] An SQI score in Pantheon is considered robust if it is attributed with 16 or more species

usually with elements of disturbance through livestock poaching, natural events or human activity. Whereas F112 is associated more with more established, short sward grassland where there is a provision of exposed bare ground, through livestock poaching or similar activities. F111 is usually expressed in sparsely vegetated early successional habitats. According to the Pantheon description, dependency of F112 species on warm, dry conditions is less extreme than for F111 species.

A10.274 In addition to those already listed, several species of conservation status were only attributed within the overarching 'Short sward and bare ground' habitat-level assemblage. With 16 species of recognised conservation status, this assemblage (which includes the SATs F111 and F112) was attributed with almost three times as many species of higher conservation value attributed to any assemblage at habitat-level for Area 5 and collectively they can be seen as the site's stand-out feature.

A10.275 Species attributed to 'Short sward and bare ground', but not considered sufficiently specialised to ascribe to F111 or F112, included: The RDB3 Squat Furrow Bee *Lasioglossum pauperatum* and the nationally scarce Black Mining Bee *Andrena pilipes,* both of which are strongly associated with coastal brownfield habitats in the Thames corridor; Little Sickle-jawed Blood Bee *Sphecodes longulus*, Lobe-spurred Furrow Bee *Lasioglossum pauxillum*. Both Black Mining Bee and Little Sickle-jawed Blood Bee were recorded only from Area 5 during the 2020 survey.

A10.276 Little Sickle-jawed Blood Bee is 'mainly associated with dry, sandy heathland and other disturbed sandy situations such as sandpits.' (Collins and Roy eds.,2018), the bee is a a cleptoparasite in the nests of other Halicticine bees; recorded hosts include Least Furrow Bee *Lasioglossum minutissimum* (which was recorded from Areas 2 and 15 during the current survey) and possibly *also L. morio* and *L. leucopus*, which were both also recorded from Area 5 in 2020.

A10.277 The RDB2 classed Bee-wolf *Philanthus triangulum* and Lobe-spurred Furrow Bee *Lasioglossum pauxillum* were both also attributed to 'Short sward and bare ground'; however, both species have considerably increased their UK ranges in recent years and are in need of status review. Another species, the Chalk Yellow-Faced Bee *Hylaeus dilatatus*, is possibly listed as RDB3 in error within the Pantheon database. This species has been subject to confusion with the much rarer and very similar *H. annularis*, which was erroneously considered to be the commoner of the two species in the UK. *H. dilatatus* is now considered to be a locally common species in southern England, whilst *H. annulatus* is an extreme rarity, associated with coastal shingle.

A10.278 Of the three resource-based SATs achieving species scores exceeding their respective FC thresholds for Area 5; F002 'Rich flower resource' was extremely

well attributed. This assemblage comprises entirely of bee species; but as it is poorly defined in terms of tangible reflection of habitat, the flower resouce can cut across several closely approximated habitats. However, F002 focuses on bees and can be interpreted to some extent based on the number, status and habitat usage of attributed species. For Area 5, 33 species were attributed to the F002 'Rich flower resource' SAT and of these, eight species are listed as species of conservation status within Pantheon. These included the s41 listed Brown-banded Carder Bee *Bombus humilis,* as well as other species mentioned previously in relation to other assemblages.

A10.279 Additional bees attriuted to the F002 SAT included the nationally scarce Spined Hylaeus *Hylaeus cornutus*, a stem-nesting species, which according to Falk and Lewington (2015) 'occurs in a variety of umbellifer-rich habitats, especially where Wild Carrot *Daucus carota* is abundant'.

A10.280 The Large Meadow Mining Bee *Andrena labialis,* a rather local species associated with legume-rich grasslands was also attributed to the F002 output for Area 5. Large Meadow Mining Bee has been considered to be worthy of upgrading to nationally scarce status, due to a decline in records.

A10.281 Importantly, the large number of bee species recorded and attributed to the F002 SAT for Area 5, highlight the importance of the flower-rich resource on site, reflecting the actual quality of the grassland habitat recorded on site.

A10.282 In relation to conservation value, the significance of the F001 'Scrub edge' resource-based SAT within Pantheon output has often been considered a rather low value assemblage within Pantheon output for other sites in the wider Swanscombe survey area. This being due to the SAT often comprising entirely of common and widespread species, even when achieving FC status.

A10.283 However, for Area 5, two species of recognised conservation status were attributed to this status. These included the Hop-garden Earwig *Apterygida media* and the previously mentioned, Spined Hylaeus. F003 'Scrub heath and moorland' also achieved a species score which exceeded its FC threshold in Pantheon. Whilst the expression of F003 within habitat far removed from acid heathland conditions, several species attributed to this assemblage are well recorded within brownfield scrub assemblages in the Thames corridor.

A10.284 Species attributed to this assemblage included a nationally scarce comb-footed spider *Kochiura aulica*, which is strongly scrub associated, as well as local orb web spiders *Neoscona adianta* and *Agalenatea redii* found throughout the OMH and coastal grasslands in the Thames corridor.

A10.285 In relation to more woody habitat on site, whilst none of the 'Tree-associated' assemblages were particularly well attributed at habitat, or SAT level; five species of conservation status with affinity to wooded element of the site were attributed at broad-biotope level. These included two jumping spiders including nationally scarce *Ballus chalybeius,* which was well recorded throughout the 2020 survey areas and *Macaroeris nidicolens*, a distinctive arboreal species recorded in the UK for the first time in 2002. *M. nidicolens* is more or less restricted to the Thames corridor in the UK and is primarily found on trees on brownfield land. Another nationally scarce tree-associated species recorded for Area 5, was a long-legged fly *Medetera dendrobaena* and a solitary wasp *Nysson trimaculatus*.

A10.286 Wetland sampling from Area 5 included the large pond (P3) and the northern section of adjacent ditch (D11). From the Pantheon output for wetland habitats, 34 species in total were recognised. However, only two species of recognised conservation status were ascribed collectively to wetlands.

A10.287 The same two species, the nationally scarce and 'Near Threatened' water-scavenger beetle *Berosus luridus* and nationally scarce crawling water beetle *Peltodytes caesus,* were attributed to wetland habitats within the Swanscombe peninsula, including Areas 6b, 7 and 8. As with those assemblages, species of brackish persuasion were also detected from the lake. In the case of Area 5, the Dun Sentinel *Assiminea grayana,* a small snail associated with saltmarshes and brackish water habitats, was also recorded (although the only specimen recorded was long dead). Overall, whilst a reasonable number of species were recorded from the aquatic habitats in Area 5, the conservation value, based on analysis of 2020 data, was generally rather modest compared to the drier terrestrial habitats.

A10.288 The non-Pantheon SQI score recorded for Area 5 was 9.7 for terrestrial only data and 9.1 for combined terrestrial and aquatic datasets. According to Harvey (2014)[33] an SQI value approaching 10.00 is 'almost certainly of national significance.' These scores indicate a conservation value of national significance for the terrestrial only assemblage, although it is clear that the recorded wetland assemblage was not of negligible value and contributed to the conservation value of the Peninsula as a whole, the conservation value of this habitat was relatively modest in comparison to the overall terretrial element.

Conclusion

[33] Harvey based his evaluation on invertebrate fauna in Essex, the Kent fauna within the Swanscombe part of the Thames corridor is comparable with this standard.

A10.289 The invertebrate fauna recorded from the terrestrial elements of Area 5 were found to be representative of herb-rich grassland mosaic and OMH on both a site-level and within a broader Thames corridor. landscape scale.

A10.290 A large number of species of recognised conservation status were recorded from the site during the 2020 survey. The largest number of species of conservation status were attributed through Pantheon analysis to 'Open habitats' at biotope level, with relatively few being distributed to either 'Tree-associated' or 'Wetland' assemblages at this level.

A10.291 This finding was increasingly defined both at habitat and SAT level, the outstanding habitat-level assemblage from Area 5 was found to be 'Short sward and bare ground', whilst F112 'Open short sward' both achieved a species score exceeding its Favourable Condition threshold in Pantheon and comprised a large number of species of recognised conservation status at this level.

A10.292 The results show that the invertebrate fauna of highest conservation value recorded from Area 5 comprise more strongly thermophilic species, with a requirement for elements including short sward grassland occupying warm microhabitats with a resource of bare ground. The very high number of bee species recorded from the site, exhibited through the strongly represented F002 'Rich flower resource' SAT, which also achieved a score well exceeding its FC score in Pantheon, illustrated the value of the diverse and abundant flower resource on the site.

A10.293 Several of the species of conservation status recorded from the site were stem-nesting bee species. Species such as the Little Blue Carpenter Bee *Ceratina cyanea* and Spined Hylaeus *Hylaeus cornutus,* require a resource of woody stems*,* including Bramble and tall-herb vegetation for nesting, alongside herb-rich grassland habitat within a warm, sunny microhabitat.

A10.294 The value of the scrub element of Area 5 was exhibited both through the habitat-level 'Tall herb and scrub', the largest assemblage in terms of species recorded from the site and at SAT-level through the F001 'Scrub edge' and also the F003 'Scrub-heath and moorland' assemblage. Although the latter of these can be seen as being a 'red herring' in a Thames corridor context due to the absence of heathland habitat, several species attributed to this assemblage in Pantheon are scrub associated species, such as the spider *Kochiura aulica*.

A10.295 Although the wetland habitats on site, including the large pond (P3) and adjacent ditch (D10) produced reasonable species lists, the overall conservation value of recorded assemblages was relatively modest.

A10.296 In conclusion, Area 5 can be said to support a 'Short sward and bare ground' and F112 'Open short sward' assemblage of National significance. On a site level an independently calculated SQI of 9.7, indicates that the site's overall conservation value, excluding wetlands, was also of National Importance.

Area 6a and 6b: Swanscombe Grassland And Scrub And Swanscombe Stw Wetland

Centroid grid reference: Area 6a: TQ 60570 75848; Area 6b: TQ 60539 75503

Overall area: Area 6a: 11 hectares; Area 6b: 14.23 hectares

Designations on site: None

S41 habitats present: Open mosaic habitat on previously developed land; Reedswamp

Habitat Description

A10.297 Areas 6a and 6b collectively comprised an extensive area of habitat enclosed within a fenced compound. The habitat within the smaller, northernmost section (Area 6a) comprised semi-improved grassland/scrub mosaic habitat, raised into an elongate, man-made, hill-like feature, with a relatively flat plateau area with moderately steep slopes on all aspects. The base of the southern slope formed a border with the largely flat, more extensive, area of wetland habitat called Area 6b. The boundary of the two habitats was defined by a narrow strip of exposed, partially inundated silt and shingle. This strip, despite being evidently man-made, provided opportunities for hygrophilous invertebrates with specialised habitat requirements.

A10.298 The open grassland and scrub mosaic of Area 6a was frequently tussocky and herb-poor, with Hawthorn *Crataegus monogyna* dominated scrub being quite uniformly spread, becoming increasingly dense on the slopes of the site. This was particularly evident on the site's north, west and eastern aspects; the southerly slope and parts of the plateaued top were significantly more open. The scrub was relatively young, pioneer growth for the most part, with other scrub species including Blackthorn *Prunus spinosa*, Dogwood *Cornus sanguinea* and Grey and Goat Willows occurring alongside sizeable patches of Bramble.

A10.299 Graminoids recorded within the grassland included Common Couch *Elytrigia repens*, Red Fescue *Festuca rubra,* Yorkshire Fog *Holcus* lanatus*,* Creeping Bent *Agrostis stolonifera,* Common Bent *A. capillaris* and Smooth-stalked

Meadow Grass *Poa pratensis*, with more locally occurring Tall Fescue *Festuca arundinacea.*

A10.300 More herb-rich areas of grassland were generally in the shorter sward areas towards the top of the site. Here a range of herbs including Wild Carrot *Daucus carota,* Ribwort Plantain *Plantago lanceolata*, Cut-leaved Crane's-bill *Geranium dissectum*, Narrow-leaved Bird's-foot Trefoil *Lotus tenuis,* Common Bird's-foot Trefoil *L. corniculatus,* Black Medick *Medicago lupulina,* Common Vetch *Vicia sativa*, clovers *Trifolium* spp, Common Cat's-ear *Hypocharis radicata,* Common Mouse-ear *Cerastium fontanum* and other typical herbs of the site as a whole were recorded.

A10.301 There were some areas of vegetated bare ground in places on the site, including around the access gate and between the slope botton and marginal wetland habitat.

A10.302 Area 6b, was largely inaccessible, but could be seen to comprise extensive areas of reed-swamp, with expanses of open water further south and several wide drains passing both around and through the reedswamp. Substantial, mature areas of wet woodland/carr habitat were present in this compartment, with Grey Willow *Salix cinerea,* Goat Willow *S. caprea* and other scrub/wet woodland species such as Alder *Alnus glutinosus*. Large patches of Bramble *Rubus fruticosus* agg. occupied some of the drier parts of the reedswamp, such as around the derelict remains of a former sewage treatment works and at the boundary of the railway terminal crossing the site.

A10.303 There were also some stands of tall herb vegetation, with species such as Greater Willowherb *Epilobium hirsutum,* Common Nettle *Urtica dioica* and Bittersweet *Solanum dulcamara,* persisting within the reedswamp. Few other macrophytes were visible; however, there were stands of Greater Reedmace *Typha latifolia* and also Sea Club-rush *Bolboschoenus maritimus,* the latter possibly indicating slightly brackish conditions.

A10.304 Together, Areas 6a and 6b occupy a significant footprint and are integral in connecting and being complementary to, the biodiversity value of the Swanscombe Peninsula as a whole. Combined, the reedswamp habitat around the former Swanscombe Sewage works (Area 6B) discussed here, the similarly extensive reedswamps of Black Duck Marsh (Area 4), the coastal grazing marshes of Botany Marsh and associated reedswamps (Areas 7 and 8), along with other brackish and freshwater habitat scattered throughout the lower lying areas of the Peninsula, form a significant resource of wetland habitat. Similarly, the grassland and scrub mosaic habitat comprising Area 6a supports comparable, drier grassland habitat and other more calcareous grassland and

scrub mosaics, both on the Peninsula and throughout the survey areas stretching southwards.

A10.305 Both habitat types are representative of and contribute on a wider landscape scale, to the collective network of statutory and non-statutory designated sites within the Thames corridor.

A10.306 Substrate: Area 6a and 6b: Chalk sedimentary bedrock (Lewes Nodular Chalk Formation; Seaford Chalk Formation and Newhaven Chalk Formation) with alluvium, clay, silt, sand and peat sedimentary superficial deposits.

A10.307 Wetness: Area 6a was bordered extensively by the moat-like wetland of Area 6b, containing Common Reed *Phragmites australis* and other macrophyte vegetation. A wet, mud and shingle strip runs between the dry, semi-improved grassland and scrub, south facing slope and the extensive reed-swamp habitat of Area 6b. The juxtaposition of the wetland and drier habitats can support specialist invertebrate assemblages of high conservation value.

A10.308 Structure: Areas 6a and 6b were structurally diverse habitats both individually and collectively. The contours of Area 6a provided slopes of all aspect, with the southern aspect, in particular providing a more open topography of value to thermophilic invertebrates. The mosaic of scrub and grassland provided structural architecture of value to a diverse range of invertebrates. The reedswamp habitat, despite being largely flattish, varied in degrees of inundation and supported both open water and vegetated areas, with some mature scrub habitat, contributing to the varied structure. The site is likely to support a strong resource of bark and sapwood wood decay habitat, and the reeds and Bramble scrub provide a resource for stem nesting species including aculeate Hymenoptera, wainscot moths (Lepidoptera) and two-winged flies and beetles.

Invertebrate Survey Dates:

- Terrestrial surveys were conducted at Areas 6a and 6b on the following dates: 19-20/05/2020; 15-17/06/2020; 14/07/2020 and 18-19/08/20; and

- Aquatic surveys were conducted on the following dates: 2/06/2020, 14/07/2020 and 10/08/2020.

Table EDP A10.33: Number of samples per substrate.

	Area 6a – Grassland and Scrub	Area 6b - Wetland	Total
Sweep	4		4
Vacuum	4		4

Beating	4		4
Pan traps (cluster of 10)	4		4
Pitfall trap (cluster of 10)		3	3
Malaise trap		3	3
Aquatic (3 minute sweep)		8	8

Total Number of Species Recorded:

- Combined terrestrial and aquatic sample data = 420;
- Terrestrial data only = 346[34]; and
- Aquatic data only = 79[35].

A10.309 A comparison of the relative number of species recorded from each of the major taxons is included in the following graph (includes species collected using both terrestrial and aquatic sampling methods).

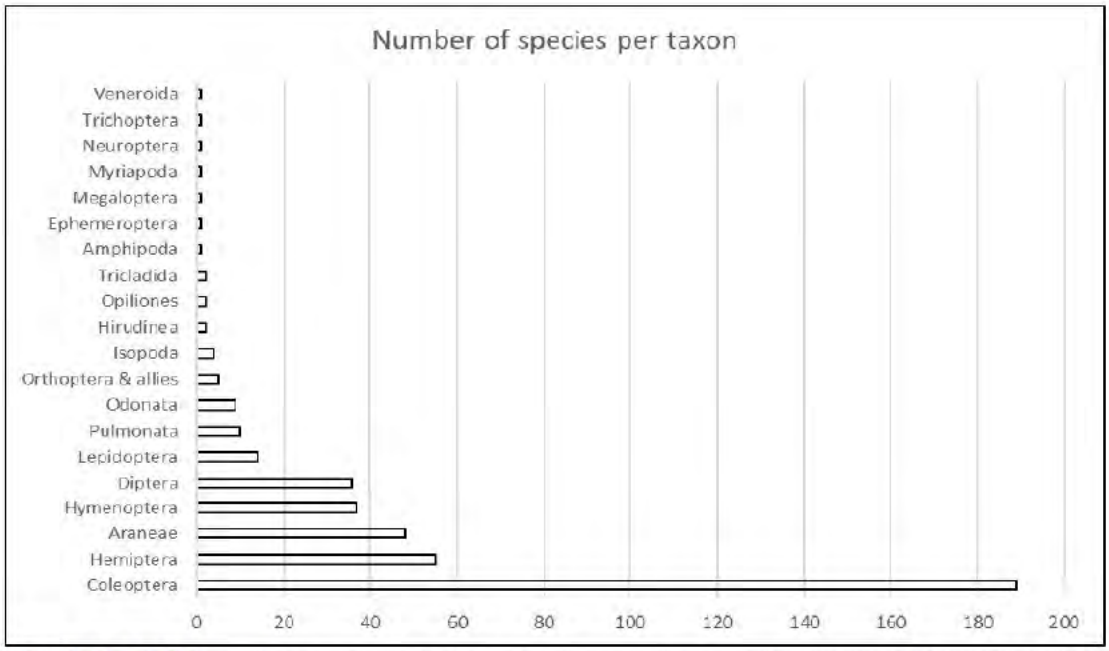

Chart EDP A10.8: A comparison of the relative number of species recorded from each of the major taxons

Table EDP A10.34: Species of recognised conservation recorded from Area 6a and 6b.

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
A ground beetle	*Scybalicus*	Carabidae	Coleoptera	Nationally Rare	VU

34 Note: Terrestrial and aquatic data may not add up to the combined figure, as there may be overlap between species recorded both in terrestrial and aquatic samples

35 Species list small, as many of the contributing species were not recorded to species-level and therefore, not used for conservation evaluation

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
	oblongiusculus				
Beewolf	*Philanthus triangulum*	Crabronidae	Hymenoptera	Nationally Vulnerable (RDB2 pre-1994)	LC
A mirid bug	*Lygus pratensis*	Miridae	Hemiptera	RDB3 pre-1994 criteria	LC
Blue Carpenter Bee	*Ceratina cyanea*	Apidae	Hymenoptera	RDB3 pre-1994 criteria	LC
Saltmarsh Short-spur	*Anisodactylus poeciloides*	Carabidae	Coleoptera	S41 Priority species; Nationally Scarce	LC
A water scavenger beetle	*Berosus luridus*	Hydrophilidae	Coleoptera	Nationally Scarce; Near Threatened	NT
A shining flower beetle	*Olibrus flavicornis*	Phalacridae	Coleoptera	Red Data Book-insufficiently known	DD
A running crab spider	*Thanatus striatus*	Philodromidae	Araneae	Nationally Scarce	LC
A jumping spider	*Ballus chalybeius*	Salticidae	Araneae	Nationally Scarce	LC
A jumping spider	*Sibianor aurocinctus*	Salticidae	Araneae	Nationally Scarce	LC
A jumping spider	*Synageles venator*	Salticidae	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	*Cyclodinus constrictus*	Anthicidae	Coleoptera	Nationally Scarce	LC
An apionid weevil	*Protapion filirostre*	Apionidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Bembidion normannum*	Carabidae	Coleoptera	Nationally Scarce	LC
Bombadier beetle	*Brachinus crepitans*	Carabidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Dyschirius nitidus*	Carabidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Dyschirius politus*	Carabidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Dyschirius salinus*	Carabidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Pterostichus longicollis*	Carabidae	Coleoptera	Nationally Scarce	LC
A longhorn beetle	*Gracilia minuta*	Cerambycidae	Coleoptera	Nationally Scarce	LC
A leaf beetle	*Cryptocephalus hypochaeridis*	Chrysomelidae	Coleoptera	Nationally Scarce	LC
A weevil	*Glocianus punctiger*	Curculionidae	Coleoptera	Nationally Scarce	
A diving beetle	*Rhantus frontalis*	Dytiscidae	Coleoptera	Nationally	LC

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
				Scarce	
A crawling water beetle	*Peltodytes caesus*	Haliplidae	Coleoptera	Nationally Scarce	LC
A grooved water scavenger beetle	*Helophorus alternans*	Hydrophilidae	Coleoptera	Nationally Scarce	LC
A grooved water scavenger beetle	*Helophorus fuligidicollis*	Hydrophilidae	Coleoptera	Nationally Scarce	LC
A dung beetle	*Aphodius plagiatus*	Scarabaeidae	Coleoptera	Nationally Scarce	
A rove beetle	*Bledius tricornis*	Staphylinidae	Coleoptera	Nationally Scarce	
A chloropid fly	*Trachysiphonella scutellata*	Chloropidae	Diptera	Nationally Scarce	
An opomyzid fly	*Geomyza apicalis*	Opomyzidae	Diptera	pNS	
A planthopper	*Asiraca clavicornis*	Delphacidae	Hemiptera	Nationally Scarce	LC
A damsel bug	*Nabis pseudoferus*	Nabidae	Hemiptera	Nationally Scarce	LC
Scarce Tortiose Shieldbug	*Eurygaster maura*	Scutelleridae	Hemiptera	Nationally Scarce	LC
Pantaloon Bee	*Dasypoda hirtipes*	Melittidae	Hymenoptera	Nationally Scarce	LC
A spider-hunting wasp	*Auplopus carbonarius*	Pompilidae	Hymenoptera	Nationally Scarce	LC
A spider-hunting wasp	*Priocnemis agilis*	Pompilidae	Hymenoptera	Nationally Scarce	
Brown-banded Carder Bee	*Bombus humilis*	Apidae	Hymenoptera	S41 Priority species	
Cinnabar	*Tyria jacobaeae*	Erebidae	Lepidoptera	S41 research only	LC
Variable Nomad Bee	*Nomada zonata*	Apidae	Hymenoptera	Recent UK colonist	

A10.310 SQI score for Area 6a and 6b: Swanscombe grassland and scrub and Swanscombe STW wetland:

- Combined terrestrial and aquatic sample data = 8.5 (416 contributing species); and
- Terrestrial data only = 9.5 (343 contributing species).

Pantheon Output Tables for Area 6a and 6b: Swanscombe Grassland and Scrub and Swanscombe STW Wetland:

Table EDP A10.35: Habitats & resources: broad biotopes

Broad biotopei	No. of species	% representation	SQI	Conservation statusi	Species with conservation status
open habitatsi	209	5	131	1 pNS; 4 Nbi; 2 [Nb]; 2 [RDB 3]; 2 Section 41 Priority Species; 8 NSi; 1 [RDB 2]; 1 NRi; 1 VUi;	21

Broad biotopei	No. of species	% representation	SQI	Conservation statusi	Species with conservation status
				1 Section 41 Priority Species - research only	
wetlandi	108	4	119	5 NSi; 1 NTi	5
tree-associatedi	43	1	138	1 Nbi; 1 NSi; 1 RDB 2i	3
coastali	13	3	325	8 NSi; 1 Nbi; 1 Section 41 Priority Species	9
shaded woodland floori	1	33	100		

Table EDP A10.36: Habitats & resources: habitats

Broad biotopei	Habitati	No. of species	% representation	Conservation statusi	SQI	Species with conservation status
open habitatsi	tall sward & scrubi	144	5	1 [Nb]; 2 Section 41 Priority Species; 1 Nbi; 1 NSi; 1 pNS; 1 Section 41 Priority Species - research only; 1 [RDB 3]	113	7
wetlandi	marshlandi	77	9	3 NSi; 1 NTi	119	3
open habitatsi	short sward & bare groundi	56	4	6 NSi; 4 Nbi; 1 NRi; 1 VUi; 1 [Nb]; 1 [RDB 2]	180	13
tree-associatedi	arborealı	24	2	1 NSi	113	1
wetlandi	peatlandi	23	2	1 NSi	113	1
tree-associatedi	decaying woodi	11	<1	1 RDB 2i	191	1
coastali	saltmarshi	11	4	1 Section 41 Priority Species; 7 NSi; 1 Nbi	318	8
tree-associatedi	shaded woodland floori	9	<1	1 Nbi	133	1
wetlandi	lakei	9	7		100	
wetlandi	running wateri	7	<1	1 NSi	143	1
wetlandi	wet woodlandi	4	1		100	
tree-associatedi	wet woodlandi	3	1		100	

Broad biotope	Habitat	No. of species	% representation	Conservation status	SQI	Species with conservation status
coastal	brackish pools & ditches	2	2	2 NS	400	2
coastal	sandy beach	1	<1	1 NS	400	1

Table EDP A10.37: Habitats & resources: ISIS specific assemblage types

Broad biotope	Habitat	SAT	No. of species	% representation	SQI	Conservation status	Species with conservation status	Code	Reported condition
open habitats		rich flower resource	13	5	123	1 Section 41 Priority Species; 1 [Nb]; 1 [RDB 3]	3	F002	Unfavourable (13 of 15 species)
open habitats		scrub edge	11	5	155			F001	Favourable
open habitats	short sward & bare ground	open short sward	11	6	209	2 Nb; 2 NS	4	F112	Unfavourable (11 of 13 species)
open habitats	short sward & bare ground	bare sand & chalk	10	2	220	1 [Nb]; 3 NS	4	F111	Unfavourable (10 of 19 species)
tree-associated	decaying wood	bark & sapwood decay	9	2	211	1 RDB 2	1	A212	Unfavourable (9 of 19 species)
open habitats		scrub-heath & moorland	8	2	138	1 [RDB 3]; 1 NS	2	F003	Unfavourable (8 of 9 species)
wetland	marshland	open water on disturbed mineral sediments	8	20	175	2 NS; 1 NT	2	W211	Favourable
coastal	saltmarsh	saltmarsh & transitional brackish marsh	5	5	340	4 NS; 1 Section 41 Priority Species	4	M311	Unfavourable (5 of 9 species)

Broad biotopei	Habitati	SAT	No. of speciies	% representation	SQI	Conservation statusi	Species with conservation status	Code	Reported conditioni
wetlandi	peatlandi	moss & tussock feni	2	4	100			W313	Unfavourable (2 of 6 species)
wetlandi	peatlandi	reed-fen & poolsi	1	<1	100			W314	Unfavourable (1 of 11 species)
coastali	sandy beachi	sandy beachesi	1	2	400	1 NSi	1	M211	Unfavourable (1 of 7 species)
wetlandi	peatlandi	Sphagnum bogi	1	<1	100			W312	Unfavourable (1 of 8 species)

Site-Specific Limitations

A10.311 Area 6a and 6b, was subject to the following sampling limitations/constraints:

- Much of the wetland habitat on the site was inaccessible, especially the reedswamp habitats, therefore, a malaise trap was deployed at the margin of reedswamp habitat; and
- At the time of writing, the majority of diptera records of the site are unavailable. Diptera are an important component of grazing marsh/wetland habitats and the absence of these are likely to have influenced the findings from analysis of the available dataset.

Discussion/Evaluation - Area 6a and 6b

A10.312 Area 6a and 6b, were included in the same unit, partly as the area comprising these sites was contained within a compound and partly as there was an interesting division between two very different habitat types including, (6a) the raised herb-rich grassland and scrub and OMH and (6b) the STW wetland habitat, which comprised an extensive mosaic of reedswamp, open water and willow carr habitats. The boundary between the dry grassland and reedswamp was defined by a narrow, man-made strip of more or less unvegetated silt and shingle. This strip mimicked the kind of exposed habitat found at brackish saltmarsh margins and was found to support a number of invertebrate species characteristic of such habitat.

A10.313 The upper dry grassland habitat was generally well-established, with a varying degree of succession, from thinly scattered to almost contiuous scrub. The lower reaches of this area supported some more heavily disturbed early successional habitat, providing more classic OMH. As there was an ambiguity of deployment, particularly at the boundary between the wet and dry habitat areas, where pitfall and malaise trapping was undertaken, data collected from both Area 6a and 6b was analysed as a single dataset in Pantheon.

A10.314 It can, however, be reasonably assumed that 'Open-habitat' and 'Arboreal' assemblages resulting from Pantheon analysis, broadly relate to the grassland habitats of Area 6a, whilst the 'Wetland' and 'Coastal' (Saltmarsh) assemblages relate more specifically to the wetlands. Due to access issues, whilst some aquatic sampling was undertaken in the open water areas of Area 6b, all sampling from tree-associated habitats was undertaken in Area 6a.* see below

A10.315 Observations of species occupying the wet silted/shingle strip at the interface between the drier grassland and reedswamp habitats, suggest that the more 'Saltmarsh' associated species were recorded from this area. Brackish-associated ground beetles including the s41 Saltmarsh Short-spur *Anisodactylus* poeciloides, as well as several rove beetles of the genus *Bledius*, were observed within this habitat during the 2020 survey.

A10.316 As with Areas 2 and 3, some attention was paid to potential usage of the more OMH parts of Area 6a by the Distinguished Jumping Spider *Sitticus distinguendus* and low-density aggregate blocks were deployed in this area. However, the spider was not recorded from this site during 2020.

A10.317 During the 2020 survey, from combined terrestrial and aquatic sampling, a total of 419 species were recorded from Area 6a and 6b combined. Of these 345 species were derived from terrestrial only sampling methods and 79 were from sampling of aquatic habitat. In total, 41 of the recorded species were of recognised conservation status in the UK.

A10.318 These included four species classed as 'Species of principal importance' under section 41 of the NERC Act (2006); one species classed as both Nationally Rare and 'Vulnerable' categories based on post-2001 IUCN criteria; one species classed as Nationally Vulnerable (RDB2) based on pre-1994 criteria; two Nationally Rare (RDB3) species based on pre-1994 criteria; one species classed as 'Insufficiently known' RBDK and 33 species are currently classed as Nationally Scarce in the UK. (two of which also have a post-2001 IUCN threat status of 'Near Threatened').

A10.319 Three s41 species of note, as well as one 'research only' species were recorded for Area 6a/6b; these included Saltmarsh Short-spur *Anisodactylus poeciloides,* a species of ground beetle found in 'saltmarshes, salt-pans and brackish ditches at the margins of grazing levels' (Hyman and Parsons, 1992); a weevil *Glocianus punctiger,* which occurs in grasslands and waste places, where it is associated with Dandelion *Taraxacum officinale* (Morris,2008); and the Brown-banded Carder Bee *Bombus humilis,* a flagship species of OMH and herb-rich Thames terrace grasslands in the Thames corridor. The third s41 species was the relatively common, but declining, Cinnabar *Tyria jacobaea.* This day-flying moth is often found in OMH and grassland habitats supporting its larval foodplants which include Ragwort *Senecio jacobaea*.

A10.320 From Pantheon analysis undertaken for Area 6a/6b, the largest number of species (209) were attributed to 'Open habitats' on a broad biotope level, whilst 108 species were ascribed to the'Wetland' assemblage, 43 to 'Tree associated' and 13 to the 'Coastal' assemblage. This broad-biotope deployment reasonably reflects the habitats present on site and level of targeted sampling.

A10.321 Of the habitat level assemblages nested within the 'Open habitats' biotope-level assemblages, 'Tall sward and scrub' was most strongly attributed with 144 species, with 56 species being attributed to the 'Short sward and bare ground assemblage'. As is commonly the case with grassland and scrub mosaic sites, the greater overall number of species was attributed to 'Tall sward and scrub'.

A10.322 In terms of rarity, the SQI score registered for the 'Short sward and bare ground' assemblage was 180, indicating an assemblage of very high conservation value at this level, compared to a SQI score 113 recorded in Pantheon for 'Tall sward and scrub'. At habitat-level, 'Short sward and bare ground' was also the stand-out assemblage compared to the less well-subscribed habitat-level assemblages. These included 'Marshland' with an SQI of 119 from 77 attributed species; 'Arboreal' with an SQI of 113, from 24 species and 'Peatland' also with an SQI of 113 from 23 species.

A10.323 However, one habitat-level assemblage, 'Saltmarsh' was attributed with 11 species, too few to produce a robust SQI score in Pantheon[36], but still of particular note, as eight out of 11 species attributed to this assemblage were of recognised conservation, more than for any of the much larger assemblages other than 'Short sward and bare ground'.

A10.324 Although 'Tall sward and scrub' did not achieve a particularly high SQI score, this was due in part to the dilution of uncommon species by species relatively

[36] Technically 15 species is just belwo the threshold for significant SQIs in Pantheon.

widespread in the UK. In total, seven species of recognised conservation status were attributed to this assemblage. These included three s41 species including nationally scarce weevil *Glocianus punctiger*, Brown-banded Carder Bee and the Cinnabar moth; the stem-nesting, RDB3 listed Little Blue Carpenter Bee *Ceratina cyanea*; a spider-hunting wasp *Priocnemis agilis*, a wetland and grassland associated opomyzid fly *Geomyzia apicalis* and a philodromid spider *Thanatus striatus,* found in sandy habitats and coastal grasslands.

A10.325 At Specific Assemblage Type (SAT) level[37], only two SATs, W211 'Open water on disturbed mineral sediments', which is nested within the 'Marshland' habitat-level assemblage and the resource-based F001 'Scrub edge' SAT, achieved species scores exceeding their respective Favourable Condition (FC) targets from Pantheon analysis of the Area 6a/6b dataset.

A10.326 Surprisingly for such a large dataset and in consideration of the grassland and OMH habitat present on the site, neither F112 'Open short sward' or F111 'Bare sand and chalk' were attributed with a sufficient number of species to exceed their respective FC thresholds. However, of these the F112 SAT was attributed with 11 out of the 13 species required for Favourable Condition. Furthermore, F112 and F111 were each attributed with four species of recognised conservation, more than for any of the additional SATs recorded for Area 6a/6b, other than M311 'Saltmarsh and transitional brackish marsh', which also fell short of achieving its FC target.

A10.327 Collectively, the F112 and F111 are nested within the 'Short sward and bare ground' habitat-level assemblage, previously mentioned as supporting an assemblage of very high conservation value. The 'Short sward and bare ground' assemblage was attributed with 13 species of recognised conservation value, more than any other assemblage recorded at habitat level. Of these, five species of recognised conservation status were attributed only at habitat-level and four each were also attributed at SAT-level to the F112 and F111 assemblages, indicating a greater level of specialisation.

A10.328 Species of recognised conservation attributed only to 'Short sward and bare ground' at habitat-level included, arguably, one of the rarest species recorded during the entire 2020 survey; *Scybalicus oblongiusculus*, is a nationally rare species of ground beetle, with a threat status of 'Vulnerable' under post-2001 IUCN criteria. 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.' Telfer (2016) conjectured that *S. oblongiusculus* may feed on the seeds of Fennel *Foeniculum vulgare*, the beetle having been found in close-proximity of this plant on several occasions.

[37] SAT level is considered to be the most important level for assessing conservation value of a site.

A10.329 Other species of conservation concern attributed at habitat level included; the Beewolf *Philanthus triangulum* (now much commoner than its RDB2 status suggests) and nationally scarce species including a zodariid spider *Zodarion italicum* which occurs in 'dry, warm, sunny open habitats containing a proportion of bare ground' (Harvey *et al*, 2002). The damselbug *Nabis psuedoferus,* a species of 'dry, sandy places' (Kirby, 1992) and a little-known spider-hunting wasp *Priocnemis agilis* also associated with 'dry, warm, grassy habitats, with 'a preference for clay soils' (Day, 1988).

A10.330 The 'Short sward and bare ground' species of recognised conservation status also attributed at SAT level are all classed as nationally scarce and included, for F112 'Open short sward'; a *medicago*-associated apionid weevil *Protapion filirostre*, a pot beetle *Cryptocephalus hydrochaeridis,* the Scarce Tortoise Shieldbug *Eurygaster maura,* and a planthopper *Asiraca clavicornis.*

A10.331 The nationally scarce species attributed to the F111 'Bare sand and chalk' SAT included two jumping spiders, *Sibianor aurocinctus* and *Synageles venator,* the Bombardier Beetle *Brachinus crepitans* and the Pantaloon Bee *Dasypoda hirtipes.* These species are all typical of OMH and dry grassland habitats within the Thames corridor, Bombardier Beetle having a strong affinity with calcareous substrates.

A10.332 With 77 attributed species, the majority of wetland species were attributed at habitat-level to the 'Marshland', rather than 'Peatland' assemblage, to which only 23 species were recognised within Pantheon.

A10.333 The distinction between these habitats is that 'Marshland' habitat is on mineral soils which are subject to a greater level of stress from seasonal drying and water-level fluctuation, whilst 'Peatland' habitat tends to be characterised by year round saturation, due in part to the water-retaining properties of peat. Whilst in terms of rarity value neither assemblage was attributed with a high proportion of rarities, at SAT-level, generally considered the most important level for assessing conservation value of a site, the W211 'Open water on disturbed mineral sediments' was attributed with sufficient species to achieve FC status.

A10.334 Eight species were attributed to this SAT in Pantheon, compared to a FC threshold score of six. Uncommon species attributed to this SAT included a water-scavenger beetle *Berosus luridus*, which is classed as nationally scarce, with a post-2001 IUCN threat status of 'Near threatened' and a nationally scarce crawling water beetle *Peltodytes caesus,* a species of lowland rich-fen and ditches. According to Foster (2010), *B. luridus* is found in 'lowland ponds and slow drains with a peaty substratum'.

A10.335 Interestingly, in Pantheon it is suggested that the W211 SAT can overlap with elements of the M311 'Saltmarsh and transitional brackish marsh' assemblage. These two SATs were also reported from the same slightly brackish ditches from Area 7 Botany Marsh (West) and despite the reasonable distance of these areas from the coastal saltmarsh, saltmarsh species were attributed in reasonable number both at habitat-level, with 11 species and at SAT-level, with five attributed species.

A10.336 The M311 'Saltmarsh and transitional brackish marsh', can be expressed both within periodically inundated upper saltmarsh zones and in transitional zones, which also support freshwater assemblage types, as is the case here. Importantly, whilst few species were attributed to M311, four out of five species attributed to this SAT were of recognised conservation status and a further four species were also attributed at habitat-level to the overarching 'Saltmarsh' assemblage.

A10.337 Uncommon species attributed to M311 'Saltmarsh and transitional brackish marsh' for Area 6b included; s41 and nationally scarce Saltmarsh Short-spur *Anisodactylus poeciloides*. Other nationally scarce species included another ground beetle *Bembidion normannum*, an ant-like flower beetle *Cyclodinus constrictus* and *Helophorus fulgidicollis* a grooved water-scavenger beetle.

A10.338 Further species, all nationally scarce, recorded from Area 6b, attributed only at habitat-level to the 'Saltmarsh' assemblage included: burrowing ground beetle species *Dyschirius nitidus* and *D. salinus*, a rove beetle *Bledius* tricornis and another grooved water-scavenger beetle *Helophorus alternans*.

A10.339 Interestingly, with the exception of the grooved water-scavenger beetles Helophorus *fulgidicollis* and *Helophorus alternans,* which occur primarily in brackish pools and ditches, all of these species are hygrophilus, rather than aquatic, associated with brackish water margin habitats. These species were recorded from pitfall samples at the boundary between Area 6a and 6b, rather than from the aquatic sampling of the marsh, which produced relatively few records of conservation value.

A10.340 Habitat specialists such as the burrowing *Bledius tricornis* are adapted for survival in areas subject to periodic tidal inundation. The ground beetles *Dyschirius nitidus* and *D. salinus,* also burrowing species, are thought to be predators of rove beetles of the genus *Bledius*.

A10.341 Other assemblages represented within Pantheon output were of relatively low conservation value. Whilst, as with some other sites within the 2020 survey area, Favourable Condition status was afforded to the resource-based F001

'Scrub edge' SAT, the species attributed to this assemblage were, at most, local in the UK; F002 'Rich flower resource' was attributed with relatively few (13) bee species compared to other grassland sites within the survey area, although three species of conservation status were attributed this group, these were expressed more meaningfully in some of the other assemblages for Area 6a/6b.

A10.342 From the collective 'Tree associated' assemblages, only three species of conservation status were recorded and none of the assemblages achieved FC status. All three species are now classed as nationally scarce and include the Basket Longhorn *Gracilia minuta* (attributed to 'Bark and sapwood decay', a jumping spider *Ballus chalybeius* (attributed to 'Arboreal') and a spider-hunting wasp *Auplopus carbonarius,* a 'Shaded woodland floor' species.

A10.343 The non-Pantheon SQI score recorded for Area 6a and 6b combined was 9.5 for terrestrial only data, and 8.5 for terrestrial combined with aquatic data. According to Harvey (2014)[38] an SQI value approaching 10.00 is 'almost certainly of national significance.'

Conclusion

A10.344 The Area 6a and 6b can be seen as distinct habitats, 6a being predominately a grassland scrub mosaic and OMH area whilst 6b comprises of wetland habitat, including reedswamp, open water and carr habitats. However, there was a transition zone between the two areas and data collected in this zone had potential to blur the results of analysis if the 6a and 6b datasets were treated separately.

A10.345 The independently claculated SQI score of 9.5 indicates a conservation value of national significance for the terrestrial only assemblage; however, this score is based on sampling method only and it can be seen from the outcome of the survey, that a significant element of the 'wetland' assemblage was sampled through terrestrial methods.

A10.346 It appears that in reality, the more open water, predominately aquatic invertebrate fauna sampled using traditional aquatic survey methods, were of relatively modest conservation value. However, the hygrophilous element of the fauna, including species attributed collectively to brackish coastal assemblages and freshwater 'Open water on disturbed mineral sediments', in Pantheon, were almost all collected using terrestrial sampling methods such as pitfall trapping of marginal habitat.

[38] Harvey based his evaluation on invertebrate fauna in Essex, the Kent fauna within the Swanscombe part of the Thames corridor is comparable with this standard.

A10.347 From Pantheon, the main value of the grassland element of the site (relating to Area 6a) is expressed through the habitat-level 'Short sward and bare ground' assemblage, achieving a high SQI score of 180. An extremely rare ground beetle *Scybalicus oblongiusculus* with a threat status of 'Vulnerable' was attributed at habitat-level only for this assemblage.

A10.348 Assessment of the invertebrate conservation value of the wetland elements of the site is more complicated. Whilst the overarching 'Marshland' habitat-level assemblage scored a relatively modest SQI score, the W211 'Open water on disturbed mineral sediments' SAT achieved a score exceeding its Favourable Condition status, which also included two of the species of conservation status afforded to this assemblage. In addition, the majority of species attributed to the M311 'Saltmarsh and transitional brackish marsh' are species of recognised conservation status in the UK.

A10.349 In the Pantheon glossary account of the W211 assemblage, it is suggested that the W211 and M311 can have considerable overlap in brackish transition habitats and data divided between these habitats were largely derived from sampling of the wetted mud and shingle interface between Area 6a and 6b. Collectively, 10 species of conservation status were recorded in this area, distributed between the W211 and M311 SATs and 'Saltmarsh' habitat-level assemblage.

A10.350 For Area 6a and 6b combined, 41 species of recognised conservation status were recorded including significant s41 species Saltmarsh Short-spur *Anisodactylus poeciloides,* a weevil *Glocianus punctiger* and the Brown-banded Carder Bee *Bombus humilis* and an extremely rare ground beetle *Scybalicus oblongiusculus.* Pantheon analysis of site-level data, indicated the presence of a 'Short sward and bare ground' habitat-level assemblage of National Importance, relating specifically to Area 6a.

A10.351 Results indicated that the freshwater aquatic elements of Area 6b were of modest conservation value. However, the hygrophilous element included species attributed to both freshwater margins, expressed through W211 'Open water on disturbed mineral sediments' and brackish assemblages M311 'Saltmarsh and transitional brackish marsh' along with 'Saltmarsh' at habitat-level, were of very high conservation value and should be considered collectively to be of National Importance.

Area 7: Botany Marsh West

Centroid grid reference: TQ 60825 75525

Overall area: 13.6 hectares

Designations on site: None

S41 habitats present: Coastal and floodplain grazing marsh

Habitat Description

A10.352 Typically for Coastal and floodplain and coastal grazing marsh, Area 7 was largely flat, with some variation in microtopography provided by the field drains crossing and bordering the site, as well as shallow in-field scrapes, which were partially dried-out at the time of survey. The ditches were generally around two metres wide and of varying depth. Some sections were dried out at the time of survey; however, the more northerly drains in particular, were inundated up to around a maximum depth of c50cm. The intersections of drains were often significantly expanded and swollen, often cattle poached and with more extensive macrophyte stands at these points, over shallow water interspersed with exposed bare mud. Shallow cliffs were often present along the ditch banks, with exposed bare ground and varied microtopography.

A10.353 The grassland habitat was generally herb-poor within the area surveyed and was of relatively uniform sward height due to mixed, cattle and sheep grazing. The sward comprised predominately of Creeping Bent *Agrostis stolonifera,* Perennial Rye Grass *Lolium perenne,* with locally abundant Common Couch *Elytrigia repens* and Marsh Foxtail *Alopecurus geniculatus*, with herbs including Curled Dock *Rumex crispus* and few other species, typical of wet grassland habitats.

A10.354 The botanical diversity was somewhat greater within and around the field drains and scrapes; with Common Reed *Phragmites australis* occurring frequently within the linear sections of the ditches, with Common Spike-rush *Eleocharis palustris* often forming extensive stands within the more open nodes at the ditch junctions and within the field scrapes. Additional macrophytes recorded in the field drains included Sea Club-rush *Bolboschoenus maritimus*, Pink Water Speedwell *Veronica catenata*, Amphibious Bistort *Persicaria amphibia,* a water crowfoot *Ranunculus* sp., Common Water-plantain *Alisma plantago-aquatica,* Greater Willowherb *Epilobium hirsutum* and a grass-leaved pondweed *Potamogeton* sp.

A10.355 The most diverse sections tended to occupy the nodes, which were frequently also subject to cattle poaching and some sections were somewhat nutrient enriched and eutrophic due to livestock dung.

A10.356 Connectivity: Botany Marsh West (Area 7) comprises traditionally managed coastal and floodplain grazing marsh habitat. Such habitat which was formerly abundant in the Thames Estuary, is now much reduced, both locally and on a national scale. This has lead to the habitat being selected as a 'priority habitat' under section 41 of the NERC Act (2006). On a site scale, the habitat contributes to the wetland diversity of the Swanscombe Peninsula and together with the contiguous, Botany Marshes East (Area 8), forms a significant area of a much declined habitat, which is known to support a diversity of specialist wetland invertebrates. Within the wider landscape, Area 7 contributes to a network of remnant coastal and floodplain grazing marsh sites. According to NE's habitat inventory, within a 10 kilometre radius of the site, there are significant areas of similar habitat in Kent to the west and on the north bank of the Thames in Essex. The closest site is within approximately 2.5 kilometres of the site, to the northeast in Essex. In addition, there are numerous saltmarsh and other wetland sites within closer proximity to the site.

A10.357 Substrate: Area 7: Chalk sedimentary bedrock (Lewes Nodular Chalk Formation; Seaford Chalk Formation and Newhaven Chalk Formation) with alluvium, clay, silt, sand and peat sedimentary superficial deposits.

A10.358 Wetness: Area 7 was an extensive wetland site, comprising seasonally inundated wet grassland; areas of reedswamp and a network of field drains.

A10.359 Structure: The general topography of the open grassland habitat was generally flat with only subtle variation due to the presence of in -field scrapes; however, the cliffed and poached margins and depth variation within the field drains provided significant topographic variation and provided areas of exposed inundated and dried out bare earth. This together with hydrological variation and the varied structure of macrophyte stands, provided potentially suitable habitat for specialist hygrophilous invertebrates, as well as those species associated more exclusively with aquatic habitats. The sward within the fields as a whole was generally of even height, due to livestock grazing and did not generally provide particularly diverse structure, although this is frequently the case within floodplain grazing marsh habitat. The in channel reed swamp provided structural habitat potentially beneficial to stem-living invertebrate species. There was little scrub on the site other than at the margins.

Invertebrate Survey Dates:

- Terrestrial surveys were conducted on the following dates: 13/07/2020 and 18-19/08/20; and
- Aquatic surveys were conducted on the following dates: 28/07/20 and 10/08/2020

Table EDP A10.38: Number of Samples per Substrate.

	Area 7 – Botany Marsh West	Total
Sweep	4	4
Vacuum	4	4
Aquatic (3 minute sweep)	4	4

Total Number of Species Recorded:

- Combined terrestrial and aquatic sample data = 223;
- Terrestrial data only = 154; and
- Aquatic data only = 68

A10.360 A comparison of the relative number of species recorded from each of the major taxons is included in the following graph (includes species collected using both terrestrial and aquatic sampling methods).

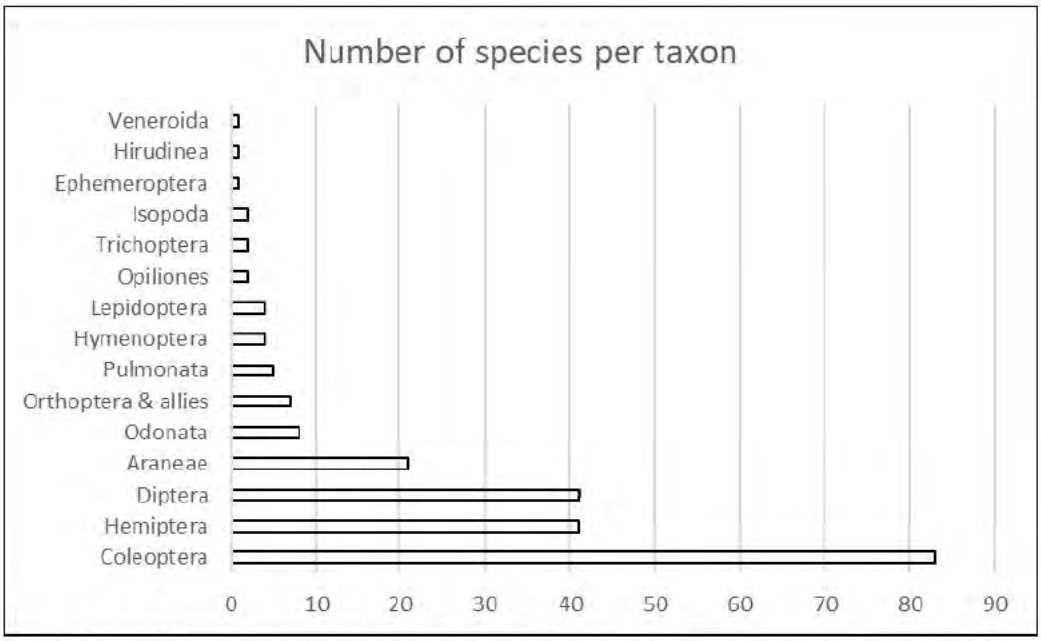

Chart EDP A10.9: A comparison of the relative number of species recorded from each of the major taxons.

Table EDP A10.39: Species of Recognised Conservation Recorded from Area 7:

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
Great Silver Water Beetle	*Hydrophilus piceus*	Hydrophilidae	Coleoptera	NT (Near Threatened)	NT
A leafhopper	*Psammotettix alienus*	Cicadellidae	Hemiptera	RDBK 'unknown'	NA
A running crab spider	*Thanatus striatus*	Philodromidae	Araneae	Nationally Scarce	LC
A comb-footed spider	*Kochiura aulica*	Theridiidae	Araneae	Nationally Scarce	LC
A ground beetle	*Bembidion fumigatum*	Carabidae	Coleoptera	Nationally Scarce	LC
A diving beetle	*Agabus conspersus*	Dytiscidae	Coleoptera	Nationally Scarce	LC
A diving beetle	*Hygrotus parallellogrammus*	Dytiscidae	Coleoptera	Nationally Scarce	LC
A diving beetle	*Rhantus frontalis*	Dytiscidae	Coleoptera	Nationally Scarce	LC
A whirligig beetle	*Gyrinus paykulli*	Gyrinidae	Coleoptera	Nationally Scarce	LC
A crawling water beetle	*Haliplus apicalis*	Haliplidae	Coleoptera	Nationally Scarce	LC
A crawling water beetle	*Peltodytes caesus*	Haliplidae	Coleoptera	Nationally Scarce	LC
A hydraenid beetle	*Ochthebius nanus*	Hydraenidae	Coleoptera	Nationally Scarce	LC
A water scavenger beetle	*Berosus luridus*	Hydrophilidae	Coleoptera	Nationally Scarce	NT
A water scavenger beetle	*Cryptopleurum crenatum*	Hydrophilidae	Coleoptera	Nationally Scarce	LC
A water scavenger beetle	*Enochrus halophilus*	Hydrophilidae	Coleoptera	Nationally Scarce	LC
A grooved water scavenger beetle	*Helophorus alternans*	Hydrophilidae	Coleoptera	Nationally Scarce	LC
A grooved water scavenger beetle	*Helophorus fulgidicolis*	Hydrophilidae	Coleoptera	Nationally Scarce	LC
A grooved water scavenger beetle	*Helophorus nanus*	Hydrophilidae	Coleoptera	Nationally Scarce	LC
A chloropid fly	*Trachysiphonella scutellata*	Chloropidae	Diptera	Nationally Scarce	
A sciomyzid fly	*Colobaea punctata*	Sciomyzidae	Diptera	Nationally Scarce	
A sciomyzid fly	*Ditaeniella grisescens*	Sciomyzidae	Diptera	Nationally Scarce	
A sciomyzid fly	*Pherbellia dorsata*	Sciomyzidae	Diptera	Nationally Scarce	
A sciomyzid fly	*Pherbellia griseola*	Sciomyzidae	Diptera	Nationally Scarce	
A lesser waterboatman	*Sigara selecta*	Corixidae	Hemiptera	Nationally Scarce	LC
A planthopper	*Laodelphax striatella*	Delphacidae	Hemiptera	Nationally Scarce	
A pond skater	*Aquarius paludum*	Gerridae	Hemiptera	Nationally Scarce	LC
A shore bug	*Saldula opacula*	Saldidae	Hemiptera	Nationally Scarce	
A shore bug	*Saldula pallipes*	Saldidae	Hemiptera	Nationally Scarce	
A water cricket	*Microvelia pygmaea*	Velidae	Hemiptera	Nationally Scarce	LC
Southern Migrant Hawker	*Aeshna affinis*	Aeshnidae	Odonata	Recent UK colonist	
Lesser Emperor	*Anax parthenope*	Aeshnidae	Odonata	Rare annual migrant	

A10.361 SQI score for Area 7: Botany Marsh West:

- Combined terrestrial and aquatic sample data = 9.0 (218 contributing species); and
- Terrestrial data only = 7.9 (151 contributing species).

Pantheon Output Tables for Area 7:

Table EDP A10.40: Habitats & resources: broad biotopes

Broad biotopei	No. of speciesi	% representationi	SQIi	Conservation statusi	Species with conservation statusi
wetlandi	110	4	150	4 Notablei; 12 NSi; 2 NTi	16
open habitatsi	68	2	118	1 Notablei; 2 NSi	3
coastali	15	3	269	9 NSi	9
tree-associatedi	7	<1	150	1 DDi	1

Table EDP A10.41: Habitats & resources: habitats

Broad biotopei	Habitati	No. of speciesi	% representationi	Conservation statusi	SQIi	Species with conservation statusi
wetlandi	marshlandi	84	10	2 Notablei; 1 NTi; 7 NSi	138	9
open habitatsi	tall sward & scrubi	57	2	1 Notablei; 1 NSi	111	2
wetlandi	peatlandi	33	3	4 Notablei; 5 NSi; 1 NTi	188	9
coastali	brackish pools & ditchesi	14	12	9 NSi	280	9
coastali	saltmarshi	14	5	8 NSi	260	8
wetlandi	lakei	7	6	2 NSi	186	2
open habitatsi	short sward & bare groundi	7	<1		143	
wetlandi	running wateri	4	<1		175	
tree-associatedi	arborealı	3	<1		100	
coastali	saline lagooni	2	6	1 NSi	250	1
tree-associatedi	wet woodlandi	2	<1		100	
tree-associatedi	decaying woodi	2	<1	1 DDi	250	1
wetlandi	wet woodlandi	2	<1		100	

Broad biotopei	Habitati	No. of species	% representation	Conservation statusi	SQI	Species with conservation status
tree-associatedi	shaded woodland floori	2	<1		100	
coastali	sandy beachi	1	<1		100	

Table EDP A10.42: Habitats & resources: ISIS specific assemblage types

Broad biotopei	Habitati	SAT	No. of species	% representation	SQI	Conservation statusi	Species with conservation status	Code	Reported conditioni
wetlandi	marshlandi	open water on disturbed mineral sedimentsi	10	25	190	3 NSi; 1 NTi	3	W211	Favourable
wetlandi	peatlandi	reed-fen & poolsi	7	6	300	2 NSi; 2 Notablei; 1 NTi	4	W314	Unfavourable (7 of 11 species)
open habitatsi	short sward & bare groundi	bare sand & chalki	4	<1	175			F111	Unfavourable (4 of 19 species)
coastali	saltmarshi	saltmarsh & transitional brackish marshi	3	3	300	2 NSi	2	M311	Unfavourable (3 of 9 species)
open habitatsi		scrub edgei	3	1	100			F001	Unfavourable (3 of 11 species)
open habitatsi		scrub-heath & moorlandi	3	<1	200	1 NSi	1	F003	Unfavourable (3 of 9 species)
open habitatsi		rich flower resourcei	2	<1	100			F002	Unfavourable (2 of 15 species)
tree-associatedi	decaying woodi	bark & sapwood decayi	1	<1	100			A212	Unfavourable (1 of 19 species)
wetlandi	marshlandi	undisturbed	1	3				W221	Unfavourable (1 of 4

Broad biotopei	Habitati	SAT	No. of species	% representation	SQI	Conservation statusi	Species with conservation status	Code	Reported conditioni
		fluctuating marshi							species)
wetlandi	peatlandi	Sphagnum bogi	1	<1	400	1 NSi	1	W312	Unfavourable (1 of 8 species

Site-Specific Limitations

A10.362 Area 7, was subject to the following sampling limitations/constraints:

- At the time of writing, there was a delay in obtaining identified Diptera data from the current site;
- No pan traps or pitfalls were deployed in Area 7 due to livestock grazing;
- Site access was not granted until late July. Therefore, sampling was not undertaken before this time; and
- In compliance with the risk assessment, it was not realistically possible to survey the more southerly parts of the site, due to occupation with grazing cattle; therefore, the survey concentrated on the more northerly sections. However, the habitat sampled appeared representative of the site as a whole.

Discussion/Evaluation – Area 7

A10.363 Area 7 Botany Marsh (West) supported a relatively large area of remnant coastal and floodplain grazing marsh s41 habitat. Unlike the contiguous Area 8 Botany Marsh (East), the entire site was subject to traditional livestock grazing using cattle and sheep. As is typically the case of grazing marsh, grassland habitat was relatively herb-poor and of low botanical diversity; However, the network of grazing marsh ditches was generally well-vegetated with Common Reed *Phragmites australis,* brackish tolerant species such as Sea Clubrush *Bolboschoenus maritimus* and a variety of other species.

A10.364 From an invertebrate perspective, the junctions between ditches were often expanded into well-vegetated, albeit cattle-poached, pools which were generally of greater botanical diversity than the linear sections. These nodes also provided a more varied microtopography, with exposed mud margins of value to hygrophilous invertebrates such as ground beetles (Carabidae), rove

beetles (Staphylinidae), saldid bugs (Saldidae), spiders (Araneae) as well as wetland associated two-winged flies (Diptera).

A10.365 At the time of survey, some ditch sections had dried out, whilst other areas were well inudated. Besides the ditches there was a large seasonally inundated infield scrape, which provided additional opportunities for grazing masrh invertebrate assemblages.

A10.366 During the 2020 survey a total of 223 invertebrate species were recorded from Area 7, including 154 species derived from terrestrial survey methods (timed sweep and vacuum samples) and 68 from aquatic sampling using timed sweep. In, total 29 species are of recognised conservation status in the UK were recorded from Area 7. These included one species classed as as Near Threatened (and nationally scarce) under post-2001 IUCN criteria; one RDBK 'unknown' species and 27 species currently classed as Nationally Scarce in the UK. Where applicable, these species are listed in relation to the attributed Pantheon assemblages to which they are attributed, below.

A10.367 In addition to the above it is worthy of note that two species of dragonfly, both of which are recent colonists of the UK were recorded within Area 7 during the survey. These included Southern Migrant Hawker *Aeshna affinis* and Lesser Emperor *Anax parthenope*. Southern Migrant Hawker, was particularly noticeable within the ditch network and mating was observed as well as female oviposition. After being a scarce migrant to the UK for a number of years, a signigicant influx of the species to southeast England was recorded in 2010 and since that time the dragonfly has been recognised to be breeding in sites in the Thames corridor (Brooks and Cham, 2014).

A10.368 Similarly, Lesser Emperor was first recorded in the UK in 1996 and has recently been recorded as a breeding species in Cornwall (Brooks and Cham, 2014). However, whilost Lesser Emperor was recorded on site during 2020, no breeding activity was recorded.

A10.369 From Pantheon analysis undertaken for Area 7, the largest number of species was attributed to the 'Wetland' assemblage at biotope level, with 110 attributed species. In addition, 68 species were attributed to 'Open habitats', 15 to 'Coastal' and seven 'Tree associated' species were recorded. This broad-biotope deployment accurately reflected the level of targeted sampling and also the habitats present.

A10.370 Whilst a relatively high proportion of recorded species were attributed to 'Open habitats' at this level, these represented only two percent of the overall 'Open habitats' species pool within the Pantheon database; the 'Wetland' pool is

significantly smaller and consequently, the 110 species attributed to this assemblage represented four percent of all species within the database.

A10.371 At biotope level an SQI score of 150 for was recorded for 'Wetland', indicating an overall assemblage of high conservation value. In contrast the score of 118 for 'Open habitats', was relatively modest. However, whilst being represented by only 15 species[39], the SQI score ascribed to the 'Coastal' biotope-level assemblage was an extremely high 269. This reflected the fact that a very large proportion of the species attributed to this assemblage were of recognised conservation status. Of the 15 attributed species, a total of nine were nationally scarce.

A10.372 At habitat level, the largest number of species attributed to a single assemblage was 84, attributed to the 'Marshland' assemblage, with 57 species being ascribed to 'Tall sward and scrub', 33 were attibuted to the other major freshwater wetland assemblage, 'Peatland'. Other assemblages of note, which were represented at non-significant levels included 'Brackish pools and ditches' and 'Saltmarsh', both with 14 recognised species and 'Lake', mentioned here as two of the seven species attributed to this assemblage were nationally scarce.

A10.373 In terms of rarity value, whilst 'Marshland' was attributed with nine (out of 84) species of recognised conservation status, at 138, the SQI score for this assemblage was somewhat lower than for the less well subscribed, albeit, significantly represented habitat-level assemblage 'Peatland'. This assemblage was also attributed with nine species of higher conservation value, despite comprising only 33 species and achieved an SQI score of 188.

A10.374 Even more striking, was the deployment of nine out of only 14 species being attributed to the 'Brackish pools and ditches' and eight out of 14 to 'Saltmarsh'. It should be noted that the same nine nationally scarce species attributed at habitat level to 'Brackish pools and ditches' than were attributed at biotope level; furthermore, eight of the same nationally scarce species were also attributed to the 'Saltmarsh' assemblage.

A10.375 In pre-Pantheon ISIS versions, when FC thresholds were set at habitat-level (then called Broad Assemblage Types BATs), the target SQI score for 'Peatland' was 180. Although, the FC approach was removed at habitat level with the advent of Pantheon, it gives an indication of the relative value of assemblages at this level. Following this approach, the 'Peatland' assemblage can be considered to be significantly represented and of very high conservation value at this level. Unfortunately, as both 'Brackish pools and ditches' and

[39] 15 species is considered to be the minimum number of species from which a robust SQI score can be calculated in Pantheon

'Saltmarsh' were attributed with marginally too few species to produce significant SQI scores at this level. However, as has already been mentioned, the rarity value achieved at biotope-level for the overarching 'Coastal' assemblage was extremely high, with an SQI of 269.

A10.376 Importantly, the majority of species attributed both to the wetland and coastal assemblages, including in particular 'Marshland', 'Peatland', 'Brackish pools and ditches'/'Saltmarsh', were aquatic or hygrophilus species collected/recorded directly with the ditch or scrape habitats within Area 7. Adjusted to account for the overlap[40] between assemblages, a total of 23 nationally scarce species, including both brackish and freshwater aquatic species and species living on the exposed mud at the ditch and scrape margins, were recorded for Area 7.

A10.377 Although the outstanding assemblages at habitat-level in terms of rarity value included 'Peatland' and the coastal assemblages 'Brackish pools and ditches' and 'Saltmarsh'; the only SAT-level assemblage to attain a score exceeding its corresponding Favourable Condition threshold, was W211'Open water on disturbed mineral sediments', which is nested in the 'Marshland' habitat-level assemblage.

A10.378 According to the Pantheon glossary, The W211 'Open water on disturbed mineral sediments' occurs in coastal marshes and large river floodplains, which are subject to periodic heavy flooding events. This description corresponding to the conditions present on site. Species of note attributed to this assemblage form the 2020 survey data were all aquatic species and included: *Berosus luridus* a water-scavenger beetle classed as both nationally scarce and 'Near Threatened' under post-2001 IUCN criteria; *Peltodytes caesus* a nationally scarce crawling water beetle *Peltodytes caesus* and *Aquarius paludum* a nationally scarce pond skater.

A10.379 According to Foster (2010), *B. luridus* is mainly found in 'lowland ponds and slow drains with a peaty substratum' but is not confined to this habitat type; Foster and Friday (2009) state that *Peltodytes caesus* is 'Confined to lowland rich fen pools and ditches'; whilst *A. paludum* is said by Kirby (1992) to occur 'in colonies on the surface of large open waterbodies such as lakes and resrevoirs, and on flowing water in rivers and canals'.

A10.380 Whilst not achieving a score exceeding its FC threshold, the next best represented SAT from the Area 7 Pantheon analysis was W314 'Reedfen and pools', nested in the 'Peatland' habitat-level assemblage. The 'Reedfen and pools' is described in the Pantheon glossary as being 'mainly restricted to topogenous mires and fens. Many sites are in floodplains or at lake margins

[40] Several species were attributed to more than one assemblage

and subject to water level fluctuations. Nevertheless, the substratum rarely dries out completely.'

A10.381 Despite being attributed with only seven species (the FC threshold being 11), four nationally scarce species were attributed to the W314 'Reedfen and pools' SAT. These included two beetles: Great Silver Water Beetle *Hydrophilus piceus* (also classed as 'Near Threatened' under post-2001 IUCN criteria), and *Gyrinus paykulli,* a whirligig beetle; and two snail-killing flies (Sciomyzidae) including *Colobaea punctata* and *Pherbellia dorsata.*

A10.382 Great Silver Water Beetle *Hydrophilus piceus* (also classed as 'Near Threatened' under post-2001 IUCN criteria) is the UK's largest aquatic beetle. It is considered a flagship species of grazing marsh ditch habitats, with populations largely being confined to these habitat in the UK; whilst *G. paykulli* 'typically skulks in reedbeds and can occur in base-enriched sites'. (Foster and Friday, 2009).

A10.383 Spot-sided Pygmy Snailkiller *Colobaea punctata* is according to Falk (1992), associated with 'Lush marginal vegetation beside rivers, ponds and ditches'; whilst *Pherbellia dorsata,* occurs in 'A range of wetlands are utilised, both inland and coastal from both shaded and exposed sites.' (Falk, 1992). As their names suggest, the larvae of both species are highly specialised parasites feeding on terrestrial and aestavating aquatic snails; *Pherbellia dorsata* is particularly associated with the Ramshorn *Planorbis planorbis* (Falk, 1992).

A10.384 The terrestrial F111 'Bare sand and chalk' was the next best represented assemblage for the Pantheon output for Area 7. This assemblage was well recorded within the Swanscombe survey area as a whole, can be seen as relating to the grassland element of the site. No species of recognised conservation status were attributed to this SAT, however, somewhat local wolf spider species including *Pardosa hortensis* and *P. palustris* were attributed to this assemblage, alongside a chloropid fly *Trachysiphonella scutellata* which occurs in dry grassland both in calcareous and acid situations, and was classed as Nationally Scarce prior to a status review by Falk *et al* (2016).

A10.385 The only other SAT worthy of note in the context of the Area 7 Pantheon output was M311 'Saltmarsh and transitional brackish marsh'

A10.386 The description of M311 In the Pantheon glossary M311 is described as 'a wide ranging SAT' occupying 'a range of different zones from mid saltmarsh, where assemblages are relatively pure through upper saltmarsh to transitional marshes containing freshwater assemblage types, where the representation of saltmarsh species can be very small.'

A10.387 Interestingly, the Pantheon summary goes on to state that 'In fact the species restricted to these habitats probably occur more frequently with W211 species than with other saltmarsh species and should perhaps be recoded.' This is of interest, as the W211 'Open water on disturbed mineral sediments' was the best represented SAT for Area 7 and species included within this primarily freshwater habitat, clearly occurred alongside brackish water specialists on this site.

A10.388 Species of conservation value attributed to the M311 assemblage for Area 7 included a nationally scarce grooved water-scavenger Beetle *Helophorus fuligidicollis* and *Saldula opacula*, a nationally scarce saldid bug. *H.* fulgidicollis is confined to brackish water, where it usually occurs according to Foster *et al* (2014) 'in muddy pools with grassy edges in extensive areas of saltmarsh'. Kirby (1992) stated in relation to *Saldula opacula,* that 'the species has been recorded from a wide range of wetland habitats and it has also been associated with moderately to strongly brackish water margins.'

A10.389 Besides the SATs 17 species of recognised conservation status were only assigned to the previously discussed, habitat-level assemblages in Pantheon. These, which are all currently classed as nationally scarce, were deployed as follows. To both 'brackish pools and ditches' and 'Saltmarsh' assemblages, the following nationally scarce species were attributed:

A10.390 Diving beetle (Dytiscidae) species including *Agabus conspersus,* Hygrotes *parallelogrammus,* a crawling water beetle *Haliplus apicalis,* water-scavenger beetles (Hydrophilidae) including *Enochrus halophilus* and *Helophorus alternans* and a lesser waterboatman (Corixidae) *Sigara selecta*.

A10.391 An additional hydraenid beetle Ochthebius *nanus* was attributed to 'brackish pools and ditches' and also to the 'Marshland' assemblage.

A10.392 Nationally scarce species attributed only to the 'Marshland' habitat-level assemblage included a ground beetle *Bembidion fumigatum* associated with water margins, a grooved water-scavenger beetle Helophorus nanus and a saldid bug *Saldula pallipes.*

A10.393 Nationally scarce species attributed only to the 'Peatland' *habitat*-level assemblage included; a diving beetle *Rhantus frontalis,* a snail-killing fly *Pherbellia griseola,* a water-cricket *Microvelia pygmaea* and a cased-caddisfly *Oecetis furva.*

A10.394 The remaining nationally scarce species, the Hairy-sided Little Snailkiller *Ditaeniella grisescens* was attributed both to 'Marshland and Peatland assemblages in the Pantheon output for Area 7.

A10.395 The non-Pantheon SQI score recorded for Area 7 was 7.5 for species collected using terrestrial sampling methods only and 9.1, based on combined terrestrial and aquatic sample data. According to Harvey (2014)[41] an SQI value of 7.5 indicates an 'excellent' site for invertebrates, whilst one approaching 10.00 is 'almost certainly of national significance.' It should be noted, that species collected using the terrestrial sampling methods contained not only species with affinities to dry habitats, but also wetland species such as snail-killing flies and ground beetles associated with water margins and/or with aquatic larvae.

Conclusion

A10.396 Area 7, Botany Marsh (West) was found to support representative coastal and floodplain grazing marsh habitat. This habitat appears to have been subject to a continued history of grazing using cattle and at the time of the survey, a small number of sheep were also grazing the site.

A10.397 Whilst it is commonly the case with grazing marsh sites, the pasture component was relatively nutrient-rich, probably due to the combined influence of livestock and seasonal inundation. The grassland was, consequently, fairly herb-poor compared with the drier calcareous swards elsewher on the Peninsula.

A10.398 In contrast, the ditch network some more structurally and compositionally diverse habitat. The degree of inundation varied within and between the ditches and scrapes on site, with some permanently inundated habitat and some which was subject to seasonal drying. This combination provided conditions suitable for supporting characteristic grazing marsh invertebrates, including species adapted for survival in both permanent and/or seasonally fluctuating wetlands. This combination was evident through the finding of Pantheon analysis, where species were ascribed to both the characteristically fluctuating 'Marshland' assemblage and the permanently inundated 'Peatland' assemblage.

A10.399 The presence of brackish-associated macrophytes such as Sea Clubrush *Bolboschoenus maritimus,* within the ditches, belied the presence of a brackish habitat element. Furthermore, whilst the site's most strongly represented assemblages included freshwater associated 'wetland' at biotope level, a significant number of species recorded from the aquatic elements of the site were strongly or obligatorily associated with brackish habitats.

[41] Harvey based his evaluation on invertebrate fauna in Essex, the Kent fauna within the Swanscombe part of the Thames corridor is comparable with this standard.

A10.400 From the site as a whole, the vast majority of rarities were species of either freshwater or brackish affinities and very few fundamentally terrestrial species of recognised conservation status were recorded from the site. Whilst more than twice the number of species were attributed to 'Marshland' at habitat-level, than for the 'Peatland' assemblage, nine nationally scarce species each were deployed within these assemblages. A greater concentration still, was found within the brackish assemblages where, again nine scarce species were attributed to the 'Brackish pools and ditches' with most of these species also being attributed to 'Saltmarsh'.

A10.401 The majority of both freshwater 'Marshland' and 'Peatland' and brackish associated species of conservation status were aquatic or hygrophilous beetles, with relatively fewer snail-killing flies (Sciomyzidae) and aquatic and semi-aquatic bugs. At SAT level the only assemblage achieving Favourable Condition was the W211 'Open water on disturbed sediments' SAT. However, of the less well represented SATs, W314 'Reedfen and pools' which is nested in the 'Peatland' assemblage at habitat-level, was attributed with four nationally scarce.

A10.402 Regardless of the Pantheon affinities of aquatic and hygrophilus species recorded from the site, these elements were found to be highly diverse and included a total of 23 nationally scarce species, of both freshwater and brackish affinity, essentially occupying the same habitat. Many of these were also species with a strong association with coastal and flood plain grazing marshes. The Near Threatened and nationally scarce Great Silver Water Beetle *Hydrophilus piceus*, recorded from the site is considered a flagship species of coastal grazing marshes and a number of the other species are also associated with this habitat.

A10.403 From Pantheon analysis of 2020 terrestrial and aquatic Invertebrate data from Area 7, Botany Marsh (West), The site can be said to support wetland invertebrate assemblages representative of coastal grazing marshes with brackish influence of or approaching National importance. The independently calculated SQI scores of 7.5 for species collected using terrestrial sampling methods only and 9.1, based on combined terrestrial and aquatic sample data, endorse the view that the combined wetland and brackish assemblages recorded from Area 7 may be considered to support invertebrate assemblages of National Importance.

Area 8: Botany Marsh East

Centroid grid reference: TQ 61076 75471

Overall area: 18 hectares

Designations on site: Botany Marshes LWS

S41 habitats present: Coastal and floodplain grazing marsh

Habitat Description

A10.404 Area 8 comprised of a largely flat, complex mosaic of grazing marsh, reedswamp and scrub habitat. Like Area 7 contiguous to the site's western border, Area 8 was divided by a network of field drains; however, unlike this area, hedgerows and areas of dense and scattered within field scrub are present, often following the field drains. The drains themselves were frequently inaccessible due to scrub edges and in the wetter areas, carr habitat. The more open areas, often closer to the site's eastern boundary, had been subject to conservation work and several of the drains had been cleared and expanded into small ponds/scrapes. There were several smallish blocks of reed swamp on the site and the northern end of the site was characterised by evenly spaced, parallel groups of shallow man-made field drains/grips, which sometimes occupied more open grassy areas, sometimes occurring within more regimented stands of Common Reed *Phragmites australis.*

A10.405 The grassland within the defined fields on the site supported generally herb-poor and sometimes rank sward, with graminoids including co-dominants including Yorkshire Fog *Holcus lanatus,* Creeping Bent *Agrostis stolonifera* and Common Couch *Elytrigia repens,* with other grasses typical of periodically inundated grasslands such as Marsh Foxtail *Alopecurus geniculatus* and Tall Fescue *Festuca arundinacea* and sedges *Carex* spp. occurring more locally.

A10.406 Much of the grassland supported a limited range of herbs, with species such as Common Nettle *Urtica dioica*, Cow Parsley *Anthriscus sylvestris*, Curled Dock *Rumex crispus,* Creeping Thistle *Cirsium arvense* and Teasel *Dipsacus fullonum* being most noticeable during the earlier part of the season. However, there were some more herb-rich areas, with Ribwort Plantain *Plantago lanceolata*, Greater Bird's-foot Trefoil *Lotus pedunculatus*, Ox-eye Daisy *Chrysanthemum leucanthemum*, Selfheal *Prunella vulgaris,* Yarrow *Achillea millefolium*, Common Knapweed *Centaurea nigra*, Bristly Ox-tongue *Picris echioides*, Common Vetch *Vicia sativa,* clovers *Trifolium spp.,* Common Ragwort *Senecio jacobaea,* Hoary Ragwort *S. erucifolia* and Hogweed *Heracleum sphondylium* amongst others.

A10.407 The reedswamps were generally fairly uniform in composition with Common Nettle, Greater Willowherb *Epilobium hirsutum,* Bittersweet *Solanum dulcamara* and low-growing Bramble *Rubus fruticosus* agg. occurring alongside

Common Reed. The more mature stands had deep litter layers, however, there was evidence of reedbed management on the site with stands of various age classes present.

A10.408 The wetter ditch habitat were often poorly vegetated other than common reed and sometimes shaded by scrub. More accessible, open water areas supported macrophytes including Greater Reedmace *Typha latifolia* and Water Dock *Rumex hydrolapathi* besides the ubiquitous Common Reed. Locally, water crow-foots *Ranunculus* spp. were present in the channels and rarely Sea Aster *Aster tripolium* was present, suggesting a brackish element.

A10.409 Scrub species occurring on site included Grey Willow *Salix cinerea,* Goat Willow *S. caprea* especially in the wetter areas and carr habitat, with hedge bondaries oftne including Hawthorn *Crataegus monogyna,* Blackthorn *Prunus spinosa,* English Elm *Ulmus procera,* Elder *Sambucus nigra* and Dog Rose *Rosa canina* (agg.) The maturity of scrub varied over the site. There were some significant areas of Bramble scrub and a wood decay resource was evident on the site, both in terms of standing and fallen deadwood and through managed log piles.

A10.410 Connectivity: Botany Marsh East (Area 8) comprises traditionally managed coastal and floodplain grazing marsh habitat. Such habitat which was formerly abundant in the Thames Estuary, is now much reduced, both locally and on a national scale. This has lead to the habitat being selected as a 'priority habitat' under section 41 of the NERC Act (2006). On a site scale, the habitat contributes to the wetland diversity of the Swanscombe Peninsula and together with the contiguous, Botany Marshes West (Area 7), forms a significant area of a much declined habitat, which is known to support a diversity of specialist wetland invertebrates. Within the wider landscape, Area 8 contributes to a network of remnant coastal and floodplain grazing marsh sites. According to NE's habitat inventory, within a 10 kilometre radius of the site, there are significant areas of similar habitat in Kent to the west and on the north bank of the Thames in Essex. The closest site is within approximately 2.5 kilometres of the site, to the northeast in Essex. In addition, there are numerous saltmarsh and other wetland sites within closer proximity to the site.

A10.411 Substrate: Area 8: Chalk sedimentary bedrock (Lewes Nodular Chalk Formation; Seaford Chalk Formation and Newhaven Chalk Formation) with alluvium, clay, silt, sand and peat sedimentary superficial deposits.

A10.412 Wetness: Area 8 was an extensive wetland site, comprising seasonally inundated wet grassland; areas of reedswamp and a network of field drains.

A10.413 Structure: The topography of the open grassland and scrub habitat was generally flat with only subtle variation due to the presence of in-field scrapes, ditches and grips. There were some raised, drier grassland banks and small

mounds, which increased the hydrological variation on the site. The mosaic of various-aged scrub, reedswamp, grassland, and aquatic habitat provided considerable structural diversity over the site and this, rather than the botanical diversity, which was generally low, provided the greater value for both generalist and specialised invertebrates.

Invertebrate Survey Dates:

- Terrestrial surveys were conducted on the following dates: 19-20/05/2020; 15-17/06/2020; 14/07/2020 and 18-19/08/20; and
- Aquatic surveys were conducted on the following dates: 2/06/2020 and 10/08/2020.

Table EDP A10.43: Number of Samples per Substrate.

	Area 8 – Botany Marsh East	**Total**
Sweep	4	4
Vacuum	4	4
Beating	4	4
Pitfall trap (cluster of 10)	3	3
Malaise trap	3	3
Aquatic (3 minute sweep)	4	4

Total Number of Species Recorded:

- Combined terrestrial and aquatic sample data = 256;
- Terrestrial data only = 23142; and
- Aquatic data only = 27[43].

A10.414 A comparison of the relative number of species recorded from each of the major taxons is included in the following graph (includes species collected using both terrestrial and aquatic sampling methods).

[42] Note: Terrestrial and aquatic data may not add up to the combined figure, as there may be overlap between species recorded both in terrestrial and aquatic samples

[43] Species list small as many of contributing species were not recorded to species-level and therefore, not used for conservation evaluation

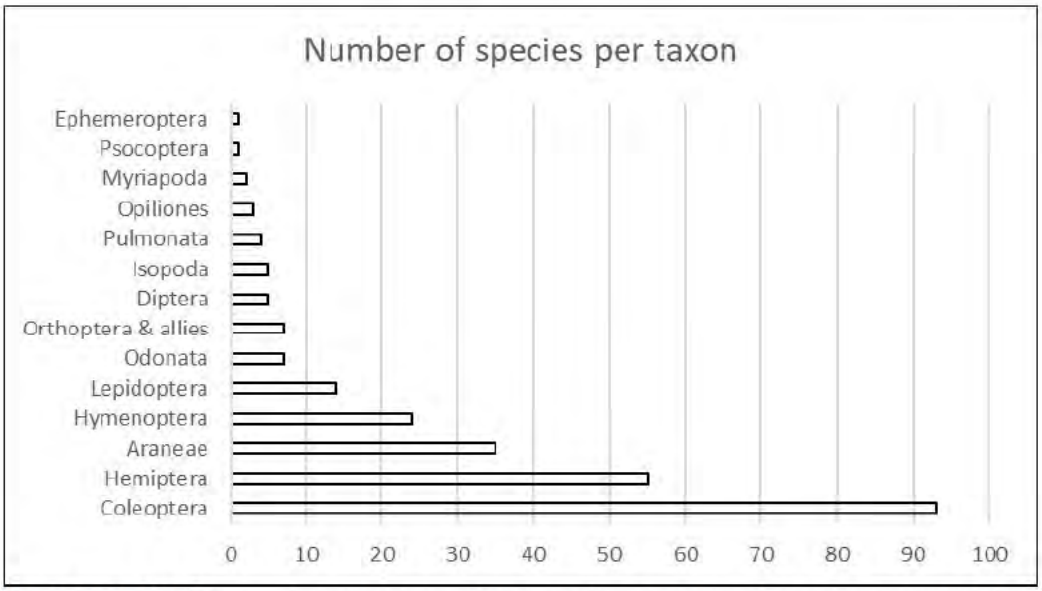

Chart EDP A10.10: A comparison of the relative number of species recorded from each of the major taxons.

Table EDP A10.44: Species of Recognised Conservation Recorded from Area 8.

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
A mirid bug	*Lygus pratensis*	Miridae	Hemiptera	RDB3 pre-1994 criteria	LC
Blue Carpenter Bee	*Ceratina cyanea*	Apidae	Hymenoptera	RDB3 pre-1994 criteria	LC
A solitary wasp	*Passaloecus clypealis*	Crabronidae	Hymenoptera	RDB3 pre-1994 criteria	
A shining flower beetle	*Olibrus flavicornis*	Phalacridae	Coleoptera	Red Data Book-insufficiently known	DD
A running crab spider	*Thanatus striatus*	Philodromidae	Araneae	Nationally Scarce	LC
A jumping spider	*Ballus chalybeius*	Salticidae	Araneae	Nationally Scarce	LC
A jumping spider	*Sibianor aurocinctus*	Salticidae	Araneae	Nationally Scarce	LC
A comb-footed spider	*Kochiura aulica*	Theridiidae	Araneae	Nationally Scarce	LC
A ground beetle	*Pterostichus longicollis*	Carabidae	Coleoptera	Nationally Scarce	LC
A weevil	*Larinus planus*	Curculionidae	Coleoptera	Nationally Scarce	LC
A crawling water beetle	*Peltodytes caesus*	Haliplidae	Coleoptera	Nationally Scarce	LC
A water scavenger beetle	*Berosus luridus*	Hydrophilidae	Coleoptera	Nationally Scarce	NT
A tumbling flower beetle	*Mordellistena variegata*	Mordellidae	Coleoptera	Nationally Scarce	LC
A leafhopper	*Paralimnus phragmitis*	Cicadellidae	Hemiptera	Nationally Scarce	LC
A planthopper	*Asiraca clavicornis*	Delphacidae	Hemiptera	Nationally Scarce	LC
Spined Hylaeus	*Hylaeus cornutus*	Colletidae	Hymenoptera	Nationally Scarce	LC
Little Yellow-faced	*Hylaeus pictipes*	Colletidae	Hymenoptera	Nationally Scarce	

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
Bee					
Rosy-striped Knot-horn	*Oncocera semirubella*	Pyralidae	Lepidoptera	Nationally Scarce	LC
Cinnabar	*Tyria jacobaeae*	Erebidae	Lepidoptera	S41 research only	LC
Jersey Tiger	*Euplagia quadripunctaria*	Erebidae	Lepidoptera	Habitats Directive Annex 2 (non-priority species)	LC
An aderid beetle	*Anidorus sanguinolentus*	Aderidae	Coleoptera	First UK record	
A leafhopper	*Macrosteles sardus*	Cicadellidae	Hemiptera	First UK record	
Southern Migrant Hawker	*Aeshna affinis*	Aeshnidae	Odonata	Recent UK colonist	

A10.415 SQI score for Area 8: Botany Marsh East:

- Combined terrestrial and aquatic sample data = 7.3 (243 contributing species); and
- Terrestrial data only = 7.6 (220 contributing species).

Pantheon Output Tables for Area 8:

Table EDP A10.45: Habitats & resources: broad biotopes

Broad biotopei	No. of species	% representation	SQI	Conservation statusi	Species with conservation status
open habitatsi	144	3	123	1 [Nb]; 2 [RDB 3]; 2 [Na]; 4 NSi; 1 Nbi; 1 RDB 3i; 1 Section 41 Priority Species - research only	12
wetlandi	48	2	148	1 Nbi; 1 [RDB 3]; 3 NSi; 1 NTi	5
tree-associatedi	31	<1	129	2 [Na]; 1 NSi	3
coastali	1	<1	100		

Table EDP A10.46: Habitats & resources: habitats

Broad biotopei	Habitati	No. of species	% representation	Conservation statusi	SQI	Species with conservation status
open habitatsi	tall sward & scrubi	108	4	1 NSi; 1 RDB 3i; 1 Section 41 Priority Species - research only; 1 [RDB 3]	108	4
wetlandi	marshlandi	34	4	3 NSi; 1 NTi	141	3
open habitatsi	short sward & bare groundi	25	2	1 Nbi; 1 [Nb]; 2 NSi; 1 RDB 3i	150	5

Broad biotope	Habitat	No. of species	% representation	Conservation status	SQI	Species with conservation status
tree-associated	decaying wood	17	1	2 [Na]	135	2
tree-associated	arboreal	14	1	1 NS	121	1
wetland	peatland	9	<1	1 [RDB 3]	167	1
wetland	running water	3	<1		100	
tree-associated	shaded woodland floor	2	<1		100	
wetland	wet woodland	1	<1		100	
tree-associated	wet woodland	1	<1		100	
coastal	brackish pools & ditches	1	<1		100	

Table EDP A10.47: Habitats & resources: ISIS specific assemblage types

Broad biotope	Habitat	SAT	No. of species	% representation	SQI	Conservation status	Species with conservation status	Code	Reported condition
tree-associated	decaying wood	bark & sapwood decay	15	3	140	2 [Na]	2	A212	Unfavourable (15 of 19 species)
open habitats		rich flower resource	13	5	192	1 RDB 3; 2 [Na]; 1 [RDB 3]	4	F002	Unfavourable (13 of 15 species)
open habitats		scrub edge	11	5	155	2 [Na]	2	F001	Favourable
wetland	marshland	open water on disturbed mineral sediments	6	15	200	1 NT; 2 NS	2	W211	Favourable
open habitats	short sward & bare ground	bare sand & chalk	5	1	220	2 NS	2	F111	Unfavourable (5 of 19 species)

Broad biotopei	Habitati	SAT	No. of speciesi	% representationi	SQIi	Conservation statusi	Species with conservation status	Code	Reported conditioni
open habitatsi		scrub-heath & moorlandi	5	1	160	1 [RDB 3]; 1 NSi	2	F003	Unfavourable (5 of 9 species)
open habitatsi	short sward & bare groundi	open short swardi	5	2	220	1 Nbi; 1 [Nb]	2	F112	Unfavourable (5 of 13 species)
wetlandi	peatlandi	reed-fen & poolsi	3	3	300	1 [RDB 3]	1	W314	Unfavourable (3 of 11 species)
tree-associatedi	decaying woodi	epiphyte faunai	2	10	100			A215	Unfavourable (2 of 3 species)
wetlandi	marshlandi	undisturbed fluctuating marshi	1	3	100			W221	Unfavourable (1 of 4 species)

Site-Specific Limitations

A10.416 Area 8 was subject to the following sampling limitations/constraints:

- Much of the wetland habitat on the site was inaccessible, especially the reedswamp habitats, therefore, a malaise trap was deployed at the margin of reedswamp habitat; and

- At the current time, the majority of diptera records of the site are unavailable. Diptera are an important component of grazing marsh/wetland habitats and the absence of these are likely to have influenced the findings from analysis of the available dataset.

Discussion/Evaluation – Area 8

A10.417 Area 8 Botany Marsh (East) supported a relatively large area of habitat best described as coastal and floodplain grazing marsh s41 habitat. Unlike the contiguous Area 7 Botany Marsh (West), the site did not appear to be subject to traditional livestock grazing, although there was evidence of periodic cutting. Like Area 7, Area 8 was subdivided by a network of field drains, the drain network being interconnected with those in Area 7.

A10.418 However, whilst there was evidence of conservation management, with small enlarged ditch junctions developed into pond-like features, these were

generally less structurally and compositionally diverse than those in Area 7. In contrast, the field drains were often clogged with denser Common Reed *Phragmites australis* growth, often were often bordered by heavy bramble and willow scrub. In addition, unlike Area 7, which was a relatively open in character, dense hedgerows created shading over the ditches in some areas.

A10.419 The reedbeds on site appeared to be subject to rotational management and the parallel, reed-lined grips in the northern end of the site added some structural variation of benefit to coastal and floodplain grazing marsh invertebrates. Strucurally, the overall habitat of Area 8 was very diverse, due to the tall-herb, scrub and grassland elements. There was also an evident wood decay resource and some of the hedgelines were characterised by veteran scrub elements, remnants of historical management. This resource was not generally elsewhere on the Swanscombe peninsula, where much woody growth had resulted from recent relatively recent planting/succession.

A10.420 On face-value, the habitat within Area 8 provided a considerable range of structural elements of benefit to invertebrates including stem-nesting and wood decay assemblages, whilst there were some more herb-rich elements within the grassland areas, the majority of the site was herb-poor and likely to be of less value to invertebrates requiring a rich flower resource, or foodplant specialists. The wetland habitat, despite being hydrologically linked to Area 7, was frequently heavily shaded by scrub and lacked floristic diversity. However, there were some more open water areas on the site.

A10.421 The juxtapostion of Area 8 to Area 7 and the coastal grassland and saltmarsh elements, increase the value of Area 8 which also contributes to the grazing marsh resource of value to invertebrates in a wider landscape scale.

A10.422 During the 2020 survey a total of 356 invertebrate species were recorded from Area 8, including 231 species derived from terrestrial survey methods and 27 from aquatic sampling. In, total 20 species of recognised conservation status in the UK were recorded from Area 8. These included one ‘research only’ species under section 41 of the NERC Act (2006), three species classed as Nationally Rare (RDB3) based on pre-1994 criteria; one species classed as ‘Insufficiently known’ DD under post-2001 IUCN criteria and 14 species currently classed as Nationally Scarce in the UK.

A10.423 One additional species, the Jersey Tiger *Euplagia* quadripunctaria is also listed as a non-priority species under schedule 2 of the EU Habitats Directive. Where applicable, these species are listed in relation to the attributed Pantheon assemblages to which they are attributed, below.

A10.424 From specimens collected during the 2020 survey of Area 8, two species never before recorded from the UK were identified. These included an aderid beetle *Anidorus sanguinolentus,* recorded from pitfall samples on the site. A specimen was tentatively identified by Calum Urquhart, who sent the specimen to Max Barclay at the Natural History Museum London. The species was subsequently confirmed by coleoptera specialist Dmitri Telnov. The other was a leafhopper *Macrosteles sardus,* which was identified from 2020 samples by Hemiptera specialist Tristan Bantock. Dr Bantock identified the majority of Hemiptera specimens from the 2020 samples. These species are described in more detail in **Table EDP A10.87**.

A10.425 In addition to the above, it is worthy of note that one species of dragonfly, Southern Migrant Hawker *Aeshna affinis,* a recent colonists of the UK, was recorded within Area 8 during the survey. After being a scarce migrant to the UK for a number of years, a signigicant influx of the species to southeast England was recorded in 2010 and since that time the dragonfly has been recognised to be breeding in sites in the Thames corridor (Brooks and Cham, 2014).

A10.426 From Pantheon analysis undertaken for Area 8, the largest number of species was attributed to the 'Open habitats' assemblage at biotope level, with 144 attributed species. In addition, 48 species were attributed to 'Wetland', 31 to 'Tree associated' and one 'Coastal' species was recorded.

A10.427 At biotope level an SQI score of 148 for was recorded for 'Wetland', indicating an overall assemblage of fairly high conservation value. The score of 123 for 'Open habitats', indicated an overall assemblage of reasonable, but not exceptional conservation value and a similar evaluation would seem appropriate for the 'Tree associated' biotope-level assemblage, for which an SQI of 129 was recorded. In contrast to the contiguous Area 7 Botany Marsh (West), only one species was attributed to the 'Coastal' biotope-level assemblage for Area 8.

A10.428 At habitat level, the largest number of species attributed to a single assemblage was 108, attributed to the 'Tall sward and scrub' assemblage. In addition 34 species were ascribed to 'Marshland', 25 to 'Short sward and bare ground' and 17 species were attributed to the 'Tree-associated' habitat-level assemblage,'Decaying wood'.

A10.429 Other assemblages attributed with too few species to register significant SQI scores, included another 'Tree-associated' habitat-level assemblage 'Arboreal' and the other major wetland assemblage, 'Peatland' was attributed with only nine species at habitat-level. The deployment of species between both habitat

and broad biotope level differed significantly from the deployment recorded from the adjacent Area 7 Botany Marsh (West) site.

A10.430 In terms of rarity value, unlike the majority of Swanscombe sites surveyed during 2020, no outstanding assemblages were evident at habitat-level. Although in common with most other sites, the 'Tall sward and scrub' assemblage was attributed with, by far, the largest number of species, the SQI score of 108 recorded was relatively low, indicating an unexceptional assemblage. Whilst four species of conservation value were attributed to 'Tall sward and scrub', this was relatively small number compared to that recorded for some other sites.

A10.431 Of the remaining assemblages for which robust SQIs could be calculated in Pantheon, 'Short sward and bare ground' was the highest with an SQI of 150, this assemblage being attributed with five species of conservation value derived from a relatively small dataset, can be considered as being of relatively high conservation value. The 'Marshland' assemblage, with 3 attributed species resulting in an SQI score of 141, could also be considered to be of some conservation value, but in no way approaching national significance. Compared to other sites, the 'Decaying wood' habitat-level assemblage was relatively well subscribed, although the SQI of 135, based on two out of 17 species being of conservation value, did not indicate an assemblage of exceptional quality at this level.

A10.432 At SAT level, whilst two assemblages, F001 'Scrub edge' and W211 'Open water on disturbed mineral sediments' were attributed with sufficient species to attain Favourable condition status; the most strongly represented SAT in terms of species number was A212 'Bark and sapwood decay'; 15 species were attributed to this assemblage, compared with the threshold of 19 for FC set in Pantheon.

A10.433 The species attributed to the A212 assemblage included wood decay beetles such as the Plum Longhorn *Tetrops praeustus* the Common Grammoptera *Grammoptera ruficornis* and a scraptiid beetle *Anaspis maculatus,* which feed in decaying branches. However, the species of greater conservation value attributed to A212 'Bark and sapwood decay' included two nationally scarce bees Spined Hylaeus *Hylaeus cornutus* and Little Yellow-faced Bee *Hylaeus pictipes.* Whilst Spined Hylaeus has been recorded to nest in dead stems of tall herbs with hollow woody stems, such as Wild Parsnip *Pastinaca sativa* and docks *Rumex* spp., the Little Yellow-faced Bee is known to nest in Bramble *Rubus fruticosus* agg. and Roses *Rosa* spp. Interestingly, a number of the bees and solitary wasps recorded from the site are stem-nesting species associated with Bramble and Rose and/or dead, woody stems of tall herbs and Common Reed.

A10.434 These included other species attributed to the 'Bark and sapwood decay' assemblage, the Hairy Yellow-faced Bee *Hylaeus hyalinatus* and Brown-footed Leafcutter Bee *Megachile versicolor* as well as the RDB3 Little Blue Carpenter Bee *Ceratina cyanea,* Chalk Yellow Faced Bee *Hylaeus dilatatus* and a solitary wasp *Pemphredon lethifer* (both species dubiously listed as RDB3 species in Pantheon). In addition, another solitary wasp, the rare RDB3 *Passaloecus clypealis*, nests in Common Reed and is consequently strongly associated with reedbeds (note: *P. clypealis* was one of three species attributed to the W314 'Reedfen and pools' SAT).

A10.435 A strong feature of Area 8 was the availability of dead-stem resource, often occurring due to lack of evident management of resources such as Bramble scrub, Reeds in ditches and tall herb vegetation. The abundance of stem-nesting aculeates, inclu and other species was testimony to the value of this resource in Area 8 and in its present condition, stem-nesting species could be seen as one of the features of highest conservation value recorded from Area 8.

A10.436 Pantheon results indicate that the value of the wetland habitat of Area 8 for invertebrates was relatively low compared to the adjacent Area 7, which scored wetland assemblages of very high conservation value. The overall number of species attributed to 'Wetlands' at biotope-level was reasonably high; although the 'Peatland' habitat-level assemblage was poorly subscribed, 'Marshland' was fairly well subscribed and supported an assemblage, based on the SQI score of 141, of some conservation value. The W211 'Open water on disturbed mineral sediments' SAT was subscribed with sufficient species to achieve favourable condition status.

A10.437 Two nationally scarce species were attributed to this assemblage, including a a water-scavenger beetle *Berosus luridus* and a crawling water beetle *Peltodytes casesus*. Both species were also recorded, as part of a much richer recorded marshland fauna for the contiguous Area 7. The hydrological linkage of drains between these habitats makes movement of species and population expansion/contraction of species to occur between these sites over time highly likely.

A10.438 According to Foster (2010), *B. luridus* is mainly found in 'lowland ponds and slow drains with a peaty substratum' but is not confined to this habitat type and Foster and Friday (2009) state that *Peltodytes caesus* is 'Confined to lowland rich fen pools and ditches'.

A10.439 Other species of conservation importance recorded for wetlands as a whole included the RDB3 reed-stem solitary wasp *Passaloecus clypealis* (discussed in

relation to stem-nesting species above); and nationally scarce species including *Pterostichus longicollis,* a ground beetle associated with bare pond margins, often on calcareous substrates (Hyman and Parsons, 1992) and *Paralimnus phragmites* a leafhopper, which is associated with Common Reed *Phragmites australis* often in coastal wetlands.

A10.440 The open-habitat 'Tall-sward and scrub' and 'Short sward and bare ground' assemblages recorded from Area 8 also included some species of rarity value. However, fewer species of conservation value were recorded from Area 7 compared to most other sites supporting grassland and OMH within the 2020 survey area and also, the species of conservation importance were mainly species recorded from one or more other sites in the wider area. Species of note attributed to 'Tall-sward and scrub' included a nationally scarce philodromid spider *Thanatus striatus*, which is associated mainly with sandy coastal and brackish grassland habitats and the s41 research only Cinnabar *Tyria jacobaeae,* a relatively common dat-flying moth associated with ragworts *Senecio* spp.

A10.441 Nationally scarce species attributed to 'Short sward and bare ground' included a wolf spider *Pardosa agrestis* (or the subspecies purbeckensis[44]), a jumping spider *Sibianor aurocinctus*, a weevil *Larinus planus* which is mainly associated with coastal grassland habitats where the larvae develop in the flowerheads of thistles and a planthopper *Asiraca clavicornis,* a grassland and OMH species, which is rare nationally, but is relatively common in the UK.

A10.442 The non-Pantheon SQI score recorded for Area 8 was 7.6 for species collected using terrestrial sampling methods only and 7.3, based on combined terrestrial and aquatic sample data. According to Harvey (2014)[45] an SQI value of 7.5 indicates an 'excellent' site for invertebrates, whilst one approaching 10.00 is 'almost certainly of national significance.' It should be noted, that species collected using the terrestrial sampling methods contained not only species with affinities to dry habitats, but also wetland species such as snail-killing flies and ground beetles associated with water margins and/or with aquatic larvae.

Conclusion

A10.443 Pantheon analysis of 2020 data collected from both terrestrial and aquatic surveys of Area 8 Botany Marsh (East), indicated that the rarity value of the site was distributed rather diffusely between several distinct assemblages. The W211 'Open water and disturbed mineral sediments' SAT achieved a score exceeding its Favourable Condition threshold and included species of

[44] There is debate over whether or not *P. agrestis* and *P. purbeckensis* are separate species, though it has been suggested that spiders found in coastal habitats are more likely to be the latter.

[45] Harvey based his evaluation on invertebrate fauna in Essex, the Kent fauna within the Swanscombe part of the Thames corridor is comparable with this standard.

conservation status, including nationally scarce aquatic beetles *Berosus luridus* and *Peltodytes caesus*. However, this assemblage comprised very few species and the wetland assemblages recorded from Area 8 as a whole, were relatively poorly represented in terms of rarity value compared to the very high scoring wetland and brackish assemblages, recorded for the contiguous and hydrologically connected Area 7.

A10.444 One group of species expressed both within the A212 'Bark and sapwood decay' SAT, but also deployed elsewhere within the 2020 Area 8 dataset, included predominately stem-nesting aculeate species. Reed-nesting RDB3 solitary wasp *Passaloecus clypealis*, was recorded from the site alongside Bramble and dead stem-nesting Little Blue Carpenter Bee *Ceratina cyanea,* nationally scarce Spined Hylaeus *Hylaeus cornutus* and Little Yellow-faced Bee *Hylaeus pictipes* and several more common and widespread species.

A10.445 These species indicated the structural value of the more degenerate scrub, reedbed and unmanaged tall-herb dead-stem resource of Area 8.

A10.446 Although the combined shorter and taller grassland and scrub invertebrate assemblages recorded from Area 8 were not of particularly high conservation value compared with those recorded from some of the other 2020 survey sites, at least six species of recognised conservation value were attributed jointly to these habitats within the Pantheon output.

A10.447 A finding of particular significance from Area 7, was the recording of two species never before recorded in the UK, from Area 7. During the current survey, an aderid beetle *Anidorus sanguinolentus* was recorded by Calum Urquhart and authenticated by Dmitri Telnov and *Macrosteles sardus*, a species of leafhopper determined by Dr Tristan Bantock, was also recorded.

A10.448 The invertebrate conservation interest from samples collected from Area 7 Botany Marsh (East) was rather diffusely scattered between a range of assemblages in the Pantheon output. Whilst 20 species of conservation value out of an overall total of 256 species, produced a more modest SQI score (7.6) than was attained for many of the sites within the 2020 survey area, Area 7 can, nevertheless, be considered a significant site for invertebrates, supporting an assemblage of Regional Importance.

AREA 10: CRAYLANDS PIT

Centroid grid reference: TQ 601161 74893

Overall area: 7.12 hectares

Designations on site: None

S41 habitats present: Open mosaic habitat on previously developed land

Habitat Description

A10.449 The site is roughly rectangular in shape and occupies the footprint of a former quarry. It is sheltered from all but the west-facing aspect by vertical (c15 to 25 metre) chalk cliffs. The substrate over much of the site was also chalk, often with no overlying soil and the central area of the site from west to east comprised a flattish plateau. The northern margin of the site parallel to the London Road was generally at a lower elavation, being separated from the central plateau by a shallow raised bank and a graded slope, which itself sloped gradually on the east/west axis of the site, culminating in a deeper depression and giving rise to a moderately steep, west and north-facing, grassy escarpment. There were areas of hard-standing on the site, mainly including an access track leading down to a fenced-off underpass in the site's northeast corner.

A10.450 Whilst the main plateau area was generally flat, there was varied microtopography, due to regular striations/ruts and the raised bank at the top of the escarpment and the escarpment itself provided some valuable habitat variation. The vegetation on site consisted largely of OMH supporting a herb-rich, strongly calcareous grassland flora. The margins of the site supported well-developed, albeit narrow, scrub edges. This was most advanced along the southern site boundary; there was also colonising scattered scrub within the central plateau area; however, the site was far less advanced than within the adjacent Area 11 (Sportsground).

A10.451 Herb cover varied somewhat across the site; with some large areas of more sparsely vegetated habitat giving rise to extensive bare ground patches of friable chalk. The steeper slopes were generally supported a more established, denser sward.

A10.452 Grassland habitat on the main plateau and slopes supported a diverse range of herbs including: Narrow-leaved Bird's-foot Trefoil *Lotus tenuis,* Common Bird's-foot Trefoil *L. corniculatus,* Kidney Vetch *Anthyllis vulneraria,* Sainfoin *Onobrychis viciifolia,* Wild Carrot *Daucus carota,* Red Bartsia *Odontites vernus,*

Salad Burnet *Sanguisorba minor,* Creeping Cinquefoil *Potentilla reptans,* Ribwort Plantain *Plantago lanceolata,* Hoary Plantain *P. media,* Ox-eye Daisy *Chrysanthemum leucanthemum,* Yarrow *Achillea millefolium,* Self-heal *Prunella vulgaris,* Rough Hawk's-beard *Crepis biennis,* Bristly Ox-tongue *Picris echioides,* Common Vetch *Vicia sativa,* Black Medick *Medicago lupulina,* Red Clover *Trifolium pratense,* Common Knapweed *Centaurea nigra,* Meadow Buttercup *Ranunculus acris,* Yellow Wort *Blackstonia perfoliata,* Stemless Thistle *Cirsium acuale,* Creeping Thistle *Cirsium vulgare,* Coltsfoot *Tussilago farfara,* Common Ragwort *Senecio jacobaea* and Ground Ivy *Glechoma hederacea.*

A10.453 Typical OMH non-native plants recorded on site included Goat's Rue *Galega officinalis*, Lucerne *Medicago sativa*, White Melilot *Melilotus albus*.

A10.454 The site can be considered to be an OMH site due to the former quarrying history and elements of disturbance on the site.

A10.455 Connectivity: The site is connected in the landscape being in close proximity to similar OMH and calcareous grassland and scrub mosaic habitats comprising Swanscombe Peninsula to the north and the Sportsground (Area 11) and the corridor to the south including Bamber Pit (Area 12), The Former landfill (Area 13); Station Quarter (Area 14) and Station Quarter South (Area 15). Collectively these habitats constitute a large overall area and provide a significant habitat corridor of value to specialist invertebrates.

A10.456 Substrate: Chalk sedimentary bedrock (Lewes Nodular Chalk Formation; Seaford Chalk Formation and Newhaven Chalk Formation); localised superficial deposits (sand and gravel).

A10.457 Wetness: No standing water was recorded during the survey; however, the lower lying areas of the site to the northeast corner and around the slope bottom hardstanding area, supported some damper habitat with evidence of drainage impedence.

A10.458 Structure: The site was structurally diverse, with areas of bare ground, short sward grassland, more established calcareous grassland, tall herb and scrub habitats. Some wood decay habitat was present on site including deposited railway sleepers and log piles.

Invertebrate Survey Dates

A10.459 The site was surveyed on four occasions including: 18/05/2020; 15/06/2020; 13/07/20 and 17/08/20.

Table EDP A10.48: Number of Samples per Substrate.

	Grassland/OMH and Scrub	Total
Sweep	4	4
Vacuum	4	4
Beating	4	4
Pan trap	4	4

A10.460 Total number of species recorded: 319. A comparison of the relative number of species recorded from each of the major taxons is included in the following table:

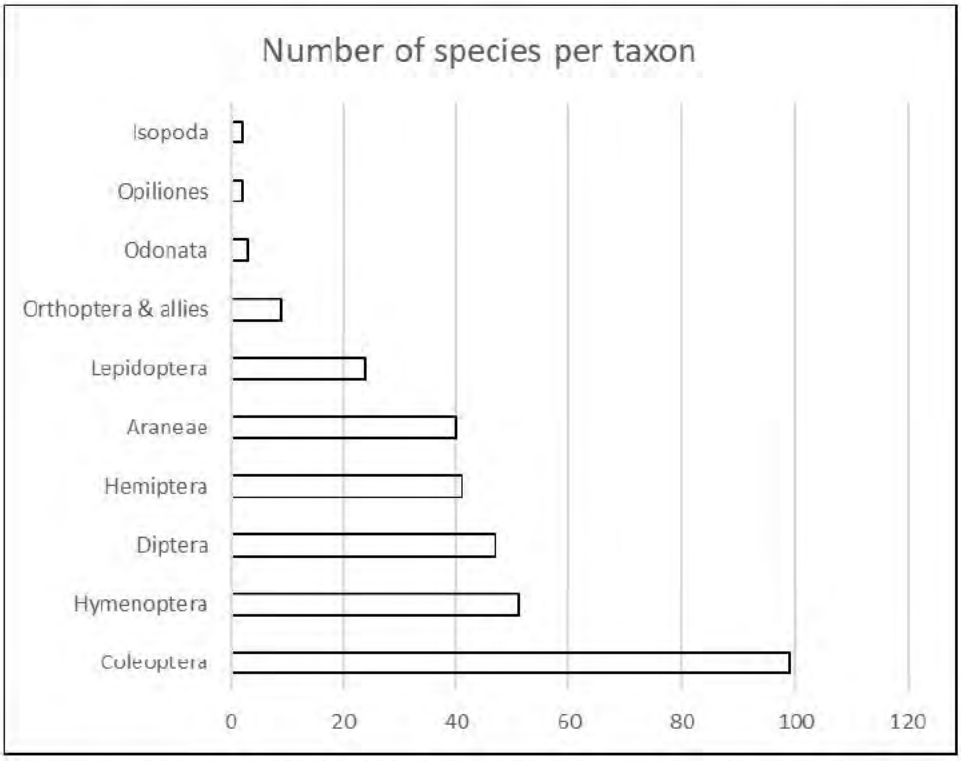

Chart EDP A10.11: A comparison of the relative number of species recorded from each of the major taxons.

Table EDP A10.49: Species of recognised conservation recorded from Area 10.

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
A tachinid fly	*Cistogaster globosa*	Tachinidae	Diptera	RDB2 (Nationally Vulnerable) pre-1994 criteria	
Beewolf	*Philanthus triangulum*	Crabronidae	Hymenoptera	RDB2 (Nationally Vulnerable) pre-1994 criteria	
A mirid bug	*Lygus pratensis*	Miridae	Hemiptera	RDB3 (Nationally Rare) pre-1994 criteria	LC
Blue Carpenter Bee	*Ceratina cyanea*	Apidae	Hymenoptera	RDB3 (Nationally Rare) pre-1994 criteria	

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
Spotted Dark Bee	*Stelis ornatula*	Megachilidae	Hymenoptera	RDB3 (Nationally Rare) pre-1994 criteria	LC
A shining flower beetle	*Olibrus flavicornis*	Phalacridae	Coleoptera	RDBK (insufficiently known)	LC
A clubionid spider	*Cheiracanthium virescens*	Clubionidae	Araneae	Nationally Scarce	LC
A gnaphosid spider	*Drassodes pubescens*	Gnaphosidae	Araneae	Nationally Scarce	LC
A lycosid spider	*Alopecosa cuneata*	Lycosidae	Araneae	Nationally Scarce	LC
A jumping spider	*Ballus chalybeius*	Salticidae	Araneae	Nationally Scarce	LC
A jumping spider	*Sibianor aurocinctus*	Salticidae	Araneae	Nationally Scarce	LC
A jumping spider	*Synageles venator*	Salticidae	Araneae	Nationally Scarce	LC
A comb-footed spider	*Kochiura aulica*	Theridiidae	Araneae	Nationally Scarce	LC
A ground beetle	*Harpalus attenuatus*	Carabidae	Coleoptera	Nationally Scarce	LC
A leaf beetle	*Cryptocephalus hypochaeridis*	Chrysomelidae	Coleoptera	Nationally Scarce	LC
A pot beetle	*Cryptocephalus parvulus*	Chrysomelidae	Coleoptera	Nationally Scarce	LC
Adonis Ladybird	*Hippodamia variegata*	Coccinellidae	Coleoptera	Nationally Scarce	LC
A ladybird beetle	*Platynaspis luteorubra*	Coccinellidae	Coleoptera	Nationally Scarce	LC
A weevil	*Cathormiocerus spinosus*	Curculionidae	Coleoptera	Nationally Scarce	LC
A weevil	*Microplontus campestris*	Curculionidae	Coleoptera	Nationally Scarce	
A weevil	*Mononychus punctumalbum*	Curculionidae	Coleoptera	Nationally Scarce	
A weevil	*Polydrusus formosus*	Curculionidae	Coleoptera	Nationally Scarce	
A weevil	*Sitona macularius?*	Curculionidae	Coleoptera	Nationally Scarce	
A weevil	*Sitona waterhousei*	Curculionidae	Coleoptera	Nationally Scarce	LC
A pollen beetle	*Meligethes rotundicollis*	Nitidulidae	Coleoptera	Nationally Scarce	LC
Hop-garden Earwig	*Apterygida media*	Forficulidae	Dermaptera	Nationally Scarce	LC
A chloropid fly	*Trachysiphonella scutellata*	Chloropidae	Diptera	Nationally Scarce	
Broad-headed Bug	*Alydus calcaratus*	Alydidae	Hemiptera	Nationally Scarce	LC
Slender-horned Leatherbug	*Ceraleptus lividus*	Coreidae	Hemiptera	Nationally Scarce	LC
A planthopper	*Asiraca clavicornis*	Delphacidae	Hemiptera	Nationally Scarce	LC
Scarce Tortiose Shieldbug	*Eurygaster maura*	Scutelleridae	Hemiptera	Nationally Scarce	LC
Plain Mini-mining Bee	*Andrena minutuloides*	Andrenidae	Hymenoptera	Nationally Scarce	
Lobe-spurred Furrow	*Lasioglossum pauxillum*	Halictidae	Hymenopte	Nationally Scarce	LC

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
Bee			ra		
Pantaloon Bee	*Dasypoda hirtipes*	Melittidae	Hymenoptera	Nationally Scarce	LC
A spider-hunting wasp	*Auplopus carbonarius*	Pompilidae	Hymenoptera	Nationally Scarce	
A spider-hunting wasp	*Priocnemis agilis*	Pompilidae	Hymenoptera	Nationally Scarce	
A spider-hunting wasp	*Priocnemis confusor*	Pompilidae	Hymenoptera	Nationally Scarce	
A flesh fly	*Blaesoxipha plumicornis*	Sarcophagidae	Diptera	pNationally Scarce	
A flesh fly	*Sarcophila latifrons*	Sarcophagidae	Diptera	pNationally Scarce	
A tephritid fly	*Miltogramma germari*	Tephritidae	Diptera	pNationally Scarce	
Brown-banded Carder Bee	*Bombus humilis*	Apidae	Hymenoptera	S41 Priority species	LC
Cinnabar	*Tyria jacobaeae*	Erebidae	Lepidoptera	S41 research only	LC
Small Blue	*Cupido minimus*	Lycaenidae	Lepidoptera	S41 Priority species	LC
Small Heath	*Coenonympha pamphilus*	Nymphalidae	Lepidoptera	S41 Priority species	LC

A10.461 SQI score for Area 10 Craylands Pit: 9.9

Pantheon Output Tables for Area 10

Table EDP A10.50: Habitats & resources: broad biotopes

Broad biotope*i*	No. of species	% representation	SQI	Conservation status*i*	Species with conservation status
open habitats*i*	230	5	142	1 Section 41 Priority Species - research only; 3 [RDB 3]; 4 [Nb]; 1 [RDB 2]; 13 NS*i*; 4 Nb*i*; 4 [Na]; 3 pNS; 3 Section 41 Priority Species; 1 Legal Protection*i*; 1 RDB 3*i*; 2 NT*i*; 1 pNT	37
tree-associated*i*	40	1	132	2 NS*i*; 1 [Na]; 1 Nb*i*	4
wetland*i*	8	<1	182	1 [Na]	1
coastal*i*	5	1	175	1 [Na]	1

Table EDP A10.51: Habitats & resources: habitats

Broad biotope*i*	Habitat*i*	No. of species	% representation	Conservation status*i*	SQI	Species with conservation status
open habitats*i*	tall sward & scrub*i*	138	5	2 [Nb]; 1 NT*i*; 2 Section 41 Priority Species; 1 Legal Protection*i*; 3 NS*i*; 2 [RDB 3]; 1 Nb*i*; 1 pNS; 1 pNT; 1 RDB 3*i*; 1 Section 41 Priority Species - research only	120	13
open habitats*i*	short sward & bare ground*i*	87	7	9 NS*i*; 4 Nb*i*; 2 [Nb]; 1 [RDB 2]; 4 [Na]; 2 pNS; 1 RDB 3*i*; 1 NT*i*; 1 Section 41 Priority Species	180	24
tree-associated*i*	arboreal*i*	31	2	2 NS*i*; 1 [Na]	130	3
tree-associated*i*	decaying wood*i*	5	<1		100	
wetland*i*	marshland*i*	5	<1		175	
tree-associated*i*	shaded woodland floor*i*	4	<1	1 Nb*i*	250	1
coastal*i*	saltmarsh*i*	3	1		100	
wetland*i*	peatland*i*	3	<1		100	
coastal*i*	brackish pools & ditches*i*	2	2		100	
wetland*i*	running water*i*	2	<1	1 [Na]	250	1
open habitats*i*	upland*i*	1	<1		100	
coastal*i*	sea cliff*i*	1	2	1 [Na]	400	1
coastal*i*	rocky shore*i*	1	3		100	

Table EDP A10.52: Habitats & resources: ISIS specific assemblage types

Broad biotope*i*	Habitat*i*	SAT	No. of species	% representation	SQI	Conservation status*i*	Species with conservation status	Code	Reported condition*i*
open habitats*i*		rich flower	31	13	129	2 [Na]; 1 [Nb];	7	F002	Favourable

Broad biotope*i*	Habitat*i*	SAT	No. of species	% representation	SQI	Conservation status*i*	Species with conservation status	Code	Reported condition*i*
		resource*i*				1 Section 41 Priority Species; 2 [RDB 3]; 1 RDB 3*i*			
open habitats*i*	short sward & bare ground*i*	bare sand & chalk*i*	20	5	270	6 NS*i*; 1 [Na]; 1 [Nb]; 2 pNS	10	F111	Favourable
open habitats*i*	short sward & bare ground*i*	open short sward*i*	16	8	200	2 Nb*i*; 2 NS*i*; 1 Section 41 Priority Species; 1 NT*i*	5	F112	Favourable
open habitats*i*		scrub edge*i*	8	4	175	2 NS*i*	2	F001	Unfavourable (8 of 11 species)
open habitats*i*		scrub-heath & moorland *i*	8	2	138	1 NS*i*; 1 [RDB 3]	2	F003	Unfavourable (8 of 9 species)
tree-associated*i*	decaying wood*i*	bark & sapwood decay*i*	5	<1	100			A212	Unfavourable (5 of 19 species)
open habitats*i*	short sward & bare ground*i*	exposed sea-cliff*i*	1	2	400	1 [Na]	1	F113	
coastal*i*	saltmarsh*i*	saltmarsh & transitional brackish marsh*i*	1	<1	100			M311	Unfavourable (1 of 9 species)

Site-Specific Limitations

A10.462 Area 10, was subject to the following sampling limitations/constraints:

- At the time of writing, some diptera records of the site were unavailable. The absence of these records may influence the Pantheon and SQI output.

Discussion/Evaluation - Area 10

A10.463 Area 10 Craylands Pit may be described as supporting herb-rich OMH habitat on a strongly calcareous substrate, giving the site a strong affinity with calcareous grassland. The site is in close proximity to sites supporting structurally and compositionally similar habitat, both in terms of substrate, flora and essentially in terms of recorded invertebrate assemblages.

A10.464 During the 2020 survey a total of 318 species were recorded from Area 10, of which 44 species are of recognised conservation status in the UK. These included four species classed as 'Species of principal importance' under section 41 of the NERC Act (2006), two species classed as Nationally Vulnerable (RDB2) based on pre-1994 criteria, three Nationally Rare (RDB3) species based on pre-1994 criteria, one species classed as 'Insufficiently known' RBDK and 34 species currently classed as Nationally Scarce in the UK.

A10.465 S41 species of particular note included Brown-banded Carder Bee *Bombus humilis,* a flagship species of OMH and herb-rich Thames terrace grasslands in the Thames corridor and Small Blue *Cupido minimus*, a butterfly with a strong association with herb-rich calcareous grasslands supporting Kidney Vetch *Anthylis vulneraria.* However, the Nationally Rare Spotted Dark Bee *Stelis ornatula*, a cleptoparasite of the Welted Lesser Mason Bee *Hoplitis claviventris*, was arguably the rarest species recorded during the survey. Both the RDB2 classed Beewolf *Philanthus triangulum* and RDB3 mirid bug *Lygus pratensis* are in need of status review, being much commoner than formerly, whilst both RDB2 *Cistogaster globosa,* a tachinid fly which predates Bishop's Mitre Shieldbug *Aelia acuminata*, and the stem-nesting Little Blue Carpenter Bee *Ceratina cyanea* (RDB3) have been recorded more frequently in recent years, but are still scarce in the UK.

A10.466 From Pantheon analysis undertaken for Area 10, the vast majority of species (230) were attributed to 'Open habitats' on a broad biotope level, whilst 40 species were ascribed to the 'Tree associated' assemblage, eight to 'Wetland' and five to the 'Coastal' assemblage. This broad-biotope deployment accurately reflected the habitats present on site and level of targeted sampling.

A10.467 At a habitat level, 138 species were attributed to the 'Tall sward and scrub' assemblage, with 87 species being attributed to the 'Short sward and bare ground assemblage'. Whilst, as is commonly the case with grassland and scrub mosaic sites, the greater overall number of species were attributed to 'Tall sward and scrub', this assemblage was attributed with five percent of its national species pool,[46] compared to the seven percent represented within the

[46] The total number of species attributed to a given assemblage in the Pantheon database – there are proportionally more Tall sward and scrub species than Short sward and bare ground species listed in the Pantheon database

'Short sward and bare ground' output. Therefore, the 'Short sward and bare ground assemblage can be considered to be proportionally better represented within the Pantheon output for this site. Furthermore, in terms of rarity, the SQI score registered for the 'Short sward and bare ground' assemblage was 180, indicating a nationally significant assemblage, compared to 120 attributed to 'Tall sward and scrub'.

A10.468 This trend was replicated at Specific Assemblage Type (SAT) level, the most important level for assessing conservation value of a site. For Area 10, three SATs achieved species scores exceeding their respective Favourable Condition (FC) targets in Pantheon, these included F111 'Bare sand and chalk' and F112 'Open short sward', both nested within the habitat-level 'Short sward and bare ground' assemblage and a third resource-based SAT F002 'Rich flower resource'.

A10.469 Both F111 'Bare sand and chalk' and F112 'Open short sward' assemblages were not only attributed by sufficient species to achieve Favourable Condition status, but also achieved high SQI[47] scores. Of the two assemblages, both the highest species and SQI scores (20 and 270 respectively) were achieved for F111 'Bare sand and chalk'; the SQI score is particularly high, reflecting the proportionally high rarity value of the attributed species. Nationally scarce species attributed to this assemblage included jumping spiders *Sibianor aurocinctus* and *Synageles venator*, a clubionid spider *Cheiracanthium virescens*, a wolf spider *Alopecosa cuneata,* a ground beetle *Harpalus attenuatus,* a broad-nosed weevil *Cathormiocerus spinosus*, sarcophilid flies including *Miltogramma germari* and *Sarcophila latifrons,* an alydid bug *Alydus calcaratus* and the Pantaloon Bee *Dasypoda hirtipes.* The majority of these species are strongly associated with OMH and herb-rich calcareous grassland habitats within the Thames corridor.

A10.470 Whilst the number of species and SQI score attributed to F112 'Open short sward', was not quite as high as for F111, the recorded scores of 16 species and SQI of 200 indicate an asseemblage of national importance. Nationally scarce species attributed to this assemblage included a pot beetle *Cryptocephalus hypochaeridis* a pea weevil *Sitona waterhousei* and hemipteran bugs including the Scarce Tortoise Bug *Eurygaster maura* and a planthopper *Asiraca clavicornis*.

A10.471 The remaining SAT achieiving FC status, F002 'Rich flower resource', differed from the other two in being a resource-based SAT, as such the assemblage does not have a strong affinity with a particular habitat, but instead, provides a measure of the value of the flowering resource of a site, irrespective of component habitats. However, the assemblage which is made up entirely of

[47] An SQI score in Pantheon is considered robust if it is attributed with 16 or more species

bee species, gives an indication of the diversity of bee species recorded and the value of the SAT is increased by the component species as well as the overall number of attributed species. In the case of Area 10, 31 bee species were attributed to this SAT, this being more than double the FC threshold of 14 set within Pantheon.

A10.472 Of the species attributed the s41 listed Brown-banded Carder Bee, two RDB3 stem-nesting species Spotted Dark Bee and Little Blue Carpenter Bee and the ground nesting Pantaloon Bee and the Plain Mini-miner *Andrena minutuloides,* are all typical OMH and herb-rich grassland species.

A10.473 Of the less well represented assemblages, the 'Arboreal' habitat-level assemblage, with 31 attributed species, is worthy of note and reflected the importance of scrub/woodland habitat within the survey area. Uncommon species attributed to this assemblage included a jumping spider *Ballus chalybeius*, which is nationally scarce, but is particularly well represented within the Thames corridor brownfield sites. A pot beetle *Cryptocephalus parvulus* was also attributed to this assemblage as was *Polydrusus formosus,* an arboreal species of leaf weevil, which is now much commoner nationally than its nationally scarce status implies.

A10.474 *Cryptocephalus parvulus* was also attributed at SAT level to the F001 'Scrub edge' assemblage, to which the nationally scarce Hop-garden Earwig *Apterygida media* was also attributed. The scrub component of the site, in particular Bramble *Rubus fruticosus* (agg.), also provided a nesting resource for uncommon species including Little Blue Carpenter Bee and *Hoplitis claviventris,* the host to the rare Spotted Dark Bee, these species requiring both flower-rich grassland and scrub edge resources.

A10.475 The non-Pantheon SQI score recorded for Area 10 Craylands Pit was 9.9. According to Harvey (2014)[48] an SQI value approaching 10.00 is 'almost certainly of national significance.'

Conclusion

A10.476 From 2020 survey data, Area 10 Craylands Pit was found to support a large number of species of recognised conservation status in the UK. A number of these species, together with many more local and widespread species recorded from the site, are characteristic of herb-rich grassland and mosaic and OMH within the Thames Corridor area.

[48] Harvey based his evaluation on invertebrate fauna in Essex, the Kent fauna within the Swanscombe part of the Thames corridor is comparable with this standard.

A10.477 From Pantheon analysis, the two SATs F111 'Bare sand and chalk' and F112 'Open short sward' strongly reflected this view and together with the F002 'Rich flower resource' assemblage, achieved scores both exceeding their corresponding FC thresholds and individually exhibited very high SQI scores. The SQI score of 180 for the overarching Short sward and bare ground habitat-level assemblage, showed that the quality of this assemblage also held up on a broader level.

A10.478 Using a method used by Harvey (2014), described in Ball (1986) a site-level SQI score of 9.9 was calculated for the invertebrate fauna of the site as a whole. Considering the representativeness, size and ecological position of Area 10 Craylands Pit and its associated habitat and invertebrate fauna, coupled with findings of the 2020 Pantheon analysis and independent SQI score, the site can be said to support an invertebrate fauna of National Importance.

Area 11: Sportsground

Centroid grid reference: TQ 60812 74831

Overall area: 4.4 hectares

Designations on site: None

S41 habitats present: Open mosaic habitat on previously developed land

Habitat Description

A10.479 Area 11 (Sportsground) occupies the footprint of a former chalk quarry. It is sheltered from all but the east-facing aspect, by vertical (c20 to 25 metre) chalk cliffs. The site is more or less flat, with some microtopographic variation; particularly at the eastern end of the site closest to the access point and there were developing (Yellow Meadow Ant *Lasius flavus*) anthills, in some open grassland patches. There was a reasonable resource of bare ground due, in part, to rabbit grazing, which also maintained a more structurally diverse sward locally within the site.

A10.480 The chalk cliffs provide shelter to habitat at groundlevel; but due to their height these also cast shade over the scrubbed edges to some extent, though the site was generally open and subject to insolation for much of the day.

A10.481 The vegetation on site consisted largely of semi-improved grassland in mosaic with relatively uniform scrub. The scrub became denser and more mature towards the western edge of the site, grading into semi-woodland with taller

trees such as Sycamore *Acer pseudoplatanus* and Ash *Fraxinus excelsior*, with dense scrub comprising Hawthorn, Elder *Sambucus nigra,* Grey Willow *Salix cinerea*, with extensive Bramble *Rubus fruticosus* agg. and Common Dogrose *Rosa canina* (agg.) scrub, especially at the edges of tracks. The southern margin, adjacent to the chalk boundary cliff also supported some mature scrub for much of its length. The dampest and most shaded part of the site was towards the southwest corner of the site, where the calcareous cliffs were heavily vegetated with Ivy *Hedera helix* and other scrub and tree species. There was some wood decay habitat (mainly bark and sapwood decay habitat) due to fallen branches, though this was not an extensive resource.

A10.482 The grassland element of the site varied in terms of diversity. More herb-rich areas were located in well lit gaps and along access tracks, particularly towards the site's eastern extremity. In common with Craylands Pit (Area 10) nearby, the underlying substrate was calcareous and consequently, the grassland flora supported some herbs typical of calcareous grassland such as Pyramidal Orchid *Anacamptis pyramidalis*. However, this was less pronounced than for Craylands Pit and further west, the grassland was more rank, mesotrophic and herb-poor. The dominant scrub species within the more open, central area of the site was Hawthorn *Crataegus monogyna,* which formed a fairly uniform layer constituting about 35 percent cover. The growth towards the eastern end of the site was relatively young, being one to 2.5 metres tall. Other scrub species, occurring frequently in this area included Dogwood *Cornus sanguinea*, Bramble, Common Dog-rose and Grey Willow.

A10.483 Herbs recorded from the more open grassland habitat included Wild Carrot *Daucus carota*, abundant composites including Ox-eye Daisy *Chrysanthemum leucanthemum,* Common Ragwort *Senecio jacobaea,* Yarrow *Achillea millefolium,* Common Cat's-ear *Hypochaeris radicata*, Rough Hawk's-bit *Leontodon hispidus,* Rough Hawk's-beard *Crepis biennis,* Bristly Ox-tongue *Picris echioides,* Common Knapweed *Centaurea nigra* and Goatsbeard *Tragopogon pratensis*; legumes including Red Clover *Trifolium pratense,* Tufted Vetch Vicia *cracca, Common Vetch Vicia sativa,* Grass Vetchling *Lathyrus nissolia,* Black Medick *Medicago lupulina*, Common Bird's-foot Trefoil *Lotus corniculatus* and Narrow-leaved Bird's-foot Trefoil *L. tenuis*; as well as a range of other typical neutral to calcareous grasssland herbs including Selfheal *Prunella vulgaris*, Creeping Cinquefoil *Potentilla reptans,* Ribwort Plantain *Plantago lanceolata,* Bulbous Buttercup *Ranunculus bulbosus,* Goatsbeard *Tragopogon pratensis*, Common Mallow *Malva sylvestris* and Pyramidal Orchid *Anacamptis pyramidalis*.

A10.484 Graminoids recorded within the grassland included: Common Couch *Elytrigia repens*, Red Fescue *Festuca rubra,* Rough-stemmed Meadow Grass Poa

trivialis, Yorkshire Fog *Holcus lanatus*, False Oat Grass *Arrhenatherum elatius*, Cock's-foot *Dactylis glomerata* and Creeping Bent Grass *Agrostis stolonifera.*

A10.485 Taller herbs recorded from the site included Cow Parsley *Anthriscus sylvestris,* Upright Hedge-parsley *Torilis japonica,* Teasel *Dipsacus fullonum*, Tansy *Tanacetum* vulgare, Hogweed *Heracleum sphodylium*, Fennel *Foeniculum vulgare* and Red Valerian *Centranthus ruber*. The latter of these occurring predominately at the foot of the less shaded, south-facing chalk-cliff.

A10.486 The scrub woodland habitat comprised woody species including Hawthorn *Crataegus monogyna,* Dogwood *Cornus sanguineum,* Bramble *Rubus fruticosus* agg., Common Dogrose *Rosa canina* (agg.), Grey Willow *Salix cinerea*, Goat Willow *S. caprea*, Ivy *Hedera helix*, Sycamore *Acer pseudoplatanus*, Ash *Fraxinus excelsior*, Elder *Sambucus nigra* and Old Man's Beard *Clematis vitalba*. More shade tolerant/scrub edge herbs including White Dead-nettle *Lamium album,* Red Dead-nettle *L. purpureum,* Ground-ivy *Glechoma hederacea,* Common Nettle *Urtica dioica* and Cleavers *Galium aparine,* were often abundant in these areas.

A10.487 Typical OMH non-native plants recorded on site included Goat's Rue *Galega officinalis* (which formed some significant stands at the eastern extremity of the site's grassland); Lucerne *Medicago sativa* and Wallflower *Erysimum* sp.

A10.488 Connectivity: The site is connected in the landscape being in close proximity to similar OMH and calcareous grassland and scrub mosaic habitats comprising Swanscombe Peninsula and Craylands Pit (Area 10) to the north and west and being part of the virtually contiguous corridor of OMH and grassland sites to the south including Bamber Pit (Area 12), The Former landfill (Area 13); Station Quarter (Area 14) and Station Quarter South (Area 15). Collectively these habitats constitute a large overall area and provide a significant habitat corridor of value to specialist invertebrates.

A10.489 Substrate: Chalk sedimentary bedrock (Lewes Nodular Chalk Formation; Seaford Chalk Formation and Newhaven Chalk Formation); localised superficial deposits (sand and gravel).

A10.490 Wetness: No standing water was recorded during the survey; however, the more shaded habitat further west supported groundflora associated with damp grassland habitats.

A10.491 Structure: The site was structurally diverse, ranging from sparsely vegetated bare-ground habitats, through taller sward grassland, tall-herb vegetation and various structural stages of scrub habitat from low-growing Bramble, through younger Hawthorn to more mature scrub and broadleaved trees towards the

west of the site. There was a limited supply of wood decay habitat on site including mainly bark and sapwood decay habitat.

Invertebrate Survey Dates

A10.492 The site was surveyed on four occasions including: 18/05/2020; 15/06/2020; 13/07/20 and 17/08/20.

Table EDP A10.53: Number of Samples per Substrate.

	Grassland/OMH and Scrub	Total
Sweep	4	4
Vacuum	4	4
Beating	4	4
Pan trap	4	4

A10.493 Total number of species recorded: 306

A10.494 A comparison of the relative number of species recorded from each of the major taxons is included in the following table.

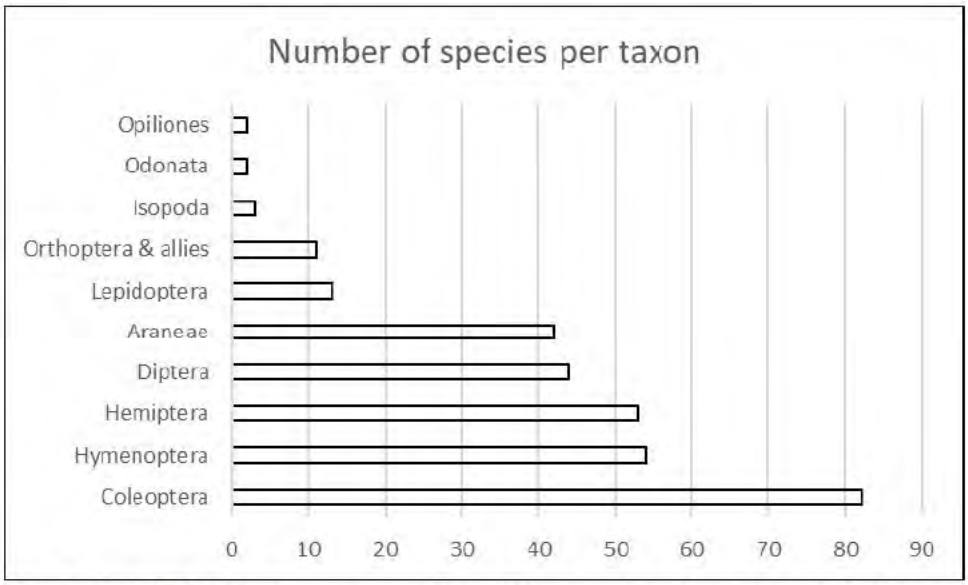

Chart EDP A10.12: A comparison of the relative number of species recorded from each of the major taxons.

Table EDP A10.54: Species of Recognised Conservation Recorded from Area 11:

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
Mellet's Downy-Back	*Ophonus melletii*	Carabidae	Coleoptera	S41 Priority species; Nationally Rare; Near Threatened	NT
Phoenix Fly	*Dorycera graminum*	Ulidiidae	Diptera	S41 Priority species; Near Threatened (Post-2001 IUCN	NT

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
				criteria); RDB3 'rare' pre-1994	
A mirid bug	*Lygus pratensis*	Miridae	Hemiptera	RDB3 pre-1994 criteria	LC
Blue Carpenter Bee	*Ceratina cyanea*	Apidae	Hymenoptera	RDB3 pre-1994 criteria	LC
Squat Furrow Bee	*Lasioglossum pauperatum*	Halictidae	Hymenoptera	RDB3 pre-1994 criteria	
Spotted Dark Bee	*Stelis ornatula*	Megachilidae	Hymenoptera	RDB3 pre-1994 criteria	
Hawk'sbeard Mining Bee	*Andrena fulvago*	Andrenidae	Hymenoptera	[Nationally notable A]	
A running crab spider	*Thanatus striatus*	Philodromidae	Araneae	Nationally Scarce	LC
A jumping spider	*Ballus chalybeius*	Salticidae	Araneae	Nationally Scarce	LC
A jumping spider	*Sibianor aurocinctus*	Salticidae	Araneae	Nationally Scarce	LC
A jumping spider	*Synageles venator*	Salticidae	Araneae	Nationally Scarce	LC
A comb-footed spider	*Kochiura aulica*	Theridiidae	Araneae	Nationally Scarce	LC
Ground-ivy Jewel Beetle	*Trachys scrobiculatus*	Buprestidae	Coleoptera	Nationally Scarce	LC
A leaf beetle	*Cryptocephalus hypochaeridis*	Chrysomelidae	Coleoptera	Nationally Scarce	LC
Adonis Ladybird	*Hippodamia variegata*	Coccinellidae	Coleoptera	Nationally Scarce	LC
A ladybird beetle	*Platynaspis luteorubra*	Coccinellidae	Coleoptera	Nationally Scarce	LC
A mordellid beetle	*Mordellistena parvula*	Mordellidae	Coleoptera	Nationally Scarce	LC
Hop-garden Earwig	*Apterygida media*	Forficulidae	Dermaptera	Nationally Scarce	LC
Broad-headed Bug	*Alydus calcaratus*	Alydidae	Hemiptera	Nationally Scarce	LC
A stilt bug	*Berytinus hirticornis*	Berytidae	Hemiptera	Nationally Scarce	LC
A planthopper	*Asiraca clavicornis*	Delphacidae	Hemiptera	Nationally Scarce	LC
A ground bug	*Drymus latus*	Lygaeidae	Hemiptera	Nationally Scarce	
Sandrunner Shieldbug	*Sciocoris cursitans*	Pentatomidae	Hemiptera	Nationally Scarce	LC
Blunthorn Nomad Bee	*Nomada flavopicta*	Apidae	Hymenoptera	Nationally Scarce	
Painted Nomad Bee	*Nomada fucata*	Apidae	Hymenoptera	Nationally Scarce	LC
Lobe-spurred Furrow Bee	*Lasioglossum pauxillum*	Halictidae	Hymenoptera	Nationally Scarce	LC
Swollen-thighed Blood Bee	*Sphecodes crassus*	Halictidae	Hymenoptera	Nationally Scarce	LC
Pantaloon Bee	*Dasypoda hirtipes*	Melittidae	Hymenoptera	Nationally Scarce	LC
A spider-hunting wasp	*Priocnemis agilis*	Pompilidae	Hymenoptera	Nationally Scarce	
A chloropid fly	*Trachysiphonella ruficeps*	Chloropidae	Diptera	pNationally Scarce	

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
A muscid fly	*Coenosia atra*	Muscidae	Diptera	pNationally Scarce	
A weevil	*Microplontus campestris*	Curculionidae	Coleoptera	[Nationally Scarce B]	
A weevil	*Trachyphloeus spinimanus*	Curculionidae	Coleoptera	[Nationally Scarce B]	
A shining flower beetle	*Olibrus flavicornis*	Phalacridae	Coleoptera	Red Data Book-insufficiently known	DD
Brown-banded Carder Bee	*Bombus humilis*	Apidae	Hymenoptera	S41 Priority species	NT
Small Heath	*Coenonympha pamphilus*	Nymphalidae	Lepidoptera	S41 Priority species	NT

A10.495 SQI score for Area 11: 10.9

Pantheon Output Tables for Area 11

Table EDP A10.55: Habitats & resources: broad biotopes

Broad biotopei	No. of species	% representation	SQI	Conservation statusi	Species with conservation status
open habitatsi	223	5	137	5 Nbi; 6 [Nb]; 3 [Na]; 4 [RDB 3]; 9 NSi; 3 pNS; 1 RDB 3i; 1 pNT; 4 Section 41 Priority Species; 2 NTi; 1 NRi	33
tree-associatedi	37	1	118	1 NSi	1
wetlandi	11	<1	127	1 pNS	1
coastali	1	<1	100		

Table EDP A10.56: Habitats & resources: habitats

Broad biotopei	Habitati	No. of species	% representation	Conservation statusi	SQI	Species with conservation status
open habitatsi	tall sward & scrubi	147	6	2 Section 41 Priority Species; 2 [RDB 3]; 2 Nbi; 3 NSi; 1 [Nb]; 1 RDB 3i; 1 pNS; 1 pNT	121	11
open habitatsi	short sward & bare groundi	72	6	5 [Nb]; 3 [Na]; 5 NSi; 2 Section 41 Priority Species; 1 NRi; 2 NTi; 1 pNS; 4 Nbi; 1 RDB 3i; 1 [RDB 3]	163	21
tree-associatedi	arborealı	20	2	1 NSi	115	1
tree-associatedi	decaying woodi	10	<1		130	

Broad biotopei	Habitati	No. of species	% representation	Conservation statusi	SQI	Species with conservation status
tree-associatedi	shaded woodland floori	7	<1		100	
wetlandi	marshlandi	6	<1		100	
wetlandi	peatlandi	5	<1		100	
wetlandi	running wateri	1	<1		100	
open habitatsi	uplandi	1	<1		100	
coastali	saltmarshi	1	<1		100	

Table EDP A10.57: Habitats & resources: ISIS specific assemblage types

Broad biotopei	Habitati	SAT	No. of species	% representation	SQI	Conservation statusi	Species with conservation status	Code	Reported conditioni
open habitatsi		rich flower resourcei	35	14	134	2 [Nb]; 3 [Na]; 1 Section 41 Priority Species; 3 [RDB 3]; 1 RDB 3i	10	F002	Favourable
open habitatsi		scrub edgei	14	6	143	1 NSi	1	F001	Favourable
open habitatsi	short sward & bare groundi	bare sand & chalki	14	3	192	3 NSi; 1 [Nb]; 1 pNS	5	F111	Unfavourable (14 of 19 species)
open habitatsi	short sward & bare groundi	open short swardi	9	4	200	2 NSi; 1 Nbi; 1 NTi; 1 Section 41 Priority Species; 1 [Nb]	5	F112	Unfavourable (9 of 13 species)
tree-associatedi	decaying woodi	bark & sapwood decayi	8	2	138			A212	Unfavourable (8 of 19 species)

Broad biotopei	Habitati	SAT	No. of species	% representation	SQI	Conservation statusi	Species with conservation status	Code	Reported conditioni
open habitatsi		scrub-heath & moorlandi	6	2	150	1 [RDB 3]: 1 NSi	2	F003	Unfavourable (6 of 9 species)
coastali	saltmarshi	saltmarsh & transitional brackish marshi	1	<1	100			M311	Unfavourable (1 of 9 species)
tree-associatedi	decaying woodi	heartwood decayi	1	<1	100			A211	Unfavourable (1 of 6 species)

Site-specific Limitations

A10.496 Area 11 was subject to the following sampling limitations/constraints:

- At the time of writing, some diptera records of the site were unavailable. The absence of these records may influence the Pantheon and SQI output.

Discussion/Evaluation - Area 11:

A10.497 Area 11 Sportsground may be described as supporting established dry, semi-improved grassland of more calcareous sward. Much of the grassland was relatively herb-rich, the diversity diminishing somewhat towards the site's more densely scrubbed-over, western extremity. In comparison to adjacent Area 10, which is on similar geology and also occupies the site of a former chalk quarry, Area 11 supported almost uniform Hawthorn *Crataegus monogyna*, scrub layer, forming a close mosaic throughout the more open grassland areas of the site.

A10.498 The site is in close proximity to sites including Areas 10 and 12, both of which support structurally and compositionally similar habitat, both in terms of substrate, flora and essentially in terms of recorded invertebrate assemblages.

A10.499 During the 2020 survey a total of 306 species were recorded from Area 11, of which 36 species are of recognised conservation status in the UK. These included four species classed as 'Species of principal importance' under section 41 of the NERC Act (2006), two species classed as Nationally Rare and with a threat status of 'Near Threatened' based on post-2001 IUCN criteria, a further four species are Nationally Rare (RDB3) based on pre-1994 criteria,

one species is classed as 'Insufficiently known' RBDK and 26 species currently classed as Nationally Scarce in the UK.

A10.500 S41 species of particular note recorded from Area 11 included Mellet's Downy-Back *Ophonus melletii* the Phoenix Fly *Dorycera graminum.* Both species are also classed as Nationally Rare and Near Threatened in the UK under post-2001 IUCN criteria.

A10.501 Mellet's Downy-Back is a species of ground beetle, which is found mainly in coastal sites with calcareous grassland and on chalky *soils*, whilst Phoenix Fly is a large Ulidid fly associated with OMH and disturbed rough grassland and scrub sites. The OMH and coastal grassland flagship species Brown-banded Carder Bee *Bombus humilis* was also recorded from Area 11, as well as several other sites during the 2020 survey.

A10.502 Other nationally rare (RDB3) species recorded from Area 11 included the Spotted Dark Bee *Stelis ornatula* a cleptoparasite of the Welted Lesser Mason Bee Hoplitis *claviventris* and another stem-nesting species the Little Blue Carpenter Bee *Ceratina cyanea,* both of which were also recorded from Area 10 and the ground nesting Squat Furrow Bee *Lasioglossum pauperatum,* which shows a preference for OMH and Thames terrace grassland sites in the Thames Corridor area.

A10.503 From Pantheon analysis undertaken for Area 11, the vast majority of species (223) were attributed to 'Open habitats' on a broad biotope level, whilst 37 species were ascribed to the 'Tree associated' assemblage, eleven to 'Wetland' and one to the 'Coastal' assemblage. This broad-biotope deployment reasonably accurately reflected the habitats present on site and level of targeted sampling. Whilst a larger proportion of species recorded may be expected to be 'Arboreal' due to the extent of woody scrub on site, the habitat level 'Tall sward and scrub' assemblage is actually nested in 'Open habitats' rather than the 'Tree associated' biotope level assemblage.

A10.504 At a habitat level, 147 species were attributed to the 'Tall sward and scrub' assemblage, with 73 species being attributed to the 'Short sward and bare ground assemblage'. Whilst, as is commonly the case with grassland and scrub mosaic sites, the greater overall number of species were attributed to 'Tall sward and scrub', this assemblage was attributed with six percent of its national species pool,[49] which is equal in terms of percentage representation to the proportion of species attributed to the 'Short sward and bare ground' output (also six percent).

[49] The total number of species attributed to a given assemblage in the Pantheon database – there are proportionally more Tall sward and scrub species than Short sward and bare ground species listed in the Pantheon database

A10.505 Compared to Area 10, there were, however, a greater overall number of species attributed to 'Tall sward and scrub' for Area 11 and conversely, there were fewer 'Short sward and bare ground species' represented within the Pantheon output for Area 11. This shift appears to reflect the greater proportion of scrub and less open grassland conditions present within the Area 11 site. However, whilst the SQI score for the Area 11 'Tall sward and scrub' at 121, remained relatively close to that recorded for Area 10, the score of 163 for 'Short sward and bare ground' indicated that this assemblage was of high conservation value for the site, despite, the score being somewhat lower than was recorded for the same assemblage from the Area 10 analysis.

A10.506 However, at SAT level, whilst both assemblages were reasonably well attributed, neither F111 'Bare sand and chalk' or F112 'Open short sward' assemblages were attributed with a sufficient number of species to exceed their, respective FC targets. Despite this, the species listed for both these assemblages were attributed with a comparable range of uncommon species as Area 10. Nationally scarce species attributed to the 'Bare sand and chalk' assemblage included jumping spiders *Sibianor aurocinctus* and *Synageles venator,* an alydid bug *Alydus calcaratus* and the Pantaloon Bee *Dasypoda hirtipes* (all of which were also recorded from Area 10 and elsewhere within the survey area), and *Trachysiphonella ruficeps*, a scarce species of chloropid fly associated with dry grassland habitats, where it is possibly associated with ants.

A10.507 Species of recognised conservation status attributed to 'Open short sward' included species also recorded from Area 10 including a pot beetle *Cryptocephalus hypochaeridis* and a planthopper *Asiraca clavicornis,* both nationally scarce and the s41 listed Small Heath *Coenonympha pamphilus*. In addition, the nationally scarce Sandrunner Shieldbug *Sciocoris cursitans* and a broad-nosed weevil *Trachyphloeus spinimanus* were also attributed to the F112 assemblage for Area 11. Both species are associated with free-draining grassland and OMH on chalk and other free draining substrates.

A10.508 Whilst the 'Tall sward and scrub' habitat-level assemblage for Area 11 did not achieve a particularly high SQI score, this was mainly due to the recruitment of a large number of non-scoring, widespread and local species. The assemblage was however, attributed with 11 species of recognised conservation status. including previously mentioned s41 'priority species', Phoenix Fly and Brown-banded Carder Bee; a nationally scarce philodromid spider *Thanatus striatus*, predominately a species of coastal grassland habitat; three nationally scarce species of beetle including *Platynaspis luteorubra* a ladybird which was also recorded from Area 11 in 2015, the Ground Ivy Jewel Beetle *Trachys scrobiculatus*, a calcareous grassland species associated with Ground Ivy

Glechoma hederacea and the Adonis Ladybird *Hippodamia variegata*, a species which has increased in the UK and requires status revision.

A10.509 Other nationally scarce species attributed to 'Tall sward and scrub' for Area 11, which have not been mentioned elsewhere include a ground bug *Drymus latus,* associated with tall calcareous grassland and a spider-hunting wasp *Priocnemis agilis,* which is thought to predate ground-living spiders of the genus *Drassodes*.

A10.510 Of the remaining SATs represented within the Pantheon output for Area 11, two resource-based SATs F002 'Rich flower resource' and F001 'Scrub edge' achieved species scores exceeding their respective FC thresholds. 'Rich flower resource' does not have a strong affinity with a particular habitat, but instead, provides a measure of the value of the flowering resource of a site, irrespective of component habitats. However, the assemblage which is made up entirely of bee species, gives an indication of the diversity of bee species recorded and the value of the SAT is increased by the component species as well as the overall number of attributed species. In the case of Area 11, 35 bee species were attributed to this SAT, this being more than double the FC threshold of 14 set within Pantheon.

A10.511 Furthermore, 10 of the species attributed to the assemblage at this level were of recognised conservation status. Although some of the statuses are in need of revision, bee species attributed to this assemblage included the RDB3 listed ground-nesting Squat Furrow Bee *Lasioglossum pauperatum* and nationally scarce Hawk's-beard Mining Bee *Andrena fulvago*, as well as, cuckoo species including Blunthorn Nomad Bee *Nomada flavopicta* and Painted Nomad Bee *N. fucata* and previously mentioned s41 listed Brown-banded Carder Bee, the two two RDB3 stem-nesting species Spotted Dark Bee and Little Blue Carpenter Bee and another ground nesting species, the Pantaloon Bee.

A10.512 The majority of uncommon and local species attributed to the F111, F112 and F002 assemblages have a strong affinity with OMH and herb-rich calcareous grassland habitats within the Thames corridor.

A10.513 The F001 'Scrub edge' SAT also achieved Favourable Condition status due to being attributed with 14 species compared to a threshold of 12 set in Pantheon. Scrub edge is described in Pantheon as being found where 'scrub or woodland grades into or is interspersed with open areas of grassland, heathland or early successional vegetation types'. The presence of this assemblage strongly reflects the conditions on site, where scrub was a strong and constant feature in mosaic with grassland. Whilst the assemblage exceeded its FC threshold, the majority of species attributed were relatively common, with only one nationally scarce species, the Hop-garden Earwig

Apterygida media, being attributed. Hop-garden Earwig is restricted mainly to East Anglia and Kent in the UK. It was formerly considered a common species in the hop gardens of Kent, but has declined severely, perhaps in response to increased pesticide use.

A10.514 Of the less well represented assemblages, the 'Arboreal' habitat-level assemblage, with 20 attributed species, is worthy of note and reflected the importance of scrub/woodland habitat within the survey area. However, the only uncommon species attributed to this assemblage was a nationally scarce jumping spider *Ballus chalybeius*. This species was also recorded from a number of other sites within the 2020 survey and is well represented within the Thames corridor brownfield sites.

A10.515 The non-Pantheon SQI score recorded for Area 11 Sportsground was 10.9. According to Harvey (2014)[50] an SQI value approaching 10.00 is 'almost certainly of national significance.' This score is independent of Pantheon and is based more exclusively on pre-1994 rarity criteria as well as the less formal 'local' classification.

Conclusion

A10.516 From the 2020 survey of Area 11 (Sportsground), a large number of invertebrates of recognised conservation value, in addition to a number of species considered to be local in the UK, were recorded.

A10.517 A number of these species were characteristic of OMH and grassland and scrub mosaic habitats within the Thames corridor area. Of four s41 species recorded for Area 11, Mellet's Downy-Back *Ophonus melletii* and Phoenix Fly *Dorycera graminum* are also classed as Nationally Rare and Near Threatened in the UK under post-2001 IUCN criteria, whilst the OMH flagship species Brown-banded Carder Bee *Bombus humilis* was also recorded from the site.

A10.518 The recorded fauna reasonably represented the dry grassland and locally herb-rich grassland habitat present on the site. However, whilst neither the 'Bare sand and chalk' or 'Open short sward' SAT assemblages were attributed with a sufficient number of species to achieve FC status, the SQI for the overarching habitat-level assemblage, 'Short sward and bare ground', exceeded the now obsolete FC score of 160 which was set for this assemblage in the pre-Pantheon versions of ISIS.

A10.519 The site supported a large number of 'Tall sward and scrub edge' species, as expected owing to the proportion of scrub in relation to grassland recorded. In

[50] Harvey based his evaluation on invertebrate fauna in Essex, the Kent fauna within the Swanscombe part of the Thames corridor is comparable with this standard.

addition, the F001 ‘Scrub edge’ and F002 ‘Reich-flower resource’ SATs were attributed with sufficient species to achieve FC status. The More advanced scrub element of Area 11 reflects a shift away from more open, early successional habitat seen in nearby Area 10. The number and diversity of bee species, including both ground and stem nesting species, several of which are nationally rare or scarec in the UK.

A10.520 At the time of survey, the balance between open, well lit and relatively herb-rich grassland habitat and scrub, provides opportunities for both thermophilic, bare ground species and more shade-tolerant species associated with taller grassland and scrub habitats. Overall, the non-Pantheon SQI score of 10.9 recorded for Area 11, together with the range of rarities and results from Pantheon analysis, indicate that the site as a whole supports an invertebrate fauna of National Importance. The conservation value of the site is, however, likely to diminish with lack of management resulting in the site becoming scrubbed over and losing the current fine balance between scrub and grassland elements.

Area 12: Bamber Pit North (and Bamber Pit South August Only Data)

Centroid grid reference: TQ 60876 74595; Area 13a: TQ 61157 74413

Overall area: 12.9 hectares; Area 13a: 3.3 hectares

Designations on site: None

S41 habitats present: Open mosaic habitat on previously developed land

Habitat Description

A10.521 Area 12 is the site of an ex-quarry and has considerable macro and micro topographic variation. The site comprises of densely scrubbed upper areas with steep escarpments descending to a flatter, more open and sparsely vegetated quarry bottom area (TQ 60870 74550), which at the time of the scoping study, had evidently been subject to recent scrub clearance. More established, grassy scallops were also present in this area, occupying the northwest facing escarpment at around TQ 60876 74509 and TQ 60911 74526, these converging with the cleared area at their bases and gradating into more dense scrub up-slope. At the site’s lowest point to the east of the cleared area, was a large pond (P4 on EDP plan), which occupied the eastern extremity of the site around TQ 61002 74607.

A10.522 Mown, grassy paths provided a ride-like access track through the more densely scrubbed upper areas of the site around TQ 60766 74709. The scrub edge along this track, which was around two to five metres wide, comprised species including Hawthorn *Crataegus monogyna,* Blackthorn *Prunus spinosa,* Elder *Sambucus nigra,* Goat Willow *Salix caprea*, Bramble *Rubus fruticosus* (agg.), Dog Rose *Rosa canina* (agg.), Dogwood *Cornus sanguinea,* cultivated apple *Malus domesticus* and Wild Privet *Ligustrum vulgare*, with climbing species including Old-man's Beard *Clematis vitalba* and Ivy *Hedera helix*. The non-native Buddleia *Buddleja davidii* was also an abundant scrub component throughout the site.

A10.523 The mown rides supported reasonable diversity of herbs, including scrub-edge species such as Ground-ivy *Glechoma hederacea*, Sweet Violet *Viola* odorata, Perforate St John's Wort *Hypericum perforata* and Common Nettle *Urtica dioica,* as well as typical semi-improved grassland herbs such as Creeping Cinquefoil *Potentilla reptans,* Selfheal *Prunella vulgaris,* Daisy *Bellis perennis* and a forget-me-not *Myosotis sp.* Spotted Medick *Medicago arabica* and non-native Hoary Cress *Lepidium draba*.

A10.524 The sward was generally short in the early part of the season, becoming taller by late summer. There were more open areas at the junction of tracks and patches of bare ground. The scrub edge habitat provided an important early season forage resource for bees and a range of other scrub associated invertebrates.

A10.525 The recently-cleared open habitat at the quarry base was only sparsely vegetated at the time of survey, with scattered scrub patches and more dense scrub at the margins. Here Silver Birch *Betula pendula* and Wayfaring Tree *Viburnum lantana* occurred alongside previously mentioned scrub species, predominately including Blackthorn, Hawthorn, Bramble, Privet and Dogwood. Pedunculate Oak *Quercus robur* also occurred in the scrub layer in this area, but not as mature trees.

A10.526 The groundlayer of the open habitat was of thin, chalky soil, sparsely vegetated with bare ground colonisers including Viper's Bugloss *Echium vulgare,* Teasel *Dipsacus fullonum,* Perforate St John's Wort, Creeping Cinquefoil Potentilla *reptans,* Spotted Medick *Medicago arabica*, Common Centaury *Centaurium erythraea*, Fairy Flax *Linum catharticum* and Germander Speedwell *Veronica chamaedrys.*

A10.527 This habitat was well-lit and sheltered and supported a number of ground nesting bee species were recorded in this area, including the Green-eyed Flower Bee *Anthophora bimaculata*, Small Shaggy Bee *Panurgus calcaratus*.

Another ground nesting species, the nationally rare (RDB3) Squat Furrow Bee *Lasioglossum pauperatum* was also recorded from the site.

A10.528 The scallops which converged with the open ground habitat supported smallish patches of fairly herb-rich grassland, with grasses including Yorkshire Fog *Holcus lanatus*, False Oat Grass *Arrhenatherum elatius,* Red Fescue *Festuca rubra* and False Brome *Brachypodium sylvaticum/pinnatum* and herbs such as Creeping Cinquefoil, Common Knapweed *Centaurea nigra,* Ribwort Plantain *Plantago lanceolata*, Common Cat's-ear *Hypochaeris radicata,* Yarrow *Achillea millefolium,* White Clover *Trifolium repens,* Viper's Bugloss, Germander Speedwell and Fairy Flax. This habitat was northwest facing, but provided a sheltered herb-rich resource beneficial to bee species including the s41 Brown-banded Carder Bee *Bombus humilis,* which was recorded from the site.

A10.529 The pond (P14) at the eastern edge of the site had gently shelving margins, sloping to deeper water in the centre. There was relatively little macrophyte vegetation visible at the margins or within the open water areas of the pond; with some Greater/Lesser Pond Sedge *Carex riparia/acutiformis* and Common Reed *Phragmites australis* at the margins. Inundated mats of Creeping Bent *Agrostis stolonifera* and Amphibious Bistort *Persicaria amphibia* were also recorded at the margins, which were often overhung by dense scrub.

A10.530 Connectivity: Areas 12 was contiguous with Areas 13a (Bamber Pit South) and 13 (Former Landfill Site) to the south. Area 13a supported similar OMH and scrub habitat as Area 12 and could be seen as a continuation of this site. Area 13 and other sites further south, including Area 14 (Station Quarter) and 15 (Station Quarter South) also supported grassland and scrub habitats of similar composition, over similar geology, as did sites to the north including the contiguous Area 11 (Sportsground) and nearby Craylands Pit (Area 10). Areas 11 and 10 supported similar ex-quarry habitat and OMH and calcareous grassland/scrub mosaic of a broadly comparable structural and floral composition. These sites, in turn, provided a linkage to the extensive habitat resource of the Swanscombe Peninsula. Collectively these sites provided a significant OMH, grassland, scrub and wetland resource, which was representative of habitat of known importance to invertebrates in the wider Thames corridor.

A10.531 Substrate: Area 12: Chalk sedimentary bedrock (Lewes Nodular Chalk Formation; Seaford Chalk Formation and Newhaven Chalk Formation) with alluvium, clay, silt, sand and peat sedimentary superficial deposits. Localised Head clay silt, sand and gravel superficial deposits.

A10.532 Wetness: Area 12 supported both dry, free draining habitat and damper areas subject to drainage impedence, which was evident through the site's flora. The

soil varied from thin soils over bare chalk to clay and was evidently subject to historic disturbance and probable deposition of spoil. The large pond (P14) on site provided a significant area of open water habitat and the margins supported wertland flora.

A10.533 Structure: Area 12 was a structurally diverse site, both in terms of topography. There were slopes of most aspect, as well as uneven ground providing varied microtopography throughout the site. The central area of the site supported a significant bare ground resource, with more extensive grassland and scrub mosaics providing sheltered microhabitats in a close mosaic. Much of the site was, however, densely scrubbed over, with little light reaching the ground layer over much of the site. The woody resource however, provided habitat structure for arboreal and scrub edge invertebrates and there was an evident bark and sapwood decay resource on the site.

Invertebrate Survey Dates:

- Terrestrial surveys were conducted at Area 12 on the following dates: 19-20/05/2020; 15-17/06/2020; and 14/07/2020. Data collected from Area 13a on 18-19/08/20 was used in lieu of August data for Area 12; and

- An aquatic invertebrate survey was conducted on a single occasion: 2/06/2020.

Table EDP A10.58: Number of Samples per Substrate.

	Area 12 – Grassland and Scrub/OMH	Area 13a - OMH	Area 12 - Wetland	Total
Sweep	3	1		4
Vacuum	3	1		4
Beating	3	1		4
Pan traps (cluster of 10)	3		1	4
Aquatic (3 minute sweep)			1	1

A10.534 Total number of species recorded:

- Combined terrestrial and aquatic sample data = 291;

- Terrestrial data only = 273[51]; and

- Aquatic data only = 18[52].

[51] Note: Terrestrial and aquatic data may not add up to the combined figure, as there may be overlap between species recorded both in terrestrial and aquatic samples

A10.535 A comparison of the relative number of species recorded from each of the major taxons is included in the following graph (includes species collected using both terrestrial and aquatic sampling methods).

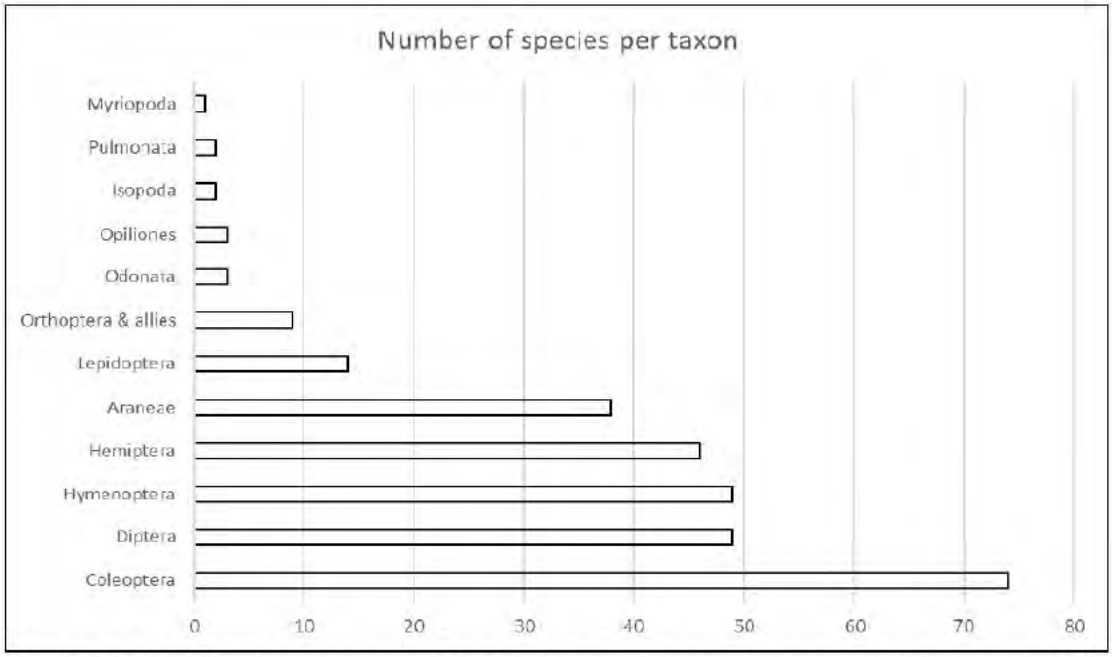

Chart EDP A10.13: A comparison of the relative number of species recorded from each of the major taxons.

Table EDP A10.59: Species of Recognised Conservation Recorded from Area 12:

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
A mirid bug	*Lygus pratensis*	Miridae	Hemiptera	RDB3 pre-1994 criteria	LC
Blue Carpenter Bee	*Ceratina cyanea*	Apidae	Hymenoptera	RDB3 pre-1994 criteria	LC
A solitary wasp	*Pemphredon lethifer*	Crabronidae	Hymenoptera	RDB3 pre-1994 criteria	
Squat Furrow Bee	*Lasioglossum pauperatum*	Halictidae	Hymenoptera	RDB3 pre-1994 criteria	
Great Silver Water Beetle	*Hydrophilus piceus*	Hydrophilidae	Coleoptera	NT (Near Threatened)	NT
A shining flower beetle	*Olibrus flavicornis*	Phalacridae	Coleoptera	Red Data Book-insufficiently known	DD
A pirate spider	*Ero tuberculata*	Mimetidae	Araneae	Nationally Scarce	LC
A jumping spider	*Ballus chalybeius*	Salticidae	Araneae	Nationally Scarce	LC
A jumping spider	*Sibianor aurocinctus*	Salticidae	Araneae	Nationally Scarce	LC
A comb-footed spider	*Kochiura aulica*	Theridiidae	Araneae	Nationally Scarce	LC
A comb-footed	*Theridion*	Theridiidae	Araneae	Nationally Scarce	LC

[52] Species list small, as many of the contributing species were not recorded to species-level and therefore, not used for conservation evaluation; also only one sample was collected from Area 12

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
spider	*blackwalli*				
An apionid weevil	*Squamapion flavimanum*	Apionidae	Coleoptera	Nationally Scarce	
A leaf beetle	*Cryptocephalus hypochaeridis*	Chrysomelidae	Coleoptera	Nationally Scarce	LC
A weevil	*Hypera fuscocinerea*	Curculionidae	Coleoptera	Nationally Scarce	
A chloropid fly	*Trachysiphonella scutellata*	Chloropidae	Diptera	Nationally Scarce	
A muscid fly	*Phaonia cincta*	Muscidae	Diptera	Nationally Scarce	
Broad-headed Bug	*Alydus calcaratus*	Alydidae	Hemiptera	Nationally Scarce	LC
A stilt bug	*Berytinus hirticornis*	Berytidae	Hemiptera	Nationally Scarce	LC
A planthopper	*Asiraca clavicornis*	Delphacidae	Hemiptera	Nationally Scarce	LC
A solitary wasp	*Nysson trimaculatus*	Crabronidae	Hymenoptera	Nationally Scarce	
A myrmicine ant	*Myrmica schencki*	Formicidae	Hymenoptera	Nationally Scarce	LC
Lobe-spurred Furrow Bee	*Lasioglossum pauxillum*	Halictidae	Hymenoptera	Nationally Scarce	LC
Swollen-thighed Blood Bee	*Sphecodes crassus*	Halictidae	Hymenoptera	Nationally Scarce	LC
Pantaloon Bee	*Dasypoda hirtipes*	Melittidae	Hymenoptera	Nationally Scarce	LC
A spider-hunting wasp	*Auplopus carbonarius*	Pompilidae	Hymenoptera	Nationally Scarce	LC
An apionid weevil	*Protapion filirostre*	Apionidae	Coleoptera	Nationally Scarce	LC
A flesh fly	*Blaesoxipha plumicornis*	Sarcophagidae	Diptera	pNationally Scarce	
Brown-banded Carder Bee	*Bombus humilis*	Apidae	Hymenoptera	S41 Priority species	
Buff Ermine	*Spilosoma lutea*	Erebidae	Lepidoptera	S41 research only	LC
Cinnabar	*Tyria jacobaeae*	Erebidae	Lepidoptera	S41 research only	LC

A10.536 SQI score for Area 12:

- Combined terrestrial and aquatic sample data = 8.8 (288 contributing species); and
- Terrestrial data only = 8.9 (268 contributing species).

Pantheon Output Tables for Area 12

Table EDP A10.60: Habitats & resources: broad biotopes

Broad biotopei	No. of species	% representation	SQI	Conservation statusi	Species with conservation status
open habitatsi	194	4	124	6 Nbi; 2 [Nb]; 2 RDB 3i; 4 NSi; 3 [RDB 3]; 1 Section 41 Priority Species - research only; 1 Section 41 Priority Species; 2 [Na]; 1 Nai; 1 pNS; 1 pNT	21
tree-associatedi	40	1	116	1 [Nb]; 1 RDB 3i; 1 Nbi; 1 NSi	4
wetlandi	24	<1	133	1 NTi; 1 NSi	1

Table EDP A10.61: Habitats & resources: habitats

Broad biotopei	Habitati	No. of species	% representation	Conservation statusi	SQI	Species with conservation status
open habitatsi	tall sward & scrubi	129	5	2 RDB 3i; 1 Section 41 Priority Species; 1 pNS; 1 pNT; 1 Section 41 Priority Species - research only; 1 [RDB 3]	105	6
open habitatsi	short sward & bare groundi	63	5	2 [Na]; 1 Nai; 1 RDB 3i; 3 NSi; 6 Nbi; 2 [Nb]; 1 [RDB 3]	160	14
tree-associatedi	arborealı	23	2	1 NSi	114	1
wetlandi	marshlandi	19	2		127	
tree-associatedi	decaying woodi	10	<1	1 RDB 3i	100	1
tree-associatedi	shaded woodland floori	8	<1	1 Nbi; 1 [Nb]	150	2
wetlandi	peatlandi	4	<1	1 NSi; 1 NTi	175	1
wetlandi	running waterı	3	<1		100	
wetlandi	lakei	1	<1		100	
wetlandi	wet woodlandi	1	<1		100	
tree-associatedi	wet woodlandi	1	<1		100	

Table EDP A10.62: Habitats & resources: ISIS specific assemblage types

Broad biotopei	Habitati	SAT	No. of speciesi	% representationi	SQIi	Conservation statusi	Species with conservation status	Codei	Reported conditioni
open habitatsi		rich flower resourcei	25	10	136	1 [Nb]; 1 Section 41 Priority Species; 1 [Na]; 2 [RDB 3]; 1 RDB 3i	6	F002	Favourable
open habitatsi		scrub edgei	13	6	100	1 RDB 3i	1	F001	Favourable
open habitatsi	short sward & bare groundi	bare sand & chalki	12	3	175	1 [Nb]; 2 NSi	3	F111	Unfavourable (12 of 19 species)
open habitatsi	short sward & bare groundi	open short swardi	11	6	209	2 Nbi; 1 NSi; 1 Nai; 1 [Na]	4	F112	Unfavourable (11 of 13 species)
tree-associatedi	decaying woodi	bark & sapwood decayi	9	2	100	1 RDB 3i	1	A212	Unfavourable (9 of 19 species)
open habitatsi		scrub-heath & moorlandi	5	1	160	1 NSi; 1 [RDB 3]	2	F003	Unfavourable (5 of 9 species)
wetlandi	marshlandi	open water on disturbed mineral sedimentsi	3	8	100			W211	Unfavourable (3 of 6 species)
tree-associatedi	decaying woodi	epiphyte faunai	1	5	100			A215	Unfavourable (1 of 3 species)
wetlandi	peatlandi	reed-fen & poolsi	1	<1	400	1 NTi; 1 NSi	1	W314	Unfavourable (1 of 11 species)

Site-Specific Limitations

A10.537 Area 12 was subject to the following sampling limitations/constraints:

- Some of the scrub habitat on the site was inaccessible due to the site's topography;

- Although permission was granted for May, June and July surveys of Area 12, due to health and safety constraints, access to Area 12 was denied prior to the August survey. Consequently August data from the contiguous Area 13A Bamber Pit South, which supported similar OMH was added to the Area 12 dataset;

- In addition, the aquatic habitat (P14) was only sampled on a single occasion due to access constraints during August; and

- At the time of writing some diptera records of the site may be unavailable.

Discussion/Evaluation - Area 12

A10.538 Area 12 Bamber Pit was a topographically diverse site supporting sheltered OMH and calcareous grassland habitat in the base of an old chalk quarry. Whilst site supported a similar flora to comparable sites including Areas 10 and 13, Bamber Pit was a more extensively scrubbed over site. Much of the habitat in the upper reaches and slopes of the site, comprised dense continuous scrub. However, the flatter slope bottom area had recently been cleared and supported sparsely vegetated bare ground as well as more established calcareous grassland in scrub edged scallops. Although the site provided habitat for short sward species attributed primarily with more thermophilic and xerophile invertebrate assemblages, the site had a slightly damper overall feeling due to shading and localised drainage impedence. The site also supported a large pond, aquatic sample data from this waterbody are included within the Pantheon analysis.

A10.539 During the 2020 survey a total of 291 species were recorded from Area 12, of which 30 species are of recognised conservation status in the UK. These included three species classed as 'Species of principal importance' under section 41 of the NERC Act (2006), four species classed as Nationally Rare (RDB3) based on pre-1994 criteria, one species classed as 'Insufficiently known' RBDK and 21 species currently classed as Nationally Scarce in the UK (includes proposed Nationally Scarce species).

A10.540 Of the three s41 species recorded for Area 12 of particular note, two were common and widespread moths included as s41 species in the 'research only' category due to a recorded decline in the UK. These included the Cinnabar *Tyria jacobaea* and Buff Ermine *Spilosoma lutea*. The third species, however, was the Brown-banded Carder Bee *Bombus humilis,* a flagship species of OMH and herb-rich Thames terrace grasslands in the Thames corridor.

A10.541 From Pantheon analysis undertaken for Area 12, the vast majority of species (194) were attributed to 'Open habitats' on a broad biotope level, whilst 40 species were ascribed to the 'Tree associated' assemblage and 24 to the 'Wetland' assemblage. A somewhat greater count may have been expected for the 'wetland' assemblage at this level, due to aquatic, as well as terrestrial sampling having been undertaken on this site. Otherwise, the broad-biotope deployment can be seen as accurately reflecting the habitats present on site and level of targeted sampling.

A10.542 At a habitat level, 129 species were attributed to the 'Tall sward and scrub' assemblage, with 63 species being attributed to the 'Short sward and bare ground' assemblage. This proportional deployment, is commonly recorded from Pantheon analysis of grassland and scrub mosaic sites. However, both assemblages were represented by five percent of their respective national species pool, this reflects the larger overall number of species attributed to the 'Tall sward and scrub' assemblage, the national species pool,[53] within the Pantheon database, compared to the species pool for 'Short sward and bare ground'.

A10.543 In terms of species quality index, an SQI score of 160 was recorded for 'Short sward and bare ground', this being considerably higher than the score of 105 recorded for 'Tall sward and scrub'.

A10.544 This reflected the greater number of species of recognised conservation status attributed to the 'Short sward and bare ground' than for 'Tall sward and scrub'. In total 14 rarities were attributed to 'Short sward and bare ground', compared with six for 'Tall sward and scrub'.

A10.545 Due to the large number of relatively common and widespread grassland species recruited to 'Tall sward and scrub', the conservation value is often diluted in terms of SQI score. However, species of conservation significance attributed to this assemblage for Area 12 included; the s41 'priority species' Brown-banded Carder Bee and s41 'research only' Cinnabar *Tyria jacobaea;* as well as, the Little Blue Carpenter Bee *Ceratina* cyanea*,* a stem nesting species

[53] The total number of species attributed to a given assemblage in the Pantheon database – there are proportionally more Tall sward and scrub species than Short sward and bare ground species listed in the Pantheon database

of herb-rich grassland and scrub mosaics, which is currently classed as RDB3 'rare' but is overdue for status revision owing to increased recording; and *Blaesoxipha plumicornis*, a flesh fly listed both in the nationally scarce and 'Near Threatened' categories. This species is also associated with calcareous grasslands, where the larvae parasitise common species of grasshopper (Acrididae) and the adults nectar on flowers including Wild Carrot *Daucus carota.*

A10.546 At Specific Assemblage Type (SAT) level, the most important level for assessing conservation value of a site, two SATs achieved species scores exceeding their respective Favourable Condition (FC) targets in Pantheon. These included F002 'Rich flower resource' and F001 'Scrub edge'. These assemblages are both resource-based and as such, do not necessarily have affinity with any particular habitat and as such is generally less valuable as a means of assessing the *conservation* value of a site. This is particularly the case for the F002 assemblage, which is made up entirely of bees. In the case of Area 12, the 25 bee species attributed to this assemblage from 2020 data, indicates that this group is well-represented at Area 12.

A10.547 Species of conservation significance attributed to this group included the RDB3 Squat Furrow Bee *Lasioglossum pauperatum* and nationally scarce species including Lobe-spurred Furrow Bee *L. pauxillum* and Pantaloon Bee *Dasypoda hirtipes*, as well as previously mentioned Brown-banded Carder Bee and Little Blue Carpenter Bee. The rather local Green-eyed Flower Bee *Anthophora bimaculata* was also attributed to this group. These species are all strongly associated with herb-rich grassland and OMH habitats within the Thames corridor.

A10.548 Although the F001 'Scrub edge' assemblage for Area 12, registered a species score exceeding its FC threshold, the species attributed to this assemblage were almost all very common and widespread species found in hedgerow verges and scrub edge habitats in grasslands throughout the UK. Exceptions included local species such as the solitary wasp *Pemphredon lethifer* (dubiously listed as RDB3 in Pantheon) and the charismatic Great Green Bush-cricket *Tettigonia viridissima.*

A10.549 Although neither of the two SATs F111 'Bare sand and chalk' and F112 'Open short sward', both nested *within* the habitat-level 'Short sward and bare ground' assemblage, attained scores exceeding their respective FC thresholds, these assemblages provide a more tangible link to invertebrate habitat quality than either the previously discussed, F001 or F002 assemblages.

A10.550 Both assemblages were reasonably well represented compared their respective FC thresholds; however, whilst F111 was attributed with one more

species than was attributed, the F112 assemblage is drawn from a smaller national species pool in the Pantheon database and has a correspondingly lower FC threshold. The threshold score for the F112 'Open short sward' in Pantheon is 13 and 11 species were attributed to this assemblage for Area 12. In comparison, whilst 12 species were attributed to F111 'Bare sand and chalk', this score was somewhat lower in comparsion to its threshold score of 19. Furthermore, four of the 11 species attributed to 'Open short sward' were of recognised conservation status, compared to three ascribed to the F111 SAT.

A10.551 All four species attributed to F112 are nationally scarce and included two apionid weevils *Protapion filirostre* and *Squamapion flavimanum*, both of which are associated with calcareous grasslands. P. filirostre which was recorded from several other sites during the survey, is associated with Medicago species including Black *Medicago lupulina* and Lucerne *M. sativa. S. flavimanum* was recorded only from Area 12 during the survey is associated with Wild Marjoram *Origanum vulgare,* which was recorded from the site, as well as other labiates. The other scarce species recorded included another calcareous and OMH associated beetle, *Cryptocephalus hydrochaeridis* and *Asiraca clavicornis*, a distinctive species of planthopper. Both species were recorded from most other grassland and OMH sites during the 2020 survey.

A10.552 The uncommon species attributed to the F111 'Bare sand and chalk' SAT, were also all nationally scarce in the UK and included a jumping spider *Sibianor aurocincta*, an Alydid Bug *Alydus calcaratus* and the Pantaloon Bee *Dasypoda hirtipes*, all of which are typical of better quality, OMH and flower-rich grassland sites in the Thames corridor.

A10.553 Several other species of recognised conservation status were attributed at habitat, but not SAT level to the overarching 'Short sward and bare ground assemblage'. These included a stilt bug *Berytinus hirticornis* a hyperine weevil *Hypera fuscocinerea* and a myrmicine ant *Myrmica schencki*, all of which are associated with dry coastal grassland and OMH sites in the Thames corridor. The remaining species, the Swollen-thighed Blood Bee *Sphecodes crassus*, is a cuckoo species associated with *Lasioglossum nitidiusculum* (not recorded from Area 12) and several other *Lasioglossum* species.

A10.554 Other significantly[54] represented habitat-level assemblages for Area 12 included 'Arboreal' with 23 species and 'Marshland' with 19 species. At this level, non-significant assemblage included the other two tree-associated assemblages, 'Decaying wood' with 10 species and 'Shaded woodland floor' with eight species and the other major wetland assemblage 'Peatland' was attributed with four species.

[54] An SQI score in Pantheon is considered robust if it is attributed with 16 or more species

A10.555 The SQI scores for 'Arboreal' and 'Marshland', were 114 and 127 respectively, reflecting relatively low conservation value values for both of these assemblages. The only nationally scarce species attributed to the 'Arboreal' assemblage was a species of jumping spider *Ballus chalybeius*; however, two of only eight species attributed to the 'Shaded woodland floor' assemblage were nationally scarce.

A10.556 These included a spider-hunting wasp *Auplopus carbonarius* and a solitary wasp *Nysson trimaculatus,* both of these species were also recorded from several other sub-sites during the survey. Of the species attributed to the remaining tree-associated, habitat-level assemblage 'Decaying wood', was a solitary wasp *Pemphredon lethifer*. Although this species is classed as Nationally Rare (RDB3) in Pantheon, the insect it not assigned a status in a review by Collins and Roy (2012) and records suggest that it is at most a local species in the UK.

A10.557 In relation to the recorded habitats, whilst none of the species assigned to 'Marshland' were species of status, the largest British water beetle, the Great Silver Water Beetle *Hydrophilus piceus* currently classed as nationally scarce with a threat status of 'Near Threatened', was attributed to the 'Peatland' assemblage. This species, also recorded from coastal grazing marsh (Area 7) on the Swanscombe Peninsula during the survey. This species, alongside most other water beetles and aquatic fauna attributed to both 'Marshland' and 'Peatland' assemblages were recorded from the aquatic sampling of the pond (P14), occupying the eastern margin of Area 12.

A10.558 Although none of the other species attributed to the wetland assemblages on site were of recognised conservation status, three of the water beetles including two water scavenger beetles *Berosus affinis*, *Helochares lividus* and a grooved water scavenger beetle *Helophorus griseus,* were all formerly classed as nationally scarce in the UK, being downgraded due to recorded increase in a review by Foster (2010).

A10.559 Great Silver Water Beetle is usually associated with well-vegetated ponds and is particularly associated with coastal grazing marsh ditches and both *Berosus affinis* and *Helochares lividus* are mainly associated with well vegetated aquaitc habitats.

A10.560 The non-Pantheon SQI score recorded for Area 12 terrestrial only data was 8.9. compared to 8.8 for combined terrestrial and aquatic data. According to Harvey (2014)[55] an SQI value of 7.5 is indicative of an 'excellent' invertebrate site and one approaching 10.00 is 'almost certainly of national significance.'

[55] Harvey based his evaluation on invertebrate fauna in Essex, the Kent fauna within the Swanscombe part of the Thames corridor is comparable with this standard.

Conclusion

A10.561 Area 12 Bamber Pit was one of several survey areas within the chain of contiguous, disused chalk quarry sites, running southwards from the Swanscombe peninsula. As such, the site supported habitat which had been subject to historic anthropogenic disturbance. The site was diverse, both in terms of macro and microtopography and due to the varied vegetation structure. Whilst the site supported a larger proportion of mature scrub than most other OMH/grassland survey areas, there was quarry bottom OMH and calcareous grassland habitat, which occurred in sheltered conditions.

A10.562 This habitat was representative of and complementary to the wider landscape, forming both habitat resource and habitat connectivity beneficial to specialist OMH and herb-rich grassland invertebrates. Besides the terrestrial habitat, a largish pond (P14) located within the site provided aquatic habitat. Whilst the fauna recorded from the pond was of relatively moderate conservation value, the Near Threatened Great silver Water Beetle *Hydrophilus piceus* was recorded from the site.

A10.563 The greater value of the site was evidently represented within the open habitat assemblages and whilst some species of recognised conservation status were attributed to the most strongly represented 'Tall herb and scrub' assemblage, the 'Short sward and bare ground' and nested SATs F112 'Open short sward' and F111 'Bare sand and chalk', were of highest conservation value. Although neither F111 or F112 assemblages were attributed with sufficient species to achieve Favourable Condition status, both supported several species of conservation status and the SQI score for the overarching 'Short sward and bare ground' assemblage was of a level indicative of an assemblage of high conservation value.

A10.564 The two SATs achieving FC status from Area 12, was included the F002 'Rich flower resource' and F001 'Scrub edge'. Whilst F002 does not provided a tangible means of assessing conservation value, as it is resource rather than habitat-based, the assemblage highligted the number of bee species attributed to this site. These included the s41 OMH flagship species Brown Banded Carder Bee Bombus *humilis,* as well as several rare, scarce and local species. The tree-associated assemblage was unsurprisingly, represented by a significant number of species, with 40 being attributed to this assemblage on site. Whilst the majority of species attributed to this assemblage in Pantheon, were widespread and common, several species of recognised conservation status were recorded for the site. However, these were scattered between habitat level assemblages including 'Arboreal', 'Wood decay' and 'Shaded woodland floor'.

A10.565 Overall, Area 12 can be said to support 'Short sward and bare ground' assemblages approaching national importance, together with tree-associated and wetland assemblages of more modest value. Using a method used by Harvey (2014), described in Ball (1986) a site-level SQI score of 8.9 was calculated for the invertebrate fauna of the site as a whole. Considering the representativeness, size and ecological position of Area 12 Bamber Pit and its associated habitat and invertebrate fauna, coupled with findings of the 2020 Pantheon analysis and independent SQI score, the site can be said to support an invertebrate fauna of Regional Importance.

Area 13 Former Landfill And 13a Bamber Pit (South)

Centroid grid reference: Area 13 = TQ 61068 74100; Area 13a = TQ 61157 74413

Overall area: Area 13 = 22.8 hectares; Area 13a = 3.3 hectares

Designations on site: None

S41 habitats present: Open mosaic habitat on previously developed land

Habitat Description

A10.566 Area 13 (Former Landfill) comprises an extensive area of predominately, semi-improved grassland habitat occupying the footprint on the site of a former landfill site. The site has varied topography which is contoured and raised above much of the surrounding landscape into gentle hillocks. There are gentle to moderate slopes to most aspects, but particularly to the east and west. The sward over much of this area was generally of fairly even height, being approximately five to 10 cm tall for the most part. The site is evidently managed by periodic mowing and there was little scrub within the open grassland area. However, some areas of the grassland were herb-rich, supporting a neutral to calcareous flora.

A10.567 In addition, two, more or less circular landforms of uncertain origin, were present on the site at TQ 61237 74041 and TQ 61151 74120. These features were both of similar size and structure; with outer, ring-like banks and raised and cliffed central areas, which were heavily scrubbed over. The contoured banks and associated grassland, scrub and bare ground habitat within and around these features provided structural variation, complementing the more even structure of the wider grassland.

A10.568 Scrub habitat was otherwise mainly confined to the border of the site and in the northeastern corner of the site, the scrub border was shared with Area 13a (Bamber Pit South)[56]. A shallow, raised bank/dyke feature at the eastern boundary of Area 13 (TQ 61173 74196) provided both additional microtopographic variation and a resource of tall herb vegetation dominated by Goat's Rue *Galega officinalis* and other tall herbs typically associated with OMH.

A10.569 Area 13a was divided from Area 13 by the abovementioned ditch/dyke feature, which at the point of access, constituted little more than a subtle variation in microtopography. However, the habitat within this area differed in general character to the more open grassland of Area 13. Area 13a comprised an area of OMH comprising more open, short sward grassland with encroaching scrub (TQ 61182 74335), grading into more established scrub/woodland around (TQ 61129 74453), towards the northern site boundary with Area 12.

A10.570 The habitat in the open part of Area 13a was fairly structurally diverse, with areas of taller sward habitat, supporting sands of Goat's Rue and other tall herbs, as well as very short, rabbit-grazed habitat with bare ground patches. There was extensive Bramble scrub encroachment in this area, grading into more established scrub/woodland. A smallish stand of Reed Canary Grass *Phalaris arundinacea* was also recorded in Area 13a, indicating localised drainage impedence and possible seasonal inundation; however, there was no evidence other than the presence of Reed Canary Grass and tall herbs such as Teasel *Dipsacus fullonum*. The wooded habitat to the north of Area 13 was generally dense, the edge of this habitat, however, provided sheltered scrub-edge habitat.

A10.571 The general grassland habitat with Area 13 was locally herb-rich; the sward consisted of graminoids including (amongst others) Red Fescue *Festuca rubra,* Smooth-stalked Meadow Grass *Poa pratensis,* Yorkshire Fog *Holcus* lanatus*,* Common Bent *Agrostis capillaris,* Creeping Bent *A. stolonifera,* Cock's-foot *Dactylis glomerata*, Sweet Vernal Grass *Anthoxanthum odoratum* and in the taller sward edge habitats False-Oat Grass *Arrhenatherum elatius* and locally, Pendulous Sedge *Carex pendula.*

A10.572 Herbs included composites including Ox-eye Daisy *Chrysanthemum leucanthemum,* Common Ragwort *Senecio jacobaea,* Yarrow *Achillea millefolium, Common* Cat's-ear *Hypochaeris radicata*, Rough Hawk's-beard *Crepis biennis, Dandelion Taraxacum officinale (agg.),* Bristly Ox-tongue *Picris echioides,* Common Knapweed *Centaurea nigra*, Creeping Thistle *Cirsium*

[56] Area 13a (Bamber Pit South was treated as a sub-site of Area 13 for the first three survey events. However, due to access being denied to Area 12 (Bamber Pit north) at the time of the final, August sampling event, a decision was made to integrate the August 13a sample data with the Area 12 data to provide sufficient samples for Pantheon analysis for this site. The habitat was both comparable to and contiguous with Area 12.

arvense, Goatsbeard *Tragopogon pratensis* and Colt's-foot *Tussilago farfara*; legumes including Red Clover *Trifolium pratense,* White Clover *T. repens,* Narrow-leaved Bird's-foot Trefoil *L. tenuis*, Common Bird's-foot Trefoil *Lotus corniculatus,* Common Vetch *Vicia sativa,* Grass Vetchling *Lathyrus nissolia,* Black Medick *Medicago lupulina* and Hop Trefoil *Trifolium campestre* as well umbellifers including Wild Carrot *Daucus carota,* Wild Parsnip *Pastinaca sativa* as well as a range of other typical neutral to calcareous grasssland herbs including: Selfheal *Prunella vulgaris*, Creeping Cinquefoil *Potentilla reptans,* Ribwort Plantain *Plantago lanceolata,* Bulbous Buttercup *Ranunculus bulbosus,* Creeping Buttercup *R. repens,* Meadow Buttercup *R. acris,* Germander Speedwell *Veronica chamaedrys,* Cut-leaved Crane's-bill *Geranium dissectum,* Dove's-foot Crane's-bill *Geranium molle*, Common Mouse-ear *Cerastium fontanum*, Common Mallow *Malva sylvestris,* Red Dead-nettle *Lamium purpurea* and Pyramidal Orchid *Anacamptis pyramidalis*. Columbine *Aquilega vulgaris* was also recorded locally within the sward.

A10.573 Non-native herbs recorded included Goat's Rue *Galega officinalis* and Lucerne *Medicago sativa*, these species providing a valuable foraging resource for bees and a foodplant for a range of other invertebrates.

A10.574 Area 13a was not as diverse in terms of species-richness as the more herb-rich parts of Area 13. Particularly abundant herb species included Creeping Cinquefoil, Black Medick, a forget-me-not *Myosotis* sp., Ground-Ivy *Glechoma hederacea,* Ribwort Plantain, Bulbous Buttercup and Common Cat's-ear *Hypochaeris radicata* in the more heavily rabbit grazed patches and Bristly Ox-tongue, Creeping Thistle, Teasel, Goat's Rue, Lucerne, Ox-eye Daisy, Common Knapweed, Wild Carrot and Wild Parsnip in the taller sward areas. A similar range of graminoids were recorded as in Area 13.

A10.575 Scrub habitat occurring both in Areas 13 and 13a included lower growing species including Bramble *Rubus fruticosus* (agg.); Dog Rose *Rosa canina* (agg.), Dogwood *Cornus sanguinea*, Common Gorse *Ulex europaeus*, Broom *Cytisus scoparius*; taller scrub species including Blackthorn *Prunus spinosa,* Hawthorn *Crataegus monogyna,* Wayfaring Tree *Viburnum lantana,* Goat Willow *Salix caprea,* Grey Willow *S. cinerea* and Pedunculate Oak *Quercus robur.* Non-native tree and scrub species including *Lombardy Poplar Populus nigra var. italica,* Holm Oak *Quercus ilex* and Buddliea *Buddleja davidii,* were also recorded.

A10.576 Connectivity: Areas 13 and 13a are connected via a mutual boundary and are jointly contiguous to Area 12 Bamber Pit (north), which itself is more or less contiguous with Area 11 which lies in close proximity to extensive habitat of similar composition within both Area 10 and the Swanscombe Peninsula. To

the south. Area 13 is separated only by road crossings to Area 14 and 15, which collectively constitute a significant area of habitat of similar composition.

A10.577 Substrate: Area 13: Chalk sedimentary bedrock (Lewes Nodular Chalk Formation; Seaford Chalk Formation and Newhaven Chalk Formation); localised Head clay, silt, sand and gravel (superficial deposits). Area 13a similar, but with the superficial deposits overlying the whole area. Area 13 would have been capped, following restoration from landfill. The grassland was typically neutral to calcareous in composition, with a similar flora to adjoining sites.

A10.578 Wetness: No standing water was recorded during the survey, other than a heavily shaded drainage ditch which followed the site's eastern border. There were dried out drainage ditches crossing the site, often indicated by stands of Pendulous Sedge *Carex pendula* and Hard Rush *Juncus inflexus*; however, these were not surveyed. There were indications of Area 13a due to a small stand of Reed Canary Grass *Phalaris arundinacea;* however, no standing water or saturated mud was recorded within this area.

A10.579 Structure: Area 13 was generally more elevated and had greater overall topographical variation, due to slopes than any of the survey areas to the south of Swanscombe Peninsula. Whilst microtopography was generally less well represented, within the main overall grassland, the two localised circular features with ditches and banks provided some microtopographical variation as did the ditch/dyke at the eastern site boundary. Vegetation structure within the general grassland was fairly uniform; however, the edge habitat, especially relating to the circular features and with Area 13a, provided variation in sward height, as well as, shelter and additional structural variation from scrub and wooded habitat. Area 13a was somewhat more structurally diverse, with mosaic habitat including elements of bare ground, short sward and taller sward grassland, tall herb, scrub and woodland edge habitats.

Invertebrate Survey Dates

A10.580 The site was surveyed on four occasions including: 19/05/2020; 15/06/2020; 13/07/20 and 17-18/08/20

Table EDP A10.63: Number of Samples per Substrate:

	Area 13 (SI Grassland and Scrub)	Area 13a (OMH and Scrub)	Total
Sweep	4	3	7
Vacuum	4	3	7
Beating	2	2	4
Pan trap	4	3	7

A10.581 Total number of species recorded: 358

A10.582 A comparison of the relative number of species recorded from each of the major taxons is included in the following table.

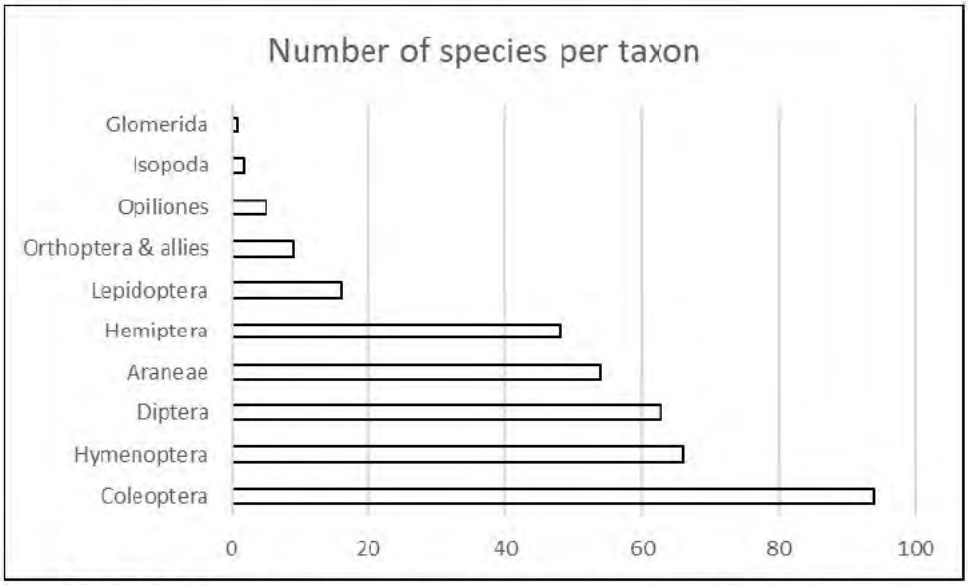

Chart EDP A10.14: A comparison of the relative number of species recorded from each of the major taxons.

Table EDP A10.64: Species of Recognised Conservation Recorded from Area 13.

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
A mirid bug	*Lygus pratensis*	Miridae	Hemiptera	RDB3 pre-1994 criteria	LC
Blue Carpenter Bee	*Ceratina cyanea*	Apidae	Hymenoptera	RDB3 pre-1994 criteria	LC
Squat Furrow Bee	*Lasioglossum pauperatum*	Halictidae	Hymenoptera	RDB3 pre-1994 criteria	LC
Spotted Dark Bee	*Stelis ornatula*	Megachilidae	Hymenoptera	RDB3 pre-1994 criteria	
A shining flower beetle	*Olibrus flavicornis*	Phalacridae	Coleoptera	Red Data Book-insufficiently known	DD
A mason wasp	*Odynerus melanocephalus*	Eumenidae	Hymenoptera	S41 'priority species'; Nationally Scarce	
A gnaphosid spider	*Drassodes pubescens*	Gnaphosidae	Araneae	Nationally Scarce	LC
A lycosid spider	*Alopecosa cuneata*	Lycosidae	Araneae	Nationally Scarce	LC
A pirate spider	*Ero aphana*	Mimetidae	Araneae	Nationally Scarce	LC
A pirate spider	*Ero tuberculata*	Mimetidae	Araneae	Nationally Scarce	LC
A running crab spider	*Thanatus striatus*	Philodromidae	Araneae	Nationally Scarce	LC
A jumping spider	*Ballus chalybeius*	Salticidae	Araneae	Nationally Scarce	LC
A jumping spider	*Sibianor*	Salticidae	Araneae	Nationally Scarce	LC

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
	aurocinctus				
A comb-footed spider	*Kochiura aulica*	Theridiidae	Araneae	Nationally Scarce	LC
An apionid weevil	*Protapion filirostre*	Apionidae	Coleoptera	Nationally Scarce	LC
Bombadier beetle	*Brachinus crepitans*	Carabidae	Coleoptera	Nationally Scarce	LC
A leaf beetle	*Cryptocephalus hypochaeridis*	Chrysomelidae	Coleoptera	Nationally Scarce	LC
Adonis Ladybird	*Hippodamia variegata*	Coccinellidae	Coleoptera	Nationally Scarce	LC
A ladybird beetle	*Platynaspis luteorubra*	Coccinellidae	Coleoptera	Nationally Scarce	LC
A weevil	*Calosirus terminatus*	Curculionidae	Coleoptera	Nationally Scarce	
A weevil	*Sitona waterhousei*	Curculionidae	Coleoptera	Nationally Scarce	
A click beetle	*Athous campyloides*	Elateridae	Coleoptera	Nationally Scarce	
A mordellid beetle	*Mordellistena parvula*	Mordellidae	Coleoptera	Nationally Scarce	LC
Hop-garden Earwig	*Apterygida media*	Forficulidae	Dermaptera	Nationally Scarce	LC
Slender-horned Leatherbug	*Ceraleptus lividus*	Coreidae	Hemiptera	Nationally Scarce	LC
A planthopper	*Asiraca clavicornis*	Delphacidae	Hemiptera	Nationally Scarce	LC
Painted Nomad Bee	*Nomada fucata*	Apidae	Hymenoptera	Nationally Scarce	LC
Lobe-spurred Furrow Bee	*Lasioglossum pauxillum*	Halictidae	Hymenoptera	Nationally Scarce	LC
Swollen-thighed Blood Bee	*Sphecodes crassus*	Halictidae	Hymenoptera	Nationally Scarce	LC
A spider-hunting wasp	*Auplopus carbonarius*	Pompilidae	Hymenoptera	Nationally Scarce	LC
A spider-hunting wasp	*Priocnemis agilis*	Pompilidae	Hymenoptera	Nationally Scarce	
A spider-hunting wasp	*Priocnemis confusor*	Pompilidae	Hymenoptera	Nationally Scarce	
A Solitary Wasp	*Odynerus melanocephalus*	Vespidae	Hymenoptera	Nationally Scarce	
A flesh fly	*Blaesoxipha plumicornis*	Sarcophagidae	Diptera	pNationally Scarce	
Brown-banded Carder Bee	*Bombus humilis*	Apidae	Hymenoptera	S41 Priority species	
Small Heath	*Coenonympha pamphilus*	Nymphalidae	Lepidoptera	S41 Priority species	NT
Cinnabar	*Tyria jacobaeae*	Erebidae	Lepidoptera	S41 research only	LC

A10.583 SQI score for Area 13: 8.9

Pantheon Output Tables for Area 13

Table EDP A10.65: Habitats & resources: broad biotopes

Broad biotopei	No. of species	% representation	SQI	Conservation statusi	Species with conservation status
open habitatsi	251	6	129	8 Nbi; 10 NSi; 3 [Nb]; 4 [RDB 3]; 1 RDB 3i; 1 Section 41 Priority Species - research only; 3 Section 41 Priority Species; 4 [Na]; 1 NTi; 1 pNS; 1 pNT	33
tree-associatedi	51	1	120	1 DDi; 1 Nbi; 1 [Na]; 2 NSi; 1 New to Britaini	5
wetlandi	12	<1	100		
coastali	2	<1	400	1 Nbi	1

Table EDP A10.66: Habitats & resources: habitats

Broad biotopei	Habitati	No. of species	% representation	Conservation statusi	SQI	Species with conservation status
open habitatsi	tall sward & scrubi	168	6	4 NSi; 1 Section 41 Priority Species; 2 [RDB 3]; 2 Nbi; 1 pNS; 1 pNT; 1 [Nb]; 1 RDB 3i; 1 Section 41 Priority Species - research only	118	13
open habitatsi	short sward & bare groundi	80	6	7 Nbi; 1 NTi; 2 Section 41 Priority Species; 3 [Na]; 5 NSi; 2 [Nb]; 1 RDB 3i; 1 [RDB 3]	155	19
tree-associatedi	arborealı	28	2	1 New to Britaini; 1 NSi; 1 [Na]	111	3
tree-associatedi	shaded woodland floori	13	1	1 Nbi	133	1
tree-associatedi	decaying woodi	11	<1	1 DDi; 1 New to Britaini; 1 NSi	127	2
wetlandi	marshlandi	7	<1		100	
wetlandi	peatlandi	6	<1		100	
wetlandi	running waterı	2	<1		100	
open habitatsi	uplandi	1	<1		100	
coastali	sea cliffi	1	2	1 Nbi		1

Broad biotopei	Habitati	No. of species	% representation	Conservation statusi	SQI	Species with conservation status
					400	

Table EDP A10.67: Habitats & resources: ISIS specific assemblage types

Broad biotopei	Habitati	SAT	No. of species	% representation	SQI	Conservation statusi	Species with conservation status	Code	Reported conditioni
open habitatsi		rich flower resourcei	34	14	135	1 Section 41 Priority Species: 3 [RDB 3]; 2 [Na]; 1 [Nb]; 1 RDB 3i	8	F002	Favourable
open habitatsi	short sward & bare groundi	open short swardi	18	9	183	1 NSi; 4 Nbi; 1 NTi; 1 Section 41 Priority Species	6	F112	Favourable
open habitatsi		scrub edgei	14	6	121	1 [Na]; 1 NSi	2	F001	Favourable
open habitatsi		scrub-heath & moorlandi	9	3	167	2 NSi; 1 [RDB 3]	3	F003	Favourable
open habitatsi	short sward & bare groundi	bare sand & chalki	9	2	200	3 NSi	3	F111	Unfavourable (9 of 19 species)
tree-associatedi	decaying woodi	bark & sapwood decayi	7	1	100			A212	Unfavourable (7 of 19 species)
open habitatsi	short sward & bare groundi	exposed sea-cliffi	1	2	400	1 Nbi	1	F113	
tree-associatedi	decaying woodi	heartwood decayi	1	<1	100			A211	Unfavourable (1 of 6 species)

Site-Specific Limitations

A10.584 Area 13/13a, was subject to the following sampling limitations/constraints:

- At the time of writing, some diptera records of the site were unavailable. The absence of these records may influence the Pantheon and SQI output; and

- Although the sample data for 13a was including within the dataset for Area 13 for May, June and July surveys, data from the August sampling of Area 13a was used as a surrogate for loss of sampling in contiguous Area 12 Bamber Pit. Survey permission in Area 12 itself was withdrawn at this time due to unsafe conditions.

Discussion/Evaluation - Area 13

A10.585 Area 13 Former Landfill comprised an extensive area of herb-rich grassland of a calcareous nature, occupying the capped footprint of a former landfill site. The main grassland area was smoothly contoured with slopes of most aspect, providing topographical variation. The grassland was managed by periodic mowing giving much of the site a relatively uniform structure and diminishing the growth of scrub, which occurs at a much lower density within the central parts of the site.

A10.586 The two circular landforms within the site, provided more obvious microtopographic variation, as well as being more structurally diverse in terms of vegetation. These features providing scrub and grassland vegetation and banks with localised patches of exposed bare ground. Further variation of benefit to OMH invertebrates was found on the site's eastern border, where tall herb vegetation including an extensive resource of Goat's Rue *Galega officinalis* and other flowering plants of value as forage, occupied a ditch and dyke.

A10.587 This feature separated the main Area 13 from the more structurally diverse, 13a (Bamber Pit South) the data from which was analysed for the most-part alongside Area 13, although the late summer data was added to the Area 12 Bamber Pit dataset, owing to access being denied to this site later in the field season. Overall Areas 13 and 13a combined provided an extensive resource of herb-rich grassland and OMH representative of the wider survey area. The site's value as part of a chain of contiguous grassland and OMH sites, contributed to its conservation value for invertebrates on a landscape scale.

A10.588 During the 2020 survey a total of 357 species were recorded from Area 13 and 13a combined, of which 37 species are of recognised conservation status in the UK. These included four species classed as 'Species of principal importance' under section 41 of the NERC Act (2006), four Nationally Rare (RDB3) species based on pre-1994 criteria, one species classed as

'Insufficiently known' RBDK and 29 species currently classed as Nationally Scarce in the UK.

A10.589 The most significant s41 species recorded from Area 13/13a included the Black-headed Mason Wasp *Odynerus melanogaster*, a nationally scarce species which stocks its nest with the larvae of weevils of the genus *Hypera* and Brown-banded Carder Bee *Bombus humilis,* a flagship species of OMH and herb-rich Thames terrace grasslands in the Thames corridor. Additional s41 species included, the relatively common but declining Small Heath *Coenonympha pamphilus,* which is also afforded a threat status of Near Threatened based on post-2001 IUCN criteria and the Cinnabar *Tyria jacobaea*, one of a number of common and widespread moth species included as s41 'research only' species.

A10.590 The RDB3 species, Spotted Dark Bee *Stelis ornatula*, a cleptoparasite of the Welted Lesser Mason Bee *Hoplitis claviventris*, was arguably the rarest species recorded from Area 13/13a during the 2020 survey. Squat Furrow Bee *Lasioglossum pauperatum,* can also still be considered to warrant RDB status; however, the stem-nesting Little Blue Carpenter Bee *Ceratina cyanea* (RDB3) have been recorded more frequently in recent years, but are still scarce in the UK. The remaining species, a mirid bug *Lygus pratensis,* is still listed as RDB3 despite having massively increased its UK range in recent years. This species has not, as yet, been subject to formal status revision.

A10.591 From Pantheon analysis undertaken for Area 13/13a, the vast majority of species (251) were attributed to 'Open habitats' on a broad biotope level, whilst 51 species were ascribed to the 'Tree associated' assemblage, 12 to 'Wetland' and two to the 'Coastal' assemblage. This broad-biotope deployment accurately reflected the habitats present on site and level of targeted sampling.

A10.592 At a habitat level, 168 species were attributed to the 'Tall sward and scrub' assemblage, with 80 species being attributed to the 'Short sward and bare ground' assemblage. This proportional deployment, is commonly recorded from Pantheon analysis of grassland and scrub mosaic sites. However, both assemblages were represented by six percent of their respective national species pool, this reflects the larger overall number of species attributed to the 'Tall sward and scrub' assemblage, the national species pool,[57] within the Pantheon database, compared to the species pool for 'Short sward and bare ground'.

[57] The total number of species attributed to a given assemblage in the Pantheon database – there are proportionally more Tall sward and scrub species than Short sward and bare ground species listed in the Pantheon database

A10.593 In terms of species quality index, an SQI score of 155 was recorded for 'Short sward and bare ground', this being somewhat higher than the score of 118 recorded for 'Tall sward and scrub'.

A10.594 Whilst this discrepency is not as exaggerated as for many of the OMH and grassland and scrub mosaic sites within the survey area, a greater number of species of recognised conservation status attributed to the 'Short sward and bare ground' than for 'Tall sward and scrub'. In total 19 rarities were attributed to 'Short sward and bare ground', compared with 13 for 'Tall sward and scrub'.

A10.595 Due to the large number of relatively common and widespread grassland species recruited to 'Tall sward and scrub', the conservation value is often diluted in terms of SQI score. However, a number of species of conservation significance attributed to this assemblage for Area 13/13a including previously mentioned species, the s41 Brown-banded Carder Bee and Cinnabar *Tyria jacobaea;* the RDB3 Spotted Dark Bee *Stelis ornatula* and Little Blue Carpenter Bee *Ceratina cyanea,* as well as, *Blaesoxipha plumicornis*, a flesh fly listed both in the nationally scarce and 'Near Threatened' categories; three nationally scarce spiders including a gnaphosid spider *Drassodes pubescens,* a pirate spider *Ero aphana* and a philodromid spider *Thanatus striatus*, three species of beetle including two ladybird beetles *Platynaspis luteorubra* and Adonis Ladybird *Hippodamia variegata* and a click beetle *Athous campyloides.* The Hop-garden Earwig *Apterygida media* and a spider-hunting wasp *Priocnemis agilis,* were also attributed to the 'Tall sward and scrub' assemblage.

A10.596 Several of these species were recorded from several other grassland and OMH sites during the 2020 survey and included species for which the Thames corridor is a national stronghold.

A10.597 Species of recognised conservation status attributed at habitat-level to the 'Short sward and bare ground' assemblage, but not at SAT level for Area 13/13a, included the s41 Black-headed Mason Wasp *Odynerus melanogaster, the* RDB3 Squat Furrow Bee *Lasioglossum pauperatum,* and nationally scarce species including Painted Nomad Bee *Nomada fucata,* Swollen-thighed Blood Bee *Sphecodes crassus,* a spider-hunting wasp *Priocnemis confusor* and the Slender-horned Leatherbug *Ceraleptus lividus*.

A10.598 Four SATs supporting sufficient species to exceed their respective FC targets were recorded for Area 13/13a. These included habitat-based assemblage F112 'Open short sward' and three resource-based assemblages including F002 'Rich flower resource', F001 'Scrub edge' and F003 'Scrub-heath and moorland'.

A10.599 For Area 13/13a the F111 'Bare sand and chalk' SAT, was represented by only nine species and therefore, fell well short in terms of species score to exceed its corresponding FC of 19. However, as was found within other sites within the survey area, the output for this assemblage included species of recognised conservation status. The F111 assemblage is more typical of early successional habitats, rather than established grasslands, where there is a higher proportion of bare ground and disturbance habitat.

A10.600 The invertebrate assemblage for Area 13/13a, compared to many of the adjacent sites, supported more continuous tracts of established grassland managed by periodic mowing. Interestingly, the dominance of F111 over F112 observed in most of the 2020 survey areas was reversed for Area 13/13a, this seemingly relating to establishment of more permanent and managed grassland.

A10.601 F112 'Open short sward' is decribed in the Pantheon glossary as being 'found in lowland habitats where grazing or cutting of vegetation over calcareous soils limits the development of taller vegetation. It generally occurs over nutrient-poor soils, limiting the dominance of grasses, thereby encouraging widespread development of broadleaved herbs.'

A10.602 For Area 13/13a, the F112 SAT was attributed with 18 species, clearly exceeding the threshold of 12 in Pantheon. The assemblage also attained a SQI score of 183, indicating an 'Open short sward' assemblage of very high conservation value. The six species of conservation importance attributed to this assemblage comprised mainly of nationally scarce beetle species.

A10.603 These included a Black Medick *Medocago lupulina* associated apionid weevil *Protapion filirostre*, *Sitona waterhousei* a pea weevil associated with bird's-foot trefoils *Lotus* spp., *Calosirus terminatus*, a ceutorhyncine weevil associated exclusively with Wild Carrot *Daucus carota* and a pot beetle *Cryptocephalus hypochaeridis*, which feeds on pollen of yellow composities, buttercups *Ranunculus* spp. and other predominately yellow-flowered herbs. The remaining nationally species attributed to 'Open short sward' was a planthopper *Asiraca clavicornis*, which is uncommon nationally, but occurs commonly within the Thames corridor. The s41 and Near Threatened Small Heath *Coenonympha pamphilus,* a short sward grassland butterfly, was also attributed to F112.

A10.604 The beetle species, in particular strongly reflect the grassland compostion on the site. Several of these species were also recorded from other sites within the survey area which supported a similar flora.

A10.605 The three nationally scarce species attributed to the F111 'Bare sand and chalk' SAT included a wolf spider *Alopecosa cuneata*, a jumping spider *Sibianor aurocincta* and the Bombardier Beetle Brachinus crepitans. These made up the remaining rarities attributed to the overarching 'Short sward and bare ground' habitat-level assemblage.

A10.606 Although the F002 'Rich flower resource' is generally considered to be of limited value in assessing conservation value, as it is a diffuse resource-based, rather than a tangible habitat-related assemblage, a total of 34 bee species were attributed to this assemblage, this being more than double the number required to exceed the corresponding FC threshold of 14 species. In addition, eight species of recognised conservation status were listed for the assemblage, resulting in a relatively high SQI score. Species attributed to F002 included all previously mentioned bees, other than Swollen-thighed Blood Bee *Sphecodes crassus* which was not listed. Two of the bees including Sharp-collared Furrow Bee *Lasioglossum malachurum* and Lobe-spurred Furrow Bee *L. pauxillum* have increased significantly in the UK in recent years and are likely to have their statuses revised out of the Nationally Scarce category.

A10.607 Of the species not listed as being of high conservation value, the Welted Lesser Mason Bee *Hoplitis claviventris* was recorded from the site. This locally distributed species is of interest in being the host of the cleptoparasitic RDB3 Spotted Dark Bee *Stelis ornatula*, both these species were attributed both to the F002 assemblage.

A10.608 The remaining two resource-based SATs recorded as supporting a sufficient number of species to exceed their respective FC thresholds in Pantheon included F001 'Scrub edge' and F003 'Scrub heath and moorland'. The representation of the latter of these SATs appears anomolous and the description in Pantheon does not fit the description of Area 13/13a, or indeed, other sites within the survey area supporting elements of this assemblage.

A10.609 However, species attributed to F003 include *Lygus pratensis*, a species which has both markedly extended its UK range and also the range of habitats it occurs in and other species attributed to this assemblage for Area 13/13a, including a comb-footed spider *Kochiura aulica* and a pirate spider *Ero aphana* are both found on brownfield sites in the Thames corridor besides their more traditional habitat of lowland heathland. Another, commoner species attributed to this assemblage was the Gorse Weevil *Exapion ulicis,* which is associated with gorses *Ulex* spp. which whilst being integral to heathland, frequently grow in grassland and scrub and OMH sites. During 2020, *E. ulicis* was recorded from Common Gorse *Ulex europaeus* scrub in Area 13/13a.

A10.610 The F001 Scrub edge assemblage can be seen as being closely allied to the F003 SAT, as species ascribed to this assemblage have structurally similar affinities. Whilst, as is often the case for F003, the majority of species attributed to this assemblage for Area 13/13a were common and widespread, the nationally scarce Hop-garden Earwig *Apterygida media* was attributed to F003 in Pantheon. The Median Wasp *Dolichovespula media*, is also listed as a species of status in the Psantheon output; however, this species formerly recorded as RDB3 and subsequently as nationally scarce, is now much more widespread in the UK than formerly and is no longer considered to warrant nationally scarce status.

A10.611 The non-Pantheon SQI score recorded for Area 13 and 13a combined was 8.9. According to Harvey (2014)[58] an SQI value of 7.5 is indicative of an 'excellent' invertebrate site whilst one approaching 10.00 is 'almost certainly of national significance.

Conclusion

A10.612 From 2020 survey data, Area 13 Former Landfill and Bamber Pit (south) combined, were found to support a large number of species of recognised conservation status in the UK. A number of these species, together with many more local and widespread species recorded from the site, are characteristic of herb-rich grassland and mosaic and OMH within the Thames Corridor area.

A10.613 At habitat level, the majority of species were distributed between the two major open-habitat assemblages, 'Tall sward and scrub' and 'Short sward and bare ground'. However, unlike a number of similar areas within the southern chain of 2020 sample sites, the stand-out assemblage for Area 13/13a at SAT-level, was F112 'Open short sward'. This SAT both exceeded its Favourable Condition threshold in Pantheon and supported a high proportion of rarities, indicated by the very high recorded SQI score of 183. This assemblage is more strongly represented in more established, short-sward and herb-rich calcareous grasslands which are managed either by grazing, or was the case for Area 13, by periodic mowing.

A10.614 In additon, three other SATs were represented sufficiently well to achieve FC status in Pantheon, whilst all three of these were resource-based SATs, the F002 'Rich flower resource' was represented by a large number of bee species, including eight species listed as being of conservation significance in Pantheon, including the s41 listed Brown-banded Carder Bee *Bombus humilis* and nationally rare Spotted Dark Bee *Stelis ornatula.* F002 is generally considered to be a poor indicator of habitat quality due to being a diffuse

[58] Harvey based his evaluation on invertebrate fauna in Essex, the Kent fauna within the Swanscombe part of the Thames corridor is comparable with this standard.

resource-based asssemblage, which is hard to relate to a specific habitat. However, a number of the species were also specialists of herb-rich grasslands, some of which are known to be monolectic[59] being associated with forage resources present on the site.

A10.615 Using a method used by Harvey (2014), described in Ball (1986) a site-level SQI score of 8.9 was calculated for the invertebrate fauna of Area 13 and 13a combined. This score is not quite as high as some of the SQIs recorded for other sites within the 2020 survey area. However, the findings of Pantheon analysis, particularly the Favourable Condition status combined with the rarity value achieved for F112 'Open Short Sward' and arguably also F001 'Rich flower resource', indicate that the site supports an invertebrate fauna of National Significance. The site supported habitat and invertebrate species and assemblages representative of the grassland and OMH resource occurring within the Thames corridor region of north Kent and the site forms part of a substantial corridor of near-contiguous habitat of a similar composition.

Area 14: Station Quarter

Centroid grid reference: TQ 61303 73598

Overall area: 14 hectares (excluding carpark).

Designations on site: None

S41 habitats present: Open mosaic habitat on previously developed land

Habitat Description

A10.616 Despite the presence of a carpark occupying around half of its overall area, Area 14 (Station Quarter) comprised a largish block of OMH/SI grassland and scrub mosaic of a similar composition as much of the habitat recorded from the near contiguous Area 15 (Station Quarter South). The site was generally flattish, with some microtopographic variation, particularly due to banks at the site's margins and some uneven terrain. Relatively well developed Yellow Meadow Ant *Lasius flavus* anthills also occurred within the grassland, also contributed to the site's microtopography. Bare ground habitat occurred mainly within the shorter sward grassland areas of the more central areas; however, there was some exposed ground on the banks an uneven ground at the southern margin of the site.

[59] A monolectic species forages for pollen from a single flower species.

A10.617 The site supported established grassland areas and more disturbed areas with typical OMH flora. The grassland was tussocky in some areas such as in mosaic with scrub to the south of the site. Coarse grasses including False Oat Grass *Arrhenatherum elatius*, Yorkshire Fog *Holcus lanatus,* Common Couch *Elytrigia repens* and Cock's-foot *Dactylis glomeratus* were abundant in these areas, which were relatively herb-poor compared with the more open grassland areas, supporting taller herbs such as Teasel *Dipsacus fullonum*, Ox-eye Daisy *Chrysanthemum leucanthemum* and Broad-leaved Dock *Rumex obtusifolius* and patches of Bramble *Rubus fruticosus* (agg) scrub. This habitat graded into more uneven OMH, with extensive stands of Goat's Rue *Galega officinalis* with Bristly Ox-tongue *Picris echioides,* Mugwort *Artemisia vulgaris* and other tall, flowering herbs.

A10.618 Shorter sward grassland (sward height 10-20cm) occupied the more open areas of the site and supported a greater range of graminoids with Smooth-stalked Meadow Grass *Poa pratensis*, Red Fescue *Festuca rubra* and Yellow Oat Grass *Trisetum flavescens* being recorded, alongside herbs including Wild Carrot *Daucus carota*, Ox-eye Daisy *Chrysanthemum leucanthemum,* Rough Hawk's-beard *Crepis biennis,* Ribwort Plantain *Plantago lanceolata,* Common Bird's-foot Trefoil *Lotus corniculatus*, Common Vetch *Vicia sativa,* Common Ragwort *Senecio jacobaea,* Creeping Thistle *Cirsium arvense,* Spear *Thistle C. vulgare*, Red Bartsia *Odontites vernus*, Yarrow *Achillea millefolium* and Dandelion *Taraxacum officinale* (agg.),

A10.619 Scrub was well-represented on the site, with continuous well-established stands along the western and northern site margins. In the south, scrub was more scattered, occurring in mosaic with grassland with some relatively mature scrub/woodland, overstanding the damper tussocky grassland habitat. Bramble scrub occurred in patches in mosaic with the grassland and OMH, with other lower-growing species including Dog Rose *Rosa canina* (agg.) and Dogwood *Cornus sanguinea,* with Hawthorn *Crataegus monogyna,* Field Maple *Acer campestre* and Wayfaring Tree *Viburnum lantana* and trees associated with damper habitat including Grey Willow *Salix cinerea*, Goat Willow *S. caprea* and naturalised White Poplar *Populus alba*.

A10.620 Connectivity: Area 14 occupies part of the habitat corridor comprising contiguous, or near contiguous sites, progressing southwards from Area 11 (Sportsground) to Area 15 (Station Quarter South). The site is separated from Area 13 Former Landfill immediately north and Area 15 (Station Quarter South) by roads only. To the north, this group of sites culminating in Areas 11 and 10 (Craylands Pit) are in close proximity to the extensive habitat resource of the Swanscombe Peninsula. Collectively these habitats support comparable grassland, scrub and OMH occupying a consistant calcareous geology.

A10.621 Substrate: Area 14: Chalk sedimentary bedrock (Lewes Nodular Chalk Formation; Seaford Chalk Formation and Newhaven Chalk Formation) with no superficial deposits. Also, Thanet Formation (sand sedimentary bedrock).

A10.622 Wetness: No standing water was recorded during the survey and the site was predominately dry; however, Grey Willow Salix cinerea was an abundant component of the lower-lying scrub habitat and there was some evidence of drainage impedence through localised clay soil.

A10.623 Structure: Area 14 was a relatively flat site with some microtopographic variation, due to banks, uneven ground and the presence of anthills. Bare ground was rather limited resource on the site, being confined to the OMH areas at the site margins and the shorter sward grassland areas. The vegetation on site was structurally diverse, with areas of short-sward and taller sward grassland in mosaic with disturbed ground OMH and scrub of various height, density and age class. Bramble scrub and other woody growth provided a potential resource for stem nesting species; however, the wood decay resource on the site was limited.

Invertebrate Survey Dates

A10.624 The site was surveyed on four occasions including: 18/05/2020; 16/06/2020; 14/07/20 and 17-18/08/20

Table EDP A10.68: Number of Samples per Substrate.

	Area 14 (SI Grassland and Scrub/OMH)	Total
Sweep	4	4
Vacuum	4	4
Beating	4	4
Pan traps	4	4

A10.625 Total number of species recorded: 246

A10.626 A comparison of the relative number of species recorded from each of the major taxons is included in the following table.

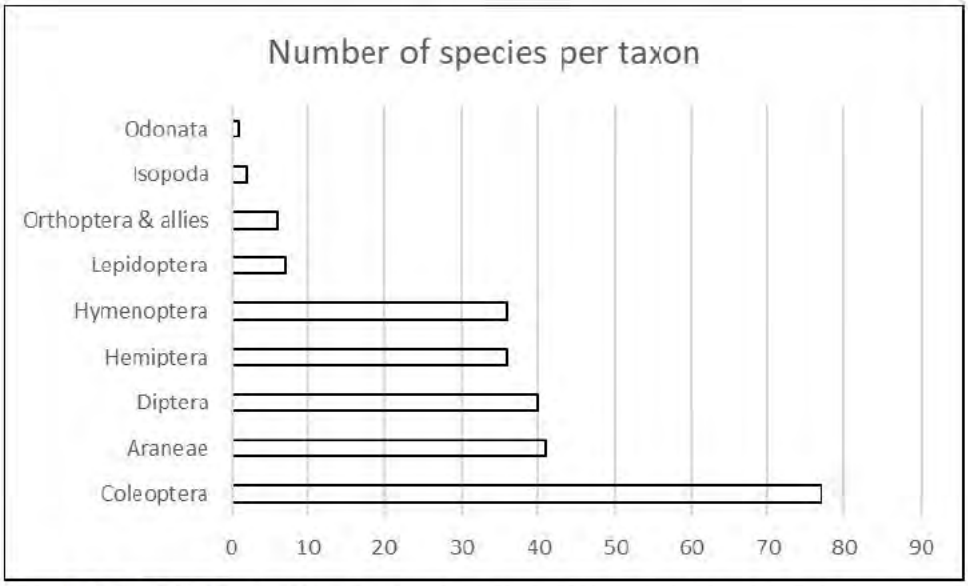

Chart EDP A10.15: A comparison of the relative number of species recorded from each of the major taxons.

Table EDP A10.69: Species of Recognised Conservation Recorded from Area 14.

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
A mirid bug	*Lygus pratensis*	Miridae	Hemiptera	RDB3 pre-1994 criteria	LC
Squat Furrow Bee	*Lasioglossum pauperatum*	Halictidae	Hymenoptera	RDB3 pre-1994 criteria	
A shining flower beetle	*Olibrus flavicornis*	Phalacridae	Coleoptera	RDBK - insufficiently known	DD
A clubionid spider	*Cheiracanthium virescens*	Clubionidae	Araneae	Nationally Scarce	LC
A linyphiid spider	*Agyneta simplicitarsis*	Linyphiidae	Araneae	Nationally Scarce	LC
A running crab spider	*Thanatus striatus*	Philodromidae	Araneae	Nationally Scarce	LC
A jumping spider	*Ballus chalybeius*	Salticidae	Araneae	Nationally Scarce	LC
A jumping spider	*Sibianor aurocinctus*	Salticidae	Araneae	Nationally Scarce	LC
A comb-footed spider	*Kochiura aulica*	Theridiidae	Araneae	Nationally Scarce	LC
Bombadier beetle	*Brachinus crepitans*	Carabidae	Coleoptera	Nationally Scarce	LC
A ground beetle	*Syntomus truncatellus*	Carabidae	Coleoptera	Nationally Scarce	LC
A leaf beetle	*Cryptocephalus hypochaeridis*	Chrysomelidae	Coleoptera	Nationally Scarce	LC
A weevil	*Polydrusus formosus*	Curculionidae	Coleoptera	Nationally Scarce	
A mordellid beetle	*Mordellistena parvula*	Mordellidae	Coleoptera	Nationally Scarce	LC
A chloropid fly	*Trachysiphonella scutellata*	Chloropidae	Diptera	Nationally Scarce	
Broad-headed Bug	*Alydus calcaratus*	Alydidae	Hemiptera	Nationally Scarce	LC
Slender-horned Leatherbug	*Ceraleptus lividus*	Coreidae	Hemiptera	Nationally Scarce	LC

Sandrunner Shieldbug	*Sciocoris cursitans*	Pentatomidae	Hemiptera	Nationally Scarce	LC
Scarce Tortiose Shieldbug	*Eurygaster maura*	Scutelleridae	Hemiptera	Nationally Scarce	LC
A mason wasp	*Odynerus melanocephalus*	Eumenidae	Hymenoptera	Nationally Scarce	
Lobe-spurred Furrow Bee	*Lasioglossum pauxillum*	Halictidae	Hymenoptera	Nationally Scarce	LC
A spider-hunting wasp	*Auplopus carbonarius*	Pompilidae	Hymenoptera	Nationally Scarce	LC
A spider-hunting wasp	*Priocnemis confusor*	Pompilidae	Hymenoptera	Nationally Scarce	
A flesh fly	*Blaesoxipha plumicornis*	Sarcophagidae	Diptera	pNationally Scarce	
A weevil	*Microplontus campestris*	Curculionidae	Coleoptera	[Nationally Scarce B]	
Brown-banded Carder Bee	*Bombus humilis*	Apidae	Hymenoptera	S41 Priority species	

A10.627 SQI score for Area 14: 8.4

Pantheon Output Tables for Area 14

Table EDP A10.70: Habitats & resources: broad biotopes

Broad biotopei	No. of species	% representation	SQI	Conservation statusi	Species with conservation status
open habitatsi	167	4	132	12 NSi; 1 Nbi; 1 RDB 3i; 1 [Nb]; 2 Section 41 Priority Species; 2 [Na]; 2 [RDB 3]; 1 pNS; 1 pNT	21
tree-associatedi	30	<1	143	2 NSi; 1 DDi; 1 [Na]; 1 Nbi	4
wetlandi	9	<1	100		
coastali	1	<1	100		

Table EDP A10.71: Habitats & resources: habitats

Broad biotopei	Habitati	No. of species	% representation	Conservation statusi	SQI	Species with conservation status
open habitatsi	tall sward & scrubi	115	4	1 Section 41 Priority Species; 3 NSi; 1 RDB 3i; 1 pNS; 1 pNT	111	6
open habitatsi	short sward & bare groundi	48	4	1 RDB 3i; 8 NSi; 2 [Na]; 1 [RDB 3]; 1 [Nb]; 1 Nbi; 1 Section 41 Priority Species	181	14
tree-associatedi	arborealı	18	1	1 [Na]; 1 NSi	133	2
tree-associatedi	shaded woodland	7	<1	1 Nbi		1

Broad biotopei	Habitati	No. of species	% representation	Conservation statusi	SQI	Species with conservation status
	floori				160	
tree-associatedi	decaying woodi	5	<1	1 NSi; 1 DDi	160	1
wetlandi	marshlandi	5	<1		100	
wetlandi	peatlandi	4	<1		100	
wetlandi	running wateri	2	<1		100	
open habitatsi	uplandi	1	<1		100	
coastali	saltmarshi	1	<1		100	

Table EDP A10.72: Habitats & resources: ISIS specific assemblage types

Broad biotopei	Habitati	SAT	No. of species	% representation	SQI	Conservation statusi	Species with conservation status	Code	Reported conditioni
open habitatsi		rich flower resourcei	21	9	114	1 Section 41 Priority Species; 1 [Na]; 1 [RDB 3]; 1 RDB 3i	4	F002	Favourable
open habitatsi	short sward & bare groundi	bare sand & chalki	11	2	236	4 NSi	4	F111	Unfavourable (11 of 19 species)
open habitatsi	short sward & bare groundi	open short swardi	8	4	213	3 NSi	3	F112	Unfavourable (8 of 13 species)
open habitatsi		scrub edgei	8	4	100			F001	Unfavourable (8 of 11 species)
open habitatsi		scrub-heath & moorlandi	5	1	160	1 [RDB 3]; 1 NSi	2	F003	Unfavourable (5 of 9 species)
tree-associatedi	decaying woodi	bark & sapwood decayi	3	<1	10			A212	Unfavourable (3 of 19

Broad biotopei	Habitati	SAT	No. of species	% representation	SQI	Conservation statusi	Species with conservation status	Code	Reported conditioni
					0				species)
coastali	saltmarshi	saltmarsh & transitional brackish marshi	1	<1	100			M311	Unfavourable (1 of 9 species)
tree-associatedi	decaying woodi	heartwood decayi	1	<1	100			A211	Unfavourable (1 of 6 species)

Site-specific Limitations

A10.628 Area 14, was subject to the following sampling limitations/constraints:

- At the time of writing, some diptera records of the site were unavailable. The absence of these records may influence the Pantheon and SQI output.

Discussion/Evaluation - Area 14

A10.629 Area 14 Station Quarter supported dry grassland and scrub mosaic habitat over a calcareous substrate which has been previously subject to human intervention. The site was of generally flat topography, but the ground was uneven, due in part to historic intervention, including landforming activities. The ecological position of Area 14 being more or less contiguous to both Area 13 in the north and Area 15 to the south, increases the value of the site as part of a habitat corridor and the structure and floristic composition of the site was consistent with that supported by other grassland and scrub/OMH habitats both within the survey area and elsewhere within the Thames corridor. These habitats collectively and individually support OMH and calcareous associated invertebrate assemblages of high conservation value.

A10.630 During the 2020 survey a total of 246 species were recorded from Area 14, of which 26 species are of recognised conservation status in the UK. These included two species classed as a 'Species of principal importance' under section 41 of the NERC Act (2006), two species classed as Nationally Rare (RDB3) based on pre-1994 criteria, one species classed as 'Insufficiently known' RBDK and 21 species currently classed as Nationally Scarce in the UK.

A10.631 The two s41 species recorded from Area 14 included the Black-headed Mason Wasp *Odynerus melanogaster*, a nationally scarce species which stocks its nest with the larvae of weevils of the genus *Hypera* and Brown-banded Carder Bee *Bombus humilis,* a flagship species of OMH and herb-rich Thames terrace grasslands in the Thames corridor. Of the RDB3 species, only one the Squat Furrow Bee *Lasioglossum pauperatum,* can still be considered a genuine rarity; the other species a mirid bug *Lygus pratensis* has massively increased its UK range in recent years, but still awaits status revision.

A10.632 From Pantheon analysis undertaken for Area 14, the vast majority of species (167) were attributed to 'Open habitats' on a broad biotope level, whilst 30 species were ascribed to the 'Tree associated' assemblage, nine to 'Wetland' and one to the 'Coastal' assemblage. This broad-biotope deployment accurately reflected the habitats present on site and level of targeted sampling.

A10.633 At a habitat level, 115 species were attributed to the 'Tall sward and scrub' assemblage, with 48 species being attributed to the 'Short sward and bare ground' assemblage. This proportional deployment, is commonly recorded from Pantheon analysis of grassland and scrub mosaic sites. In terms of representation, these two assemblages were represented by four percent apiece, this reflects the larger overall number of species attributed to the 'Tall sward and scrub' assemblage, the national species pool,[60] within the Pantheon database compared to the species pool for 'Short sward and bare ground'

A10.634 More than twice the number of species were attributed to 'Tall sward and scrub' in Pantheon, as were attributed to 'Short sward and bare ground'. However, an SQI score of 181 was recorded for the latter assemblage, this being considerably higher than the score of 111 recorded for 'Tall sward and scrub'.

A10.635 This reflected the much greater number of species of recognised conservation status attributed to the 'Short sward and bare ground' than for 'Tall sward and scrub'. In total 14 rarities were attributed to 'Short sward and bare ground', compared with six for 'Tall sward and scrub'.

A10.636 Species of recognised conservation status attributed at habitat-level to the 'Short sward and bare ground' assemblage, but not at SAT level included the s41 Black-headed Mason Wasp *Odynerus melanogaster, the* RDB3 Squat Furrow Bee *Lasioglossum pauperatum* and nationally scarce species including a spider-hunting wasp *Priocnemis confusor*, the Slender-horned Leatherbug *Ceraleptus lividus* and a ceutorhynchine weevil *Microplontus campestris.*

[60] The total number of species attributed to a given assemblage in the Pantheon database – there are proportionally more Tall sward and scrub species than Short sward and bare ground species listed in the Pantheon database

A10.637 For Area 14, one Specific Assemblage Type (SAT) achieved a species score exceeding its respective Favourable Condition (FC) target in Pantheon, this was the F002 'Rich flower resource', a resource-based SAT comprising entirely of bee species. This assemblage was attributed with 21 species in total, therefore achieving a score well in excess of its corresponding FC threshold score of 14 set in Pantheon. F002 is a 'resource-based' SAT, rather than being tangibly attributed to a particular habitat, it is a representation of the importance of the flower-resouce of a site for species such as bees and therefore, is of less value in assessing conservation significance than more tangible, habitat-based SATs.

A10.638 However, bees attributed to the SAT included the s41 Brown-banded Carder Bee, RDB3 Squat Furrow Bee and Lobe-spurred Furrow Bee *Lasioglossum pauxillum*, which is currently nationally scarce, but is likely to be downgraded due to status revision.

A10.639 SATs arguably of greater significance for site assessment of Area 14, included F111 'Bare sand and chalk' and F112 'Open short sward', both nested within the habitat-level 'Short sward and bare ground' assemblage. Whilst neither of these assemblages was sufficiently well attributed to attain FC status, these assemblages were both attributed with several rare and uncommon species representative of the OMH herb-rich calcareous grassland habitats within the Swanscombe survey area as a whole.

A10.640 Nationally scarce species attributed to the F111 assemblage included a jumping spider *Sibianor aurocinctus* and *Synageles venator* and a clubionid spider *Cheiracanthium virescens*, as well as Bombardier Beetle Brachinus crepitans - a the strong calcicole and an alydid bug *Alydus calcaratus.*

A10.641 Whilst for the closely allied, but somewhat less well attributed, F112 ' Open short sward' SAT, three nationally scarce species, including a pot beetle *Cryptocephalus hypochaeridis* and heteropteran bugs including the Sandrunner Shieldbug Sciocoris *cursitans* and the Scarce Tortoise Shieldbug *Eurygaster maura.* Like the species attributed to F111, these species are all highly characteristic of OMH and herb-rich grassland habitat within the Thames corridor, but are generally rare in the UK as a whole.

A10.642 Although the 'Tall sward and scrub' habitat-level assemblage did not score highly in terms of SQI score, this assemblage was attributed with six species of recognised conservation status. Also this assemblage is worthy of discussion due to the large number of species attributed to it and because it has no directly nested SATs (although both the F001 'Scrub edge' and F003 'Scrub heath and moorland' resource-based SATs could be said share some affinity with this assemblage at SAT level).

A10.643 The previuosly mentioned, s41 Brown-banded Carder Bee was attributed to 'Tall sward and scrub' together with nationally scarce species including a linyphiid spider *Agyneta simplicitarsis* (listed as *Meioneta simplicitarsis* in Pantheon), which is mainly found in calcareous grassland near the coast; a philodromid spider *Thanatus striatus,* which occurs at the bases of grassy tussocks in drier, often coastal grassland and OMH; a ground beetle *Syntomus truncatellus,* which according to Duff (2012) occurs 'In litter in dry grassland in open areas'; and *Blaesoxipha plumicornis* a flesh fly which is listed both in the nationally scarce and 'Near Threatened' categories. This species is also associated with calcareous grasslands, where the larvae parasitise common species of grasshopper (Acrididae) and the adults nectar on flowers including Wild Carrot *Daucus carota.*

A10.644 Of the less well represented assemblages, the 'Arboreal' habitat-level assemblage, with 18 attributed species, is worthy of note and reflected the importance of scrub/woodland habitat within the survey area. Uncommon species attributed to this assemblage included a jumping spider *Ballus chalybeius*, which is nationally scarce, but is particularly well represented within the Thames corridor brownfield sites. *Polydrusus formosus,* an arboreal species of leaf weevil, which is now much commoner nationally than its nationally scarce status implies was also attributed to the 'Arboreal' assemblage.

A10.645 Associated with woodland and scrub habitats, a nationally scarce spider-huting wasp *Auplopus carbonarius,* was attributed to the 'Shaded woodland floor' assemblage at habitat-level and a single long-legged fly species *Medetera dendrobaena*, which is associated with wood decay habitat, was also recorded for Area 14. Another nationally scarce species recorded from the site, which is associated with scrub habitats was a comb-footed spider *Kochiura aulica.* This species was also recorded from several other sites in the 2020 survey area.

A10.646 The non-Pantheon SQI score recorded for Area 14 Craylands Pit was 8.4. According to Harvey (2014)[61] an SQI value of 7.5 is indicative of an 'excellent' invertebrate site (in the Essex region) one approaching 10.00 is 'almost certainly of national significance.'

Conclusion

A10.647 From 2020 survey data, Area 14 Station Quarter was found to support a reasonably large number of species of recognised conservation status in the UK. A number of these species, together with many more local and widespread

[61] Harvey based his evaluation on invertebrate fauna in Essex, the Kent fauna within the Swanscombe part of the Thames corridor is comparable with this standard.

species recorded from the site, are characteristic of herb-rich grassland and mosaic and OMH within the Thames Corridor area.

A10.648 From Pantheon analysis, although FC status was achieved only by the F002 'Rich flower resource' for this site; the best represented of the more tangible habitat-specific SATs including F111 'Bare sand and chalk' and F112 'Open short sward' strongly reflected the herb-rich and OMH assemblages expected from a site such as Area 14.

A10.649 Arguably, however, the value of the habitat is better expressed at the overarching habitat-level. The 'Short sward and bare ground' habitat-level assemblage in which the F111 and F112 are nested, was both robustly represented in the Pantheon output and recorded a SQI score of 181, which is indicative of very high conservation value at this level. This assemblage was attributed with 14 species of recognised conservation status including the s41 priority species Black-headed Mason Wasp *Odynerus melanogaster*, amongst others.

A10.650 Whilst the 'Short sward and bare ground' assemblage and its constituant species, can be seen as the head-line feature of Area 14, both 'Tall sward and scrub' at habitat-level and the collective 'Tree associated' assemblages also supported several species of recognised conservation value and s41 Brown-banded Carder Bee *Bombus humilis* attributed to both 'Tall herb and scrub' and F002 'Rich flower resource' was also recorded from the site.

A10.651 Using a method used by Harvey (2014), described in Ball (1986) a site-level SQI score of 8.4 was calculated for the invertebrate fauna of the site as a whole. Considering the representativeness, size and ecological position of Area 14 Station Quarter and its associated habitat and invertebrate fauna, coupled with findings of the 2020 Pantheon analysis and independent SQI score, the site can be said to support an invertebrate fauna approaching, but not achieving National Importance. As such can be considered to support an invertebrate assemblage of Regional Importance.

Area 15: Station Quarter South

Centroid grid reference: TQ 61493 73078

Overall area: 25 Hectares

Designations on site: None

S41 habitats present: Open mosaic habitat on previously developed land; Reed swamp

Habitat Description

A10.652 The western and to central area of Area 15 supported an extensive area of predominately dry grassland and scrub mosaic/OMH. Whilst this area was generally flattish, there was a gentle downslope gradient to lower lying wetland habitat, which followed the site's eastern boundary. The habitat in this area was largely wooded and followed the course of the Ebbsfleet River (D35), which is better described as a stream at this point; although the adjacent wet woodland and reedswamp habitat in this zone were evidently subject to periods of seasonal inundation. Towards the northeast corner of the site were two moderately large ponds (P17 and P18); P17 being unfenced and subject to seasonal drying; P18 was a more formal, permanent pond with a marginal zone of Common Reed *Phragmites australis* and other macrophytes.

A10.653 The drier grassland and scrub mosaic areas in the west to central areas of the site, were frequently subject to heavy rabbit grazing, with extensive areas with a very short sward (c2cm in height), with frequent sandy bare ground patches due to rabbit activity. However, scrub was also strongly represented in these areas, with dominant scrub species including Hawthorn *Crataegus monogyna,* Bramble *Rubus fruticosus* (agg.) and Dogwood *Cornus sanguinea* alongside Dog Rose *Rosa canina* (agg.) Goat Willow *Salix caprea* and Grey Willow *S. cinerea*, Wayfaring Tree *Viburnum lantana* and young Pedunculate Oak *Quercus robur.* Old Man's Beard *Clematis vitalba,* was also a frequent component of the scrub in the drier parts of the site.

A10.654 Tall-herb stands often occurred at scrub edges and also in localised stands within the open areas of the site. These comprised tall herbs such as Goat's Rue *Galega officinalis,* Common Nettle *Urtica dioica,* Teasel *Dipsacus fullonum,* Bristly Ox-tongue *Picris echioides*, Wild Carrot *Daucus carota,* Wild Parsnip *Pastinaca sativa,* Rough Hawk's-beard *Crepis biennis,* Mugwort *Artemisia vulgaris* and Creeping Thistle *Cirsium arvense* and graminoids including False Oat Grass Arrhenatherum elatius and Cock's-foot *Dactylis glomerata.*

A10.655 The open areas of short, rabbit grazed grassland varied somewhat over the site. Recorded speciess included graminoids including Yorkshire *Fog Holcus lanatus*, bent grasses *Agrostis* spp. and Red Fescue *Festuca rubra;* with herbs including *Creeping* Cinquefoil *Potentilla reptans*, Ground Ivy *Glechoma hederacea*, Ribwort Plantain *Plantago lanceolata*, Spotted Medick *Medicago arabica*, forget-me-nots *Myosotis* spp., Red Bartsia *Odontites vernus*, Common Ragwort *Senecio jacobaea*, Hoary Ragwort *S. erucifolius*, Wild Strawberry *Fragaria vesca,* Dandelion *Taraxacum officinale* (agg.), Narrow-leaved Bird's-

foot Trefoil *Lotus tenuis,* White Clover *Trifolium repens*, Red Clover *T. pratense*, Common Centaury *Centaurium erythraea,* Yellow-wort *Blackstonia perfoliata* and Pyramidal Orchid *Anacamptis pyramidalis.* The latter two species being strongly associated with calcareous soils.

A10.656 The more-heavily wooded slope bottom following the eastern margin of the site, was often heavily shaded following the path of the River Ebbsfleet (D35), this area supported some mature wet woodland with trees including Crack Willow *Salix fragilis,* with lower Grey Willow *S. cinerea* and other standards including Ash *Fraxinus excelsior* and Pedunculate Oak *Quercus robur* occurring in drier areas. The River Ebbsfleet was generally no more than two metres wide, although there was sometimes wider areas of very shallow flow over shallow substrates and through areas vegetated with lush macrophyte vegetation comprising Fool's Watercress *Apium nodiflorum* and Branched Bur-reed *Sparganium erectum.* There was an evident resource of wood decay habitat including some saturated dead wood suitable for supporting larval stages of specialist diptera, amongst other shade tolerant wetland invertebrates.

A10.657 Within a more open area on the site's eastern boundary was a Common Reed *Phragmites australis* reedswamp (TQ 61562 73116), which supported additional macrophytes including Yellow Iris *Iris pseudacorus* and Greater Reedmace *Typha latifolia* as well as having in stand Grey Willow *Salix cinerea* scrub.

A10.658 Of the two largish ponds at the site's northeast corner, Pond 17 appeared to be of greater conservation interest for invertebrates. During May, the open water element of Pond 17 was extensive; however, by July, the pond had completely dried out following prolonged periods of dry weather. The pond was generally shallow and supported gradually sloping margins, with non-aquatic wet mud habitat of value for hygrophilous invertebrates such as ground beetles and rove beetles, as well as other species. The pond supported stands of marginal vegetation including Common Reed and Greater Reedmace, with floating mats of Creeping Bent Agrostis stolonifera being evident early in the season as well as a sweet-grass *Glyceria* sp. and other macrophytes including Amphibious Bistort *Persicaria amphibia* and Curled Dock Rumex crispus. The margins of the pond also supported Grey Willow scrub.

A10.659 Connectivity: Area 15 constituted the southernmost site within the habitat corridor comprising contiguous, or near contiguous sites, progressing southwards from Area 11 (Sportsground). The site is separated from Area 14 (Station Quarter) by a road crossing. To the north, this group of sites culminating in Areas 11 and 10 (Craylands Pit) are in close proximity to the extensive habitat resource of the Swanscombe Peninsula. Collectively these habitats support comparable OMH, grassland, scrub and wetland habitat occupying a consistant calcareous geology.

A10.660 Substrate: Area 15: To west of site: Chalk sedimentary bedrock (Lewes Nodular Chalk Formation; Seaford Chalk Formation and Newhaven Chalk Formation) with no superficial deposits; wetter eastern side of site with Head clay, silt, sand and gravel sediments and southern area with a narrow band of Thanet formation sand sedimentary bedrock.

A10.661 Wetness: Area 15 supported dry, free draining grassland and OMH habitat with localised damper areas subject to drainage impedence, evident through the site's flora. However, more extensive wetland associated with the River Ebbsfleet occurred at the slope bottom throughout the north to south axis of the site's eastern margin. This habitat including the wet woodland, reedswamp and ponds in the site's southeast corner added significant hydrological variation to the site. The areas adjoining the River Ebbsfleet are likely to become flooded during the winter months, inudating the immediate habitat in this area. The variety of wetland habitat on site and juxtaposition with drier habitats, provided habitat of high potential for a variety of specialist and generalist invertebrates.

A10.662 Structure: The ground throughout Area 15 was generally uneven within a flattish to slightly sloping prevailing topography. Disturbance through rabbit activity increased the structural diversity of the site and there were also anthills created by Yellow Meadow Ant *Lasius flavus*. The vegetation structure was diverse, with areas of bare ground exposures, short sward grassland, taller grassland, tall herb vegetation in mosaic with varying aged scrub and wet woodland. There were extensive resources of bare ground for ground nesting aculeates and an associated flowering resource, habitat for reed and stem-nesting species and niches for a range of wetland and wet woodland invertebrates as well as an evident wood decay resource.

Invertebrate Survey Dates:

- Terrestrial surveys were conducted at Area 15 on the following dates: 18/05/2020; 16/06/2020; 14/07/2020 and 17-18/08/20; and

- Aquatic surveys were conducted on the following dates: 2/06/2020 and 10/08/2020.

Table EDP A10.73: Number of Samples per Substrate.

	Area 12 – Grassland and Scrub/OMH	Area 15 - Wetland	Total
Sweep	4		4
Vacuum	4		4
Beating	2	2	4

Pan traps (cluster of 10)	4	4	8
Aquatic (3 minute sweep)		3	3

A10.663 Total number of species recorded:

- Combined terrestrial and aquatic sample data = 380;
- Terrestrial data only = 356[62]; and
- Aquatic data only = 24[63].

A10.664 A comparison of the relative number of species recorded from each of the major taxons is included in the following graph (includes species collected using both terrestrial and aquatic sampling methods).

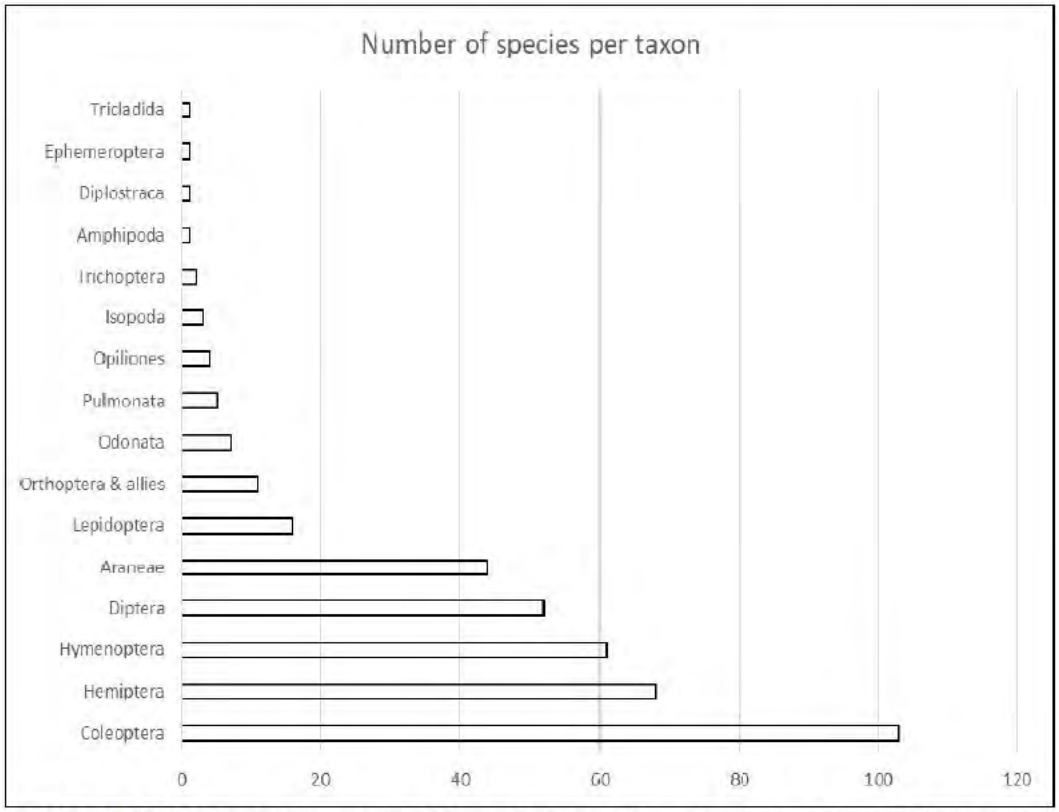

Chart EDP A10.16: A comparison of the relative number of species recorded from each of the major taxons.

Table EDP A10.74: Species of Recognised Conservation Status Recorded from Area 15.

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status

62 Note: Terrestrial and aquatic data may not add up to the combined figure, as there may be overlap between species recorded both in terrestrial and aquatic samples

63 Species list small, as many of the contributing species were not recorded to species-level and therefore, not used for conservation evaluation; also only one sample was collected from Area 12

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
Five-banded Weevil-wasp	*Cerceris quinquefasciata*	Crabronidae	Hymenoptera	Section 41 priority species; RDB3 (pre-1994 criteria)	
Beewolf	*Philanthus triangulum*	Crabronidae	Hymenoptera	RDB2 'vulnerable' pre-1994 criteria	LC
A tachinid fly	*Gymnosoma rotundatum*	Tachinidae	Diptera	RDB3 'rare' pre-1994 criteria	
A mirid bug	*Lygus pratensis*	Miridae	Hemiptera	RDB3 'rare' pre-1994 criteria	LC
Bryony Mining Bee	*Andrena florea*	Andrenidae	Hymenoptera	RDB3 'rare' pre-1994 criteria	
A ruby-tailed wasp	*Hedychrum niemelai*	Chrysididae	Hymenoptera	RDB3 'rare' pre-1994 criteria	
Squat Furrow Bee	*Lasioglossum pauperatum*	Halictidae	Hymenoptera	RDB3 'rare' pre-1994 criteria	
Spotted Dark Bee	*Stelis ornatula*	Megachilidae	Hymenoptera	RDB3 'rare' pre-1994 criteria	
A shining flower beetle	*Olibrus flavicornis*	Phalacridae	Coleoptera	Red Data Book-insufficiently known	DD
Large-headed Resin Bee	*Heriades truncorum*	Megachilidae	Hymenoptera	RDBK 'insufficiently known' pre-1994 criteria)	
A pirate spider	*Ero aphana*	Mimetidae	Araneae	Nationally Scarce	LC
A jumping spider	*Ballus chalybeius*	Salticidae	Araneae	Nationally Scarce	LC
A jumping spider	*Sibianor aurocinctus*	Salticidae	Araneae	Nationally Scarce	LC
A comb-footed spider	*Kochiura aulica*	Theridiidae	Araneae	Nationally Scarce	LC
Ground-ivy Jewel Beetle	*Trachys scrobiculatus*	Buprestidae	Coleoptera	Nationally Scarce	LC
A flea beetle	*Chaetocnema confusa*	Chrysomelidae	Coleoptera	Nationally Scarce	LC
A leaf beetle	*Cryptocephalus hypochaeridis*	Chrysomelidae	Coleoptera	Nationally Scarce	LC
A weevil	*Magdalis barbicornis*	Curculionidae	Coleoptera	Nationally Scarce	
A weevil	*Polydrusus formosus*	Curculionidae	Coleoptera	Nationally Scarce	
A weevil	*Zacladus exiguus*	Curculionidae	Coleoptera	Nationally Scarce	LC
A diving beetle	*Agabus conspersus*	Dytiscidae	Coleoptera	Nationally Scarce	LC
A rove beetle	*Lomechusa emarginata*	Staphylinidae	Coleoptera	Nationally Scarce	
Lesne's Earwig	*Forficula lesnei*	Forficulidae	Dermaptera	Nationally Scarce	LC
A chloropid fly	*Trachysiphonella scutellata*	Chloropidae	Diptera	Nationally Scarce	
A stilt bug	*Berytinus hirticornis*	Berytidae	Hemiptera	Nationally Scarce	LC
A ground bug	*Drymus latus*	Lygaeidae	Hemiptera	Nationally Scarce	

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
Lobe-spurred Furrow Bee	*Lasioglossum pauxillum*	Halictidae	Hymenoptera	Nationally Scarce	LC
Swollen-thighed Blood Bee	*Sphecodes crassus*	Halictidae	Hymenoptera	Nationally Scarce	LC
Pantaloon Bee	*Dasypoda hirtipes*	Melittidae	Hymenoptera	Nationally Scarce	LC
A spider-hunting wasp	*Priocnemis confusor*	Pompilidae	Hymenoptera	Nationally Scarce	
A muscid fly	*Coenosia atra*	Muscidae	Diptera	Provisionally Nationally Scarce	
A flesh fly	*Blaesoxipha plumicornis*	Sarcophagidae	Diptera	Provisionally Nationally Scarce	
Small Heath	*Coenonympha pamphilus*	Nymphalidae	Lepidoptera	S41 Priority species	NT
Cinnabar	*Tyria jacobaeae*	Erebidae	Lepidoptera	S41 research only	LC

A10.665 SQI score for Area 15:

- Combined terrestrial and aquatic sample data = 8.2 (367 contributing species); and
- Terrestrial data only = 8.6 (345 contributing species).

Pantheon Output Tables for Area 15

Table EDP A10.75: Habitats & resources: broad biotopes

Broad biotopei	No. of species	% representation	SQI	Conservation statusi	Species with conservation status
open habitatsi	246	6	128	1 [RDB K]; 5 Nbi; 5 NSi; 1 Notablei; 3 [Nb]; 2 RDB 3i; 6 [RDB 3]; 1 Section 41 Priority Species - research only; 2 pNS; 1 [RDB 2]; 1 [Na]; 2 Section 41 Priority Species; 1 NTi; 1 pNT	28
tree-associatedi	50	1	132	2 NSi; 1 [NS]; 2 [Na]; 1 [RDB K]; 1 DDi	6
wetlandi	30	1	136	1 NSi; 1 pNS	2
coastali	3	<1	250	1 NSi	1

Table EDP A10.76: Habitats & resources: habitats

Broad biotopei	Habitati	No. of species	% representation	Conservation statusi	SQI	Species with conservation status
open habitatsi	tall sward & scrubi	162	6	2 NSi; 1 Notablei; 2 Nbi; 1 [RDB 3]; 1 pNS; 1 pNT; 1 RDB 3i; 1 Section 41 Priority Species - research only	113	9

Broad biotopei	Habitati	No. of species	% representation	Conservation statusi	SQI	Species with conservation status
open habitatsi	short sward & bare groundi	73	6	1 RDB 3i; 4 [RDB 3]; 3 [Nb]; 2 Section 41 Priority Species; 2 NSi; 1 NTi; 1 [Na]; 3 Nbi; 1 [RDB 2]	142	15
tree-associatedi	arborealı	32	2	1 NSi; 1 [Na]	120	2
wetlandi	marshlandi	21	3		125	
tree-associatedi	decaying woodi	11	<1	1 DDi; 1 NSi; 1 [Na]; 1 [RDB K]	182	3
tree-associatedi	shaded woodland floori	7	<1		100	
wetlandi	peatlandi	6	<1	1 NSi	150	1
wetlandi	running waterı	5	<1		100	
coastali	saltmarshi	2	<1	1 NSi	250	1
wetlandi	lakei	1	<1		100	
coastali	brackish pools & ditchesi	1	<1	1 NSi	400	1
coastali	saline lagooni	1	3	1 NSi	400	1

Table EDP A10.77: Habitats & resources: ISIS specific assemblage types

Broad biotopei	Habitati	SAT	No. of species	% representation	SQI	Conservation statusi	Species with conservation status	Code	Reported conditioni
open habitatsi		rich flower resourcei	37	15	132	2 [Nb]; 1 [RDB K]; 3 [RDB 3]; 1 [Na]; 1 RDB 3i	8	F002	Favourable
open habitatsi		scrub edgei	17	7	118	1 [RDB 3]	1	F001	Favourable
open habitatsi	short sward & bare groundi	open short swardi	13	6	123	1 Section 41 Priority Species; 1 NSi; 1 NTi	2	F112	Favourable

Broad biotopei	Habitati	SAT	No. of species	% representation	SQI	Conservation statusi	Species with conservation status	Code	Reported conditioni
open habitatsi	short sward & bare groundi	bare sand & chalki	10	2	190	1 [Nb]; 1 Section 41 Priority Species; 1 [RDB 3]; 1 NSi	3	F111	Unfavourable (10 of 19 species)
tree-associatedi	decaying woodi	bark & sapwood decayi	8	2	175	1 [RDB K]; 1 [Na]	2	A212	Unfavourable (8 of 19 species)
open habitatsi		scrub-heath & moorlandi	5	1	220	2 NSi; 1 [RDB 3]	3	F003	Unfavourable (5 of 9 species)
tree-associatedi	decaying woodi	epiphyte faunai	1	5	100			A215	Unfavourable (1 of 3 species)
coastali	saltmarshi	saltmarsh & transitional brackish marshi	1	<1	100			M311	Unfavourable (1 of 9 species)
wetlandi	marshlandi	open water on disturbed mineral sedimentsi	1	2	100			W211	Unfavourable (1 of 6 species)

Site-specific Limitations

A10.666 Area 15 was subject to the following sampling limitations/constraints:

- At the time of writing some diptera records of the site may be unavailable due to identification not having been completed; and
- The pond P17 was only sampled during June as it had dried out entirely by the August survey event.

Discussion/Evaluation - Area 15

A10.667 Area 15 Station Quarter South was a large site, supporting, for the greater part a, mixture of dry grassland and scrub/OMH but with a gently sloping topography culminating in a mosaic of valley-bottom wetland habitat following

the path of the River Ebbsfleet (this being more of a stream). The wetland habitat comprised areas of open water including ponds P17 and P18, reedswamp and wet woodland/carr habitat. Much of the upper habitat was rabbit-grazed, providing extensive areas of very short sward and bare ground habitat in mosaic with scrub and tall herb vegetation. Overall, whilst the sward was locally herb-rich, it was arguably not as diverse as some of the other sites within the wider 2020 survey area, Area 10 and 13 for example.

A10.668 From the 2020 survey, a total of 379 species were recorded from Area 15, of which 34 species are of recognised conservation status in the UK. These included three species classed as 'Species of principal importance' under section 41 of the NERC Act (2006), one species classed as Nationally Vulnerable (RDB2) based on pre-1994 criteria, seven species classed as Nationally Rare (RDB3) based on pre-1994 criteria, two species classed as 'Insufficiently known' RBDK and 22 species currently classed as Nationally Scarce in the UK (includes proposed Nationally Scarce species).

A10.669 S41 species of particular note included Five-banded Weevil Wasp *Cerceris quinquefasciata* which is considered to be a flagship species of OMH and herb-rich Thames terrace grasslands in the Thames corridor. Five-banded Weevil Wasp is also classed as nationally rare in the UK. Both of the other s41 species recorded from Area 15, were much commoner species including Small Heath *Coenonympha pamphilus*, which is also classed 'Near Threatened' based on post-2001 IUCN criteria and the Cinnabar *Tyria jacobaea*, a common, but declining, day flying moth associated with ragworts *Senecio* spp. on brownfield sites.

A10.670 From Pantheon analysis undertaken for Area 15, the vast majority of species (246) were attributed to 'Open habitats' on a broad biotope level, whilst 50 species were ascribed to the 'Tree associated' assemblage and 30 to the 'Wetland' assemblage. A somewhat greater count may have been expected for the 'wetland' assemblage at this level, due to aquatic, as well as terrestrial sampling having been undertaken on this site.

A10.671 Otherwise, the broad-biotope deployment can be seen as accurately reflecting the habitats present on site and level of targeted sampling. Three species were also attributed to the 'Coastal' biotope assemblage. One of the attributed species was a nationally scarce diving beetle *Agabus conspersus,* recorded from the ephemeral pond (P17). According to Foster and Friday (2009), *A. conspersus* is 'largely confined to brackish water, usually amongst sparse vegetation in coastal lagoons and ditches'.

A10.672 In terms of species of recognised conservation value, at a biotope level, 28 of the species were deployed at 'Open-habitat' level, with comparatively few being

attributed to the remain assemblages. Of these six species of recognised conservation value were attributed to the 'Tree-associated' assemblage, two to 'Wetland' and one species, the previously mentioned *A. conspersus,* to the 'Coastal' assemblage at biotope level.

A10.673 At a habitat level, 162 species were attributed to the 'Tall sward and scrub' assemblage, with 73 species being attributed to the 'Short sward and bare ground' assemblage. This being a fairly typical species deployment for grassland and scrub mosaic and OMH sites.

A10.674 Despite the higher species deployment for 'Tall sward and scrub', a SQI score of 142 was recorded for 'Short sward and bare ground', this being somewhat higher than the score of 113 recorded for 'Tall sward and scrub'. (However, this discrepency was much smaller than for some other sites within the survey).

A10.675 This reflected the greater number of species of recognised conservation status attributed to the 'Short sward and bare ground' than for 'Tall sward and scrub'. In total 15 rarities were attributed to 'Short sward and bare ground', compared with nine for 'Tall sward and scrub'.

A10.676 Due to the large number of relatively common and widespread grassland species recruited to 'Tall sward and scrub', the conservation value is often diluted in terms of SQI score. However, species of conservation significance attributed to this assemblage for Area 15 included the very rare RDB3 listed Spotted Dark Bee *Stelis ornatula, Blaesoxipha plumicornis*, a flesh fly listed both in the nationally scarce and 'Near Threatened' categories and five nationally scarce species, including the a Pirate Spider *Ero aphana*, the Ground Ivy Jewel Beetle *Trachys scrobiculatus*, Bloody Crane's-bill Weevil *Zacladus exiguus*, a rove beetle *Lomechusa emarginata* and a ground bug *Drymus latus*. The s41 'research only' Cinnabar *Tyria jacobaea* was also attributed to 'Tall sward and scrub for Area 15.

A10.677 Three SATs supporting sufficient species to exceed their respective FC targets were recorded for Area 15. These included habitat-based assemblage F112 'Open short sward' and two resource-based assemblages including F002 'Rich flower resource' and F001 'Scrub edge'.

A10.678 Whilst the F112 'Open short sward' achieved Favourable Condition status, only two species of recognised conservation significance were attributed at this level. Furthermore, only one of these, a pot beetle *Cryptocephalus hypochaeridis,* was amongst the most frequently recorded nationally scarce species, whilst the other was the relatively common but s41 listed Small Heath *Coenonympha pamphilus.*

A10.679 For Area 15 the the closely allied F111 'Bare sand and chalk' SAT, was represented by 10 species, falling some way short of its Pantheon FC threshold of 19. However, as was found within other sites within the survey area, the output for this assemblage included species of recognised conservation status. The F111 assemblage is more typical of early successional habitats, rather than established grasslands, where there is a higher proportion of bare ground and disturbance habitat.

A10.680 The three species of conservation concern listed for F111 included the s41 and RDB3 Five-banded Weevil Wasp *Cerceris quinquefasciata,* and two nationally scarce species including a jumping spider *Sibianor aurocinctus* and the Pantaloon Bee *Dasypoda hirtipes.* Whilst the prevously mentioned F112 'Open short sward' SAT achieved FC status from its recorded assemblage, The F111 'Bare sand and chalk' supported species of greater rarity value.

A10.681 Overall for Area 15, the recruitment of rarities to F111 and F112 was rather lower than for some of the other sites within the survey area. However, at habitat-level, the 'Short sward and bare ground' assemblage within which F111 and F112 are nested, was attributed with 15 species of recognised conservation status. The majority of these species were not expressed more precisely at SAT level.

A10.682 These included some aculeates of high conservation status including RDB3 species such as Bryony Mining Bee *Andrena florea,* a specialist of scrub edge grasslands, often on sandy soils. The critical requirement is the presence of the sole pollen resource used by the species, White Bryony *Bryonica dioica;* as well as other RDB3 species including the Squat Furrow Bee *Lasioglossum pauperatum* and a ruby-tailed wasp *Hedychrum niemelai.*

A10.683 Other aculeates of conservation status attributed at habitat-level only for 'Short sward and bare ground', included nationally scarce Swollen-thighed Blood Bee *Sphecodes crassus* and a spider-hunting wasp *Priocnemis confusor* and the Beewolf *Philanthus triangulum,* now much more widespread than its RDB2 status suggests. The only non-aculeate attributed to the assemblage was a nationally scarce stiltbug *Berytinus hirticornis.*

A10.684 Although the F002 'Rich flower resource' is generally considered to be of limited value in assessing conservation value, as it is a diffuse resource-based, rather than a tangible habitat-related assemblage, a total of 37 bee species were attributed to this assemblage, this being more than double the number required to exceed the corresponding FC threshold of 14 species. In addition, eight species of recognised conservation status were listed for the assemblage, resulting in a relatively high SQI score.

A10.685 Species attributed to F002 for Area 15 included all previously mentioned bees, other than Swollen-thighed Blood Bee *Sphecodes crassus* which was not listed, as well as three additional bees including the RDBK Large-headed Resin Bee *Heriades* truncorum (mentioned under 'Wood decay' below), the Sharp-collared Furrow Bee *Lasioglossum malachurum* and Lobe-spurred Furrow Bee *L. pauxillum.* The latter two species have increased significantly in the UK in recent years and are likely to have their statuses revised below the Nationally Scarce category.

A10.686 At habitat-level, 'Tree-associated' species were deployed between 'Arboreal' (32 species); 'Decaying wood' (11 species) and 'Shaded woodland floor' (seven species) and whilst none of these assemblages were deployed significantly at SAT-level, eight of the species nested in 'Decaying wood' at habitat-level, were attributed to the A212 'Bark and sapwood decay' SAT.

A10.687 Two species of conservation status including a nationally scarce weevil *Magdalis barbicornis* associated with rosaceous trees and The RDBK-listed Large-headed Resin Bee *Heriades truncorum* which requires both wood decay resource and a resource of yellow composite flowers, such as ragworts *Senecio* spp. currently classed as RDBK were attributed to this SAT. Nationally scarce species attributed to the 'Arboreal' assemblage included a jumping spider *Ballus chalybeius* and a leaf weevil *Polydrusus formosus,* which is now far commoner than previously in the UK.

A10.688 At habitat-level 'wetland' assemblages were mainly attributed to the 'Marshland', assemblage with 21 species. However, none of the species ascribed to this habitat were of recognised conservation status. At this level, the 'Peatland' assemblage was attributed with only six species, and only one species, a flea beetle *Chaetocnema confusa,* was nationally scarce. *C. confusa* is associated with sedges, rushes and grasses occurring in wetland margins. The only other species of conservation status attributed to freshwater habitats was a muscid fly *Coenosia atra,* which was listed as pNationally Scarce in a status review by Falk and Pont (2017). Like, *C. confusa,* this fly is associated with rushes and sedges at wetland margins; however, it is not attributed beyond the 'wetland' broad-biotope level in Pantheon.

A10.689 The non-Pantheon SQI score recorded for Area 15 terrestrial only data was 8.6 compared to 8.2 for combined terrestrial and aquatic data. According to Harvey (2014)[64] an SQI value of 7.5 is indicative of an 'excellent' invertebrate site and one approaching 10.00 is 'almost certainly of national significance.'

Conclusion

[64] Harvey based his evaluation on invertebrate fauna in Essex, the Kent fauna within the Swanscombe part of the Thames corridor is comparable with this standard.

A10.690 Area 15 was a large topographically, hydrologically and structurally diverse site supporting a range of grassland and scrub/OMH, wetland and wooded habitats. In total, 34 species of recognised conservation value were recorded from the site; this can be considered a large number, indicating the site to have inherent conservation value.

A10.691 However, whilst aquatic samples were collected from several areas of the site, both wetland species diversity and rarity value of aquatic assemblages recorded were unexceptional. The only aquatic species of conservation significance recorded was nationally scarce water beetle *Agabus conspersus*, more typically associated with brackish water sites and the only other wetland species of conservation status were two hygrophilus species associated with sedges and rushes.

A10.692 Whilst the site supported a relatively high proportion of wooded habitat, of various successional stages, and a reasonable number of tree-associated species were recorded for the site, the survey results for this element was also relatively poorly subscribed in terms of rarity value. In total six species of recognised conservation status were attributed to tree-associated assemblages, However, the 'Bark and sapwood decay' SAT was attributed with two species of conservation status.

A10.693 In contrast to the tree-associated and wetland assemblages at biotope level, the open-habitat assemblage was attributed with the lion's share of the rarities recorded from the site, with 28 invertebrate species of recognised conservation status being attributed to this group.

A10.694 From Pantheon analysis, whilst the discrepency in terms of SQI between 'Tall sward and bare ground' and 'Short sward and bare ground' assemblages at habitat level, was less pronounced than that recorded for many of the 2020 Swanscombe survey sites, 'Short sward and bare ground' supported the greater number of species of conservation value at habitat-level and several RDB3 and nationally scarce aculeates including the Bryony Mining Bee *Andrena florea*, not recorded form any other sites within the 2020 survey areas, was attributed at this level.

A10.695 Whilst an impressive 15 species of conservation status were attributed to 'Short sward and bare ground', only a handful of these species were expressed within the nested SATs, F112 'Open short sward' and F111 'Bare sand and scrub'. However, the former of these achieved a species score exceeding its Favourable Condition status. The bare earth resource, resulting from rabbit grazing and flower-rich, if not particularly diverse sward, evidently provided excellent habitat for ground-nesting aculeates. This was reflected in the

extremely high species-score achieved for the F002 'Rich flower resource' SAT, to which 37 species were attributed, arguably the greatest number recorded from any of the 2020 survey sites.

A10.696 Overall, Area 15 can be said to support 'Short sward and bare ground' assemblages of or approaching national importance, whilst the tree-associated and wetland assemblages were of more modest value. Using a method used by Harvey (2014), described in Ball (1986) a site-level SQI score of 8.6 was calculated for the terrestrial invertebrate fauna alone and 8.2 for combined aquatic and terrestril data.

A10.697 Considering the representativeness, size and ecological position of Area 15 Station Quarter South and its associated habitat and invertebrate fauna, coupled with findings of the 2020 Pantheon analysis and independent SQI score, the site can be said to support an invertebrate fauna of Regional Importance. However, the aculeate assemblage expressed at habitat-level through 'Short sward and bare ground' and at SAT level through F002 'Rich flower resource' may be considered to be of National importance.

Area 16: Triangle

Centroid grid reference: TQ 61277 74575

Overall area: 1.4 hectares

Designations on site: None

S41 habitats present: Open mosaic habitat on previously developed land

Habitat Description

A10.698 Area 16 (Triangle) was the smallest subsite subject to invertebrate sampling in 2020 and was surveyed in part due to the findings of the 2015 survey undertaken in relation to earlier incarnations of the current project. Much of the area was inaccessible and comprised a fenced off substation and associated hard-standing, the main survey area occupying a small triangle of OMH adjacent to the roundabout at the Ebbsfleet International car park at the junction of the A226.

A10.699 Habitat within the area comprised a varied mosaic of scrub, tall herb, tall and short sward grassland and bare ground habitat, particularly around a well used informal path, which crossed the site, but also due to rabbit activity. The site showed subtle microtopographic variation; however, the more varied areas tended to be under Bramble scrub and tall herb vegetation.

A10.700 Shorter, rabbit grazed, vegetation included graminoids such as Yorkshire Fog *Holcus lanatus* and Red Fescue *Festuca rubra* with vegetation including abundant Creeping Cinquefoil *Potentilla reptans*, Black Medick *Medicago lupulina*, Ribwort Plantain *Plantago lanceolata,* Cut-leaved Crane's-bill *Geranium dissectum* and Common Vetch *Vicia sativa;* with somewhat taller herbs including Bristly Ox-tongue *Picris echioides,* Common Ragwort *Senecio jacobaea,* Hoary Ragwort *S. erucifolia,* Common Mallow *Malva sylvestris,* Creeping Thistle *Cirsium arvense* non-native species including Hoary Cress *Lepidium draba* and Lucerne *Medicago sativa.* These species persisting into the taller sward areas alongside graminoids including False Oat Grass *Arrhenatherum elatius* and Meadow Foxtail *Alopecurus pratensis.*

A10.701 Taller herb stands included species such as Hemlock *Conium maculatum*, Teasel *Dipsacus fullonum*, Hedge Parsley *Sisymbrium officinale* and Lesser Burdock *Arctium minus*. Habitat on site often comprised an irregular mixture of vegetation types with Bramble *Rubus fruticosus* (agg.) A block of dense scrub occupied the southwest corner of the site and comprised Hawthorn *Crataegus monogyna,* Wild Privet *Ligustrum vulgare*, willows *Salix* spp., Wayfaring Tree *Viburnum lantana*, Pedunculate Oak *Quercus robur* (saplings) and non-native Buddleia *Buddleja davidii*.

A10.702 Connectivity: Areas 16 occupies part of the habitat corridor comprising contiguous, or near contiguous sites, progressing southwards from Area 11 (Sportsground) to Area 15 (Station Quarter South). The site is separated from Areas 12 Bamber Pit North and 13a Bamber Pit South by the railway track north of Ebbsfleet international Station, whilst to the southeast, there are sections of verge habitat including grassland and scrub along either side of the A226 (Thames Way). Despite its small size, Area 16 supported OMH representative and complementary to the corridor as a whole.

A10.703 Substrate: Area 13: Chalk sedimentary bedrock (Lewes Nodular Chalk Formation; Seaford Chalk Formation and Newhaven Chalk Formation); with Head clay, silt, sand and gravel (superficial deposits).

A10.704 Wetness: No standing water was recorded during the survey and the site was predominately dry; however, the presence of tall herbs such as teasel *Dipsacus fullonum* indicated some drainage impedence.

A10.705 Structure: Area 16 was a relatively flat site with a small amount of microtopographic variation, the site sloping slightly to the southeast towards the roadside. There were bare ground patches along an informal, compacted earth footpath crossing the survey area and there were some bare ground patches at the scrub margins due to rabbit grazing. The vegetation on site was

structurally diverse for a small site, with small areas of short-sward, tall herb stands and a combination of low lying Bramble scrub and more mature scrub edge, providing shelter to the more open areas of the site.

Invertebrate Survey Dates:

A10.706 The site was surveyed on four occasions including: 19/05/2020; 16/06/2020; 13/07/20 and 18/08/20.

Table EDP A10.78: Number of Samples per Substrate.

	Area 16 (OMH)	Total
Sweep	4	4
Vacuum	4	4
Beating	1	1

A10.707 Total number of species recorded: 160

A10.708 A comparison of the relative number of species recorded from each of the major taxons is included in the following table.

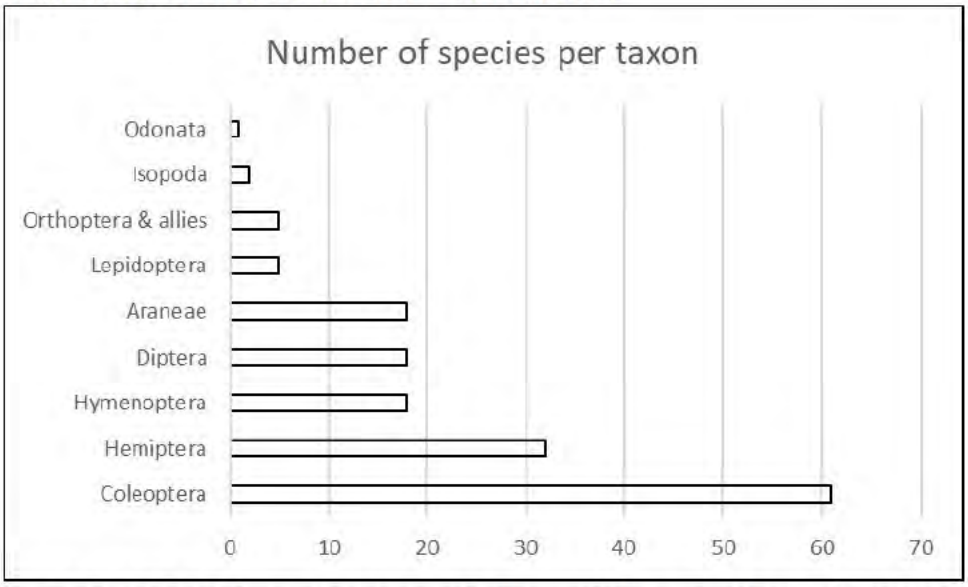

Chart EDP A10.17: A comparison of the relative number of species recorded from each of the major taxons.

Table EDP A10.79: Species of Recognised Conservation Recorded from Area 16.

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
Phoenix Fly	*Dorycera graminum*	Ulidiidae	Diptera	S41 Priority species; Near Threatened (Post-2001 IUCN criteria); RDB3 'rare' pre-1994	NT

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
Five-banded Weevil-wasp	*Cerceris quinquefasciata*	Crabronidae	Hymenoptera	Section 41 priority species; RDB3 (pre-1994 criteria)	
A mirid bug	*Lygus pratensis*	Miridae	Hemiptera	RDB3 pre-1994 criteria	LC
A solitary wasp	*Pemphredon lethifer*	Crabronidae	Hymenoptera	RDB3 pre-1994 criteria	
A shining flower beetle	*Olibrus flavicornis*	Phalacridae	Coleoptera	Red Data Book-insufficiently known	DD
A comb-footed spider	*Kochiura aulica*	Theridiidae	Araneae	Nationally Scarce	LC
A ground beetle	*Syntomus truncatellus*	Carabidae	Coleoptera	Nationally Scarce	LC
A leaf beetle	*Cryptocephalus hypochaeridis*	Chrysomelidae	Coleoptera	Nationally Scarce	LC
A weevil	*Orthochaetes setiger*	Curculionidae	Coleoptera	Nationally Scarce	
A pollen beetle	*Meligethes rotundicollis*	Nitidulidae	Coleoptera	Nationally Scarce	LC
A chloropid fly	*Trachysiphonella scutellata*	Chloropidae	Diptera	Nationally Scarce	
A planthopper	*Asiraca clavicornis*	Delphacidae	Hemiptera	Nationally Scarce	LC
Lobe-spurred Furrow Bee	*Lasioglossum pauxillum*	Halictidae	Hymenoptera	Nationally Scarce	LC
Swollen-thighed Blood Bee	*Sphecodes crassus*	Halictidae	Hymenoptera	Nationally Scarce	LC
A muscid fly	*Coenosia atra*	Muscidae	Diptera	pNationally Scarce	
Cinnabar	*Tyria jacobaeae*	Erebidae	Lepidoptera	S41 research only	LC

A10.709 SQI score for Area 16 Triangle: 8.5

Pantheon Output Tables for Area 16:

Table EDP A10.80: Habitats & resources: broad biotopes

Broad biotopei	No. of species	% representation	SQI	Conservation statusi	Species with conservation status
open habitatsi	124	3	125	2 Nbi; 2 RDB 3i; 2 [RDB 3]; 1 [Na]; 2 Section 41 Priority Species; 3 NSi; 2 [Nb]; 2 pNS; 1 pNT; 1 Section 41 Priority Species - research only	14
tree-associatedi	7	<1	100	1 RDB 3i	1
wetlandi	3	<1	200	1 pNS	1

Table EDP A10.81: Habitats & resources: habitats

Broad biotopei	Habitati	No. of species	% representation	Conservation statusi	SQI	Species with conservation status
open habitatsi	tall sward & scrubi	89	3	2 RDB 3i; 1 NSi; 1 [Nb]; 1 pNS; 1 pNT; 1 Section 41 Priority Species; 1 Section 41 Priority Species - research only	115	6
open habitatsi	short sward & bare groundi	32	2	1 [RDB 3]; 1 Section 41 Priority Species; 2 Nbi; 1 NSi; 1 RDB 3i; 1 [Nb]; 1 [Na]	139	6
tree-associatedi	arborealı	4	<1		100	
tree-associatedi	decaying woodi	3	<1	1 RDB 3i	100	1
wetlandi	marshlandi	2	<1		100	

Table EDP A10.82: Habitats & resources: ISIS specific assemblage types

Broad biotopei	Habitati	SAT	No. of species	% representation	SQI	Conservation statusi	Species with conservation status	Code	Reported conditioni
open habitatsi		rich flower resourcei	9	4	100	1 [Na]; 1 RDB 3i	2	F002	Unfavourable (9 of 15 species)
open habitatsi		scrub edgei	7	3	100	1 RDB 3i	1	F001	Unfavourable (7 of 11 species)
open habitatsi	short sward & bare groundi	open short swardi	6	3	200	1 Nbi; 1 NSi	2	F112	Unfavourable (6 of 13 species)
open habitatsi	short sward & bare groundi	bare sand & chalki	5	1	220	1 [RDB 3]; 1 Section 41 Priority Species	1	F111	Unfavourable (5 of 19 species)
open habitatsi		scrub-heath & moorlandi	4	1	175	1 [RDB 3]; 1 NSi	2	F003	Unfavourable (4 of 9 species)
tree-associatedi	decaying woodi	bark & sapwood decayi	2	<1	100	1 RDB 3i	1	A212	Unfavourable (2 of 19 species)
tree-associatedi	decaying woodi	heartwood decayi	1	<1	100			A211	Unfavourable (1 of 6 species)

Site-specific Limitations

A10.710 Area 16 was subject to the following sampling limitations/constraints:

- At the time of writing, some diptera records of the site were unavailable. The absence of these records may influence the Pantheon and SQI output; and
- Unlike all other OMH and grassland sites surveyed during 2020, no pan traps were deployed in Area 16. This was due to the small size of the site and heavy usage by dog walkers and members of the public. However, the grassland, low scrub and ground layers were sampled with sufficient resolution for Pantheon Analysis.

Discussion/Evaluation - Area 16

A10.711 At 1.4 hectares (in total), the Triangle (Area 16) was the smallest subsite surveyed during 2020. The site was surveyed partly in order to replicate surveys of sites found to support species of note during the 2015 invertebrate survey. This survey was also undertaken in relation to the London Resort project.

A10.712 Despite the small size of Area 16, the site was found to support OMH representative of sites elsewhere within the wider landscape. The site was also large enough to qualify as OMH (>0.25) hectares. The site was also structurally and floristically diverse, with patches of bare earth, short ephemeral vegetation, tall herb and scrub habitat in a close mosaic. The site was generally flat, but supported some microtopographic variation.

A10.713 During the 2020 survey a total of 160[65] species were recorded from Area 16, of which 16 species are of recognised conservation status in the UK. These included three species classed as 'Species of principal importance' under section 41 of the NERC Act (2006), two species classed as Nationally Rare (RDB3) based on pre-1994 criteria, one species classed as 'Insufficiently known' RBDK and 9 species currently classed as Nationally Scarce in the UK.

A10.714 S41 species of particular note included Five-banded Weevil Wasp *Cerceris quinquefasciata* and Phoenix Fly *Dorcycera graminum* both of which are considered flagship species of OMH and herb-rich Thames terrace grasslands in the Thames corridor. Besides their s41 status, both species are also nationally rare in the UK. Another much commoner species included within the s41 list for research only, the Cinnabar *Tyria jacobaea*, a day flying moth

[65] Further diptera records may be added to the list when available

associated with ragworts *Senecio* spp. on brownfield sites was also recorded from Area 16.

A10.715 From Pantheon analysis of Area 16 data, the vast majority of species (124) were attributed to 'Open habitats' on a broad biotope level, whilst only 7 'Tree associated' and three 'Wetland' species were recorgnised within the data.This broad-biotope deployment accurately reflected the habitats present on site and level of targeted sampling. Taller trees were not targeted directly, the survey focusing on the ground, field and low scrub layers of the site only.

A10.716 At a habitat level, 89 species, representing more than half of all species recorded from the site, were attributed to the 'Tall sward and scrub' assemblage, with 32 species being attributed to the 'Short sward and bare ground assemblage' and very small numbers only were attributed to the 'Arboreal', 'Decaying wood' and 'Marshland' habitat-level assemblages.

A10.717 Despite supporting a greater number of species, the SQI score for the 'Tall sward and scrub' assemblage was relatively low and a higher score of 139 recorded for the 'Short sward and scrub' assemblage, indicated that this assemblage was of somewhat higher conservation value at this level.

A10.718 Whilst these assemblages were not as high as for some of the other sites within the survey area and fell short of pre-Pantheon ISIS FC targets, both assemblages were attributed with several species of conservation value which were representative of OMH sites within the survey area and wider Thames corridor landscape.

A10.719 Species of recognised conservation status attributed to 'Tall herb and scrub' assemblage included the previously mentioned s41 Phoenix Fly, as well as a nationally scarce ground beetle *Syntomus truncatellus,* which is 'associated with fields, pasture woodlands and dunes' (Luff, 2007) and a weevil *Orthochaetes setiger*, which typically occurs in OMH and grassland habitats usually on calcareous substrates.

A10.720 The SAT assemblages nested within the 'Short sward and bare ground' habitat level assemblage, including F112 'Open short sward' and F111 'Bare sand and chalk' were not well represented at SAT level compared to the output from some of the larger and better sampled sites. However, several species of conservation significance were attributed to these assemblages, including the s41 and nationally rare Five-banded Weevil Wasp *Cerceris quinquefasciata,* attributed to'Bare sand and chalk' and two nationally species including a pot beetle *Cryptocephalus hypochaeridis* and a planthopper *Asiraca clvicornis,* attributed to 'Opern short sward'. Another nationally scarce species attributed only at habitat-level was the Swollen-thighed Blood Bee *Sphecodes crassus,* a

cuckoo bee species which parasitises various species of furrow bee *Lasioglossum spp.*

A10.721 Whilst the best represented assemblages at SAT level in terms of number of attributed species, were the resource-based F002 'Rich flower resource' and F001 'Scrub edge'. Neither assemblage achieved a species score approaching its FC threshold score in Pantheon, furthermore, neither was attributed with species of particularly high rarity value. The Chalk Yellow-faced Bee *Hylaeus dilatatus,* is erroneously listed as RDB3 in Pantheon and the Lobe-spurred Furrow Bee *Lasioglossum pauxillum,* though currently classed as nationally scarce, has increased in abundance in recent years.

A10.722 The non-Pantheon SQI score recorded for Area 16 Triangle was 8.5. According to Harvey (2014)[66] an SQI of 7.5 is indicative of a site of 'excellent' conservation value, whilst a value approaching 10.00 is 'almost certainly of national significance.' The overall number of species attributed to Area 16 was relatively low, therefore, the SQI score using this method would not be as robust, as from a site with a larger dataset. Nonetheless, for a small site, Area 16 supported a surprising number of species of recognised conservation status.

Conclusion

A10.723 Area 16 was a small site which was situated in close proximity to a large complex of sites supporting similar OMH including Area 12 Bamber Pit and Area 13 Former Landfill. The habitat recorded within Area 16 was representative, in terms of structure and botanical composition to these sites and therefore, can be seen as contributing on a landscape scale to the overall area of OMH.

A10.724 From 2020 survey data, a relatively large number of species of recognised conservation status were recorded from Area 16, especially in consideration of the relatively small dataset of species recorded from the site as a whole. Significant species recorded from the site included two s41 species seen as flagship species for OMH in the Thames corridor area, the Five-banded Weevil Wasp *Cerceris quinquefasciata* and the Phoenix Fly *Dorycera graminum*. Importantly, Five-banded Weevil Wasp was only recorded from Area 16 during the 2020 survey, whilst Phoenix Fly was recorded only from this site and Area 11 Sportsground.

A10.725 Pantheon analysis of site data showed recorded species to be deployed as expected, in view of the surveyed habitat, with most species being attributed to

[66] Harvey based his evaluation on invertebrate fauna in Essex, the Kent fauna within the Swanscombe part of the Thames corridor is comparable with this standard.

'Tall sward and scrub' at habitat level, with the 'Short sward and bare ground' assemblage making up the majority of the remaining species. However, SQI scores achieved by these assemblages indicated a respectable conservation value, neither assemblage, or any of the nested SATs, scored highly enough to achieve Favourable Conditions status.

A10.726 Despite this, the independent SQI score of 8.5, calculated for the site's invertebrate fauna as a whole, which took into account local species as well as more formally designated species, indicated that the site supported an overall invertebrate population of high conservation status. Whilst the site cannot be said to be of national importance, a status of County Importance would seem appropriate for Area 16.

Area 19: Tilbury Docks (Verges)

Grid reference: linear feature TQ 64589 75536 to TQ 64771 75639

Overall area: 0.2 hectares

Designations on site: None

S41 habitats present: None

Habitat Description

A10.727 Area 19 comprised a c250 metre long stretch of road verge habitat along Fort Road. The verge was approximately nine to 10 metres wide throughout. The habitat was generally flattish with subtle microtopographic variation. There was little bare earth, the sward being reasonably uniform 10-20cm tall at the time of survey, comprising graminoids including False Oat Grass *Arrhenatherum elatius*, Yorkshire Fog *Holcus lanatus,* bent grasses *Agrostis* spp. and other species. Recorded herbs included Ox-eye Daisy *Chrysanthemum leucanthemum,* Wild Carrot *Daucus carota*, Common Ragwort *Senecio jacobaea,* Yarrow *Achillea millefolium,* Meadow Buttercup *Ranunculus acris,* Bristly Ox-tongue *Picris echioides,* Ribwort Plantain *Plantago lanceolata*, Upright Hedge Parsley *Torilis japonica,* Hedge Mustard *Sisymbrium officinale,* Common Mallow *Malva sylvestris* and Broad-leaved Dock *Rumex obtusifolius*.

A10.728 Scrub species recorded included Hawthorn *Crataegus monogyna,* Field Maple *Acer campestre* and Rowan *Sorbus aucuparia.*

A10.729 Connectivity: Area 19, was part of the wider red line area encompassing parts of Tilbury Docks. The general area was largely subject to modern car parking

and active commercial development, with little habitat, other than linear verges and scrub at the edges of carparks. A small number of the verge habitat supported relatively herb-rich grassland, which had potential to support invertebrates; however, these areas were very small in area.

A10.730 On a landscape scale, the Tilbury Dock area lies in close to a number of areas of OMH, remnant Thames terrace grassland and coastal grazing marshes known to support invertebrate assemblages of national sugnificance. Immediately to the east of the redline area lies the Tilbury Marshes LWS, which comprises remnant grazing marsh habitat, with brackish ditches, as well as grassland habitat of potential value for invertebrates. Furthermore, a number of OMH sites, further east, are known to support some of the most diverse invertebrate assemblages known in the UK and several of these are currently under threat from development.

A10.731 Substrate: Area 3: Chalk sedimentary bedrock (Lewes Nodular Chalk Formation; Seaford Chalk Formation and Newhaven Chalk Formation) with alluvium, clay, silt, sand and gravel sedimentary superficial deposits.

A10.732 Wetness: No significant wetland habitat was recorded within the Tilbury Docks redline area. However, there was saltmarsh habitat immediately to the south of Fort Road, as well as the remnant grazing marsh and brackish ditch habitat within the adjacent Tilbury Marshes LWS.

A10.733 Structure: The verge habitats provided habitat of rather uniform structure; the main variation being provided by the architecture of grassland and scrub vegetation.

Invertebrate Survey Dates

A10.734 The site was surveyed on one occasion: 20/05/2020

Table EDP A10.83: Number of Samples per Substrate.

	Area 3 (OMH)	**Total**
Sweep	1	1
Vacuum	1	1
Beating	1	1

A10.735 Total number of species recorded: 57

A10.736 A comparison of the relative number of species recorded from each of the major taxons is included in the following graph.

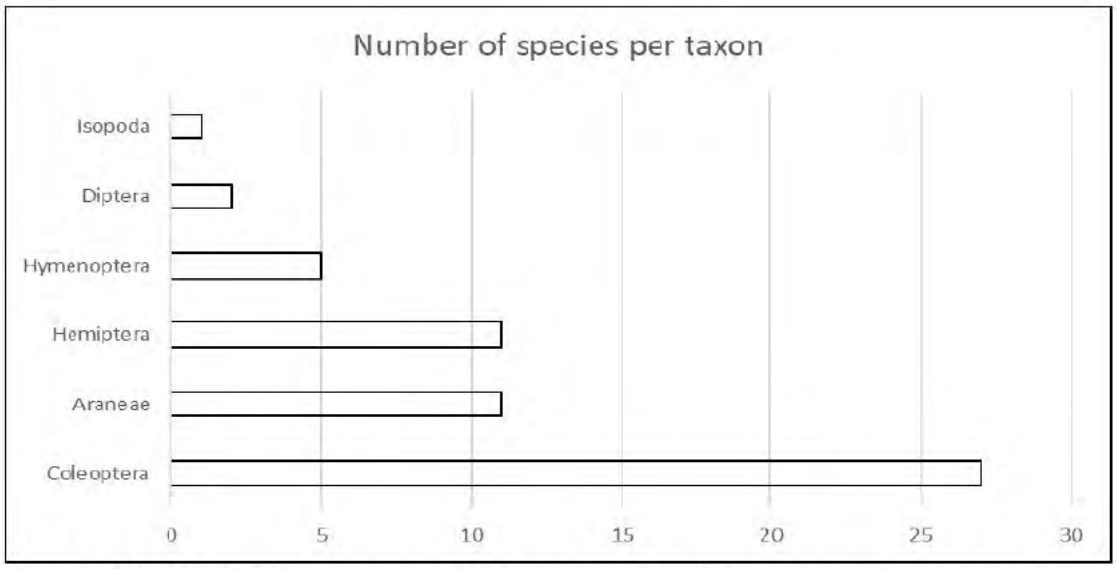

Chart EDP A10.18: A comparison of the relative number of species recorded from each of the major taxons.

Table EDP A10.84: Species of Recognised Conservation Recorded from Area 19.

Common Name	Scientific Name	Family	Order	UK Status	IUCN Post-2001 Threat Status
A shining flower beetle	*Olibrus flavicornis*	Phalacridae	Coleoptera	Red Data Book-insufficiently known	DD
A tortoise beetle	*Cassida prasina*	Chrysomelidae	Coleoptera	Nationally Scarce	LC
A weevil	*Polydrusus impressifrons*	Curculionidae	Coleoptera	Recent UK colonist	NA

A10.737 SQI score for Area 19: 6.8 (based on 52 species)

A10.738 No Pantheon analysis was undertaken for Area 19 Tilbury Docks data.

Discussion/Evaluation - Area 19:

A10.739 Following an initial scoping visit, land within the Tilbury redline area was found to support little habitat of sufficient extent or quality to support significant invertebrate populations. The area was almost all either recently developed or established light industrial, with extensive areas of carparking. However, there were small strips of grassland and scrub habitat along Fort Road, which it was felt warranted further investigation, owing mainly to the known conservation value of brownfield (OMH) sites in south Essex. Following a visit to sample this habitat, it was however, considered that the extent and quality of the habitat made it unlikely for significant invertebrate populations to be supported. On this decision was made to discontinue sampling from this area.

A10.740 Of the samples collected from Area 19 Tilbury Docks (verges), two species of recognised conservation status were recorded. These included a nationally scarce tortoise beetle *Cassida prasina*, a shining flower beetle *Olibrus*

flavicornis (currently classed in the DD 'Data deficient' category) and a leaf weevil *Polydrusus impressifrons,* which is a recent UK colonist.

A10.741 Of these both *Cassida prasina* and *Polydrusus impressifrons* were found only from Area 19, whilst *Olibrus flavicornis,* which is very locally recorded throughout the UK, was recorded from all the 2020 survey sites. Hyman and Parsons (1992) state that *C. prasina* occurs in 'Grassland, disturbed ground and probably scrub'. The recorded foodplants include Yarrow *Achillea millefolium*, Sneezewort *Achillea ptarmica* and probably Sea Campion *Silene uniflora*. Of these, Yarrow was recorded within the sward. *Polydrusus impressifrons* was first recorded from the UK in 2012. The insect is associated with broadleaved trees and was said by Duff (2016) to be restricted to Berkshire, Oxfordshire and Cambridge, at that time but spreading its UK range.

Conclusion

A10.742 Otherwise the range of species recorded from Area 19 were generally widespread grassland and scrub species. The site is unlikely to support assemblages greater than District level conservation value.

Overall Conclusions

A10.743 If the entire survey area is regarded as a whole, it can be considered as an extremely large area of contiguous, or near contiguous habitat. The constituent sub-units comprise predominately of habitat describable as grassland and scrub mosaic. However, most survey areas can also be broadly described as 'Open mosaic habitat on previously developed land' (OMH). The majority of sites within the survey area have an evident history of human intervention and disturbance. Although the elements of disturbance can be seen as being historic, rather than recent in some of these sites, vectors of disturbance such as grazing rabbits and other mammals, provided a continued resource of bare ground in several areas.

A10.744 All the sites surveyed within the Kent Project Site were found to support a diverse of grassland and scrub invertebrates, including a considerable number of species currently classed as nationally scarce, or rarer in the UK, as well as species listed as 'Species of principal importance' under section 41 of the NERC Act (2006).

A10.745 Of the rarer species, many were characteristic of OMH and herb-rich grassland habitats within the wider Thames corridor sites in north Kent and south Essex. S41 species such as the Five-banded Weevil Wasp *Cerceris quinquefasciata*, Black-headed Mason Wasp, Phoenix Fly *Dorycera graminum*, Mellet's Downy-

Back *Ophonus melletii* and the Brown-banded Carder Bee *Bombus humilis*, recorded during the 2020 survey are considered flagships of OMH priority habitat in the Thames Corridor.

A10.746 Besides the open habitat, the Swanscombe Peninsula, as well as to a lesser extent sites to the south, supported a significant resource of wetland habitat. Area 4 Black Duck Marsh and 6b Swanscombe STW wetland, supported extensive reedswamp, open water and carr habitats; whilst Areas 7 and 8, Botany Marsh West and East sections respectively, supported remnant coastal floodplain and grazing marsh habitat. Collectively and individually, these habitats supported significant invertebrate populations, including both freshwater and brackish water assemblages.

A10.747 Invertebrate assemblages recorded from the brackish ditches of Area 7 Botany Marsh West in particular, as well as those from the brackish margins of Areas 6b Swanscombe STW wetland and 4 Black Duck Marsh, were of high conservation value. Brackish water species of conservation importance including diving beetles *Hygrotus parallelogrammus* and *Agabus conspersus* and hygrophilus species such as a saldid bug *Saldula opacula*, Hairy-sided Snail Killer *Ditaeniella grisescens* and an ant-like flower beetle Cyclodinus constrictus occurred alongside freshwater species such as the 'Near Threatened' Great Silver Water Beetle *Hydrophilus piceus*, a species regarded as a flagship for coastal grazing marsh habitat and other uncommon freshwater species such as a water-scavenger beetle *Berosus luridus* and a crawling water beetle *Peltodytes caesus*.

A10.748 As expected, species defined on a broad-biotope level within Pantheon as 'Coastal' species constituted relatively small proportion of the overall species recorded from the Swanscombe 2020 survey. However, of the 61 'Coastal' species recorded, both within the non-tidal brackish water components south of the sea defence, and from the intertidal saltmarsh, 33 species of recognised conservation status were recorded.

A10.749 The saltmarsh habitat (Area 1) was found to support an invertebrate population of extremely high conservation value. Species such as the Nationally Endangered and s41 'priority species Duffey's Bell-head Spider *Praestigia duffeyi* and s41 Saltmarsh Short-spur *Anisodactylus poeciloides*, were recorded from the saltmarsh habitat during the 2020 survey, this habitat also providing important forage resource such as the s41 Brown-banded Carder Bee and RDB3 Squat Furrow Bee *Lasioglossum pauperatum*, recorded from the survey and the s41 Sea-Aster Bee *Colletes halophilus* (not recorded but known to occur on the site).

A10.750 The 2020 survey area including all sites on the Swanscombe Peninsula and sites 10 to 16, south of the A226 (London Road), was recorded as having a combined SQI score of 11.9. Based on evaluation methods used by Harvey (2014), this indicates that this area collectively supports a combined terrestrial invertebrate population of National Importance.

A10.751 However, sites are evaluated individually in **Table EDP A10.85** below. The evaluated data and rationale relating to the findings and individual significance levels can be examined by scrutiny of the individual sub-site reports. All species recorded during the 2020 survey are included in **Table EDP A10.86** at the rear of this Annex; whilst species accounts and metadata of all 204 species of conservation significance recorded during the 2020 survey, are included in **Table EDP A10.87** (also at the rear of this Annex).

Table EDP A10.85: Significance levels and assemblage features of conservation value of 2020 sample areas

Sample Area	SQI (terrestrial data only)	SQI (terrestrial and aquatic data)	Features of importance	Significance of invertebrate populations
Area 1 (Swanscombe saltmarsh)	13.3	13.5	Saltmarsh' (habitat-level); M311 'Saltmarsh and transitional brackish marsh' (SAT level)	National
Area 1a (Swanscombe sea defence bank)	7.7	n/a	Short sward and bare ground' (habitat-level)	Regional
Area 2 (Swanscombe coastal grassland and scrub)	10.5	8.8	Short sward and bare ground' (habitat-level); F111 'Bare sand and chalk; F112 'Open short sward' (SAT level)	National
Area 3 (Swanscombe OMH)	11.2	n/a	Short sward and bare ground' (habitat-level); F111 'Bare sand and chalk; F112 'Open short sward' (SAT level)	National
Area 4 (Black Duck Marsh)	11.5	9.8	W211 'Open water on disturbed mineral sediments'; W314 'Reedfen and pools'	National

Sample Area	SQI (terrestrial data only)	SQI (terrestrial and aquatic data)	Features of importance	Significance of invertebrate populations
Area 5 (Swanscombe grassland scrub/OMH/wetland	9.7	9.1	Short sward and bare ground' (habitat-level); F112 'Open short sward' (SAT level)	National (terrestrial assemblage only)
Area 6a & 6b (Swanscombe grassland and scrub and Swanscombe STW wetland)	9.5	8.5	Short sward and bare ground' (habitat-level); F112 'Open short sward' (SAT level); W211 'Open water on disturbed mineral sediments' (SAT level); M311 'Saltmarsh & transitional brackish marsh' (SAT level)	National
Area 7 (Botany Marsh West)	9	7.9	W211 'Open water on disturbed mineral sediments' (SAT level); 'Brackish pools and ditches' (habitat-level)	National (wetland assemblage only)
Area 8 (Botany Marsh East)	7.6	7.3	W211 'Open water on disturbed mineral sediments' (SAT level);	Regional
Area 10 (Craylands Pit)	9.9	n/a	Short sward and bare ground' (habitat-level); F111 'Bare sand and chalk; F112 'Open short sward' (SAT level)	National
Area 11 (Sportsground)	10.9	n/a	Short sward and bare ground' (habitat-level)	National
Area 12 (Bamber Pit)	8.9	8.8	Short sward and bare ground' (habitat-level)	Regional
Area 13 (Former Landfill)	8.9	n/a	F112 'Open short sward' (SAT level); F002 'Rich flower resource' (SAT level)	National
Area 14 (Station Quarter)	8.4	n/a	Short sward and bare ground' (habitat-level)	National
Area 15 (Station Quarter South)	8.6	8.2	F112 'Open short sward' (SAT level)	Regional (National for F112'Open short sward')

Sample Area	SQI (terrestrial data only)	SQI (terrestrial and aquatic data)	Features of importance	Significance of invertebrate populations
Area 16 (Triangle)	8.5	n/a	Short sward and bare ground' (habitat-level)	County
Area 19 (Tilbury Docks - verges)	n/a	n/a	not assessed	District

A10.752 Despite dedicated survey effort, the s41 Distinguished Jumping Spider *Sitticus distinguendus* was not recorded during the 2020 invertebrate survey. However, failure to record a species cannot on any account be seen as constituting proof that the spider no longer exists on the site. The Swanscombe Peninsula is a very large and robust site, which supports a complex of OMH and other habitats, occurring in a dynamic mosaic. Although elements of the site have altered in terms of succession since the spider was originally recorded, a number of areas with a suitable combination of habitat features to support the species are still present on site.

A10.753 Importantly, regardless of the presence/absence of Distinguished Jumping Spider, the overall survey area and a number of subsites can be seen to support invertebrate assemblages of National importance. In habitat terms; OMH, grassland and scrub mosaic, saltmarsh and coastal grazing marsh habitats can all be seen as supporting nationally important invertebrate assemblages in their own right, whilst the pure aquatic assemblages associated with the majority of freshwater habitats in land and on the Peninsula can be seen as being of somewhat lower conservation value, though the contribution of these habitats in terms of juxtaposition with drier habitats, is frequently of considerable importance to species occurring in edge habitats.

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Table EDP A10.86: 2020 Survey Species List Showing UK Status and Recorded Subsites per Species

Common Name	Scientific Name	Family	UK Status	IUCN Post-2001 Threat Status	Area 1	Area 1a	Area 2	Area 3	Area 4	Area 5	Area 6a	Area 6b	Area 7	Area 8	Area 9	Area 10	Area 11	Area 12	Area 13	Area 13A	Area 14	Area 15	Area 16	Area 19
Shrimps and sandhoppers (Amphipoda)																								
A freshwater shrimp	*Crangonyx pseudogracilis*	Crangonyctidae	Introduced (widespread)	LC						x		x										x		
A sandhopper	*Talitrus saltator*	Talitridae	Widespread	LC	x																			
Spiders (Araneae)																								
Labyrinth Spider	*Agelena labyrinthica*	Agelenidae	Widespread	LC			x	x					x				x				x			
An anyphaenid spider	*Anyphaena accentuata*	Anyphaenidae	Widespread	LC			x	x	x	x	x	x		x		x	x	x	x	x		x		
An orb-web spider	*Agalenatea redii*	Araneidae	Local	LC	x	x	x	x		x		x	x	x		x			x		x			
Garden Spider	*Araneus diadematus*	Araneidae	Widespread	LC	x					x	x						x				x		x	
An orb-web spider	*Araneus quadratus*	Araneidae	Widespread	LC												x						x		
An orb-web spider	*Araneus sturmi*	Araneidae	Local	LC														x						
An orb-web spider	*Araneus triguttatus*	Araneidae	Local	LC			x	x		x									x					
A cucumber spider	*Araniella cucurbitina*	Araneidae	Widespread	LC			x		x					x		x			x		x	x		
A cucumber spider	*Araniella opisthographa*	Araneidae	Widespread	LC				x		x	x							x				x		
Wasp Spider	*Argiope bruennichi*	Araneidae	Local	LC												x	x							
An orb-web spider	*Cyclosa conica*	Araneidae	Local	LC												x								
An orb-web spider	*Gibbaranea gibbosa*	Araneidae	Widespread	LC															x					
An orb-web spider	*Hypsosinga pygmaea*	Araneidae	Local	LC															x					
An orb-web spider	*Larinioides cornutus*	Araneidae	Widespread	LC	x	x	x	x	x				x								x	x		
An orb-web spider	*Mangora acalypha*	Araneidae	Local	LC	x	x	x	x		x	x	x		x		x	x	x	x		x	x		x
An orb-web spider	*Neoscona adianta*	Araneidae	Local	LC	x			x		x	x					x							x	
An orb-web spider	*Zygiella atrica*	Araneidae	Widespread	LC					x	x						x		x		x				
An orb-web spider	*Zygiella x-notata*	Araneidae	Widespread	LC	x	x	x														x			
A clubionid spider	*Cheiracanthium erraticum*	Clubionidae	Local	LC	x		x	x		x	x	x		x		x	x		x		x	x		
A clubionid spider	*Cheiracanthium virescens*	Clubionidae	Nationally Scarce	LC												x					x			
A clubionid spider	*Clubiona brevipes*	Clubionidae	Widespread	LC			x		x										x					
A clubionid spider	*Clubiona comta*	Clubionidae	Widespread	LC													x	x	x		x	x	x	x
A clubionid spider	*Clubiona diversa*	Clubionidae	Local	LC													x	x		x				
A clubionid spider	*Clubiona neglecta*	Clubionidae	Widespread	LC				x		x	x								x			x		
A clubionid spider	*Clubiona pallidula*	Clubionidae	Local	LC					x			x							x					
A clubionid spider	*Clubiona phragmitis*	Clubionidae	Widespread	LC				x									x							
A clubionid spider	*Clubiona reclusa*	Clubionidae	Widespread	LC												x								
A clubionid spider	*Clubiona stagnatilis*	Clubionidae	Local	LC	x													x						
A clubionid spider	*Clubiona subtilis*	Clubionidae	Local	LC			x	x											x		x			
A clubionid spider	*Clubiona terrestris*	Clubionidae	Widespread	LC																				x
A dictynid spider	*Argenna patula*	Dictynidae	Nationally Scarce	LC	x																			
Diving Bell Spider	*Argyroneta aquatica*	Dictynidae	Local	LC								x												
A dictynid spider	*Dictyna arundinacea*	Dictynidae	Widespread	LC	x		x	x		x	x	x		x		x	x	x	x		x	x	x	

Common Name	Scientific Name	Family	UK Status	IUCN Post-2001 Threat Status	Area 1	Area 1a	Area 2	Area 3	Area 4	Area 5	Area 6a	Area 6b	Area 7	Area 8	Area 9	Area 10	Area 11	Area 12	Area 13	Area 13A	Area 14	Area 15	Area 16	Area 19
A dictynid spider	*Dictyna latens*	Dictynidae	Local	LC		x	x	x		x	x			x		x	x	x	x		x	x	x	x
A dictynid spider	*Dictyna uncinata*	Dictynidae	Widespread	LC			x	x		x	x		x	x		x	x	x	x		x	x	x	
A dictynid spider	*Lathys humilis*	Dictynidae	Local	LC			x											x	x			x		
A woodlouse spider	*Dysdera crocata*	Dysderidae	Widespread	LC	x			x																
A woodlouse spider	*Dysdera erythrina*	Dysderidae	Local	LC				x																
A woodlouse spider	*Harpactea hombergi*	Dysderidae	Widespread	LC							x													
A gnaphosid spider	*Drassodes cupreus*	Gnaphosidae	Widespread	LC	x			x						x										
A gnaphosid spider	*Drassodes lapidosus*	Gnaphosidae	Local	LC				x																
A gnaphosid spider	*Drassodes pubescens*	Gnaphosidae	Nationally Scarce	LC				x	x							x			x					
A gnaphosid spider	*Drassyllus pusillus*	Gnaphosidae	Local	LC			x	x	x					x			x					x		
A gnaphosid spider	*Haplodrassus signifer*	Gnaphosidae	Local	LC				x																
A gnaphosid spider	*Trachyzelotes pedestris*	Gnaphosidae	Local	LC	x		x	x	x			x		x										
A gnaphosid spider	*Zelotes apricorum*	Gnaphosidae	Local	LC	x		x	x	x															
A gnaphosid spider	*Zelotes electus*	Gnaphosidae	Nationally Scarce	LC			x																	
A gnaphosid spider	*Zelotes latreillei*	Gnaphosidae	Local	LC	x		x	x	x	x		x									x			
A hahnid spider	*Hahnia montana*	Hahniidae	Widespread	LC													x							
A hahnid spider	*Hahnia nava*	Hahniidae	Local	LC														x			x			
A hahnid spider	*Hahnia nava*	Hahniidae	Local	LC													x							
A linyphiid spider	*Agyneta rurestris*	Linyphiidae	Widespread	LC					x															
A linyphiid spider	*Diplostyla concolor*	Linyphiidae	Widespread	LC	x									x										
A linyphiid spider	*Dismodicus bifrons*	Linyphiidae	Widespread	LC														x				x		
A linyphiid spider	*Erigone atra*	Linyphiidae	Widespread	LC					x			x	x	x							x	x		
A linyphiid spider	*Erigone dentipalpis*	Linyphiidae	Widespread	LC									x	x										
A linyphiid spider	*Erigone longipalpis*	Linyphiidae	Local	LC	x																			
A linyphiid spider	*Hypomma fulvum*	Linyphiidae	Nationally Scarce	LC	x			x																
A linyphiid spider	*Linyphia triangularis*	Linyphiidae	Widespread				x																	
A linyphiid spider	*Meioneta simplicitarsis*	Linyphiidae	Nationally Scarce	LC																	x			
A linyphiid spider	*Microlinyphia pusilla*	Linyphiidae	Widespread	LC	x														x		x			
A linyphiid spider	*Neriene clathrata*	Linyphiidae	Widespread	LC						x														
A linyphiid spider	*Oedothorax apicatus*	Linyphiidae	Widespread	LC									x											
A linyphiid spider	*Oedothorax retusus*	Linyphiidae	Widespread	LC									x											
A linyphiid spider	*Pelecopsis parallela*	Linyphiidae	Local	LC						x														
A linyphiid spider	*Pocadicnemis juncea*	Linyphiidae	Widespread	LC			x									x	x				x			
Duffey's Bell-head Spider	*Praestigia duffeyi*	Linyphiidae	s41 'priority species'; 'Endangered' post-2001 IUCN criteria; Nationally Rare	Endangered	x																			
A linyphiid spider	*Tenuiphantes flavipes*	Linyphiidae	Local	LC							x													
A linyphiid spider	*Tenuiphantes tenuis*	Linyphiidae	Widespread	LC	x			x			x			x		x	x	x		x		x		x

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A linyphiid spider	*Tenuiphantes zimmermanni*	Linyphiidae	Widespread	LC		x										x	x							
A linyphiid spider	*Walckenaria atrotibialis*	Linyphiidae	Local	LC			x																	
A lycosid spider	*Alopecosa barbipes*	Lycosidae	Local	LC				x	x															
A lycosid spider	*Alopecosa cuneata*	Lycosidae	Nationally Scarce	LC				x								x			x					
A lycosid spider	*Alopecosa pulverulenta*	Lycosidae	Widespread	LC			x	x	x							x	x		x		x			
A lycosid spider	*Arctosa leopardus*	Lycosidae	Local	LC	x				x			x		x										
A lycosid spider	*Pardosa hortensis*	Lycosidae	Local	LC				x	x				x			x		x						
A lycosid spider	*Pardosa nigriceps*	Lycosidae	Widespread	LC	x	x	x	x		x	x	x		x		x		x	x		x	x	x	
A lycosid spider	*Pardosa palustris*	Lycosidae	Widespread	LC	x	x							x						x					
A lycosid spider	*Pardosa prativaga*	Lycosidae	Widespread	LC	x		x	x	x	x		x	x	x					x		x			
A lycosid spider	*Pardosa pullata*	Lycosidae	Widespread	LC	x		x	x	x	x				x		x		x	x			x	x	
A lycosid spider	*Pardosa purbeckensis*	Lycosidae	Local	LC	x			x						x										
A lycosid spider	*Pirata latitans*	Lycosidae	Local	LC					x			x												
A lycosid spider	*Pirata piraticus*	Lycosidae	Widespread	LC	x				x			x	x	x										
A lycosid spider	*Trochosa ruricola*	Lycosidae	Widespread	LC	x		x	x	x			x		x										
A lycosid spider	*Trochosa terricola*	Lycosidae	Widespread	LC				x	x			x												
A pirate spider	*Ero aphana*	Mimetidae	Nationally Scarce	LC															x			x		
A pirate spider	*Ero cambridgei*	Mimetidae	Widespread	LC																		x		
A pirate spider	*Ero tuberculata*	Mimetidae	Nationally Scarce	LC														x		x				
A running crab spider	*Philodromus albidus*	Philodromidae	Local	LC						x							x		x		x	x		
A running crab spider	*Philodromus aureolus*	Philodromidae	Widespread	LC			x		x								x	x				x		
A running crab spider	*Philodromus cespitum*	Philodromidae	Widespread	LC			x	x		x				x		x	x	x	x		x	x		
A running crab spider	*Philodromus dispar*	Philodromidae	Widespread	LC															x	x				
A running crab spider	*Philodromus praedatus*	Philodromidae	Local	LC														x						
A running crab spider	*Philodromus rufus*	Philodromidae	Not assessed	NA						x														
A running crab spider	*Thanatus striatus*	Philodromidae	Nationally Scarce	LC	x		x	x			x		x	x			x		x		x			
A running crab spider	*Tibellus maritimus*	Philodromidae	Local	LC	x																	x		
A running crab spider	*Tibellus oblongus*	Philodromidae	Widespread	LC	x	x	x	x		x	x	x	x			x	x	x	x	x	x	x	x	x
A phrurolithid spider	*Phrurolithus festivus*	Phrurolithidae	Widespread	LC	x		x					x		x				x	x				x	
Nursery-web Spider	*Pisaura mirabilis*	Pisauridae	Widespread	LC	x		x	x		x	x		x			x	x	x	x		x	x	x	x
A jumping spider	*Neon reticulatus*	Saldidae	Widespread	LC															x		x			
A jumping spider	*Ballus chalybeius*	Salticidae	Nationally Scarce	LC			x	x		x	x	x		x		x	x	x	x	x	x	x		
A jumping spider	*Euophrys frontalis*	Salticidae	Widespread	LC	x	x	x	x		x	x	x				x	x	x	x	x	x	x	x	x
A jumping spider	*Heliophanus cupreus*	Salticidae	Widespread	LC	x		x	x		x	x					x	x	x	x	x	x	x	x	
A jumping spider	*Heliophanus flavipes*	Salticidae	Widespread	LC		x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x
A jumping spider	*Macaroeris nidicolens*	Salticidae	Recent UK colonist	NA			x			x									x					
A jumping spider	*Salticus scenicus*	Salticidae	Widespread	LC				x	x		x													
A jumping spider	*Salticus zebraneus*	Salticidae	Nationally Scarce	LC					x															
A jumping spider	*Sibianor aurocinctus*	Salticidae	Nationally Scarce	LC			x	x		x	x	x		x		x	x	x	x	x	x	x		

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A jumping spider	*Synageles venator*	Salticidae	Nationally Scarce	LC	x		x		x		x	x				x	x							
A jumping spider	*Talavera aequipes*	Salticidae	Local	LC				x																
A tetragnathid spider	*Metellina segmentata*	Tetragnathidae	Widespread	LC													x		x					
A tetragnathid spider	*Pachygnatha clercki*	Tetragnathidae	Widespread	LC	x									x										
A tetragnathid spider	*Pachygnatha degeeri*	Tetragnathidae	Widespread	LC	x	x			x				x	x		x			x					
A tetragnathid spider	*Tetragnatha extensa*	Tetragnathidae	Widespread	LC	x	x		x					x											
A tetragnathid spider	*Tetragnatha montana*	Tetragnathidae	Widespread	LC				x	x	x							x		x					
A tetragnathid spider	*Tetragnatha obtusa*	Tetragnathidae	Local	LC							x													
A tetragnathid spider	*Tetragnatha pinicola*	Tetragnathidae	Local	LC														x		x				
A comb-footed spider	*Anelosimus vittatus*	Theridiidae	Widespread	LC				x			x					x	x	x	x		x	x		
A comb-footed spider	*Crustulina guttata*	Theridiidae	Local	LC			x																	
A comb-footed spider	*Enoplognatha latimana*	Theridiidae	Widespread				x		x	x						x	x		x					
A comb-footed spider	*Enoplognatha mordax*	Theridiidae	Nationally Scarce	LC	x																			
A comb-footed spider	*Enoplognatha ovata*	Theridiidae	Widespread	LC		x	x		x	x		x				x		x	x	x		x		
A comb-footed spider	*Enoplognatha thoracica*	Theridiidae	Local	LC				x															x	
A comb-footed spider	*Episinus angulatus*	Theridiidae	Widespread	LC														x						
A comb-footed spider	*Kochiura aulica*	Theridiidae	Nationally Scarce	LC		x	x	x		x	x	x	x	x		x	x	x	x		x	x	x	
A comb-footed spider	*Paidiscura pallens*	Theridiidae	Widespread	LC																		x		
A comb-footed spider	*Parasteotoda lunata*	Theridiidae	Local				x																	
A comb-footed spider	*Phylloneta impressa*	Theridiidae	Local	LC													x							
A comb-footed spider	*Phylloneta sisyphia*	Theridiidae	Widespread	LC					x								x				x	x		
A comb-footed spider	*Platnickina tincta*	Theridiidae	Widespread	LC								x												
A comb-footed spider	*Robertus arundineti*	Theridiidae	Local	LC	x			x																
A comb-footed spider	*Theridion blackwalli*	Theridiidae	Nationally Scarce	LC														x						
A comb-footed spider	*Theridion mystaceum*	Theridiidae	Widespread	LC																		x		
A comb-footed spider	*Theridion varians*	Theridiidae	Widespread	LC													x					x		
A crab spider	*Diaea dorsata*	Thomisidae	Local	LC						x	x									x				
A crab spider	*Misumena vatia*	Thomisidae	Widespread	LC			x	x		x	x						x	x			x			
A crab spider	*Ozyptila brevipes*	Thomisidae	Local	LC	x																	x		
A crab spider	*Ozyptila praticola*	Thomisidae	Local	LC						x														
A crab spider	*Ozyptila sanctuaria*	Thomisidae	Local	LC				x																
A crab spider	*Ozyptila simplex*	Thomisidae	Local	LC	x		x	x				x		x								x		
A crab spider	*Ozyptila trux*	Thomisidae	Local	LC				x																
A crab spider	*Xysticus audax*	Thomisidae	Local	LC			x	x	x	x	x	x	x	x										
A crab spider	*Xysticus cristatus*	Thomisidae	Widespread	LC	x	x	x	x	x		x	x	x	x		x	x		x		x	x	x	x
A crab spider	*Xysticus kochi*	Thomisidae	Local	LC			x	x		x						x			x		x	x	x	x
A zodariid spider	*Zodarion italicum*	Zodariidae	Nationally Scarce	LC	x		x	x	x			x												
A zorid spider	*Zora spinimana*	Zoridae	Widespread	LC			x			x				x			x	x		x	x	x		
Beetles (Coleoptera)																								

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An aderid beetle	*Anidorus sanguinolentus*	Aderidae	First UK record											x										
A wood-boring beetle	*Anobium punctatum*	Anobiidae	Widespread	LC			x							x										
Fan-bearing Wood-borer	*Ptilinus pectinicornis*	Anobiidae	Widespread	LC						x														
An anthicid beetle	*Anthicus antherinus*	Anthicidae	Local	LC								x	x			x	x				x	x		
An anthicid beetle	*Cordicollis instabilis*	Anthicidae	Nationally Scarce	LC	x																			
An anthicid beetle	*Cyclodinus constrictus*	Anthicidae	Nationally Scarce	LC	x		x		x			x												
An anthicid beetle	*Cyclodinus salinus*	Anthicidae	Nationally Rare	LC	x																			
An anthicid beetle	*Notoxus monoceros*	Anthicidae	Local	LC					x															
An anthicid beetle	*Omonadus formicarius*	Anthicidae	Local	LC			x																	
An apionid weevil	*Apion frumentarium*	Apionidae	Widespread	LC																		x	x	
An apionid weevil	*Aspidapion aeneum*	Apionidae	Local	LC																			x	x
An apionid weevil	*Aspidapion radiolus*	Apionidae	Local	LC														x					x	x
An apionid weevil	*Betulapion simile*	Apionidae	Local	LC			x			x						x						x		
An apionid weevil	*Catapion seniculus*	Apionidae	Local	LC		x		x		x							x							
An apionid weevil	*Ceratapion carduorum*	Apionidae	Local																			x		
An apionid weevil	*Ceratapion gibbirostre*	Apionidae	Widespread	LC			x							x			x	x	x			x		
An apionid weevil	*Ceratapion onopordi*	Apionidae	Widespread	LC									x	x					x		x		x	
An apionid weevil	*Diplapion confluens*	Apionidae	Local	LC												x								
A weevil	*Diplapion stolidum*	Apionidae	Nationally Scarce (Notable Nb)			x																		
An apionid weevil	*Eutrichapion ervi*	Apionidae	Widespread			x																		
An apionid weevil	*Eutrichapion viciae*	Apionidae	Local	LC			x			x	x	x												
An apionid weevil	*Eutrichapion vorax*	Apionidae	Local	LC															x					
An apionid weevil	*Exapion ulicis*	Apionidae	Widespread	LC															x					
An apionid weevil	*Holotrichapion aethiops*	Apionidae	Local				x				x													
An apionid weevil	*Holotrichapion pisi*	Apionidae	Local	LC							x								x					
An apionid weevil	*Holotrichapion pisi*	Apionidae	Local								x													
An apionid weevil	*Ischnopterapion loti*	Apionidae	Widespread	LC		x	x	x		x	x					x			x		x			x
An apionid weevil	*Ischnopterapion virens*	Apionidae	Widespread	LC		x							x						x					
An apionid weevil	*Malvapion malvae*	Apionidae	Widespread	LC												x							x	x
An apionid weevil	*Oxystoma craccae*	Apionidae	Local						x															
An apionid weevil	*Oxystoma pomonae*	Apionidae	Widespread	LC			x	x	x					x		x		x	x					
An apionid weevil	*Perapion hydrolapathi*	Apionidae	Widespread																				x	
An apionid weevil	*Protapion apricans*	Apionidae	Widespread	LC		x	x	x		x	x	x		x			x		x					
An apionid weevil	*Protapion assimile*	Apionidae	Widespread	LC		x	x	x	x	x	x			x			x		x		x			
An apionid weevil	*Protapion filirostre*	Apionidae	Nationally Scarce B	LC		x		x		x	x							x	x					
An apionid weevil	*Protapion fulvipes*	Apionidae	Widespread	LC		x		x			x		x				x	x	x			x		x
An apionid weevil	*Protapion nigritarse*	Apionidae	Local	LC				x			x													
An apionid weevil	*Protapion ononidis*	Apionidae	Local							x														

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An apionid weevil	*Protapion trifolii*	Apionidae	Widespread	LC		x	x	x		x		x				x	x		x			x		
An apionid weevil	*Squamapion flavimanum*	Apionidae	Nationally Scarce															x						
An apionid weevil	*Stenopterapion meliloti*	Apionidae	Local	LC				x			x													
An apionid weevil	*Stenopterapion tenue*	Apionidae	Local	LC		x			x	x	x											x		
An apionid weevil	*Taeniapion urticarium*	Apionidae	Local	LC			x																	
Ground-ivy Jewel Beetle	*Trachys scrobiculatus*	Buprestidae	Nationally Scarce	LC													x					x		
A pill beetle	*Chaetophora spinosa*	Byrrhidae	Local	LC			x	x								x								
A pill beetle	*Curimopsis maritima*	Byrrhidae		LC				x																
A raspberry beetle	*Byturus ochraceus*	Byturidae	Local	LC													x					x		
Raspberry Beetle	*Byturus tomentosus*	Byturidae	Widespread	LC			x									x		x	x		x	x		
A soldier beetle	*Cantharis cryptica*	Cantharidae	Widespread	LC						x		x		x								x		
A soldier beetle	*Cantharis decipiens*	Cantharidae	Widespread	LC			x	x	x	x	x		x	x					x					
A soldier beetle	*Cantharis figurata*	Cantharidae	Widespread	LC										x										
A soldier beetle	*Cantharis lateralis*	Cantharidae	Widespread	LC					x					x							x			
A soldier beetle	*Cantharis livida*	Cantharidae	Widespread	LC					x							x								
A soldier beetle	*Cantharis nigra*	Cantharidae	Widespread	LC	x																			
A soldier beetle	*Cantharis pellucida*	Cantharidae	Widespread	LC						x														
A soldier beetle	*Cantharis rufa*	Cantharidae	Widespread	LC					x			x		x							x			
A soldier beetle	*Cantharis rustica*	Cantharidae	Widespread	LC		x																x		
A soldier beetle	*Crudosilis ruficollis*	Cantharidae	Local	LC								x												
A soldier beetle	*Crudosilis ruficollis*	Cantharidae	Local		x									x										
A soldier beetle	*Malthinus flaveolus*	Cantharidae	Widespread	LC										x										
A soldier beetle	*Malthinus seriepunctatus*	Cantharidae	Widespread	LC			x							x										
A soldier beetle	*Malthodes marginatus*	Cantharidae	Widespread	LC										x										
A soldier beetle	*Malthodes minimus*	Cantharidae	Widespread	LC										x										
A soldier beetle	*Rhagonycha fulva*	Cantharidae	Widespread	LC	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	
A soldier beetle	*Rhagonycha lignosa*	Cantharidae	Widespread	LC					x	x						x								
A ground beetle	*Acupalpus maculatus*	Carabidae	Nationally Rare	NT					x															
A ground beetle	*Acupalpus parvulus*	Carabidae	Local	LC								x												
A ground beetle	*Agonum emarginatum*	Carabidae	Widespread	LC								x		x										
A ground beetle	*Agonum marginatum*	Carabidae	Widespread	LC								x	x	x										
A ground beetle	*Agonum nigrum*	Carabidae	Nationally Scarce	LC	x																			
A ground beetle	*Agonum thoreyi*	Carabidae	Widespread	LC					x															
A ground beetle	*Amara aenea*	Carabidae	Widespread	LC				x															x	
A ground beetle	*Amara convexior*	Carabidae	Widespread	LC			x	x									x							
A ground beetle	*Amara montivaga*	Carabidae	Nationally Scarce	LC			x	x		x														
A ground beetle	*Amara ovata*	Carabidae	Widespread	LC			x														x			
A ground beetle	*Amara plebeja*	Carabidae	Widespread	LC	x																			
A ground beetle	*Amara spreta*	Carabidae	Nationally Rare	NT			x																	

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A ground beetle	*Amara tibialis*	Carabidae	Widespread	LC				x																
A ground beetle	*Anchomenus dorsalis*	Carabidae	Widespread	LC													x							
A ground beetle	*Anisodactylus binotatus*	Carabidae	Local	LC								x												
Saltmarsh Short-spur	*Anisodactylus poeciloides*	Carabidae	S41 Priority species; Nationally Scarce	LC	x							x												
A ground beetle	*Asaphidion flavipes*	Carabidae	Local	LC			x																	
A ground beetle	*Badister bullatus*	Carabidae	Widespread	LC	x			x				x					x				x			
A ground beetle	*Badister collaris*	Carabidae	Nationally Scarce	LC					x															
A ground beetle	*Bembidion aeneum*	Carabidae	Widespread										x											
A ground beetle	*Bembidion articulatum*	Carabidae	Widespread	LC					x															
A ground beetle	*Bembidion assimile*	Carabidae	Widespread	LC					x				x											
A ground beetle	*Bembidion clarkii*	Carabidae	Local	LC									x											
A ground beetle	*Bembidion dentellum*	Carabidae	Widespread	LC								x												
A ground beetle	*Bembidion fumigatum*	Carabidae	Nationally Scarce	LC									x											
A ground beetle	*Bembidion iricolor*	Carabidae	Nationally Scarce	LC	x																			
A ground beetle	*Bembidion lampros*	Carabidae	Widespread	LC	x		x					x		x										
A ground beetle	*Bembidion lunulatum*	Carabidae	Widespread	LC								x	x	x										
A ground beetle	*Bembidion minimum*	Carabidae	Local	LC	x		x																	
A ground beetle	*Bembidion normannum*	Carabidae	Nationally Scarce	LC	x		x					x												
A ground beetle	*Bembidion obtusum*	Carabidae	Widespread								x													
A ground beetle	*Bembidion octomaculatum*	Carabidae	Nationally Scarce	LC	x																			
a ground beetle	*Bembidion properans*	Carabidae	Widespread	LC							x					x								
A ground beetle	*Bembidion varium*	Carabidae	Local	LC							x		x											
Bombadier beetle	*Brachinus crepitans*	Carabidae	Nationally Scarce	LC	x		x	x			x	x							x		x			
A ground beetle	*Calathus ambiguus*	Carabidae	Nationally Scarce	LC	x																			
A ground beetle	*Calathus fuscipes*	Carabidae	Widespread	LC				x								x					x	x		
A ground beetle	*Calathus melanocephalus*	Carabidae	Widespread								x													
Violet Ground Beetle	*Carabus violaceus*	Carabidae	Widespread	LC				x			x								x		x	x		
Green Tiger Beetle	*Cicindela campestris*	Carabidae	Widespread	LC			x									x								
A ground beetle	*Clivina fossor*	Carabidae	Widespread	LC										x										
A ground beetle	*Curtonotus aulicus*	Carabidae	Widespread	LC	x		x			x	x					x	x	x	x		x	x		
A ground beetle	*Curtonotus convexiusculus*	Carabidae	Local	LC	x																			
A ground beetle	*Demetrias atricapillus*	Carabidae	Widespread	LC	x		x																	
A ground beetle	*Demetrias imperialis*	Carabidae	Local	LC									x											
A ground beetle	*Dromius meridionalis*	Carabidae	Widespread	LC					x			x												
A ground beetle	*Dyschirius aeneus*	Carabidae	Local	LC					x															
A ground beetle	*Dyschirius luedersi*	Carabidae	Widespread	LC								x												
A ground beetle	*Dyschirius nitidus*	Carabidae	Nationally Scarce	LC	x							x												
A ground beetle	*Dyschirius politus*	Carabidae	Nationally Scarce	LC								x												

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A ground beetle	*Dyschirius salinus*	Carabidae	Nationally Scarce	LC	x						x	x												
A ground beetle	*Elaphrus riparius*	Carabidae	Widespread	LC								x												
A ground beetle	*Harpalus affinis*	Carabidae	Widespread	LC	x		x	x			x	x				x					x			
A ground beetle	*Harpalus attenuatus*	Carabidae	Nationally Scarce	LC												x								
A ground beetle	*Harpalus rubripes*	Carabidae	Widespread	LC		x										x								
A ground beetle	*Harpalus rufipes*	Carabidae	Widespread	LC	x														x					
A ground beetle	*Harpalus tardus*	Carabidae	Local	LC												x					x	x		
A ground beetle	*Leistus rufomarginatus*	Carabidae	Widespread	LC			x																	
A ground beetle	*Loricera pilicornis*	Carabidae	Widespread	LC	x							x												
A ground beetle	*Microlestes maurus*	Carabidae	Local	LC			x												x					
A ground beetle	*Microlestes minutulus*	Carabidae	Local	LC				x		x	x					x								x
A ground beetle	*Nebria brevicollis*	Carabidae	Widespread	LC			x																	
A ground beetle	*Nebria salina*	Carabidae	Local	LC				x																
A ground beetle	*Notiophilus palustris*	Carabidae	Widespread	LC	x																			
A ground beetle	*Ophonus ardosiacus*	Carabidae	Local	LC			x										x							
Mellet's Downy-Back	*Ophonus melletii*	Carabidae	S41 Priority species; Nationally Rare; Near Threatened	NT				x	x								x							
A ground beetle	*Ophonus puncticeps*	Carabidae	Local	LC				x		x	x					x	x	x						
A ground beetle	*Ophonus rufibarbis*	Carabidae	Widespread	LC				x																
A ground beetle	*Oxypselaphus obscurus*	Carabidae	Widespread	LC								x												
A ground beetle	*Paradromius linearis*	Carabidae	Widespread	LC	x	x	x	x		x	x	x		x		x	x	x	x		x	x	x	
A ground beetle	*Philorhizus melanocephalus*	Carabidae	Widespread	LC	x	x	x				x	x										x		
A ground beetle	*Platyderus depressus*	Carabidae	Local	LC				x																
A ground beetle	*Poecilus cupreus*	Carabidae	Widespread	LC	x									x										
A ground beetle	*Poecilus versicolor*	Carabidae	Widespread	LC	x																			
A ground beetle	*Pogonus chalceus*	Carabidae	Local	LC	x																			
A ground beetle	*Pterostichus longicollis*	Carabidae	Nationally Scarce	LC								x		x										
A ground beetle	*Pterostichus macer*	Carabidae	Local	LC	x									x										
A ground beetle	*Pterostichus madidus*	Carabidae	Widespread	LC	x		x	x	x					x		x	x		x		x	x		
A ground beetle	*Pterostichus minor*	Carabidae	Widespread	LC								x												
A ground beetle	*Pterostichus niger*	Carabidae	Widespread	LC	x																x			
A ground beetle	*Pterostichus nigrita*	Carabidae	Widespread	LC										x										
A ground beetle	*Pterostichus strenuus*	Carabidae	Widespread	LC	x									x										
A ground beetle	*Scybalicus oblongiusculus*	Carabidae	Nationally Rare	VU							x	x												
A ground beetle	*Stenolophus mixtus*	Carabidae	Widespread	LC					x				x											
A ground beetle	*Stomis pumicatus*	Carabidae	Widespread	LC	x																			
A ground beetle	*Syntomus foveatus*	Carabidae	Widespread	LC			x	x		x														x
A ground beetle	*Syntomus obscuroguttatus*	Carabidae	Widespread	LC							x			x							x			

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A ground beetle	*Syntomus truncatellus*	Carabidae	Nationally Scarce	LC																	x		x	
Golden-bloomed Grey Longhorn Beetle	*Agapanthia villosoviridescens*	Cerambycidae	Widespread	LC	x		x							x										
Wasp Beetle	*Clytus arietis*	Cerambycidae	Widespread	LC						x	x				x									
A longhorn beetle	*Gracilia minuta*	Cerambycidae	Nationally Scarce	LC	x				x		x													
Common Grammoptera	*Grammoptera ruficornis*	Cerambycidae	Widespread	LC								x		x				x	x					
A longhorn beetle	*Pseudovadonia livida*	Cerambycidae	Widespread	LC		x																		
A longhorn beetle	*Stenurella melanura*	Cerambycidae	Widespread	LC													x							
Plum Longhorn Beetle	*Tetrops praeustus*	Cerambycidae	Local	LC			x	x	x	x	x		x	x	x	x								
A flea beetle	*Altica lythri*	Chrysomelidae	Widespread	LC																				
A flea beetle	*Altica palustris*	Chrysomelidae	Widespread	LC										x										
A flea beetle	*Aphthona euphorbiae*	Chrysomelidae	Widespread	LC	x	x		x	x	x												x		
A seed beetle	*Bruchidius imbricornis*	Chrysomelidae	Recent UK colonist	NE	x	x	x	x		x				x				x	x		x	x	x	
A seed beetle	*Bruchidius varius*	Chrysomelidae	Recent UK colonist	NE	x	x	x			x							x		x					
A seed beetle	*Bruchidius villosus*	Chrysomelidae	Widespread	LC				x		x														
A seed beetle	*Bruchus atomarius*	Chrysomelidae	Local	LC				x									x							
A seed beetle	*Bruchus brachialis*	Chrysomelidae	Recent UK colonist	NE			x	x		x														
A seed beetle	*Bruchus loti*	Chrysomelidae	Local	LC		x	x	x		x	x						x	x	x		x			
A seed beetle	*Bruchus rufimanus*	Chrysomelidae	Local	LC		x	x	x		x	x					x			x		x	x		
A seed beetle	*Bruchus rufipes*	Chrysomelidae	Widespread	LC		x		x		x	x	x		x		x	x		x		x			
A tortoise beetle	*Cassida nobilis*	Chrysomelidae	Nationally Scarce	LC	x																			
A tortoise beetle	*Cassida prasina*	Chrysomelidae	Nationally Scarce	LC																				x
A tortoise beetle	*Cassida rubiginosa*	Chrysomelidae	Widespread	LC			x							x								x		
A tortoise beetle	*Cassida vibex*	Chrysomelidae	Widespread	LC										x								x	x	
A flea beetle	*Chaetocnema concinna*	Chrysomelidae	Widespread	LC									x			x						x		
A flea beetle	*Chaetocnema confusa*	Chrysomelidae	Nationally Scarce	LC																		x		
A flea beetle	*Chaetocnema hortensis*	Chrysomelidae	Widespread	LC																		x		
A leaf beetle	*Chrysolina banksi*	Chrysomelidae	Widespread	LC				x											x					
A flea beetle	*Crepidodera aurata*	Chrysomelidae	Widespread	LC				x	x	x	x			x		x								
A flea beetle	*Crepidodera fulvicornis*	Chrysomelidae	Widespread	LC					x															
A leaf beetle	*Cryptocephalus aureolus*	Chrysomelidae	Local	LC												x	x		x		x	x		
A leaf beetle	*Cryptocephalus fulvus*	Chrysomelidae	Widespread	LC				x		x						x		x	x			x		
A leaf beetle	*Cryptocephalus hypochaeridis*	Chrysomelidae	Nationally Scarce	LC	x	x	x	x		x	x	x				x	x	x	x		x	x	x	
A leaf beetle	*Cryptocephalus labiatus*	Chrysomelidae	Widespread	LC				x								x								
A pot beetle	*Cryptocephalus moraei*	Chrysomelidae	Widespread	LC														x	x					
A pot beetle	*Cryptocephalus parvulus*	Chrysomelidae	Nationally Scarce	LC												x								
A leaf beetle	*Cryptocephalus pusillus*	Chrysomelidae	Widespread	LC			x														x			
A leaf beetle	*Galeruca tanaceti*	Chrysomelidae	Local	LC			x																	
A leaf beetle	*Galerucella lineola*	Chrysomelidae	Widespread	LC					x															

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A leaf beetle	*Galerucella sagittariae*	Chrysomelidae	Widespread	LC	x																	x		
a leaf beetle	*Longitarsus dorsalis*	Chrysomelidae	Local	LC														x						
A flea beetle	*Longitarsus exoletus*	Chrysomelidae	Local	LC														x						
A flea beetle	*Longitarsus flavicornis*	Chrysomelidae	Widespread	LC								x						x	x			x	x	
A flea beetle	*Longitarsus gracilis*	Chrysomelidae	Widespread	LC												x						x	x	
A flea beetle	*Longitarsus luridus*	Chrysomelidae	Widespread	LC		x	x		x															
A flea beetle	*Longitarsus melanocephalus*	Chrysomelidae	Widespread	LC		x				x								x	x				x	
A flea beetle	*Longitarsus parvulus*	Chrysomelidae	Local	LC			x																	x
A flea beetle	*Longitarsus pratensis*	Chrysomelidae	Widespread	LC	x	x	x	x		x	x	x					x		x			x	x	
A flea beetle	*Longitarsus succineus*	Chrysomelidae	Widespread	LC		x										x	x							x
A flea beetle	*Longitarsus suturellus*	Chrysomelidae	Widespread	LC						x														
A flea beetle	*Neocrepidodera ferruginea*	Chrysomelidae	Widespread	LC								x	x						x			x	x	
A flea beetle	*Neocrepidodera transversa*	Chrysomelidae	Widespread	LC							x								x		x	x	x	
A leaf beetle	*Oulema melanopus*	Chrysomelidae	Widespread	LC							x													
A leaf beetle	*Phaedon cochleariae*	Chrysomelidae	Widespread	LC	x																			
A flea beetle	*Phyllotreta atra*	Chrysomelidae	Widespread	LC	x													x			x			
A flea beetle	*Phyllotreta cruciferae*	Chrysomelidae	Nationally Scarce	LC	x																			
A flea beetle	*Phyllotreta nigripes*	Chrysomelidae	Widespread	LC		x				x	x													
A flea beetle	*Phyllotreta undulata*	Chrysomelidae	Widespread	LC		x																		
A flea beetle	*Phyllotreta vittula*	Chrysomelidae	Local	LC	x				x				x	x										
A flea beetle	*Psylliodes chrysocephala*	Chrysomelidae	Widespread	LC												x			x				x	
A flea beetle	*Sphaeroderma rubidum*	Chrysomelidae	Widespread	LC																	x			
A flea beetle	*Sphaeroderma testaceum*	Chrysomelidae	Widespread	LC			x										x				x	x		
Two-spot Ladybird	*Adalia bipunctata*	Coccinellidae	Widespread	LC		x										x					x			
10-spot Ladybird	*Adalia decempunctata*	Coccinellidae	Widespread	LC			x	x	x	x						x					x	x		
Water Ladybird	*Anisosticta novemdecimpunctata*	Coccinellidae	Widespread	LC									x											
Kidney-spot ladybird	*Chilocorus renipustulatus*	Coccinellidae	Widespread	LC										x										
A ladybird beetle	*Clitostethus arcuatus*	Coccinellidae	Nationally Endangered (RDB1 pre-1994)						x															
A ladybird beetle	*Coccidula rufa*	Coccinellidae	Widespread	LC	x		x					x	x											
A ladybird beetle	*Coccidula scutellata*	Coccinellidae	Local	LC					x															x
Seven-spot Ladybird	*Coccinella septempunctata*	Coccinellidae	Widespread	LC	x	x	x	x	x	x	x	x	x	x		x	x		x	x	x	x	x	x
Orange Ladybird	*Halyzia sedecimguttata*	Coccinellidae	Local	LC													x							
Harlequin Ladybird	*Harmonia axyridis*	Coccinellidae	Introduced invasive							x									x	x	x	x		
Adonis Ladybird	*Hippodamia variegata*	Coccinellidae	Nationally Scarce	LC		x	x	x		x						x	x		x					
A ladybird beetle	*Nephus redtenbacheri*	Coccinellidae	Widespread	LC			x	x			x	x							x					
A ladybird beetle	*Platynaspis luteorubra*	Coccinellidae	Nationally Scarce	LC												x	x		x					
14-spot Ladybird	*Propylea*	Coccinellidae	Widespread	LC	x	x						x		x		x					x	x	x	

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	quattuordecimpunctata																							
22-spot Ladybird	*Psyllobora vigintiduopunctata*	Coccinellidae	Widespread	LC	x	x	x		x	x				x			x	x	x		x	x	x	
A ladybird beetle	*Rhyzobius chrysomeloides*	Coccinellidae	Local	LC				x	x							x		x	x			x		
A ladybird	*Rhyzobius forestieri*	Coccinellidae	None native introduction (Australia)																		x			
A ladybird beetle	*Rhyzobius litura*	Coccinellidae	Widespread	LC	x	x		x		x	x	x	x	x			x	x	x		x	x	x	
A ladybird beetle	*Rhyzobius lophanthae*	Coccinellidae	None native introduction (New Zealand)						x										x					
A ladybird	*Scymnus frontalis*	Coccinellidae	Local	LC												x		x	x					
A ladybird	*Scymnus haemorrhoidalis*	Coccinellidae	Local	LC															x			x		
A ladybird beetle	*Scymnus limbatus*	Coccinellidae	Nationally Scarce	LC					x															
24-spot Ladybird	*Subcoccinella vigintiquatuorpunctata*	Coccinellidae	Widespread	LC	x	x	x	x			x	x		x		x	x	x			x	x	x	
16-spot Ladybird	*Tytthaspis sedecimpunctata*	Coccinellidae	Widespread	LC	x	x	x	x		x	x	x	x	x		x	x		x				x	
A cryptophagid beetle	*Antherophagus pallens*	Cryptophagidae	Local	LC												x								
A cryptophagid beetle	*Atomaria fuscata*	Cryptophagidae	Widespread										x											
A cryptophagid beetle	*Atomaria gutta*	Cryptophagidae	Local										x											
A weevil	*Anthonomus pedicularius*	Curculionidae	Widespread	LC				x						x				x						
Strawberry-blossom weevil	*Anthonomus rubi*	Curculionidae	Widespread	LC			x	x	x								x	x	x			x	x	x
A weevil	*Archarius pyrrhoceras*	Curculionidae	Widespread	LC								x												
A weevil	*Archarius salicivorus*	Curculionidae	Widespread	LC			x			x	x					x								
A weevil	*Brachypera zoilus*	Curculionidae	Local																			x		
A weevil	*Calosirus terminatus*	Curculionidae	Nationally Scarce																x					
A weevil	*Cathormiocerus spinosus*	Curculionidae	Nationally Scarce	LC												x								
A weevil	*Ceutorhynchus contractus*	Curculionidae	Widespread	LC							x												x	
A weevil	*Ceutorhynchus obstrictus*	Curculionidae	Widespread	LC	x	x	x			x	x			x		x	x	x	x		x	x	x	
A weevil	*Ceutorhynchus pallidactylus*	Curculionidae	Widespread				x									x								
A weevil	*Ceutorhynchus turbatus*	Curculionidae	Local	LC	x		x																x	x
A weevil	*Ceutorhynchus typhae*	Curculionidae	Widespread	LC		x	x			x	x													
A weevil	*Cosmobaris scolopacea*	Curculionidae	Nationally Rare (pre-1994)		x																			
A weevil	*Dorytomus dejeani*	Curculionidae	Local																		x			
A weevil	*Dorytomus melanophthalmus*	Curculionidae	Widespread	LC					x	x	x										x			
A weevil	*Dorytomus rufatus*	Curculionidae	Widespread	LC				x	x		x					x								
A weevil	*Dorytomus taeniatus*	Curculionidae	Widespread	LC			x	x	x	x	x					x			x		x			
A broad-nosed weevil	*Exomias pellucidus*	Curculionidae	Widespread	LC	x		x	x			x	x										x		
A weevil	*Glocianus distinctus*	Curculionidae	Local	LC			x	x		x	x						x		x		x		x	
A weevil	*Glocianus punctiger*	Curculionidae	Nationally Scarce				x				x													

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A bark beetle	*Hylastinus obscurus*	Curculionidae	Local									x												
A bark beetle	*Hylurgops palliatus*	Curculionidae	Local														x							
A weevil	*Hypera fuscocinerea*	Curculionidae	Nationally Scarce					x										x						
A weevil	*Hypera nigrirostris*	Curculionidae	Widespread			x					x								x					
A weevil	*Hypera plantaginis*	Curculionidae	Widespread					x								x								
A weevil	*Hypera postica*	Curculionidae	Widespread			x	x	x		x	x								x		x	x	x	
A weevil	*Hypera venusta*	Curculionidae	Local													x								
A weevil	*Larinus planus*	Curculionidae	Nationally Scarce	LC										x										
A true weevil	*Larinus turbinatus*	Curculionidae	Unknown	NA										x										
A weevil	*Liparus coronatus*	Curculionidae	Nationally Scarce B				x																	
A weevil	*Lixus scabricollis*	Curculionidae	RDBK (insufficiently known - pre-1994 criteria)		x																			
A weevil	*Macrorhyncolus littoralis*	Curculionidae	Recent UK colonist	NA	x				x															
A weevil	*Magdalis barbicornis*	Curculionidae	Nationally Scarce																			x		
A weevil	*Mecinus pascuorum*	Curculionidae	Widespread			x	x	x		x	x	x				x	x		x			x	x	x
A weevil	*Mecinus pyraster*	Curculionidae	Widespread					x									x						x	
A weevil	*Microplontus campestris*	Curculionidae	[Nationally Scarce B]													x	x				x			
A weevil	*Mogulones asperifoliarum*	Curculionidae	Local															x	x					
A weevil	*Mononychus punctumalbum*	Curculionidae	[Nationally Scarce A]													x								
A weevil	*Orthochaetes setiger*	Curculionidae	Nationally Scarce																				x	
A weevil	*Otiorhynchus indefinitus*	Curculionidae	Established introduction				x	x																
A weevil	*Otiorhynchus ovatus*	Curculionidae	Local						x													x		
A weevil	*Otiorhynchus rugosotriatus*	Curculionidae	Local					x																
A weevil	*Parethelcus pollinarius*	Curculionidae	Widespread																			x		
A weevil	*Phyllobius maculicornis*	Curculionidae	Widespread								x					x						x	x	
A weevil	*Phyllobius oblongus*	Curculionidae	Local													x	x	x			x			
A weevil	*Phyllobius pyri*	Curculionidae	Widespread				x				x					x					x			
A weevil	*Phyllobius roboretanus*	Curculionidae	Widespread			x	x			x						x	x							
A weevil	*Phyllobius virideaeris*	Curculionidae	Widespread			x	x	x		x	x					x		x				x	x	x
A weevil	*Polydrusus cervinus*	Curculionidae	Widespread					x								x								
A weevil	*Polydrusus formosus*	Curculionidae	Nationally Scarce													x					x	x		
A weevil	*Polydrusus impressifrons*	Curculionidae	Recent UK colonist																					x
A weevil	*Rhamphus pulicarius*	Curculionidae	Local				x		x		x													
A weevil	*Rhinoncus pericarpius*	Curculionidae	Widespread									x						x					x	
A weevil	*Rhinusa antirrhini*	Curculionidae	Local													x	x							
A weevil	*Romualdius angustisetulus*	Curculionidae	Local					x	x															

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A weevil	*Sciaphilus asperatus*	Curculionidae	Widespread				x																	
A pea weevil	*Sitona cylindricollis*	Curculionidae	Local				x											x						
A pea weevil	*Sitona hispidulus*	Curculionidae	Widespread			x													x		x	x		
A pea weevil	*Sitona humeralis*	Curculionidae	Local							x		x				x	x	x	x			x		
A pea weevil	*Sitona lepidus*	Curculionidae	Widespread													x								
A pea weevil	*Sitona lineatus*	Curculionidae	Widespread			x	x	x		x	x	x	x	x		x	x	x	x		x	x	x	x
A weevil	*Sitona macularius?*	Curculionidae	[Nationally Scarce B]													x								
A weevil	*Sitona puncticollis*	Curculionidae	Local																x					
A weevil	*Sitona striatellus*	Curculionidae	Widespread							x														
A weevil	*Sitona sulcifrons*	Curculionidae	Local			x		x		x	x					x	x		x					
A weevil	*Sitona waterhousei*	Curculionidae	Nationally Scarce							x						x			x					
A weevil	*Smicronyx reichi*	Curculionidae	[RDB3]					x																
A weevil	*Tanymecus palliatus*	Curculionidae	Nationally Scarce				x																	
A weevil	*Trachyphloeus spinimanus*	Curculionidae	[Nationally Scarce B]														x							
A weevil	*Trichosirocalus troglodytes*	Curculionidae	Widespread	LC			x	x	x	x	x						x		x		x	x	x	
A weevil	*Tychius junceus*	Curculionidae	Local	LC		x	x	x		x	x	x					x		x					
A weevil	*Tychius meliloti*	Curculionidae	Local	LC			x	x		x	x					x								
A weevil	*Tychius picirostris*	Curculionidae	Widespread	LC			x	x		x				x		x			x		x	x	x	x
A weevil	*Tychius schneideri*	Curculionidae	Nationally Scarce	LC				x																
A weevil	*Tychius squamulatus*	Curculionidae	Nationally Scarce				x																	
A weevil	*Tychius stephensi*	Curculionidae	Local	LC		x										x								
A weevil	*Zacladus exiguus*	Curculionidae	Nationally Scarce B	LC																		x		
A dasytid beetle	*Dasytes aeratus*	Dasytidae	Widespread	LC				x	x	x												x		
A dermestid beetle	*Anthrenus fuscus*	Dermestidae	Local	LC				x																
Carpet Beetle	*Anthrenus verbasci*	Dermestidae	Widespread	LC													x							
A drilid beetle	*Drilus flavescens*	Drilidae	Local	LC				x		x														
A dryopid beetle	*Dryops luridus*	Dryopidae	Widespread	LC								x												
A diving beetle	*Agabus bipustulatus*	Dytiscidae	Widespread	LC						x														
A diving beetle	*Agabus conspersus*	Dytiscidae	Nationally Scarce	LC									x									x		
A diving beetle	*Agabus didymus*	Dytiscidae	Widespread	LC								x										x		
A diving beetle	*Agabus nebulosus*	Dytiscidae	Widespread	LC									x	x				x						
A diving beetle	*Agabus sturmii*	Dytiscidae	Widespread	LC								x										x		
A diving beetle	*Colymbetes fuscus*	Dytiscidae	Widespread	LC			x		x			x												
A diving beetle	*Dytiscus circumcinctus*	Dytiscidae	Nationally Scarce	LC					x															
A diving beetle	*Graptodytes bilineatus*	Dytiscidae	Nationally Scarce	LC					x															
A diving beetle	*Graptodytes pictus*	Dytiscidae	Widespread	LC					x			x												
A diving beetle	*Hydroglyphus geminus*	Dytiscidae	Widespread	LC					x				x	x										
A diving beetle	*Hydroporus angustatus*	Dytiscidae	Widespread	LC								x												

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A diving beetle	*Hydroporus erythrocephalus*	Dytiscidae	Widespread	LC								x												
A diving beetle	*Hydroporus incognitus*	Dytiscidae	Widespread	LC			x																	
A diving beetle	*Hydroporus palustris*	Dytiscidae	Widespread	LC					x		x	x	x					x						
A diving beetle	*Hydroporus planus*	Dytiscidae	Widespread	LC					x	x		x						x				x		
A diving beetle	*Hygrotus confluens*	Dytiscidae	Widespread	LC			x						x											
A diving beetle	*Hygrotus impressopunctatus*	Dytiscidae	Widespread	LC			x		x		x	x	x											
A diving beetle	*Hygrotus impressopunctatus lineellus*	Dytiscidae	Widespread	LC									x											
A diving beetle	*Hygrotus inaequalis*	Dytiscidae	Widespread	LC					x	x	x	x	x	x										
A diving beetle	*Hygrotus parallellogrammus*	Dytiscidae	Nationally Scarce	LC									x											
A diving beetle	*Hygrotus versicolor*	Dytiscidae	Widespread	LC					x			x												
A diving beetle	*Hyphydrus ovatus*	Dytiscidae	Widespread	LC					x	x		x	x											
A diving beetle	*Ilybius ater*	Dytiscidae	Widespread	LC					x															
A diving beetle	*Ilybius guttiger*	Dytiscidae	Local	LC								x												
A diving beetle	*Liopterus haemorrhoidalis*	Dytiscidae	Widespread	LC								x												
A diving beetle	*Rhantus frontalis*	Dytiscidae	Nationally Scarce	LC					x		x		x											
A diving beetle	*Rhantus grapii*	Dytiscidae	Local	LC					x		x													
A diving beetle	*Rhantus suturalis*	Dytiscidae	Local	LC							x													
A diving beetle	*Stictotarsus duodecimpustulatus*	Dytiscidae	Widespread	LC								x						x						
A click beetle	*Agriotes acuminatus*	Elateridae	Widespread	LC						x							x							
A click beetle	*Agriotes lineatus*	Elateridae	Widespread	LC	x			x				x		x			x							
A click beetle	*Agriotes obscurus*	Elateridae	Widespread	LC	x			x								x								
A click beetle	*Agriotes sputator*	Elateridae	Widespread	LC	x		x	x		x		x				x	x		x		x	x		
A click beetle	*Agrypnus murinus*	Elateridae	Widespread	LC			x	x	x	x	x	x				x	x		x		x	x		
A click beetle	*Athous campyloides*	Elateridae	Nationally Scarce																x					
A click beetle	*Athous haemorrhoidalis*	Elateridae	Widespread	LC					x	x						x								
An erirhinid weevil	*Notaris scirpi*	Erirhinidae	[Nationaly Scarce B]						x															
A whirligig beetle	*Gyrinus caspius*	Gyrinidae	Widespread	LC									x											
A whirligig beetle	*Gyrinus paykulli*	Gyrinidae	Nationally Scarce	LC					x				x											
A whirligig beetle	*Gyrinus substriatus*	Gyrinidae	Widespread	LC					x			x	x											
A crawling water beetle	*Haliplus apicalis*	Haliplidae	Nationally Scarce	LC									x											
A crawling water beetle	*Haliplus immaculatus*	Haliplidae	Widespread	LC					x			x	x	x										
A crawling water beetle	*Haliplus lineatocollis*	Haliplidae	Widespread	LC					x					x										
A crawling water beetle	*Haliplus obliquus*	Haliplidae	Widespread	LC					x				x	x										
A crawling water beetle	*Haliplus ruficollis*	Haliplidae	Widespread	LC					x			x	x	x										
A crawling water beetle	*Peltodytes caesus*	Haliplidae	Nationally Scarce	LC			x		x	x		x	x	x										
A hydraenid beetle	*Hydraena rufipes/britteni/riparia*	Hydraenidae	Unknown	Unknown																		x		
A hydraenid beetle	*Ochthebius dilatatus*	Hydraenidae	Widespread	LC								x	x											

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A hydraenid beetle	*Ochthebius minimus*	Hydraenidae	Widespread	LC			x											x						
A hydraenid beetle	*Ochthebius nanus*	Hydraenidae	Nationally Scarce	LC									x											
A hydraenid beetle	*Ochthebius viridis*	Hydraenidae	Nationally Scarce	LC			x																	
A water scavenger beetle	*Anacaena bipustulata*	Hydrophilidae	Local	LC														x						
A water scavenger beetle	*Anacaena globulus*	Hydrophilidae	Widespread	LC						x		x												
A water scavenger beetle	*Anacaena limbata*	Hydrophilidae	Widespread	LC					x			x										x		
A water scavenger beetle	*Berosus affinis*	Hydrophilidae	Local	LC					x	x		x	x					x						
A water scavenger beetle	*Berosus luridus*	Hydrophilidae	Nationally Scarce	NT					x	x		x	x	x										
A water scavenger beetle	*Berosus signaticollis*	Hydrophilidae	Local	LC					x				x											
A water scavenger beetle	*Cryptopleurum crenatum*	Hydrophilidae	Nationally Scarce	LC									x											
A water scavenger beetle	*Cymbiodyta marginellus*	Hydrophilidae	Widespread	LC					x			x												
A water scavenger beetle	*Enochrus coarctatus*	Hydrophilidae	Widespread	LC					x				x											
A water scavenger beetle	*Enochrus halophilus*	Hydrophilidae	Nationally Scarce	LC									x											
A water scavenger beetle	*Enochrus ochropterus*	Hydrophilidae	Widespread	LC					x															
A water scavenger beetle	*Enochrus testaceus*	Hydrophilidae	Widespread	LC					x	x			x											
A water scavenger beetle	*Helochares lividus*	Hydrophilidae	Widespread	LC					x									x						
A grooved water scavenger beetle	*Helophorus aequalis*	Hydrophilidae	Widespread	LC								x												
A grooved water scavenger beetle	*Helophorus alternans*	Hydrophilidae	Nationally Scarce (Na)	LC								x	x											
A grooved water scavenger beetle	*Helophorus arvernicus*	Hydrophilidae	Local	LC			x						x	x				x						
A grooved water scavenger beetle	*Helophorus brevipalpis*	Hydrophilidae	Widespread	LC			x		x			x	x											
A grooved water scavenger beetle	*Helophorus fulgidicollis*	Hydrophilidae	Nationally Scarce	LC								x	x											
A grooved water scavenger beetle	*Helophorus griseus*	Hydrophilidae	Widespread	LC						x	x	x	x					x						
A grooved water scavenger beetle	*Helophorus minutus*	Hydrophilidae	Widespread	LC								x	x											
A grooved water scavenger beetle	*Helophorus nanus*	Hydrophilidae	Nationally Scarce	LC									x											
A grooved water scavenger beetle	*Helophorus nubilus*	Hydrophilidae	Nationally Scarce					x																
A grooved water scavenger beetle	*Helophorus obscurus*	Hydrophilidae	Widespread	LC									x											
A water scavenger beetle	*Hydrobius fuscipes*	Hydrophilidae	Widespread	LC					x			x	x											
A water scavenger beetle	*Hydrochus ignicollis*	Hydrophilidae	Near Threatened	NT					x															
Great Silver Water Beetle	*Hydrophilus piceus*	Hydrophilidae	NT (Near Threatened)	NT									x					x						
A water scavenger beetle	*Laccobius minutus*	Hydrophilidae	Widespread	LC					x		x	x	x											
A water scavenger beetle	*Laccobius striatulus*	Hydrophilidae	Widespread	LC								x												
A water scavenger beetle	*Laccophilus hyalinus*	Hydrophilidae	Widespread	LC					x			x												
A water scavenger beetle	*Laccophilus minutus*	Hydrophilidae	Widespread	LC					x															
A water scavenger beetle	*Megasternum concinnum*	Hydrophilidae	Widespread																			x		

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Screech Beetle	*Hygrobia hermanni*	Hygrobiidae	Widespread	LC					x															
A false pollen beetle	*Brachypterolus pulicarius*	Kateretidae	Local							x														
A latridiid beetle	*Cartodere bifasciata*	Latridiidae	Widespread		x								x											
A latridiid beetle	*Corticaria crenulata*	Latridiidae	Local		x																			
A latridiid beetle	*Corticaria impressa*	Latridiidae	Local		x			x			x	x	x									x	x	
A latridiid beetle	*Corticarina minuta*	Latridiidae	Widespread		x	x			x	x	x		x										x	
A latridiid beetle	*Cortinicara gibbosa*	Latridiidae	Widespread				x	x		x	x	x		x			x	x				x		
A latridiid beetle	*Enicmus transversus*	Latridiidae	Widespread		x				x			x					x						x	
A latridiid beetle	*Melanophthalma sp*	Latridiidae	Unknown				x																	
A latridiid beetle	*Melanophthalma suturalis*	Latridiidae	Unknown						x	x														
A fungus beetle	*Catops chrysomeloides*	Leiodidae	Local											x										
A fungus beetle	*Catops nigricans*	Leiodidae	Local					x																
A fungus beetle	*Catops tristis*	Leiodidae	Local		x																			
A malachite beetle	*Anthocomus rufus*	Malachiidae	Local	LC		x							x	x										
A malachite beetle	*Axinotarsus pulicarius*	Malachiidae	Nationally Rare	VU	x																			
A malachite beetle	*Cerapheles terminatus*	Malachiidae	Nationally Rare	LC					x															
A malachite beetle	*Cordylepherus viridis*	Malachiidae	Local	LC	x	x	x	x	x	x	x	x		x		x	x	x	x		x	x	x	x
A malachite beetle	*Malachius bipustulatus*	Malachiidae	Widespread	LC			x	x		x				x		x	x	x	x		x		x	
A mordellid beetle	*Mordellistena neuwaldeggiana*	Mordellidae	Nationally Scarce	LC				x	x															
A mordellid beetle	*Mordellistena parvula*	Mordellidae	Nationally Scarce	LC													x		x		x			
A tumbling flower beetle	*Mordellistena pumila*	Mordellidae	Local	LC	x			x	x							x	x	x				x	x	
A tumbling flower beetle	*Mordellistena variegata*	Mordellidae	Nationally Scarce	LC				x	x					x										
A tumbling flower beetle	*Mordellochroa abdominalis*	Mordellidae	Local	LC													x							
A sap beetle	*Epuraea aestiva*	Nitidulidae	Widespread	LC													x							
A pollen beetle	*Meligethes aeneus*	Nitidulidae	Widespread	LC	x	x	x	x	x	x	x			x		x	x	x	x		x	x	x	x
A pollen beetle	*Meligethes carinulatus*	Nitidulidae	Local	LC	x																			
A pollen beetle	*Meligethes nigrescens*	Nitidulidae	Widespread	LC		x	x			x	x	x				x	x		x					
A pollen beetle	*Meligethes rotundicollis*	Nitidulidae	Nationally Scarce	LC												x							x	
Larger Noterus	*Noterus clavicornis*	Noteridae	Widespread	LC					x	x		x	x					x						
Wharf Borer	*Nacerdes melanura*	Oedemeridae	Local	LC			x																	
Lurid Flower Beetle	*Oedemera lurida*	Oedemeridae	Widespread	LC		x	x	x	x	x	x	x		x		x	x	x	x		x	x	x	x
Thick-kneed Flower Beetle	*Oedemera nobilis*	Oedemeridae	Widespread	LC	x	x	x	x	x	x	x	x		x		x	x	x	x		x	x	x	x
A shining flower beetle	*Olibrus aeneus*	Phalacridae	Widespread	LC						x	x								x		x			
A shining flower beetle	*Olibrus affinis*	Phalacridae	Local	LC			x	x													x			
A shining flower beetle	*Olibrus corticalis*	Phalacridae	Local																		x			
A shining flower beetle	*Olibrus flavicornis*	Phalacridae	Red Data Book-insufficiently known	DD		x	x	x	x	x	x	x		x		x	x	x	x		x	x	x	x
A shining flower beetle	*Olibrus liquidus*	Phalacridae	Local	LC		x		x		x		x												x

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A shining flower beetle	*Phalacrus fimetarius*	Phalacridae	Local	LC		x	x	x			x	x												x
A phalacrid beetle	*Stilbus oblongus*	Phalacridae	Local										x											
A shining flower beetle	*Stilbus testaceus*	Phalacridae	Widespread	LC	x													x						
A wood-boring beetle	*Ochina ptinoides*	Ptinidae	Widespread	LC															x					
Six-spotted spider beetle	*Ptinus sexpunctatus*	Ptinidae	Local	LC								x												
Red-headed Cardinal Beetle	*Pyrochroa serraticornis*	Pyrochoridae	Widespread	LC								x		x				x						
Apple Fruit Rhynchites	*Neocoenorrhinus aequatus*	Rhynchitidae	Widespread	LC			x				x			x			x	x	x			x		x
A leaf-rolling weevil	*Neocoenorrhinus germanicus*	Rhynchitidae	Widespread	LC						x									x					
A leaf-rolling weevil	*Temnocerus nanus*	Rhynchitidae	Local								x													
A dung beetle	*Aphodius plagiatus*	Scarabaeidae	Nationally Scarce									x												
The Welsh Chafer	*Hoplia philanthus*	Scarabaeidae	Local	LC			x	x	x	x	x					x	x		x			x		
A dung beetle	*Onthophagus joannae*	Scarabaeidae	Local																			x	x	
Brown chafer	*Serica brunnea*	Scarabaeidae	Local						x															
A scirtid beetle	*Cyphon coarctatus*	Scirtidae	Widespread	LC			x	x	x	x		x												
A scirtid beetle	*Cyphon hilaris*	Scirtidae	Widespread						x					x										
A scirtid beetle	*Cyphon laevipennis*	Scirtidae	Widespread									x	x											
A scirtid beetle	*Cyphon palustris*	Scirtidae	Widespread						x															
A scirtid beetle	*Cyphon variabilis*	Scirtidae	Widespread	LC				x																
A scirtid beetle	*Microcara testacea*	Scirtidae	Widespread	LC					x				x											
A scraptiid beetle	*Anaspis maculata*	Scraptiidae	Widespread	LC			x					x		x			x	x	x		x	x		
A scraptiid beetle	*Anaspis pulicaria*	Scraptiidae	Local	LC			x	x		x	x					x		x	x					
A carrion beetle	*Nicrophorus interruptus*	Silphidae	Nationally Scarce	LC	x																			
A silphid beetle	*Silpha laevigata*	Silphidae	Local	LC	x			x								x								
A silphid beetle	*Silpha tristis*	Silphidae	Local	LC												x								
A silvanid beetle	*Psammoecus bipunctatus*	Silvanidae	Widespread										x											
A rove beetle	*Achenium depressum*	Staphylinidae	Unknown											x										
A rove beetle	*Aleochara bipustulata*	Staphylinidae	Local		x																			
A rove beetle	*Amischa decipiens*	Staphylinidae	Local										x											
A rove beetle	*Amischa nigrofusca*	Staphylinidae	Local		x																			
A rove beetle	*Anotylus rugosus*	Staphylinidae	Widespread		x		x					x		x										
A rove beetle	*Anotylus sculpturatus*	Staphylinidae	Widespread									x												
A rove beetle	*Astenus lyonessius*	Staphylinidae	Local	LC														x					x	
A rove beetle	*Bledius limicola*	Staphylinidae	Local		x							x												
A rove beetle	*Bledius spectabilis*	Staphylinidae	Local	LC								x												
A rove beetle	*Bledius tricornis*	Staphylinidae	Nationally Scarce				x					x												
A rove beetle	*Brachygluta fossulata*	Staphylinidae	Widespread									x												
A rove beetle	*Brachygluta helferi*	Staphylinidae	Local		x																			
A rove beetle	*Drusilla canaliculata*	Staphylinidae	Widespread	LC	x	x	x	x	x		x	x				x	x					x		

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A rove beetle	*Falagrioma thoracica*	Staphylinidae	Local						x			x												
A rove beetle	*Gyrohypnus fracticornis*	Staphylinidae	Local		x																			
A rove beetle	*Lathrobium fulvipenne*	Staphylinidae	Widespread									x												
A rove beetle	*Lomechusa emarginata*	Staphylinidae	Nationally Scarce																			x		
A rove beetle	*Metopsia clypeata*	Staphylinidae	Widespread	LC			x			x	x					x	x	x	x		x	x	x	
A rove beetle	*Micropeplus staphylinoides*	Staphylinidae	Widespread	LC				x																
A rove beetle	*Mocyta fungi agg.*	Staphylinidae	Widespread		x																	x		
A rove beetle	*Ocypus brunnipes*	Staphylinidae	Local					x																
Devil's Coach-horse	*Ocypus olens*	Staphylinidae	Widespread	LC	x			x						x			x		x		x	x		
A rove beetle	*Paederus riparius*	Staphylinidae	Widespread	LC	x							x												
A rove beetle	*Philonthus concinnus*	Staphylinidae	Widespread		x																			
A rove beetle	*Philonthus quisquiliarius*	Staphylinidae	Widespread									x	x											
A rove beetle	*Platydracus stercorarius*	Staphylinidae	Local					x	x					x										
A rove beetle	*Platystethus alutaceus*	Staphylinidae	Local										x											
A rove beetle	*Platystethus arenarius*	Staphylinidae	Widespread					x																
A rove beetle	*Platystethus cornutus*	Staphylinidae	Widespread								x		x											
A rove beetle	*Platystethus nitens*	Staphylinidae	Local											x										
A rove beetle	*Quedius cruentus*	Staphylinidae	Local											x										
A rove beetle	*Quedius fuliginosus*	Staphylinidae	Widespread					x																
A rove beetle	*Quedius levicollis*	Staphylinidae	Widespread					x																
A rove beetle	*Quedius molochinus*	Staphylinidae	Widespread		x																			
A rove beetle	*Quedius picipes*	Staphylinidae	Widespread					x																
A rove beetle	*Quedius picipes*	Staphylinidae	Widespread		x													x						
A rove beetle	*Quedius schatzmayri*	Staphylinidae	Widespread			x																		
A rove beetle	*Quedius semiobscurus*	Staphylinidae	Widespread					x											x					
A rove beetle	*Quedius simplicifrons*	Staphylinidae	Local		x																			
A rove beetle	*Sepedophilus nigripennis*	Staphylinidae	Widespread				x	x	x	x	x					x	x	x			x		x	
A rove beetle	*Staphylinus dimidiaticornis*	Staphylinidae	Local		x									x										
A rove beetle	*Stenus aceris*	Staphylinidae	Local				x	x		x	x	x				x	x	x			x	x	x	
A rove beetle	*Stenus boops*	Staphylinidae	Widespread										x											
A rove beetle	*Stenus brunnipes*	Staphylinidae	Widespread				x				x													
A rove beetle	*Stenus clavicornis*	Staphylinidae	Widespread									x										x		
A rove beetle	*Stenus fulvicornis*	Staphylinidae	Widespread										x					x						
A rove beetle	*Stenus impressus*	Staphylinidae	Widespread			x	x	x		x	x					x	x	x			x	x	x	
A rove beetle	*Stenus ossium*	Staphylinidae	Widespread					x			x	x		x				x					x	
A rove beetle	*Stenus similis*	Staphylinidae	Widespread															x				x		
A rove beetle	*Tachinus laticollis*	Staphylinidae	Widespread		x		x																	
A rove beetle	*Tachyporus atriceps*	Staphylinidae	Local					x				x												
A rove beetle	*Tachyporus chrysomelinus*	Staphylinidae	Widespread														x					x		

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A rove beetle	*Tachyporus dispar*	Staphylinidae	Widespread		x				x									x			x	x	x	
A rove beetle	*Tachyporus hypnorum*	Staphylinidae	Widespread		x	x	x	x		x				x		x	x	x	x		x	x	x	
A rove beetle	*Tachyporus nitidulus*	Staphylinidae	Widespread				x						x						x		x	x		
A rove beetle	*Tachyporus solutus*	Staphylinidae	Widespread																			x		
A rove beetle	*Tasgius ater*	Staphylinidae	Local		x																			
A rove beetle	*Tasgius globulifer*	Staphylinidae	Local											x										
A rove beetle	*Tasgius morsitans*	Staphylinidae	Widespread		x																			
A rove beetle	*Tasgius winkleri*	Staphylinidae	Local					x																
A rove beetle	*Thinonoma atra*	Staphylinidae	Local										x											
A rove beetle	*Xantholinus elegans*	Staphylinidae	Local		x																x			
A rove beetle	*Xantholinus linearis*	Staphylinidae	Widespread		x			x				x		x										
A rove beetle	*Xantholinus longiventris*	Staphylinidae	Widespread		x																			
A darkling beetle	*Isomira murina*	Tenebrionidae	Local	LC	x		x	x	x	x				x										
A darkling beetle	*Lagria hirta*	Tenebrionidae	Widespread	LC															x			x		
A throscid beetle	*Trixagus carinifrons*	Throscidae	Local											x										
A throscid beetle	*Trixagus dermestoides*	Throscidae	Local						x															
A throscid beetle	*Trixagus obtusus*	Throscidae	Local						x					x										
Hop-garden Earwig	*Apterygida media*	Forficulidae	Nationally Scarce	LC						x						x	x		x					
Common Earwig	*Forficula auricularia*	Forficulidae	Widespread	LC	x		x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	
Lesne's Earwig	*Forficula lesnei*	Forficulidae	Nationally Scarce	LC																		x		
Water fleas (Diplostraca)																								
A water flea	*Simocephalus vetulus*	Daphniidae	Widespread	LC						x														
Two-winged flies (Diptera)																								
An anthomyiid fly	*Adia cinerella*	Anthomyiidae	Local		x						x		x	x			x		x			x		
An anthomyiid fly	*Anthomyia liturata*	Anthomyiidae	Widespread				x			x						x		x	x		x			
An anthomyiid fly	*Anthomyia pluvialis*	Anthomyiidae	Local							x								x						
An anthomyiid fly	*Anthomyia procellaris*	Anthomyiidae	Local															x						
An anthomyiid fly	*Botanophila depressa*	Anthomyiidae	pNearThreatened		x																			
An anthomyiid fly	*Delia floralis*	Anthomyiidae	Unknown																		x			
An anthomyiid fly	*Delia platura*	Anthomyiidae	Widespread		x		x	x		x	x					x	x	x	x		x	x		
An anthomyiid fly	*Delia radicum*	Anthomyiidae	Widespread																			x		
An anthomyiid fly	*Pegomya cunicularia*	Anthomyiidae	Unknown		x											x						x		
Violet Black-legged Robberfly	*Dioctria atricapilla*	Asilidae	Widespread	LC	x		x																	
Fan-bristled Robberfly	*Dysmachus trigonus*	Asilidae	Widespread													x								
Striped Slender Robberfly	*Leptogaster cylindrica*	Asilidae	Widespread	LC	x			x									x						x	
Kite-tailed Robberfly	*Machimus atricapillus*	Asilidae	Widespread					x		x	x					x	x	x	x			x		
An asteiid fly	*Asteia concinna*	Asteiidae	Local		x		x																	
Dark-edged Beefly	*Bombylius major*	Bombyliidae	Widespread	LC				x	x	x								x						
A calliphorid fly	*Bellardia viarum*	Calliphoridae	Widespread																			x		

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A calliphorid fly	*Bellardia vulgaris*	Calliphoridae	Widespread															x						
A calliphorid fly	*Calliphora vicina*	Calliphoridae	Widespread															x	x		x	x		
A calliphorid fly	*Lucilia caesar*	Calliphoridae	Widespread				x				x							x			x			
A calliphorid fly	*Lucilia illustris*	Calliphoridae	Widespread		x		x				x					x	x	x	x		x	x		
A calliphorid fly	*Lucilia sericata*	Calliphoridae	Widespread		x		x	x		x	x					x	x	x	x		x	x		
A calliphorid fly	*Melanomya nana*	Calliphoridae	Widespread															x				x		
A calliphorid fly	*Pollenia angustigena*	Calliphoridae	Widespread																x					
A calliphorid fly	*Pollenia pediculata*	Calliphoridae	Widespread				x															x		
A calliphorid fly	*Pollenia rudis*	Calliphoridae	Widespread				x										x	x	x		x	x		
A chamaemyid fly	*Chamaemyia flavipalpis*	Chamaemyiidae	Widespread				x	x				x				x			x			x		
A chloropid fly	*Calamoncosis glyceriae*	Chloropidae	Local								x													
A chloropid fly	*Cetema neglectum*	Chloropidae	Widespread										x											
A chloropid fly	*Chlorops hypostigma*	Chloropidae	Widespread									x												
A chloropid fly	*Chlorops pumilionis*	Chloropidae	Widespread			x	x			x	x		x				x		x					
A chloropid fly	*Dicraeus fennicus*	Chloropidae	Local		x		x	x															x	
A chloropid fly	*Dicraeus scibilis*	Chloropidae	pNS		x			x																
A chloropid fly	*Diplotoxa messoria*	Chloropidae	Local										x											
A chloropid fly	*Elachiptera brevipennis*	Chloropidae	Local		x								x											
A chloropid fly	*Elachiptera cornuta*	Chloropidae	Widespread										x											
A chloropid fly	*Elachiptera tuberculifera*	Chloropidae	Local				x	x						x										
A chloropid fly	*Lasiosina cinctipes*	Chloropidae	Local		x	x	x	x		x		x					x		x					
A chloropid fly	*Lasiosina herpini*	Chloropidae	Unknown				x																	
A chloropid fly	*Meromyza femorata*	Chloropidae	Widespread							x						x			x		x			
A chloropid fly	*Meromyza nigriventris*	Chloropidae	Widespread		x			x								x	x		x		x	x		
A chloropid fly	*Meromyza pallida*	Chloropidae	Local				x	x									x							
A chloropid fly	*Meromyza sp.*	Chloropidae	Unknown		x	x											x				x		x	
A chloropid fly	*Oscinella frit*	Chloropidae	Widespread		x	x	x	x		x		x	x	x		x		x	x		x	x	x	
A chloropid fly	*Oscinella nitidissima*	Chloropidae	Local				x																	
A chloropid fly	*Oscinimorpha minutissima*	Chloropidae	Local		x		x	x		x	x		x			x								
A chloropid fly	*Thaumatomyia glabra*	Chloropidae	Widespread		x			x									x		x			x	x	
A chloropid fly	*Thaumatomyia hallandica*	Chloropidae	Widespread			x	x			x	x	x				x	x		x			x		
A chloropid fly	*Thaumatomyia notata*	Chloropidae	Widespread		x					x									x				x	
A chloropid fly	*Trachysiphonella ruficeps*	Chloropidae	pNS		x												x							
A chloropid fly	*Trachysiphonella scutellata*	Chloropidae	Nationally Scarce		x		x	x		x	x		x			x		x			x	x	x	
A chloropid fly	*Tricimba cincta*	Chloropidae	Local														x		x			x		
A conopid fly	*Thecophora atra*	Conopidae	Local					x			x								x					
A long-legged fly	*Chrysotus blepharosceles*	Dolichopodidae	Widespread																		x	x		
A long-legged fly	*Dolichopus clavipes*	Dolichopodidae	Local		x																			
A long-legged fly	*Dolichopus festivus*	Dolichopodidae	Widespread																x					

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A long-legged fly	*Dolichopus griseipennis*	Dolichopodidae	Widespread		x						x		x						x					
A long-legged fly	*Dolichopus nubilus*	Dolichopodidae	Widespread										x											
A long-legged fly	*Dolichopus plumipes*	Dolichopodidae	Widespread										x											
A long-legged fly	*Hercostomus chrysozygos*	Dolichopodidae	Local										x											
A long-legged fly	*Machaerium maritimae*	Dolichopodidae	Local		x																			
A long-legged fly	*Medetera dendrobaena*	Dolichopodidae	Local							x									x		x	x		
A long-legged fly	*Medetera petrophiloides*	Dolichopodidae	Local										x											
A long-legged fly	*Micromorphus albipes*	Dolichopodidae	Widespread		x																			
A long-legged fly	*Poecilobothrus nobilitatus*	Dolichopodidae	Widespread					x					x											
A long-legged fly	*Poecilobothrus nobilitatus*	Dolichopodidae	Widespread				x																	
A long-legged fly	*Sciapus laetus*	Dolichopodidae	Ns		x																			
A long-legged fly	*Sciapus wiedemanni*	Dolichopodidae	Local	LC								x												
A drosophlid fly	*Drosophila suzukii*	Drosophilidae	Local															x						
A drosophlid fly	*Scaptomyza pallida*	Drosophilidae	Widespread		x					x									x		x	x		
An ephydid fly	*Clanoneurum cimiciforme*	Ephydridae	Local		x																			
An ephydid fly	*Ephydra riparia*	Ephydridae	Local		x								x											
An ephydid fly	*Hyadina guttata*	Ephydridae	Local					x																
An ephydid fly	*Hydrellia griseola*	Ephydridae	Widespread													x								
An ephydid fly	*Hydrellia maura*	Ephydridae	Widespread					x											x			x		
An ephydid fly	*Lamproscatella sibilans*	Ephydridae	Local		x																			
An ephydid fly	*Notiphila graecula*	Ephydridae	Local		x								x											
An ephydid fly	*Notiphila riparia*	Ephydridae	Widespread										x											
An ephydid fly	*Philygria interstincta*	Ephydridae	Local					x																
An ephydid fly	*Psilopa leucostoma*	Ephydridae	Local		x		x																	
An ephydid fly	*Psilopa nitidula*	Ephydridae	Local		x			x					x						x			x	x	
An ephydid fly	*Scatella tenuicosta*	Ephydridae	Widespread		x								x			x								
A fanniid fly	*Fannia lucidula*	Fanniidae	Nationally Scarce		x																			
A lauxaniid fly	*Minettia tabidiventris*	Lauxaniidae	Widespread					x		x							x	x	x		x	x	x	
A lauxaniid fly	*Sapromyza quadripunctata*	Lauxaniidae	Widespread			x	x	x		x	x	x							x		x	x		x
A lauxaniid fly	*Tricholauxania praeusta*	Lauxaniidae	Widespread																			x		
A limonid cranefly	*Symplecta stictica*	Limoniidae	Widespread		x								x											
A spear-winged fly	*Lonchoptera furcata*	Lonchopteridae	Widespread															x						
A spear-winged fly	*Lonchoptera lutea*	Lonchopteridae	Widespread							x			x					x			x			
A muscid fly	*Coenosia atra*	Muscidae	Provisionally Nationally Scarce		x												x					x	x	
A muscid fly	*Coenosia tigrina*	Muscidae	Widespread							x	x								x					
A muscid fly	*Helina evecta*	Muscidae	Widespread							x							x		x					
A muscid fly	*Helina quadrum*	Muscidae	Local																x					
A muscid fly	*Helina reversio*	Muscidae	Widespread		x			x		x						x	x		x		x			

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A muscid fly	*Helina setiventris*	Muscidae	Local																		x	x		
A muscid fly	*Morellia simplex*	Muscidae	Widespread																x					
A muscid fly	*Musca autumnalis*	Muscidae	Widespread							x							x	x	x					
A muscid fly	*Muscina prolapsa*	Muscidae	Widespread														x							
A muscid fly	*Phaonia cincta*	Muscidae	Nationally Scarce															x						
A muscid fly	*Phaonia rufipalpis*	Muscidae	Local							x								x						
A muscid fly	*Phaonia subventa*	Muscidae	Widespread															x						
A muscid fly	*Phaonia tuguriorum*	Muscidae	Widespread				x									x	x		x					
A muscid fly	*Polietes lardarius*	Muscidae	Widespread		x																			
An opomyzid fly	*Geomyza apicalis*	Opomyzidae	pNS								x													
An opomyzid fly	*Geomyza tripunctata*	Opomyzidae	Widespread														x		x					
An opomyzid fly	*Opomyza germinationis*	Opomyzidae	Widespread										x					x						
A rust fly	*Chamaepsila nigricornis*	Psilidae	Widespread				x																	
A woodlouse fly	*melanophora roralis*	Rhinophoridae	Local																				x	
A woodlouse fly	*Phyto melanocephala*	Rhinophoridae	Widespread																x					
A woodlouse fly	*Rhinophora lepida*	Rhinophoridae	Widespread		x		x	x		x	x					x	x	x	x		x	x		
A woodlouse fly	*Stevenia deceptoria*	Rhinophoridae	Recent UK colonist													x	x		x					
A woodlouse fly	*Tricogena rubricosa*	Rhinophoridae	Local													x								
A flesh fly	*Blaesoxipha plumicornis*	Sarcophagidae	Provisionally Nationally Scarce				x			x						x		x	x		x	x		
A flesh fly	*Nyctia halterata*	Sarcophagidae	Widespread					x		x								x			x			
A flesh fly	*Ravinia pernix*	Sarcophagidae	Local					x			x											x		
A flesh fly	*Sarcophaga africa*	Sarcophagidae	Local														x							
A flesh fly	*Sarcophaga anaces*	Sarcophagidae	Local					x			x					x		x	x					
A flesh fly	*Sarcophaga carnaria*	Sarcophagidae	Widespread				x	x			x						x	x	x		x			
A flesh fly	*Sarcophaga crassimargo*	Sarcophagidae	Widespread				x																	
A flesh fly	*Sarcophaga dissimilis*	Sarcophagidae	Widespread														x							
A flesh fly	*Sarcophaga filia*	Sarcophagidae	Local					x		x	x					x	x					x		
A flesh fly	*Sarcophaga haemorrhoa*	Sarcophagidae	Widespread					x								x	x	x	x			x		
A flesh fly	*Sarcophaga hirticrus*	Sarcophagidae	Local		x			x			x					x								
A flesh fly	*Sarcophaga incisilobata*	Sarcophagidae	Widespread		x		x	x		x						x	x	x	x		x	x		
A flesh fly	*Sarcophaga melanura*	Sarcophagidae	Widespread							x							x		x					
A flesh fly	*Sarcophaga nigriventris*	Sarcophagidae	Widespread		x		x	x		x	x					x	x	x	x		x	x		
A flesh fly	*Sarcophaga pumila*	Sarcophagidae	Widespread				x				x					x	x				x			
A flesh fly	*Sarcophaga rosellei*	Sarcophagidae	Local															x						
A flesh fly	*Sarcophaga subulata*	Sarcophagidae	pNS				x																	
A flesh fly	*Sarcophaga subvicina*	Sarcophagidae	Widespread								x					x	x		x					
A flesh fly	*Sarcophaga teretirostris*	Sarcophagidae	Widespread		x		x	x								x	x	x	x		x			
A flesh fly	*Sarcophaga vagans*	Sarcophagidae	Widespread		x					x								x						

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A flesh fly	*Sarcophaga variegata*	Sarcophagidae	Widespread		x			x			x					x	x		x		x			
A flesh fly	*Sarcophila latifrons*	Sarcophagidae	pNS				x	x		x						x								
A dung fly	*Scathophaga litorea*	Scathophagidae	Widespread		x								x											
A dung fly	*Scathophaga stercoraria*	Scathophagidae	Widespread										x											
A sciomyzid fly	*Colobaea punctata*	Sciomyzidae	Nationally Scarce										x											
A sciomyzid fly	*Coremacera marginata*	Sciomyzidae	Widespread		x		x					x					x	x					x	
A sciomyzid fly	*Dichetophora obliterata*	Sciomyzidae	Local																		x			
A sciomyzid fly	*Ditaeniella grisescens*	Sciomyzidae	Nationally Scarce										x											
A sciomyzid fly	*Hydromya dorsalis*	Sciomyzidae	Widespread										x											
A sciomyzid fly	*Limnia unguicornis*	Sciomyzidae	Local					x									x	x	x		x			
A sciomyzid fly	*Pherbellia cinerella*	Sciomyzidae	Widespread									x				x			x			x		
A sciomyzid fly	*Pherbellia dorsata*	Sciomyzidae	Nationally Scarce										x											
A sciomyzid fly	*Pherbellia griseola*	Sciomyzidae	Nationally Scarce										x											
A sciomyzid fly	*Pherbina coryleti*	Sciomyzidae	Widespread		x																			
A sciomyzid fly	*Sepedon sphegea*	Sciomyzidae	Widespread										x											
A sciomyzid fly	*Sepedon spinipes*	Sciomyzidae	Widespread										x											
A sciomyzid fly	*Tetanocera ferruginea*	Sciomyzidae	Widespread										x											
A sciomyzid fly	*Trypetoptera punctulata*	Sciomyzidae	Widespread					x										x						
A sepsid fly	*Saltella sphondylii*	Sepsidae	Widespread		x		x									x						x		
A sepsid fly	*Sepsis fulgens*	Sepsidae	Widespread			x	x						x						x					
A sepsid fly	*Sepsis punctum*	Sepsidae	Widespread					x		x			x											
A sepsid fly	*Themira lucida*	Sepsidae	Widespread										x											
A blackfly	*Simulium angustitarse*	Simulidae	Unknown	Unknown																		x		
A sphaerocerid fly	*Copromyza stercoraria*	Sphaeroceridae	Widespread		x																			
A sphaerocerid fly	*Leptocera nigra*	Sphaeroceridae	Local		x			x														x		
A sphaerocerid fly	*Pteremis fenestralis*	Sphaeroceridae	Widespread											x									x	
A sphaerocerid fly	*Rachispoda lutosoidea*	Sphaeroceridae	Local		x			x					x											
Broad Centurion	*Chloromyia formosa*	Stratiomyidae	Widespread		x																			
A soldierfly	*Chorisops nagatomi/tibialis*	Stratiomyidae	Unknown	LC																		x		
Dull Four-spined Legionnaire	*Chorisops tibialis*	Stratiomyidae	Widespread																			x		
Green gem	*Microchrysa flavicornis*	Stratiomyidae	Widespread									x												
Flecked Snout	*Nemotelus notatus*	Stratiomyidae	Local		x	x	x									x								
Barred Snout	*Nemotelus uliginosus*	Stratiomyidae	Local					x																
Three-lined Soldier	*Oxycera trilineata*	Stratiomyidae	Local										x											
Dark-winged Black	*Pachygaster atra*	Stratiomyidae	Widespread	LC	x		x												x		x	x		
Flecked General	*Stratiomys singularior*	Stratiomyidae	Local	LC	x			x																
A hoverfly	*Chrysotoxum bicinctum*	Syrphidae	Widespread					x										x				x		
Marmalade Hoverfly	*Episyrphus balteatus*	Syrphidae	Widespread	LC												x			x		x	x		x
A hoverfly	*Eristalinus aeneus*	Syrphidae	Local		x											x								

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A hoverfly	*Eristalinus sepulchralis*	Syrphidae	Local		x			x			x											x		
A hoverfly	*Eristalis arbustorum*	Syrphidae	Widespread							x									x					
A hoverfly	*Eupeodes corollae*	Syrphidae	Widespread																			x		
A hoverfly	*Helophilus hybridus*	Syrphidae	Local		x																			
A hoverfly	*Helophilus pendulus*	Syrphidae	Widespread	LC			x	x																
A hoverfly	*Helophilus trivittatus*	Syrphidae	Widespread	LC				x																
A hoverfly	*Myathropa florea*	Syrphidae	Widespread	LC													x		x		x		x	
A hoverfly	*Paragus haemorrhous*	Syrphidae	Widespread															x						
A hoverfly	*Pipizella viduata*	Syrphidae	Widespread					x											x		x	x		
A hoverfly	*Platycheirus albimanus*	Syrphidae	Widespread															x						
A hoverfly	*Scaeva pyrastri*	Syrphidae	Widespread	LC												x								
A hoverfly	*Sphaerophoria scripta*	Syrphidae	Widespread	LC		x										x		x	x		x			
A hoverfly	*Syritta pipiens*	Syrphidae	Widespread													x								
A hoverfly	*Volucella bombylans*	Syrphidae	Widespread	LC														x						
Hornet Hoverfly	*Volucella zonaria*	Syrphidae	Local	LC														x						
A hoverfly	*Xanthogramma pedissequum*	Syrphidae	Widespread							x														
Orange-belted Hoverfly	*Xylota segnis*	Syrphidae	Widespread	LC			x																	
Twin-lobed Deerfly	*Chrysops relictus*	Tabanidae	Widespread	LC												x								
A tachinid fly	*Aplomya confinis*	Tachinidae	Local													x								
A tachinid fly	*Catharosia pygmaea*	Tachinidae	Recent UK colonist							x								x						
A tachinid fly	*Cistogaster globosa*	Tachinidae	RDB2 (check)				x									x								
A tachinid fly	*Compsilura concinnata*	Tachinidae	Local				x																	
A tachinid fly	*Dinera grisescens*	Tachinidae	Local		x		x																	
A tachinid fly	*Eriothrix rufomaculata*	Tachinidae	Widespread		x		x	x		x	x					x	x		x		x	x	x	
A tachinid fly	*Estheria cristata*	Tachinidae	Local				x	x								x								
A tachinid fly	*Gastrolepta anthracina*	Tachinidae	Local							x														
A tachinid fly	*Gymnosoma rotundatum*	Tachinidae	RDB3 'rare' pre-1994 criteria																			x		
A tachinid fly	*Phania funesta*	Tachinidae	Widespread		x																			
A tachinid fly	*Phasia pusilla*	Tachinidae	Widespread																x			x		
A tachinid fly	*Siphona sp.*	Tachinidae	Unknown																				x	
A tachinid fly	*Solieria pacifica*	Tachinidae	Local															x						
A tachinid fly	*Thelaira nigripes*	Tachinidae	Widespread														x							
A tachinid fly	*Voria ruralis*	Tachinidae	Widespread		x													x	x			x		
A tephritid fly	*Campiglossa plantaginis*	Tephritidae	Local			x																		
A tephritid fly	*Chaetorellia jaceae*	Tephritidae	Local															x						
A tephritid fly	*Merzomyia westermanni*	Tephritidae	Nationally Scarce				x																	
A tephritid fly	*Miltogramma germari*	Tephritidae	pNS													x								
A tephritid fly	*Myopites eximius*	Tephritidae	RDB 3		x																			

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A tephritid fly	*Tephritis cometa*	Tephritidae	Local																		x			
A tephritid fly	*Tephritis formosa*	Tephritidae	Widespread					x																
A tephritid fly	*Tephritis neesii*	Tephritidae	Local		x		x			x				x					x			x	x	
A tephritid fly	*Tephritis vespertina*	Tephritidae	Widespread																x					
A tephritid fly	*Urophora quadrifasciata*	Tephritidae	Local															x						
Crochet-hooked Stiletto	*Thereva plebeja*	Therevidae	Local		x																			
A tiger cranefly	*Nephrotoma flavescens*	Tipulidae	Widespread	LC				x																
A cranefly	*Tipula paludosa*	Tipulidae	Widespread										x											
Phoenix Fly	*Dorycera graminum*	Ulidiidae	S41 Priority species; Near Threatened (Post-2001 IUCN criteria); RDB3 'rare' pre-1994	NT													x						x	
A ulidiid fly	*Melieria omissa*	Ulidiidae	Local										x											
A ulidiid fly	*Melieria picta*	Ulidiidae	pNS		x			x																
A ulidiid fly	*Melieria crassipennis*	Ulidiidae	Widespread										x											
Mayflies (Ephemeroptera)																								
Large Dark Olive	*Baetis rhodani*	Baetidae	Widespread	LC																		x		
Pond Olive	*Cloeon dipterum*	Baetidae	Widespread	LC			x		x	x	x	x	x	x										
An angler's curse mayfly larva	*Caenis horaria*	Caenidae	Widespread	LC					x															
An angler's curse mayfly larva	*Caenis luctuosa/macrura*	Caenidae	Unknown	Unknown					x															
An angler's curse mayfly larva	*Caenis robusta*	Caenidae	Widespread	LC					x															
Centipedes, millipedes and pill millipedes (Myriopoda)																								
A centipede	*Henia vesuviana*	Dignathodontidae	Nationally Scarce						x															
A centipede	*Geophilus flavus*	Geophilidae	Local					x																
Common Pill Millipede	*Glomeris marginata*	Glomeridae	Widespread	LC														x	x	x				
A centipede	*Lithobius forficatus*	Lithobiidae	Widespread	LC	x			x	x			x		x										
A stone centipede	*Lithobius microps*	Lithobiidae	Widespread	LC			x	x																
Striped Millipede	*Ommatoiulus sabulosus*	Julidae	Widespread	LC			x																	
Leeches (Hirudinea)																								
A freshwater leech	*Helobdella stagnalis*	Glossiphoniidae	Widespread	LC					x	x		x												
A freshwater leech	*Alboglossiphonia heteroclita*	Rhynchobdellida	Widespread	LC					x			x												
A freshwater leech	*Theromyzon tessulatum*	Rhynchobdellida	Widespread	LC					x				x											
True bugs (Diplostraca)																								
Hawthorn Shieldbug	*Acanthosoma haemorrhoidale*	Acanthosomatidae	Widespread	LC					x											x				
Birch Shieldbug	*Elasmostethus interstinctus*	Acanthosomatidae	Widespread	LC						x														
Parent Bug	*Elasmucha grisea*	Acanthosomatidae	Widespread													x								
Broad-headed Bug	*Alydus calcaratus*	Alydidae	Nationally Scarce	LC		x	x	x								x	x	x			x			
A flower bug	*Anthocoris confusus*	Anthocoridae	Widespread	LC														x						

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A flower bug	*Anthocoris nemoralis*	Anthocoridae	Widespread	LC					x								x	x			x	x		
Common Flower Bug	*Anthocoris nemorum*	Anthocoridae	Widespread	LC					x					x								x		
A flower bug	*Cardiastethus fasciiventris*	Anthocoridae	Local	LC										x								x		
A flower bug	*Orius laticollis*	Anthocoridae	Local																			x		
A flower bug	*Orius majusculus*	Anthocoridae	Widespread	LC															x					
A flower bug	*Orius niger*	Anthocoridae	Widespread	LC													x	x				x		x
A flower bug	*Orius vicinus*	Anthocoridae	Local	LC			x	x	x					x								x		
Alder Spittlebug	*Aphrophora alni*	Aphrophoridae	Widespread	LC					x	x											x			
A froghopper	*Neophilaenus campestris*	Aphrophoridae	Widespread	LC				x								x		x	x		x	x	x	
A froghopper	*Neophilaenus lineatus*	Aphrophoridae	Widespread	LC		x							x				x	x						
Common Froghopper	*Philaenus spumarius*	Aphrophoridae	Widespread	LC			x	x					x	x			x	x	x			x	x	
A stilt bug	*Berytinus hirticornis*	Berytidae	Nationally Scarce	LC				x									x	x				x		
A stiltbug	*Berytinus signoreti*	Berytidae	Widespread	LC				x																
A leafhopper	*Adarrus ocellaris*	Cicadellidae	Widespread	LC							x	x												
A leafhopper	*Agallia consobrina*	Cicadellidae	Widespread	LC				x										x						
A leafhopper	*Allygus mixtus*	Cicadellidae	Widespread	LC																		x		
A leafhopper	*Anaceratagallia ribauti*	Cicadellidae	Local	LC	x	x	x	x	x	x	x		x	x		x	x	x	x		x	x	x	
A leafhopper	*Anaceratagallia venosa*	Cicadellidae	Widespread	LC			x	x								x	x							
A leafhopper	*Anoscopus albifrons*	Cicadellidae	Widespread	LC			x					x							x					
A leafhopper	*Anoscopus serratulae*	Cicadellidae	Widespread	LC	x		x	x						x									x	
A leafhopper	*Aphrodes aestuarina*	Cicadellidae	Nationally Scarce	LC	x																			
A leafhopper	*Aphrodes makarovi*	Cicadellidae	Widespread	LC	x	x					x			x		x			x		x	x	x	
A leafhopper	*Arboridia parvula*	Cicadellidae	Local	LC														x						
A leafhopper	*Arthaldeus pascuellus*	Cicadellidae	Widespread	LC									x				x	x	x			x		
A leafhopper	*Athysanus argentarius*	Cicadellidae	Local	LC				x						x					x					
A leafhopper	*Batracomorphus allionii*	Cicadellidae	Recent UK colonist	NA			x																	
A leafhopper	*Deltocephalus pulicaris*	Cicadellidae	Widespread	LC							x		x									x		
A leafhopper	*Doratura stylata*	Cicadellidae	Widespread	LC		x					x								x			x		
A leafhopper	*Elymana sulphurella*	Cicadellidae	Widespread					x																
A leafhopper	*Eupelix cuspidata*	Cicadellidae	Local	LC			x	x			x					x	x	x	x					
A leafhopper	*Eupteryx aurata*	Cicadellidae	Widespread	LC	x				x					x										
A leafhopper	*Eupteryx florida*	Cicadellidae	Widespread	LC										x										
A leafhopper	*Eupteryx notata*	Cicadellidae	Widespread	LC																		x		
A leafhopper	*Eupteryx urticae*	Cicadellidae		LC								x		x										
A leafhopper	*Eupteryx vittata*	Cicadellidae	Widespread	LC																		x		
A planthopper	*Eurysa lineata*	Cicadellidae	Local	LC		x																		
A leafhopper	*Euscelis incisus*	Cicadellidae	Widespread	LC		x		x		x	x		x			x	x	x	x		x	x	x	x
A leafhopper	*Euscelis lineolatus*	Cicadellidae	Widespread	LC																	x			
A leafhopper	*Graphocraerus ventralis*	Cicadellidae	Local	LC										x				x						

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A leafhopper	*Ledra aurita*	Cicadellidae	Local	LC					x								x							
A leafhopper	*Limotettix striola*	Cicadellidae	Local	LC																				
A leafhopper	*Macropsis fuscula*	Cicadellidae	Local	LC				x		x														
A leafhopper	*Macropsis infuscata*	Cicadellidae	Local	LC				x			x					x					x			
A leafhopper	*Macropsis scotti*	Cicadellidae	Widespread	LC				x										x						
a leafhopper	*Macropsis scutellata*	Cicadellidae	Widespread																			x		
A leafhopper	*Macrosteles sardus*	Cicadellidae	First UK record	LC										x										
A leafhopper	*Macrosteles sexnotatus*	Cicadellidae	Widespread	LC									x											
A leafhopper	*Macrosteles viridigriseus*	Cicadellidae	Widespread	LC																		x		
A leafhopper	*Macustus grisescens*	Cicadellidae	Widespread	LC													x							
A leafhopper	*Megophthalmus scanicus*	Cicadellidae	Widespread	LC		x				x	x					x	x	x			x	x	x	
A leafhopper	*Megopthalmus scabripennis*	Cicadellidae	Widespread	LC			x																	
A leafhopper	*Metidiocerus rutilans*	Cicadellidae	Local	LC												x								
A leafhopper	*Mocydia crocea*	Cicadellidae	Widespread	LC	x	x	x				x			x			x	x	x		x	x		
A leafhopper	*Mocydiopsis attenuata*	Cicadellidae	Widespread	LC												x							x	
a leafhopper	*Mocydiopsis parvicauda*	Cicadellidae	Widespread	LC				x											x					
A leafhopper	*Oncopsis flavicollis*	Cicadellidae	Widespread	LC					x															
A leafhopper	*Oncopsis subangulata*	Cicadellidae	Widespread	LC												x								
A leafhopper	*Orientus ishidae*	Cicadellidae	Unknown																			x		
A leafhopper	*Paralimnus phragmitis*	Cicadellidae	Nationally Scarce	LC										x										
A leafhopper	*Psammotettix alienus*	Cicadellidae	RDBK 'unknown'					x					x											
A leafhopper	*Psammotettix confinis*	Cicadellidae	Widespread	LC		x		x			x	x	x						x		x			
A leafhopper	*Psammotettix helvolus*	Cicadellidae	Unknown							x	x					x			x			x	x	x
A leafhopper	*Psammotettix putoni*	Cicadellidae	Local	LC	x																			
A leafhopper	*Rhopalopyx elongata*	Cicadellidae	Unknown	LC										x					x					
A leafhopper	*Rhytistylus proceps*	Cicadellidae	Widespread	LC												x						x		
A leafhopper	*Ribautiana tenerrima*	Cicadellidae	Widespread	LC																		x		
A leafhopper	*Streptanus aemulans*	Cicadellidae	Widespread	LC	x		x							x										
A leafhopper	*Synophropsis lauri*	Cicadellidae	Recent UK colonist							x														
A leafhopper	*Thamnotettix dilutior*	Cicadellidae	Widespread	LC					x															
A leafhopper	*Zygina flammigera*	Cicadellidae	Widespread	LC					x															
A leafhopper	*Zyginidia scutellaris*	Cicadellidae	Widespread	LC		x	x				x	x		x							x	x		
A lacehopper	*Cixius nervosus*	Cixiidae	Widespread	LC				x																
A lacehopper	*Pentastiridius leporinus*	Cixiidae	Nationally Scarce	LC	x				x															
A lacehopper	*Reptalus quinquecostatus*	Cixiidae	Nationally Scarce					x																
A lacehopper	*Tachycixius pilosus*	Cixiidae	Widespread	LC			x				x	x		x	x	x								
Slender-horned Leatherbug	*Ceraleptus lividus*	Coreidae	Nationally Scarce	LC		x	x									x			x		x			
Dock Bug	*Coreus marginatus*	Coreidae	Widespread	LC			x	x		x						x			x		x	x	x	
Denticulate Leatherbug	*Coriomeris denticulatus*	Coreidae	Widespread	LC		x	x	x			x				x		x		x			x	x	x

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Box Bug	*Gonocerus acuteangulatus*	Coreidae	Local	LC			x		x	x							x		x	x		x		
A lesser waterboatman	*Callicorixa praeusta*	Corixidae	Widespread	LC					x	x		x	x											
A lesser waterboatman	*Corixa affinis/panzeri*	Corixidae	Unknown	Unknown									x											
A lesser waterboatman	*Corixa panzeri*	Corixidae	Widespread	LC							x		x											
A lesser waterboatman	*Corixa punctata*	Corixidae	Widespread	LC					x		x	x	x	x								x		
A lesser waterboatman	*Cymatia coleoptrata*	Corixidae	Widespread	LC					x	x														
A lesser waterboatman	*Hesperocorixa linnaei*	Corixidae	Widespread	LC					x				x											
A lesser waterboatman	*Hesperocorixa moesta*	Corixidae	Local	LC									x											
A lesser waterboatman	*Hesperocorixa sahlbergi*	Corixidae	Widespread	LC					x		x	x												
A lesser waterboatman	*Sigara concinna*	Corixidae	Widespread	LC					x	x		x	x											
A lesser waterboatman	*Sigara dorsalis*	Corixidae	Widespread	LC										x				x						
A lesser waterboatman	*Sigara dorsalis/striata*	Corixidae	Unknown	Unknown					x			x	x	x										
A lesser waterboatman	*Sigara falleni*	Corixidae	Widespread	LC					x	x		x	x	x										
A lesser waterboatman	*Sigara fossarum*	Corixidae	Widespread	LC					x			x												
A lesser waterboatman	*Sigara lateralis*	Corixidae	Widespread	LC						x			x	x										
A lesser waterboatman	*Sigara selecta*	Corixidae	Nationally Scarce	LC									x											
A lesser waterboatman	*Sigara stagnalis*	Corixidae	Local	LC					x				x											
Rambur's Pied Shieldbug	*Tritomegas sexmaculatus*	Cydnidae	Recent UK colonist	NA	x									x			x						x	
A planthopper	*Asiraca clavicornis*	Delphacidae	Nationally Scarce	LC		x	x	x		x	x			x		x	x	x	x	x			x	
A planthopper	*Criomorphus albomarginatus*	Delphacidae	Widespread	LC												x						x		
A planthopper	*Delphax pulchellus*	Delphacidae	Local	LC							x	x												
A planthopper	*Dicranotropis hamata*	Delphacidae	Widespread	LC										x								x		x
A planthopper	*Eurybregma nigrolineata*	Delphacidae	Local	LC										x			x				x	x		
A planthopper	*Eurysa lineata*	Delphacidae	Local	LC			x			x							x		x					
A planthopper	*Hyledelphax elegantulus*	Delphacidae	Widespread	LC												x	x	x				x		
A planthopper	*Javesella dubia*	Delphacidae	Widespread	LC									x					x						
A planthopper	*Javesella pellucida*	Delphacidae	Widespread	LC			x	x			x	x	x								x			
A planthopper	*Laodelphax striatella*	Delphacidae	Nationally Scarce										x											
A planthopper	*Muirodelphax aubei*	Delphacidae	Local	LC	x																			
A planthopper	*Prokelisia marginata*	Delphacidae	Introduced (North America)		x																			
A planthopper	*Stenocranus minutus*	Delphacidae	Widespread	LC													x							
A planthopper	*Xanthodelphax straminea*	Delphacidae	Local	LC																				
A pond skater	*Aquarius paludum*	Gerridae	Nationally Scarce	LC									x											
A pond skater	*Gerris lacustris*	Gerridae	Widespread	LC					x															
A pond skater	*Gerris thoracicus*	Gerridae	Widespread	LC								x	x											
A planthopper	*Issus coleoptratus*	Issidae	Widespread	LC															x					
A ground bug	*Beosus maritimus*	Lygaeidae	Local																		x			
A ground bug	*Chilacis typhae*	Lygaeidae	Widespread	LC			x		x			x	x											

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A ground bug	*Cymus glandicolor*	Lygaeidae	Widespread	LC										x										
A ground bug	*Cymus melanocephalus*	Lygaeidae	Widespread	LC	x	x		x			x													
A ground bug	*Drymus latus*	Lygaeidae	Nationally Scarce														x					x		
A ground bug	*Drymus sylvaticus*	Lygaeidae	Widespread	LC														x				x		
Nettle Ground Bug	*Heterogaster urticae*	Lygaeidae	Widespread	LC				x						x				x						
European Clinchbug	*Ischnodemus sabuleti*	Lygaeidae	Widespread	LC	x	x	x	x		x	x	x		x			x	x	x		x		x	
Birch Catkin Bug	*Kleidocerys resedae*	Lygaeidae	Widespread	LC			x	x	x	x	x		x	x		x						x		
A ground bug	*Megalonotus antennatus*	Lygaeidae	Nationally Scarce	LC			x																	
A ground bug	*Megalonotus chiragra*	Lygaeidae	Widespread	LC				x									x					x		
A ground bug	*Megalonotus emarginatus*	Lygaeidae	Local	LC													x							x
A ground bug	*Metapoplax ditomoides*	Lygaeidae	Recent UK colonist	NA			x														x		x	x
A ground bug	*Nysius huttoni*	Lygaeidae	Recent UK colonist	NA				x						x										
A ground bug	*Nysius senecionis*	Lygaeidae	Widely scattered	LC	x		x							x			x	x				x		
A ground bug	*Peritrechus geniculatus*	Lygaeidae	Widespread	LC							x			x		x	x	x					x	
A ground bug	*Peritrechus lundii*	Lygaeidae	Local	LC														x						
A ground bug	*Peritrechus nubilus*	Lygaeidae	Local														x							
A ground bug	*Scolopostethus affinis*	Lygaeidae	Widespread	LC	x									x				x						
A ground bug	*Stygnocoris fuligineus*	Lygaeidae	Widespread																				x	
A ground bug	*Stygnocoris sabulosus*	Lygaeidae	Widespread				x	x		x							x							
A ground bug	*Taphropeltus contractus*	Lygaeidae	Widespread					x																
Lucerne Bug	*Adelphocoris lineolatus*	Miridae	Widespread	LC		x	x	x		x	x	x				x	x		x	x	x	x		
A mirid bug	*Amblytylus nasutus*	Miridae	Widespread	LC							x											x		
A mirid bug	*Atractotomus mali*	Miridae	Widespread	LC										x				x	x			x		
A mirid bug	*Capsus ater*	Miridae	Widespread	LC		x					x			x				x				x		
A mirid bug	*Closterotomus norwegicus*	Miridae	Widespread	LC		x										x			x			x	x	
A mirid bug	*Conostethus griseus*	Miridae	Local	LC	x																			
A mirid bug	*Deraeocoris lutescens*	Miridae	Widespread	LC					x	x				x								x		
A mirid bug	*Deraeocoris ruber*	Miridae	Widespread	LC															x					
A mirid bug	*Dicyphus epilobii*	Miridae	Widespread	LC					x					x										
A mirid bug	*Dryophilocoris flavoquadrimaculatus*	Miridae	Local	LC																			x	
A mirid bug	*Grypocoris stysi*	Miridae	Widespread	LC														x						
A mirid bug	*Heterotoma planicornis*	Miridae	Widespread	LC						x				x			x	x	x			x		
A mirid bug	*Leptopterna dolabrata*	Miridae	Widespread	LC		x																		
A mirid bug	*Leptopterna ferrugata*	Miridae	Local	LC		x										x			x					
A mirid bug	*Liocoris tripustulatus*	Miridae	Widespread																				x	
A mirid bug	*Lygus maritimus*	Miridae	Local	LC	x																			
A mirid bug	*Lygus pratensis*	Miridae	RDB3	LC	x	x	x	x		x		x		x		x	x	x	x		x	x	x	
A mirid bug	*Lygus rugulipennis*	Miridae	Widespread	LC												x			x					

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A mirid bug	*Macrotylus paykulli*	Miridae	Local	LC						x														
A mirid bug	*Malacocoris chlorizans*	Miridae	Widespread																			x		
A mirid bug	*Megaloceroea recticornis*	Miridae	Widespread	LC		x													x					
A grass bug	*Notostira elongata*	Miridae	Widespread	LC	x		x	x			x			x			x				x		x	
A mirid bug	*Orthocephalus saltator*	Miridae	Local	LC						x									x					
A mirid bug	*Orthops campestris*	Miridae	Widespread														x					x		
A mirid bug	*Orthops kalmii*	Miridae	Widespread	LC			x	x								x	x	x	x			x		
A mirid bug	*Orthotylus flavosparsus*	Miridae	Widespread		x																			
A mirid bug	*Orthotylus moncreaffi*	Miridae	Local	LC	x																			
A mirid bug	*Phytocoris ulmi*	Miridae	Widespread	LC				x	x		x								x			x		
A mirid bug	*Phytocoris varipes*	Miridae	Widespread	LC	x		x	x		x	x	x	x			x	x		x			x	x	
A mirid bug	*Pilophorus perplexus*	Miridae	Local	LC			x									x						x		
A mirid bug	*Pithanus maerkeli*	Miridae	Widespread	LC		x	x															x		
A mirid bug	*Plagiognathus arbustorum*	Miridae	Widespread	LC			x			x				x		x	x		x			x	x	
A mirid bug	*Plagiognathus chrysanthemi*	Miridae	Widespread	LC		x		x		x														
A mirid bug	*Psallus assimilis*	Miridae	Widely scattered	LC																				x
A mirid bug	*Psallus sp*	Miridae	Unknown															x						
A grass bug	*Stenodema calcarata*	Miridae	Widespread	LC		x	x	x	x	x	x	x	x	x			x							
A grass bug	*Stenodema laevigata*	Miridae	Widespread	LC	x		x							x		x	x		x		x		x	x
A mirid bug	*Stenotus binotatus*	Miridae	Widespread	LC		x																		
A mirid bug	*Sthenarus rotermundi*	Miridae	Local	LC																	x	x		
A mirid bug	*Trigonotylus caelestialium*	Miridae	Local	LC		x							x											
A mirid bug	*Trigonotylus ruficornis*	Miridae	Widespread	LC	x																			
Tree Damselbug	*Himacerus apterus*	Nabidae	Widespread	LC													x	x	x	x		x		
A damselbug	*Himacerus boops*	Nabidae	Local	LC	x						x													
Grey Damselbug	*Himacerus major*	Nabidae	Widespread	LC	x		x			x								x						
Ant Damselbug	*Himacerus mirmicoides*	Nabidae	Widespread	LC		x	x	x	x	x	x			x		x	x	x	x		x	x	x	x
Field Damselbug	*Nabis ferus*	Nabidae	Widespread	LC									x			x		x						
Marsh Damselbug	*Nabis limbatus*	Nabidae	Widespread	LC										x										
Reed Damselbug	*Nabis lineatus*	Nabidae	Local	LC							x													
A damsel bug	*Nabis pseudoferus*	Nabidae	Nationally Scarce	LC							x													
Common Damselbug	*Nabis rugosus*	Nabidae	Widespread	LC	x													x	x		x			
Saucer Bug	*Ilyocoris cimicoides*	Naucoridae	Widespread	LC			x		x	x		x	x	x				x						
Water Scorpion	*Nepa cinerea*	Nepidae	Widespread	LC					x		x	x												
A waterboatman	*Notonecta glauca*	Notonectidae	Widespread	LC					x	x	x		x	x										
A waterboatman	*Notonecta viridis*	Notonectidae	Widespread	LC						x			x											
Bishop's Mitre Shieldbug	*Aelia acuminata*	Pentatomidae	Widespread	LC	x		x	x		x	x	x		x		x	x		x	x	x		x	x
Hairy Shieldbug	*Dolycoris baccarum*	Pentatomidae	Widespread	LC			x									x	x				x	x	x	
Brassica Bug	*Eurydema oleracea*	Pentatomidae	Widespread	LC	x		x			x											x		x	

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Woundwort Shieldbug	*Eysarcoris venustissimus*	Pentatomidae	Local	LC											x									
Small Grass Shieldbug	*Neottiglossa pusilla*	Pentatomidae	Local	LC						x														
Common Green Shieldbug	*Palomena prasina*	Pentatomidae	Widespread	LC						x	x						x	x	x	x		x		
Red-legged Shieldbug	*Pentatoma rufipes*	Pentatomidae	Widespread	LC													x							
Gorse Shieldbug	*Piezodorus lituratus*	Pentatomidae	Widespread	LC		x													x					
Turtle Shieldbug	*Podops inuncta*	Pentatomidae	Local	LC	x			x		x		x				x			x		x	x	x	
Sandrunner Shieldbug	*Sciocoris cursitans*	Pentatomidae	Nationally Scarce	LC					x	x							x				x			
Bronze Shieldbug	*Troilus luridus*	Pentatomidae	Widespread	LC													x							
A beet bug	*Parapiesma quadratum*	Piesmatidae	Widespread	LC	x		x																	
A pygmy backswimmer	*Plea minutissima*	Pleidae	Widespread	LC					x			x	x	x				x				x		
A rhopalid bug	*Corizus hyoscyami*	Rhopalidae	Local	LC			x																	
A rhopalid bug	*Myrmus miriformis*	Rhopalidae	Widespread	LC		x	x									x	x	x			x	x		
A rhopalid bug	*Rhopalus subrufus*	Rhopalidae	Widespread	LC		x											x					x	x	
A rhopalid bug	*Stictopleurus abutilon*	Rhopalidae	Unknown	NA												x	x	x						
A rhopalid bug	*Stictopleurus punctatonervosus*	Rhopalidae	Unknown	NA			x			x				x			x				x		x	
A shore bug	*Chartoscirta cincta*	Saldidae	Widespread	LC									x											
A shore bug	*Saldula opacula*	Saldidae	Nationally Scarce										x											
A shore bug	*Saldula pallipes*	Saldidae	Nationally Scarce										x											
A shore bug	*Saldula saltatoria*	Saldidae	Widespread	LC		x		x				x												
Scarce Tortiose Shieldbug	*Eurygaster maura*	Scutelleridae	Nationally Scarce	LC		x					x					x					x			
A lacebug	*Acalypta parvula*	Tingidae	Widely scattered																		x	x		
A lacebug	*Kalama tricornis*	Tingidae	Local	LC			x	x		x		x							x			x		
A lacebug	*Physatocheila dumetorum*	Tingidae	Widely scattered	LC										x				x						
A lace bug	*Tingis ampliata*	Tingidae	Widespread	LC										x										
A water cricket	*Microvelia pygmaea*	Velidae	Nationally Scarce	LC									x											
A water cricket	*Microvelia reticulata*	Velidae	Widespread	LC					x															
A water cricket	*Velia caprai*	Velidae	Widespread	LC									x											
Snails and slugs (Pulmonata)																								
Grey Field Slug	*Deroceras reticulatum*	Agriolimacidae	Widespread	LC				x																
A slug	*Arion circumscriptus*	Arionidae	Local	LC				x																
Dun Sentinel	*Assiminea grayana*	Assimineidae	Nationally Scarce	LC	x					x														
Common Bithynia	*Bithynia tentaculata*	Bithyniidae	Widespread	LC								x												
Copse Snail	*Arianta arbustorum*	Helicidae	Widespread	LC						x														
Wrinkled Snail	*Candidula intersecta*	Helicidae	Widespread	LC		x	x	x	x															
White-lipped Snail	*Cepaea hortensis*	Helicidae	Widespread	LC						x														
Brown-lipped Snail	*Cepaea nemoralis*	Helicidae	Widespread	LC								x	x											
Striped Snail	*Cernuella virgata*	Helicidae	Widespread	LC						x														
Common Garden Snail	*Cornu aspersum*	Helicidae	Widespread	LC				x																

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Kentish Snail	*Monacha cantiana*	Helicidae	Widespread	LC			x	x	x															
A hairy snail	*Ashfordia granulata*	Hygromiidae	Widespread	LC										x										
Dwarf Pond Snail	*Galba truncatula*	Lymnaeidae	Widespread	LC					x	x		x	x											
Great Pond Snail	*Lymnaea stagnalis*	Lymnaeidae	Widespread	LC																		x		
Wandering Pond Snail	*Radix balthica*	Lymnaeidae	Widespread	LC					x	x		x	x	x				x				x		
Marsh Pond Snail	*Stagnicola palustris*	Lymnaeidae	Widespread	LC																		x		
Smooth Glass Snail	*Aegopinella nitidula*	Oxychilidae	Widespread	LC						x		x												
Rounded Snail	*Discus rotundatus*	Patulidae	Widespread	LC	x				x	x		x												
A bladder snail	*Physella acuta*	Physidae	Widespread	LC					x	x		x	x	x				x				x		
Whirlpool Ramshorn	*Anisus vortex*	Planorbidae	Widespread	LC								x												
Twisted Ramshorn	*Bathyomphalus contortus*	Planorbidae	Widespread	LC					x															
Nautilus Ramshorn	*Gyraulus crista*	Planorbidae	Widespread	LC					x			x	x	x								x		
The Ramshorn	*Planorbis planorbis*	Planorbidae	Widespread	LC								x	x											
Large Amber Snail	*Succinea putris*	Succineidae	Widespread	LC						x		x												
Jenkins' Spire Shell	*Potamopyrgus antpodarum*	Tateidae	Introduced (widespread)	LC					x	x				x										
Bees, ants and wasps (Aculeate Hymenoptera)																								
Gwynne's Mining Bee	*Andrena bicolor*	Andrenidae	Widespread	LC																		x		
Hawthorn Mining Bee	*Andrena chrysosceles*	Andrenidae	Widespread	LC				x						x										
Ashy Mining Bee	*Andrena cineraria*	Andrenidae	Widespread	LC				x																
Short-fringed Mining Bee	*Andrena dorsata*	Andrenidae	Widespread	LC			x	x	x	x	x			x			x		x		x		x	
Yellow-legged Mining Bee	*Andrena flavipes*	Andrenidae	Widespread	LC	x			x		x						x	x		x		x	x		
Bryony Mining Bee	*Andrena florea*	Andrenidae	RDB3 pre-1994 criteria																			x		
Tawny Mining Bee	*Andrena fulva*	Andrenidae	Widespread	LC				x		x								x				x		
Hawk'sbeard Mining Bee	*Andrena fulvago*	Andrenidae	[Nationally notable A]		x												x							
Orange-tailed Mining Bee	*Andrena haemorrhoa*	Andrenidae	Widespread	LC				x		x								x				x		
Large Meadow Mining Bee	*Andrena labialis*	Andrenidae	Local		x	x		x		x						x	x		x	x	x			
Common Mini-mining Bee	*Andrena minutula*	Andrenidae	Widespread	LC	x			x		x	x			x		x	x	x	x	x	x	x		
Plain Mini-mining Bee	*Andrena minutuloides*	Andrenidae	Nationally Scarce	LC												x								
Buffish Mining Bee	*Andrena nigroaenea*	Andrenidae	Widespread	LC	x			x	x	x							x		x					
Grey-patched Mining Bee	*Andrena nitida*	Andrenidae	Widespread				x															x		
Small Gorse Mining Bee	*Andrena ovatula*	Andrenidae	Local	LC															x					
Black Mining Bee	*Andrena pilipes*	Andrenidae	Nationally Scarce							x														
Chocolate Mining Bee	*Andrena scotica*	Andrenidae	Widespread	LC																		x		
Shiny-margined Mini-mining Bee	*Andrena semilaevis*	Andrenidae	Widespread	LC	x													x				x		
Impunctate Mini-mining Bee	*Andrena subopaca*	Andrenidae	Widespread																			x		
Wilke's Mining Bee	*Andrena wilkella*	Andrenidae	Widespread					x								x			x	x	x			
Small Shaggy Bee	*Panurgus calcaratus*	Andrenidae	Local		x		x	x		x						x	x	x	x	x	x	x		

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Green-eyed Flower Bee	*Anthophora bimaculata*	Apidae	Local	LC			x		x	x						x	x	x						
Hairy-footed Flower Bee	*Anthophora plumipes*	Apidae	Widespread	LC				x		x								x						
Four-banded Flower Bee	*Anthophora quadrimaculata*	Apidae	Nationally Scarce	LC		x			x															
Honey Bee	*Apis mellifera*	Apidae	Widespread	LC	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Garden bumblebee	*Bombus hortorum*	Apidae	Widespread														x		x					
Brown-banded Carder Bee	*Bombus humilis*	Apidae	S41 Priority species		x		x			x	x					x	x	x	x		x			
Tree Bumblebee	*Bombus hypnorum*	Apidae	Widespread	LC												x	x	x	x	x	x			
Large Red-tailed Bumblebee	*Bombus lapidarius*	Apidae	Widespread	LC	x	x	x	x		x						x	x	x	x	x	x	x	x	
Common Carder Bee	*Bombus pascuorum*	Apidae	Widespread	LC	x		x	x		x	x			x		x	x	x	x	x	x	x	x	
Early bumblebee	*Bombus pratorum*	Apidae	Widespread		x																			
Buff-tailed Bumblebee	*Bombus terrestris (agg.)*	Apidae	Widespread	LC	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Vestal Cuckoo Bee	*Bombus vestalis*	Apidae	Widespread	LC						x														
Blue Carpenter Bee	*Ceratina cyanea*	Apidae	RDB3 pre-1994 criteria	LC				x	x	x	x			x		x	x	x	x					
Black-thighed Epeolus	*Epeolus variegatus*	Apidae	Local													x	x							
Common Mourning Bee	*Melecta albifrons*	Apidae	Local	LC				x																
Fabricius' Nomad Bee	*Nomada fabriciana*	Apidae	Widespread														x							
Small Nomad Bee	*Nomada flavoguttata*	Apidae	Widespread					x									x	x				x		
Blunthorn Nomad Bee	*Nomada flavopicta*	Apidae	Nationally Scarce				x										x							
Painted Nomad Bee	*Nomada fucata*	Apidae	Nationally Scarce	LC													x		x					
Gooden's Nomad Bee	*Nomada goodeniana*	Apidae	Widespread	LC			x																	
Marsham's Nomad Bee	*Nomada marshamella*	Apidae	Widespread	LC				x														x		
Sheppard's Nomad Bee	*Nomada sheppardana*	Apidae	Local	LC														x						
Variable Nomad Bee	*Nomada zonata*	Apidae	Recent UK colonist								x								x					
Rose Sawfly	*Arge pagana*	Argidae	Widespread	LC												x	x		x		x	x		
A bethylid wasp	*Pseudisobrachium subcyaneum*	Bethylidae	Rare				x																	
Wheat stem borer sawfly	*Cephus pygmeus*	Cephidae	Local				x							x										
A chalcidoid wasp	*Chalcis sispes*	Chalcididae	Nationally Scarce		x																			
A cuckoo wasp	*Hedychridium ardens*	Chrysidae	Local	LC				x																
A ruby-tailed wasp	*Hedychrum niemelai*	Chrysididae	RDB3 pre-1994 criteria					x														x		
A ruby-tailed wasp	*Hedychrum nobile*	Chrysididae	Recent UK colonist														x							
A ruby-tailed wasp	*Pseudospinolia neglecta*	Chrysididae	Local	LC																		x		
A cuckoo wasp	*Trichrysis cyanea*	Chrysididae	Widespread																x					
Ivy bee	*Colletes hederae*	Colletidae	Recent UK colonist													x								
Short-horned Yellow-faced Bee	*Hylaeus brevicornis*	Colletidae	Local																			x		
Common Yellow-faced Bee	*Hylaeus communis*	Colletidae	Widespread	LC			x			x												x		
White-jawed Yellow-faced Bee	*Hylaeus confusus*	Colletidae	Local	LC				x			x											x		
Spined Hylaeus	*Hylaeus cornutus*	Colletidae	Nationally Scarce	LC				x		x				x										

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Chalk Yellow-face Bee	*Hylaeus dilatatus*	Colletidae	Local	LC		x	x	x		x				x		x	x	x	x	x	x	x	x	
Hairy Yellow-faced Bee	*Hylaeus hyalinatus*	Colletidae	Local				x	x		x				x		x								
Reed Yellow-faced Bee	*Hylaeus pectoralis*	Colletidae	Local						x					x										
Little Yellow-faced Bee	*Hylaeus pictipes*	Colletidae	Nationally Scarce											x										
A solitary wasp	*Astata boops*	Crabronidae	Local							x						x	x							
Five-banded Weevil-wasp	*Cerceris quinquefasciata*	Crabronidae	Section 41 priority species; RDB3 (pre-1994 criteria)																			x	x	
Ornate-tailed Digger Wasp	*Cerceris rybyensis*	Crabronidae	Local	LC	x		x			x									x			x		
A solitary wasp	*Diodontus luperus*	Crabronidae	Local				x																	
A solitary wasp	*Diodontus minutus*	Crabronidae	Local														x							
A solitary wasp	*Ectemnius continuus*	Crabronidae	Widespread	LC										x				x				x		
A Solitary Wasp	*Ectemnius dives*	Crabronidae	Local								x						x							
A Solitary Wasp	*Ectemnius lituratus*	Crabronidae	Widespread							x														
A solitary wasp	*Entomognathus brevis*	Crabronidae	Local													x		x				x	x	
A solitary wasp	*Gorytes laticinctus*	Crabronidae	RDB3 pre-1994 criteria					x																
A solitary wasp	*Nysson trimaculatus*	Crabronidae	Nationally Scarce		x	x	x	x		x								x						
A Solitary Wasp	*Oxybelus uniglumis*	Crabronidae	Widespread						x	x									x					
A solitary wasp	*Passaloecus clypealis*	Crabronidae	RDB3 pre-1994 criteria											x										
A solitary wasp	*Passaloecus gracilis*	Crabronidae	Local	LC					x									x						
A solitary wasp	*Pemphredon lethifer*	Crabronidae	RDB3 pre-1994 criteria															x					x	
Beewolf	*Philanthus triangulum*	Crabronidae	Nationally Vulnerable (RDB2 pre-1994)	LC	x		x			x	x					x						x		
A solitary wasp	*Psenulus pallipes*	Crabronidae	Widespread															x						
A Solitary Wasp	*Tachysphex pompiliformis*	Crabronidae	Local				x	x		x									x					
A crabronid wasp	*Trypoxylon attenuatum*	Crabronidae	Widespread	LC	x		x	x		x	x	x		x			x	x	x	x	x	x		
A solitary wasp	*Trypoxylon clavicerum*	Crabronidae	Widespread	LC			x	x			x			x					x			x		
A solitary wasp	*Trypoxylon figulus*	Crabronidae	Local																			x		
A solitary wasp	*Trypoxylon medium*	Crabronidae	Local	LC	x		x					x							x		x			
A formicine ant	*Formica cunicularia*	Formicidae	Local	LC	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
A formicine ant	*Formica fusca*	Formicidae	Widespread	LC	x			x		x	x					x	x	x	x	x	x	x	x	
A formicine ant	*Lasius alienus*	Formicidae	Local	LC				x				x												x
Yellow Meadow Ant	*Lasius flavus*	Formicidae	Widespread	LC			x											x	x	x		x		
A formicine ant	*Lasius niger*	Formicidae	Widespread	LC	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
A formicine ant	*Lasius platythorax*	Formicidae	Widespread	LC			x																	
A myrmicine ant	*Leptothorax acervorum*	Formicidae	Local	LC				x																
A myrmicine ant	*Myrmecina graminicola*	Formicidae	Local	LC		x			x			x												

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A myrmicine ant	*Myrmica rubra*	Formicidae	Widespread	LC														x						
A myrmicine ant	*Myrmica ruginodis*	Formicidae	Widespread	LC	x		x					x		x						x	x	x		
A myrmicine ant	*Myrmica sabuleti*	Formicidae	Widespread	LC	x	x	x	x	x	x	x	x				x	x	x	x	x	x	x	x	
A myrmicine ant	*Myrmica scabrinodis*	Formicidae	Widespread	LC	x		x	x	x	x	x	x		x		x	x	x	x	x	x	x	x	
A myrmicine ant	*Myrmica schencki*	Formicidae	Nationally Scarce	LC			x											x						
A myrmicine ant	*Myrmica specioides*	Formicidae	Nationally Rare (RDB3 pre-1994)						x															
A myrmicine ant	*Myrmica sulcinodis*	Formicidae	Widespread	LC				x		x	x													
A myrmicine ant	*Tetramorium caespitum*	Formicidae	Local	LC	x	x			x															
Orange-legged Furrow Bee	*Halictus rubicundus*	Halictidae	Widespread	LC				x								x								
Bronze Furrow Bee	*Halictus tumulorum*	Halictidae	Widespread	LC		x										x	x		x		x	x		
Bloomed Furrow Bee	*Lasioglossum albipes*	Halictidae	Widespread	LC																		x		
Turquoise Furrow Bee	*Lasioglossum cupromicans*	Halictidae	Local	LC														x						
Chalk Furrow Bee	*Lasioglossum fulvicorne*	Halictidae	Widespread																			x		
Furry-claspered Furrow Bee	*Lasioglossum lativentre*	Halictidae	Local					x									x		x					
White-footed Green Furrow Bee	*Lasioglossum leucopus*	Halictidae	Widespread	LC						x	x					x	x	x	x			x	x	
White-zoned Furrow Bee	*Lasioglossum leucozonium*	Halictidae	Local	LC				x		x	x													
Sharp-collared Furrow Bee	*Lasioglossum malachurum*	Halictidae	Widespread		x		x												x			x		
Least Furrow Bee	*Lasioglossum minutissimum*	Halictidae	Local	LC			x															x	x	
Common Green Furrow Bee	*Lasioglossum morio*	Halictidae	Widespread	LC	x			x	x	x	x					x	x	x	x	x	x	x		
Tufted Furrow Bee	*Lasioglossum nitidiusculum*	Halictidae	Local	LC															x					
Smooth-gastered Furrow Bee	*Lasioglossum parvulum*	Halictidae	Local	LC															x		x	x		
Squat Furrow Bee	*Lasioglossum pauperatum*	Halictidae	RDB3 pre-1994 criteria		x		x	x		x							x	x	x	x	x	x		
Lobe-spurred Furrow Bee	*Lasioglossum pauxillum*	Halictidae	Nationally Scarce	LC				x		x						x	x	x	x	x	x	x	x	
Long-faced Furrow Bee	*Lasioglossum punctatissimum*	Halictidae	Local	LC			x			x						x			x			x		
Smeathman's Furrow Bee	*Lasioglossum smeathmanellum*	Halictidae	Local	LC						x						x	x	x	x	x				
Shaggy Furrow Bee	*Lasioglossum villosulum*	Halictidae	Widespread	LC												x	x							
Swollen-thighed Blood Bee	*Sphecodes crassus*	Halictidae	Nationally Scarce	LC													x	x	x			x	x	
Geoffroy's Blood Bee	*Sphecodes geoffrellus*	Halictidae	Local	LC						x								x		x	x	x		
Little Sickle-jawed Blood Bee	*Sphecodes longulus*	Halictidae	Nationally Scarce	LC						x														
Box-headed Blood Bee	*Sphecodes monilicornis*	Halictidae	Widespread	LC										x		x	x	x						
Sickle-jawed blood bee	*Sphecodes puncticeps*	Halictidae	Widespread	LC				x			x													
Rough-backed blood bee	*Sphecodes scabricollis*	Halictidae	RDB3 pre-1994 criteria					x																
An ichneumon wasp	*Amblyteles armatorius*	Ichneumonidae	Widespread																x					
Wool Carder Bee	*Anthidium manicatum*	Megachilidae	Local													x			x					
Rufescent Sharp-tailed Bee	*Coelioxys rufescens*	Megachilidae	Local	LC					x	x														

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Large-headed Resin Bee	*Heriades truncorum*	Megachilidae	RDBK (insufficiently known - pre-1994 criteria)																			x		
Welted Lesser Mason Bee	*Hoplitis claviventris*	Megachilidae	Local																x	x	x			
Brown-footed Leafcutter Bee	*Megachile versicolor*	Megachilidae	Widespread	LC										x							x	x		
Willughby's Leafcutter Bee	*Megachile willughbiella*	Megachilidae	Widespread														x		x					
Red Mason Bee	*Osmia bicornis*	Megachilidae	Widespread	LC						x														
Orange-vented Mason Bee	*Osmia leaiana*	Megachilidae	Widespread													x	x							
Spined Mason Bee	*Osmia spinulosa*	Megachilidae	Local					x		x	x					x	x	x	x	x	x	x		
Spotted Dark Bee	*Stelis ornatula*	Megachilidae	RDB3													x	x		x			x		
Pantaloon Bee	*Dasypoda hirtipes*	Melittidae	Nationally Scarce	LC	x	x	x			x	x					x	x	x				x		
Red Bartsia Bee	*Melitta tricincta*	Melittidae	Nationally Scarce	LC		x																		
A spider-hunting wasp	*Agenioideus cinctellus*	Pompilidae	Local							x														
A spider-hunting wasp	*Anoplius infuscatus*	Pompilidae	Local	LC	x						x	x												
A Spider-hunting Wasp	*Anoplius nigerrimus*	Pompilidae	Widespread	LC			x	x		x						x			x					
A spider-hunting wasp	*Arachnospila anceps*	Pompilidae	Widespread					x		x						x	x							
A Spider-hunting Wasp	*Arachnospila spissa*	Pompilidae	Local				x									x			x					
A spider-hunting wasp	*Auplopus carbonarius*	Pompilidae	Nationally Scarce	LC				x			x					x		x	x		x			
A spider-hunting wasp	*Caliadurgus fasciatellus*	Pompilidae	Local	LC			x	x		x														
A spider-hunting wasp	*Priocnemis agilis*	Pompilidae	Nationally Scarce								x					x	x		x					
A spider-hunting wasp	*Priocnemis confusor*	Pompilidae	Nationally Scarce													x			x		x	x		
A spider-hunting wasp	*Priocnemis cordivalvata*	Pompilidae	Nationally Scarce				x																	
A spider-hunting wasp	*Priocnemis exaltata*	Pompilidae	Widespread		x		x	x		x						x			x					
A spider-hunting wasp	*Priocnemis parvula*	Pompilidae	Local													x								
A Spider-hunting Wasp	*Priocnemis perturbator*	Pompilidae	Widespread				x				x							x						
A spider-hunting wasp	*Priocnemis pusilla*	Pompilidae	Local				x	x		x	x					x	x	x						
Sand Digger Wasp	*Ammophila sabulosa*	Sphecidae	Widespread	LC				x									x							
A sawfly	*Athalia rosae*	Tenthredinidae	Widespread			x		x																
A solitary wasp	*Tiphia femorata*	Tiphiidae	Local		x			x								x	x	x	x	x	x	x		
A Solitary Wasp	*Ancistrocerus gazella*	Vespidae	Widespread								x													
A social wasp	*Dolichovespula media*	Vespidae	Widespread	LC															x					
A Solitary Wasp	*Gymnomerus laevipes*	Vespidae	Local								x													
A mason wasp	*Odynerus melanocephalus*	Vespidae	Section 41 priority species; Nationally Scarce																x	x	x			
A Solitary Wasp	*Odynerus spinipes*	Vespidae	Local																x					
German wasp	*Vespula germanica*	Vespidae	Widespread				x										x	x				x		
Common Wasp	*Vespula vulgaris*	Vespidae	Widespread	LC			x			x		x		x				x	x	x	x	x		
Woodlice, hoglice and slaters (Isopoda)																								
A Pill Woodlouse	*Armadillidium nasatum*	Armadillidiidae	Local	LC			x	x																

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Common Pill Woodlouse	*Armadillidium vulgare*	Armadillidiidae	Widespread	LC	x		x	x		x		x	x	x		x	x	x	x	x	x	x	x	
A water hoglouse	*Asellus aquaticus*	Asellidae	Widespread	LC					x	x	x	x		x								x		
Common Shiny Woodlouse	*Oniscus asellus*	Oniscidae	Widespread	LC				x																
Common Striped Woodlouse	*Philoscia muscorum*	Philoscidae	Widespread	LC	x		x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x
Common Rough Woodlouse	*Porcellio scaber*	Porcellionidae	Widespread	LC	x		x	x				x		x			x							
Rathke's woodlouse	*Trachelipus rathkii*	Trachelipodidae	Local											x										
Butterflies and moths (Lepidoptera)																								
Dark Elm Case-bearer	*Coleophora limosipennella*	Coleophoridae	Local	LC					x															
Scarce Footman	*Eilema complana*	Erebidae	Local	LC							x					x								
Burnet Companion	*Euclidia glyphica*	Erebidae	Widespread	LC		x										x			x					
Jersey Tiger	*Euplagia quadripunctaria*	Erebidae	Habitats Directive Annex 2 (non-priority species)	LC										x	x									
Vapourer moth	*Orgyia antiqua*	Erebidae	Widespread	LC					x															
Buff Ermine	*Spilosoma lutea*	Erebidae	S41 research only	LC														x						
Cinnabar	*Tyria jacobaeae*	Erebidae	S41 research only	LC			x	x			x			x		x		x	x			x	x	
Treble Bar	*Aplocera plagiata*	Geometridae	Widespread	LC				x																
Cream Wave	*Scopula floslactata*	Geometridae	Widespread	LC					x															
Large Skipper	*Ochlodes sylvanus*	Hesperiidae	Widespread	LC		x	x		x		x					x	x		x			x		
Essex Skipper	*Thymelicus lineolus*	Hesperiidae	Widespread	LC							x					x								
Small Skipper	*Thymelicus sylvestris*	Hesperiidae	Widespread	LC	x		x	x		x				x		x	x	x	x		x	x		
Brown Argus	*Aricia agestis*	Lycaenidae	Widespread	LC				x			x								x			x		
Green Hairstreak	*Callophrys rubi*	Lycaenidae	Widespread	LC																	x			
Holly Blue	*Celastrina argiolus*	Lycaenidae	Widespread	LC			x		x				x			x	x	x	x					
Small Blue	*Cupido minimus*	Lycaenidae	S41 Priority species	NT												x								
Small Copper	*Lycaena phlaeas*	Lycaenidae	Widespread	LC												x			x					
Common Blue	*Polyommatus icarus*	Lycaenidae	Widespread	LC			x	x		x	x		x	x		x	x		x		x	x	x	
Silver Y	*Autographa gamma*	Noctuidae	Regular migrant	LC				x								x	x							
Mother Shipton	*Callistege mi*	Noctuidae	Widespread	LC												x			x					
Vine's Rustic	*Hoplodrina ambigua*	Noctuidae	Widespread				x																	
Smoky Wainscot	*Mythimna impura*	Noctuidae	Widespread	LC								x												
Common Wainscot	*Mythimna pallens*	Noctuidae	Widespread	LC								x												
Lesser Yellow Underwing	*Noctua comes*	Noctuidae	Widespread	LC								x												
Large Yellow Underwing	*Noctua pronuba*	Noctuidae	Widespread	LC						x														
Puss Moth	*Cerura vinula*	Notodontidae	Widespread	LC												x								
Small Tortoiseshell	*Aglais urticae*	Nymphalidae	Widespread	LC	x	x	x		x					x				x			x		x	
Ringlet	*Aphantopus hyperantus*	Nymphalidae	Widespread	LC												x	x	x			x	x	x	
Small Heath	*Coenonympha pamphilus*	Nymphalidae	S41 Priority species	NT	x			x								x	x		x	x		x		
Peacock	*Inachis io*	Nymphalidae	Widespread	LC			x		x		x			x		x		x				x		

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Meadow Brown	*Maniola jurtina*	Nymphalidae	Widespread	LC		x	x	x		x	x		x	x		x	x	x	x	x	x	x	x	
Marbled White	*Melanargia galathea*	Nymphalidae	Widespread	LC												x	x					x		
Speckled Wood	*Pararge aegeria*	Nymphalidae	Widespread	LC					x					x							x			
Comma	*Polygonia c-album*	Nymphalidae	Widespread	LC			x											x						
Gatekeeper	*Pyronia tithonus*	Nymphalidae	Widespread	LC		x		x					x	x		x	x	x	x		x	x		
Red Admiral	*Vanessa atalanta*	Nymphalidae	Widespread/partial migrant	LC			x												x	x				
Painted Lady	*Vanessa cardui*	Nymphalidae	Regular migrant	LC				x																
Orange Tip	*Anthocharis cardamines*	Pieridae	Widespread	LC										x			x	x	x			x		
Brimstone	*Gonepteryx rhamni*	Pieridae	Widespread	LC				x	x	x				x		x						x		
Large White	*Pieris brassicae*	Pieridae	Widespread	LC	x	x			x	x	x			x		x	x	x	x			x		
Green-veined White	*Pieris napi*	Pieridae	Widespread	LC			x											x						
Small White	*Pieris rapae*	Pieridae	Widespread	LC	x	x	x			x	x			x		x		x				x		
Round-winged Bagworm	*Epichnopterix plumella*	Psychidae	Local	LC					x															
A bagworm moth	*Psyche casta*	Psychidae	Widespread	LC															x					
Twin-barred Knot-horn	*Homoeosoma sinuella*	Pyralidae	Widespread	LC							x													
Rosy-striped Knot-horn	*Oncocera semirubella*	Pyralidae	Nationally Scarce	LC					x					x										
Long-legged Tabby	*Synaphe punctalis*	Pyralidae	Nationally Scarce	LC		x																		
Six-belted Clearwing	*Bembecia ichneumoniformis*	Sesiidae	Local	LC			x	x								x								
A tortricid moth	*Agapeta hamana*	Tortricidae	Widespread	LC																				
Bramble Shoot Moth	*Notocelia uddmanniana*	Tortricidae	Widespread	LC					x															
Six-spot Burnet Moth	*Zygaena filipendulae*	Zygaenidae	Widespread	LC					x							x	x					x		
Alderflies (Megaloptera)																								
An alderfly larva	*Sialis lutaria*	Sialidae	Widespread	LC					x		x													
Lacewings (Neuroptera)																								
A brown lacewing	*Micromus angulatus*	Hemerobiidae	Local									x												
Dragonflies and damselflies (Odonata)																								
Southern Migrant Hawker	*Aeshna affinis*	Aeshnidae	Recent UK colonist										x	x										
Southern Hawker	*Aeshna cyanea*	Aeshnidae	Widespread	LC	x				x		x													
Brown Hawker	*Aeshna grandis*	Aeshnidae	Widespread	LC					x	x			x				x							
Migrant Hawker	*Aeshna mixta*	Aeshnidae	Widespread	LC								x												
Emperor Dragonfly	*Anax imperator*	Aeshnidae	Widespread	LC	x						x	x	x	x		x	x					x		
Lesser Emperor	*Anax parthenope*	Aeshnidae	Rare annual migrant										x											
Azure Damselfly	*Coenagrion puella*	Coenagrionidae	Widespread	LC					x		x	x						x				x		
Common Blue Damselfly	*Enallagma cyathigerum*	Coenagrionidae	Widespread	LC				x	x		x	x						x						
Red-eyed Damselfly	*Erythromma najas*	Coenagrionidae	Widespread	LC					x			x		x										
Common Blue-tailed Damselfly	*Ischnura elegans*	Coenagrionidae	Widespread	LC					x			x	x	x							x		x	
Emerald Damselfly	*Lestes sponsa*	Lestidae	Widespread	LC					x				x									x		
Broad-bodied Chaser	*Libellula depressa*	Libellulidae	Widespread	LC					x													x		

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Four-spotted Chaser	*Libellula quadrimaculata*	Libellulidae	Widespread	LC																		x		
Black-tailed Skimmer	*Orthetrum cancellatum*	Libellulidae	Widespread	LC							x	x		x		x						x		
Red-veined Darter	*Sympetrum fonscolombii*	Libellulidae	Recent UK colonist	LC					x															
Ruddy Darter	*Sympetrum sanguineum*	Libellulidae	Local	LC									x	x										
Common Darter	*Sympetrum striolatum*	Libellulidae	Widespread	LC					x		x	x	x	x		x		x				x		
Harvestmen (Opiliones)																								
A harvestman	*Mitostoma chrysomelas*	Nemostomatidae	Widespread	LC										x										
A harvestman	*Dicranopalpus ramosus*	Phalangiidae	Widespread	LC					x									x	x	x		x		
A harvestman	*Lophopilio palpinalis*	Phalangiidae	Widespread	LC				x		x														
A harvestman	*Opilio saxatilis*	Phalangiidae	Widespread	LC									x				x	x		x				
A harvestman	*Paroligolophus agrestis*	Phalangiidae	Widespread	LC					x					x		x	x	x		x		x		
A harvestman	*Phalangium opilio*	Phalangiidae	Widespread	LC	x	x	x	x	x		x	x	x			x			x	x		x		
A harvestman	*Platybunus triangularis*	Phalangiidae	Widespread	LC		x		x		x												x		
A harvestman	*Anelasmocephalus cambridgei*	Trogulidae	Local	LC				x				x		x						x				
Grasshoppers, groundhoppers, crickets and allied insects (Orthoptera and Dermaptera)																								
Lesser Marsh Grasshopper	*Chorthippus albomarginatus*	Acrididae	Widespread	LC	x	x	x						x	x			x	x	x		x	x	x	
Field Grasshopper	*Chorthippus brunneus*	Acrididae	Widespread	LC	x	x	x	x		x	x			x		x	x	x	x	x	x	x	x	
Meadow Grasshopper	*Chorthippus parallelus*	Acrididae	Widespread	LC	x	x	x	x	x		x	x	x			x	x	x	x	x	x	x	x	
Mottled Grasshopper	*Myrmeleotettix maculatus*	Acrididae	Widespread	LC				x																
Common Green Grasshopper	*Omocestus viridulus*	Acrididae	Widespread	LC		x										x			x					
Short-winged Conehead	*Conocephalus dorsalis*	Conocephalidae	Local	LC	x								x											
Long-winged Conehead	*Conocephalus fuscus*	Conocephalidae	Widespread	LC	x	x	x	x			x		x			x	x	x			x	x	x	
Hop-garden Earwig	*Apterygida media*	Forficulidae	Nationally Scarce	LC						x						x	x		x					
Common Earwig	*Forficula auricularia*	Forficulidae	Widespread	LC	x		x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	
Lesne's Earwig	*Forficula lesnei*	Forficulidae	Nationally Scarce	LC																		x		
Southern Oak Bush-cricket	*Meconema meridionale*	Meconematidae	Recent UK colonist	NA			x	x		x						x	x		x	x		x		
Oak Bush-cricket	*Meconema thalassinum*	Meconematidae	Widespread	LC													x							
Speckled Bush Cricket	*Leptophyes punctatissima*	Phaneropteridae	Widespread	LC			x	x	x							x	x	x				x		
Slender Groundhopper	*Tetrix subulata*	Tetrigidae	Widespread	LC					x		x			x								x		
Common Groundhopper	*Tetrix undulata*	Tetrigidae	Widespread	LC	x			x					x	x								x		
Roesel's Bush-cricket	*Metrioptera roeselii*	Tettigoniidae	Widespread	LC		x	x	x					x	x		x	x	x	x		x	x		
Dark Bush Cricket	*Pholidoptera griseoaptera*	Tettigoniidae	Widespread	LC				x	x					x				x						
Great Green Bush-cricket	*Tettigonia viridissima*	Tettigoniidae	Local	LC													x	x	x					
Barkfliess (Psocoptera)																								
A psocid	*Propsocus pulchripennis*	Elipsocidae	Unknown				x																	
A psocid	*Graphopsocus cruciatus*	Stenopsocidae	Widespread	LC			x							x										
Caddisflies (Trichoptera)																								
A caddis fly larva	*Oecetis furva*	Leptoceridae	Local	LC									x											

Common Name	Scientific Name	Family	UK Status	IUCN Post-2001 Threat Status	Area 1	Area 1a	Area 2	Area 3	Area 4	Area 5	Area 6a	Area 6b	Area 7	Area 8	Area 9	Area 10	Area 11	Area 12	Area 13	Area 13A	Area 14	Area 15	Area 16	Area 19
A caddis fly larva	*Limnephilus incisus/affinis*	Limnephilidae	Widespread	LC								x												
A caddis fly larva	*Limnephilus lunatus*	Limnephilidae	Widespread	LC					x	x			x									x		
A caddis fly larva	*Limnephilus marmoratus*	Limnephilidae	Widespread	LC					x															
A caddis fly larva	*Holocentropus picicornis*	Polycentropodidae	Widespread	LC					x															
A caddis fly larva	*Rhyacophila dorsalis*	Rhyacophilidae	Widespread	LC																		x		
Flatworms (Tricladida)																								
A flatworm	*Dendrocoelum lacteum*	Dendrocoelidae	Widespread									x												
A flatworm	*Dugesia lugubris*	Dugesiidae	Widespread	LC								x												
A flatworm	*Polycelis nigra*	Planariidae	Introduced (widespread)																			x		
Freshwater mussels (Veneroida)																								
Lake Orb Musssel	*Musculium lacustre*	Sphaeriidae	Widespread	LC					x															
Shining Pea Mussel	*Pisidium nitidum*	Sphaeriidae	Widespread	LC						x														

Table EDP A10.87: Species Listed as having a Conservation Designation in the UK/England Recorded during the Survey (includes Nationally Scarce and S41 Species)

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A clubionid spider	*Cheiracanthium virescens*	Clubionidae	Araneae	Nationally Scarce	Area 10,14	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. Unlike its sibling species *Cheiracanthium erraticum* which was found in most areas during the survey, *C. virescens* was recorded only from Craylands Pit (Area 10) and the Station Quarter (Area 14). These sites are characterised by herb-rich grassland, Craylands Pit supporting herb-rich grassland over calcareous grassland which was frequently sparsely vegetated and free draining. Harvey *et al.* (2002) describe 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.
A dictynid spider	*Argenna patula*	Dictynidae	Araneae	Nationally Scarce	Area 1	Coastal - saltmarsh	*Argenna patula* is a scarce cribellate spider, largely restricted to coastal saltmarsh habitat in the UK. The spider has been recorded from widely scattered locations around the UK coast, with the largest aggregations in the Thames estuary and around the East Anglian coast. There are a number of records from the north Kent coast and from sites opposite to the Swansworth Peninsula in Essex. The spider occurs amongst strandline litter and under stones on the banks of tidal rivers, or on estuaries and saltmarshes. During the 2020 survey, *A. patula* was recorded only from the saltmarsh habitat of Area 1.
A gnaphosid spider	*Drassodes pubescens*	Gnaphosidae	Araneae	Nationally Scarce	Area 3,4,10,13	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 2020 survey, *D. pubescens* was recorded from OMH in Area 3; a grassy bank adjacent to wetland in Area 4; in calcareous grassland/OMH in area 10 and from herb-rich grassland in Area 13.
A gnaphosid spider	*Zelotes electus*	Gnaphosidae	Araneae	Nationally Scarce	Area 2	Open habitats - Short sward and bare ground - Bare sand and chalk	*Zelotes electus* is a scarce gnaphosid spider. In the UK the spider is mainly restricted to coastal sites, with records from around much of the English and Welsh coast, as well as from the east coast of Scotland. There are also inland records from the Brecklands in East Anglia and Bedfordshire. Coastal records are predominately from sandy, coastal dune habitat and there are several records from north Kent and south Essex, though most of these are records from a further east of the Swanscombe Peninsula. The spider is more colourful than most *Zelotes* species and typically occurs at the base of low vegetation in sandy habitat and under stones (Bee *et al*, 2017). During the 2020 survey, *D. pubescens* was recorded from coastal grassland in Area 2.
A linyphiid spider	*Agyneta (Meioneta) simplicitarsis*	Linyphiidae	Araneae	Nationally Scarce	Area 14	Not assigned	*Agyneta simplicitarsis* is a scarce species of linyphiid spider. In the UK the spider is confined to the southern English counties, with a greater number of coastal records than from inland. The majority of records are from the Thames corridor, the spider occurring on both sides of the estuary in Kent and north Essex. *A. simplicitarsis* is mainly found in calcareous grassland near the coast as well as taller, tussocky grassland in grazing marsh habitat and occasionally on inland heathland. During the survey, the spider was recorded only from Area 14, which supported tussoccky, semi-improved calcareous grassland in mosaic with scrub.
A linyphiid spider	*Hypomma fulvum*	Linyphiidae	Araneae	Nationally Scarce	Area 1,3	Wetland - Peatland	*Hypomma fulvum* is a scarce species of linyphiid spider. The majority of UK records are from southeast England and the spider has been well recorded from both north Kent and south Essex, with several records from close to the survey area, including one from the Swanscombe Peninsula. *H. fulvum* is mainly associated with fens and marshes, occurring on Common Reed *Phragmites australis* and in the litter beneath, as well as on a range of coastal habitats including saltmarsh and grazing marsh habitat. During the 2020 survey, *H. fulvum* was recorded from the Swanscombe Peninsula saltmarsh (Area 1) as well as from the OMH (Area 3).

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
Duffey's Bell-head Spider	*Praestigia duffeyi*	Linyphiidae	Araneae	s41 'priority species'; 'Endangered' post-2001 IUCN criteria; Nationally Rare	Area 1	Coastal - saltmarsh - Saltmarsh and transitional brackish marsh	The S41 'priority species' Duffey's Bell-head Spider *Praestigia duffeyi* is an extreme rarity in the UK, being classed as Nationally Rare, with a threat status of Endangered based on post-2001 IUCN criteria. The males have a distinctive, hat-like prominence on their head region. The species has been recorded from the east coast, at Havergate Island in East Suffolk and a number of sites along the sides of tidal rivers and tributaries of the Stour, Colne, Crouch and Thames in Essex and West Kent (Harvey *et al,* 2002). Whilst the spider has been recorded to be abundant where it occurs, it is very restricted in range. It appears to have been recorded historically from the Swanscombe Peninsula. *P. duffeyi* is associated with coastal saltmarsh and brackish marshes, occurring in litter or on mud beneath saltmarsh vegetation including, According to Harvey *et al* (2002) '*Halimone, Phragmites* and other vegetation'. Owing to its distribution, the spider is considered to be under threat from coastal development, due to loss of important saltmarsh habitat. During the survey males were recorded from the saltmarsh habitat in Area 1.
A lycosid spider	*Alopecosa cuneata*	Lycosidae	Araneae	Nationally Scarce	Area 3,8,10,13	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 a few kilometres of the survey area. According to Harvey *et al* (2002), the spider is associated mainly with chalk grassland and coastal dune habitats. During the 2020 survey, *A. cuneata* was recorded from Area 3 OMH and grazing marsh habitat (Area 8) on the Swanscombe Peninsula, as well as from OMH/calcareous grassland sites inland at Craylands Pit (Area 10) and the Former Landfill (Area 13).
A pirate spider	*Ero aphana*	Mimetidae	Araneae	Nationally Scarce	Area 13,15	Open habitats - Tall sward and scrub - Scrub heath and moorland	Formerly classed as RDB2 'Vulnerable' in the UK, *Ero aphana* has been recorded more widely in southern England in recent decades with the majority of records being from southeast England. There are several recent records from south Essex, immediately north of the Swanscombe Peninsula, and to a lesser extent, from sites in north Kent. The spider has historically been associated with dry heathland, where it typically occurs in the building and mature phases of the ericoid cycle and in areas where dry stony bare ground is present. However, more recently it has been recorded from a variety of dry habitats including gardens and brownfield sites (Harvey *et al*, 2002), as is the case in Kent and Essex. Like other species in the genus, *E. aphana* are predators of other spiders and do not use a web, but attack their prey within their webs, hence the name 'pirate spiders'. (Roberts, 1995). During the 2020 survey, the spider was recorded from sparsely vegetated grassland and OMH inland of the Swanscombe Peninsula at Area 15.
A pirate spider	*Ero tuberculata*	Mimetidae	Araneae	Nationally Scarce	Area 12/13A	Not assigned	*Ero tuberculata* is a scarce species of pirate spider (Mimetidae), which is recorded mainly from central south and southeast England in the UK. The spider has been recorded from both the Kent and Essex sides of the Thames corridor with Essex records in particular being from within close proximity of the survey. Whilst Harvey *et al.* (2002), cite lowland heathland as the main habitat for the species, *E. tuberculata* has been recorded from a number of habitats including fens and around buildings. During the 2020 survey the spider was recorded from both north and south sections of Bamber Pit (Areas 12 and 13a).
A philodromid spider	*Philodromus rufus*	Philodromidae	Araneae	Not assessed	Area 5	Tree associated - Arboreal	*Philodromus rufus* is a rare species of running crab spider (Philodromidae). In the UK, the spider appears to be more or less confined to the London and Thames corridor. There are several records from the Thames immediately opposite the Swanscombe Peninsula in north Essex and from a few kilometres west of the site in Kent. The spider is known to be difficult to separate from closely related *P. albidus*, which was recorded commonly during the survey and *P. rufus* defaults to *P. albidus* when input into Pantheon. During the survey a male tentatively identified as *P. rufus* was recorded from grassland and scrub mosaic habitat in Area 5 (based on the male palp (Roberts (1995) and coloration). According to Bee *et al.* (2017), the spider is associated with more open scrub habitats than *P. albidus*, which would also fit with the description.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A philodromid spider	*Thanatus striatus*	Philodromidae	Araneae	Nationally Scarce	Area 1,2,3,6a,7,8,11,13,14	Open habitats; Tall sward and scrub	The main UK stronghold of *Thanatus striatus* includes coastal sites around the Thames Gateway in south Essex and north Kent; however, there are also a number of inland records and the spider has been well recorded in Surrey and there are several records from inland sites in Sussex. 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 2020, this distinctive spider was recorded from a number of survey areas, both on the Peninsula and inland; the substrate within the majority of the recorded areas, whilst being often dry and sparsely vegetated, was often on a calcareous, rather than a sandy substrate.
A jumping spider	*Ballus chalybeius*	Salticidae	Araneae	Nationally Scarce	Area 2,3,5,6a,6b,8,10,11,12,13,14	Tree associated - Arboreal	*Ballus chalybeius* is locally distributed in the UK, but most records are from the southeast including the Thames Gateway area. It is a distinctively marked jumping spider associated with broadleaved bushes and trees. Roberts (1995) cites oaks *Quercus* spp. as being particularly favoured. Although, the spider was recorded from Pedunculate Oak *Quercus robur* during the 2020 survey, it was more frequently beaten from Hawthorn *Crataegus monogyna*, within grassland scrub mosaic habitat. *B. chalybeius* was recorded from suitable habitat within almost all the 2020 survey compartments.
A jumping spider	*Macaroeris nidicolens*	Salticidae	Araneae	Recent UK colonist	Area 2,5,13	Tree associated - Arboreal - decaying wood	*Macaroeris nidicolens* is a distinctive species of jumping spider which was first recorded in the UK in 2002. The species is currently almost restricted to the Thames corridor area, having been recorded from coastal sites on both Essex and Kent sites of the estuary. There are a number of records from Essex immediately north of the Swanscombe Peninsula. In Europe, the spider is associated with arboreal habitats, including on the branches and trunks of trees (Roberts, 1995) and in the UK it has been recorded from scrub on brownfield land including gorse *Ulex* spp., Wild Privet *Ligustrum vulgare* and Hawthorn *Crataegus monogyna*. During the 2020 survey. *M. nidicolens* was beaten from Hawthorn scrub in the coastal grassland and scrub mosaic sites of Areas 2 and 5 on the peninsula, as well as from scrub edge habitat in Area 13 (Former Landfill).
A jumping spider	*Salticus zebraneus*	Salticidae	Araneae	Nationally Scarce	Area 4	Tree associated - Arboreal - decaying wood	*Salticus zebraneus* is a distinctive species of jumping spider which despite having shown a recent recorded range increase, is still of very local occurrence in the UK. The majority of records are from the Thames corridor area and there are records from several locations in north Kent and south Essex, including records from within close proximity to Swanscombe Peninsula. *S. zebraneus* is an arboreal species, which has been associated with pine *Pinus* spp. as well as a range of, often mature broadleaved trees especially in ancient woodland and wood pasture habitats, but also in field margins within an agricultural setting. During the 2020 survey, the spider was recorded from wet woodland/scrub habitat at the southeastern edge of Area 4. The habitat supported some mature growth including willow *Salix* spp..
A jumping spider	*Sibianor aurocinctus*	Salticidae	Araneae	Nationally Scarce	Area 2,3,5,6a,8,10,11,12,13,13a,14,15	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). Whilst the majority of records are from the adjacent Thames shoreline of south Essex, there are post-1992 records for the Swanscombe Peninsula itself, as well as several nearby Kent locations. The spider is associated with a range of dry, sparsely vegetated habitats including brownfield sites. During the 2020 survey *S. aurocinctus* was recorded from several grassland and OMH compartments on calcareous substrate. It was recorded both on the Swanscombe Peninsula and inland.
A jumping spider	*Synageles venator*	Salticidae	Araneae	Nationally Scarce	Area 1,2,4,6a,6b,10,11	Open habitats - Short sward and bare ground - Bare sand and chalk	*Synageles venator* is an ant -mimicking species of jumping spider (Salticidae). In the UK, the spider has most commonly been recorded from coastal dune habitats where it occurs low down in Marram Grass tussocks; however, there are also records from brick pits in Essex and other habitat including tussocks in fen habitat. Most records are from coastal locations (Harvey *et al*, 2002). The species is often found in association with ants and the sample collected from the Crayford site was found alongside several species of ant. There are several records from close to the Thames in Essex including records from across the Thames immediately north of Swanscombe Peninsula; however, there appear to be relatively few records from the Kent side. During the 2020 survey a number of specimens were collected both from the saltmarsh and grasslands and reedswamp habitat on the Peninsula as well as inland sites including Craylands Pit and the Sportsground.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A comb-footed spider	*Enoplognatha mordax*	Theridiidae	Araneae	Nationally Scarce	Area 1	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 Swanscombe peninsula. 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 2020 survey, *E. mordax* was recorded only from saltmarsh habitat in Area 1.
A theridiid spider	*Kochiura aulica*	Theridiidae	Araneae	Nationally Scarce	Area 3,5,6a,6b,7,8, 10,11,14,15,1 6	Open habitats - Tall sward and scrub - 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. The spider can occur in post-industrial habitats in conditions which structurally and climatically resemble heathland and in particular where Gorse *Ulex europaeus* occurs. There are a cluster of historic records within the Thames Gateway on the Essex side of the Thames immediately north of the Swanscombe Peninsula. Male *K. aulica* spiders are readily separated from closely related species such as *Anelosimus vittatus* due to their distinctive palps and were recorded from the majority of the 2020 Swanscombe survey sites. However, gorse was present, though not abundant, at most of the sites.
A comb-footed spider	*Sardinidion blackwalli*	Theridiidae	Araneae	Nationally Scarce	Area 12	Not assigned	*Sardinidion blackwalli* (formerly known as *Theridion blackwalli*) is an uncommon spider, recorded both in the midlands and southern England, with historic records close to the survey area on the Essex and Kent sides of the Thames. Although the spider is often associated with human habitation where it uses structures such as gravestones and other parts of the built environment for web construction, Harvey *et al.* (2002) also state that the spider can be found 'in grass tussocks and other low plants and tree trunks in a variety of habitats'. During the survey *T. blackwalli* was recorded from scrub and grassland matrix habitat within Area 12. This site occurs in close proximity to residential areas.
A zodariid spider	*Zodarion italicum*	Zodariidae	Araneae	Nationally Scarce	Area 2,3,4,6b	Open habitats - Short sward and bare ground	*Zodarion italicum* is a scarce spider which, in the UK, is largely restricted to the Thames corridor area, where it is best 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 2020 survey *Z. italicum* was recorded from the drier OMH and grassland habitats of Areas 2 and 3 on the Swanscombe Peninsula. However, the spider was also recorded from the margins of reedswamp habitat in areas 2 and 3.
An aderid beetle	*Anidorus sanguinolentus*	Aderidae	Coleoptera	First UK record	Area 8	Not assigned	A species of aderid beetle *Anidorus sanguinolentus* was recorded for the first time in the UK during the 2020 survey.A specimen collected during the June survey of Botany Marsh (East) Area 8 was collected and identified by Calum Urquhart, who subsequently sent the specimen to Max Barclay (NHM) who in turn sent it to Dmitry Telnov, who confirmed the record. The species is known from southern Europe, but has been recently recorded for the first time in Belgium in 2015 and the French Alsace in 2016. Troukens *et al* (2019), speculated that *A. sanguinolentus* 'may have started a silent advance towards Central Europe', from the south. This first UK record may indicate a further advance of its colonisation northwards. The record corresponded with a period of hot weather, which appears to have resulted in a number of species of more southerly distribution being recorded from new sites outside of their usual range. The beetle belongs to the family Aderidae, formerly a subfamily of Anthicidae. Species of this family are often associated with wood decay habitats such as in powdered wood under bark, under straw and hay and on shrubs and herbaceous plants (Harde, 1998) .
An anthicid beetle	*Cordicollis instabilis*	Anthicidae	Coleoptera	Nationally Scarce	Area 1	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 are from the Thames corridor area, the beetle having been recorded both in north Kent and south Essex, within 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 2020 survey, the beetle was recorded only from saltmarsh habitat in Area 1.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
An anthicid beetle	*Cyclodinus constrictus*	Anthicidae	Coleoptera	Nationally Scarce	Area 1,2,4,6b	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 south east England and East Anglia. There are several records from north Kent and south Essex including the Swanscombe Peninsula. During the survey several specimens were recorded from more sandy parts of the coastal saltmarsh in Area 1 as well as from more inland brackish habitats on the peninsula.
An ant flower beetle	*Cyclodinus salinus*	Anthicidae	Coleoptera	Nationally Rare	Area 1	Coastal - saltmarsh - Saltmarsh and transitional brackish marsh	*Cyclodinus salinus* is a rare species of ant-like flower beetle, restricted to coastal habitats in southeast England. The majority of records are from the Kent side of the Thames Estuary, the Solent in Hampshire and from the coasts of East Anglia. According to Hyman and Parsons (1992), the beetle is found in saltmarshes, where it is 'probably associated with rotting vegetation'. Hyman and Parsons (1992) state that 'adults have been found under vegetation, running in the open or damp or muddy ground, and a single example has been found under a stone'. During the survey, *C. salinus* was recorded from coastal saltmarsh in Area 1.
A weevil	*Diplapion stolidum*	Apionidae	Coleoptera	Nationally Scarce (Notable Nb)	Area 1a	Open habitats - Short sward and bare ground - Bare sand and chalk	*Diplapion stolidum* is recorded from scattered locations across the southern UK. There are several records from Kent and Essex within the Thames Gateway area; however, this is generally a scarce species. The beetle is found in field margins, disturbed ground, roadside verges and grassland where it is associated with Oxeye Daisy *Chrysanthemum leucanthemum* and according to Hyman and Parsons (1992), possibly also Scentless Mayweed *Tripleurospermum inodorum*. The larvae are thought to develop in the stems and rootstocks of the foodplants. During the 2020 survey, *D. stolidum* was recorded, alongside several other apionid species from the relatively herb-rich grassland on the sea defence bank in Area 1a. The habitat in this area is periodically managed by cutting.
An apionid weevil	*Protapion filirostre*	Apionidae	Coleoptera	Nationally Scarce B	Area 6a,13	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. During the survey, *P. filirostre* was recorded from herb-rich OMH/grassland habitat on the Peninsula in Areas 6a and inland at the Former Landfill site (Area 13). Both sites supported abundant Black Medick as well as naturalised Lucerne *Medicago sativa*.
An apionid weevil	*Squamapion flavimanum*	Apionidae	Coleoptera	Nationally Scarce	Area 12	Open habitats - Short sward and bare ground - Open short sward	*Squamapion flavimanum* is a scarce species of apionid weevil. Historically, the species has been recorded from scattered locations across central southern England, but the majority of records are from south of the Thames in Kent and it has been recorded from a few kilometres south of the Swanscombe Peninsula. According to Hyman and Parsons (1992), *S. flavimanum* (then known as *Apion flavimanum*), is associated with 'Calcareous grassland and hedgerows', and the recorded foodplants include Wild Marjoram *Origanum vulgare* and Calamint *Calmintha* spp., as well as possibly Wild Basil *Clinopodium vulgare*. During the 2020 survey, *S. flavimanum* was recorded from Bamber Pit (Area 12), which supported residual areas of calcareous grassland supporting Wild Marjoram amongst and a range of other typical calcareous grassland herbs. The habitat occurred in mosaic with scrub habitat.
Ground-ivy Jewel Beetle	*Trachys scrobiculatus*	Buprestidae	Coleoptera	Nationally Scarce	Area 11,15	Open habitats - Tall sward and scrub	Ground Ivy Jewel Beetle *Trachys scrobiculatus* is an uncommon beetle listed as nationally scarce in a review by Alexander (2014). The species is recorded mainly in southern England and there is a concentration of records in the Thames Corridor area. In Hyman and Parsons (1991), recorded habitats of *T. scrobiculatus* are listed as including 'Grassland, woodland and possibly quarries'. it is also state that the beetle is 'Largely, if not exclusively, confined to chalk and limestone'. Larvae of the Ground Ivy Jewel Beetle are leaf miners, associated primarily with Ground-ivy *Glechoma hederacea*, although it has been recorded from several other herbs. Adults typically occur around the roots of the foodplant and it is likely that the beetle was swept or vacuumed from Ground-ivy, which was abundant within the scrub-edge swards at the sites from which it was recorded during the 2020 survey. It was found in the Area 11 former chalk quarry 'The sportsground' and from Area 15 'Station Quarter South', which supported disturbance habitat of calcareous substrate.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A ground beetle	*Acupalpus maculatus*	Carabidae	Coleoptera	Nationally Rare; Near Threatened	Area 4	Wetland - Marshland	*Acupalpus maculatus* is a species of ground beetle which was first recorded in the UK in 1996 and to date, has been recorded from around Rye in West Sussex and from sites adjacent to the Thames in north Kent. According to Luff (2007), the beetle is found 'in moss and at the edges of pools and lakes'. In a review of the conservation status of UK carabidae by Telfer (2016), *A. maculatus* was afforded Nationally Rare with a threat status of Near Threatened. During the 2020 survey, the beetle was recorded from samples collected from the southeast corner of Black Duck Marsh; where pitfall traps were deployed at the margin of a shallow area of open water and swamp habitat.
A ground beetle	*Agonum nigrum*	Carabidae	Coleoptera	Nationally Scarce	Area 1	Wetland - Peatland; Reedfen and pools	*Agonum nigrum* is an uncommon ground beetle with a mainly coastal distribution in the UK. There are several records from the Thames corridor including records from within close proximity to the Swanscombe survey area. The species was listed as Notable (b) in a review by Hyman and Parsons (1992) and Nationally Scarce in the most recent review by Telfer (2016). Hyman and Parsons (1992) describe the habitat preferences of *A. nigrum* as 'River banks, estuarine reed-beds, marshes in dune slacks, saltmarshes and the margins of lakes, ponds and gravel pits.' The beetle is a predator found on bare mud and amongst lush vegetation in wetland habitats. During the 2020 survey, *A. nigrum* was recorded only from the saltmarsh habitat (Area 1) on the Swanscombe Peninsula).
A ground beetle	*Amara montivaga*	Carabidae	Coleoptera	Nationally Scarce	Area 2,3,5	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. 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. maculatus* was classed as Nationally Scarce in the UK. During the 2020 survey, the beetle was recorded from samples collected from the drier band of coastal grassland and scrub, south of the saltmarsh; this area included localised areas of more sparsely vegetated calcareous grassland habitat.
A ground beetle	*Amara spreta*	Carabidae	Coleoptera	Nationally Rare; Near Threatened	Area 2	Open habitats - Short sward and bare ground - Bare sand and chalk	*Amara spreta* is a rare ground beetle with a widely scattered and mainly coastal distribution in the UK. There are several Kent records and additional records from the London area, but the species does not appear to have been historically recorded from the Thames corridor. The species was listed as Nationally Rare with a threat status of Near Threatened in the most recent review by Telfer (2016). Hyman and Parsons (1992) describe the habitat preferences of *A. spreta* as 'Sand dunes', where the beetle occurs in 'dry, loose sand amongst Marram'; However, Luff (2007) additionally cites 'sand pits'. During the 2020 survey, *A. spreta* was recorded only from the coastal grassland of Swanscombe Peninsula (Area 2) Whilst there is no dune habitat in this area, it includes some patches, of drier, more arid/sandy habitat.
Saltmarsh Short-spur	*Anisodactylus poeciloides*	Carabidae	Coleoptera	S41 Priority species; Nationally Scarce	Area 1,6b	Coastal - saltmarsh - Saltmarsh and transitional brackish marsh	The Saltmarsh Short-spur *Anisodactylus poeciloides* is a scarce species of ground beetle listed as a 'priority species' under s41 of the NERC Act 2006. In the UK, the beetle is virtually restricted to coastal sites, occurring mainly in on the East Anglian coast of Suffolk and Essex, within the Thames corridor and from sites along the south coasts of Dorset and Hampshire. According to Hyman and Parsons (1992), the Saltmarsh Short-spur is found in 'saltmarshes, salt-pans and brackish ditches at the margins of grazing levels'. The species is considered to be at risk due to loss of habitat through development within parts of its range where it is most common, such as the Thames corridor area. During the 2020 survey, Saltmarsh Shortspur was recorded from the Swanscombe saltmarsh habitat in Area 1, as well as from the brackish edge of reedswamp habitat of Area 6b.
A ground beetle	*Badister collaris*	Carabidae	Coleoptera	Nationally Scarce	Area 4	Wetland; Tree associated - Marshland; Wet woodland; Shaded woodland floor	*Badister collaris* is a scarce species of ground beetle, which is largely restricted to southeast England in the UK. There are several records within the Thames corridor, both in north Kent and south Essex and there are records within a few kilometres of the survey area. According to Luff (2007), *B. collaris* occurs 'In litter at the well-vegetated edges of ponds and flooded gravel pits'. During the 2020 survey, the beetle was recorded only from the southeast corner of Black Duck Marsh (Area 4), where it was recorded from pitfall traps located on a partially vegetated bank adjacent to swamp habitat.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A ground beetle	*Bembidion fumigatum*	Carabidae	Coleoptera	Nationally Scarce	Area 7	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 a few kilometres of the 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 the 2020 survey, the beetle was recorded only from the ditch edge grazing marsh habitat in Botany Marshes (west) Area 7.
A ground beetle	*Bembidion iricolor*	Carabidae	Coleoptera	Nationally Scarce	Area 1	Coastal - saltmarsh - Saltmarsh and transitional brackish marsh	*Bembidion iricolor* is a scarce species of ground beetle, which in the UK, has a widespread but exclusively coastal distribution as far north as the Scottish border. There are a number of records from both north Kent and south Essex, within the Thames corridor and it has been found historically within a few kilometres of the survey area. According to Luff (2007), *B. iricolor* occurs 'In saltmarshes and estuarine litter'. During the 2020 survey, the beetle was recorded only from the saltmarsh habitat (Area 1) on the Swanscombe Peninsula.
A ground beetle	*Bembidion normannum*	Carabidae	Coleoptera	Nationally Scarce	Area 1,2,6b	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 both from the coastal saltmarsh of Swanscombe Peninsula and from brackish, wet mud and shingle at the interface of reedswamp and drier, calcareous grassland at the edge of Area 6b.
A ground beetle	*Bembidion octomaculatum*	Carabidae	Coleoptera	Nationally Scarce	Area 1	Wetland - Marshland	*Bembidion octomaculatum* is a scarce species of ground beetle, which in the UK, is mainly restricted to the southeast, where it there are scattered records both inland and on the coast. There are a few records from north Kent, these mainly being some distance from the Swanscombe site. According to Hyman and Parsons (1992), *B. octomaculatum* occurs on the 'Margins of freshwater, usually small pools.' and the 'species has also been found on the seashore'. During the 2020 survey, the beetle was recorded only from the saltmarsh habitat (Area 1) on the Swanscombe Peninsula.
Bombadier beetle	*Brachinus crepitans*	Carabidae	Coleoptera	Nationally Scarce	Area 1,2,3,6a,6b,13,14	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 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 hiostoric records from the Swanscombe Peninsula. 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 2020 aurvey, Bombardier Beetle was recorded from several sites both inland and on the Swanscombe Peninsula.
A ground beetle	*Calathus ambiguus*	Carabidae	Coleoptera	Nationally Scarce	Area 1	Open habitats - Short sward and bare ground - Bare sand and chalk	*Calathus ambiguus* is a scarce species of ground beetle, which has a widely scattered UK distribution, with inland and coastal records from as far north as Scotland. However, arguably the greatest density of records are from the Thames corridor area and there are records from both north Kent and south Essex within close proximity of the survey area. According to Hyman and Parsons (1992), *C. ambiguus* occurs on variety of dry, sparsely vegetated habitats on sandy or chalk substrates such as 'Heathland, sand-dunes, chalk pits, gravel pits and disused quarries'. During the 2020 survey, the beetle was recorded only from the saltmarsh habitat (Area 1) on the Swanscombe Peninsula, which suppported some sandy shore and shingle habitats.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A ground beetle	*Dyschirius nitidus*	Carabidae	Coleoptera	Nationally Scarce	Area 1,6b	Coastal - saltmarsh	*Dyschirius nitidus* is a scarce species of ground beetle, which has a widely scattered UK distribution, with aggregations of records distributed around the English and Welsh coasts. There are several records from the Thames corridor, including from within close proximity to the survey area. According to Hyman and Parsons (1992), *Dyschirius nitidus* is predominately coastal and 'frequents sandy places and the edges of saltmarsh'. The beetle lives in burrows and is thought to predate rove beetles of the genus *Bledius*, several species of which were also recorded from saltmarsh and brackish habitat on the Swanscombe Peninsula. During the 2020 survey, the beetle was recorded from the saltmarsh habitat (Area 1) on the Swanscombe Peninsula and also from a strip of saturated bare mud and shingle at the edge of the interface between reedbed and calcareous grassland in Area 6b.
A ground beetle	*Dyschirius politus*	Carabidae	Coleoptera	Nationally Scarce	Area 6b	Wetland - Running water	*Dyschirius politus* is a scarce species of ground beetle, which has a widely scattered UK distribution, with aggregations of records distributed both inland and around the UK coast as far north as Scotland. There are several records from the Thames corridor, including one from within, or in close proximity to the survey area. Luff (2007) states that *D. politus* occurs 'On bare sand and silt, not always near water' and also refer to an association with saltmarsh habitats. During the 2020 survey, the beetle was recorded from a strip of saturated bare mud and shingle at the edge of the interface between reedbed and calcareous grassland in Area 6b on the Swanscombe Peninsula. This habitat also supported two closely related *Dyschirius* species and a range of other wetland and brackish associated beetles.
A ground beetle	*Dyschirius salinus*	Carabidae	Coleoptera	Nationally Scarce	Area 1,6a,6b	Coastal - saltmarsh	*Dyschirius salinus* is a scarce species of ground beetle, which has been recorded around the English and Welsh coasts, with outlying records in the north of Scotland. The greatest concentration of UK records are from the Thames corridor and there are records from within close proximity of the survey area. According to Luff (2007), *D. salinus* occurs 'In saltmarshes on clay or fine silt/sand banks'.During the 2020 survey, the beetle was recorded from the saltmarsh habitat (Area 1) on the Swanscombe Peninsula and also from a strip of saturated bare mud and shingle at the edge of the interface between reedbed and calcareous grassland in Area 6b. This habitat also supported two other closely related *Dyschirius* species and a range of other wetland and brackish associated beetles.
A ground beetle	*Harpalus attenuatus*	Carabidae	Coleoptera	Nationally Scarce	Area 10	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 survey the beetle was recorded from OMH/ calcareous grassland at Craylands Pit (Area 10), which supported predominately dry, sparsely vegetated, chalky substrates.
Mellet's Downy-Back	*Ophonus melletii*	Carabidae	Coleoptera	S41 Priority species; Nationally Rare; Near Threatened	Area 3,4,11	Open habitats - Short sward and bare ground	The s41 'priority species' Mellet's Downy-back *Ophonus melletii* is a rare species of ground beetle, which has a scattered distribution within the southern half of the UK. The beetle occurs on the coast and to a lesser extent, from inland sites. The highest concentration of records are from north Kent and south Essex, within the Thames corridor and it has been found historically within close proximity of the survey area. According to Hyman and Parsons (1992), Mellet's Downy-back occurs on 'calcareous grassland' and 'open ground on chalky or alluvial soils'. Adults probably occurring under stones and at the base of tussocky vegetation. During the 2020 survey, the beetle was recorded only from Areas 3 and 4 on the Swanscombe Peninsula as well as from the Sportsground (Area 11), which supported semi-improved calcareous grassland in mosaic with scrub.
A ground beetle	*Pterostichus longicollis*	Carabidae	Coleoptera	Nationally Scarce	Area 6b,8	Wetland - Marshland	*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 it has been found historically 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 river banks, 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 from the interface between reedbed and calcareous grassland in Area 6b and from coastal grazing marsh habitat of Botany Marshes (East) Area 8, on the Swanscombe Peninsula.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A ground beetle	*Scybalicus oblongiusculus*	Carabidae	Coleoptera	Nationally Rare; Vulnerable	Area 6a,6b	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 2020 survey, *S. oblongiusculus* was recorded from the interface between reedbed and calcareous grassland in Area 6b, on the Swanscombe Peninsula. According to Telfer (2016), the species is considered to have an elevated vulnerability to local and regional extinction in the UK.
A ground beetle	*Syntomus truncatellus*	Carabidae	Coleoptera	Nationally Scarce	Area 14,16	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. 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 2020 survey, *S. truncatellus* was recorded from OMH/grassland habitat in Areas 14 (Station Quarter) and 16 (The Triangle).
Basket Longhorn Beetle	*Gracilia minuta*	Cerambycidae	Coleoptera	Nationally Scarce	Area 1,4,6a	Tree associated - decaying wood - Bark and sapwood decay	The Basket Longhorn Beetle *Gracilia minuta* is a scarce species, which has a scattered UK distribution with records as far north as Glasgow. The beetle has been relatively well recorded in north Kent and south Essex, within the Thames corridor and it has been found historically within close proximity of the survey area. According to Hyman and Parsons (1992), Basket Longhorn occurs in woodland and scrub and is 'Associated with blackthorn, elm, hazel, lime and osier.' However, the beetle has also been recorded to breed 'in bramble and loganberry canes and in the stems of dog rose'. The beetle has also been recorded emerging from wickerwork, hence the name of Basket Longhorn. During the 2020 survey, *Gracilia minuta* was recorded from the Saltmarsh (Area 1), the wooded margin of Black Duck Marsh (Area 4) and from grassland and scrub mosaic habitat in Area 6a.
A tortoise beetle	*Cassida nobilis*	Chrysomelidae	Coleoptera	Nationally Scarce	Area 1	Open habitats - Tall sward and scrub	*Cassida nobilis* is an attractive species of tortoise beetle which has a widely scattered UK distribution, with most records being from coastal habitats in the southern half of the UK; however, there are a number of records well inland. In the southeast, the beetle has been recorded from both Kent and Essex sides of the Thames in close proximity to the survey area. Hyman and Parsons (1992) state that *C. nobilis* is a species of 'Sandy and chalky soils' and mention its main foodplant as being Corn Spurrey *Spergula arvensis* and possibly other Caryophyllaceae', but also refer to the beetle being associated with with goosefoots Chenopodiaceae and Sea Sandwort *Honkenya peploides*. During the 2020 survey, *C. nobilis* was recorded from saltmarsh habitat in Area 1; which supported both *Spergularia, Honkenya* as well as Chenopodiaceae spp.
A tortoise beetle	*Cassida prasina*	Chrysomelidae	Coleoptera	Nationally Scarce	Area 19	Open habitats - Short sward and bare ground - Open short sward	*Cassida prasina* is a species of tortoise beetle which has a widely scattered distribution, with most records being from the southern half of the UK; In the extreme southeast, there appear to be relatively few records, although it has been recorded from close to Ilford, north London. Hyman and Parsons (1992) state that *C. prasina* occurs in 'Grassland, disturbed ground and probably scrub'. The recorded foodplants include Yarrow *Achillea millefolium*, Sneezewort *Achillea ptarmica* and probably Sea Campion *Silene uniflora*. During the 2020 survey, *C. prasina* was recorded only from Area 19 verge habitat near the Tilbury Docks, Essex, where the most probable foodplant was Yarrow.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A flea beetle	*Chaetocnema confusa*	Chrysomelidae	Coleoptera	Nationally Scarce	Area 15	Wetland - Peatland	*Chaetocnema confusa* is a scarce species of flea beetle which, has a scattered distribution within England and Wales. Whilst a number of records are from coastal sites, the species also occurs inland. Whilst the species has been historically recorded from sites in Kent and Essex, records are generally sparse in this area. *C. confusa* occurs mainly in wetland habitats and is associated with various sedges and possibly Purple Moor Grass *Molinia caerulea* and rushes. The adult beetles overwinter in moss and grass tussocks. During the 2020 survey *C. confusa* was recorded from wet grassland habitat in the Station Quarter South (Area 15). This site supported wetland habitats including ephemeral ponds.
A leaf beetle	*Cryptocephalus hypochaeridis*	Chrysomelidae	Coleoptera	Nationally Scarce	Area 1,1a,2,3,5,6a, 6b,10,11,12,1 3,14,15,16	Open habitats - Short sward and bare ground - Open short sward	*Cryptocephalus hypochaeridis* is a species of leaf beetle with a scattered distribution within the southern half of the UK, occurring both on the coast and inland sites. The beetle has been well recorded within the Thames corridor, with several records from within and close to the Swanscombe Peninsula. Inland, the species is mainly associated with calcareous grassland habitats but also occurs in coastal dune systems. The beetle is associated with yellow-flowered herbs including composites and buttercups (Ranunculus). During the survey, *C. hypochaeridis* was recorded from most of the survey areas both inland and on the peninsula. The closely related but slightly commoner *C. aureolus* was also recorded during the survey.
A pot beetle	*Cryptocephalus parvulus*	Chrysomelidae	Coleoptera	Nationally Scarce	Area 10	Open habitats; Tree associated - Tall sward and scrub; Arboreal - Scrub edge	*Cryptocephalus parvulus* has a scattered UK distribution, with records as far north as the Lake District. However, the majority of records are from southeast England including Surrey, Sussex and Kent. There are several records from sites near to Swanscombe, within the Thames corridor. *C. parvulus* is a phytophagous species of broadleaved woodland and scrub. It is associated mainly with birch in the UK, but has mainly been recorded from oak on the continent. Larvae feed on birch leaves, particularly those that are brown and have a fungal infection. It is thought that the larval stage lasts for two years. During the 2020 survey, the insect was recorded from Craylands Pit (Area 10). Silver Birch *Betula pendula* constituted a significant scrub component on this site.
A flea beetle	*Phyllotreta cruciferae*	Chrysomelidae	Coleoptera	Nationally Scarce	Area 1	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 previous records from the Thames Gateway and London area. According to Duff (2016), this species is associated with 'many wild and cultivated Brassicaceae', but 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 2020 survey, *P. cruciferae* was recorded from the saltmarsh in Area 1 on the Swanscombe Peninsula.
A ladybird beetle	*Clitostethus arcuatus*	Coccinellidae	Coleoptera	Nationally Endangered (RDB1 pre-1994)	Area 4	Tree associated - Arboreal	The Horseshoe Ladybird *Clitostethus arcuatus* is a minute (1.2-1.5mm) ladybird with a distinctive horseshoe-shaped marking on its elytra (wing-cases). Most records are from the Thames Gateway area and East Anglia, but there are recent records from South Wales and Yorkshire. Though it is still a very scarce species, it appears to be spreading, perhaps due to climate warming (Roy and Brown 2018). This may suggest that its Nationally Endangered status is out of date. *C.arcuatus* is associated predominantly with Ivy-covered trees (Duff 2020), but has also been recorded on Honeysuckle *Lonicera*, Holly *Ilex* and other shrubs and trees (Roy and Brown 2018), in a variety of habitats. During the 2020 survey, *C. arcuatus* was recorded in marshy deciduous woodland in Area 4 on the Swanscombe Peninsula.
Adonis Ladybird	*Hippodamia variegata*	Coccinellidae	Coleoptera	Nationally Scarce	Area 1a,2,3,5,10,1 1,13	Open habitats - Tall sward and scrub	Adonis Ladybird *Hippodamia variegata* is listed as Nationally Scarce (Notable B) in Hyman and Parsons (1992), but is likely to be downgraded due to an increase in records. The Adonis Ladybird has been well recorded throughout much of southern half of the UK, with fewer records in the west. There are a number of records from both north and south of the Thames in Essex and Kent. According to Hyman and Parsons, Adonis Ladybird is 'A mainly coastal species'; however, it has been well recorded inland. Favoured habitats listed by Hyman and Parsons (1992) include 'Heathland, grassland, parkland, sand dunes, riverbanks and wasteground'. The beetle is a predatory species frequently found 'on thistles, knapweed, broom, gorse and bramble'. During the 2020 survey, Adonis Ladybird was recorded from OMH and herb-rich grassland habitat in Areas 10 and 13.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A ladybird beetle	*Platynaspis luteorubra*	Coccinellidae	Coleoptera	Nationally Scarce	Area 10,11	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 and the beetle was recorded within the survey area during the 2015 survey; however, records of the species are infrequent. 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 Craylands Pit (Area 10) and the Sportsground (Area 11). Both sites support grassland scrub mosaic habitat, with Craylands Pit being the more open site.
A ladybird beetle	*Scymnus limbatus*	Coccinellidae	Coleoptera	Nationally Scarce	Area 4	Tree associated - Arboreal	The Bordered Scymnus *Scymnus limbatus* is a small 'inconspicuous ladybird' which is very locally distributed within the UK, occuring most frequently in south-east England, with records centered in the London and Thames Gateway area. According to Roy and Brown (2018), *S.limbatus* is a species of 'deciduous trees in marshy habitats', with a particularly strong affinity for Willows *Salix* and Poplars *Populus*. During the 2020 survey, *S. limbatus* was recorded in marshy deciduous woodland with Willows *Salix* in Area 4 on the Swanscombe Peninsula.
A weevil	*Calosirus terminatus*	Curculionidae	Coleoptera	Nationally Scarce	Area 13	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 a couple of records from the Thames gateway area, with a greater concentration found on the south Kent coast. 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 2020 survey, *C. terminatus* was found only in the herb-rich calcareous grassland area of Craylands Pit (Area 10).
A weevil	*Cathormiocerus spinosus*	Curculionidae	Coleoptera	[Nationally Scarce A]	Area 10	Open habitats - Short sward and bare ground - Bare sand and chalk	The weevil *Cathormiocerus spinosus* occurs widely but locally throughout England and Wales, being most frequent in the south-east of England. There are many previous records in Kent, incuding in the Thames Gateway area where it has previously been recorded close to the Swanscombe Peninsula. The Nationally Notable A status is thought to be in need of revision, as this weevil has proven to be fairly widespread in suitable habitats, though it probably still warrants a Nationally Scarce status. It has probably been under-recorded historically due to its cryptic camouflage, and habit of feeding at the roots of plants. A recent increase in the use of suction sampling as a survey technique has increased our knowledge of its true distribution. It occurs on dry chalky and sandy soils (Duff 2016), often in sparsely vegetated areas. During the 2020 survey, *C. spinosus*was found only in the herb-rich calcareous grassland area of Craylands Pit (Area 10).
A weevil	*Cosmobaris scolopacea*	Curculionidae	Coleoptera	Nationally Rare (pre-1994)	Area 1	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. It is known to occur around 15km east of the survey site around the Medway Estuary, but has not previously been recorded from the Swanscombe Peninsula. 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 found to be fairly frequent in the saltmarsh of Area 1 on the Swanscombe Peninsula, where its primary host plant in the UK- Sea-purslane, was abundant.
A weevil	*Glocianus punctiger*	Curculionidae	Coleoptera	S41 'priority species'; Nationally Scarce	Area 2,6a	Open habitats - Tall sward and scrub	*Glocianus punctiger* is a species of weevil which has been recorded widely but thinly throughout much of central and southern England and Wales. It is listed as a s41 'Species of principal importance' in the Pantheon database. There are several records from the Thames Gateway, in north Kent and south Essex. Morris (2008) describes the favoured habitats as including '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 survey, *G. punctiger* was recorded from flower-rich grassland/OMH in Areas 2 and 6a on the Swanscombe Peninsula.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A weevil	*Hypera fuscocinerea*	Curculionidae	Coleoptera	Nationally Scarce B	Area 3	Open habitats - Short sward and bare ground	The weevil *Hypera fuscocinerea* is scarce but widely distributed in the UK, occuring as far north as southern Scotland, but more frequently in south-east England, with a concentration of records in Kent and the wider Thames Gateway area. There are previous records around 12km to the south and east of the survey area. It is possible that this species is sometimes overlooked as the similar but far more common *Hypera postica*, as Duff (2016) suggests that *H. fuscocinerea* usually occurs at very low levels of abundance. It is found in open grassland where it is associated with dry sandy and chalky soils, feeding on Medicks *Medicago* (Duff, 2016). During the 2020 survey, *H. fuscocinerea* was found only in the dry calcareous brownfield grassland of Area 3 on the Swanscombe Peninsula.
A weevil	*Larinus planus*	Curculionidae	Coleoptera	Nationally Scarce	Area 8	Open habitats - Short sward and bare ground - Open short sward	*Larinus planus* is a fairly large, elongate weevil associated with thistles, particularly of the genera *Carduus* and *Cirsium* and the larvae feed within the flowerheads. The species is scarce in the UK and according to both Hyman and Parsons (1992) and Duff (2016) is mainly found near the coast. During the 2018 survey, *L. planus* was recorded only from Area 8, Botany Marshes (east) which comprised a mosaic of of damp grassland, scrub and wetland habitats. Both Creeping Thistle *Cirsium arvense* and *C. vulgare* were fairly abundant in the vegetation. *Larinus planus* has been historically recorded on both Kent and Essex sides of Thames corridor. Management is considered important to maintain the open, grassland habitats required by this species.
A true weevil	*Larinus turbinatus*	Curculionidae	Coleoptera	Unknown	Area 8	Not assigned	The weevil *Larinus turbinatus* is a recentl colonist that is still very rare in Britain. It was first found in the UK in 2008 (Duff 2016) , around 15km West of the survey area, and has since been found to be present at a minimum of two other localities, both in the Thames Gateway area (Gurney and Barclay 2017). *L. turbinatus* is a relatively large weevil (4-9mm) that can be distinguished from the similar *L. carlinae* by its broader body shape, and stubbier, straighter rostrum. It is found in grassland and brownfield sites where it feeds on Thistles *Cirsium*(Duff 2016). Given the abundance of suitable habitat and its foodplants, it is likely to spread rapidly within and beyond the Thames Gateway area. During the 2020 survey, *L.turbinatus* was found only in Botany Marsh Area 8, in an area of damp grassland with abundant Thistles *Cirsium*. This record represents a new locality for *L. turbinatus* in the UK.
A weevil	*Liparus coronatus*	Curculionidae	Coleoptera	Nationally Scarce B	Area 2	Open habitats - Tall sward and scrub	*Liparus coronatus* is a very large (1cm+) and heavily built weevil that occurs locally in south-east England, with a few records from elswhere in England and in south Wales (Duff 2016). Its distribution is centered around west Kent, where there are numerous records, including some within 1km of the survey area. Despite this concentration of records, it is puzzling scarce where it occurs, often only found singly. 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 2020 survey, *L. coronatus* was found only in the dry grassland of Area 2 on the Swanscombe Peninsula.
A weevil	*Lixus scabricollis*	Curculionidae	Coleoptera	RDBK (insufficiently known - pre-1994 criteria)	Area 1	Coastal - Sandy beach	The weevil *Lixus scabricollis* is scarce in the UK, found only on the coasts of southern England and Wales. A large portion of the records are from Kent, where it is has been recorded all around the coast, including within 10km to the east of the survey area. It is thought to be an established introduction (Hyman and Parsons, 1992), first detected in the UK in west Kent in 1987 (Duff, 2016). It appears to be increasing steadily, and is often frequent where it occurs (Duff, 2016). Available records on the NBN Atlas suggest that its Red Data Book status may well be out of date, the extent of its distribution perhaps better matching the criteria for a Nationally Scarce designation. *L. scabricollis* is an unusual weevil in several respects. Firstly, its appearance is highly unusual, being very long and thin, tapering to a point at both ends. Second, it is found almost exclusively on beaches, where it feeds on or at the roots of Sea Beet *Beta vulgaris* and other Amaranthaceae. During the 2020 survey, *L. scabricollis* was found only in Area 1 on the Swanscombe Peninsula, where saltmarsh runs down into sandy beaches on the Thames shore.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A weevil	*Magdalis barbicornis*	Curculionidae	Coleoptera	Nationally Scarce	Area 15	Tree associated - decaying wood - Bark and sapwood decay	*Magdalis barbicornis* is an all-black weevil that is distributed extremely locally, but widely in southern and central England, occuring from the south coast to as far north as Nottingham. It is known from the Thames Gateway and wider London area, where it has been recorded within 12km of the survey area. It feeds on various rosaceous trees and shrubs in woods, hedgerows and scrub, and has a relatively short adult season, being found only from May to July (Duff, 2016). Males of this species have greatly enlarged antennal clubs, that perhaps serve a sensory function such as detecting the presence of females. During the 2020 survey, *M. barbicornis* was found only in Area 15- Station Quarter South, an area containing a diverse range of habitats including herb-rich grassland, scrub and woodland edge.
A weevil	*Microplontus campestris*	Curculionidae	Coleoptera	[Nationally Scarce B]	Area 10,14	Open habitats - Short sward and bare ground	*Microplontus campestris* is a small, attractively-patterned weevil that has a widespread but localised distribution in the UK, occuring across southern and central England and Wales. It has been recorded in Kent and the wider London area, though records in the eastern Thames Gateway seem sparse. It currently has the status of Nationally Scarce B, but this is considered out of date, with this species occuring more widely that previously thought. It may be that *M. campestris* is spreading, or it may have been historically overlooked, as it is often scarce where it occurs (Duff, 2016). Duff (2016) states that this species feeds on Oxeye Daisy *Leucanthemum vulgare* in a variety of habitats, including grasslands and brownfield sites. During the 2020 survey, *M. campestris* was recorded in both Area 10 (Crayland's Pit) and Area 14 (Station Quarter), areas comprised predominantly of herb-rich grassland.
A weevil	*Mononychus punctumalbum*	Curculionidae	Coleoptera	[Nationally Scarce B]	Area 10	Open habitats; Wetland; Coastal - Short sward and bare ground; Coastal sea cliff; Running water- Exposed sea cliff	The Iris Weevil *Mononychus punctumalbum* is a very localised species in the UK. The beetle is distinctive in having a single tarsal claw on each leg. The majority of UK records are from the coast of southwest England and in the southeast, the beetle has been recorded from a handful of sites. The nearest apparent records to the survey area, are from around Dulwich, approximately 13km southwest of the Swanscombe Peninsula. The insect is according to Hyman and Parsons (1992) associated with 'coastal cliffs, though occasionally also in wetland'. The larvae develop in the seed-pods of Stinking Iris *Iris foetidissima* and also Yellow Flag *I. pseudacorus* and within the 2020 survey, the species was recorded only from Craylands Pit (Area 10), which supported Stinking Iris at the woody margins.
A weevil	*Orthochaetes setiger*	Curculionidae	Coleoptera	Nationally Scarce	Area 16	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. 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 2020 survey, *O. setiger* was recorded only from the field and ground layers of a small area of OMH at the Triangle (Area 16). It is likely, however, that it occurs elsewhere within thwe wider survey area.
A weevil	*Polydrusus formosus*	Curculionidae	Coleoptera	[Nationally Scarce A]	Area 10,14,15	Tree associated - Arboreal	Formerly known as *Polydrusus sericeus, P. formosus* is a species of leaf weevil which is typically associated with broadleaved woodland rides, clearings and woodland edge habitats. Whilst the beetle is still classified as Nationally Scarce (Na), a recent recorded increase of this species has lead to a suggested status revision.There are a number of historic records from south-east England including Kent and it has been recorded within close proximity to Swanscombe. During the 2020 survey, the insect was recorded from Craylands Pit (Area 10) as well as from Station Quarter (Area 14) and Station Quarter South (Area 15). Whilst these sites (Area 15 in particular) supported some mature trees, woody vegetation consisted mainly of younger deciduous scrub and yound trees.
A weevil	*Sitona macularius*	Curculionidae	Coleoptera	[Nationally Scarce B]	Area 10	Open habitats - Tall sward and scrub	*Sitona macularius* is a very scarce broad-nosed weevil that has been recorded widely in England, Wales and Scotland (Duff, 2016), though it appears to have sharply declined in recent years, and is now very rarely recorded (Mark Gurney pers. comm.). It is for this reason that its status of Nationally Scarce B is considered to be out of date, as this species is now aparently much rarer, possibly warranting Nationally Rare status. S. *macularius* is known from the survey area, having been recorded in both the 2012 and 2015 surveys. Its rarity and decline are particularly puzzling, as it is known to feed on a variety of common herbaceous Fabaceae, such as Vetches *Vicia,* Medicks *Medicago,* and Clovers *Trifolium* (Duff, 2016). During the 2020 survey, S. *macularius* was recorded only in Area 10 (Crayland's Pit), an area of herb-rich calcareous grassland.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A weevil	*Sitona waterhousei*	Curculionidae	Coleoptera	Nationally Scarce B	Area 5,10,13	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. *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 tenuis* (glaber) 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 Area 10 Craylands Pit; *Lotus glaber* was particularly abundant and *L. corniculatus* also occurred at this site.
A weevil	*Smicronyx reichi*	Curculionidae	Coleoptera	[RDB3]	Area 3	Open habitats - Short sward and bare ground - Open short sward	The weevil *Smicronyx reichi* is very scarce in the UK, occuring predominantly in the far south-east of England and the Thames Gateway area. It has been recorded in the Swanscombe area previously, but was not recorded in the 2012 or 2015 survey. Its status of Red Data Book 3 is considered possibly out of date due to the previous under-recording of this species, it now being known to occur more widely, but still warranting a Nationally Scarce status. It may have been previously overlooked due to its small size, slow movements, and cryptic pattern of scales. *S. reichi* may be increasing, as despite Duff (2016) stating that it is usually rare where found, it can be locally frequent on Thames Gateway brownfield sites. It feeds on Common Centaury *Centaurium erythraea*, and possibly also Yellow-wort *Blackstonia perfoliata* (Duff 2016). During the 2020 survey, *S. reichi* was recorded only in the sparsely vegetated area of brownfield land in Area 3 on the Swanscombe Peninsula, where both Common Centaury *C. erythraea* and Yellow-wort *Blackstonia perfoliata* were present in abundance.
A weevil	*Tanymecus palliatus*	Curculionidae	Coleoptera	Nationally Scarce	Area 2	Open habitats - Tall sward and scrub	*Tanymecus palliatus* is a nationally scarce species of broad-nosed weevil with a scattered distribution throughout England and parts of Wales, with records as far north as the western English/Scottish border. There a number of records from southeast England including Kent and Essex, being most strongly recorded along the south coast and in East Anglia. There are historic records from immediately south of the Swanscombe Peninsula. In Hyman and Parsons (1992) recorded habitats of *T. palliatus* are listed as including 'Hedgebanks, roadside verges, grassland, undercliffs and possibly also woodland.' The larvae of the weevil feed on the roots of plants, whilst in the UK adults are associated with various plants including, according to Hyman and Parsons (1992), 'thistles, nettles, greater burdock *Arctium lappa*, Greater Knapweed *Centaurea scabiosa* and Black Knapweed *C. nigra*'. During the 2020 survey, *T. palliatus* was recorded from coastal grassland and scrub mosaic habitat on the Swanscombe Peninsula (Area 2).
A weevil	*Trachyphloeus spinimanus*	Curculionidae	Coleoptera	[Nationally Scarce B]	Area 11	Open habitats - Short sward and bare ground - Open short sward	*Trachyphloeus spinimanus* is a small (2-3mm) ground-dwelling weevil that is highly camouflaged, being pale soil-like in colour and texture. It is very scarce in the UK, with most records from the south Kent coast, north Kent Thames Gateway area, and the Brecklands of East Anglia. It has been recorded in the Swanscombe area previously, but was not found in either the 2012 or 2015 survey. It is found at plant roots in open habitats on dry soils (Duff, 2016), usually on chalk or short turf by the coast, but sometimes in other grasslands, such as in the Brecklands where it is found on sandy soils. Its status of Nationally Scarce B is considered possibly out of date- it may well be that it is scarcer than previously thought, though it is hard to assess its true distribution as its appearance and habits make it particularly difficult to detect. During the 2020 survey, *T. spinimanus* was recorded only from the flower-rich chalk grassland scrub mosaic habitat of the former chalk quarry Area 11 (The Sportsground).

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A weevil	*Tychius schneideri*	Curculionidae	Coleoptera	Nationally Scarce	Area 3	Open habitats - Short sward and bare ground - Open short sward	*Tychius schneideri* is one of a number of similar species in the genus *Tychius* with scales arranged in a pattern of longitudinal stripes. It is widespread but scarce in southern England and Wales, with clusters of records on the south and east Kent coasts, as well as to the eastern end of the Kent Thames Gateway area, where it has been recorded around 10km from the survey area. It is typically found in open habitats by the coast, but also occurs inland in suitable habitats where its sole foodplant Kidney Vetch *Anthyllis vulneraria* is found (Duff, 2016). Duff (2016) states that this species hibernates in moss, and can be frequent where it is found. During the 2020 survey, *T. schneideri* was recorded only in the sparsely vegetated area of brownfield land in Area 3 on the Swanscombe Peninsula, where its foodplant Kidney Vetch *A. vulneraria* was frequent.
A weevil	*Tychius squamulatus*	Curculionidae	Coleoptera	Nationally Scarce	Area 2	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, with the closest previous records around 12km south-east of the 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 2020 survey, it was found only in Area 2 on the Swanscombe Peninsula, in the flower-rich but sparsely vegetated inland section, where Bird's-foot-trefoils *Lotus spp.* were abundant.
A weevil	*Zacladus exiguus*	Curculionidae	Coleoptera	Nationally Scarce B	Area 15	Open habitats - Tall sward and scrub	*Zacladus exiguus i*s locally distributed in the UK with most records from southeast England and East Anglia. There are several records from the Thames Gateway area and West Kent. 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 Station Quarter South (Area 15).
A diving beetle	*Agabus conspersus*	Dytiscidae	Coleoptera	Nationally Scarce	Area 7,15	Coastal - Brackish pools and ditches; saline lagoon; saltmarsh	*Agabus conspersus* is a scarce, but distinctive species of diving beetle, which is largely confined to coastal wetlands in the UK, due to an affinity with brackish conditions. The beetle has a scattered distribution around the UK coasts, with records from as far north as Edingburgh. The largest number of records, however, are from southeast England and East Anglia. *A. conspersus* is well recorded within the Thames corridor, with coastal records on both sides of the Thames in Kent and Essex. The beetle has been recorded historically from, or within close proximity to the survey area. According to Foster and Friday (2009), *A. conspersus* is 'largely confined to brackish water, usually amongst sparse vegetation in coastal lagoons and ditches'. During the 2020 survey, the beetle was recorded from the grazing marsh ditches of Botany Marsh West (Area 7), but also occurred somewhat out of its usual contex, inland from Station Quarter South (Area 15).
A diving beetle	*Dytiscus circumcinctus*	Dytiscidae	Coleoptera	Nationally Scarce	Area 4	Wetland - Marshland; Open water on disturbed mineral sediments	*Dytiscus circumcinctus* is a large species of diving beetle, which has been recorded from scattered sites throughout the southern half of the UK. There are a few records from the Thames corridor area on both Kent and Essex sides of the estuary. Foster and Friday (2009) state that *D. circumcinctus* occurs in 'vegetated, permanent still water in lowland ponds, lakes and drains'. The beetle is thought to have disappeared from old fenland sites in Cambridgeshire and Huntingdonshire, Foster and Friday (2009) refer to coastal grazing levels in the Kent (and some other coastal counties). During the 2020 survey, *D. circumcinctus* was recorded only from Black Duck Marsh (Area 4).
A diving beetle	*Graptodytes bilineatus*	Dytiscidae	Coleoptera	Nationally Scarce	Area 4	Wetland - Peatland; Reedfen and pools	*Graptodytes bilineatus* is a scarce species of diving beetle, which is largely confined to coastal wetlands in the UK. The majority of UK records are from coastal sites and whilst there are a few records from the southwest, the species has mainly been recorded from the east coast of England, with scattered aggregations of records as far north as the Humber. *G. bilineatus* is well recorded within the Thames corridor, with records from sites in Essex and Kent. Foster and Friday (2009) state that '*G. bilineatus* occurs in England mainly in reedbeds, sometimes in brackish water'. During the 2020 survey, the beetle was recorded only from the reed swamp dominated, Black Duck Marsh (Area 4); the habitat within this area conforming to the descriptions in Foster and Friday (2009).

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A diving beetle	*Hygrotus parallellogrammus*	Dytiscidae	Coleoptera	Nationally Scarce	Area 7	Coastal - Brackish pools and ditches; saltmarsh	*Hygrotus parallellogrammus* is a scarce species of diving beetle, which is largely confined to coastal wetlands in the UK. The majority of UK records are from coastal sites and whilst there are a few records from the southwest, the species has mainly been recorded from the east coast of England. The Thames corridor, arguably holds the greatest density of records and *H. parallellogrammus* has historically been recorded within close proximity of the Swanscombe Peninsula. Foster and Friday (2009) state that *H. parallellogrammus* 'is confined to brackish water, but that there are occasional inland records'. During the 2020 survey, the beetle was recorded only from the brackish ditches of Area 7 Botany Marsh West.
A diving beetle	*Rhantus frontalis*	Dytiscidae	Coleoptera	Nationally Scarce	Area 4,6A,7	Wetland - Peatland	*Rhantus frontalis* is a scarce, medium sized species of diving beetle, which has been mainly recorded from populations in southeast England, with a number of records also coming from southern Scotland and Ireland. Theb highest density of records appears to be from the Thames corridor and the insect has historically been recorded from the Swanscombe Peninsula. According to Foster and Friday (2009), *R. frontalis* is found in 'Lowland pools amongst vegetation, often over partly exposed substrata, in particular sand'. During the 2020 survey, the beetle was recorded from Areas 4, 6a and 7 on the Swanscombe Peninsula, the habitat including reedswamp drains as well as ditches within grazing marsh habitat.
A click beetle	*Athous campyloides*	Elateridae	Coleoptera	Nationally Scarce	Area 13	Open habitats - Tall sward and scrub	The click beetle *Athous campyloides* is fairly widespread but scarce in south and central England, and Wales. Although it is recorded widely, most records are from Kent and Sussex, where it has been recorded in the Thames Gateway area within 10km of the survey area. It is very local elsewhere. *A. campyloides* occurs in a variety of habitats including grasslands and gardens, where it is usually found on low vegetation (Duff, 2020). It is thought to be crepuscular (Duff, 2020) or possibly nocturnal, with multiple records attributed to the use of light traps. It may therefore prove to be more widespread, but is just difficult to detect due to these habits and the short adult season. During the 2020 survey, it was found only in Area 13 (Former Landfill), an area predominantly comprised of herb-rich grassland.
An erirhinid weevil	*Notaris scirpi*	Erirhinidae	Coleoptera	[Nationaly Scarce B]	Area 4	Wetland - Marshland	*Notaris scirpi* is a weevil in the family Erirhinidae, a relatively small family with only 14 British species, closely related to the True Weevils- Curculionidae. It occurs locally throughout central and south-eastern England and Wales, with a few records in north England. *N. scirpi* has been recorded widely in Kent and throughout the Thames Gateway area. It is strongly associated with wetland habitats, where its foodplants are Sedges *Carex*, Club-rushes *Schoenoplectus* and Bulrushes *Typha*, the larvae feeding at the roots, the adults on the foliage (Duff, 2016). Its status of Nationally Scarce B is deemed out of date as it has now been recorded far more widely than this status suggests, possibly due to a recent range expansion, or previous under-recording. During the 2020 survey, it was recorded only in Area 4 on the Swanscombe Peninsula, an area of mixed wetland habitats.
A whirligig beetle	*Gyrinus paykulli*	Gyrinidae	Coleoptera	Nationally Scarce	Area 4,7	Wetland - Peatland; Reedfen and pools	*Gyrinus paykulli* is a scarce species of whirligig beetle which as been recorded from scattered sites throughout the UK. However, the majority of records are from sites on or close to the coast in eastern England, where it has been particularly well recorded between south Kent north to the Humber. There are several records from the Thames corridor, including records from both north Kent and essex which are reasonably close to the 2020 survey area. According to Foster and Friday (2009) *G. paykulli* 'typically skulks in reedbeds and can occur in base-enriched sites'. During the 2020 survey, the beetle was recorded from the Black Duck Marsh (Area 4) reedbed, as well as from drainage ditches in Botany Marsh West (Area 7); the ditches in the area supported stands of Common Reed *Phragmites australis*.
A crawling water beetle	*Haliplus apicalis*	Haliplidae	Coleoptera	Nationally Scarce	Area 7	Coastal - Brackish pools and ditches; saltmarsh	*Haliplus apicalis* is a species of crawling water beetle which is more or less restricted to coastal sites in the UK. The species has been recorded mainly from the east coast of England as far north as southern Scotland. However, the largest aggregation of records are from coastal sites in south east England and East Anglia and the species has been well recorded along the Thames Estuary, including from sites in close proximity to the Swanscombe Peninsula. According to Foster and Friday (2009), *H. apicalis* is 'found in brackish waters such as coastal lagoons, puddles and drainage ditches,' however, the species also occassionally occurs inland. During the 2020 survey, the beetle was recorded only from the grazing marsh ditches of Area 7 Botany Marsh West.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A crawling water beetle	*Peltodytes caesus*	Haliplidae	Coleoptera	Nationally Scarce	Area 2,4,5,6B,7,8	Wetland - Marshland; Open water on disturbed mineral sediments	*Peltodytes caesus* is a scarce species of crawling water beetle which is mainly confined to the southern half of the UK. Other than a large concentration of records from the Somerset Levels, the majority of UK records are from eastern England, occurring both inland and on the coast. There are a number of historic records from the Thames Estuary in north Kent and south Essex and the beetle has been recorded within close proximity to the survey area. Foster and Friday (2009) state that the insect is 'Confined to lowland rich fen pools and ditches'. During the 2020 survey, *P. caesus* was recorded from a number of survey areas on the Swanscombe Peninsula, but not from any of the inland sites. The recorded habitats included grazing marsh (Areas 7 and 8) and reed swamp habitat in Areas 4, 5 and 6B.
A grooved water scavenger beetle	*Helophorus nubilus*	Helophoridae	Coleoptera	Nationally Scarce	Area 3	Open habitats - Tall sward and scrub	The Wheat Mud Beetle *Helophorus nubilus* is a a beetle in the family Helophoridae, known as the Grooved Water Scavenger Beetles. Despite this, it is not associated with water, but with open and often dry habitats. It is local but widely distributed throughout the UK, including in the Thames Gateway area where it has been recorded within a 5km of the survey area. Available records suggest that its Nationally Scarce status may be out of date, perhaps as the beetle has been previously overlooked due to its small size, slow movements and cryptic appearance. Adults are found in decaying vegetable matter, and at the roots of various plants (Duff, 2016). During the 2020 survey, it was found only in Area 3 on the Swanscombe Peninsula, a sparsely-vegetated brownfield grassland area.
A hydraenid beetle	*Ochthebius nanus*	Hydraenidae	Coleoptera	Nationally Scarce	Area 7	Coastal - Brackish pools and ditches; Marshland	*Ochthebius nanus* is a scarce species of water beetle which is mainly confined to the southern half of the UK. Other than a large concentration of records from the Somerset Levels and scattered records from Wales and the southwest, the majority of UK records are from mainly coastal areas of eastern England, although it has been recorded from several inland sites. There are historic records from the Thames Estuary in north Kent and south Essex and the beetle has been recorded within close proximity to the survey area. Duff (2012) state that the insect occurs in 'Canals, ditches and ponds, mainly near the coast'. During the 2020 survey, *O. nanus* was recorded only from coastal grazing marsh ditches in Botany Marsh West (Area 7).
A hydraenid beetle	*Ochthebius viridis*	Hydraenidae	Coleoptera	Nationally Scarce	Area 2	Coastal - Brackish pools and ditches; Marshland	*Ochthebius viridis* is a scarce species of water beetle which is mainly recorded from coastal sites in eastern England, There are a number of records from the Thames Estuary in north Kent and south Essex and the beetle has been recorded within close proximity to the survey area. Duff (2012) state that the insect occurs in 'Brackish pools and silt ponds'. During the 2020 survey, *O. viridis* was recorded only from a brackish ditch in the coastal grassland and scrub habitat immediately behind the saltmarsh in Area 2.
A water scavenger beetle	*Berosus luridus*	Hydrophilidae	Coleoptera	Near Threatened (post-2001 IUCN criteria); Nationally Scarce	Area 4,5.6B,7,8	Wetland - Marshland; Open water on disturbed mineral sediments	*Berosus luridus* is a nationally scarce species of water-scavenger beetle, which was also classed within the 'Near Threatened' category in a review by Foster (2010). Most records are from the southern half of the UK, where it occurs in both inland and coastal wetland sites. In the Thames corridor *B. luridus* has been reasonably well recorded, with several records from coastal sites in north Kent, both to the east and west of the Swanscombe Peninsula. According to Foster (2010), *B. luridus* is found in 'lowland ponds and slow drains with a peaty substratum'. However, the species is not confined to acid substratum, occurring in marl and clay lakes in the Republic of Ireland. Foster also states that the larvae of *Berosus* spp. are unusual amongst the Hydrophilidae, as they are 'apneustic, obtaining oxygen from water by the use of pseudobranchiae'. This enables them to live in mud at the bottom of ponds. During the 2020 survey, *B. luridus* was recorded from several wetland sites on the Swanscombe Peninsula.
A water scavenger beetle	*Cryptopleurum crenatum*	Hydrophilidae	Coleoptera	Nationally Scarce	Area 7	Open habitats - Tall sward and scrub	*Cryptopleurum crenatum* is a scarce species of water scavenger beetle. In the UK, the species has been recorded from relatively few, widely scattered sites in central and southern England. There are several records of the beetle from the Thames Estuary in north Kent and south Essex and the beetle has been recorded within a few kilometres of the survey area. Foster *et al* (2014) describe *C. crenatum* as being 'found in natural wetland habitats among plant debris and moss, particularly in sunlit sites'. However, like other menmbers of the genus, the beetle is also associated with decaying organic matter and dung. During the 2020 survey, *C. crenatum*was recorded only from grazing marsh ditch habitats in Botany Marsh West (Area 7).

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A water scavenger beetle	*Enochrus halophilus*	Hydrophilidae	Coleoptera	Nationally Scarce	Area 7	Coastal - Brackish pools and ditches; saltmarsh	*Enochrus halophilus* is a scarce species of water scavenger beetle with a mainly coastal distribution in the UK. There are scattered records from around the coasts of England and Wales, however, the majority of records are from East Anglia and the Thames corridor, where the beetle has been recorded both sides of the estuary, including the Swanscombe Peninsula itself. According to Foster *et al* (2014), *E. halophilus* 'is confined to brackish water not just on the coast, but also where there is brackish seepage inland'. During the 2020 survey, *E. halophilus* was recorded from the coastal grazing marsh ditches of Botany Marsh West.
A water scavenger beetle	*Helophorus alternans*	Hydrophilidae	Coleoptera	Nationally Scarce (Na)	Area 6B,7	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 are from south Kent, the Thames corridor and the east coast including Essex and Suffolk. Most records are from sites lying to the east of Swanscombe Peninsula. 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 2020 survey, *H. alternans* was recorded from the brackish ditch network in Botany Marsh West and also from the reedswamp and other wetland habitat in Area 6B.
A water scavenger beetle	*Helophorus fulgidicollis*	Hydrophilidae	Coleoptera	Nationally Scarce	Area 6B,7	Coastal; Brackish pools and ditches, saltmarsh; Saltmarsh and transitional brackish marsh	*Helophorus fulgidicollis* is a scarce species of grooved water scavenger beetle, which has been recorded widely around the UK coast as far north as Scotland. The beetle has been well recorded from both Kent and Essex sides of the Thames corridor and there are records in close proximity of the Swanscombe Peninsula. Like the closely related *Helophorus alternans,* which was also recorded during the survey, *H.fulgidicollis* is confined to brackish water, where it occurs according to Foster *et al* (2014) 'usually in muddy pools with grassy edges in extensive areas of saltmarsh'. During the 2020 survey, *H. fulgidicollis* was recorded from the brackish ditch network in Botany Marsh West and also from the reedswamp and other wetland habitat in Area 6B.
A water scavenger beetle	*Helophorus nanus*	Hydrophilidae	Coleoptera	Nationally Scarce	Area 7	Wetland - Marshland	*Helophorus nanus* is one of the more readily identified British species of the genus *Helophorus.*The species has been recorded widely throughout the southern half of the UK, occurring both inland and on the coast. The beetle has been recorded from both Kent and Essex sides of the Thames corridor and there are records within a few kilometres of the Swanscombe Peninsula. According to Foster *et al* (2014) *H. nanus* occurs 'mainly in old fenland areas and on the Brecks' the beetle 'can be abundant in fen conditions amongst grasses and moss'. During the 2020 survey, the beetle was recorded only from coastal grazing marsh ditches of Botany Marsh West (Area 7).
A water scavenger beetle	*Hydrochus ignicollis*	Hydrophilidae	Coleoptera	Near Threatened	Area 4	Wetland - Peatland; Reedfen and pools	*Hydrochus ignicollis* is a rare species of water-scavenger beetle, which is largely confined to southeast England and East Anglia in the UK, with outlying records in the southwest and Anglesey. There are several records from estuarine wetland habitats in north Kent and the species has been recorded from a few kilometres east of the Swanscombe survey area. According to Foster (2010), 'the species occurs in stagnant, well vegetated pools, often in association with mosses in the margins of pools which dry out.' Foster (2010) also states that 'this species is exclusively associated with areas of ancient fenland, for example in the Breckland palsa scar ("pingo") fens. During the 2020 survey, *H. ignicollis* was recorded only from Area 4 Black Duck Marsh, a site which supports historically occurring fen habitat.
Great Silver Water Beetle	*Hydrophilus piceus*	Hydrophilidae	Coleoptera	NT (Near Threatened)	Area 7,12	Wetland - Peatland; Reedfen and pools	Great Silver Water Beetle *Hydrophilus piceus is* classed in the 'Near Threatened' classification under post-2001 IUCN criteria. In the UK, the beetle is strongly associated with drainage ditch networks in coastal grazing marshes and the largest populations in the UK occur in areas such as the Somerset and Gwent Levels, grazing marsh in Kent and Sussex and the Thames corridor, as well as in coastal Suffolk and the Norfolk Broads. Great Silver Water Beetle has been recorded from a number of sites within close proximity to the survey area. The beetle is typically associated with ditches in mid-successional phase, which support a diverse flora of floating aquatic macrophytes. Ideal habitat would include floating mats of species such as Ivy-leaved Duckweed *Lemna trisulca*, Frogbit *Hydrocharis morsus-ranae*, Water Violet *Hottonia palustris* and/or other floating aquatic species, which provide similar structure. During the survey, an adult Great Silver Water Beetle was recorded from the pond at Bamber Pit (Area 12) and larvae and egg cases were recorded from aquatic samples collected from a well vegetated field drain in Botany Marshes west (Area 7).

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A malachite beetle	*Axinotarsus pulicarius*	Malachiidae	Coleoptera	Nationally Rare, Vulnerable	Area 1	Open habitats - Tall sward and scrub	*Axinotarsus pulicarius* is an extremely rare species of malachite beetle which, according to Alexander (2014) is 'Restricted to the south-east of England: through the lower Thames corridor, northwards along the coastal zone of East Anglia (North Essex and East Norfolk), and on the south coast in East Sussex and East Kent.' Alexander (2014) also states that 'The larvae are believed to develop in the stems or at the roots of plants in areas of damp grassland and coastal shingle.' and that 'The adults fly in rank herbage and visit flowers'. During the 2020 survey the insect was recorded only from the coastal saltmarsh habitat of Area 1. The species was identified from samples by Steve Lane.
A malachite beetle	*Cerapheles terminatus*	Malachiidae	Coleoptera	Nationally Rare	Area 4	Wetland; Peatland; 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. It appears that this is the first record of *C. terminatus* in the Thames Gateway area, with the species not having been recorded in either the 2012 or 2015 surveys. Duff (2020) states that this species is usually found 'on flowers in meadows and fens'. It is possible that this record of *C. terminatus* relates to a stray individual, however, given the extent of potentially suitable wetland habitat in the area, it may represent a previously unknown population. During the 2020 survey, *C. terminatus* was recorded only in Area 4 on the Swanscombe Peninsula, an area comprised of a mixture of wetland habitats including extensive reedbeds.
A mordellid beetle	*Mordellistena neuwaldeggiana*	Mordellidae	Coleoptera	Nationally Scarce	Area 3	Tree associated - decaying wood - Bark and sapwood decay	Most UK records of *Mordellistena neuwaldeggiana* are from the southern half of England and there are a number of records from the Thames corridor and London Area. It has been recorded from several sites close to the Swanscombe survey area in Kent, as well as north of the Thames in Essex. According to Hyman and Parsons (1992), the insect is associated with woodland and pasture woodland habitats and on the Continent it is mainly associated with wood edges. The larvae are thought to be associated with wood decay habitat or plant stems, whilst adults can be found on the flowers of umbellifers such as Hogweed *Heracleum sphondylium*. During the survey, *M. neuwaldeggiana* was recorded from comparatively mature broadleaved woodland edge habitat at the boundary of Area 3.
A mordellid beetle	*Mordellistena parvula*	Mordellidae	Coleoptera	Nationally Scarce	Area 11,13,14	Not assigned	*Mordellistena parvula* is a Mordellid Beetle that is very scarce in the UK, with scattered records in central and southern England, and south-west Wales. There are several previous Kent records, with the closest being around 13km to the east of the survey area. Mordellids are sometimes known as tumbling flower beetles, due to their habit of tumbling erratically from flowers as an escape mechanism. Duff (2020) states that *M. parvula* is found 'on flowers, often Mugwort *Artemisia vulgaris*, in grassland, especially at well insolated sites on calcareous soils'. The taxonomy of this species is historically confused, with the species' now known under the names of *M. nanuloides* and *M. pseudoparvula* previously recorded as *M. parvula*, alongside the true *M. parvula*. This combined with the difficulty of identifying species in this genus may have resulted in under-recording, though it does appear that *M. parvula* is genuinely scarce. During the 2020 survey, this species was recorded in the former chalk quarry Area 11,13 and 14, all of which supported flower-rich grassland on calcareous geology.
A tumbling flower beetle	*Mordellistena variegata*	Mordellidae	Coleoptera	Nationally Scarce	Area 4,8	Not assigned	In a recent status revision by Alexander *et al* (2015), *Mordellistena variegata* was listed as nationally scarce. The insect has a patchily recorded distribution with records being confined to the southern half of the UK. There are a number of records from the West Midlands south of Birmingham, with relatively fewer records stretching eastwards to Norfolk. In the south, the insect is confined to the southeast, with a number of records from Surrey, Sussex and Kent, south of London. There are historic records of the insect within close proximity of the survey area in Grays, Essex and in Kent. Like other tumbling flower beetles, *M. variegata* is a saproxylic species. The larvae develop in delignified rotting wood and the beetle has been recorded from a range of broadleaved trees including Pedunculate Oak *Quercus robur*, Field Maple *Acer campestre* and Rowan *Sorbus aucuparia*. The insect is also sometimes associated with traditionally managed fruit orchards. During the survey the beetle was beaten from wet woodland habitat on the edge of Area 4 and scrub habitat in Area 8.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A pollen beetle	*Meligethes rotundicollis*	Nitidulidae	Coleoptera	Nationally Scarce	Area 10,16	Not assigned	The pollen beetle *Meligethes rotundicollis* is very scarce in the UK, occuring widely but extremely locally in England and Wales. It has been recorded several times in Kent, incuding in the Thames Gateway area, around 6km from the survey area. Duff (2020) states that *M. rotundicollis* is found 'on or near flowering Charlock *Sinapis arvensis* and Hedge Mustard *Sisymbrium officinale*' between the months of March and August. It may be that this species is under-recorded due to the difficulty in identifying species in the genus *Meligethes*, though it does appear to be genuinely scarce, despite having common and widespread foodplants. During the 2020 survey, *M. rotundicollis* was recorded in Area 10 (Crayland's Pit)- an area of herb-rich calcareous grassland, and Area 16 (The Triangle)- an area of tall herb and scrub habitat.
A shining flower beetle	*Olibrus flavicornis*	Phalacridae	Coleoptera	Red Data Book-insufficiently known	Area 1a,2,3,4,5,6a, 6b,10,11,12,1 3,14,15,16,19	Not assigned	*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. 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 2018, the beetle was recorded from the majority of survey Areas, apart from the saltmarsh (Area 1) and east and west sections of the Botany Marshes (Areas 7 and 8). The majority of sites supported rough, semi-improved grassland and or OMH. Autumn Hawkbit was recorded from some though not all of the sites; however, there waws a general abundance of yellow composites.
A dung beetle	*Aphodius plagiatus*	Scarabaeidae	Coleoptera	Nationally Scarce	Area 6b	Coastal - Sandy beach - Sandy beaches	The dung beetle *Aphodius plagiatus* is widely distributed but very scarce and localised in the UK, being found by the coast in Wales, north-western, eastern and southern England. There are multiple previous records from the north Kent coast, with the nearest to the survey area being around 10km to the east. It was not recorded in either the 2012 or 2015 survey. Despite being in the dung beetle family (Scarabaeidae), *A. plagiatus* is not associated with dung, with Duff (2020) stating that it is found 'in algal mats and damp litter in salt marshes, tidal creeks and wet dune slacks on sandy soils at the coast'. During the 2020 survey, *A. plagiatus* was recorded only in area 6b on the Swanscombe Peninsula, at the muddy edge of a saline/ brackish lagoon.
A carrion beetle	*Nicrophorus interruptus*	Silphidae	Coleoptera	Nationally Scarce	Area 1	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 in Kent, as well as in London and throughout the Thames Gateway area. *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 2020 survey, *N. interruptus* was recorded only in Area 1 on the Swanscombe Peninsula, an area that is predominantly saltmarsh.
A rove beetle	*Bledius tricornis*	Staphylinidae	Coleoptera	Nationally Scarce B	Area 2,6b	Coastal - saltmarsh	The rove beetle *Bledius tricornis* is very scarce in the UK, occuring widely but very locally around the coasts of central and southern England, and Wales. It has been recorded on the north, east and south coasts of Kent, but not within 15km of the survey area. *B. tricornis* is one of several similar species in which males show highly developed secondary sexual characters, in this case, a long horn projecting forwards from the pronotum, and two horns projecting forwards from the head. It is thought that these may be used to compete with other males for access to females. Lott (2009) states that this species is found on 'sand and mud in saltmarshes and estuaries' often with a similar but much more frequent species: *B. limicola*. During the 2020 survey, *B. tricornis* was recorded in both Area 2 and Area 6b on the Swanscombe Peninsula. Both of these areas contain areas of mud or sand in saline situations.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A rove beetle	*Lomechusa emarginata*	Staphylinidae	Coleoptera	Nationally Scarce	Area 15	Open habitats - Tall sward and scrub	*Lomechusa emarginata* is a widespread but scarce aleocharine rove beetle, found in central and southern England, and Wales. It has been recorded in Kent, but appears not to be known from the Thames Gateway area. It was not recorded in either the 2012 or 2015 survey. *L. emarginata* has a very unusual appearance, being heavily sclerotised and very stocky in build, unlinke most other rove beetles. It also has a peculiar life history, being an obligate myrmecophile (ant associate) with an alternating life-cycle. The larvae live in the nests of ants in the genus *Formica* in the Spring and Summer, where they are protected and fed in exchange for nutrient-rich secretions (Parmentier, 2019). The adults then reside in the nests of ants in the genus *Myrmica* overwinter, where they are cared for in a similar manner (Parmentier, 2019). The ant *Formica cunicularia* was abundant throughout the survey area, as were several species of *Myrmica*, providing many suitable host nests. During the 2020 survey, *L. emarginata* was recorded only in Area 15- Station Quarter South, an area containing a diverse range of habitats including herb-rich grassland, scrub and woodland edge.
Hop-garden Earwig	*Apterygida media*	Forficulidae	Dermaptera	Nationally Scarce	Area 5,10,11,13	Open habitats - Tall sward and scrub - Scrub edge	Hop Garden Earwig *Apterygida media* is a smallish earwig restricted mainly to East Anglia and Kent in the UK. However, there are a number of records from these areas including several records from sites immediately south of the Swansworth Peninsula. According to Haes and Harding (1997), the insect was historically a common species within the Hop Gardens of Kent, but has declined seemingly following the widespread introduction of pesticide use. Little is known about the lifecycle of the Hop Garden Earwig, but it has been recorded from 'trees and shrubs, including the edges of woods, hedges and domestic gardens' (Haes and Harding, 1997), During the 2020 survey, the insect was recorded from the grassland and scrub mosaic habitat of Area 5 on the Peninsula, as well as from similar habitat on inland sites including Areas 10,11 and 13.
Lesne's Earwig	*Forficula lesnei*	Forficulidae	Dermaptera	Nationally Scarce	Area 15	Tree associated - decaying wood	Lesne's Earwig *Forficula lesnei* is a smallish earwig on the northern edge of its range in the UK. The insect is a habitat generalist, having been historically recorded from a range of habitats including trees and shrubs, hedges amongst nettles and in rough vegetation, predominately on base-rich soils (Haes and Harding, 1997). The insect has been recorded from scattered locations in southern England and on the Gower Peninsula, South Wales. There are a number of records within the Thames Corridor, on both the Kent and Essex sides of the Estuary. During the survey Lesne's Earwig was recorded from Station Quarter South (Area 15) , being recorded mainly from scrub, but also grassland and OMH habitats.
An anthomyiid fly	*Botanophila depressa*	Anthomyiidae	Diptera	pNearThreatened	Area 1	Not assigned	*Botanophila depressa* is an uncommon species of root maggot fly which was classed in the 'Near Threatened' category in a status review by Falk and Pont (2017). The fly is a sparsely recorded coastal species in the UK, with records from southern and eastern England, Wales and Scotland. In Kent it has been recorded from sites towards the eastern, seaward part of the Thames estuary, a few kilometres east of the 2020 survey area. Falk and Pont (2017) cite recorded habitats of *B. depressa* as including 'Coastal dunes and dune slacks, shingle beds, and waste ground near the coast,' stating that 'the species has been reared from annual sea-blite *Suaeda maritima*'. During 2020, *B. depressa* was recorded only from the saltmarsh habitat in Area 1. A sea-blite *Suaeda* sp. was occasionally recorded from the upper saltmarsh.
A chloropid fly	*Dicraeus scibilis*	Chloropidae	Diptera	Provisionally Nationally Scarce	Area 1,3	Open habitats; Tall sward and scrub	*Dicraeus scibilis* is one of several flies of the family chloropidae recorded during the survey. The insect is, according to Falk *et al* (2016) 'Very localised and infrequently recorded, except on the north Kent Marshes where it is locally frequent'. Whilst the fly is most strongly associated with coastal grassland, including saltmarsh and dune habitats, inland records are mainly from water meadows and unimproved pastures. The biology of the species is unknown, however, Falk *et al* (2016) speculates that the 'Larvae probably develop in grass seeds like related species'. During the survey, *D. scibilis* was recorded from saltmarsh habitat (Area 1), and from OMH close to the coast in Area 3.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A chloropid fly	*Trachysiphonella ruficeps*	Chloropidae	Diptera	Provisionally Nationally Scarce	Area 1,11	Open habitats - Short sward and bare ground - Bare sand and chalk	In the UK *Trachysiphonella ruficeps* is a very locally distributed species of chloropid fly, which has been recorded from widely scattered sites in southern England. According to Falk *et al* (2016), 'the Brecklands of East Anglia appear to be a stronghold'. The fly has been historically recorded from Kent, but it is uncertain whether it has been recorded within close proximity to the survey area. Falk *et al* (2016) descrube the favoured habitat of *T. ruficeps* as 'Dry, short grassland and heathland, but apparently not as short as for *Trachysiphonella pygmaea*.' The insect's biology unknown, although in Greece the genus has been found to be associated with ants.' During the 2020 survey *T. ruficeps* was recorded both from the Swanscombe saltmarsh (Area 1) and from the Sportsground (Area 11).
A chloropid fly	*Trachysiphonella scutellata*	Chloropidae	Diptera	Nationally Scarce	Area 1,2,3,5,6a,7,10,12,14,15,16	Open habitats - Short sward and bare ground - Bare sand and chalk	*Trachysiphonella scutellata* is a species of grass fly, originally listed as Nationally Scarce in the UK, the fly may have been downgraded following Falk *et al* (2016) due to increase of records. Falk (2016) gives the reason for downgrading as 'Occurs widely'. In the UK there are widely scattered records from both coastal and inland sites in England and Wales, with the furthest north record being in south Yorkshire. There are several records from south Essex sites close to the Thames. The fly is associated with dry grassland both in calcareous and acid situations, however, the biology is currently unknown. During the 2020 survey, *T. scutellata* was recorded from the majority of survey areas both on the Peninsula and inland, there are several historic records of the species within the general survey area.
A long-legged fly	*Sciapus laetus*	Dolichopodidae	Diptera	Nationally Scarce	Area 1	Coastal - saltmarsh - Saltmarsh and transitional brackish marsh	*Sciapus laetus* is a southern species of long-legged fly, with a patchy UK distribution around the coast from south Wales to Suffolk (Drake, 2018). Although there seem to be relatively few records for this species in the Thames corridor, there are records from sites north of the Thames in Essex, within 2kms of the Swanscombe peninsula. Drake (2018) states that *S. laetus* is 'A species of upper saltmarsh, often occurring beside pools or freshwater seepages flowing over it, sometimes in wet dune slacks and brackish ditches on grazing marsh.' During the 2020 survey, the fly was recorded only from coastal saltmarsh habitat in Area 1.
A fanniid fly	*Fannia lucidula*	Fanniidae	Diptera	Nationally Scarce	Area 1	Coastal; Open habitat - Saltmarsh	*Fannia lucidula* is a scarce species of lesser house fly recorded from mainly coastal habitats in the UK, although the species has been recorded from some sites inland. The species has been recorded from the Thames corridor on both the Kent and Essex sides of the estuary, with Essex records being closest to the survey area. Falk and Pont (2017) cite recorded habitats of *F. lucidula* (under *F. glaucescens*) as including 'Coastal salt marshes and salt meadows, and sand dunes/dune slacks; also inland, around gravel pits, in fens, and in marshy woodland.' stating that *Fannia* larvae develop in a wide range of decaying organic matter.' and that this species is found by sweeping Sea Beet *Beta vulgaris*. During the 2020 survey, *F. lucidula* was recorded only from the Swanscombe saltmarsh (Area 1). Sea Beet was locally recorded in the upper shore during the survey.
A muscid fly	*Coenosia atra*	Muscidae	Diptera	Provisionally Nationally Scarce	Area 1,11,15,16	Open habitats; Wetland	*Coenosia atra* is a scarce species of fly of a group collectively known as houseflies. The fly has been classed as pNationally Scarce in a review by Falk and Pont (2017). In the UK, the insect has been recorded mainly from central southern England, as well as South Wales. There are records from Kent and in Essex there are several records from the Tilbury area immediately north of the Swansworth Peninsula. Falk and Pont (2017) cite recorded habitats of *C. atra* as including 'marshy areas on heaths, rush *Juncus* and sedge *Carex* fens, and dune slacks.' The biology of the species is not known, however, Falk and Pont (2017) state that 'larvae of other *Coenosia* are known to be predators of Diptera larvae'. During thw 2020 survey, *C. atra* was recorded only from the saltmarsh (Area 1) on the Peninsula, but was also recorded from inland sites including Areas 11,15 and 16.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A muscid fly	*Phaonia cincta*	Muscidae	Diptera	Nationally Scarce	Area 12	Not assigned	*Phaonia cincta* is a scarce species of fly of a group collectively known as houseflies. The fly has been classed as pNationally Scarce in a review by Falk and Pont (2017). In the UK, the species has been recorded from widely scattered sites, with most records in central England, with outliers in Wales and southern Scotland. There are several records from the Thames corridor, west of the survey area, as well as from south Essex. Falk and Pont (2017) cite recorded habitats of *P. cincta* as including 'Old broad-leaved woodland, and old parkland with mature trees.' Falk and Pont (2017) state that 'The larvae have been reared from sap running from elm *Ulmus* and horse chestnut *Aesculus hippocastanum*'. During the 2020 survey, *P. cincta* was recorded only from Area 12, Bamber Pit. This site supported some mature trees, although it is uncertain whether there were mature Horse Chestnut on the site English Elm *Ulmus procera* was recorded as a scrub species.
An opomyzid fly	*Geomyza apicalis*	Opomyzidae	Diptera	pNationally Scarce	Area 6a	Open habitats - Tall sward and scrub	*Geomyza apicalis* is an uncommon species in the UK, with records distributed thinly as far north as Scotland. There are a number of histroric records in habitat adjacent to the Thames Estuary in Essex, but there are few records away from the coast and although it has certainly been recorded within a one or two kilometre radius of the survey area, it is uncertain whether the fly has been recorded from the Kent side of the river. 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 2020, *G. apicalis* was recorded from dry grassland habitat in close proximity to wetlands in Area 6a.
A flesh fly	*Blaesoxipha plumicornis*	Sarcophagidae	Diptera	Provisionally Nationally Scarce	Area 2,5,10,12,13, 14,15	Open habitats; tall sward and scrub	*Blaesoxipha plumicornis* is a flesh fly which, according to Falk and Pont (2017) is a 'rather poorly-known species, although possibly overlooked because of the relatively low level of recording in this group'. In the UK, the species is mainly known from Dorset, but has been recorded from several other southern English counties. It is associated with calcareous grassland and heathland habitats and the larvae are known to be parasitoids of grasshoppers including *Chorthippus parallelus, C. brunneus* and *Omocestus viridulus,* all of which were plentiful on site. Adult *B. plumicornis* are attracted to flowers of plants including Wild Carrot *Daucus carota* and Wood Spurge *Euphorbia amygdalioides*. During the survey, *B. plumicornis* was recorded from most grassland sites within the 2020 survey area.
A flesh fly	*Sarcophaga subulata*	Sarcophagidae	Diptera	Provisionally Nationally Scarce	Area 2	Tree associated - Shaded woodland floor	*Sarcophaga subulata* is a species of flesh fly which was classed as pNationally Scarce in a review by Falk and Pont (2017). In the UK, the species has been recorded from widely scattered sites in southern and central England and Wales. There are several records from the Thames corridor in Essex, including a record from the northen bank of the Thames directly north of the Swanscombe peninsula. Falk and Pont (2017) cite recorded habitats of *S. subulata* as including 'Calcareous grassland, sandy heaths, and broad-leaved woodland', with 'one record from a suburban garden.' In terms of biology, Falk and Pont (2017) state that 'This species has been reared in mainland Europe from the gypsy moth *Lymantria dispar* (Lepidoptera, Lymantriidae) and in England from the Kentish snail *Monacha cantiana* (Helicidae).' Kentish Snail was recorded on several occasions during the current survey. During the survey, *S. subulata* was recorded only from coastal grassland habitat of Area 2 on the Swanscombe peninsula.
A flesh fly	*Sarcophila latifrons*	Sarcophagidae	Diptera	Provisionally Nationally Scarce	Area 2,3,5,10	Open habitats - Short sward and bare ground - Bare sand and chalk	*Sarcophila latifrons* is a species of flesh fly which was classed as pNationally Scarce in a review by Falk and Pont (2017). The species is almost exclusively coastal in the UK, with scattered records from around the coasts of the England and Wales. Within the Thames corridor there are a number of records from south Essex, directly north of the survey area. Falk and Pont (2017) cite recorded habitats of *S. latifrons* as 'Usually coastal grassland, dunes and beaches, but occasionally inland heathland.' Falk and Pont (2017) state that larvae have been 'reared from vertebrate and invertebrate carrion', and have been considered to be 'parasitoids of various grasshoppers (Orthoptera, Acrididae), although Pape (1987) doubts the attribution to *S. latifrons* of the last observation.' During the 2020 survey, *S. latifrons* was recorded from coastal grassland and scrub mosaic and OMH from sites including Areas 2,3 and 5 on the Swanscombe peninsula and from Area 10, just inland.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
Spot-sided Pygmy Snailkiller	*Colobaea punctata*	Sciomyzidae	Diptera	Nationally Scarce	Area 7	Wetland - Peatland; Reedfen and pools	Spot-sided Pygmy Snailkiller *Colobaea punctata* is a scarce species of snail-killing fly (Sciomyzidae).There are widely scattered inland and coastal records from England as far north as Yorkshire and mainly coastal records from Wales. There are several records from within the Thames corridor, including records from close to the survey area. According to Falk (1992), the fly has been recorded from 'Lush marginal vegetation beside rivers, ponds and ditches'. 'The adults are characteristically found where lower summer water levels leave their snail hosts beside ditches and ponds. The larvae are highly specialised parasites feeding on terrestrial and aestavating aquatic snails.' During 2020 Spot-sided Pygmy Snailkiller was recorded only from coastal grazing marsh habitat at Botany Marsh west (Area 7).
A sciomyzid fly	*Ditaeniella grisescens*	Sciomyzidae	Diptera	Nationally Scarce	Area 7	Wetland - Marshland;Peatland	The Hairy-sided Little Snailkiller *Ditaeniella grisescens*, is a scarce species of snail-killing fly. It has been recorded from widely scattered sites in England with records extending to the far north. The fly has also been recorded from mainly coastal sites in Wales, however, the largest number of records are from East Anglia and southeast England, including the Thames corridor. According to Falk (1992) 'The majority of records are from coastal situations such as grazing marsh and levels, suggesting that mildly brackish conditions are favoured.' Falk (1992) also states that 'The larvae develop as parasitoids of snails' and conjectures that 'brackish water species such as *Hydrobia ventrosa* (Hydrobiidae) may prove to be more typical hosts in natural circumstances'. During the 2020 survey, D. grisescens was recorded only from coastal grazing marsh habitat in Area 7 Botany Marsh West.
A sciomyzid fly	*Pherbellia dorsata*	Sciomyzidae	Diptera	Nationally Scarce	Area 7	Wetland - Peatland; Marshland; Reedfen and pools	*Pherbellia dorsata* is a scarce species of snail-killing fly, which has been recorded from scattered inland sites in England and Wales, with records as far north as Newcastle upon Tyne. The largest aggregation of records is from the East Anglian fens; however, the species has been well recorded from the Thames corridor, with records from close to the 2020 survey area. In relation to the habitat preferences of *Pherbellia dorsata*, Falk (1992) states that 'A range of wetlands are utilised, both inland and coastal from both shaded and exposed sites.' As with other sciomyzid flies, 'The larvae develop as parasitoids of the aquatic snail *Planorbis planorbis*' (Falk, 1992). During the 2020 survey *P. dorsata* was recorded only from coastal grazing marsh habitat at Botany Marsh west (Area 7).
A sciomyzid fly	*Pherbellia griseola*	Sciomyzidae	Diptera	Nationally Scarce	Area 7	Wetland - Peatland	*Pherbellia griseola* is a scarce species of snail-killing fly which has been recorded from widely scattered sites in England, Wales with records extending as far north as Yorkshire. There are also a handful of records from, the far north of Scotland. In the Thames corridor, the fly has been recorded from sites in south Essex, including one within one kilometre of the Swanscombe peninsula. According to Falk (1992) 'A wide range of wetlands are used (by this species) including fens, bogs, dune slacks and damp woods and a requirement for standing water is present' Falk (1992) also states that 'The larvae develop as parasitoids of snails such as *Lymnaea palustris*'. During 2020, P. griseola is known only from the coastal grazing marsh habitat of Area 7 Botany Marsh West.
A tachinid fly	*Cistogaster globosa*	Tachinidae	Diptera	RDB2 pre-1994 criteria	Area 2,10	Not assigned	*Cistogaster globosa* is a distinctive species of tachinid fly, which was until recently, considered a great rarity in the UK, afforded a status of RDB1 'Endangered'. However, the species has been recorded more frequently within the past decade or so and there are records from a number of sites in south and central England. There are a number of records from the Thames corridor, both in Kent and Essex and *C. globosa* has been recorded on or within close proximity of the Swanscombe survey area. According to Belshaw (1993), the fly is a parasite of the Bishop's-Mitre Shieldbug *Aelia acuminata*. The aduly fly lays eggs on the dorsal surface of the host's abdomen eventually evacuating the host to pupate in the ground. During the 2020 survey, *C. globosa* was recorded from dry grassland habitat in Area 2 and 10. the host, *A. acuminata* was recorded extensively throughout the survey area.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A tachinid fly	*Gymnosoma rotundatum*	Tachinidae	Diptera	RDB3 'rare' pre-1994 criteria	Area 15	Open habitats	*Gymnosoma rotundatum* is a rare and distinctive species of tachinid fly which is is confined in the UK to southeast England including London, Surrey, Sussex and Kent (Belshaw, 1993). The species can be abundant in Surrey and Sussex, but Kent records are sparse. Like other flies in the genus *Gymnosoma, G. rotundum* is a parasitoid of heteropteran bugs and the species is associated specifically with shieldbugs of the genus *Palomena* spp. (Pentatomidae). Other Pentatomids may also be parasitised, though these records are 'old and questionable' according to Belshaw (1993). The recorded habitat according to Belshaw (1993) includes 'dry sandy areas on downland and heathland and isolated shrubs.' It may be associated with Hazel *Corylus avellana* and other trees and shrubs frequented by the host. During the survey, the fly was recorded from Area 15 (Station Quarter South), which supported a mosaic of grassland, scrub and more mature woodland. Common Green shieldbug *Palomena prasina* was recorded from this area, as well as a number of other survey sites.
A tephritid fly	*Merzomyia westermanni*	Tephritidae	Diptera	Nationally Scarce	Area 2	Open habitats - Short sward and bare ground; Tall sward and scrub	*Merzomyia westermanni* has been recorded from scattered sites across the southern UK. However, there a number of records of the species from south Essex and Thames Gateway area and the majority of British records are concentrated in southeast England. According to White (1988), the species is associated with Hoary Ragwort *Senecio erucifolius* and Common Ragwort *S. jacobaeae,* the larvae developing within the flower/seedheads. It is often recorded fronm OMH and grasslands. During the survey the fly was recorded from open scrub and grassland mosaic in Area 6a. Ragworts were recorded from the site.
A tephritid fly	*Miltogramma germari*	Tephritidae	Diptera	Nationally Scarce	Area 10	Open habitats - Short sward and bare ground - Bare sand and chalk	*Miltogramma germari* is a flesh fly recorded in the UK from south-west England and South Wales, with records from south Essex on the Thames. The fly is found in dunes, sandy heaths and chalk downland. The larvae are believed to feed on the food stores of mining bees and the adults are likely to occur in habitat which supports good colonies of such bees. During 2020 *M. germari* was recorded from the OMH/chalk grassland habitat in Area 10 Craylands Pit.
A tephritid fly	*Myopites eximius*	Tephritidae	Diptera	RDB3 pre-1994 criteria	Area 1	Coastal - saltmarsh - Saltmarsh and transitional brackish marsh	*Myopites eximius* is a rare species of picture-winged fly which is restricted to a few widely scattered coastal regions of southern England and Wales. The most strongly recorded area appears to include the Thames corridor, where there are records from both Essex and Kent sides of the Thames, most of these being from towards the upper reaches of the Estuary. In the UK, the species is more or less confined to saltmarsh and saline shingle banks. According to White (1988), *Myopites eximius* induces a gall in the capitulum of Golden Samphire *Inula crithmoides,* in which the larvae develop. During the 2020 survey, the fly was recorded only from coastal saltmarsh habitat Area 1, on the Swanscombe peninsula.
Phoenix Fly	*Dorycera graminum*	Ulidiidae	Diptera	S41 Priority species; Near Threatened (Post-2001 IUCN criteria); RDB3 'rare' pre-1994.	Area 11, 16	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) and 'Near Threatened' based on post-2001 IUCN criteria. 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. The habitat preferences of the species remain unresolved despite research undertaken for Natural England by Ismay (2000). Ismay refers to anecdotal records of the 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). On site the insect was swept from OMH at Areas 11 (The Sportsground) and 16 (The Triangle). These sites supported tall herb and scrub habitat, with umbellifers such as Wild Carrot *Daucus carota* and Fennel *Foeniculum vulgare*.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A ulidiid fly	*Melieria picta*	Ulidiidae	Diptera	Provisionally Nationally Scarce	Area 1,3	Coastal - saltmarsh - Saltmarsh and transitional brackish marsh	*Melieria picta* is a species of picture-winged fly of the family Ulidiidae. The species was listed as provisionally nationally scarce in a review by Falk *et al (*2016). The UK distribution of this fly has a strong southeasterly bias and the majority of records are from the Thames Estuary. Falk *et al* (2016) describe the favoured habitat of *M. picta* as 'Saltmarsh and brackish ditches and fleets of coastal levels.' The life history of the fly is poorly known, though the larvae may develop in decaying vegetable matter. During 2020, *M. picta* was recorded from the saltmarsh habitat in Area 1 and also from Area 3, possibly from the more coastal section.
A centipede	*Henia vesuviana*	Dignathodontidae	Geophilomorpha	Nationally Scarce	Area 4	Not assigned	*Henia vesuviana* is a Nationally Scarce Geophilomorph Centipede, also known as an earth centipede. It has been recorded widely but locally in southern England, including in the London area (Barber, 2008). Its habitat preferences are unclear, having been recorded in a vairety of situations, from gardens to the upper shore of beaches (Barber, 2008). It is probably highly under-recorded due to its habit of spending large portions of the year underground. When found, it is often in a characteristic and peculiar resting position in which the animal is knotted and curled into a ball. During the 2020 survey, *H. vesuviana* was recorded only in Area 4 on the Swanscombe Peninsula, an area of mixed wetland habitats.
Broad-headed Bug	*Alydus calcaratus*	Alydidae	Hemiptera	Nationally Scarce	Area 1a,2,3,10,11, 12,14	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). The species has been recorded from widely scattered sites across southern England and coastal sites in Wales and there are records from both Kent and Essex sides of the Thames in close proximity to the Swanscombe site. Although the species is primarily associated with dry lowland heathland, *A. calcaratus* is also found in sparsely vegetated brownfield habitats and occurs in such habitat within the Thames Gateway area. 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. Whilst there are few recorded sites in Essex, the insect was recorded from coastal OMH habitat in Area 3, during the current survey.
a stilt bug	*Berytinus hirticornis*	Berytidae	Hemiptera	Nationally Scarce	Area 3,11,12,15	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 OMH and dry grassland in Areas 3,12 and 15; Grass Vetchling was noted at several sites including Area 15 during the 2020 survey.
A leafhopper	*Aphrodes aestuarina*	Cicadellidae	Hemiptera	Nationally Scarce	Area 1	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 2020 survey *A. aestuarina* was recorded only from saltmarsh habitat (Area 1)
A leafhopper	*Macrosteles sardus*	Cicadellidae	Hemiptera	New to Britain	Area 8	Not assigned	*Macrosteles sardus* is a species of leafhopper which according to Tristan Bantock (pers com) has not been recorded in Britain prior to the specimen(s) collected for the purpose of the current survey. The species has been reported from various wetland habitats in Europe, including river flood plains and lake shores. Host plants unclear but may include *Epilobium hirsutum*. During the 2020 survey, *M. sardus* was recorded from Botany Marsh East (Area 8). Within this compartment, the most abundant willowherb recorded was Greater Willowherb *Epilobium hirsutum,* a common species of drier ditches and marginal wetland habitats.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A leafhopper	*Paralimnus phragmitis*	Cicadellidae	Hemiptera	Nationally Scarce	Area 8	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 2020 survey, *P. phragmitis* was recorded only from the coastal grazing marsh habitat of Botany Marsh East. This site supported a signifficant resource of Common Reed.
A leafhopper	*Psammotettix alienus*	Cicadellidae	Hemiptera	RDBK 'unknown'	Area 3,7	Not assigned	*Psammotettix alienus* is a species of leafhopper which has been recorded from very few sites in the UK and due to uncertainty over its distribution it is currently classed in the RDBK 'unknown' category. At the time of writing, Kirby (1992) stated that the species had only been recorded from the East Anglian Breckland. Tristan Bantock (pers com) stated that the insect occurred 'on grasses in open dry situations.' During the 2020 survey, the leafhopper was recorded both from OMH in Area 3 and within coastal grazing marsh habitat in Area 7 (Botany Marsh West).
A lacehopper	*Pentastiridius leporinus*	Cixiidae	Hemiptera	Nationally Scarce	Area 1,4	Coastal - saltmarsh	*Pentastiridius leporinus* (also known as *Oliarus 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 from south Essex and Kent. 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, *P. leporinus* has 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, *P. leporinus* was recorded from the saltmarsh habitat (Area 1) and the periphery of Black Duck Marsh (Area 4).
A cixiid bug	*Reptalus quinquecostatus*	Cixiidae	Hemiptera	Nationally Scarce	Area 3	Not assigned	Also known as *Oliarus panzeri, Reptalus quinquecostatus* is a scarce species of planthopper, which apart from a handful of records is known only from sites within the Thames corridor in south Essex and north Kent and the insect has been historically recorded from the Swanscombe Peninsula. According to Kirby (1992), *O. panzeri* has been recorded mainly from sites which are periodically waterlogged but which dry out and crack during summer. It has been suggested that the insect require cracked ground in which to oviposit below groundlevel. Adult insects area associated with grasslands. During 2020, *R. quinquecostatus* was recorded only from coastal grazing marsh habitat in Area 7 (Botany Marsh West).
Slender-horned Leatherbug	*Ceraleptus lividus*	Coreidae	Hemiptera	Nationally Scarce	Area 1a,2,10,13,14	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 Kent and and East Anglia and there are records from within close proximity 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 2020 survey, the insect was recorded from a number of grassy locations both inland and on the Swanscombe Peninsula.
A lesser waterboatman	*Sigara selecta*	Corixidae	Hemiptera	Nationally Scarce	Area 7	Coastal - Brackish pools and ditches; saltmarsh	*Sigara selecta* is a scarce species of lesser waterboatman in the UK, with records being almost exclusively from coastal sites in southeast and eastern England. There are a number of records from both the Kent and Essex sides of the Thames Estuary and the species has been recorded from within close proximity of the Swanscombe Peninsula. According to Southwood and Leston (1959), *S. selecta* is associated with saltmarsh habitats, stating that 'the Thames saltmarshes support it in great numbers'. Southwood and Leston (1959) also state that 'it has been found in shallow pools a little above the high water mark on raised beaches in Hampshire'. During the 2020 survey S. selecta was recorded from the brackish ditches within the coastal grazing marsh habitat of Area 7, Botany Marsh West.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A planthopper	*Asiraca clavicornis*	Delphacidae	Hemiptera	Nationally Scarce	Area 1a,2,3,5,6a,8, 10,11,12,13,16	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 and during the 2020 survey, a number of specimens were recorded from most grassland and scrub sites both on Swanscombe Peninsula and inland.
A planthopper	*Laodelphax striatella*	Delphacidae	Hemiptera	Nationally Scarce	Area 7	Not assigned	*Laodelphax striatella* is a Nationally Scarce species of planthopper, which has historically been recorded commonly from southeast England, but has declined significantly. Kirby (1992) states that 'British records are predominately from damp grassland' and that the species is 'probably polyphagous on grasses'. During the 2020 survey, the insect was recorded only from coastal grazing marsh habitat in Area 7.
A pond skater	*Aquarius paludum*	Gerridae	Hemiptera	Nationally Scarce	Area 7	Wetland - Marshland; Open water on disturbed mineral sediments	*Aquarius paludum* is a large species of pond skater which, was is currently classed as Nationally Scarce in the UK, following a status review by Cook (2015). The species was afforded a similar status in a review by Kirby (1992); however, according to Cook (2015) there has been an increase in records since that time. The majority of UK records are from sites inland and on the coast in southeast England and East Anglia. There are records from sites in close proximity to the 2020 survey area. According to Kirby (1992) *A. paludum* occurs 'in colonies on the surface of large open waterbodies such as lakes and resrevoirs, and on flowing water in rivers and canals'. During the 2020 survey, *A. paludum* was recorded only from samples collected from grazing marsh habitat in Area 7.
A ground bug	*Drymus latus*	Lygaeidae	Hemiptera	Nationally Scarce	Area 11,15	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, mainly from the east of the country. The majority of records for the insect are from the sites bordering the Thames in south Essex and north Kent. 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 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 2020 survey, *D. latus* was recorded from flower-rich SI calcareous grassland/scrub mosaic in Area 11 and from somewhat less herb-rich habitat in Area 15.
A ground bug	*Megalonotus antennatus*	Lygaeidae	Hemiptera	Nationally Scarce	Area 2	Open habitats - Tall sward and scrub	In the UK, the ground bug *Megalonotus antennatus* is classed as nationally scarce. has been recorded mainly from the southern half of England, south of the Wash, with most records being from the Midlands and the southeast. There are several records from close to the Thames both in north Kent and in south Essex. Kirby (1992) describes the recorded habitat for this ground bug as 'woodland rides and clearings, from limestone quarries, disused clay workings, dry grassland near the coast and on earth banks'. More specifically the species can 'occur in moss, amongst grass or other low vegetation and amongst stones and litter on partly bare ground' (Kirby, 1992) and the species is considered to be exclusively ground dwelling. In Essex it has been associated with damp, heavy soils, both in woodland rides and more open situations. During the survey *M. antennatus* was recorded from grassland and scrub mosaic habitat in Area 2.
a plant bug	*Lygus pratensis*	Miridae	Hemiptera	RDB3	Area 1,1a,2,3,5,6b, 8,10,11,12,13 ,14,15,16	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. Many of the records for this species are from southeast England including the Thames Gateway. During the 2020 survey *L. pratensis* was recorded from the majority of surveyed subcompartments, both on the Peninsula and inland.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A damsel bug	*Nabis pseudoferus*	Nabidae	Hemiptera	Nationally Scarce	Area 6a	Open habitats - Short sward and bare ground	*Nabis pseudoferus* is a nationally scarce species of damselbug, which has been recorded mainly from widely scattered coastal sites in the southern half of the UK. There are several records from Kent and an isolated from south Essex; within a few kilometres of the survey area. According to Kirby (1992), '*N. pseudoferus* is usually found in dry, sandy places'. and most records are from 'coastal dunes, but on sandy heathland and dry grassland in Kent'. Kirby also states that the insect 'occurs amongst both short sparse and relatively long grass and other vegetation, but always in dry, open and sunny locations.' During the 2020 survey, *N. pseudoferus* was recorded only from Area 6a, which conprises predominately of dry, fairly herb-rich calcareous grassland; although the more sparsely vegetated OMH within this area may have supported the species.
Sandrunner Shieldbug	*Sciocoris cursitans*	Pentatomidae	Hemiptera	Nationally Scarce	Area 4,5,11,14	Open habitats - Short sward and bare ground - Open short sward	The Sand-runner Shieldbug *Sciocoris cursitans* is a scarce and distinctive bug in the UK. It 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 and the species has also been recorded from around Dartford and putatively from just southwest of the Swanscombe Peninsula. Sand-runner Shieldbug is the known host to a Nationally Endangered (RDB1) tachinid fly *Gymnosoma nitens*. 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 insect 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*. During the 2020 survey, several specimens were swept/vacuumed from dry grassland/OMH habitat at Area 5 on the Peninsula and also from ex-chalk quarry grassland and scrub mosaic the 'Sportsground' (Area 11).
A shore bug	*Saldula opacula*	Saldidae	Hemiptera	Nationally Scarce	Area 7	Coastal - Brackish pools and ditches; saltmarsh-Saltmarsh and transitional brackish marsh	*Saldula opacula* is a scarce species of saldid bug, which is largely confined to sites on or near the coast between Norfolk and Kent, to the east and the western Welsh coast. The species also occurs inland in the Cambridgeshire area of East Anglia and in parts of Scotland. According to Kirby (1992), the species has been recorded from a wide range of wetland habitats and it has also been associated with moderately to strongly brackish water margins. During the survey *S. opacula* was recorded only from the coastal grazing marsh habitat of Area 7 (Botany Marsh west), which supported a network of ditches.
A shore bug	*Saldula pallipes*	Saldidae	Hemiptera	Nationally Scarce	Area 7	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 2020 survey area. According to Tristan Bantock (pers com) *S. pallipes* occurs in a various wetland margin habitats. During the 2020 survey, the insect was recorded only from grazing marsh ditch edge habitat, within Botany Marsh West (Area 7).
Scarce Tortiose Shieldbug	*Eurygaster maura*	Scutelleridae	Hemiptera	Nationally Scarce	Area 1a,6a,10,14	Open habitats - Short sward and bare ground - Open short sward	The Scarce Tortoise Bug is the rarer of two Biritsh species, both of which were recorded during the 2020 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 close proximity of the survey area. Nymphs of the insect feed on grasses and during the survey, Scarce Tortoise Bug was recorded from grassland areas of the Swanscombe Peninsula including the seawall (Area 1a) and inland calcareous grassland and scrub habitat in Area 6a.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A water cricket	*Microvelia pygmaea*	Velidae	Hemiptera	Nationally Scarce	Area 7	Wetland - Peatland; Sphagnum bog	*Microvelia pygmaea* is a small species of water cricket which is currently classed as Nationally Scarce in the UK, following a status review by Cook (2015). The species was afforded a similar status in a review by Kirby (1992) and according to Cook (2015) there has been little change in the recorded status of the insect since that time. The majority of UK records are from sites inland and on the coast in southeast England and East Anglia and there are records from sites in close proximity to the 2020 survey area. According to Kirby (1992) *M. pygmaea* is a semi-aquatic bug, which lives on the water surface, which is 'found in still and very slow flowing water,' usually in sites where there is a 'thick growth of emergent vegetation such as reeds or sedges, or where there is extensive growth of overhanging marginal vegetation'. However, the insect is considered to be tolerant of a wide range of water quality conditions of varied pH. During the 2020 survey, *Microvelia pygmaea* was recorded only from samples collected from grazing marsh habitat in Area 7. The habitat in this area was frequently well vegetated with macrophyte vegetation.
Bryony Mining Bee	*Andrena florea*	Andrenidae	Hymenoptera	RDB3 pre-1994 criteria	Area 15	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. 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 from Area 15 (Station Quarter South). The habitat included scrub, fairly herb-rich grassland and woodland edge habitat and White Bryony was recorded within the scrub component of the site, which also supported plentiful, sandy bare ground created by rabbit activity.
Hawk'sbeard Mining Bee	*Andrena fulvago*	Andrenidae	Hymenoptera	Nationally Scarce	Area 1,11	Open habitats - Short sward and bare ground - Rich flower resource	The Hawk's-beard Mining Bee *Andrena fulvago* is a scarce bee in the UK, occurring mainly in southern England with a few records from Wales. There are historic records within close proximity of the survey area. The bee is classed as 'Near Threatened' under post-2001 IUCN threat criteria, as well as being nationally scarce. According to Falk and Lewington (2015), *A. fulvago* nests in light soils, sometimes in large aggregations and whilst the favoured recorded habitat is calcareous grassland, it also occurs in acid grasslands, non-calcareous coastal grasslands, soft rock cliffs and quarries. Pollen is mainly collected from yellow composites including Hawk's-beards *Crepis* spp. and Hawkbits *Leontodon* spp. amongst others. During the 2020 survey, Hawk's-beard Mining Bee was recorded from both the coastal saltmarsh of Area 1 and from Area 11 (Sportsground). The latter area supported abundant Rough Hawk's-beard *Crepis biennis*.
Plain Mini-mining Bee	*Andrena minutuloides*	Andrenidae	Hymenoptera	Nationally Scarce	Area 10	Open habitats - Short sward and bare ground - Rich flower resource	The Plain Mini-mining Bee, *Andrena minutuloides*, is one of a number of similar small black mining bees. It has a very limited distribution in the UK, almost confined to the far south and south-east of England, with an outlying stronghold in the Brecklands of East Anglia. It has been widely recorded in Kent and the Thames Gateway area, including in close proximity to the survey area. Falk and Lewington (2015) note that it is 'strongly associated with chalk grassland (especially downland)', but it is known from other warm, open habitats, including coastal grassland and heathland. There are two generations per year. The spring generation feeds on a wide variety of spring-flowering shrubs and herbs, whereas the summer generation seems to strongly favour umbellifers such as Wild Carrot *Daucus carota* and Wild Parsnip *Pastinaca sativa* Falk and Lewington (2015). During the 2020 survey, *A. minutuloides* was recorded only in Area 10 (Crayland's Pit), an area of herb-rich calcareous grassland.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
Black Mining Bee	*Andrena pilipes*	Andrenidae	Hymenoptera	Nationally Scarce	Area 5	Open habitats - Tall sward and scrub	*Andrena pilipes* is one of two very similar, black *Andrena* species, 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. Like its sibling species, *A. nigrospina*, the coastal brownfield sites within the Thames Estuary are a national stronghold for this species, which typically nests in soft cliffs and forages within the adjacent flower-rich OMH and grassland habitats. *A. pilipes* has two generations per year. The spring generation 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 2020 survey, *A. pilipes* was recorded from herb-rich calcareous grassland on the Swanscombe Peninsula in Area 5.
Four-banded Flower Bee	*Anthophora quadrimaculata*	Apidae	Hymenoptera	Nationally Scarce	Area 1a,4	Open habitats - Short sward and bare ground - Rich flower resource	The Four-banded Flower Bee, *Anthophora quadrimaculata,* is a very locally distributed species in the UK, found in southern England as far north as Norfolk, although very scarce away from the London and Thames Gateway area (Falk and Lewington, 2015). It is locally frequent in Kent and the wider Thames Gateway area, where it has been recorded in close proximity to the survey area. *A. quadrimaculata* is most frequent in gardens, urban parks, brownfield sites and other flower-rich habitats. It feeds on the pollen of various herbs, but shows a strong preference for labiates, such as Black Horehound *Ballota nigra* and Dead-nettle *Lamium* species (Falk and Lewington, 2015).. It nests in small aggregations on open, often sandy ground, sometimes alongside the similar *A. bimaculata* (Falk and Lewington, 2015). During the 2020 survey, *A. quadrimaculata* was recorded from Area 1a and Area 4 on the Swanscombe Peninsula. Area 1a is an area comprised of flower-rich grassland, Area 4 being mostly wetland habitats, with some dry flower-rich edges.
Brown-banded Carder Bee	*Bombus humilis*	Apidae	Hymenoptera	S41 Priority species	Area 2, 10, 11, 12, 13, 14	Open habitats - Tall sward and scrub - Rich flower resource	The Brown-banded Carder Bee suffered a serious decline during the latter decades of the C20th. This has lead 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-industral areas. The bee is also associated with the flower-rich Thames terrace grasslands. There are several historic records from within and in close proximity to the Swanscombe Peninsula. During the survey the bee was recorded from flower-rich grassland and OMH, both within the Peninsula and to the south as far as the Station Quarter site (Area 14).
Blue Carpenter Bee	*Ceratina cyanea*	Apidae	Hymenoptera	RDB3 pre-1994 criteria	Area 3,4,5,6a,8,10, 11,12,13	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, close to the survey area, with apparently, relatively few in Kent. Key sites in the Thames corridor, due to development and the species is considered to be under threat in the 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 2020 survey, the bee was recorded from most of the drier grassland/scrub and OMH, both on the Swanscombe Peninsula and inland and there was plenty of suitable habitat throughout these areas.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
Blunthorn Nomad Bee	*Nomada flavopicta*	Apidae	Hymenoptera	Nationally Scarce	Area 2,11	Open habitats - Tree-associated - Decaying wood - Rich flower resource	The Blunthorn Nomad Bee, *Nomada flavopicta*, is widely distributed but scarce and localised in England and Wales, with one recent record in southern Scotland. It is most frequent on the north and south downs (Falk 2015), and in the Thames Gateway area, where it has been recorded in close proximity to the survey area. *N. flavopicta* is a cleptoparasite of the Red Bartsia Bee *Melitta tricincta*, the Clover Melitta *Melitta leporina*, and the Gold-tailed Melitta *Melitta haemorrhoidalis*, and can therefore be found in a wide variety of flower-rich habitats where any of the hosts are present. It has been recorded on a wide variety of flowers from several families, including the Compositae and Apiaceae (Falk and Lewington, 2015). During the 2020 survey, *N. flavopicta* was recorded in flower-rich grassland and scrub in Area 2 on the Swanscombe Peninsula, and former chalk quarry Area 11 (The Sportsground) inland.
Painted Nomad Bee	*Nomada fucata*	Apidae	Hymenoptera	Nationally Scarce	Area 11,13	Open habitats - Short sward and bare ground - Rich flower resource	*Nomada fucata* has mainly been recorded from southern counties in the UK where it occurs most commonly in coastal habitats; however, the range has expanded in recent decades. There are a number of confirmed and unconfirmed records of the bee from the Thames Gateway, being well recorded from coastal OMH and grassland habitat adjacent to the Thames in south Essex and north Kent. *Nomada fucata* is a cuckoo bee which lays its eggs in the nest of its host the Yellow-legged Mining Bee *Andrena flavipes*. The insect, like its host is associated with a range of habitats including, according to (Falk and Lewington, 2015), 'soft rock cliffs, chalk downland and brownfield sites such as quarries and sandpits.' The bee nectars as an adult on various shrubs, yellow composites, buttercups and cinquefoils. During the 2020 survey, the bee was recorded from herb-rich grassland/OMH in the Former Landfill Site (Area 13); the bee's host *Andrena flavipes* was also recorded from this, as well as several other sites during the survey.
Variable Nomad Bee	*Nomada zonata*	Apidae	Hymenoptera	Recent UK colonist	Area 6a	Not assigned	The Variable Nomad Bee, *Nomada zonata*, was recorded new to the channel islands on Jersey in 2011, and then subsequently new to the British mainland in 2016 from Thames Gateway sites in both Essex and Kent. It has spread remarkably fast, and is now widespread but local throughout south-east England, as far north as Norfolk and Northamptonshire. It is now locally frequent in the Thames Gateway area. *N. zonata* is a cleptoparasite of the Short-fringed Mining Bee *Andrena dorsata*, which is widespread in southern and central England and Wales, and was recorded from multiple areas during the 2020 survey. *N. zonata* can be found in a variety of habitats where its host is present, including cliff-top grassland (Falk and Lewington, 2015)., scrub and brownfield sites. During the 2020 survey, *N. zonata* was recorded only from the dry grassland of Area 6a on the Swanscombe Peninsula.
A bethylid wasp	*Pseudisobrachium subcyaneum*	Bethylidae	Hymenoptera	Rare	Area 2	Open habitats - Short sward and bare ground	*Pseudisobrachium subcyaneum* is a Bethylid wasp that is very rare in the UK, with old records from several counties in the far south of England, including East Kent. It has recently been recorded only in south Essex. The females of this species are wingless, and also lack eyes. Very little is known about the biology and habits of *P. subcyaneum*, other than that it is associated with ants. The larvae of this species and other Bethylid wasps may feed on the larvae of ants, or the larvae of commensal beetles that also occur in ant nests. During the 2020 survey, *P. subcyaneum* was recorded only from Area 2 on the Swanscombe Peninsula, an area of mixed habitats including open grassland and scrub.
A chalcidoid wasp	*Chalcis sispes*	Chalcididae	Hymenoptera	pNationally Scarce	Area 1	Not assigned	*Chalcis sispes* is a particularly large and striking chalcidid wasp that occurs very locally in the UK, predominantly in coastal grazing marshes and saltmarshes in the Thames Gateway area, but also in Norfolk, Somerset, and a few other areas in southern England and Wales. It has been given a provisional Nationally Scarce status, though there has not been a review of parasitic Hymenoptera in the UK. *C. sispes* is parasitic of several large soldierfly (Stratiomyidae) species in the genus *Stratiomys*. During the 2020 survey, *C. sispes* was recorded only from the saltmarsh in Area 1 on the Swanscombe Peninsula, where it was found in good numbers. The nationally scarce soldierfly *Stratiomys singularior* was recorded in this area in good numbers, suggesting that it was the likely host for *C. sispes* at this site.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A ruby-tailed wasp	*Hedychrum niemelai*	Chrysididae	Hymenoptera	RDB3 pre-1994 criteria	Area 3,15	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 lead to calls for the status to be revised from the current RDB3 category (Edwards and Telfer (eds.), 2002). There are some records within the Thames Gateway region including the Grays and Tilbury area of south Essex. *H. niemelai* is a cuckoo species of solitary wasps, and recorded hosts include *Cerceris* species, Edwards and Telfer (2002) cite *Cerceris ruficornis, C. arenaria, C. rybyensis* and *C. quinquefasciata*. The latter two of these were both recorded from Area 15 inland; however, whilst neither were recorded from Area 3, *C. rybyensis* was recorded from within close proximity of this area in Areas 1 and 2 and is likely to also occur in Area 3. Edwards and Telfer (2002), describe *H. niemelai* habitat as 'Open sandy localities, lowland heaths, coastal dunes, cliffs with sandy deposits and other disturbed locations'.
Spined Hylaeus	*Hylaeus cornutus*	Colletidae	Hymenoptera	Nationally Scarce	Area 3,5,8	Open habitats; Tree associated - Decaying wood; Bark and sapwood decya; 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 has previously been recorded in close proximity to the 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 sides of the face of females. These border a slight depression which it uses to carry part of its pollen load. During the 2020 survey, *H. cornutus* was recorded in Area 3, 5 and 8 on the Swanscombe Peninsula.
Five-banded Weevil-wasp	*Cerceris quinquefasciata*	Crabronidae	Hymenoptera	Section 41 priority species; RDB3 (pre-1994 criteria)	Area 15,16	Open habitats - Short sward and bare ground - Bare sand and chalk	The Five Banded-tailed Digger 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. 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. There are a number of post-1990 records from sites close to the Thames and it 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 also sometimes on orthocerous species such as Apionidae (Baldock, 2010) on which the developing larvae feed. During the survey, *C. quinquefasciata* was recorded from OMH/grassland/scrub mosaic habitat slightly inland from the coast at Areas 15 and 16. As expected, legume associated weevils of the genus *Sitona* were very common on both sites, as were Apionids.
A solitary wasp	*Gorytes laticinctus*	Crabronidae	Hymenoptera	RDB3 pre-1994 criteria	Area 3	Open habitats - Short sward and bare ground	*Gorytes laticinctus* is the rarest of three *Gorytes* species recorded from the UK. Historically this solitary wasp has been recorded from widely scattered locations across the southern half of the UK and the insect has been recorded from several Essex and Kent sites within the Thames corridor. According to Falk (1991), *G. laticinctus* habitat frequently comprises rough vegetation including Bramble scrub growing over light soils and 'nests are usually excavated in light sandy soils on warm, sunny slopes'. The wasp predates and stocks its nests with froghoppers such as *Philaenus spumarius* and other, closely related species. During the 2020 survey, *G. laticinctus* was recorded only from Area 3, which supports sparsely vegetated OMH with elements of scrub including bramble.
A solitary wasp	*Nysson trimaculatus*	Crabronidae	Hymenoptera	Nationally Scarce	Area 1,1a,2,3,,12	Tree associated - Shaded woodland floor	*Nysson trimaculatus* is a scarce species in the UK, with a scattered distribution across central and southern England, and eastern Wales. It is locally quite frequent in the Thames Gateway area and Kent, where it has been recorded in close proximity to the survey area. It is found in a variety of open habitats, including dry grassland and scrub, heathland and brownfield sites. *N. trimaculatus* is a cleptoparasite of two wasps in the genus *Gorytes: G. bicinctus* and *G. quadrifasciatus* and probably relies on the former species in the far south-east of its range. During the 2020 survey, *N. trimaculatus* was recorded from a number of areas on the Swanscombe Peninsula, as well as Area 12 (Bamber Pit) inland.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A solitary wasp	*Passaloecus clypealis*	Crabronidae	Hymenoptera	RDB3 pre-1994 criteria	Area 8	Wetland - Peatland; Reedfen and pools	*Passaloecus clypealis* is a rare species in the UK that is restricted to south-east England. Most modern records are from east Norfolk, Dungeness and the Thames Gateway area, where there are unconfirmed 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 2020 survey, it was recorded only from Area 8 (Botany Marsh) on the Swanscombe Peninsula. This is an area of scrub and extensive wetland habitats, including reedbeds.
A solitary wasp	*Pemphredon lethifer*	Crabronidae	Hymenoptera	RDB3 pre-1994 criteria	Area 12,16	Open habitats - F001 Scrub edge; Tree associated - Decaying wood - A212 Bark and sapwood decay; Open habitats - Tall sward and scrub	*Pemphredon lethifer* is a species of solitary wasp which has been recorded largely from around the south coast of England, although there are a number of inland and coastal records in northern England and several isolated records in southeast Scotland. There are records both from north Kent and Essex, close to and inland of the Thames Estuary. Whilst *P. lethifer* is described as 'not regarded as being scarce or threatened' and does not appear to be assigned a status in a review by Collins and Roy (2012), the species is listed in the Pantheon database and NBN gateway as RDB3 (nationally rare). The number of UK records would suggest that the species was a local, but not rare species. *P. lethifer* is a stem-nesting species which mainly uses stems of rosaceae such as Bramble, but may also use other woody stem cavities. The nests are stocked with aphids. During the survey, P. lethifer was recorded from inland sites including Bamber Pit (Area 12) and the Triangle (Area 16).
Beewolf	*Philanthus triangulum*	Crabronidae	Hymenoptera	Nationally Vulnerable (RDB2 pre-1994)	Area 1,2,5,10	Open habitats - Short sward and bare ground	The Beewolf 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 species and 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. The insect has been recorded historically from several sites both north and south of the Thames in the Thames Gateway area and during the survey, Beewolf was recorded from several Areas on the Swanscombe Peninsula, as well as in Craylands Pit (Area 10).
A myrmicine ant	*Myrmica schencki*	Formicidae	Hymenoptera	Nationally Scarce	Area 2,12	Open habitats - Short sward and bare ground	*Myrmica schencki* is very locally distributed in the UK, with the highest concentration of records being from around the Thames corridor in south Essex and north Kent. There are historic records from within close proximity to the Swanscombe survey area. The ant 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). *M. schencki* forms smallish colonies in soil and occasionally grass tussocks. The insect predates other ant species, but also feeds on nectaries of plants and can be found amongst aphids. During the 2020 survey, *M. schencki* was recorded from the coastal grassland habitat on Swanscombe Peninsula (Area 2) and from Bamber Pit (Area 12).
A myrmicine ant	*Myrmica specioides*	Formicidae	Hymenoptera	Nationally Rare (RDB3 pre-1994)	Area 4	Open habitats - Short sward and bare ground - Bare sand and chalk/Rich flower resource	*Myrmica specioides* is a red ant species which is similar to the much commoner *M. scabrinodis* (recorded from most compartments on the site). The species is known by some authors as *M. bessarabica*. The ant is of very local occurrence in the UK, with the majority of records being from the London and Thames Gateway area. There are records from habitats adjacent to the Thames in close proximity to the survey area where it occurs primarily in warm coastal situations. Preferred habitat is described in Collins and Roy eds. (2012) as 'Warm, dry, sunny situations with sparse vegetation'. The insect is said to favour 'coastal south facing slopes and sand dunes', but 'suitable post-industrial sites' are also cited. *M. specioides* is known to predate on weaker *Lasius* species including the Yellow Meadow Ant *Lasius flavus*, which was also recorded during the survey. During the survey *M. specioides* was recorded only from Area 4 (Black Duck Marsh). Although this area supported mainly wetland habitat, raised banks with drier habitat was recorded within the inland section, where the ant was recorded. It is probable that the insect also occurs elsewhere within the Swanscombe Peninsula survey area.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
Squat Furrow Bee	*Lasioglossum pauperatum*	Halictidae	Hymenoptera	RDB3 pre-1994 criteria	Area 1,2,3,10,11,12,13,13A,14,15	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 recent records are from the Thames corridor in Essex and Kent, where the species can sometimes be abundant (Else and Edwards, 2018). The species is listed as RDB3 'rare' in the UK. The majority of Thames corridor records are from brownfield and Thames terrace grassland sites. 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 unkown, 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 *Echium* (Viper's Bugloss?) and composites such as Hawk's-beards *Crepis* and Ragworts *Senecio*. During the survey, Squat Furrow Bee was recorded from Area 3 on the Peninsula, as well as all of the inland survey areas apart from Area 16).
Lobe-spurred Furrow Bee	*Lasioglossum pauxillum*	Halictidae	Hymenoptera	Nationally Scarce	Area 5	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. 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. The bee is polylectic, nectaring on a range of flowering herb. During the survey the species was recorded from open herb-rich, calcareous grassland and scrub mosaic during the 2020 survey on the Swanscombe Peninsula (Area 5). (sources: Else and Edwards (2018) and Edwards and Broad (2005).
Swollen-thighed Blood Bee	*Sphecodes crassus*	Halictidae	Hymenoptera	Nationally Scarce	Area 11,12,13,14,15,16	Open habitats - Short sward and bare ground	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). The bee is well represented within the Thames corridor, with records both from north and south of the River. Like other *Sphecodes* spp., Swollen-thighed Blood Bee is a cuckoo within nests of *Lasioglossum nitidiusculum* and *L. parvulum*, though other hosts 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 survey the bee was recorded from grassland and scrub mosaic habitat in Areas 11,12,13,14,15 and 16). This site is well within the recorded range of the species in Kent.
Little Sickle-jawed Blood Bee	*Sphecodes longulus*	Halictidae	Hymenoptera	Nationally Scarce	Area 5	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 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 also recorded during the 2020 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 survey, *Sphecodes longulus* was recorded on the Swanscombe Peninsula from herb-rich grassland habitat at Area 5.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
Rough-backed blood bee	*Sphecodes scabricollis*	Halictidae	Hymenoptera	RDB3 pre-1994 criteria	Area 3	Open habitats - Short sward and bare ground	The Rough-backed Blood Bee, *Sphecodes scabricollis*, is a rare species in the UK, recorded extremely locally and sparingly in southern England and south Wales. There are more records in south-east England than elsewhere, including in the Thames Gateway area, but it is rare even in these areas. *S. scabricollis* is a cleptoparasite of the Bull-headed Furrow Bee *Lasioglossum zonulum*, which is a fairly common species in south-east England. Relatively little is known about its habitat and pollen collection preferences, but it has been recorded from heathland, coastal dunes and brownfield sites, feeding on thistles and other composites (Falk, 2015). During the 2020 survey, *S. scabricollis* was recorded only from Area 3 on the Swanscombe Peninsula, an area of pen, flower-rich brownfield grassland.
Large-headed Resin Bee	*Heriades truncorum*	Megachilidae	Hymenoptera	RDBK (insufficiently known - pre-1994 criteria)	Area 15	Open habitats; Tree associated - Decaying wood - Bark and sapwood decay; Rich flower resource	The Large-headed Resin Bee *Heriades truncorum* is of limited range in the UK, being largely confined to southeast England. However, Collins and Roy (eds.) (2009) stated that 'This species is undoubtedly spreading and becoming more frequently found'. In recent years, the bee has been increasingly recorded from sites close to the Thames in north Kent and south Essex. According to Else and Edwards (2018), *H. truncorum* nests in wood decay habitat and uses the exit holes of wood-boring beetles; therefore, a resource of wood decay habitat is required. However, Falk and Lewington (2015) also lists 'walls and hollow stems', citing Bramble *Rubus fruticosus* agg. and also mentions 'bee hotels'. The bee favours open habitats with an abundant supply of yellow composite flowers. Common Ragwort *Senecio jacobaeae* is considered an important pollen and nectar resource, though other flowers including Common Cat's-ear *Hypochaeris radicata*, Hawk's-bits *Leontodon* spp. and some other species are also visited. During the 2020 survey of Area 15, *H. truncorum* was recorded from grassland/OMH habitat. Common Ragwort was well represented on this site.
Spotted Dark Bee	*Stelis ornatula*	Megachilidae	Hymenoptera	RDB3 pre-1994 criteria	Area 10,11,13,15	Open habitats - Tall sward and scrub - Rich flower resource	Spotted Dark Bee *Stelis ornatula* is a rare bee in the UK, occurring mainly in southeast England and south Wales, but with scattered coastal and inland records further north. There are a small number of records mainly from sites adjacent to the Thames Estuary, including within close proximity of the survey area. The bee is classed as nationally rare (RDB3). According to Falk and Lewington (2015), Spotted Dark Bee occurs in open sites with a plentiful supply of bird's-foot trefoils *Lotus* spp., being most frequent in calcareous and coastal grasslands. The bee is a cleptoparasite of the Welted Lesser Mason Bee *Hoplitis claviventris*, itself an uncommon species, which nests in twigs and hollow stems. *H. claviventris* was recorded from Areas 13 and 14 during the survey and is likely to also occur in other sites within the survey area. During the survey, Spotted Dark Bee was recorded from the more inland grassland and OMH habitats including Areas 10,11,13 and 15. These sites all supported, to a greater or lesser extent, *Lotus* spp. Areas 10, 11 and 13 in particular supported both Common Bird's-foot Trefoil *L. corniculatus* and Slender-leaved Bird's-foot Trefoil *L. tenuis*.
Pantaloon Bee	*Dasypoda hirtipes*	Melittidae	Hymenoptera	Nationally Scarce	Area 1,1a,2,5,6a,10,11,12,15	Open habitats - Short sward and bare ground - Bare sand and chalk/Rich flower resource	The Pantaloon Bee is locally distributed in the southern part of the UK, occurring primarily in coastal areas in the west and both by the coast and inland in suitable habitat inland in the east. The bee is associated mainly with sandy habitats such as heathland, coastal dunes, acid grassland, saltmarsh edge and sandy brownfield sites. The insect has been recorded historically on both Kent and Essex sides of the Thames and during the 2020 survey, it was recorded from coastal grassland on the Swanscombe Peninsula (Areas 2,5 and 6a) and within the flower-rich chalk grassland and sparsely vegetated OMH of Crayland's Pit (Area 10) with additional records from Areas 12 and 15. The bee forages predominately on the flowers of yellow composites, but occasionally visits non-yellow species such as knapweed *Centaurea* spp., and thistles *Cirsium/Carduus* spp.
Red bartsia bee	*Melitta tricincta*	Melittidae	Hymenoptera	Nationally Scarce	Area 1a	Open habitats - Short sward and bare ground - Open short sward - Rich-flower resource	The Red Bartsia Bee, *Melitta tricincta*, has a very limited distribution in the UK, centered around south-east England, where Falk and Lewington (2015) states that it can be 'locally common on the North Downs, South Downs, Salisbury Plain area, chalk areas of Dorset and the Thames Gateway'. As suggested, it has been recorded copiously in Kent and the Thames Gateway area, including in close proximity to the survey area. This species has a notably late flight season, only appearing in late July (Falk and Lewington, 2015). It can be found in a variety of habitats, including calcareous grasslands and brownfield sites, and coastal grazing marsh. It collects pollen solely from Red Bartsia *Odontites vernus*, so a strong population of this plant must be present to support the bee. During the 2020 survey, *M. tricincta* was recorded only from Area 1a on the Swanscombe Peninsula, an area comprised of flower-rich grassland with large patches of Red Bartsia.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
A spider-hunting wasp	*Auplopus carbonarius*	Pompilidae	Hymenoptera	Nationally Scarce	Area 3,6a,10,12,13,14	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 2020 survey, *A. carbonarius* was recorded only in Area 6b on the Swanscombe Peninsula, from an area of damp mud on the boundary between a reedbed and dry grassland. This is typical habitat for *A. carbonarius* to be found collecting nest-building material.
A spider-hunting wasp	*Priocnemis agilis*	Pompilidae	Hymenoptera	Nationally Scarce	Area 6a,10,11,13	Open habitats - Short sward and bare ground; Tall sward and scrub	*Priocnemis agilis* is one of a number of very similar red and black spider-hunting wasps. It is very scarce in the UK, occuring mostly in southern England, to as far north as Lincolnshire and Cheshire. Day (1988) states that it is 'sometimes locally common'. There are numerous records from the Thames Gateway, but none within 10km of the survey area. *P. agilis* is a relatively poorly-known species, suspected to excavate underground nests, which it will provision with spiders. It is predominantly found in dry, warm, grassy habitats, and Day (1988) suggests a preference for clay soils. During the 2020 survey, it was recorded from a number grassland areas: 10, 11 and 13 inland, and Area 6a on the Swanscombe Peninsula.
A spider-hunting wasp	*Priocnemis confusor*	Pompilidae	Hymenoptera	Nationally Scarce	Area 10,11,13,,14, 15	Open habitats - Short sward and bare ground	*Priocnemis confusor* is a nationally scarce species of spider-hunting wasp. Whilst there are widely scattered records of the insect from as far north as Yorkshire, the vast majority of records are from the southeast, there being a concentration of records within the Thames corridor including north Kent and south Essex. According to Collins and Roy (eds) (2016), *P. confusor* has been associated both with woodlands and open ground on clay and with more sandy areas. Like other spider-hunting wasps, the insect paralyses and stores spiders in burrows, the larvae subsequently feeding on the spider. There is little information relating to the prey species, although species of the genus *Clubiona* (Clubionidae) and family Salticidae are cited in Collins and Roy (eds) (2016). *P. confusor* was recorded from the majority of inland OMH and grassland/scrub sites.
A spider-hunting wasp	*Priocnemis cordivalvata*	Pompilidae	Hymenoptera	Nationally Scarce	Area 2	Open habitats;Tree Associated - Short sward and bare ground; Shaded woodland floor - Scrub edge	*Priocnemis cordivalvata* is one of a number of very similar red and black spider-hunting wasps. It is very scarce in the UK, occuring mostly in southern England, to as far north as Yorkshire. It has also been recorded in south Wales. It is known from Kent and the wider Thames Gateway area, where it has been recorded within 10km of the survey area. *P. cordivalvata* is a relatively poorly-known species, suspected to excavate underground nests, which it will provision with spiders. It appears to prefer open woodland (Day, 1988). During the 2020 survey, it was recorded only in Area 2 on the Swanscombe Peninsula, an area containing a variety of habitats including dry grassland and extensive scrub.
A Solitary Wasp	*Odynerus melanocephalus*	Vespidae	Hymenoptera	S41 Priority species; Nationally Scarce	Area 13/13a/14	Open habitats - Short sward and bare ground	*Odynerus melanocephalus* is a scarce and locally distributed wasp in the UK, found across southern England, west to Devon, north to the midlands. It is also known from north-west Wales. There are several records in the Thames Gateway area, including in close proximity to the survey area. It is found in a variety of open habitats on light, clayey soils, including grasslands, saltmarshes and brownfield sites. It excavates multi-celled nests on level, exposed areas of soil, which it provisions with weevil larvae and smaller butterfly and moth caterpillars. During the 2020 survey, *O. melanocephalus* was recorded only in Areas 13 and 14, areas predominantly comprising herb-rich grassland.
Buff Ermine	*Spilosoma lutea*	Erebidae	Lepidoptera	S41 research only	Area 12	Not assigned	Buff Ermine is one of a number of moth species which are still generally widespread and common in England, but were included in the 'research only' category of Section 41 list as 'Species of principal importance' due to a recorded decline in the UK in recent decades. Waring and Townsend (2003) state that Buff Ermine occurs in 'most habitats, including gardens, hedgerows, parks and woodland'. Larval foodplants include a wide range of herbaceous plants, especially Common Nettle *Urtica dioica* and also woody plants including Honeysuckle *Lonicera periclymenum*, Hop *Humulus lupulus* and other species.
Cinnabar	*Tyria jacobaeae*	Erebidae	Lepidoptera	S41 research only	Area 2,3,6a,8,10, 11, 12, 13, 15, 16	Open habitats - Tall sward and scrub	Whilst the Cinnabar 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 lead 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 grasslands 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 numerous historic records throughout the general 2020 survey area.

Common Name	Scientific Name	Family	Order	UK Status	Recorded Sample Areas	Pantheon Affinities	Description
Small Blue	*Cupido minimus*	Lycaenidae	Lepidoptera	S41 Priority species; Near Threatened (Post-2001 IUCN criteria)	Area 10	Open habitats - Tall sward and scrub	The Small Blue *Cupido minimus* is the smallest British butterfly. Whilst it is locally commpon in suitable habitats in the UK, Small Blue has been has been included as a 'priority species' under section 41 of the NERC Act (2007) due to a recorded decline in the UK. The butterfly also currently has a threat status of Near Threatened, based on post-2001 IUCN criteria. There are a number of records records, mainly from inland sites in Kent. There are, however, a few records from close to the Swanscombe survey area. In the UK, Small Blue is only known to feed on Kidney Vetch *Anthylis vulneraria* and is, therefore, confined to calcareous habitats, such as unimproved chalk and limestone grasslands inland and on the coast. The insect typically forms small colonies on slopes of more southerly aspect, which support the foodplant. These habitats can occur in various sward heights and are often on slopes with a combination of scrub and grassland habitats. During the 2020 survey, a colony of Small Blue was recorded on established, herb-rich, calcareous grassland in Area 10 (Craylands Pit). Several individuals were recorded both during June and again during the August surveys. This latter survey would have coincided with the late summer partial second brood. The recorded habitat and site as a whole, supported a significant resource of Kidney Vetch.
Small Heath	*Coenonympha pamphilus*	Nymphalidae	Lepidoptera	S41 Priority species; Near Threatened (Post-2001 IUCN criteria)	Area 2, 3, 10, 11, 13	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 lead to the species being included as an S41 and S42 'Species of principal importance' in England and Wales respectively. The species 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 survey the butterfly was relatively abundant within most of the drier grassland and OMH sites within the Peninsula and inland.
Rosy-striped Knot-horn	*Oncocera semirubella*	Pyralidae	Lepidoptera	Nationally Scarce	Area 4	Not assigned	The Rosy-striped Knot-horn Moth *Oncocera semirubella*, is a scarce species in the UK, mostly confined to southern England, with recent outlying records in Northumberland (Sterling and Parsons, 2012). It is locally frequent on the north and south downs, and has been recorded in the Thames Gateway and London areas. *O. semirubella* is an attractively coloured species, being predominantly bright pink, with mustard-yellow above, and sometimes a white streak along the costa of the forewing. Its preferred habitats include chalk and limestone downland and cliffs, vegetated shingle, and sparse open grassland, where adults are on the wing from June to August (Sterling and Parsons, 2012). The larval foodplants include Bird's-foot-trefoils *Lotus* spp. and White Clover *Trifolium repens*, and possibly other fabaceous plants (Sterling and Parsons 2012). During the 2020 survey, *O. semirubella* was recorded only from Area 4 on the Swanscombe Peninsula. This is mainly an area of mixed wetland habitats, however, the moth was recorded in a dry flower-rich scrub margin towards the edge of the area.
Long-legged Tabby	*Synaphe punctalis*	Pyralidae	Lepidoptera	Nationally Scarce	Area 1a	Not assigned	The Long-legged Tabby Moth *Synaphe punctalis* has a local distribution in the UK, being mostly confined to southern coastal counties. It is, however, also known from inland East Anglia, as well as throughout the London and Thames Gateway area. Although its distribution is limited, Long-legged Tabby can be common or even abundant where found. Sterling and Parsons (2012) state that *S. punctalis* is found in a variety of habitats including 'vegetated shingle, dune-slacks, saltmarshes, sheltered hollows on chalk downland, grazed acid grassland, lowland heathland', where adults fly from late May to mid September. The larvae feed on mosses such as *Hypnum cupressiforme*, living in a silk tube amongst the moss (Sterling and Parsons, 2012). During the 2020 survey, *S. punctalis* as recorded only from Area 1a on the Swanscomne Peninsula, an area of flower-rich grassland on the edge of saltmarsh.

Annex EDP 11
Aquatic Invertebrate Surveys

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Methodology

Invertebrate Scoping Study

A11.1 An invertebrate habitat scoping study to highlight which areas of the Project Site should be prioritised for further survey was conducted during two periods; 14 to 16 April 2020, and 20 to 22 April 2020.

A11.2 The Project Site was walked and both terrestrial and aquatic habitats and habitat features with potential to support significant invertebrate assemblages/key species, target-noted, mapped and geo-referenced. Habitat was assessed in terms of topography, substrate and general vegetation composition and structure.

Detailed Invertebrate Surveys

Standing Waterbodies

A11.3 Aquatic invertebrate samples of standing waterbodies across the Project Site encompassing areas associated with Black Duck Marsh, Botany Marsh, Swanscombe Marsh and land adjacent to the River Ebbsfleet, were undertaken over two, discrete sampling events. The first sampling period took place during July 2020 with the second completed in August 2020.

Sample Site Selection and Collection of Macroinvertebrate Samples

A11.4 Where a number of waterbodies occurred within a single survey area, samples were taken from a sufficient range of waterbodies to represent the area as a whole, with sampling prioritised across those waterbodies exhibiting habitat characteristics of highest potential to support macroinvertebrate assemblages of higher conservation value. The locations where samples have been collected from are shown on Figure 12.27 (Document Reference 6.3.12.27).

A11.5 Each aquatic invertebrate sample was collected by a three-minute sweep method from a sufficient range of representative meso-habitats to adequately cover the main invertebrate niches of the waterbody.

A11.6 Once collected, each sample was preserved in 99.9% ethanol and transported to the laboratory for washing, sorting and identification.

A11.7 At each sample location, waterbody characteristics and a range of other environmental features were recorded including exposed and submerged bank profiles, channel width and depth, levels of grazing, poaching and shelving. Abiotic parameters were recorded in the surface 10cm of water including pH, conductivity,

total dissolved solids and temperature using a Hanna HI83303 Aquaculture Photometer.

Washing, Sorting and Identification of Samples

A11.8 Each sample was thoroughly washed and graded by rinsing through a series of different sized meshes. All invertebrates were separated from the retained sediment/detritus into major taxonomic groups and referred to an appropriately experienced taxonomist for identification. Where possible, all specimens were identified to species level. Exceptions to this were such groups as chironomidae larvae and oligochaeta. Abundances were estimated or converted from actual counts to an approximately geometric scale: A - 1-9; B - 10-99; C - 100-999; and D - >1000.

A11.9 From the taxonomic data, a suite of standards biotics indices were calculated including Biological Monitoring Working Party (BWMP), Average Score Per Taxon (ASPT) and N-Taxa (Number of Scoring Taxa) which together provide a standard measure of biological quality and indicate background levels of organic pollution. The Community Conservation Index (CCI) Score was assigned to each taxon to evaluate the conservation value of the invertebrate community and, where appropriate analysed alongside terrestrial data using Pantheon.

Data Analysis

A11.10 Data collected during the surveys were processed using SAFIS analysis (Site Analysis for Freshwater Invertebrate Surveys v.30.0, (Adrian Chalkley)). The SAFIS routine uses an inbuilt species dictionary to automate the calculation of metrics relating to conservation values and water quality, outlined below. The SAFIS analysis allowed an assessment of conservation value and water quality and also highlighted any species of conservation interest present. For each of the sample sites, six standard measurements or metrics have been calculated allowing an assessment of the condition of the watercourse as revealed by the invertebrate community it supports. These metrics include:

- The Biological Monitoring Working Party Score (BMWP);
- The Average Score Per Taxon (ASPT);
- The Community Conservation Index; and
- Lincoln Quality Index (LQI).

A11.11 BMWP, ASPT and CCI are described above in relation to surveys of the Rivers Ebbsfleet. LQI is a metric similar to and based on BMWP which indicates water

quality, it not only takes account of the average score per family but habitat quality as well (from habitat rich to habitat poor). LQI sites are rated with the following categories:

- I & H, very poor quality;
- G & F, poor quality;
- E & D, moderate quality;
- C & B, good quality; and
- A, A+ & A++ representing excellent quality water.

Limitations

A11.12 Species within the orders Hirundinea (leeches) and Tricladida (flatworms) can be affected by preservation in ethanol (damage to eyes and genital pores – often key features of identification). During the survey these species were found and identified in the field and released. The remainder of the specimens were preserved as normal in isopropanol alcohol as above.

A11.13 Some of the surveys were carried out in non-optimal conditions due to access issues, meaning that the surveys were carried out on predetermined days rather than optimal ones. This may have reduced the diversity recorded as some sampling was carried out on dull days.

A11.14 Some of the habitats were ephemeral and in the first surveys in June 2020, the water of several of the ponds and ditches was receding. In the second survey period several of these were dry and accordingly no second samples were taken.

A11.15 The current survey draws its conclusions from extrapolating findings from a representative selection of the waterbodies within the area; sampling alternative waterbodies or sections of waterbody would inevitably yield subtly different findings.

River Ebbsfleet

A11.16 To assess the current biological water quality of the River Ebbsfleet, the aquatic macroinvertebrate community was sampled at four locations along the length of the Rivers Ebbsfleet, deemed to be representative of the watercourse, as illustrated at Figures 12.28 and 12.29 (Document References 6.3.12.28 and 6.3.12.29).

A11.17 The locations of aquatic macroinvertebrate sampling points were initially established during the River Corridor Survey. Sampling of the watercourse was undertaken on 26 May 2020 and 16 September 2020 by a suitably qualified ecologist.

A11.18 At each sampling location a single three-minute kick/sweep sample was collected following the standard protocol detailed in the Environment Agency's handbook, BT001[1] and in the procedure for collecting and analysing aquatic macroinvertebrate samples for RIVPACS.[2.] Each kick/sweep sample encompassed all the in-stream habitats present at the sampling location in proportion to their occurrence over the three-minutes sampling time. Additionally, a further one-minute hand search of submerged stones, woody debris, plants and tree roots was undertaken to capture any animals that might have evaded the kick/sweep sample. Each sample was then transferred to a sealed plastic sample pot and preserved in 99% Industrial Methylated Spirit for future washing, sorting and identification.

A11.19 At each sample location, a suite of environmental parameters was recorded to in further inform an assessment including:

- Estimated surface current velocity (m/sec);
- Wetted width (m);
- Water depth (cm);
- Substratum composition (% boulders, cobbles, pebbles/gravel, sand and silt/clay) across the sample location;
- Channel vegetation (% cover); and
- Flow type (riffle, runs, glides, pools, slacks) – measured across the whole sampling area.

Washing, Sorting and Identification of Samples

A11.20 Samples were washed using a 500µm sieve to separate preservative and fine silt from the retained sample fraction. Samples were then sorted into a plastic sorting square with specimens picked out from the remaining sediment. Specimens were

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1 Environment Agency (1999) *Procedures for Collecting and Analysis Macroinvertebrate Samples* (issue 2.0), Environment Agency BT001.

2 Murray-Bligh, J.A.D., Furse, M.T., Jones, F.H., Gunn, R.J.M, Dines, R.A. and Wright, J.F. (1997) *Procedure for collecting and analysing macroinvertebrate samples for RIVPACS*. Joint publication by the Institute of Freshwater Ecology and the Environment Agency, 162 pp.

identified to species level (or as far as possible if damaged/too small) with the aid of dichotomous keys.

A11.21 From the taxonomic data, a suite of standards biotics indices were calculated including BWMP (Biological Working Monitoring Party), ASPT (Average Score per Taxon) and N-Taxa (Number of Scoring Taxa), which together provide a standard measure of biological quality and indicate background levels of organic pollution and are calculated as follows:

- BWMP relates to the pollution tolerance of an aquatic macroinvertebrate assemblage. This assigns a numerical score (from 1 to 10) to a range of aquatic macroinvertebrate families, depending on their tolerance/intolerance to organic pollution. Pollution sensitive families score more highly than pollution tolerant ones. The cumulative score of these assigned values, therefore, provides a good indication of biological water quality;

- Average core Per Taxon is obtained by dividing the BMWP score by the number of scoring families. The product is, therefore, independent of the taxon richness. Usually, the higher the ASPT, the more sensitive the population is to pollution. Usually, a low ASPT indicates the site is suffering from pollution; and

- Taxon richness is defined as the number of taxa (such as a given species, genus or family) recorded and provides a measure of biodiversity.

A11.22 In general, BWMP scores may be interpreted as stated within **Table EDP A11.1**.

Table EDP A11.1: Biological Water Quality Categories.

BMWP Score	Category	Interpretation
0-10	Very poor	Heavily polluted
11-40	Poor	Polluted or impacted
41-70	Moderate	Moderately impacted
71-100	Good	Clean, but slightly impacted
>100	Very good	Unpolluted, unimpacted

A11.23 In addition, the Community Conservation Index (CCI) Score was then assigned to each taxon identified to evaluate the conservation value of the aquatic macroinvertebrate community (with reference to the Red Data Book (RBD) register of threatened wildlife) Identified taxa are scored from 1-10 (1 being 'very common' and 10 being endangered) as indicated within **Table EDP A11.2**.

Table EDP A11.2: Conservation Scores for Freshwater Invertebrates in Great Britain[3].

CCI Score	Definition
10	RDB1 (Endangered)
9	RDB2 (Vulnerable)
8	RDB3 (Rare)
7	Notable
6	Regionally Notable
5	Local
4	Occasional (species not in categories 10-5, which occur in up to 10% of all samples from similar habitats)
3	Frequent (species not in categories 10-5, which occur in greater than 10-25% of all samples from similar habitats)
2	Common (species not in categories 10-5, which occur in greater than 25-50% of all samples from similar habitats)
1	Very Common (species not in categories 10-5, which occur in greater than 50-100% of all samples from similar habitats)

A11.24 Following assignment of CCI scores to each appropriate species, the sum of the CSs is calculated and divided by the number of contributing species to give a mean measure of conservation value. This is then multiplied by a Community Score to give the final CCI. In general, the resultant CCI can be interpreted as within **Table EDP A11.3**.

Table A11.3: CCI Categories[4].

CCI Score	Description	Interpretation
0.0 - 5.0	Sites supporting only common species and/or community of low taxon richness	Low conservation value
>5.0-10.0	Sites supporting at least 1 species of restricted distribution and/or a community of moderate taxon richness	Moderate conservation value
>10.0-15.0	Sites supporting several uncommon species, at least one of which may be national rare and/or a community of high taxon richness	High conservation value
>20.0	Sites supporting several rarities, or at least one extreme rarity and/or a community of very high taxon richness	Very high conservation value

Results

Standing Waterbodies

A11.25 **Table EDP A11.4** presents the full aquatic macroinvertebrate species lists for each sample location across the Project Site during July and August 2020 whilst

[3] Chadd, R. and Extence, C. 2004. The conservation of freshwater macroinvertebrate populations: a community-based classification scheme. *Aquatic Conservation: Marine and Freshwater Ecosystems* 14: 597–624.

[4] Chadd, R. and Extence, C. 2004. The conservation of freshwater macroinvertebrate populations: a community-based classification scheme. *Aquatic Conservation: Marine and Freshwater Ecosystems* 14: 597–624.

a summary of the invertebrate community identified at each sample location is provided below:

Black Duck Marsh Site 23 (TQ5969375351)

A11.26 Samples here were taken from the southern portion of the open water within the marsh. The aquatic community here was very limited. The vegetation was limited to the main *Phragmites australis* swamp surrounding and encroaching into the open water. There were small stands of *Bolboscheonus maritimus* and *Typha latifolia* on the southern edge of the site, within areas of shallower water. The only macrophytes in the water were filamentous algae and very sporadic *Potamogeton pusilus*. The base of the waterbody was firm under foot and circa 50-60cm deep with a deeper channel near the middle of the open water.

A11.27 A total of 603 specimens were identified of 21 taxa (14 identified to species). These were dominated by Chironomidae larvae and Corixinae species, most of which were early instar. Two local species were found *Ilyocoris cimicoides* and *Sigara concinna*. Molluscs were scarce in the samples; the introduced *Physella acuta* dominated and there was a single bivalve, *Musculium lacustre*. Flying aquatic invertebrates seen during the surveys included, *Coenagrion puella*, a single *Aeshna cyanea*, and two *Aeshna affinis*.

Black Duck Marsh 22 (TQ5975375460)

A11.28 Samples were taken from the open water, dense filamentous algae, and the marginal vegetation *Phragmites australis*. The water depth here was around 60cm deep with a firm substrate and limited soft muds. *Potamogeton pusilus* and *Lemna trisulca* were both rare components to the macrophyte community.

A11.29 A total of 903 specimens were identified of 23 taxa (16 identified to species). These were dominated by *Cladocera* sp., Chironomidae larvae, and Corixinae species. Most of the latter were early instar, with three species identified. One local species was found, *Sigara concinna*. Molluscs were scarce in the samples with the introduced *Physella acuta* dominating. A single caddisfly species *Holocentropus picicornis* and two common leeches were also recorded in low numbers. Flying aquatic invertebrates seen during the surveys, included *Coenagrion puella*, an *Anax imperator*, and an *Aeshna cyanea*.

Black Duck Marsh 5 (TQ5988975643)

A11.30 The sample was taken in the large wide deep ditch to the north of the reedbeds in the marginal *Phragmites australis* vegetation. The water depth here was over 1.5m deep with a soft substrate. Any aquatic macrophytes were very limited, with *Potamogeton pusilus* and *Lemna trisulca* components to the community.

Sub-samples produced very few invertebrates. A total of 269 specimens were identified of 17 taxa (11 identified to species). These were dominated by *Cladocera* sp., Chironomidae larvae and Corixinae species most of the latter were early instar. Three local species were found: *Sigara concinna, Sigara stagnalis*, and *Ilyocoris comicoides*. Molluscs were scarce in the samples and included *Physella acuta, Radix balthica and Gyraulus crista*. Flying aquatic invertebrates seen during the surveys include *Coenagrion puella*, a single *Anax imperator*, a single *Aeshna affinis*, and three *Erythromma najas*.

Black Duck Marsh 21 (TQ6001875697)

A11.31 The sample taken from the northern bank of Black Duck Marsh, to the west of the pond in a shallow margin of the northern ditch. The vegetation was dominated by *Phragmites australis* swamp; this was surrounding and encroaching into the open water. There was a gentle slope into the water with an area that was used by local dogs to access the water. The material here was soft and silty with a high clay and chalk component. There were no aquatic macrophytes and limited filamentous algae. The water where the sampling was undertaken was up to 1m deep at full reach.

A11.32 A total of 470 specimens were identified of 50 taxa (33 identified to species). Although dominated by *Asellus aquaticus* and *Cladocera* sp., seventeen species of beetle were found. Sixteen species of interest were identified, with one Na *Dytiscus circumcinctus,* three Nb *Berosus affinis; Berosus luridus* and *Rhantus frontalis*, and six species that were local *Noterus clavicornis; Cymbiodyta marginellus; Enochrus coarctatus; Enochrus testaceus; Hygrobia Hermanni* and *Hygrotus versicolor.* The only other species of interest were four local species of Hemiptera: *Microvelia reticulata; Plea minutissima;* and *Sigara concinna.* Flying aquatic invertebrates seen during the surveys include *Coenagrion puell* and *Anax imperator*.

Black Duck Marsh 4 (TQ6003675761)

A11.33 The sample was taken from the pond in the north east of Black Duck Marsh. The water body was shallow on both survey dates, with limited water in the August samples. The vegetation was limited to a margin of *Phragmites australis* to the south that was dying back and small stands of *Bolboscheonus maritimus* and *Agrostis stolonifera* spreading through the shallows of the water onto the land. There was a gentle slope into the water. The material here was firm underfoot with numerous pieces of covered rubble and other large detritus. Algae was scattered throughout the water. The water was shallow at under 25cm.

A11.34 A total of 1800 specimens were identified of 57 taxa (38 identified to species). The sample was dominated by *Asellus aquaticus* and *Cladocera* sp. Seventeen

species of beetle were found: one RDB3 *Hydrochus ignicollis*, four Nb *Rhantus frontalis; Rhantus grapii; Enochrus ochropterus;* and *Hydroglyphus geminus*, and seven species that were local *Cymbiodyta marginellus; Enochrus coarctatus; Enochrus testaceus; Hygrotus impressopunctatus; Hygrotus versicolor; Laccobius minutus; Noterus clavicornis* The only other species of interest were two local species of Hemiptera*, Ilyocoris cimicoides* and *Plea minutissima.* There were very few flying aquatic invertebrates seen during the surveys; only *Coenagrion puella*, and *Anax imperator* were observed.

Black Duck Marsh 13 (TQ6008075431)

A11.35 The sample was taken from a shallow lagoon on the south east of Black Duck Marsh. This water body was very shallow in June and dry at the time of the August sampling. As with sample point 4, the vegetation was limited to *Phragmites australis* to the south and small stands of *Bolboscheonus maritimus* and *Agrostis stolonifera* spreading through the shallows of the water onto the land. The material here was firm underfoot with numerous pieces of covered rubble and other large detritus. Charaphytes were scattered throughout the water. The water was shallow at under 25cm.

A11.36 A total of 480 specimens were identified of 31 taxa (19 identified to species). These were dominated by the snails *Radix balthica* and *Physella acuta.* Of the other species found two were Nb *Rhantus frontalis; Berosus signaticollis; Peltodytes caesus* and four species were local *Hygrotus impressopunctatus; Ilyocoris cimicoides; Noterus clavicornis;* and *Plea minutissima.* There were very few flying aquatic invertebrates seen during the surveys; only *Coenagrion puella*, and *Anax imperator* were recorded.

Black Duck Marsh 20 (TQ6011875582)

A11.37 The sample was taken at an area close to the track at the boat access point. This was a north-south running ditch leading to the rest of the marsh system. This was the only vegetated ditch within the Black Duck Marsh and there was only 200m of this vegetated habitat. Beyond, the vegetation rapidly decreased and disappeared abruptly at each end of the ditch. The vegetation was dominated by *Ceratophylum demersum* and *Potamogeton pectinatus*. Algae was frequent throughout the community with limited emergents of *Ranunculus sceleratus* and *Veronica anagalis-aquatica* with taller emergents of *Typha latifolia* and *Phragmites australis*. The water body was 7m wide with a depth of 1.8m and there was a large amount of woody debris fallen across the ditch, creating several hazards. Bramble scrub also encroached across the ditch in some areas.

A11.38 A total of 742 specimens were identified of 67 taxa (49 identified to species). These were dominated by *Asellus aquaticus*, *Cloeon dipterum*, and the

introduced mollusc *Physella acuta.* Twenty-three species of beetle were found: two RDB3 *Hydrochus ignicollis* and *Graptodytes bilineatus*, one Na *Gyrinus paykulli,* two Nb *Helochares lividus and Berosus affinis*, and ten species that were local (including species of Odonata and Hemiptera) *Enochrus testaceus; Erythromma najas* (red-eyed damselfly)*; Graptodytes pictus; Haliplus immaculatus; Hygrotus impressopunctatus; Hygrotus versicolor; Laccophilus minutus; Lestes sponsa* (emerald damselfly)*; Noterus clavicornis; Plea minutissima* (pygmy backswimmer)*.* There were a large number of flying aquatic invertebrates seen during the surveys: *Coenagrion puella*, *Anax imperator*, *Aeshna affinis, Erythromma najas, Erythromma viridulum*, and *Ischnura elegans*.

Botany Marsh 8 (TQ6084975541)

A11.39 This sample was taken at the junction of two ditches in the centre of the more natural grazing marshes within Botany Marsh. There was only a limited area of open water and wet marsh habitat along the choked ditches across this section of marsh. The narrow-choked ends of this site were dominated by *Phragmites australis* with an abundance of *Agrostis stolonifera* as a supporting species. *Ranunculus baudotii* was the only aquatic macrophyte present within the water, alongside the filamentous algae. The whole area is grazed by cattle, the margins were heavily poached and much of the vegetation grazed to some extent into the middle of the ditch. Due to the low water levels the cattle needed to enter the ditch further; whereas a higher water level would result in less poaching. The water body was 4m wide, with a length of 15m and a depth of only 90cm, of which 35cm was water the remaining being soft silts and sediment.

A11.40 A total of 1583 specimens were identified of 66 taxa (51 identified to species). These were dominated by Corixidae sp. (early instar), *Helophoris brevipalpis*, *Radix balthica* and the introduced mollusc *Physella acuta.* Twenty seven species of beetle were found, and a total of 22 species of interest were identified; RDB3 *Hydrophilus piceus;* three Na *Gyrinus paykulli, Microvelia pygmaea* and *Enochrus halophilus* nine Nb *Berosus affinus, Berosus luridus, Berosus signaticollis, Gerris paludum, Helophorus griseus, Hygrotus parallelogrammus, Peltodytes caesus, Sigara selecta* and *Corixa affinis;* with nine species that were local *Enochrus testaceus, Gyrinus caspius, Haliplus immaculatus, Hygrotus confluens, Ilyocoris cimicoides, Laccobius minutus, Noterus clavicornis, Plea minutissima and Sigara stagnalis.* There were a large number of *Coenagrion puella, Anax imperator, Aeshna affinis*, and *Ischnura elegans* seen during the surveys.

Botany Marsh 9 (TQ6086575670)

A11.41 The sample area was a man-made wetland/pond adjacent to the existing north-south running ditch. A small island of vegetation was still present in the centre of the pond/wetland. The whole area was heavily grazed and very heavily poached. The vegetation was dominated by *Lolium perenne* and *Agrostis stolonifera* and short grazed *Phragmites australis*. Within the water body a small number of *Ranunculus baudotii*, the base of the body was soft silts and filamentous algae. The water body was 30m long, with a width of 12m and a depth of 80cm. There was no shade along the ditch.

A11.42 A total of 2066 specimens were identified of 60 taxa (47 identified to species). These were dominated by Corixidae sp. (early instar), Cloeon dipterum, Helophoris brevipalpis, Radix balthica and the introduced mollusc Physella acuta. Twenty-one species of beetle were found, contributing to a total of 13 species of interest within the sample: one RDB3 Hydrophilus piceus, one Na Helophorus fulgidicolis; seven Nb Agabus conspersus, Berosus affinis, Berosus luridus, Berosus signaticollis, Corixa affinis, Helophorus griseus, Octhebius dilitatus and Hygrotus parallelogrammus; with five species that were local Hygrotus confluens, Hygrotus impressopunctatus, Ilyocoris cimicoides, Laccobius minutus and Noterus clavicornis. There were a large number of flying aquatic invertebrates seen during the surveys, including Coenagrion puella, Anax imperator, Aeshna affinis, and Ischnura elegans.

Botany Marsh 10 (TQ6091475519)

A11.43 These samples were collected from the wide grazing marsh ditch running east-west across the site. This area was a confluence of two ditches with a wider area of water that was rapidly drying. The vegetation was dominated by *Eleocharis palustris* within the open water portion of the wetland with *Lolium perenne* and *Agrostis stolonifera* supporting around the margins and within the heavily grazed pool and ditch. Along the ditch running to the north there was a dominance of *Phragmites australis*, although this too was all grazed. No aquatic macrophytes were present within the sample sites. The water body was 23m wide and 23m long, with a depth of 80cm. There was no shading of the site and the water was rapidly reducing.

A11.44 A total of 1937 specimens were identified of 57 taxa (40 identified to species). These were dominated by *Cloeon dipterum*, *Helophoris brevipalpis*, *Radix balthica* and the introduced mollusc *Physella acuta*. Twenty-one species of beetle were found and there was a total of sixteen species of interest; one RDB3 *Hydrophilus piceus*, nine Nb *Berosus affinis*, *Berosus luridus*, *Corixa affinis*, *Helophorus griseus*, *Hesperocorixa moesta*, *Hydroglyphus geminus*, *Hygrotus parallelogrammus*, *Peltodytes caesus* and *Rhantus frontalis* with seven species

that were local, *Enochrus coarctatus*, *Hygrotus confluens*, *Ilyocoris cimicoides*, *Noterus clavicornis*, *Notonecta viridis*, *Oecetis furva* and *Plea minutissima*. There were a large number of flying aquatic invertebrates seen during the surveys, including *Coenagrion puella*, *Anax imperator*, *Aeshna affinis*, and *Ischnura* elegans.

Botany Marsh 9 (TQ6095375793)

A11.45 This set of samples were taken along a ditch on the northern margin of the site. The original plan was to sample the lagoon present here; however, at the time of the survey this lagoon was dry and remained so over the survey period. To the south of the lagoon was a ditch running east to west. Water was limited in extent and depth with dense *Phragmites australis* at either end of the sampling area. The water was only 10cm deep with a 90cm depth of silt. The area of open water was 4m wide and 20m long. All areas of the available habitat were sampled. There were no aquatic macrophytes within the waterbody, which did support a fine algal community. The water was very turbid and other than the *Phragmites*, there were no other emergent species.

A11.46 A total of 395 specimens were identified of 32 taxa (22 identified to species). These were dominated by Chironomidae larvae and *Corixidae* sp. early instar specimens. There were eight species of interest at this site and eleven species of beetle. The species of interest were one Na *Helophorus alternans;* three Nb *Rhantus frontalis, Berosus affinis* and *Helophorus arvernicus* with five species that were local *Enochrus testaceus; Sigara stagnalis*, *Corixa panzer, Hygrotus impressopunctatus* and *Corixa affinis*.

Botany Marsh 17 (TQ6108175381)

A11.47 These samples were collected from a man-made pond within the eastern portion of the Botany Marshes. The pond was accessed across a shallow ditch, beyond which was an area of *Phragmites australis* leading down to the ponds edge. The pond had a dense margin of *Phragmites australis* with a less densely vegetated area to the north and south. The aquatic macrophytes were scattered through the waterbody, including *Ranunculus baudotii* and *Potamogeton pusilis,* all were covered in a dense layer of filamentous algae. The samples were taken in the more open areas and around the base of the *Phragmites australis*. The water body was 30m wide and 60m long, with a depth of 1.4m.

A11.48 A total of 746 specimens were identified of 32 taxa (20 identified to species). These were dominated by the molluscs *Radix balthica* and the invasive *Physella acuta* specimens. There were six species of interest at this site and eight species of beetle. The species of interest were four Nb *Berosus luridus, Hydroglyphus geminus, Helophorus avernicus* and *Peltodytes caesus,* with two species that

were local *Erythromma najas,* and *Haliplus immaculatus. Coenagrion puella*, *Anax imperator,* and *Ischnura elegans* were recorded flying at the sample point.

Botany Marsh 8 (TQ6128775306)

A11.49 This site was the pond at the eastern side of Botany Marsh, near to the cement works. The pond was in the process of being cleared during the first survey and was still in a disturbed state at the time of the second sampling period. The pond was approximately a figure-of-8 shape (approximately 42m long and 20m wide) with steep sides and over 1.4m of water. The emergent vegetation was limited to *Phragmites australis* and there were no aquatic macrophytes present, only large amounts of filamentous algae.

A11.50 A total of 473 specimens were identified of 27 taxa (20 identified to species). These samples were dominated by *Chironomidae* sp. larvae, the introduced mollusc *Physella acuta*, and fish fry. Only four species of beetle were found and there were only three species of interest: one Nb *Peltodytes caesus* and two local species *Plea minutissima* and *Ilyocoris cimicoides.* There were a large number of flying aquatic invertebrates recorded during the surveys, inlcuding *Coenagrion puella*, *Anax imperator*, *Libellula quadrimaculata* and *Libellula depressa*, *Ischnura elegans*.

Ebbsfleet 14 (TQ6094674584)

A11.51 This site comprises Bamber pond, within the chalk quarry to the south of the North Kent rail line. The pond was large and deep and access with a boat was not possible, so samples were taken from the accessible western shores of the pond. There was limited emergent vegetation with *Alisma plantago-aquatica, Mentha aquatica, Solanum dulcramara* and *Lycopus europea*. The only aquatic plants were stands of *Nymphaea alba*. A large proportion of the margin had overhanging vegetation with only small areas accessible. At the survey point, the base of the pond was covered in rubble and small boulders. There was filamentous algae around the margins though the water was clear. The water body was 259m long, with a width of 90m and an unknown depth.

A11.52 A total of 351 specimens were identified of 30 taxa (19 identified to species). Dominant species were *Ilyocoris cimicoides, Plea minutissima, Radix balthica* and *Corixinae* sp. There were eleven species of beetle and only eight species of interest: one RDB3 *Hydrophilus piceus*; five Nb *Anacena bipustulata, Berosus affinis, Helochares lividus, Helophorus arvernicus* and *Helophorus griseus* and four local species *Ilyocoris cimicoides, Noterus clavicornis, Plea minutissima* and *Stictotarsus duodecimpustulatus*.

Ebbsfleet 16 (TQ6141073256)

A11.53 This site was the pond to the south of the A2260. At the time of the first visit the pond was already much reduced in area with only a small shallow section in the south west of the pond. The margins of the pond were surrounded with bramble on the south side with *Phragmites australis* to the east. Across the majority of the pond there were only the dead remains of grasses and willowherbs. The water body was 142m long with a width of 74m, when full. At the survey it was 50m by 15m and a depth of around 15cm.

A11.54 A total of 165 specimens were identified of 22 taxa (11 identified to species). These samples were dominated by *Chironomidae* larvae, the invasive *Crangonyx pseudogracilis*, and *Lestes sponsa* larvae. Only one species of beetle was found and there were three species of interest within the sample: three local species *Lestes sponsa*, *Plea minutissima* and *Crangonyx pseudogracilis.* There were no flying aquatic invertebrates seen at this site.

Ebbsfleet 18 (TQ6158772958)

A11.55 Samples 18 and 19 were taken from the same water body at 300m apart. This sample was collected from the chalk stream, from beneath the mature willows. The vegetation was dominated by *Berula erecta, Nasturtium officinalis, Valeriana officinalis* and *Phalaris arundinacea.* The water was cold and fast running through the site. At this location the river, though small, was braided into four small channels that recombined downstream. The water body was 10m wide with a depth of around 1.2m.

A11.56 A total of 170 specimens were identified of 17 taxa (12 identified to species). Dominant species were *Asellus aquaticus*, *Crangonyx pseudogracilis*, and the caddis *Limnephilus lunatus*. Only two species of beetle were found and there were only two species of interest, Nb *Agabus conspersus* and *Hydraena rufipes /britteni/riparia.* There were no flying aquatic invertebrates seen at this site.

Ebbsfleet 19 (TQ6163072900)

A11.57 This site was south of sample point 18 and was taken from a more open habitat with no shading, the vegetation was dominated by *Nasturtium officinalis* and *Phalaris arundinacea*. The water was fast running and very cold. The water body was 12m wide with a depth of around 1.4m.

A11.58 A total of 332 specimens were identified of 19 taxa (12 identified to species). These samples were dominated by *Asellus aquaticus, Tricladida* sp. and *Baetis rhodani.* Three species of beetle were found with three species of interest with

one Nb *Agabus conspersus* and a local species *Agabus didymus.* There were no flying aquatic invertebrates seen at this site.

Swanscombe Marshes 1 (TQ6088376108)

A11.59 This ephemeral lagoon was to the north of the cement works and surrounded by a chainlink fence. The vegetation surrounding the lagoon was dominated by *Elytrigia atherica*, had no aquatic macrophytes and only small quantities of filamentous algae. In the second sampling period the lagoon was dry. The water body was 49m long and 12m when full; however, at the survey it was 9m by 8m, and had a depth of around 10cm.

A11.60 A total of 296 specimens were identified of 18 taxa (11 identified to species). These samples were dominated by fly larvae species and *Cloeon dipterum*. the invasive *Crangonyx pseudogracilis* and *Lestes sponsa* larvae. There were nine species of beetle found and only five species of interest. These were: one Na *Octhebius viridis*; one Nb *Helophorus arvernicus,* and three two local species *Helophorus arvernicus, Hygrotus confluens, Hygrotus impressopunctatus, Ilyocoris cimicoides.* There were no flying aquatic invertebrates seen at this site.

Swanscombe Marshes 12 (TQ6035275923)

A11.61 This site was the 'natural' pond in the centre of the site. The water was slowly receding throughout the summer. The eastern edge of the site was dominated by *Phragmites australis* with *Elytrigia atherica* on the north and western sides of the lagoon. The water body was gently shelving from the west to east, with soft muds in the west and gravels on the base in the centre and east of the pond. The pond is only filled by rainwater. The water body was 316m long, with a width of 100m and a depth of around 1.5m.

A11.62 A total of 593 specimens were identified of 30 taxa (14 identified to species). These samples were dominated by *Corixinae* sp., *Chironomidae* larvae and *Sigara lateralis*. Only four species of beetle were found and there were only six species of interest. Two Nb *Berosus affinis, Berosus luridus* and four local species *Assiminea grayana, Enochrus testaceus, Ilyocoris cimicoides* and *Sigara concinna.* The mollusc *Assiminea grayana* was found only as a dead shell and is likely a residue from when the site was a saltmarsh. There were numerous flying aquatic invertebrates seen at this site with *Sympetrum fonscolombii* frequent around the pond. *Orthetrum cancellatum* and *Libellula quadrimaculata* were frequent too.

Swanscombe Marshes 6 (TQ6038975588)

A11.63 This site was along the ditch running to the south of the main lagoon (site 19). The marginal vegetation was dominated by *Phragmites australis* on the east of the ditch and bramble species on the west. There were no aquatic macrophytes but filamentous algae was present. The water was opaque. The bank appeared undercut on the east though this may have been a solid hover margin. The base of the ditch was silty with a solid gravel beneath. The water body was 4m wide and a depth of around 1.5m.

A11.64 A total of 205 specimens were identified of 50 taxa (42 species identified). Dominant species were *Chironomidae* larvae, the invasive *Physa acuta,* and the mollusc *Anisus vortex.* Twenty-four species of beetle were found and there were twelve species of interest. These were: one Na *Helophorus fulgidicolis*; two Nb *Peltodytes caesus* and *Octhebius dilitatus;* and nine local species *Crangonyx pseudogracilis, Cymbiodyta marginellus, Graptodytes pictus, Haliplus immaculatus, Hygrotus versicolor, Laccobius minutus, Laccobius striolatus, Plea minutissima, Stictotarsus duodecimpustulatus.* There were a few flying aquatic invertebrates seen at this site with most noticeable *Brachytron pratense*.

Swanscombe Marshes 11 (TQ6039775835)

A11.65 This site was a ditch to the east of the track running north south through the site. The ditch was dominated by *Phragmites australis* with no aquatic macrophytes found in the sample areas. The water was opaque and the banks vertical with the ditch base silty below which it was a solid gravel base. The water body was 4m wide and a depth of around 1.5m.

A11.66 A total of 210 specimens were identified of 35 taxa of 22 species. These samples were dominated by *Chironomidae* larvae. Only six species of beetle were found with only four species of interest with one Nb *Helophorus griseus* and three local species *Crangonyx pseudogracilis, Noterus clavicornis* and *Notonecta viridis.* There were a few flying aquatic invertebrates seen at this site with most noticeable *Brachytron pratense*.

Swanscombe Marshes 7 (TQ6044175743)

A11.67 This sample was from a small lagoon/pond to the north of a ditch. Both features were drying at the time of the first survey and were dry by the second. The water was slowly receding as the summer went along. The southern edge of the site was dominated by *Phragmites australis* with *Elytrigia atherica* on the southern sides of the lagoon. The water body was gently shelving from the west to east, with soft muds in the west and gravels on the base in the centre and east of the pond. The pond is only filled by rainwater. The water body was 2m wide, 10m long and a depth of around 15cm.

A11.68 A total of 554 specimens were identified of 18 taxa (8 identified to species). These samples were dominated by *Chironomidae* larvae and *Ephydridae* sp. Four species of beetle was found and there were four species of interest, with one Nb *Helophorus griseus* and three local species *Crangonyx pseudogracilis* and *Hygrotus impressopunctatus*. There were no flying aquatic invertebrates seen at this site.

Swanscombe Marshes 28 and 29 (TQ6050975483 and TQ6055675415)

A11.69 Both samples were taken from the mitigation lagoon to the east of the Ebbsfleet tunnel. The vegetation was almost exclusively *Phragmites australis,* with very few small stands of *Typha latifolia* within the emergents in the southern section of this lagoon and larger stands in the northern portion of the lagoon. *Phragmites australis* dominates all other areas. There was a scattering of *Potamogeton berchtoldii* and filamentous algae within the lagoon, which was clear to the bottom. The lagoon had a layer of soft silts to a depth of 30cm with a firm bottom and scattered pieces of rubble and stone. This lagoon was accessed using a boat and using chest waders. The water was 1m deep. The water body was 229m long, with a maximum width of 48m and a depth of around 1.3m.

A11.70 For sample 29, a total of 172 specimens were identified of 19 taxa (13 species identified). These samples were dominated by *Corixinae* sp. (early instar), *Chironomidae* and *Orthocladii* larvae and *Callicorixa praeusta*. Two species of beetle were found and there were two species of interest; these were two local species *Crangonyx pseudogracilis* and *Ilyocoris cimicoides.*

A11.71 For sample 28, a total of 374 specimens were identified of 31 taxa (23 identified to species). These samples were dominated by *Corixinae* sps (early instar), *Cloeon dipterum*, *Chaboridae* larvae and *Sigara falleni*. Seven species of beetle were found, and the sample contained seven species of interest: one Na, *Helophorus alternans*, three Nb *Berosus affinis, Berosus luridus* and *Peltodytes caesus* and three local species*, Crangonyx pseudogracilis, Erythromma najas* and *Sigara concinna.* There were numerous flying aquatic invertebrates seen at this

site, inlcuding *Anax imperator, Aeshna cyanea, Ischnura elegans* and *Sympetrum striolatum.*

Swanscombe Marshes 26, 27 and 15 (TQ6058975449, TQ6063275456, TQ6064875464)

A11.72 Samples 26 and 27 were taken from the open water of the eastern mitigation lagoon, and sample 15 was taken from the wet flooded *Phragmites* on the way into the lagoon. The vegetation was dominated by *Phragmites australis*, with limited stands of *Typha latifolia* within the emergents to the south. *Phragmites australis* dominates all other areas. There was a scattering of *Potamogeton berchtoldii* and filamentous algae within the clear water of the lagoon. The lagoon had a layer of soft silts to a depth of 40cm with a firm bottom and scattered pieces of rubble and stone. This lagoon was accessed using a boat and using chest waders. The water was 1m deep at the margins and 1.3m in the centre of the lagoon, a boat was needed due to the depth here. The water body was 132m long, with a maximum width of 72m and a depth of around 1.3m.

A11.73 Samples 26 and Sample 27 were combined. A total of 728 specimens were identified of 25 taxa (21 species identified). These samples were dominated by *Corixinae* sp. (early instar), *Cloeon dipterum*, *Chaboridae* larvae and *Sigara falleni*. Five species of beetle were found and there were three species of interest: one Na, *Helophorus alternans*, and two local species*, Crangonyx pseudogracilis,* and *Sigara concinna.*

A11.74 For sample 25, a total of 216 specimens were identified of 33 taxa (24 identified to species). Dominant species were *Asellus aquaticus, Plea minutissima, Crangonyx pseudogracilis* and the invasive mollusc *Physella acuta.* Five species of beetle was found, and five species of interest were identified. These were: one Nb *Ilybius guttiger*, and four local species*, Crangonyx pseudogracilis, Liopterus haemorrhoidalis, Noterus clavicornis* and *Plea minutissima.*

A11.75 There were good numbers of flying aquatic invertebrates recorded at this site. This included *Anax imperator, Aeashna cyanea, Ischnura elegans* and *Sympetrum striolatum.*

Swanscombe Marshes 10 (TQ6058975449)

A11.76 This sample was taken in the ditch near the main power lines across the site. The ditch was densely vegetated with emergent *Phragmites australis* on both banks and there was a considerable amount of *Phragmites australis* debris in the samples. There were no aquatic macrophytes but limited *Lemna minor* on the surface. The water body was 4m wide and a depth of around 1.2m. A total of 484 specimens were identified of 27 taxa (18 identified to species). These samples

were dominated by *Chironomidae* larvae and *Cloeon dipterum*. Eight species of beetle and seven species of interest were recorded. The species of interest were: four Nb *Helophorus griseus, Rhantus frontalis, Rhantus grapii and Rhantus suturalis* and three local species *Corixa panzeri, Hygrotus impressopunctatus and Laccobius minutus.* There were no flying aquatic invertebrates seen at this site.

Swanscombe Marshes 3 (TQ6099176412)

A11.77 This lagoon was on the land above the tidal section of the saltmarsh and behind a low sea wall/bund. It was predominantly filled by runoff from the dangerous pits to the north west and topped up by rainwater. The runoff from these lagoons flowed into this lagoon and then the water flowed into the saltmarsh to the east. The vegetation was dominated by *Elytrigia atherica, Puccinellia maritima* and *Atriplex portulacoides*. The water body was 22m wide, 100m long, and had a depth of up to 15cm during the survey. The water was brown/opaque. A total of over 200 specimens were identified of 1 taxon, no species of interest were found. There were no flying aquatic invertebrates seen at this site.

Swanscombe Marshes 2 (TQ6111176222)

A11.78 This saltmarsh lagoon was on the eastern edge of the site, close to the River Thames, on the seaward side of the embankment. There was limited water within the lagoon in the June survey and there was no water in the August sampling, at this time there was only wet very soft muds. There was no emergent vegetation from the lagoon, though it was surrounded by a dense sward of *Puccinellia maritima, Atriplex portulacoides* and *Elytrigia atherica*. The lagoon is filled by rainwater and spring tides overtopping the saltmarsh. The water body was 13m wide, 10m long and a water depth of around 5cm.

A11.79 A total of 1013 specimens were identified of 6 taxa (2 species identified). These samples were dominated by *Setacera* larvae. One species of interest was identified, this was the local saltmarsh mollusc *Assiminea grayana*. Flying aquatic invertebrates were limited to low numbers of *Anax imperator* and *Ischnura elegans*.

Overview of Conservation Status

A11.80 In total, 217 taxa of aquatic invertebrates were recorded within the study area, of these, 155 identified to species level, with 72 species of beetle and four species of vertebrate - two fish and two amphibians.

A11.81 Two species of vulnerable RDB3 beetle were found in Black Duck Marsh. *Graptodytes bilineatus* was collected from the edge of the ditch close to the track

and *Hydrochus ignicollis* was found at site 4 - at the northern end of BDM within the desiccating pond and along the ditch close to the track at site 20. A third species, *Hydrophilus piceus*, was recorded in the three ditches surveyed at Botany Marsh and a single specimen was collected from Bamber Pit.

A11.82 Eight near threatened species were collected across the sites. Six were beetles and one was the hemiptera *Microvevlia pygmaea*, this was only found in the centre of Botany Marsh. The majority of these rare beetles (*Crytopleurum crenatum, Enochrus halophilus, Gyrinus paykulli* and *Octhebius nanus*) were recorded within samples taken from Botany Marshes grazing ditches (site 8). *Ochthebius viridis* was found once in the drying lagoon at site 181 *Helophorus alternans* found in samples at the mitigation lagoon close to the Ebbsfleet tunnel (28 and 27), and *Helophorus fulgidicolis* found in the ditch sample at site 6.

A11.83 Twenty-two species of Notable b status were found across the site. Two were hemiptera, *Hesperocorixa moesta* and *Gerris paludum*. These were found in Botany Marsh grazing ditches. The remaining twenty species were all beetles. The majority of these were also found in the samples collected from the grazing marsh ditches of Botany Marsh. A single Notable species, *Sigara selecta*, was identified twice. Both recordings of this species were made in Botany Marshes samples.

A11.84 Thirty-four species found were considered of local status. One was the mollusc *Assiminea grayana*, which was found in the saltmarsh lagoon (site 3). Twenty of these were beetles that were scattered across the site, with the majority from the samples at the north and eastern sides of Black Duck Marsh and in the three samples collected from Botany Marsh. Nine species were hemiptera, again these were predominantly from similar areas of Black Duck Marsh and Botany Marsh, with a small number of specimens collected across all the main site areas. The three most abundant local species were *Ilyocoris cimicoides* (13 sites), *Noterus clavicornis* (10 sites) and *Plea minutissima* (12 sites).

A11.85 In total, fifteen of the thirty sites samples had a CCI score above 20, with two sites scoring over 30 and one over 45. Such scores are indicative of high conservation status. The areas of highest importance comprise the eastern and northern areas of Black duck marsh and the grazing marsh ditches of Botany marsh. Aquatic beetles, in particular, are good indicators of habitat quality. Survey effort recorded 75 species of beetle across the four broad survey areas. A total of 155 species of aquatic invertebrate were identified from the two survey periods; that 75 were aquatic beetles is highly significant for the site.

Overview of Water Quality

A11.86 A summary of the biotic scores calculated using SAFIS for each sample location

during is displayed in **Table EDP A11.5** below.

A11.87 With respect to biological water quality of standing waterbodies, BMWP and LQI scores were variable across the survey area, ranging from poor to good water quality. This appears to be correlated with the numbers of coleoptera and odonata species identified in samples. Those sites supporting the highest diversity of beetles, dragonflies and damselflies were similarly representative of moderate to good water quality. With respect to those waterbodies of poor water quality, dense filamentous algae was often recorded in association with these indicating some level of nutrient enrichment.

A11.88 With respect to Botany Marsh, those waterbodies associated with the western extents of the marsh were typically representative of moderate-good water quality, whilst waterbodies across the eastern extents of the marsh area, particularly along the boundaries, were representative of poor water quality. In addition to a relatively diverse odonata and coleoptera community, site 10 also supported the pollution sensitive cased caddisfly Ocetis fulva, an indicator of relatively clean water. Nevertheless, poaching of these waterbodies by cattle was observed which may have some impact on overall condition.

A11.89 With respect to standing waterbodies associated with the River Ebbsfleet, an invertebrate community was indicative of poor water quality with samples dominated by pollution tolerant taxa, albeit with occurrences of pollution sensitive coleopteran and odonatan specimens. In contrast, the river itself was more representative of moderate water quality with relatively limited diversity within samples.

A11.90 Waterbodies across Swanscombe Marsh were predominantly representative of poor water quality. Waterbodies 1-3 and 12 in particular recorded a high pH indicative of alkaline conditions. Indeed, no scoring invertebrates were recorded for the lagoons at sample location 2 and 3. Waterbodies associated with samples 10 and 6 were, however, indicative of moderate-good water quality, albeit an invertebrate community was more limited in diversity when compared to other locations across Botany and Black Duck marshes.

Table A11.4: Standing Waterbodies Aquatic Invertebrate Species List (Part 1)

Species	Rareness	Black Duck Marsh					Botany Marsh					River Ebbsfleet				
		23	22	5	21	4	13	20	8	9	10	9	17	8	14	16
Graptodytes bilineatus	RDB3							2								
Hydrochus ignicollis	RDB3					5		2								
Hydrophilus piceus	RDB3														1	
Hydrophilus piceus (larvae)	RDB3								2	3	1					
Crytopleurum crenatum	Na								1							
Enochrus halophilus	Na								1							
Gyrinus paykulli	Na							1	2							
Helophorus alternans	Na												1			
Helophorus fulgidicolis	Na								7	6	4					
Microvelia pygmaea	Na								1							
Octhebius nanus	Na								1							
Octhebius viridus	Na															
Agabus conspersus	Nb									1						
Anacaena bipustulata	Nb														1	
Berosus affinis	Nb				2			1	6	4	10		4		1	
Berosus luridus	Nb				3				3	7	13	1				
Berosus signaticollis	Nb						1		1	1						
Berosus sp. (damaged)	Nb									1						
Enochrus ochropterus	Nb					1										
Gerris paludum	Nb								1							
Haliplus apicalis	Nb								1							
Helochares lividus	Nb							2							5	
Helophorus arvernicus	Nb											1	4		1	
Helophorus griseus	Nb								9	3	12				1	
Helophorus nanus	Nb								2		1					
Hesperocorixa moesta	Nb										1					

Species	Rareness	Black Duck Marsh					Botany Marsh					River Ebbsfleet				
		23	22	5	21	4	13	20	8	9	10	9	17	8	14	16
Hydroglyphus geminus	Nb					1					1	1				
Hygrotus parallellogrammus	Nb								1	6	3					
Ilybius guttiger	Nb															
Octhebius dilitatus	Nb								1	1						
Peltodytes caesus	Nb						1		2	3	1	1		3		
Rhantus frontalis	Nb				1	7	2			2	3		1			
Rhantus grapii	Nb					1										
Rhantus suturalis	Nb															
Sigara selecta	Nr								2	9						
Agabus didymus	Local															
Assiminea grayana	Local															
Assiminea grayana (long dead)	Local															
Corixa panzeri	Local												1			
Crangonyx pseudogracilis	Local															27
Cymatia coleoptera	Local				1			4								
Cymbiodyta marginellus	Local				1	2										
Dytiscus circumcinctus	Local				1											
Enochrus coarctatus	Local				2	1					1					
Enochrus testaceus	Local				1	5		8	1				1			
Erythromma najas	Local							2				1				
Graptodytes pictus	Local							2								
Gyrinus caspius	Local								1							
Haliplus immaculatus	Local							1	2			1				
Hygrobia hermanni	Local				1											
Hygrotus confluens	Local								2	2	1					
Hygrotus impressopunctatus	Local					1	1	1	3	1	1					
Hygrotus impressopunctatus linellus	Local								1	2	1		1			

Species	Rareness	Black Duck Marsh					Botany Marsh					River Ebbsfleet				
		23	22	5	21	4	13	20	8	9	10	9	17	8	14	16
Hygrotus versicolor	Local				2	8		6								
Ilyocoris cimicoides	Local	1		1		3	1	46	13	6	7			1	114	
Laccobius minutus	Local					4			1	2						
Laccobius striolatus	Local															
Laccophilus minutus	Local							1								
Lestes sponsa	Local							1								10
Liopterus haemorrhoidalis	Local															
Microvelia reticulata	Local				1											
Noterus clavicornis	Local				12	3	1	9	10	2	18				7	
Notonecta viridis	Local										1					
Oecetis furva	Local										1					
Plea minutissima	Local				7	5	1	43	5	3	14			1	49	1
Polyhydrus lineatus	Local				1	3		1								
Sigara concinna	Local	20	26	4	1					1						
Sigara stagnalis	Local			1					11	2			11			
Stictotarsus duodecimpustulatus	Local														2	

Table A11.4: Standing Waterbodies Aquatic Invertebrate Species List (Part 2)

Species	Rareness	River Ebbsfleet							Swanscombe						
		18	19	18	1	12	6	11	7	28	29	15	10	3	2
Graptodytes bilineatus	RDB3														
Hydrochus ignicollis	RDB3														
Hydrophilus piceus	RDB3														
Hydrophilus piceus (larvae)	RDB3														
Crytopleurum crenatum	Na														
Enochrus halophilus	Na														
Gyrinus paykulli	Na														

Species	Rareness	River Ebbsfleet							Swanscombe						
		18	19	18	1	12	6	11	7	28	29	15	10	3	2
Helophorus alternans	Na									3		3			
Helophorus fulgidicolis	Na					2									
Microvelia pygmaea	Na														
Octhebius nanus	Na														
Octhebius viridus	Na			1											
Agabus conspersus	Nb	3	3												
Anacaena bipustulata	Nb														
Berosus affinis	Nb				10					1					
Berosus luridus	Nb				1					1					
Berosus signaticollis	Nb														
Berosus sp. (damaged)	Nb														
Enochrus ochropterus	Nb														
Gerris paludum	Nb														
Haliplus apicalis	Nb														
Helochares lividus	Nb														
Helophorus arvernicus	Nb			4											
Helophorus griseus	Nb						1	2			1				
Helophorus nanus	Nb														
Hesperocorixa moesta	Nb														
Hydroglyphus geminus	Nb														
Hygrotus parallellogrammus	Nb														
Ilybius guttiger	Nb												1		
Octhebius dilitatus	Nb					3									
Peltodytes caesus	Nb					1				1					
Species	Nb	16	17	18	19	20	21	22	23	24	25	27	28	29	30
Rhantus frontalis	Nb										2				
Rhantus grapii	Nb										1				

Species	Rareness	River Ebbsfleet							Swanscombe						
		18	19	18	1	12	6	11	7	28	29	15	10	3	2
Rhantus suturalis	Nr										1				
Sigara selecta	Local														
Agabus didymus	Local		1			2									
Assiminea grayana	Local														9
Assiminea grayana (long dead)	Local				2										
Corixa panzeri	Local										1				
Crangonyx pseudogracilis	Local	27	11			9	2	2	1	7		7	83		
Cymatia coleoptera	Local				1										
Cymbiodyta marginellus	Local					2									
Dytiscus circumcinctus	Local														
Enochrus coarctatus	Local														
Enochrus testaceus	Local				3										
Erythromma najas	Local									1					
Graptodytes pictus	Local					4									
Gyrinus caspius	Local														
Haliplus immaculatus	Local					1									
Hygrobia hermanni	Local														
Hygrotus confluens	Local			1											
Hygrotus impressopunctatus	Local			4				2			1				
Hygrotus impressopunctatus linellus	Local														
Hygrotus versicolor	Local					3									
Ilyocoris cimicoides	Local			3	2				1						
Laccobius minutus	Local					1					1				
Laccobius striolatus	Local					1									
Laccophilus minutus	Local														
Lestes sponsa	Local														
Liopterus haemorrhoidalis	Local												1		

Species	Rareness	River Ebbsfleet							Swanscombe						
		18	19	18	1	12	6	11	7	28	29	15	10	3	2
Microvelia reticulata	Local														
Noterus clavicornis	Local						2						2		
Notonecta viridis	Local						1								
Oecetis furva	Local														
Plea minutissima	Local					4							17		
Polyhydrus lineatus	Local														
Sigara concinna	Local				13					6		2			
Sigara stagnalis	Local														
Stictotarsus duodecimpustulatus						1									

Table A11.5: Biotic Scores for Standing Waterbodies Calculated by SAFIS (Part 1)

Sample_ID	Black Duck Marsh							Botany Marsh					
	23	22	5	21	4	13	20	8	9	10	9	17	8
Total No. of Sp.	603	903	269	470	1800	480	742	1583	2066	1937	395	746	473
Revised BMWP	23.9	34.1	23.1	66.3	68.4	52.3	91.4	71.2	61.6	66.5	30.5	35.1	43.5
Revised ASPT	3.41	3.79	3.3	3.9	4.28	4.02	4.35	4.19	4.4	4.75	5.08	3.9	3.63
LQI	F	F	F	C	B	C	A	B	B	A	A	D	D
CCI	12.92	11.54	13.64	24.73	35.63	24.11	32.56	28.72	25	26.7	22.65	23.8	15.52
No of Coleoptera	0	0	0	16	16	8	21	19	18	17	10	8	5
No. of Megaloptera	0	0	0	0	0	0	2	0	0	0	0	0	0
No. of Odonata	0	0	0	2	3	1	3	4	3	0	0	2	0

Table A11.5: Biotic Scores for Standing Waterbodies Calculated by SAFIS (Part 2)

Sample_ID	River Ebbsfleet				Swanscombe Marshes												
	14	16	18	19	1	12	6	11	7	28	29	26	27	15	10	3	2
Total No. of Sp.	351	165	170	332	296	593	205	210	554	172	374	484	-	728	216	200	1013
Revised BMWP	36.4	35.5	28.2	36.7	14.4	29.7	74.1	49.8	17.3	26	39	38.6	-	29	62.6	-	-
Revised ASPT	4.04	3.92	4.03	4.59	4.8	3.71	4.36	4.53	3.46	3.71	3.55	4.29	-	3.63	4.75	-	-
LQI	D	D	D	B	C	D	B	B	E	D	E	C		D	C		
CCI	45.63	10.45	16.63	16.55	22.75	26.09	17.89	17.29	17.5	10	21.33	24.29	-	14.82	17.68	-	25
No of Coleoptera	10	1	2	3	6	4	24	6	3	2	7	8	-	5	6	0	0
No. of Megaloptera	0	0	0	0	0	0	0	0	0	0	0	1	-	0	0	0	0
No. of Odonata	2	3	0	0	0	0	2	1	1	0	2	1	-	0	1	0	0

River Ebbsfleet

A11.91 A summary of the biotic scores calculated for each sample location during May and September 2020 is displayed in **Table EDP A11.6** and **Table EDP A11.7** below whilst **Tables EDP A11.8** to **A11.15** present the full aquatic macroinvertebrate species lists and the resulting biotic scores for the four sites sampled during May and September 2020.

Table EDP A11.6: Summary Biotic Scores - May 2020.

Sample Site	BMWP	ASPT	N-Taxa	CCI Score
Site 1	47	4.7	10	1
Site 2	66	4.4	15	8.2-12.6
Site 3	56	4.67	12	4.3
Site 4	65	4.3	15	7.9

Table EDP A11.7: Summary Biotic Scores - September 2020.

Sample Site	BMWP	ASPT	N-Taxa	CCI Score
Site 1	50	4.17	12	1
Site 2	95	4.75	20	15.75
Site 3	51	3.92	13	3.75
Site 4	40	4.00	10	1

Site 1: River Ebbsfleet at Springhead Garden Centre

A11.92 The River Ebbsfleet at Section 1 is straightened, uniform section characterised by steeply sloping banks circa 3-4m with a channel substrate dominated by gravel and pebbles with occasional cobbles. In-channel vegetation is limited to patches of floating sweet grass and marginal fool's water cress with hemlock encroaching from the banks. The sampling point is located downstream of a major culvert. At the time of each survey. water flow would sporadically increase indicating a discharge into the watercourse upstream of the sample site.

A11.93 During September 2020, debris dams comprising litter was recorded within the channel and is believed to have been washed down from the culvert following periods of heavy rainfall in preceding weeks.

A11.94 Biotic scores recorded at this site are indicative of moderate (Spring BWMP, 47; ASPT 4.7; Autumn BWMP, 50; ASPT 4.17) biological quality with relatively low taxon richness. Samples were largely dominated by pollution tolerant taxa, in particular water hog-louse (*Asellus aquaticus*) and non-biting midge larvae (Chironomidae), indicators of nutrient enrichment, whilst pollution sensitive species were largely absent.

A11.95 This sample site is located within an urban environment downstream of a major culvert which travels beneath the A2 dual carriageway and thus is likely to receive a number of urban discharges which may impact the biological quality of the

stream. A macroinvertebrate community is, furthermore, likely to be suppressed by the limited diversity of micro-habitats and morphological features.

Site 2: River Ebbsfleet Upstream of Rail Bridge

A11.96 The watercourse at this site is circa 10m wide with limited flow, contiguous with a ponded area fringed by reed canary grass. The survey site is characterised by shallow bank sides reinforced and stablished with wire mesh. Water depth at the centre of the watercourse is circa 1.5m deep. The watercourse immediately downstream of the sample site flows beneath a rail bridge and thus is heavily shaded. Marginal vegetation is, therefore, limited although submerged water starwort was particularly abundant. Duckweed was similarly abundant during September 2020 and covered much of the water's surface within the sample area.

A11.97 During spring 2020, biotic scores at this site were indicative of moderate biological quality with a slightly greater taxon diversity recorded when compared to Site 1. ASPT was, however, relatively comparable. Samples are again dominated by pollution tolerant taxa including non-biting midge larvae. However, the pollution sensitive cased caddisfly (*Athripsodes atterimus*) was identified within the sample. The absence of in-channel diversity at this location also may limit a diverse aquatic macroinvertebrate assemblage although some species may be unrepresented due to limitations to survey effort associated with deep water.

A11.98 During autumn 2020, biotic scores at this site were notably higher than those recorded during spring 2020 and indicative of good water quality. Gastropods were particularly abundant and dominated the sample whilst the pollution sensitive cased caddisfly, *Athripsodes atterimus,* continued to be recorded. It is, however, considered that identification of a more diverse community was likely a result of vegetative cover across the sample area, which offered more refuges to an invertebrate community, particularly free swimming species such as beetles and water bugs (Hemiptera). Such vegetative cover was extremely limited during spring 2020.

Site 3: River Ebbsfleet at Thames Way

A11.99 The watercourse at this site is circa 4m wide and 0.4m deep. The survey site is characterised by steep bank sides circa 0.4m high. The channel substrate is dominated by gravel/pebbles with a deep layer of silt within the centre of the channel where some vegetation has established. Immediately upstream of the site the River Ebbsfleet flows through an area of woodland. Here, branched bur-reed is dominate both within the channel and also the channel margins. At the sample location, vegetation is less prolific whilst the banksides are largely bare,

with no vegetation present, forming a boundary between the watercourse and adjacent footpath and road.

A11.100 Biotic scores at this site are indicative of moderate biological quality and consistent with those recorded at other sample sites. The aquatic macroinvertebrate community here is similarly comparable. The cased caddisfly *Limnephilus lunatus*, was particularly abundant during May 2020; this species is widespread and common within the British Isles and typically found in association with slower flowing water where there is an abundance of plant material and particulate organic matter.

Site 4: River Ebbsfleet at Ebbsfleet International Station

A11.101 The watercourse at this site flows through an area of wet woodland and scrub land, and as such is predominantly heavily shaded. The Site is, however, located within an open section of the watercourse and as such the banks sides are dominated by dense sedge and common reed. The channel here is circa 2m wide and 0.4 deep but with a deep sediment layer lying across the channel. This sediment is dominated by silt with a high abundance of dead gastropods and bivalves.

A11.102 Biotic scores recorded at this site during spring 2020 are again indicative of moderate (BWMP, 47; APT 4.7) biological quality and together with Site 2 are representative of the highest BWMP score recorded within the survey area with comparably taxon richness. Although the pollution tolerant hog-louse is still relatively abundant the aquatic macroinvertebrates community is dominated by the cased caddisfly (*Limnephilus lunatus*). A relatively more diverse gastropod community was also recorded here alongside the pollution sensitive *Athripsodes atterimus* and *Mystacides longicornis*, both relatively common and widespread species typically found in slow water waters.

A11.103 During September 2020, however, biotic scores recorded at this site had declined and were indicative of poor biological quality. Pollution sensitive taxa previously recorded were absent from the sample.

Community Conservation Index

A11.104 The majority of the species recorded during each survey had a CS of one and are classed as being very common. The beetle *Ilybius quadriguttas* and lesser water boatman *Sigara concinna* and *Sigara stagnalis*, each have a CCI score of 5 (Local). Each species has a scattered distribution across the UK although records for London and south east England are frequent.

A11.105 Across samples, the invertebrate specimens identified indicate a community of low-moderate conservation value. A relatively diverse community supporting several specimens of local distribution was identified at site 2 during September 2020. In, particular *Ilybius guttiger*, a notable species, was identified at this location.

Summary

A11.106 Overall, biotic scores recorded for the Rivers Ebbsfleet are representative of moderate water quality and subject to background pollution levels arising from surface water runoff and urban discharges from surrounding development. The watercourse is, however, heavily modified and characterised by a straightened/realigned channel with limited morphological and hydromorphological diversity, which is further likely to suppress a diverse aquatic macroinvertebrate community.

Table EDP A11.8: Sample Site 1 Aquatic Invertebrate Species List - May 2020.

Scientific Name	Common Name	Abundance	BMWP Score	CCI
Agabus sp.	A beetle	1	5	-
Agapetus fuscipes	A cased caddisfly	7	7	1
Agapetus sp.	A cased caddisfly	1	-	-
Asellus aquaticus	Hoglouse	140	3	1
Baetis rhodani	A mayfly	59	4	1
Ceratopogonidae	Biting midge larvae	7	-	-
Chironomidae	Non-biting midge larvae	41	2	-
Crangonyx pseudogracilis	A freshwater shrimp	13	6	1
Dytiscidae	A beetle	10	-	-
Elmis aenea	Riffle beetle	9	5	1
Glossosomatidae	Cased caddisfly	3	-	-
Limnephilidae	Cased caddisfly	1	7	-
Limnephilus lunatus	Cased caddisfly	5	-	1
Radix balthica	Pond snail	1	3	1
Psychoda sp.	A fly	1	-	-
Tipula sp.	A cranefly	5	5	-

Table EDP A11.9: Sample Site 7 Aquatic Invertebrate Species List - May 2020.

Scientific Name	Common Name	Abundance	BMWP	CCI
Asellus aquaticus	Hoglouse	60	3	1
Athripsodes atterimus	Cased caddisfly	1	10	1
Baetidae	A mayfly	4	4	-
Ceratopogonidae	Biting midge larvae	1	-	-
Chironomidae	Non-biting midge	550	2	-
Cloeon dipterum	A mayfly	10	-	1
Corixidae	Lesser water boatman	3	5	-
Crangonyx pseudogracilis	A freshwater shrimp	13	6	1
Daphnia sp.	Water flea	1	-	-
Dytiscidae	Great diving beetle	8	5	-

Scientific Name	Common Name	Abundance	BMWP	CCI
Gyraulus alba	White ramshorn snail	3	3	1
Haliplus lineatocollis	A beetle	3	5	4
Haliplus sp.	A beetle	1	-	
Hydracarina	Water mite	6	-	-
Limnephilus lunatus	Cased caddisfly	2	7	1
Radix balthica	Pond snail	1	3	1
Ostracoda	Seed shrimp	1		-
Pisidium sp.	A bivalve	1	3	-
Potamopyrgus	Jenkin's spire shell	33	3	1
Sialis lutaria	An alderfly	10	4	1
Sigara dorsalis/striata	Lesser water boatman	1	-	1/7
Sigara concinna	Lesser water boatman	1	-	5
Stictotarsus	A beetle	1	-	2
Valvata cristata	A gastropod	1	3	2

Table EDP A11.10: Sample Site 3 Aquatic Invertebrate Species List - May 2020.

Scientific Name	Common Name	Abundance	BMWP Score	CCI
Asellus aquaticus	Hoglouse	67	3	1
Athripsodes atterimus	Cased caddisfly	3	10	1
Chironomidae	Non-biting midge	370	2	-
Crangonyx pseudogracilis	A freshwater shrimp	3	6	1
Donaclinae	A beetle	3	-	
Gyrinus sp.	Whirligig beetle	1	5	
Limnphilidae	Cased caddisfly	27	7	
Limnephilus lunatus	Cased caddisfly	12	-	1
Radix balthica	Pond snail	5	3	1
Notonectidae	Greater water boatman	1	5	
Pisidium sp.	A bivalve	10	3	-
Planorbis corneus	Ramshorn corneus	1	3	4
Scirtidae	A beetle	1	-	-
Sialis lutaria	An alderfly	1	4	1
Simuliidae	Blackfly	37	5	-

Table EDP A11.11: Sample Site 4 Aquatic Invertebrate Species List - May 2020.

Scientific Name	Common Name	Abundance	BMWP Score	CCI
Asellus aquaticus	Hoglouse	64	3	1
Athripsodes atterimus	Cased caddisfly	5	10	1
Ceratopogonidae	Biting midge larvae	1	-	-
Chironomidae	Non-biting midge	46	2	-
Crangonyx pseudogracilis	A freshwater shrimp	7	6	1
Helobdella stagnalis	A leech	1	3	1
Hydropsyche siltalai	A caseless caddisfly	2	5	1
Ilybius quadriguttas	A beetle	1	5	5
Limnphilidae	A cased caddisfly	79	7	-
Limnephilus lunatus	A cased caddisfly	44	-	1
Radix balthica	Pond snail	1	3	1
Limoniidae	A cranefly	1	5	-
Mystacides longicornis	A cased caddisfly	1	-	1

Scientific Name	Common Name	Abundance	BMWP Score	CCI
Physella acuta group	A gastropod	2	3	1
Pisidium sp.	A bivalve	4	3	-
Planorbis corneus	Ramshorn corneus	1	3	4
Potamopyrgus	Jenkin's spire shell	1	3	1
Sialis lutaria	An alderfly	1	4	1
Stagnicola palustris	A gastropod	4	-	2
Succineidae	A gastropod	3	-	-

EDP A11.12: Sample Site 1 Aquatic Invertebrate Species List - September 2020.

Scientific Name	Common Name	Abundance	BMWP Score	CCI
Agapetus fuscies	A cased caddisfly	1	7	1
Asellus aquaticus	Hoglouse	185	3	1
Chironomidae	Non-biting midge	200	2	-
Crangonyx pseudogracilis	A freshwater shrimp	1	6	1
Dicronota sp.	A cranefly	1	5	-
Elmis aenea	A riffle beetle	1	5	1
Erpobdella octoculata	Leech	2	3	1
Erpobdellidae	A leech	2	-	-
Glossosomatidae	Cased caddisfly	3	-	-
Ilybius sp	A beetle	2	5	-
Limnphilidae	A cased caddisfly	2	7	-
Radix balthica	Pond snail	47	3	1
Limnophora riparia	A fly	5	-	-
Lumbriciidae	A worm	2	-	-
Oligochaeta	A worm	2	1	-
Physella acuta group	A gastropod	2	3	1
Tipula sp	A cranefly	5	-	-

Table EDP A11.13: Sample Site 2 Aquatic Invertebrate Species List - September 2020.

Scientific Name	Common Name	Abundance	BMWP Score	CCI
Agabus didymus	A beetle	1	5	1
Anabolia nervosa	A cased caddisfly	1	7	2
Asellus aquaticus	Hoglouse	32	3	1
Athripsodes atterimus	Cased caddisfly	3	10	1
Chironomidae	Non-biting midge	2	2	-
Corixidae	Lesser water boatman	4	5	-
Crangonyx pseudogracilis	A freshwater shrimp	1	6	1
Elmis aenea	A riffle beetle	1	5	1
Gyraulus albus	A gastropod	24	3	1
Gyraulus crista	A gastropod	2	-	2
Haliplus confinis	A beetle	17	5	2
Haliplus lineatocollis	A beetle	1	-	1
Halpilus sp.	A beetle	3	-	-
Hydracarina	A water mite	1	-	-
Hydroporus angustatus	A beetle	1	-	2
Hyphydrus ovatus	A beetle	1	-	2
Ilybius guttiger	A beetle	3	-	7
Ilybius sp.	A beetle	9	-	-

Scientific Name	Common Name	Abundance	BMWP Score	CCI
Ilyocoris cimicoides	Creeping water bug	1	5	4
Laccobius bipunctatus	A beetle	1	5	2
Radix balthica	Pond snail	290	3	1
Notonecta mamorea viridis	Greater water boatman	2	5	5
Notonecta sp.	Greater water boatman	1	-	-
Physella acuta group	A gastropod	965	3	1
Planorbis planorbis	A gastropod	4	-	4
Platycnemis pennipes	White-legged damselfly	1	6	5
Polyceris nigra/tenuis	A flatworm	1	5	1
Potamopyrgus	Jenkin's spire shell	20	3	1
Siagra stagnalis	Lesser water boatman	1	-	5
Sialis lutaria	An alderfly	2	4	1
Tipula sp.	A cranefly	1	5	-

EDP A11.14: Sample Site 3 Aquatic Invertebrate Species List - September 2020.

Scientific Name	Common Name	Abundance	BMWP Score	CCI
Asellus aquaticus	Hoglouse	33	3	1
Asellus meridianus	Hoglouse	1	-	3
Chironomidae	Non-biting midge	4	2	-
Crangonyx pseudogracilis	A freshwater shrimp	1	6	1
Dytiscus sp.	A beetle	1	5	-
Gyrinus substriatus	Whirligig beetle	3	5	1
Helobdella stagnalis	A leech	1	3	1
Hydracarina	A water mite	1	-	-
Laccobius sp.	A beetle	1	5	-
Limnephilus lunatus	A cased caddisfly	4	7	1
Radix balthica	Pond snail	1	3	1
Oligochaeta	A worm	3	1	-
Oulimnius sp.	A riffle beetle	1	5	-
Physella acuta group	A gastropod	1	3	1
Pisidium sp.	A pea mussel	1	3	-

EDP A11.15: Sample Site 4 Aquatic Invertebrate Species List - September 2020.

Scientific Name	Common Name	Abundance	BMWP Score	CCI
Asellus aquaticus	Hoglouse	19	3	1
Chironomidae	Non-biting midge	4	2	-
Collembola	A springtail	1	-	-
Gnophomyiia sp	A cranefly	1	5	-
Gyraulus sp	A snail	1	3	-
Ilybius sp.	A beetle	2	5	-
Laccobius sp.	A beetle	1	5	-
Limnephilidae	A cased caddisfly	1	7	-
Pisidium sp.	A pea mussel	6	3	-
Potamopyrgus	Jenkin's spire shell	1	3	1
Sialis lutaria	An alderfly	1	4	1
Stratiomyiidae	A soldier fly	1	-	-
Succineidae	A gastropod	4	-	-

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Annex EDP 12
2012 Desk Study and Phase 1 Habitat Survey Report (CBA, 2012)

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cba

London Resort Company Holdings (LRCH) Ltd.

London Paramount

2012 Desk Study and Phase I Habitat Survey Report

July 2012

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London Resort Company Holdings (LRCH) Ltd.

London Paramount

2012 Desk Study and Phase I Habitat Survey Report

Approved	[redacted]
	Bill Wadsworth
Position	Senior Associate (Ecology)
Date	31st July 2012
Revision	Final

CONTENTS

1.0 INTRODUCTION

1.1 General

1.1.1 Chris Blandford Associates (CBA) has been appointed by London Resort Company Holdings (LRCH) Ltd. to undertake a series of ecological surveys to inform the design and assessment of the proposed London Paramount development at Swanscombe, North Kent.

1.1.2 This report details the results of the desk-top study undertaken in April 2012 and the Phase 1 habitat survey undertaken in May 2012.

1.2 Scope

1.2.1 The scope of the desk-top study was to identify the presence of any statutory and non-statutory designated sites and records of species of nature conservation concern (including species protected by law), both within the survey area and in the area surrounding it.

1.2.2 The scope of the Phase 1 habitat survey was to identify the habitats present within the proposed development area, to map their extent and distribution, and to identify key areas or habitats likely to be of broad nature conservation interest. Additionally, the survey also identifies the presence, or potential presence, of species protected by law or considered to be of nature conservation value through their inclusion in Biodiversity Action Plans and/or Red Data Listings.

Survey Limitations

1.2.3 Access was limited in a number of locations either due to landownership restrictions or due to health and safety considerations. The locations where access was restricted is discussed in detail in Section 4.1.

1.3 Key Findings

1.3.1 Three statutorily designated sites were identified: Baker's Hole Site of Special Scientific Interest (SSSI) and the Swanscombe Skull Site National Nature Reserve (NNR) and SSSI, both of which are designated for their geological interest. North of the River Thames, the West Thurrock Lagoon and Marshes SSSI is designated for its important assemblages of overwintering waders and wildfowl. The non-statutorily designated Alkerden Pit and Swanscombe Heritage Park Local Wildlife Site (LWS) and Ebbsfleet Marshes LWS are also present within 2km of the proposed development area.

1.3.2 A number of protected species and species of nature conservation importance have been recorded within the boundaries of the proposed development area including water vole, great crested newt, common pipistrelle, daubenton's and noctule bats. Species recorded within a 2km radius of the proposed development area include badger, soprano pipistrelle, brown-long eared and serotine bats.

1.3.3 The Phase 1 habitat survey revealed a range of different habitats within the proposed development area including woodland, scrub, grassland, swamp, open water, mudflat, saltmarsh, inland cliff and hedgerow. The dominant vegetation type was species-poor grassland with scattered scrub. This range of habitats has the potential to support notable plant species, notable invertebrate species, bats, birds, great crested newts, water voles and reptiles and it is recommended that further survey work is carried in respect of these groups.

1.3.4 Overall the most valuable habitats in the survey area from a nature conservation perspective are considered to be the more species-rich grasslands, reedbeds, mudflats, saltmarsh and open mosaic habitats on previously developed land. However, other habitats and features such as the woodland, scrub and standing water will also have value, including for example their potential to support protected species such as water voles.

1.3.5 Although it would otherwise be of relatively low value, some of the less species-rich grassland also has the potential to support a range of notable species. For example, areas of coarse grassland, especially where present with ruderal and scrub, are likely to be of value to reptiles.

2.0 METHODOLOGY

2.1 Desk-top Study

2.1.1 The desk-top study was carried out using data acquired from the Kent and Medway Biological Records Centre (KMBRC) in April 2012. Further information on designated sites and habitats was retrieved from the following websites:

- MAGIC (Multi-Agency Geographic Information for the Countryside)
- JNCC (Joint Nature Conservation Committee)
- Natural England
- K-LIS (Kent Landscape Information System)
- Kent BAP (Biodiversity Action Plan)

2.1.2 Habitat data and all species records (except bats) were received for evaluation within a 2km radius of the proposed development area. The data was filtered so that only recent records made since 1981 were considered. This made the data more relevant i.e. species recorded within the search area are more likely to still be present. The choice of year to cut the data is not arbitrary- it marks the implementation of the Wildlife and Countryside Act 1981, the main source of legal protection for animals and plants in the UK.

2.1.3 All bat records were received for evaluation within a 5km radius of the proposed development area. Again data was filtered so that only recent records made since 1981 were considered.

2.2 Phase 1 Habitat Survey

2.2.1 The proposed development area was surveyed over the course of four days on the 4th, 8th, 9th and 14th May 2012. The survey was undertaken during the optimal period for conducting Phase 1 habitat surveys (April-September). Weather conditions during the survey were good and posed no constraints to the results.

2.2.2 The survey was carried out using the methodology outlined in the 'Handbook for Phase 1 habitat survey - a technique for environmental audit'[1] to identify, map and describe the main habitats present along with their associated species. Target notes were taken on features of ecological interest and lists compiled of species of flora and fauna observed during the survey. An assessment was also made of the presence or likely presence of statutory protected species.

2.2.3 Where access was not possible in certain areas, observations were made on the surrounding habitats from public rights of way.

[1] JNCC (2010) *Handbook for Phase 1 habitat survey - a technique for environmental audit*. ISBN 0 86139 636 7

2.2.4 The results of single ecological surveys should be regarded as a summary of the site at a particular point in time. Surveys are often limited by the seasonal presence of many species, their mobility and difficulties associated with detection. Additional surveys have been recommended where the likelihood of protected species and species of conservation importance occurring is considered to be high.

3.0 RESULTS

3.1 Desk-top Study

Designated Sites and Habitats

Sites of Special Scientific Interest (SSSI)

3.1.1 Sites of Special Scientific Interest (SSSIs) are notified under the Wildlife and Countryside Act 1981 as being of "special interest for nature conservation". They receive statutory protection and it is an offence for anyone to intentionally or recklessly damage, or destroy, the flora, fauna, physiological or geological features of a SSSI.

3.1.2 Bakers Hole SSSI (TQ 612741) is a 6.5ha key Pleistocene site exposing various periglacial and temperate climate deposits. As a geological or earth science SSSI, it has been chosen for its research value. The site is located close to Ebbsfleet International Rail Station.

3.1.3 Located approximately 0.6km south-west of the proposed development area is another geological SSSI, Swanscombe Skull Site (TQ 597743). This 3.9ha site is nationally important as the only site to yield Lower Palaeolithic human remains. For this reason it is also designated a National Nature Reserve (NNR). NNRs are statutory reserves established under the Wildlife and Countryside Act 1981.

3.1.4 On the opposite side of the River Thames in Essex, approximately 1.2km north-west of the proposed development area is West Thurrock lagoon and marshes (TQ 585766). This 66.98ha site is a biological SSSI important for wintering wildfowl and waders. It features extensive intertidal mudflats and large areas of reedbed.

Local Wildlife Sites (LWS)

3.1.5 Local Wildlife Sites (LWSs) are considered important for the conservation of wildlife at a county level but have no statutory protection. They may support habitats or species considered to be of nature conservation value within a local context.

3.1.6 Ebbsfleet Marshes LWS (TQ 619738) is located close to Ebbsfleet International Rail Station. Habitats include grassland, marsh, scrub, the River Ebbsfleet and a large flooded quarry to the north east known as 'blue lake'. This site was first notified in 1985 and since then the Channel Tunnel Rail Link (CTRL) has been constructed with associated car parking, causing severe fragmentation and development of the site. This is likely to have decreased its value and some of the habitats and species quoted in the original citation may no longer be present.

3.1.7 Another LWS, Alkerden Pit (TQ 597745), is located immediately south of the proposed development area below the railway line, A226 and Swanscombe Marshes. Habitats include grassland, scrub, woodland and an inland cliff. The site was mainly designated for supporting nationally and county scarce plant species including narrow-leaved everlasting pea *Lathyrus sylvestris,* a relict population of yellow vetchling *Lathyrus aphaca* and the county's largest population of green-flowered helleborine *Epipactis phyllanthes*. An area of former landfill on the site is also known to support a rare assemblage of invertebrates including at least one UK Biodiversity Action Plan (BAP) species.

Country Parks

3.1.8 Alkerden Pit and Swanscombe Skull Site also overlap with Swanscombe Heritage Park. Country parks are recognised as providing a wide range of opportunities for education, health and recreation and improving the quality of life for local communities.

UK Biodiversity Action Plan (BAP) Priority Habitats

3.1.9 The following UK Biodiversity Action Plan (BAP) priority habitats occur within the proposed development area:

- Coastal saltmarsh – provides habitat for wintering and passage waterfowl and waders and nationally important for specialist invertebrates;
- Grazing marsh – provides habitat for wintering wildfowl and waders. It can support a range of invertebrates and plants and is also of particular importance for the water vole *Arvicola amphibious;*
- Inland rock – provides habitat for specialist invertebrates, mosses, lichens and liverworts;
- Mudflats – provides habitat for waders and wildfowl;
- Reedbeds – associated with a range of breeding bird species;
- Hedgerows – provide linkages within the wider landscape and support species dispersal and foraging activity; and,
- Open mosaic habitats on previously developed land - a new priority habitat recognised for its unusual plant assemblage and species-rich invertebrate fauna. It is also important for certain species of bird such as the skylark *Alauda arvensis* and grey partridge *Perdix perdix*. This habitat is defined by its known history of disturbance, early successional vegetation, bare substrate and spatial variation.

Species

Botany

3.1.10 A number of scarce or rare plant, lichen and fungi species were revealed within a 2km radius of the proposed development area. Their status, legal protection, and the number of records with a date range for each species is summarised in **Table 1.**

Table 1 Notable Plant Species within a 2km Radius (including lower plants, lichens and fungi)
UK BAP = UK Biodiversity Action Plan priority species; **NERC** = Natural Environment and Rural Communities Act 2006 (Section 41: Species of Principal Importance in England); **RDB(1/2/3)** = National Red Data Book species (Endangered/Vulnerable/Rare); **NR** = Nationally Rare; **NS** = Nationally Scarce; **KRDB(1/2/3)** = Kent Red Data Book species (Endangered/Vulnerable/Rare); **HD (V)** = Habitats Directive (Annex V); **WCA (8)** = Wildlife and Countryside Act 1981 (Schedule 8); **CROW** = Countryside and Rights of Way Act 2000; **CITES** = Convention on International Trade in Endangered Species of Wild Flora and Fauna

Common Name	Scientific Name	Status	Legal Protection	Number of records
Annual knawel	*Scleranthus annuus*	UK BAP; NERC; RDB1		1 (1997)
Bird's-nest	*Monotropa hypopitys*	UK BAP; NERC; RDB1		1 (1994)
Bitter webcap	*Cortinarius infractus*	RDB2; KRDB3		1 (2010)
Bluebell	*Hyacinthoides non-scripta*		WCA (8)	5 (1999-2010)
Borrer's saltmarsh-grass	*Puccinellia fasciculata*	UK BAP; NERC; RDB2; NS		7 (1992-2001)
Box	*Buxus sempervirens*	NR; KRDB2		2 (1985-2002)
Bryophyte	*Herzogiella seligeri*	NS; KRDB1		1 (1986)
Bryophyte	*Seligeria calcarea*	KRDB2		1 (2001)
Butcher's-broom	*Ruscus aculeatus*		HD (V)	6 (1996-2010)
Cornflower	*Centaurea cyanus*	UK BAP; NERC; KRDB1		6 (1982-1999)
Cypress spurge	*Euphorbia cyparissias*	KRDB2		1 (2000)
Divided sedge	*Carex divisa*	UK BAP; NERC; RDB2; NS		6 (1992-2011)
Eyebright	*Euphrasia anglica x micrantha*	UK BAP; NERC; RDB1		1 (1996)
Fungi	*Coriolopsis gallica*	KRDB3		1 (2007)
Fungi	*Cortinarius aureoturbinatus*	KRDB1		1 (2000)
Fungi	*Cortinarius osmophorus*	RDB2; KRDB1		2 (2010)
Fungi	*Cortinarius rufo-olivaceus*	RDB2; KRDB2		2 (2000-2010)
Fungi	*Cortinarius sodagnitus*	RDB2; KRDB1		1 (2000)
Fungi	*Lactarius mairei*	KRDB1		1 (2000)
Fungi	*Lactarius zonarius*	KRDB1		1 (2010)
Fungi	*Mycena*	KRDB1		1 (2010)

Common Name	Scientific Name	Status	Legal Protection	Number of records
	corynephora			
Fungi	*Mycena pseudocorticola*	KRDB1		1 (2010)
Fungi	*Sarcoscypha austriaca*	KRDB3		1 (2007)
Fungi	*Sowerbyella radiculata*	RDB3; KRDB2		1 (2000)
Giant funnel-cap	*Leucopaxillus giganteus*	KRDB2		1 (2000)
Gilded bolete	*Aureoboletus gentilis*	KRDB1		1 (2010)
Gilded brittlegill	*Russula aurea*	RDB2; KRDB1		3 (2000-2010)
Golden dock	*Rumex maritimus*	KRDB3		1 (2000)
Golden gilled bolete	*Phylloporus rhodoxanthus*	KRDB2		2 (2000-2010)
Green-flowered helleborine	*Epipactis phyllanthes*	NS; KRDB1	CITES	8 (1999-2010)
Heath dog-violet	*Viola canina subsp. canina*	KRDB1		1 (1987)
Hemisphaeric liverwort	*Reboulia hemisphaerica*	KRDB2		1 (1986)
Hoary cinquefoil	*Potentilla argentea*	KRDB3		1 (1997)
Italian catchfly	*Silene italica*	RDB2; KRDB1		3 (1994-2011)
Knapweed broomrape	*Orobanche elatior*	KRDB3		2 (2001)
Large White-moss	*Leucobryum glaucum*		HD (V)	1 (1986)
Lichen	*Peltigera rufescens*	KRDB1		1 (2003)
Lichen	*Pleurosticta acetabulum*	KRDB3		1 (2000)
Man orchid	*Orchis anthropophora*	UK BAP; NERC; RDB1; NS	CITES	5 (1998-2001)
Marsh helleborine	*Epipactis palustris*	KRDB2	CITES	1 (1999)
Mat-grass fescue	*Vulpia unilateralis*	NS; KRDB3		3 (1999-2001)
Pale St.John's-wort	*Hypericum montanum*	KRDB2		2 (1983-1984)
Pennyroyal	*Mentha pulegium*	UK BAP; NERC; RDB1; NS	WCA(8); CROW	1 (1999)
Petty whin	*Genista anglica*	KRDB1		2 (1981-1991)
Round-leaved wintergreen	*Pyrola rotundifolia*	NS; KRDB3		11 (1996-2010)
Sea barley	*Hordeum marinum*	UK BAP; NERC; RDB2; NS		1 (2004)
Slender hare's-ear	*Bupleurum tenuissimum*	UK BAP; NERC; RDB2; NS		2 (1995-1999)
Splendid webcap	*Cortinarius splendens*	RDB2; KRDB1		1 (2000)
Tiered tooth	*Hericium cirrhatum*	RDB2; KRDB1		1 (2000)
Townsend's	*Spartina maritima x*	UK BAP; NS;		1 (2001)

Common Name	Scientific Name	Status	Legal Protection	Number of records
cord-grass	*alterniflora = S. x townsendii*	KRDB1		
Verdigris navel	*Arrhenia chlorocyanea*	RDB3; KRDB1		1 (1998)
Wintergreen	*Pyrola rotundifolia subsp. maritima*	NS; KRDB3		5 (1984-2003)

Mammals

3.1.11 3 records of badger *Meles meles* were received within a [redacted] radius of the proposed development area. The most recent record made in 2008 is located approximately [redacted] south-east of the proposed development area. Although not rare, the badger has historically suffered from persecution and is therefore protected under the Bern Convention (Appendix III) and the Protection of Badgers Act 1992. Under the act it is an offence to kill, injure or take a badger or interfere with a sett which includes damaging it, destroying it or obstructing an entrance.

3.1.12 11 records of water vole (1996-2002) were received within the search area. Most of these were made in Swanscombe Marshes which mainly fall outside the boundaries of the proposed development area. This species has suffered severe declines in recent years due to a loss of habitat and predation by the American mink *Mustela vison*. For these reasons it is listed as a Species of Principal Importance in England (Section 41: Natural Environment and Rural Communities Act 2006) protected under the Wildlife and Countryside Act 1981 (Schedule 5) and the Countryside and Rights of Way Act 2000. It is also a UK BAP and Kent Red Data Book species.

3.1.13 Three records of hedgehog *Erinaceus europaeus* were received within the search area, the most recent made in 2000 is located approximately 0.8km south-east of the site. Due to population declines the hedgehog is listed as a Species of Principal Importance in England (Section 41: Natural Environment and Rural Communities Act 2006) and a UK BAP species.

3.1.14 Nine species of bat have been recorded within a 5km radius of the proposed development area; Serotine, Daubenton's, Whiskered, Natterer's, Leisler's, Noctule, 45kHz Pipistrelle, 55kHz Pipistrelle and Brown long-eared. Their status and the number of records for each species is summarised in **Table 2**. The distance to the nearest record and its date are also given.

All species of bat and their roosts are protected under the Wildlife and Countryside Act 1981 (Schedule 5), the Habitats Directive (Annex IV), the Bern Convention (Annex II) and the Bonn Convention (Annex II).

Table 2 Bat Species within a 5km Radius

KRDB(1/2/3) = Kent Red Data Book Species (Endangered/Vulnerable/Rare); **NERC** = Natural Environment and Rural Communities Act 2006 (Section 41: Species of Principal Importance in England); **UK BAP** = UK Biodiversity Action Plan Priority Species

Common Name	Scientific Name	Status	Number of records		Distance to nearest record
			Non-roost	Roost	
Common Pipistrelle (45kHz)	*Pipistrellus pipistrellus*		16	4	Within proposed development area (2002)
Soprano Pipistrelle (55kHz)	*Pipistrellus pygmaeus*	NERC;UK BAP	7	0	0.2km (1999)
Brown long-eared	*Plecotus auritus*	KRDB2;NERC; UK BAP	2	19	0.2km (2000)
Daubenton's	*Myotis daubentonii*		3	38	Within proposed development area (2002)
Leisler's	*Nyctalus leisleri*	KRDB1	1	0	3.9km (2008)
Natterer's	*Myotis nattereri*	KRDB2	1	22	2.5km (1984)
Noctule	*Nyctalus noctula*	KRDB2;NERC; UK BAP	5	1	Within proposed development area (2011)
Serotine	*Eptesicus serotinus*	KRDB3	2	0	0.2km (1999)
Whiskered	*Myotis mystacinus*	KRDB1	0	3	3.6km (1986)

Herptiles

3.1.15 12 records of great crested newt *Triturus cristatus* were received within a 2km radius of the proposed development area. Four of these are located within the boundaries, mainly to the south and east in Ebbsfleet Valley and Bamber Pit. Records made outside the proposed development area are located further south and east of the site. The most recent of these was in 2001 however the majority of the records were made in the 1980s. The great crested newt is afforded full legal protection under the Wildlife and Countryside Act 1981 (Schedule 5), the Bern Convention (Appendix II), the Habitats Directive (Annex II) and the Countryside and Rights of Way Act 2000. It is also listed as a Species of Principal Importance in England (Section 41: Natural Environment and Rural Communities Act 2006) and a UK BAP species. Britain is a stronghold for populations of the great crested newt and has a special responsibility for its conservation.

3.1.16 Four other species of amphibian have been recorded within the search area; palmate newt *Lissotriton helveticus,* smooth newt *Lissotriton vulgaris,* common toad *Bufo bufo* and common frog *Rana temporaria*. All of these species are protected under the Wildlife and Countryside Act 1981 (Schedule 5) with respect to sale only and the Bern Convention (Appendix III). In addition

the common toad is a Species of Principal Importance in England (Section 41: Natural Environment and Rural Communities Act 2006) and a UK BAP species. The number of records for each species and the date range is listed below:

- Palmate newt 8 (1984-2003)
- Smooth newt 15 (1984-2007)
- Common toad 4 (1993-2009)
- Common frog 4 (1991-2007)

Of these species, only the smooth newt and common toad have been recorded within the boundaries of the proposed development area.

3.1.17 Three species of reptile were recorded in the search area; slow-worm *Anguis fragilis,* common lizard *Zootoca vivipara* and grass snake *Natrix natrix*. All of these species are protected under the Wildlife and Countryside Act 1981 (Schedule 5) and the Bern Convention (Appendix III) against intentional killing or injury. Due to substantial declines they are also listed as Species of Principal Importance in England (Section 41: Natural Environment and Rural Communities Act 2006) and UK BAP species. The number of records for each species and the date range is listed below:

- Slow-worm 6 (1986-2002)
- Common lizard 55 (1985-2009)
- Grass snake 10 (1984-2008)

All three of these species have been recorded within the boundaries of the proposed development area.

Birds

3.1.18 All British bird species, their eggs and nests are protected under the Wildlife and Countryside Act 1981. However there is some additional protection for species considered rare or important in Britain, particularly those listed on schedule 1 of the Wildlife and Countryside Act 1981 which are protected by species penalties. A number of notable bird species were recorded within a 2km radius of the proposed development area. Their status, additional legal protection, and the number of records (with the date of the most recent record) for each species is summarised in **Table 3**. Further details on the criteria for assigning birds to the different status categories are provided in **Appendix D**.

Table 3 Notable Bird Species within a 2km Radius

Red/Amber List = Birds of Conservation Concern – Red/Amber List Species; **NERC** = Natural Environment and Rural Communities Act 2006 (Section 41: Species of Principal Importance in England); **UK BAP** = UK Biodiversity Action Plan Priority Species; **KRDB(1/2/3)** = Kent Red Data Book Species (Endangered/Vulnerable/Rare); **Bern (II)** = Bern Convention (Annex II); a; **WCA (I)** = Wildlife and Countryside Act 1981 (Schedule 1 Species)

Common Name	Scientific Name	Status	Legal Protection[2]	Number of records
Arctic tern	*Sterna paradisaea*	Amber list	Bern(II); BD(I)	8 (2008)
Avocet	*Recurvirostra avosetta*	Amber list; KRDB3	Bern(II); BD(I); WCA(I)	5 (2004)
Barn owl	*Tyto alba*	Amber list	Bern(II); WCA(I)	3 (2005)
Bar-tailed godwit	*Limosa lapponica*	Amber list	BD(I)	2 (1995)
Bearded tit	*Panurus biarmicus*	Amber list; KRDB3	Bern(II); WCA(I)	14 (2010)
Black redstart	*Phoenicurus ochruros*	Amber list; KRDB1	Bern(II); WCA(I)	1 (2010)
Black tern	*Chlidonias niger*	Amber list	Bern(II); BD(I); WCA(I)	10 (2008)
Black-tailed godwit	*Limosa limosa*	UK BAP; Red list; NERC; KRDB1	WCA(I)	47 (2010)
Brambling	*Fringilla montifringilla*		WCA(I)	3 (2008)
Cetti's warbler	*Cettia cetti*	KRDB1	Bern(II); WCA(I)	76 (2011)
Common crossbill	*Loxia curvirostra*		Bern(II); WCA(I)	2 (2008)
Common scoter	*Melanitta nigra*	UK BAP; Red list; NERC	WCA(I)	3 (2003)
Common tern	*Sterna hirundo*	Amber list	Bern(II); BD(I)	34 (2009)
Dartford warbler	*Sylvia undata*	Amber list	Bern(II); BD(I); WCA(I)	7 (2008)
Dunlin	*Calidris alpina*	Red list	Bern (II); BD(I)	53 (2010)
Fieldfare	*Turdus pilaris*	Red list	WCA(I)	35 (2009)
Firecrest	*Regulus ignicapillus*	Amber list; KRDB1	Bern(II); WCA(I)	1 (2008)
Garganey	*Anas querquedula*	Amber list; KRDB1	WCA(I)	3 (1995)
Goldeneye	*Bucephala clangula*	Amber list	WCA(I)	5 (2004)
Great northern diver	*Gavia immer*	Amber list	Bern(II); BD(I); WCA(I)	2 (1985)
Green sandpiper	*Tringa ochropus*	Amber list	Bern(II); WCA(I)	110 (2010)
Greenshank	*Tringa nebularia*		WCA(I)	4 (2009)
Hen harrier	*Circus cyaneus*	Red list; NERC	BD(I); WCA(I)	2 (1997)
Hobby	*Falco subbuteo*	KRDB3	Bern(II); WCA(I)	20 (2009)
Kingfisher	*Alcedo atthis*	Amber list	Bern(II); BD(I); WCA(I)	50 (2010)
Leach's petrel	*Oceanodroma leucorhoa*	Amber list	Bern(II); BD(I); WCA(I)	3 (2003)
Little egret	*Egretta garzetta*	Amber list	Bern(II); BD(I)	50 (2010)

[2] The provisions of the Birds Directive are implemented in the UK through the Conservation of Habitats and Species Regulations 2010 and the Wildlife and Countryside Act 1981.

Common Name	Scientific Name	Status	Legal Protection[2]	Number of records
Little gull	*Larus minutus*	Amber list	Bern(II); BD(I); WCA(I)	27 (2007)
Little ringed plover	*Charadrius dubius*	KRDB1	Bern(II); WCA(I)	26 (2010)
Marsh harrier	*Circus aeruginosus*	Amber list; KRDB1	BD(I); WCA(I)	5 (2010)
Mediterranean gull	*Larus melanocephalus*	Amber list; KRDB1	Bern(II); BD(I); WCA(I)	15 (2010)
Merlin	*Falco columbarius*	Amber list	Bern(II); BD(I); WCA(I)	2 (2003)
Peregrine	*Falco peregrinus*	KRDB1	Bern(II); BD(I); WCA(I)	27 (2010)
Pintail	*Anas acuta*	Amber list; KRDB3	WCA(I)	8 (2001)
Quail	*Coturnix coturnix*	Amber list; KRDB1	WCA(I)	2 (1992)
Red kite	*Milvus milvus*	Amber list	BD(I); WCA(I)	5 (2010)
Red-throated diver	*Gavia stellata*	Amber list; KRDB3	Bern(II); BD(I); WCA(I)	3 (2002)
Redwing	*Turdus iliacus*	Red list	WCA(I)	20 (2010)
Ruddy Shelduck	*Tadorna ferruginea*		Bern(II); BD(I);	3 (1997)
Ruff	*Philomachus pugnax*	Red list	BD(I); WCA(I)	4 (2000)
Sandwich tern	*Sterna sandvicensis*	Amber list; KRDB3	Bern(II); BD(I)	16 (2008)
Scaup	*Aythya marila*	UK BAP; Red list; NERC	WCA(I)	19 (2001)
Short-eared owl	*Asio flammeus*	Amber list; KRDB1	Bern(II); BD(I)	6 (2003)
Slavonian grebe	*Podiceps auritus*	Amber list	Bern(II); BD(I); WCA(I)	1 (2004)
Smew	*Mergus albellus*	Amber list	Bern(II); BD(I)	2 (2010)
Snow bunting	*Plectrophenax nivalis*	Amber list	Bern(II); WCA(I)	1 (2002)
Whimbrel	*Numenius phaeopus*	Red list	WCA(I)	20 (2009)

3.1.19 In addition to the birds listed above there were a further 57 listed solely under the Bern Convention, Appendix II. The convention places a particular emphasis on migratory species and listed fauna are required to be protected from disturbance, killing, capture, damage or destruction of nesting sites, taking of eggs and trading.

Invertebrates

3.1.20 Approximately 30 species of rare or scarce invertebrate have been described within a 2km radius of the proposed development area. The number of species within each of the relevant status categories is given below. Further details on the criteria for assigning invertebrate species to the different status categories are provided in **Appendix C**.

- National Red Data Book 1 – Endangered 2
- National Red Data Book 3 – Rare 11
- National Red Data Book K – Insufficiently known 2
- National Red Data Book X – Believed extinct 1[3]

- Nationally Notable 1

- Nationally Notable B 1

- Kent Red Data Book 1 – Endangered 5
- Kent Red Data Book 2 – Vulnerable 7
- Kent Red Data Book 3 – Rare 5
- Kent Red Data Book 4 (flies only) 1

- UK BAP 29

It should be noted that many of the above categories overlap, for example a National Red Data book species might also be a Kent Red Data Book species and be a UK Biodiversity Action Plan priority species too.

Invasive Species

3.1.21 Outlined in **Table 4** are a number of invasive alien species that have been recorded within a 2km radius of the proposed development area. Their name, status and number of records with the date of the most recent record are given. These are non-native species which pose a threat to the UK's native fauna and flora. Legal frameworks and policies such as the Convention on the Conservation of European Wildlife and Natural Habitats (1979) require that contracting parties shall prevent the introduction of non-native species, control or eradicate them where appropriate. Section 14 of the Wildlife and Countryside Act (1981) makes it illegal to release into the wild, allow to escape or grow any non-native species of animal or plant listed in schedule 9 (parts 1 and 2).

[3] A parasitic fly *Litophasia hyalipennis* recorded from Sussex in 1887 was believed extinct until rediscovered at Northfleet, Kent in 1987. Essex Field Club (2012) *Species Account for Litophasia hyalipennis*. Available at <www.essexfieldclub.org.uk> Accessed 28 May 2012

Table 4 Invasive Species within a 2km Radius

WCA(9) = Wildlife and Countryside Act 1981 (Schedule 9 species)

Common Name	Scientific Name	Status	Number of records
Plants			
Canadian waterweed	*Elodea canadensis*	WCA(9)	1 (1999)
Curly waterweed	*Lagarosiphon major*	WCA(9)	2 (1998)
Dutch rose	*Rosa 'hollandica'*		1 (1997)
False acacia	*Robinia pseudoacacia*	WCA(9)	1 (1999)
False Virginia-creeper	*Parthenocissus inserta*	WCA(9)	1 (2011)
Himalayan cotoneaster	*Cotoneaster simonsii*	WCA(9)	4 (2010)
Hollyberry cotoneaster	*Cotoneaster bullatus*	WCA(9)	1 (1994)
Indian balsam	*Impatiens glandulifera*	WCA(9)	1 (1999)
Japanese knotweed	*Fallopia japonica*	WCA(9)	8 (2011)
Japanese rose	*Rosa rugosa*	WCA(9)	2 (2011)
New Zealand pigmyweed	*Crassula helmsii*	WCA(9)	1 (1996)
Nuttall's waterweed	*Elodea nuttallii*	WCA(9)	1 (2009)
Red valerian	*Centranthus ruber*		13 (2011)
Small-leaved cotoneaster	*Cotoneaster integrifolius*	WCA(9)	1 (1999)
Wall cotoneaster	*Cotoneaster horizontalis*	WCA(9)	3 (2011)
Winter heliotrope	*Petasites fragrans*		1 (1999)
Invertebrates			
Lily beetle	*Lilioceris lilii*		2 (2004)

3.2 Phase 1 Habitat Survey

3.2.1 The Phase I Habitat Survey Maps (**Figures 1a-f**) illustrate the distribution and extent of habitats present within the survey area and shows the locations of Target Notes (TNs), which highlight features of ecological interest, or provide further information on the habitats or species present. Details of the Target Notes are listed in **Table 5**.

Habitats

3.2.2 The following habitats and features were identified in the survey area and are discussed in more detail below:

- Broadleaved semi-natural woodland – A1.1.1
- Broadleaved plantation woodland – A.1.1.2
- Dense scrub – A2.1
- Scattered scrub – A2.2
- Semi-improved neutral grassland – B2.2
- Marshy grassland – B5
- Poor semi-improved grassland – B6
- Tall ruderal – C3.1
- Swamp – F1
- Standing water – G1
- Intertidal mudflat – H1.1
- Saltmarsh – H2
- Inland cliff (basic) – I1.1.2
- Ephemeral/short perennial – J1.3
- Defunct species-poor hedgerow – J2.2.2
- Dry ditch – J2.6
- Bare ground – J4

Woodland and Trees

Semi-natural broadleaved woodland (A1.1.1)

3.2.3 Overall the amount of woodland in the proposed development area is very small. All is likely to have arisen as a result of natural succession from scrub caused by a lack of active management. The only appreciable area of woodland is located along the southern boundary of Black Duck marsh at **TN1**. This area is approximately 2 ha in size and has developed on a strip of land with steep and uneven topography. The canopy is dominated by sycamore *Acer pseudoplatanus* with a dense and more varied shrub layer consisting of dogwood *Cornus sanguinea*, privet *Ligustrum vulgare*, ash *Fraxinus excelsior* and hawthorn *Crataegus monogyna*. The ground flora is covered almost uniformly with ivy *Hedera helix* with occasional cleavers *Galium aparine* and limited other forbs.

3.2.4 An old badger hole was found in the woodland [redacted] but it appears to have been abandoned for a long time and there were no other signs of badgers being present. Some of the trees have bat roost potential with dense ivy and woodpecker holes.

3.2.5 There is a small area of woodland located in a former quarry pit at **TN43** that has recently succeeded from scrub and has a different character from the other woodland in the proposed development area**.** The canopy is dominated by even-aged stands of silver birch *Betula pendula* rather than the sycamore which characterises the other woodland areas.

Broadleaved Plantation woodland (A1.1.2)

3.2.6 Several small strips of land on the peninsula have been planted with broadleaved trees for amenity or shelter. They are all less than 30 years old and do not exceed 20m in width. Most of the woodland strips are composed of a limited number of species with frequent sycamore, field maple *Acer campestre* and Norway maple *Acer platanoides*. At the north end of the survey area there is a line of planted trees where many have died and are being replaced by a naturally colonised scrub understory. The dominant species include hawthorn, dogwood and gorse *Ulex europaeus*.

Scrub

Dense scrub (A2.1)

3.2.7 Dense scrub represents the final stage in the succession to broadleaved woodland and occurs in areas where scrub has invaded open ground and formed a closed canopy. It is found frequently across the whole survey area due to a lack of habitat management.

3.2.8 The main areas of dense scrub include:

- to the east of Swanscombe marshes where a large area of scrub has enclosed two drainage ditches;
- to the east of Botany marshes featuring in a large area of semi-improved grassland with scattered scrub;
- within the former quarry pit at **TN43** forming a gradient between the woodland and semi-improved grassland with scattered scrub;
- to the south of the former quarry at **TN42,** lining the top of the inland cliff that has been created;
- to the south of the Ebbsfleet International car parks enclosing a small area of swamp.

3.2.9 Hawthorn, dog rose *Rosa canina*, birch and willow *Salix spp.* are the most numerous species. Willow tends to occur in the damper areas such as dense scrub that surrounds areas of swamp.

3.2.10 This habitat provides a valuable nesting and foraging site for many species of warbler including nightingale *Luscinia megarhynchos*, cetti's warbler, whitethroat *Sylvia communis*, chiffchaff *Phylloscopus collybita* and blackcap *Sylvia atricapilla*.

Scattered scrub (A2.2)

3.2.11 Scattered scrub is ubiquitous throughout the proposed development area, often present in a close mosaic with grassland and ruderal vegetation and forming a successional stage between open ground and woodland. The most frequent components are hawthorn, dog rose and bramble *Rubus fruticosus*. Buddleia *Buddleia davidii* colonises bare areas of hard standing and willow is abundant on damper areas of the site such as on Black Duck marshes.

3.2.12 Scattered scrub in combination with grassland is a valuable habitat for breeding birds, reptiles and invertebrates. Common lizard *Zootoca vivipara* are likely to thrive in the proposed development area and several individuals were seen during the habitat survey in the areas of grassland with scattered scrub.

Grassland

3.2.13 Grassland is the most dominant habitat type in the survey area, the majority of which has developed naturally on bare ground as a result of lack of management. All of the grassland has been classed as semi-improved, as it neither shows signs of improvement (such as fertiliser application, re-seeding and drainage) nor has the high species diversity of unimproved grassland.

3.2.14 The underlying geology of the peninsula is Seaford and Newhaven chalk formation but this is overlain by alluvial clay deposits and none of the sward shows the plant assemblage characterising rich calcareous grassland. However there are some species present indicative of slightly chalky soils such as wild marjoram *Origanum vulgare*, hoary ragwort *Senecio erucifolius*, wild carrot *Daucus carota* and red clover *Trifolium pratense*.

Marshy Grassland (B5)

3.2.15 The area of land immediately south of the CTRL (**TN40**) exhibited some traits of marshy grassland. An area of standing water inter-mixed with both hard and soft rush *Juncus inflexus* and *Juncus effuses*, false fox sedge *Carex otrubae*, great willowherb *Epilobium hirsutum* and common fleabane *Pulicaria dysenterica*.

Poor semi-improved grassland (B6)

3.2.16 The majority of grassland in the survey area was classified as species-poor. The sward is tall, rank and dominated by a few competitive grasses indicative of a lack of grazing and mowing including cock's foot *Dactylis glomerata*, couch grass *Elytrigia repens*, red fescue *Festuca rubra* and false oat grass *Arrhenatherum elatius*. Most of the grassland also contains scattered scrub. Such areas have a low diversity of forbs, mainly restricted to those species able to compete with tall grasses such as tall melilot *Melilotus altissimus*, common vetch *Vicia sativa* and ribwort plantain *Plantago lanceolata*.

Semi-improved neutral grassland (B2.2)

3.2.17 On less fertile, free-draining land such as on banks or on grassland at an early stage of succession the dominance of tall competitive grasses is reduced, enabling a higher diversity of flowering plants. The resulting sward is moderately species-rich and has been classified as neutral semi-improved grassland. Across the survey area there are small patches of this grassland and much of it was too limited in extent to map accurately. The two main areas with a moderately species-rich sward occur on the flood banks of the River Thames at **TN13** and in a small strip to the north of the site at **TN18**.

3.2.18 The flood bank grassland (**TN13**) has a short (<20cm) sward comprising red fescue and a variety of forbs including bird's-foot trefoil *Lotus corniculatus*, red clover, common vetch, meadow vetchling *Lathyris pratensis*, yellow vetchling *Lathyrus aphaca*, rough hawkbit *Leontodon hispidus* and ox-eye daisy *Leucanthemum vulgare*. It appears to be managed by mowing.

3.2.19 The small area of grassland at **TN18** also features red fescue as the dominant grass with a wide range of forbs (some indicative of slightly calcareous soil) in common with the grassland on the flood banks. In addition wild marjoram, hoary ragwort, common knapweed *Centaurea nigra*, tufted vetch *Vicia cracca* and wild carrot are also present. The mosaic of short and tall swards and the scattered scrub could support a wide range of invertebrates.

3.2.20 Botany Marshes is an area consisting of several wet grassland fields which are grazed by cattle. These were not able to be accessed for survey and were target noted from the surrounding paths. Provisionally these fields have been classified as neutral semi-improved grassland but further survey work will be required to determine the species-richness and composition of the sward once access to the land has been granted.

Tall ruderal (C3.1)

3.2.21 Small areas of tall ruderal vegetation are present in the survey area, especially in areas with fertile and disturbed soils such as where spoil has been tipped or on the roadsides. The tall ruderal vegetation at **TN40** has developed on recently burnt ground, south of where the Channel Tunnel Rail Link emerges above ground. The dominant species include creeping thistle *Cirsium arvense*, broad-leaved dock *Rumex obtusifolius*, common nettle *Urtica dioica*, fennel *Foeniculum vulgare* and common ragwort *Senecio jacobaea*.

Swamp (F1)

3.2.22 Swamp is tall emergent vegetation which occurs in areas where the water table is at or just above ground level. In the survey area, this vegetation is dominated by uniform stands of common reed *Phragmites australis*. There are two very large reedbeds within the survey area: on Black Duck Marsh (**TN9)** and around the old sewage treatment works (**TN34**). Other small scattered areas of reedbed occur throughout, around the edges of water bodies and along ditch margins. With the exception of occasional patches of rush *Juncus spp.*, sedge *Carex spp.* and damp forbs such as common fleabane *Pulicaria dysenterica* and great willowherb *Epilobium hirsutum*, very few other plants are able to grow within the dense thatch created by the reeds. In some areas, the reedbed is gradually drying out and willow scrub invading.

3.2.23 Reedbeds are a BAP Priority Habitat and are especially important as nesting sites for reed bunting *Emberiza schoeniclus*, sedge warbler *Acrocephalus schoenobaenus* and cetti's warbler on the site.

Standing water (G1)

3.2.24 Areas of standing water have developed as a legacy of quarrying and the creation of large steep-sided depressions in the landscape. There are four main waterbodies located north of the A226 on the peninsula at **TN4**, **TN16**, **TN32** and **TN34**. Two large waterbodies occur in the bases of old quarries south of the A226 at **TN43** and **TN46**. The majority of the waterbodies are deep with steep-sided banks covered with scrub and with little marginal or emergent aquatic vegetation present. Fish were observed in some of the sites and this fact, combined with their physical characteristics, is likely to make them sub-optimal breeding habitat for the majority of amphibians.

3.2.25 There are numerous drainage ditches present in the survey area. These occur in a network across Black Duck Marshes, along the edges of the two landfills and on Botany Marshes. The average ditch profile has a width of 4-6m and a maximum depth of c.1m. The majority have emergent and marginal stands of common reed, to a lesser extent bulrush and with occasional

hard rush *Juncus inflexus*. There are several sections of dry ditch which have not been managed for some time and have become choked by common reed.

3.2.26 Most of the water bodies and ditches north of the A226 on the peninsula appeared to have been polluted by leachate from the landfill. The water is discoloured red/brown in places with an unpleasant smell. There are very few aquatic invertebrates to be observed which also raises suspicions over the water quality.

3.2.27 Evidence of water voles was discovered in Swanscombe marshes along the lengths of the drainage ditches. Signs included droppings, chopped vegetation (feeding remains) and old burrows. Little evidence was found which suggests at this early stage of survey that the population is small.

Intertidal mud (H1.1)

3.2.28 Narrow ribbons of mudflat occur along the margins of the River Thames (northern boundary of the proposed development area) which are exposed at high tide and represent an important feeding habitat for wading birds. On the upper sections of mudflat saltmarsh vegetation has colonised.

Saltmarsh (H2)

3.2.29 Narrow strips of saltmarsh have colonised the mudflats on the outer margins of the River Thames. These contain large stands of sea plantain *Plantago maritima*, sea arrow grass *Triglochin maritima*, saltmarsh grass *Puccinellia maritima* and, on the upper sections close to the bank, sea purslane *Halimione portulacoides* and sea couch grass *Agropyron junceiforme*. Between the outer and inner flood banks at **TN14** a brackish depression has formed and this area has been colonised by saltmarsh vegetation including sea plantain and sea arrow grass.

Inland cliff (I1.1.2)

3.2.30 Quarrying of the underlying bedrock on southern sections of the site has created depressions in the ground and exposed steep chalk embankments around their edges. The tops of these inland cliff faces represent the natural ground level.

Ephemeral/Short Perennial (J1.3)

3.2.31 This is a diffuse category composed of plant communities occurring on early successional swards with free-draining ground and areas of bare earth. The sward is short (<10cm) and

ephemeral in nature, quickly becoming established with grassland and scattered scrub. The main areas of ephemeral/short perennial vegetation occur at **TN6, TN11** and an area of former quarrying at **TN42**. Species occurring in such areas are typical of brownfield sites and include coltsfoot *Tussilago farfara*, ragwort, sheep's fescue *Festuca ovina*, bird's foot trefoil and rough hawkbit.

Defunct species-poor hedge (J2.2.2)

3.2.32 Only one hedgerow was recorded during the survey along the track leading from Lower Road to Botany Marshes (**TN31**). It is tall (c.4-5m), unmanaged with hawthorn, hazel *Corylus avellana* and elder *Sambucus nigra*. The ground flora is dominated by ivy and nettles.

Protected Species

Badger

3.2.33 No evidence was found during the survey that suggested badgers were currently present. A mammal burrow was found in the woodland at [redacted] that may have been the entrance to an old badger sett. There were no paths leading to and from this hole and no evidence of tracks or other field signs. The whole area is overgrown with ivy and if there are any other entrances these are obscured and not in use.

Water vole

3.2.34 The survey area features a range of wetland habitats such as reedbeds, grazing marsh and drainage ditches that have the potential to support water voles. Evidence of this species was discovered along the ditches of Swanscombe marshes (**TN49**) however it did not appear to be present in large numbers.

Bats

3.2.35 Areas of woodland, wetland and grassland within the survey area are potential foraging habitats for bats. It might also be expected that linear features such as the drainage ditches and secondary woodland strips are used for dispersal between roosts and foraging grounds. The area of mature woodland at **TN1**, known as 'Lord's Wood' featured potential roosting opportunities in the form of trees with woodpeckers holes and densely covered with ivy.

Dormice

3.2.36 No evidence of dormice was found during the survey however this species is nocturnal, secretive and can be hard to detect. Dormice prefer ancient woodland habitats with hazel coppice or mature hedgerows linked to suitable woodland, neither of which were found within the survey area. The isolated areas of scrub and secondary woodland are deemed sub-optimal habitats and overall it is unlikely that dormice are present.

Great Crested Newts

3.2.37 There are a limited number of water bodies within the survey area with the potential to support great crested newts. In the main body of the proposed development area (Swanscombe Peninsula) most of the drainage ditches are too heavily choked with vegetation and are deemed unsuitable as they provide little or no open water for the newts to display. The water bodies at **TN16** and **23** provide large areas of open water but feature little or no aquatic vegetation and the biological quality is questionable. There were other water bodies that couldn't be accessed and will require further investigation but in the first instance most of them appeared unsuitable due to the presence of fish (**TN43**), waterfowl (**TN34**) or other factors.

Reptiles

3.2.38 There are extensive areas of habitat in the survey area deemed suitable for reptiles. The mosaic of long grass and scattered scrub covering the landfills is likely to be a key habitat, especially around the margins where it is interspersed with short grass or grades into areas that were recently cleared and now feature ruderal or ephemeral/short perennial vegetation. An example of this is the landfill central to the Swanscombe Peninsula (**TN12**) that features short grass to the north and recently cleared areas further north and to the south (**TN11**, **37**). There are a number of tracks and public footpaths running through the peninsula with short grass on their margins that provided opportunities to spot common lizard basking so this species alone is confirmed as present. It is highly possible that grass snakes and slow-worms will also be found in the proposed development area.

Breeding Birds

3.2.39 Areas of woodland, scrub and reedbed in the survey area are prime habitats providing nesting and foraging sites for birds. The mudflats, saltmarsh and grazing marsh are likely to be important for wintering and migrating wildfowl and waders, particularly as foraging areas but potentially nesting sites too.

Other Species

Invertebrates

3.2.40 Brownfield sites in the Thames Gateway are renowned for their important invertebrate assemblages and support populations of several UK BAP species, so the proposed development area should also be noted for its potential in this area. In particular the recently cleared areas at **TN11** and **TN37** feature patches of bare sandy soil that are suitable for burrowing wasps and bees and the flood banks of the River Thames (**TN13**) are quite forb rich, providing foraging opportunities for a range of adult insects. Lord's Wood was limited in the amount of dead wood it provided so the potential for saproxylic species is small but the saltmarsh and grazing marsh on the peninsula may support its own specialist invertebrate assemblage. The water bodies in the survey area have the potential to support various aquatic invertebrates but due to the poor water quality are unlikely to be rich in sensitive species such as caddisflies, dragonflies and damselflies.

Table 5 Phase 1 Habitat Survey Target Notes (see **Figure 1** for location of Target Notes).

Target Note (TN)	Habitat/feature	Comments
1	Broad-leaved semi-natural woodland	Secondary woodland strip running in east-west direction to the south of Black Duck Marsh. The area has a steep, uneven topography and is c.500m in length with an average width of 100m. Canopy dominated by sycamore with a dense and more varied shrub layer with dogwood, privet, ash and hawthorn. The ground flora is covered with ivy. An old badger hole was found in the wood and some of the trees have bat roost potential with dense ivy and woodpecker holes.
2	Poor semi-improved grassland with scattered scrub	Open area between the woodland at TN1 and the A226. Large areas of bare earth and rubbly ground but a developing grassland sward with abundant sheep's fescue, bird's foot-trefoil, ribwort plantain and melilot. There is scattered willow, hawthorn and buddleia scrub throughout.
3	Tall ruderals	Recently cleared ground to the southwest of the abandoned warehouse buildings with a tall ruderal sward consisting of creeping thistle, common nettle and colt's foot.
4	Standing water	A lake with standing water has developed in the excavation quarry immediately north of the A226. It is surrounded by very steep sides and was inaccessible to survey. There was little apparent aquatic vegetation except occasional clumps of hard rush. The banks are covered by woodland to the south and willow scrub to the north.

Target Note (TN)	Habitat/feature	Comments
5	Semi-improved neutral grassland with scattered scrub	Grassland with scattered hawthorn scrub between the A226 and the old warehouse buildings. The sward is tall with coarse grasses dominated by couch grass and frequent cock's foot. Forbs include common vetch, creeping cinquefoil and ribwort plantain.
6 (see TN 37)	Ephemeral/short perennial with scattered scrub	Patchy short vegetation colonising area of hard standing Buddleia and birch scrub are scattered throughout the area.
7	Dense scrub/semi-improved neutral grassland	Area of mature willow, birch and hawthorn scrub with closed canopy and small open areas with couch grass, false oat grass, spotted meddick, creeping cinquefoil, ribwort plantain and bird's foot-trefoil.
8	Semi-improved neutral grassland with scattered scrub	Former compound area surrounded by coal spoil banks. The ground is flat and the soil clayey. There is abundant willow scrub and the ground flora consists of similar species to TN5 but with additional plants associated with recently disturbed, well-drained waste ground such as teasel, bristly ox-tongue and mouse-ear hawkweed.
9	Swamp with standing water (ditches) and scattered scrub	An extensive reedbed has developed on an area of former quarrying known as Black Duck Marshes or Swanscombe Marshes. The area extends from the woodland at TN1 to the banks of the River Thames. It is bisected by several ditches and there are small areas of standing water. However, the majority of the wetland appears to have dried out and consists almost exclusively of common reed.
10	Standing water (ditch)	A typical ditch on Black Duck Marsh. The channel is c.6m wide with a variable depth of water to c.1m. Common reed dominates the bank and channel vegetation. There is little other vegetation besides *Phragmites* with only occasional patches of bulrush.
11	Ephemeral/short perennial	Large expanse of recently-colonised bare ground with low sward of brownfield and ruderal species including ragwort, colt's foot and patches of grassland with extensive bird's foot-trefoil. Shelducks use the area for loafing.
12	Poor semi-improved grassland with scattered scrub	Gently sloping area, a former landfill with Channel Tunnel rail link passing underground. The majority of the sward consists of tall rank grasses and is species-poor. There are extensive patches of bramble and hawthorn scrub which support breeding warblers.
13	Semi-improved neutral grassland	The flood banks above the River Thames have a short (<20cm) mown grassland sward with a higher diversity of forbs than the majority of the grassland on site. There is abundant red fescue with bird's foot trefoil, red clover, common vetch, meadow vetchling, yellow vetchling and ox-eye daisy.

Target Note (TN)	Habitat/feature	Comments
14	Scattered saltmarsh plants	Brackish depression formed by borrow pit excavation between the outer and inner river banks. The area has developed saltmarsh type vegetation including sea plantain and sea arrow grass.
15	Saltmarsh	Narrow strips of saltmarsh have colonised the mudflats on the outer margins of the River Thames. These contain large areas of sea plantain, sea arrow grass, saltmarsh grass and, on the upper sections, sea purslane and sea couch.
16	Standing water	Medium-sized waterbody in between two former landfill sites. There was no aquatic vegetation visible and the water appeared to be polluted with landfill leachate. There are narrow strips of marginal common reed and a planted belt of broadleaved woodland on the western banks.
17	Standing water (ditch)	A ditch draining the landfill appears to have been recently dredged. Common reed and bulrush within the channel.
18	Semi-improved neutral grassland	Small area of comparatively species-rich grassland lies to the north of the landfill bordering the planted woodland strip at TN19. Red fescue is the dominant grass with a wide range of forbs (some indicative of slightly calcareous soil) including wild marjoram, hoary ragwort, red clover, ox-eye daisy, common knapweed, tufted vetch, meadow vetchling, yellow vetchling and wild carrot. The mosaic of short and tall swards and the scattered scrub could support a wide range of invertebrates.
19	Broad-leaved scattered trees/dense scrub	Narrow planted shelterbelt consisting predominantly of sycamore with understory of dense hawthorn, dogwood and gorse scrub. Many of the planted trees have died and are standing dead wood.
20	Poor semi-improved grassland	The grassland on the north-east corner of Broadness Marsh has an open and flat topography with a uniform and species-poor sward dominated by common couch and plants indicative of a fertile soil including common nettle, creeping thistle and cleavers. Several pairs of skylarks were heard singing.
21	Bare ground	An area of active workings (off-site and not able to be accessed) with extensive earth mounds and spoil tips. There is little vegetation excepting recently colonised ruderal species.
22	Poor semi-improved grassland with scattered scrub	The area of the former CKD landfill is covered by a species-poor grassland sward with scattered scrub with a similar plant assemblage to other areas of tall grassland on site.
23	Standing water	Recently created lagoon with steep bare soil banks. The water quality appears to be poor (and possibly contaminated with landfill leachate) and there was little aquatic vegetation or observable invertebrates.

Target Note (TN)	Habitat/feature	Comments
24	Poor semi-improved grassland with standing water	The area known as Botany Marshes consists of several fenced and cattle-grazed pasture fields. The area could not be accessed for survey and was observed from adjacent paths. The sward is short (<20cm), disturbed by poaching and enriched with frequent thistles and nettles. There are several narrow reed-fringed ditches dividing the field and small areas of standing water. Displaying lapwing were observed and it is likely that they use the field for breeding.
25	Poor semi-improved grassland	Strips of mown and well-trodden grassland along the path consisting of a short sward with plants tolerant of trampling and close mowing such as daisy, dandelion, plantain and yarrow.
26	Standing water (ditch)	Drainage ditch with some areas of open water (to 50cm depth), long stretches of which are densely vegetated with common reed.
27	Planted grass banks	The steep banks on the western boundary of the industrial units north of Botany Marshes have been planted with lyme grass to stabilise the soil.
28	Scraped soil	Area of recent scraping bordering the ditch along the northern boundary of Botany Marshes where stands of young common reed are colonising. Many planted trees in the land to the south have recently died (possibly due to the brackish conditions or pollution).
29	Dense scrub	An area of mature dense scrub thicket between Manor Way and Botany Marshes. Singing nightingales were heard.
30	Poor semi-improved grassland with scattered scrub	The majority of the land (possibly scrubbed-over former grazing fields) between Manor Way and Botany Marshes comprises naturally-colonised mature hawthorn scrub with small areas of semi-improved grassland. The area was not accessible for survey but numerous singing warblers were heard including nightingale, whitethroat, chiffchaff and blackcap.
31	Species-poor defunct hedge	Mature hedgerow along the northern edge of the track running from Lower Road to Botany Marshes. It is tall (c.4-5m), unmanaged with hawthorn, hazel and elder. The ground flora is dominated by ivy and nettles.
32	Standing water	Medium-sized waterbody to the north of the A226 surrounded by industrial development and ruderal vegetation.
33	Swamp	Area of shallow water which is rapidly vegetating over with common reed and bulrush. It grades into marshy grassland on the north-western side with creeping bent, great willowherb and hard rush.
34	Standing water and swamp	Large area of recently created water to the south of the old sewage treatment works. The whole area is surrounded by a very large swamp dominated by common reed. Several species of waterfowl were noted on the water.

Target Note (TN)	Habitat/feature	Comments
35	Poor semi-improved grassland	Early successional short (5-10cm) grassland on recently disturbed area on southern edge of landfill with extensive colt's foot, red fescue and bird's foot trefoil.
36	Badger hole	Single entrance hole made by badger on [redacted] The hole appeared to be disused with no signs of recent occupation and no other setts in the surrounding area.
37 (see TN6)	Ephemeral/short perennial/poor semi-improved grassland with scattered scrub	Patchy short vegetation communities colonising area of hard standing on land bordering Manor Way. A close matrix of bare ground and ephemeral/short perennials with areas of developing grassland sward at a later stage of succession. Scattered birch, buddleia and willow scrub throughout.
38	Standing water (ditch)	Ditch on western side of track running between Manor Way and old sewage works. It is broad (c. 6m bank-width) with standing water in channel to at least 50cm, emergent bulrush and banks with tall grass and ruderal vegetation.
39	Standing water (ditch)	Ditch on eastern side of track running between Manor Way and old sewage works with standing water and dense stands of *Phragmites* and occasional great willowherb.
40	Marshy grassland with scattered scrub/standing water/swamp/tall ruderals	Area of recently disturbed (and burnt) ground with a wide range of different habitats. Areas of shallow open water fringed by reed and bulrush swamp grading into marshy grassland (consisting of hard rush, soft rush, false fox sedge, great willowherb and common fleabane).
41	Semi-improved neutral grassland with scattered scrub	Bank of semi-improved grassland with bulbous buttercup, wild marjoram, yarrow, ox-eye daisy, cowslips and bird's-foot trefoil. Scattered hawthorn and buddleia scrub.
42	Ephemeral/short perennial	Area of former quarrying to the south of the A226 bordering the railway. Short patchy vegetation sward has developed and there are still extensive remaining areas of bare ground. Not accessible for survey.

Target Note (TN)	Habitat/feature	Comments
43	Tall ruderals and semi-improved neutral grassland with scattered scrub/dense scrub/broadleaved woodland/standing water	Very extensive area to the east of Swanscombe High Street extending to the HS1 Railway line. Possibly a former quarry pit with steep uneven topography and a lake at the base. The area is a complex mosaic of land at various stages of succession: short rabbit-grazed and taller grassland swards, scattered scrub and small areas of developing birch woodland. The taller grassland has low plant diversity and contains abundant false oat grass with very extensive creeping cinquefoil. The shorter turf on the quarry slopes has a higher diversity of flowering plants including common knapweed, ox-eye daisy and perforate st-john's-wort. The area to the north of the lake, possibly a former landfill site, is dominated by ruderal species such as hoary mustard, teasel and common ragwort.
44	Poor semi-improved grassland	Area to the south of TN3 and possibly a former landfill site with a domed profile and sloping topography. The area has a tall rank grassland sward consisting of competitive grasses such as false oat grass, cock's foot, couch grass and barren brome. Forbs present include large quantities of melilot, common vetch, ribwort plantain, white clover and bristly ox-tongue.
45	Swamp	Dry reedbed bordering the railway surrounded by willow scrub.
46	Standing water	Large water body known as' blue lake' in area of former quarrying located between the A226 and Northfleet. The site is surrounded by steep chalk escarpments and was not accessible for survey.
47	Quarry pit	Large area of former quarrying to the north of TN46 occupied by patchy ephemeral/short perennial vegetation with spoil heaps and areas of bare earth. Not accessible for survey.
48	Tall ruderals with scattered scrub	Abandoned area of land between Hive Lane and Factory Road is occupied by mature scattered scrub and tall ruderals. Not accessible for survey.
49	Evidence of water voles	Some old burrows, droppings and chopped vegetation indicate the presence of water voles along the lengths of the drainage ditches in Swanscombe marshes.
50	Steep sided valley	A valley with steep sided banks dominated by buddleia, occasional willow and sycamore. Ground covered with creeping ivy and brambles. There is a pond at the bottom of the valley that is inaccessible but appears to have little/no marginal or emergent vegetation. There is much litter strewn down the valley sides and in the pond.

4.0 EVALUATION

4.1 Constraints to the survey

4.1.1 The main constraint to carrying out the Phase 1 Habitat Survey was unsafe/restricted access to certain parts of the proposed development area. Binoculars were used to help identify the broad habitat types or dominant species present where possible. The following areas had limited/no access:

- The lake at **TN4** has very limited access. It was surveyed only along its southern and western perimeter;
- The lagoon at **TN23** is currently operational with no permitted public access. The lagoon was surveyed through a mesh fence that runs around its entire perimeter;
- No access was available to Botany Marshes (**TN24, 28, 29, 30**). The area was surveyed from various locations and vantage points around its perimeter;
- No access was available to the pond at **TN32.** It was surveyed through the mesh fence on the northern boundary;
- The area of swamp and open water at **TN34** was surveyed from the adjacent paths running along the eastern and western boundaries;
- No safe access to the chalk pit at **TN42** was found. The area was surveyed from its north-western boundary;
- No safe access to the lake at **TN46** was found. The area was surveyed from a raised path located on the north-western boundary;
- No safe access to the chalk pit at **TN47** was found. The area was surveyed from its western boundary; and,
- The pond at **TN50** is in a very steep sided depression, with no safe access to its margins. It was surveyed from the top of the wooded valley.

4.1.2 Due to these restrictions it was not possible to provide detailed information on the species present in these areas; however an assessment could be made on the species likely to be present and the broad scope of the Phase 1 habitat survey was still able to be carried out.

4.2 Designated Sites

4.2.1 Statutorily designated sites in the vicinity of the proposed development area include the Baker's Hole SSSI and the Swanscombe Skull Site SSSI, both of which are designated for their geological value. The non-statutorily designated Ebbsfleet Marshes LWS has been fragmented since its original designation in 1985, by the construction of the Channel Tunnel Rail Link and Ebbsfleet International Rail Station. As a result, further detailed surveys may be required to determine its current ecological value.

4.2.2 The Swanscombe Peninsula may play a role in supporting overwintering and migrant waders and waterflowl associated with West Thurrock Lagoon and Marshes SSSI (located ~1.2km north-west of Swanscombe peninsula, on the northern bank of the River Thames). Detailed winter bird surveys will help to determine whether there is a relationship between the two sites.

4.3 Habitats and Species

Woodland and Scrub

4.3.1 Overall the woodland in the survey area is considered to have low intrinsic value, being mainly comprised of non-native (sycamore), common and widespread species (silver birch, ash). However it is recognised for its potential to provide foraging and roosting habitat for bats and breeding birds.

4.3.2 The scrub within the survey area consists of non-native (buddleia), common and widespread species such as hawthorn, bramble and willow, therefore its intrinsic value is considered to be low. However where present as a mosaic habitat with grassland and ruderal vegetation, scrub represents an important habitat for breeding birds, reptiles and invertebrates.

Grassland

4.3.3 The majority of grassland within the survey area was classified as neutral species-poor, having low diversity and ecological value. Coarse grasses such as false oat grass and couch grass dominated much of the landscape. This habitat may be of limited value to invertebrates, birds, bats and reptiles.

4.3.4 The areas of grassland with a slight calcareous influence, shorter sward and richer species assemblage have a higher intrinsic value and the potential to support rare or protected plant species.

Swamp

4.3.5 Reedbeds are a BAP priority habitat and highly valuable for supporting populations of water voles and breeding birds. Overall this habitat has high intrinsic value.

Standing Water

4.3.6 In the past the drainage ditches and open water bodies on site north of the A226 would likely have been prime habitat for water voles, breeding amphibians and aquatic invertebrates. In recent years, however, due to apparent changes in hydrological conditions, limited management and possible discharges of leachate, these habitats have deteriorated in condition and are now of limited ecological value for aquatic invertebrates and amphibians. However they do still have the potential to support populations of water vole and breeding birds.

4.3.7 The two large water bodies south of the A226 are stocked with fish and therefore of limited value in terms of providing habitat for protected species such as the great crested newt.

Mudflat and Saltmarsh

4.3.8 The areas of mudflat and saltmarsh on site have high intrinsic value, being UK BAP priority habitats. They may also be important habitats for supporting wintering and migrant birds, including those moving between recognised sites such as the West Thurrock Lagoon and Marshes SSSI. Additionally, mudflats and saltmarshes are known to play an important role in managing flood risk and coastal erosion control.

Open Mosaic Habitats on Previously Developed Land

4.3.9 Some of the ephemeral/short perennial habitat on site can be classified as the new UK BAP priority habitat 'open mosaic habitat on previously developed land'. Botanically these areas were not very interesting, being comprised of common and widespread species typical of brownfield sites such as ragwort and colt's foot. However it is recognised as a potentially rich habitat for invertebrates, particularly the burrowing wasps and bees, and an important resource for bird species such as the skylark (red list; UK BAP).

4.4 Recommendations for Further Work

4.4.1 It is recommended that further survey work is carried out in the proposed development area to assess the status of species and habitats of interest highlighted in this report.

4.4.2 A botanical survey should be carried out and specifically directed towards the saltmarshes and more species-rich grasslands where rare species could have been overlooked during the initial Phase 1 habitat survey. Saltmarshes are a declining habitat colonised by specialist and rare plant species so it is important in the case of such habitats to have a botanical expert examine the area. Botanical surveys can be carried out all year round but are optimal between April and October depending on the habitat in question.

4.4.3 It is also recommended that surveys are used to establish whether bats are using the woodland strips and water bodies on site for foraging or roosting. Summer roost emergence and activity surveys should be conducted between April and October (with an optimal period of May-September). Hibernation roosts can be inspected during the winter.

4.4.4 A suite of bird surveys is also recommended; a breeding bird survey to be undertaken between March and July and a wintering bird survey to be conducted between September and March.

The proposed development area may provide a staging post for migrant species, as well as providing suitable foraging and roosting grounds for breeding and/or wintering species.

4.4.5 A survey for great crested newts should be undertaken due to the presence of several water bodies with potential to support this species (as well as other amphibians) on site. Surveys for adult newts should be undertaken between March and June and will result in incidental records for any other amphibians present in the ditches, ponds and lakes.

4.4.6 The presence of water voles and common lizards has already been confirmed in the survey area and this should be followed up with a dedicated surveys targeted towards each of these species. Water vole surveys are best carried out between March and October (optimally during March to May, before increased vegetation growth obscures the ditch banksides) and optimal survey periods for reptiles are April to May and/or September.

4.4.7 Despite the lack of desk-top study records within a 2km radius of the site and the apparent isolation of sub-optimal habitats present on site, a dormouse survey is recommended in line with the guidance outlined in Natural England's Interim Advice Note. The advice note states '*Dormouse surveys to inform mitigation licence applications should not be limited to perceived 'optimal' habitat. Where projects that will significantly affect woody habitat occur within known dormouse range, surveys should be completed, even if the habitat appears fragmented*[4]'. Nest tube surveys should be undertaken in scrub and woodland habitats between April and November, and nut searches are best undertaken between September and December.

4.4.8 No evidence was found during the survey to suggest badgers were currently present, however they do appear to have been present on site in the past and suitable supporting habitat is still present. It is therefore recommended that the areas of woodland, scrub and hedgerows on site are surveyed thoroughly for evidence of badgers. This can be undertaken all year round, but optimally between February and April or September and November.

4.4.9 Lastly a terrestrial and aquatic invertebrate survey is recommended due to the location of the proposed development area in the Thames Gateway and the variety of habitats available that have the potential to support a diverse and rare invertebrate assemblage. Terrestrial invertebrate surveys should be conducted between March and October (bearing in mind many species are only on the wing for a few short weeks during this time) and aquatic invertebrate surveys can be carried out all year round with an optimal periods of either April to May and/or September to October.

[4] Natural England *Interim Natural England Advice Note – Dormouse Surveys for Mitigation Licensing – Best Practice and Common Misconceptions*. WML – G37 (12/11)

5.0 CONCLUSIONS

5.1.1 Three statutorily designated sites were identified: Baker's Hole Site of Special Scientific Interest (SSSI) and the Swanscombe Skull Site National Nature Reserve (NNR) and SSSI, both of which are designated for their geological interest. North of the River Thames, the West Thurrock Lagoon and Marshes SSSI is designated for its important assemblages of overwintering waders and wildfowl. The non-statutorily designated Alkerden Pit and Swanscombe Heritage Park Local Wildlife Site (LWS) and Ebbsfleet Marshes LWS are also present within 2km of the proposed development area.

5.1.2 A number of protected species and species of nature conservation importance have been recorded within the boundaries of the proposed development area including water vole, great crested newt, common pipistrelle, daubenton's and noctule bats. Species recorded within a 2km radius of the proposed development area include badger, soprano pipistrelle, brown-long eared and serotine bats.

5.1.3 The Phase 1 habitat survey revealed a range of different habitats within the proposed development area including woodland, scrub, grassland, swamp, open water, mudflat, saltmarsh, inland cliff and hedgerow. The dominant vegetation type was species-poor grassland with scattered scrub. This range of habitats has the potential to support notable plant species, notable invertebrate species, bats, birds, great crested newts, water voles and reptiles and it is recommended that further survey work is carried in respect of these groups.

5.1.4 Overall the most valuable habitats in the survey area from a nature conservation perspective are considered to be the more species-rich grasslands, reedbeds, mudflats, saltmarsh and open mosaic habitats on previously developed land. However, other habitats and features such as the woodland, scrub and standing water will also have value, including for example their potential to support protected species such as water voles.

5.1.5 Although it would otherwise be of relatively low value, some of the less species-rich grassland also has the potential to support a range of notable species. For example, areas of coarse grassland, especially where present with ruderal and scrub, are likely to be of value to reptiles.

FIGURES

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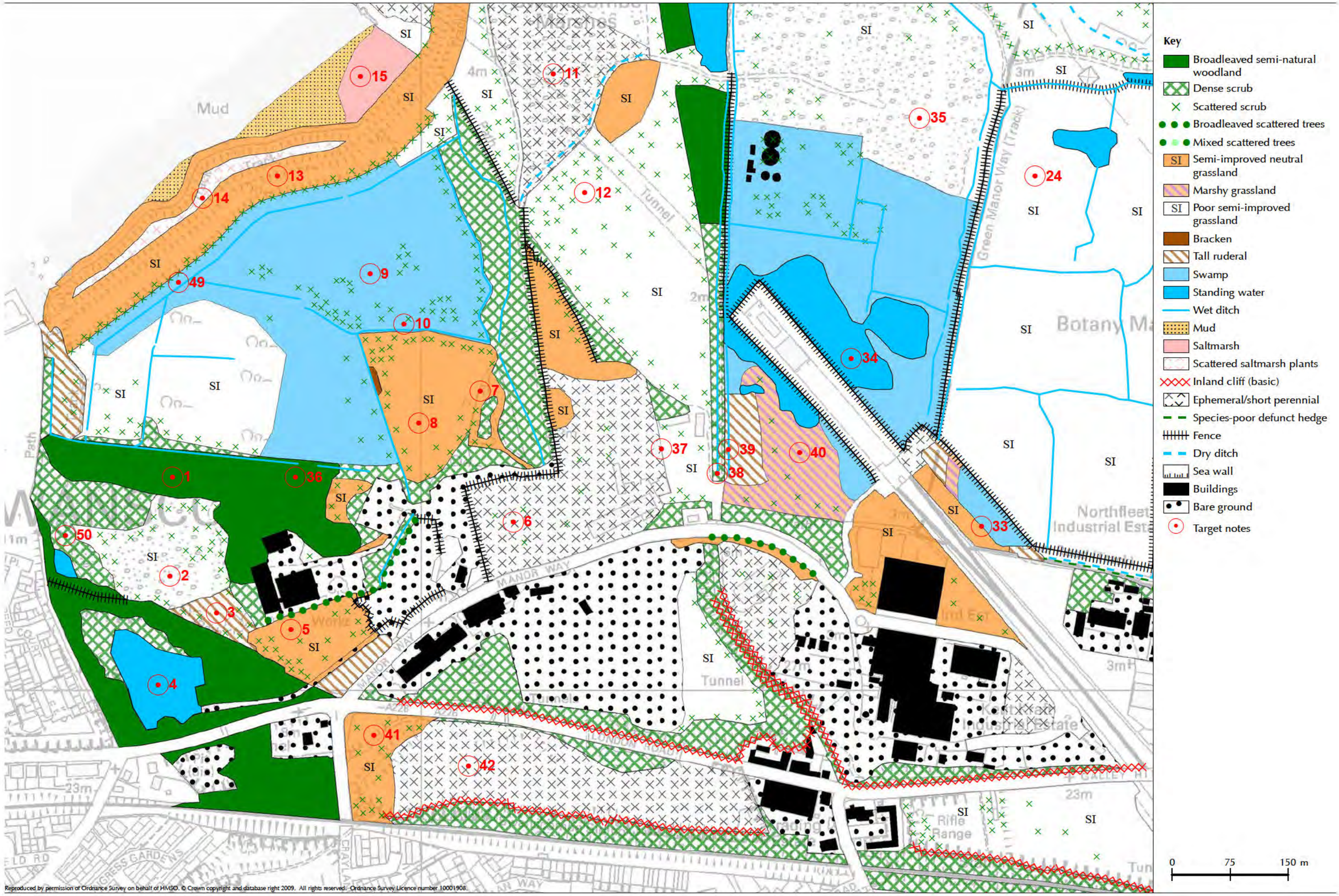
MAY 2012

LONDON PARAMOUNT
Phase 1 Habitat Survey

FIGURE 1a
Phase 1 Habitat Map



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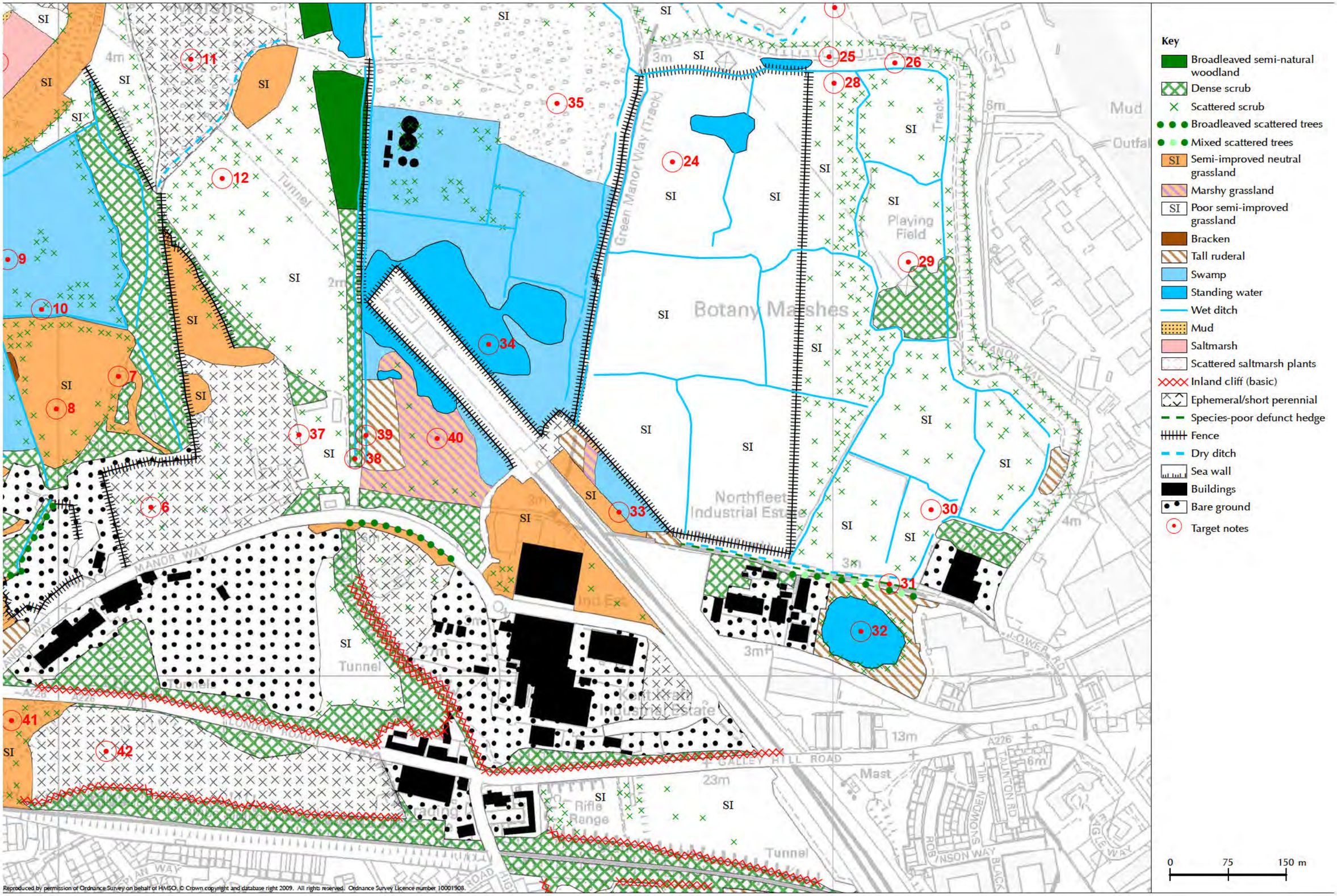
MAY 2012

LONDON PARAMOUNT
Phase 1 Habitat Survey

N

FIGURE 1b
Phase 1 Habitat Map



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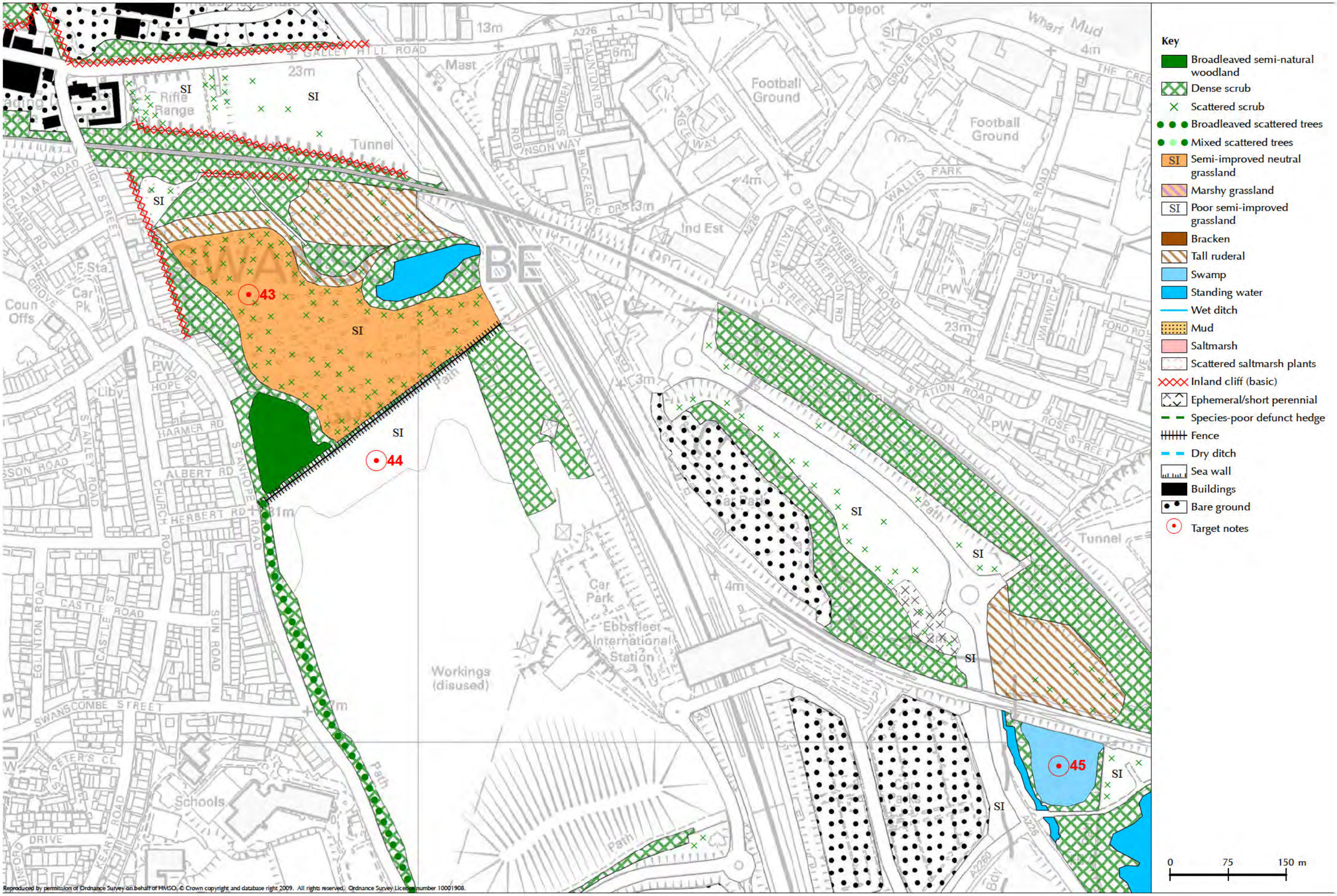
LONDON PARAMOUNT
Phase 1 Habitat Survey

FIGURE 1c
Phase 1 Habitat Map



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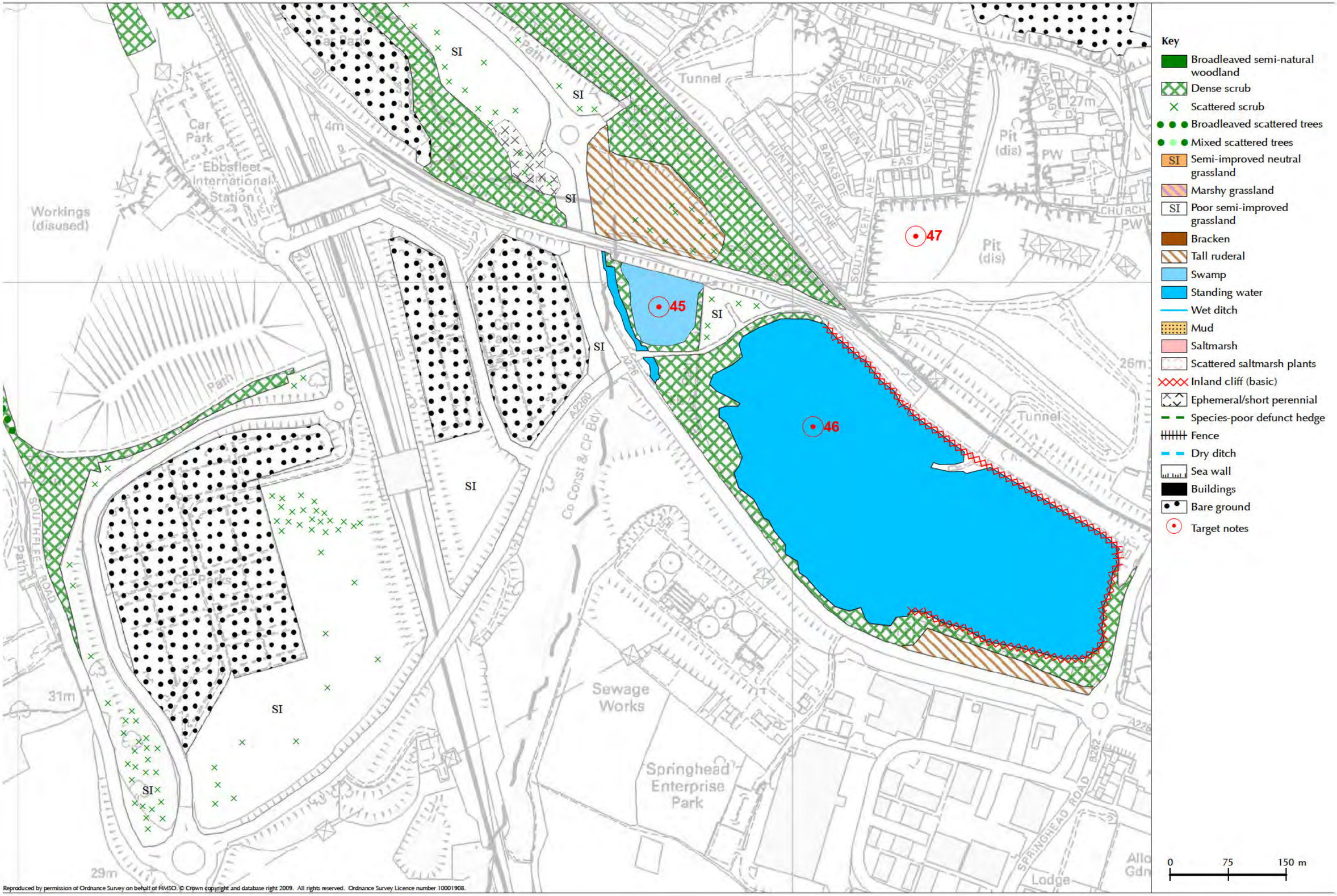
LONDON PARAMOUNT
Phase 1 Habitat Survey

FIGURE 1d
Phase 1 Habitat Map



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LONDON PARAMOUNT
Phase 1 Habitat Survey

N

FIGURE 1e
Phase 1 Habitat Map

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LONDON PARAMOUNT
Phase 1 Habitat Survey

N

FIGURE 1f
Phase 1 Habitat Map

APPENDICES

APPENDIX A
Site Photographs

Figure A1 Lake at **TN4** with surrounding willow scrub and steep-sided woodland covered banks

Figure A2 Typical species-poor grassland with scattered scrub found at **TN5** and ubiquitously on site

Figure A3 An area of ephemeral/short perennial vegetation and scattered scrub at **TN6** & **TN37** that has developed on hard standing

Figure A4 The reedbed at Swanscombe marshes with broadleaved woodland in the distance and a ditch in the foreground

Figure A5 A typical ditch on Swanscombe marshes – 5m wide channel dominated by common reed on the banks and occasional bulrush

Figure A6 A large area of ephemeral/short perennial vegetation at **TN11** with typical brownfield and ruderal species and areas of bare ground

Figure A7 Saltmarsh vegetation (mainly sea plantain) developing in a brackish depression between the outer and inner flood banks at **TN14**

Figure A8 Mudflats with saltmarsh on the upper levels - found in short sections round the coast of the peninsula

Figure A9 The lake at **TN16** fringed with common reed. The water is discoloured red/brown in places

Figure A10 The planted woodland belt at **TN19** with a dense understory of scrub

Figure A11 An area of active workings at **TN21** with extensive areas of bare ground

Figure A12 The lagoon at **TN23** with steep-sided bare soil banks. The water is discoloured red/brown- possibly due to leachate contamination

Figure A13 A reed fringed ditch north of Botany Marshes. The water is discoloured red/brown- possibly due to leachate contamination

Figure A14 A large area of mature dense scrub between Manor Way and Botany Marshes at **TN29**

Figure A15 Large areas of open water and swamp dominated by common reed at **TN34**

Figure A16 Species-poor grassland on the landfill at **TN35** with a short, early successional sward

Figure A17 Area of marshy grassland at **TN40** with the HS1 railway in the background

Figure A18 A poached field drain in the cattle-grazed fields of Botany Marshes

Figure A19 A ditch north of Botany marshes- many water bodies on site exhibit this water coloration

APPENDIX B

Total Species List Recorded during Site Visits

Common name	Scientific name
Alexanders	*Smyrnium olusatrum*
Annual meadow grass	*Poa annua*
Ash	*Fraxinus excelsior*
Barren brome	*Bromus sterilis*
Bithynian vetch	*Vicia bithynica*
Black meddick	*Medicago lupulina*
Blackthorn	*Prunus spinosa*
Bracken	*Pteridium aquilinum*
Bramble	*Rubus fruticosus agg.*
Branched bur-reed	*Sparganium erectum*
Bristly ox-tongue	*Picris echioides*
Broad-leaved dock	*Rumex obtusifolius*
Buck's-horn plantain	*Plantago coronopus*
Buddleia	*Buddleia davidii*
Bulbous buttercup	*Ranunculus bulbosus*
Charlock	*Sinapis arvensis*
Cherry	*Prunus sp.*
Cleavers	*Galium aparine*
Cock's-foot	*Dactylis glomerata*
Colt's-foot	*Tussilago farfara*
Common bird's-foot trefoil	*Lotus corniculatus*
Common broom	*Cytisus scoparius*
Common centaury	*Centaurium erythraea*
Common chickweed	*Stellaria media*
Common field speedwell	*Veronica persica*
Common figwort	*Scrophularia nodosa*
Common fleabane	*Pulicaria dysenterica*
Common gorse	*Ulex europaeus*
Common knapweed	*Centaurea nigra*
Common mallow	*Malva sylvestris*
Common nettle	*Urtica dioica*
Common orache	*Atriplex patula*
Common ragwort	*Senecio jacobaea*
Common reed	*Phragmites australis*
Common saltmarsh-grass	*Puccinellia maritima*
Common vetch	*Vicia sativa*
Cotoneaster	*Cotoneaster sp.*
Couch grass	*Elytrigia repens*
Cow parsley	*Anthriscus sylvestris*
Cowslip	*Primula veris*
Crab apple	*Malus sylvestris*
Creeping bent	*Agrostis stolonifera*

Common name	Scientific name
Creeping buttercup	*Ranunculus repens*
Creeping cinquefoil	*Potentilla reptans*
Creeping thistle	*Cirsium arvense*
Curled dock	*Rumex crispus*
Cut-leaved crane's-bill	*Geranium dissectum*
Daisy	*Bellis perennis*
Dandelion	*Taraxacum officinale*
Dog rose	*Rosa canina*
Dogwood	*Cornus sanguinea*
Dove's foot crane's-bill	*Geranium molle*
Elder	*Sambucus nigra*
Elm	*Ulmus sp.*
English scurvy grass	*Cochlearia anglica*
English yew	*Taxus baccata*
Evergreen oak	*Quercus ilex*
False fox sedge	*Carex otrubae*
False oat grass	*Arrhenatherum elatius*
Fennel	*Foeniculum vulgare*
Fennel leaved pondweed	*Potamogeton pectinatus*
Field bindweed	*Convolvulus arvensis*
Field forget-me-not	*Myosotis arvensis*
Field maple	*Acer campestre*
Fool's water-cress	*Apium nodiflorum*
Germander speedwell	*Veronica chamaedrys*
Giant hogweed	*Heracleum mantegazzianum*
Gipsywort	*Lycopus europaeus*
Goat willow	*Salix caprea*
Grass vetchling	*Lathyrus nissolia*
Great mullein	*Verbascum thapsus*
Great willowherb	*Epilobium hirsutum*
Greater bird's-foot trefoil	*Lotus pedunculatus*
Greater knapweed	*Centaurea scabiosa*
Greater plantain	*Plantago major*
Grey poplar	*Populus × canescens*
Grey willow	*Salix cinerea*
Groundsel	*Senecio vulgaris*
Hard rush	*Juncus inflexus*
Hawthorn	*Crataegus monogyna*
Hazel	*Corylus avellana*
Heath speedwell	*Veronica officinalis*
Hedge bedstraw	*Galium mollugo*
Hedge woundwort	*Stachys sylvatica*
Hemlock	*Conium maculatum*

Common name	Scientific name
Hemp agrimony	*Eupatorium cannabinum*
Hoary ragwort	*Senecio erucifolius*
Hogweed	*Heracleum sphondylium*
Holly	*Ilex aquifolium*
Hornbeam	*Carpinus betulus*
Horse chestnut	*Aesculus hippocastanum*
Hybrid black poplar	*Populus x canadensis*
Ivy	*Hedera helix*
Japanese knotweed	*Fallopia japonica*
Laburnum	*Laburnum anagyroides*
Lesser burdock	*Arctium minus*
Lesser pond sedge	*Carex acutiformis*
Leyland cypress	*Cupressocyparis x leylandii*
Lombardy poplar	*Populus nigra 'italica'*
Lyme grass	*Leymus arenarius*
Meadow buttercup	*Ranunculus acris*
Meadow vetchling	*Lathyrus pratensis*
Melilot sp.	*Melilotus sp.*
Mouse-ear hawkweed	*Hieracium pilosella*
Mugwort	*Artemisia vulgaris*
Norway maple	*Acer platanoides*
Oil seed rape	*Brassica napus*
Ox-eye daisy	*Leucanthemum vulgare*
Oxford ragwort	*Senecio squalidus*
Perforate St-John's-wort	*Hypericum perforatum*
Pineapple mayweed	*Matricaria matricarioides*
Poppy	*Papaver sp.*
Red bartsia	*Odontites vernus*
Red clover	*Trifolium pratense*
Red dead-nettle	*Lamium purpureum*
Red fescue	*Festuca rubra*
Red valerian	*Centranthus ruber*
Reedmace	*Typha latifolia*
Ribwort plantain	*Plantago lanceolata*
Rough hawkbit	*Leontodon hispidus*
Saltmarsh rush	*Juncus gerardii*
Scots pine	*Pinus sylvestris*
Sea arrow-grass	*Triglochin maritima*
Sea aster	*Aster tripolium*
Sea beet	*Beta vulgaris*
Sea couch grass	*Elytrigia atherica*
Sea plantain	*Plantago maritima*
Sea purslane	*Halimione portulacoides*

Common name	Scientific name
Sea-buckthorn	*Hippophae rhamnoides*
Sheep's fescue	*Festuca ovina*
Silver birch	*Betula pendula*
Soft brome	*Bromus hordeaceus*
Soft rush	*Juncus effusus*
Spanish bluebell	*Hyacinthoides hispanica*
Spear thistle	*Cirsium vulgare*
Spotted meddick	*Medicago arabica*
Square-stalked St John's-wort	*Hypericum tetrapterum*
Sycamore	*Acer pseudoplatanus*
Tamarisk	*Tamarix gallica*
Teasel	*Dipsacus fullonum*
Toadflax	*Linaria vulgaris*
Tufted vetch	*Vicia cracca*
Water crowfoot sp.	*Ranunculus sp.*
Water dock	*Rumex hydrolapathum*
Water starwort sp.	*Callitriche sp.*
Wayfaring tree	*Viburnum lantana*
Weld	*Reseda luteola*
White campion	*Silene alba*
White clover	*Trifolium repens*
White comfrey	*Symphytum orientale*
White dead-nettle	*Lamium album*
White helleborine	*Cephalanthera damasonium*
White mignonette	*Reseda alba*
Wild carrot	*Daucus carota*
Wild marjoram	*Origanum majorana*
Wild privet	*Ligustrum vulgare*
Wild strawberry	*Fragaria vesca*
Wood false brome	*Brachypodium sylvaticum*
Yarrow	*Achillea millefolium*
Yellow vetchling	*Lathyrus aphaca*
Yellow-wort	*Blackstonia perfoliata*

APPENDIX C
Conservation Status Categories for Invertebrates

Red Data Book (RDB) Categories

RDB categories are based upon the most modern work, usually one of the English Nature Research and Survey in Nature Conservation reviews. Where these do not exist the category given in Shirt, D.B., 1987 The British Red Data Books: 2 is given. These categories may require revision in the light of new information but a new Red Data Book has yet to be compiled. Such revisions are indicated as provisional. The new Red Data Book categories will be based on threat, of which distribution is only one part. This is likely to lead to a far more meaningful conservation assessment, as the number of squares recorded for any one species is highly susceptible to recorder effort, especially as data accumulates over time.

RDB 1. Endangered. Species currently (post 1970) known to exist in five or fewer ten-kilometre squares.

RDB 2. Vulnerable. Species in severely declining or vulnerable habitats, or of low known populations. Known to exist (post 1970) in ten, or fewer, ten-kilometre squares.

RDB 3. Rare. Species with small populations, not at present Endangered or Vulnerable, but which are felt to be at risk. Species currently known to exist (post 1970) in fifteen, or fewer, ten-kilometre squares.

RDB K. Species of undoubted RDB rank, but with insufficient information for accurate placement; includes possible recent arrivals.

RDB X. Species believed to be extinct.

Nationally Scarce. Species currently (post 1970) known to exist in one hundred, or fewer, ten-kilometre squares.

In some groups these are further sub-divided into:-

Nationally Scarce a. Species currently (post 1970) known to exist in thirty, or fewer, ten-kilometre squares.

Nationally Scarce b. Species currently known to exist in thirty-one to one hundred ten-kilometre squares.

Kent Red Data Book (RDB) Categories

KRDB was compiled by Natural England, Kent County Council, Kent Wildlife Trust, Maidstone Museum and local specialist recorders. Species on the inventory include all those located in Kent and listed on the EC Habitats Directive, EC Birds Directive, Bern Convention, Bonn Convention, UK Biodiversity Action Plan, national Red Data lists, nationally 'Notable' and 'Scarce' species or are considered a local rarity. Categorisation of species is determined by the number of 2km by 2km National Grid squares (tetrads) in which they occur in the county. Other factors are taken into account such as the dependence of a species on a threatened habitat or the rate of decline/spread.

KRDB 1. Endangered. Species that have been recorded in 1-2 tetrads.

KRDB2. Vulnerable. Species that have been recorded in 3-5 tetrads, or are considered to be undergoing a significant decline.

KRDB3. Rare. Species that have been recorded in 6-10 tetrads.

KRDB4. (Flies only) Species categorised as RDB1, 2, 3 or K nationally and have been recorded in over 10 discrete sites in Kent.

APPENDIX D
Conservation Status Categories for Birds

Birds of Conservation Concern 3 (BoCC3) Categories

BoCC3 is a quantitative review of the population status of British birds, produced in 2009 by the UK's leading bird conservation organisations.[1] Species on the Green list are considered of low conservation concern whereas those on the Amber and Red lists are considered of medium and high conservation concern respectively. Species are categorised using the following criteria;

Red list.

- Globally threatened according to IUCN criteria
- Historical population decline in UK during 1800-1995
- Severe (≥50%) decline in UK breeding population over last 25 years or since 1969
- Severe (≥50%) decline in UK non-breeding population over last 25 years or since 1969
- Severe (≥50%) contraction of UK breeding range over last 25 years or since 1969

Amber list.

- Species of European Conservation Concern (SPEC)
- Historical population decline during 1800-1995, but recovering; population size has more than doubled over last 25 years
- Moderate (25≥p<50%) decline in UK breeding population over last 25 years or since 1969
- Moderate (25≥p<50%) decline in UK non-breeding population over last 25 years or since 1969
- Moderate (25≥p<50%) contraction in UK breeding range over last 25 years or since 1969
- UK breeding population of <300 pairs or non-breeding population or <900 individuals
- ≥50% of UK breeding or non-breeding population found on ≤10 sites
- ≥20% of European breeding or non-breeding population found in the UK

Kent Red Data Book (KRDB) Categories

KRDB is a list of rare or threatened species in Kent, or those for which Kent holds a significant proportion of the British population. Due to their ecology the standard criteria for categorising KRDB species was deemed unsuitable for birds. The list was written with the Kent Ornithological Society and the following criteria used;

KRDB 1. Endangered. Breeding species with 25 pairs or fewer in Kent.

KRDB 2. Vulnerable. Breeding species with over 25 pairs in Kent but featuring on the national **Red List** for their breeding decline.

KRDB 3. Rare;

- species for which Kent holds >15% of the British population
- species that breed in 20 or fewer 2km tetrads in Kent
- nationally rare species (<1000 breeding pairs in Britain)
- nationally localised species (breeding in <15% of 10km x 10km squares in Britain)
- BTO high alert species

[1] Eaton MA, Brown AF, Noble DG, Musgrove AJ, Hearn R, Aebischer NJ, Gibbons DW, Evans A and Gregory RD (2009) Birds of Conservation Concern 3: the population status of birds in the United Kingdom, Channel Islands and the Isle of Man. *British Birds* 102, pp296–341.

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Annex EDP 13
2012 Botanical Survey Report (CBA, 2012)

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London Resort Company Holdings (LRCH) Ltd.

London Paramount

2012 Botanical Survey Report

December 2012

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London Resort Company Holdings (LRCH) Ltd.

London Paramount

2012 Botanical Survey Report

Approved	[redacted]
	Bill Wadsworth
Position	Senior Associate (Ecology)
Date	15th December 2012
Revision	Final

CONTENTS

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

1.1 General

1.1.1 Chris Blandford Associates (CBA) has been appointed by London Resort Company Holdings (LRCH) Ltd. to undertake a series of ecological surveys to inform the Environmental Impact Assessment for the proposed London Paramount development at Swanscombe, North Kent.

1.1.2 This report details the results of the botanical survey that was carried out during May and June 2012, of land in and around Swanscombe Marsh and the adjoining peninsula, and at Bamber Pit near Swanscombe (herein referred to as 'the Site').

1.2 Scope

1.2.1 The scope of the survey was to identify and evaluate the plant species and communities present that could be affected by the proposed development.

Survey Limitations

1.2.2 Some areas within the proposed development area were excluded due to access restrictions, however, beyond this, there were no limitations to the survey.

1.3 Key Findings

1.3.1 Overall, it is considered that the habitats on Swanscombe Peninsula which support nationally scarce plant species, including yellow vetchling *Lathyrus aphaca,* bithynian vetch *Vicia bithynica,* man orchid *Orchis anthropophora,* divided sedge *Carex divisa* and golden samphire *Inula crithmoides* are collectively of **County Importance** for their plant species.

1.3.2 Other habitats on the Swanscombe Peninsula not recorded as supporting nationally scarce species were found to be of **Parish** or **Local Importance** for their plant species and communities.

1.3.3 The habitats within Bamber Pit were not recorded as supporting nationally scarce species during this survey and were considered to be of **Parish Importance** for their plant species and communities.

2.0 METHODOLOGY

2.1 Scope of Survey

2.1.1 The requirement to undertake a botanical survey for the Site results from the possibility of there being rare and/or important plant species and communities present, identified during the desk-top study and Phase 1 habitat survey carried out by CBA in April-May 2012.

2.1.2 The desk-top study identified 52 notable species of vascular plant, lichen or fungi within a 2km radius of the proposed development area. The species records which were supplied by Kent and Medway Biological Records Centre (KMBRC) with an accurate grid reference of at least 6 figures (100m precision) have been shown in **Figure 1**. Species previously found on the Swanscombe Peninsula and in Bamber Pit include Townsend's cord-grass *Spartina x townsendii,* Borrer's saltmarsh-grass *Puccinellia fasciculata,* slender hare's-ear *Bupleurum tenuissimum,* divided sedge *Carex divisa* and round-leaved wintergreen *Pyrola rotundifolia*.

2.1.3 The results of the Phase 1 habitat survey suggested that the most botanically interesting habitats on Site were likely to be the areas of saltmarsh, open mosaic habitats on previously developed land and grassland with a slight calcareous influence and shorter sward height. During the botanical survey, effort was targeted at these habitat types.

2.2 Survey Methodology

2.2.1 Botanical surveys were carried out during May and June 2012 by professional ecologists working for CBA, and the methodologies used are described below. The locations of surveyed areas and habitats are illustrated in **Figure 2**.

2.2.2 Nomenclature for plant species follows Stace[1].

Habitats

2.2.3 Habitats were divided into grassland and early successional/ruderal, scrub and woodland, wetland (open water, reedbed and ditches) and salt-marsh. In each area surveyed all species identified were recorded and a broad indication of their frequency and abundance was given using the DAFOR scale (Dominant, Abundant, Frequent, Occasional and Rare). Notes were also taken of the general features of the different habitats and areas, their appearance and

[1] Stace C., 2010. New Flora of the British Isles, third edition. Cambridge University Press.

structure. Where possible and appropriate, the plant communities present have been referred to the most relevant National Vegetation Classification community[2].

Rare and Scarce Species

2.2.4 The location and extent of rare and scarce plant species, as represented by species included in the Kent Red Data List (which includes both Nationally and Kent rare and scarce species), was recorded, as was a broad indication of population size.

2.3 Evaluation Methodology

2.3.1 Habitats and species were evaluated using a range of criteria and plans, such as those outlined by Ratcliffe[3], including size, diversity, naturalness, rarity, geographical position and fragility, the potential for substituting the habitat, criteria for the selection of sites for SSSI designation[4] and for Local Wildlife Sites in Kent[5], Kent Priority Habitat and Species Action Plans[6], the UK Red Data List for vascular plant species[7], Scarce Plants in Britain[8] and Kent Red Data Book[9]. In all cases evaluations were based only on the flora of the surveyed areas and did not include evaluation for other characteristics.

[2] Rodwell, J.S. (ed) et al, 1991-2000. British Plant Communities Volumes 1-5. Cambridge University Press.
[3] Ratcliffe, D., 1977. A Nature Conservation Review, Volume 1. Cambridge University Press.
[4] Nature Conservancy Council , 1989. Guidelines for selection of biological SSSIs. Nature Conservancy Council.
[5] Kent Wildlife Trust on behalf of the Kent Biodiversity Partnership, 2006. Local Wildlife Sites in Kent (Sites of Nature Conservation Interest) Criteria for Selection and Delineation Version 1.3.
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[9] Kent Wildlife Trust, 1999. Provisional Red Data Book for Kent.

3.0 RESULTS

3.1 Swanscombe Marsh and Peninsula

3.1.1 The areas and habitats surveyed are shown in **Figure 2** and the location of **Nationally Scarce** species recorded during the survey are shown in **Figure 3**. Specific reference to a given area (e.g. **G1** or **Grassland 1**) is mentioned in the text and also shown in **Figure 2. Appendix A** lists the full results of the botanical survey for grassland and early successional/ruderal, woodland, and saltmarsh habitats respectively.

Habitats

Grassland and early successional/ruderal

3.1.2 These habitats share many species but are variable in structure and appearance, from sparsely vegetated areas to dense, coarse swards. With the exception of parts of the seawall/embankment, much of this vegetation appears to be unmanaged or to receive very low levels of management. Parts of the Site have clearly been subject to substantial disturbance and material appears to have been imported into the Site, creating a range of different growing conditions. On the whole therefore the variable structure of the vegetation appears likely to be attributable in large part to differences in disturbance regime, including the period of time following significant disturbance, as well as differences in growing conditions, including productivity. Within the communities there are elements characteristic of maritime or coastal locations, as well as of calcareous soils. Scrub (see below), of varying density is scattered throughout many of the grassland areas.

Grassland

3.1.3 Much of the Site, including the northern part of the peninsula, the area to the west of Swanscombe Marsh and the sides of the landfill area comprise a coarse sward dominated by Common couch *Elytrigia repens*, Sea couch *Elytrigia athericus* and/or False oat-grass *Arrhenatherum elatius* (**G1**). Cocksfoot *Dactylis glomerata* and Yorkshire fog *Holcus lanatus* are also widespread and locally abundant. Much of this is very species poor with a limited number of forbs such as Hawkweed oxtongue *Picris hieracioides*, Wild carrot *Daucus carota* and hogweed *Heracleum sphondyllium*. However, some areas of this grassland do support significant quantities of the **Nationally Scarce** Yellow vetchling *Lathyrus aphaca*, as well as smaller quantities of the **Nationally Scarce** Bithynian vetch *Vicia bithynica*. Most of this grassland can be attributed to NVC MG1 *Arrhenatherum elatius* – False oat grass grassland, a

grassland characteristic of low levels of management (cutting or grazing) with, in some areas, affinities to SM24 *Elymus pycnanthus* (*Elytrigia athericus*) saltmarsh.

3.1.4 Among this coarse grassland, particularly in the northern part of the site, there are pockets of less coarse and more species rich grassland, These support a range of grassland species characteristic of neutral to alkaline soils, such as Birds-foot trefoil *Lotus corniculatus*, Narrow-leaved birds-foot trefoil *Lotus tenuis*, hop trefroil *Trifolium campestre*, wild carrot, ox eye daisy *Leucanthemum vulgare*, Hawkweed oxtongue, Smooth tare *Vicia tetrasperma* and Yellow-wort *Blackstonia perfoliata*. Such areas also support a number of orchid species, of which the most frequent and numerous is Bee orchid *Ophrys apifera*, but Pyramidal *Anacamptis pyramidalis* and Common spotted *Dactylorrhiza fuchsia* are also present. A small group of 10-12 flowering spikes of the **Nationally Scarce** Man orchid *Orchis anthropophora* was also recorded in one area of such grassland.

3.1.5 Also located within this grassland in the northern part of the peninsula there are some small areas which exhibit a saline influence, with dominant Reflexed saltmarsh grass *Puccinellia distans* and frequent Lesser sea spurrey *Spergularia marina* (NVC SM23 *Spergularia marina-Puccinellia distans* lesser sea spurrey-reflexed salt-marsh grass saltmarsh community). Sea beet *Beta vulgaris* is also occasional in this area.

3.1.6 A large stand of the invasive non-native Giant hogweed *Heracleum mantegazzianum* is present on the eastern side of the landfill area.

3.1.7 In addition to the small pockets of more species rich grassland described above there are some larger areas of moderately species-rich grassland (**G2**, **G3**, **G4** and **G5**) in which forb cover is relatively high (50% and above), including a range of typical grassland species such as Red and White clover *Trifolium pratense* and *repens*, Black medick *Medicago lupulina*, Meadow vetchling *Lathyrus pratensis*, Bird's-foot and Narrow-leaved bird's foot trefoils, Ox-eye daisy, Hedge bedstraw *Galium mollugo*, Perforate St John's wort *Hypericum perforatum*, Ribwort plantain *Plantago lanceolata*, Wild marjoram *Origanum vulgare* and Red bartsia *Odontites verna*. These areas are described briefly below. With the possible exception of G6 and G7 these grasslands have affinities with the NVC MG5 *Cynosorus cristatus-Centaurea nigra* Crested dog's-tail-Common knapweed grassland, a characteristically forb-rich grassland developed on neutral soils. The coarser areas are attributable to MG1 *Arrhenatherum elatius* – False oat grass grassland.

3.1.8 **G2 -** This is located on a section of the seawall/embankment. It includes frequent grass vetchling Lathyrus nissiola and populations of the Nationally Scarce Yellow vetchling and

Bithynian vetch. This area was mown during the course of the survey and periodic mowing probably contributes to the maintenance of species diversity in this area. However, mowing of the Nationally Scarce species prior to seed set is likely to negatively impact their populations, especially as both are annual species and reliant on annual seed set and recruitment for population survival.

3.1.9 **G3 -** This has a variable sward, including both short and coarser parts. A feature of the shorter areas is abundant Hop trefoil and the grassland also supports the Nationally Scarce Yellow vetchling and Bithynian vetch.

3.1.10 **G4 -** This has high forb cover, with over 80% in parts. Wild marjoram is notably abundant here and there is a small population of the Nationally Scarce Bithynian vetch. There are some areas of very short sward with characteristic species such as Mouse-ear hawkweed *Pilosella officinarum*, Thyme-leaved sandwort *Arenaria serpyllifolia* and Eyebright *Euphrasia* sp.

3.1.11 **G5 -** This area has a moderately tall to coarse sward in which Wild marjoram and Common knapweed *Centarea nigra* are both notably abundant, the latter more so than elsewhere in the Site.

3.1.12 **G6 -** This area has a relatively fine sward with much red fescue. Forb cover is quite high and generally greater than 50%. However, on the whole the sward is less species rich than the last four areas described with the forb element generally dominated by a relatively small number of species, especially Black medick and Plantains. There are groups of bee and pyramidal orchids.

3.1.13 **G7 -** This comprises the top of the landfill area. It supports a distinctive sward dominated by abundant narrow-leaved bird's-foot trefoil with red and white clover, false oat grass, squirrel-tail fescue *Vulpia bromoides* and common couch.

Early successional/ruderal

3.1.14 A ruderal element is present throughout much of the grassland. However, through the central part of the Site there are a number of areas where the vegetation is sparse and open to varying degrees (**G8**), probably as result of disturbance and/or where the substrate is of inherently low fertility, for example on aggregates such as sands, gravels and concrete waste. The sward varies from very open, with much bare ground, to an almost closed sward. In the southernmost of these areas the vegetation is largely confined to gaps between areas of concrete.

3.1.15 Many of the species present are shared with the adjoining grasslands. However, the ruderal element is generally more prominent in such areas, conspicuous amongst which, for example, are hoary mustard *Hirschfeldia incana*, bastard cabbage *Rapiastrum rugosum*, perennial wall rocket *Diplotaxis tenuifolia*, Oxford ragwort *Senecio squalidus*, Canadian fleabane *Conyza canadensis* and melilot species *Melilotus* spp. The invasive non-native butterfly bush is frequent and locally abundant in these areas.

3.1.16 There are some small depressions within these areas which hold water during at least part of the year and these support small stands of common reed *Phragmites australis*, as well as a small number of other wetland species.

3.1.17 In addition, some areas of cleared or felled scrub and woodland also support ruderal vegetation, largely comprising common and widespread ruderal species such as nettle *Urtica dioica*, thistles *Cirsium* species, willowherbs *Epilobium* species and cleavers *Galium aparine*. These include a section of the woodland described below (**W1**), and an area in the west of the Site. A track in this area supports a small population of the **Nationally Scarce** divided sedge *Carex divisa*. It is possible that this species may be present elsewhere in the site, for example in the grassland to the east (towards Swanscombe Marsh) although it was not observed during the survey and the grassland in this area is generally very coarse.

3.1.18 The grassland and ruderal areas as a whole support a number of non-native legume species, including fodder vetch *Vicia villosa*, sand lucerne *Medicago sativa* ssp. *sativa*, goats rue *Galega officinalis*, broad-leaved everlasting pea *Lathyrus latifolius* and white melilot *Melilotus albus*.

Waterbodies

3.1.19 There are two main waterbodies in the site. The central one has stands of common reed of variable width (up to approx. 10m) on its perimeter. These support a limited number of marginal species such as woody nightshade *Solanum dulcamara*, hemlock water dropwort *Oenanthe crocata*, hemp agrimony *Agrimonia eupatoria* and great willowherb *Epilobium hirsutum*.

3.1.20 The waterbody in the south western corner of the site has very limited emergent and marginal vegetation, including small stands of common reed and reedmace *Typha latifolia*, occasional clumps of hard rush *Juncus inflexus* and jointed rush *Juncus articulatus* and some great willowherb.

3.1.21 There is a smaller pond to the north of this, set at the bottom of steep wooded banks. Observed from the top of one the banks it appeared to support little or no aquatic, emergent or marginal vegetation.

Reedbed

3.1.22 There are two larger areas of reedbed, Swanscombe Marsh and the site of the old sewage works together with an area immediately to its east. These areas were viewed from their edges but they appear to be overwhelmingly dominated by common reed with scattered willows *Salix* species. On the northern edge of the Swanscombe Marsh reedbed there are also some stands of sea club-rush *Bolboschoenus maritimus*.

3.1.23 There is a smaller area of common reed and ruderal vegetation, including thistles and willowherbs, to the south of the HS1 exit which was viewed from its south western corner.

Ditches

3.1.24 There is a network of ditches throughout the site. Apart from the wide ditch in the western part of the site (**D1**), which supports abundant fennel pondweed *Potomogeton pectinatus* little or no aquatic vegetation was observed. However, many of the ditches support extensive stands of common reed and/or reedmace, although locally there are also stands of branched bur-reed *Sparganium erectum*. The vegetation of the ditch edges includes a small number of common marginal species such as woody nightshade, hemlock water dropwort, hemp agrimony and great willowherb.

Scrub

3.1.25 Scattered and dense scrub is widespread throughout the site. This includes a range of species typical of neutral to calcareous soils, including especially Bramble *Rubus fruticosus*, Hawthorn *Crataegus monogyna*, Dog rose *Rosa canina*, Dogwood *Cornus sanguinea* and Wild privet *Ligustrum vulgare*. The field layer largely comprises species typical of the adjoining grasslands or ivy and bramble, although there is also much bare ground in the denser areas scrub. This is attributable to the NVC W21 *Crataegus monogyna-Hedera helix* Hawthorn-Ivy scrub community. The invasive non-native butterfly bush *Buddleia davidii* is also frequent and locally abundant among the scrub, especially in the southern part of the Site. In some areas the scrub is developing into woodland, with Ash *Fraxinus excelsior*, Sycamore *Acer pseudoplatanus* and Silver birch *Betula pendula* and very locally Alder *Alnus glutinosa*. In wetter areas, including some of the areas of reedbed and wet grassland, there are willows, including Grey *Salix*

cinerea, Goat *Salix caprea*, White *Salix alba*, Crack *Salix fragilis* and Osier *Salix viminilis* willows.

Woodland

3.1.26 In the south western part of the site there is an area of more mature woodland (W1). This appears to be characteristically species poor secondary woodland of recent development. The canopy is dominated by sycamore, with occasional ash and silver birch. The shrub layer includes frequent and locally abundant ash and sycamore regeneration as well as frequent dogwood and wild privet, locally abundant butterfly bush and occasional hawthorn and elder *Sambucus nigra*. The field layer is species poor and dominated by ivy *Hedera helix*, with bramble, nettle *Urtica dioica* and herb Robert *Geranium robertianum*. This comprises a species poor form of the NVC W8 *Fraxinus excelsior-Acer campestre-Mercurialis perennis* Ash-Field maple-Dog's mercury woodland community, and specifically of the *Hedera helix* Ivy sub-community.

Salt-marsh

3.1.27 A narrow strip of salt-marsh (up to approx. 40m at its widest) is present around the edge of most of the peninsula (S1). Much of the lower part of this is dominated by common salt-marsh grass *Puccinellia maritima* (NVC SM13 *Puccinellia maritima* salt-marsh community), although sea purslane *Atriplex portulacoides* and sea club-rush are also locally dominant. There are also some small areas of cord grass *Spartina anglica*. In addition to the dominant species, a range of other saltmarsh species are present and these can be frequent and locally abundant, including sea aster *Aster tripolium*, sea arrowgrass *Triglochin maritimum*, sea plantain *Plantago maritima*, lesser sea spurrey, sea milkwort *Glaux maritima*, English skurvygrass *Cochleria anglica*, sea rush *Juncus maritimus*, sea-beet *Beta maritima*, spear-leaved orache *Atriplex prostrata*. Some of these are locally abundant. Reflexed salt-marsh grass is locally abundant in some parts of the saltmarsh with lesser sea spurrey, including a number of wet depressions or pans (NVC SM23 *Spergularia marina- Puccinellia distans* lesser sea spurrey-reflexed salt-marsh grass salt-marsh community). Upper parts of the marsh, where they merge into the adjoining grassland, are mostly strongly dominated by sea couch *Elytrigia atherica* (NVC SM23 *Elymus pycnanthus* (*Elytrigia atherica*) Sea couch salt-marsh community) with mostly occasional other species, such as sea beet and spear-leaved orache. A small number of plants of the **Nationally Scarce** golden samphire *Inula crithmoides* are present in the saltmarsh and on the adjoining seawall.

3.1.28 There is a further area of upper salt-marsh vegetation (S2) between the two embankments in the north western part of the site. This includes saltmarsh rush *Juncus gerardii*, sea couch, sea aster,

sea plantain, sea arrowgrass and lesser sea spurrey. There is an area of standing water at its western end with common reed and sea club-rush.

Notable Species

Nationally Scarce species

3.1.29 As noted above five Nationally Scarce species were recorded from the site (described above). They are listed in **Table 1** below with habitat/location and an indication of population size.

Table 1 Nationally Scarce Species recorded during the 2012 Survey

Common Name	Scientific Name	Habitat	Population size
Yellow vetchling	*Lathyrus aphaca*	Grassland (G1, G2, G3, including coarse)	Large - thousands
Bithynian vetch	*Vicia bithynica*	Grassland (G1, G2, G3, G4, though rare or absent in coarsest)	Medium-large – at least hundreds
Man orchid	*Orchis anthropophora*	Grassland (G1)	Small – 10 spikes in small area
Divided sedge	*Carex divisa*	Grassland/ruderal (G1/ruderal, on track – possibly present elsewhere)	Small – small number of plants along track
Golden samphire	*Inula crithmoides*	Saltmarsh/seawall (S1)	Small – few plants

3.2 Bamber Pit

3.2.1 The areas and habitats surveyed are shown in **Figure 2. Appendix A** lists the full results of the botanical survey for grassland and ruderal, scrub and woodland respectively.

Habitats

Grassland and ruderal

3.2.2 The southern part of the pit supports a species poor to (locally) moderately species rich grassland. Much of this is dominated by false oat grass and cocksfoot (NVC MG1 *Arrhenatherum elatius* – False oat grass grassland), although there are some shorter and more open areas with creeping bent *Agrostis stolonifera* and red fescue *Festuca rubra*. Other frequent or abundant species include hawkweed oxtongue, perforate St John's wort, black medick, red bartsia, narrow-leaved birds foot trefoil and cinquefoil *Potentilla reptans*. In the southernmost part of the pit there are some areas of a very short, heavily rabbit grazed grassland with thyme-

leaved sandwort and procumbent pearlwort *Sagina procumbens*. Parts of the bottom of the pit also have a short and sparse, heavily rabbit grazed sward, with scattered field forget-me-not *Myosotis arvensis*, vipers bugloss *Echium vulgare* and centaury *Centaurium erythraea*.

3.2.3 Much of the northern part of the pit appears to have been used for landfill and supports ruderal vegetation dominated by hoary mustard, with hemlock *Conium maculatum*, common mallow *Malva sylvestris* and teasel *Dipsacus fullonum*.

Water body

3.2.4 A water body located in the eastern part of the pit supports a few patches of white water-lily *Nymphaea alba* at its western end but no other aquatic vegetation was observed. Due to the steepness of the banks there is little emergent or marginal vegetation, although a few small patches of water mint *Mentha aquatica*, woody nightshade, great willowherb and hemp agrimony are present.

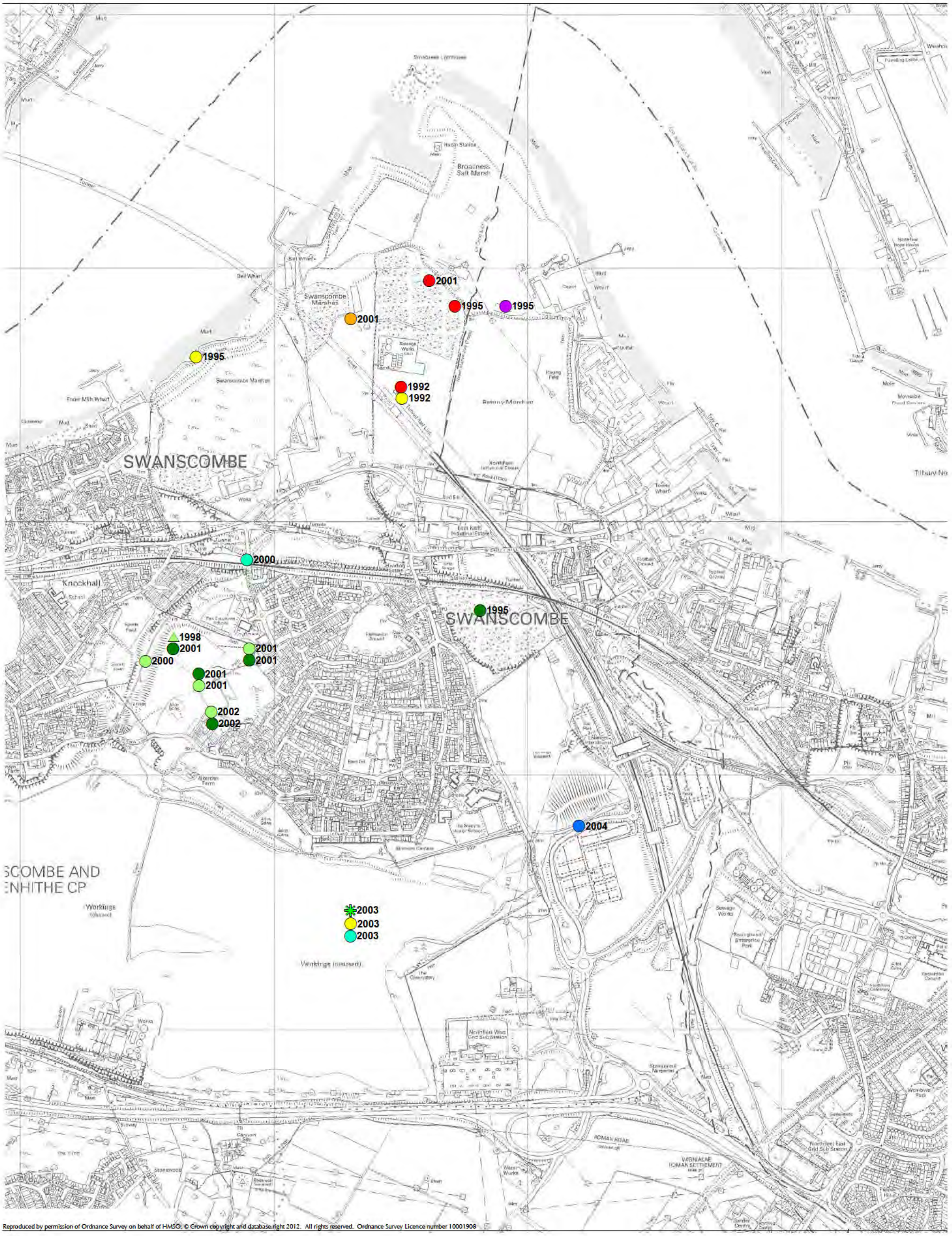
Scrub and woodland

3.2.5 There is scattered and dense scrub throughout the grassland and ruderal vegetation, including bramble, hawthorn, dog rose, dogwood, wild privet and elder. The invasive non-native butterfly bush is also frequent and locally abundant and a number of other non-native trees and shrubs are scattered throughout the pit. In some areas the scrub is developing into woodland, for example in the south western corner, where there is locally abundant silver birch. The field layer here is species poor and strongly dominated by ivy. The invasive non-native wall Cotoneaster *Cotoneaster horizontalis* is present in and around this area of developing woodland. On the banks adjoining the water body grey and goat willow are locally abundant.

Cliff faces

3.2.6 The chalk cliff faces on the western and northern sides of the pit support ivy, red valerian *Centranthus ruber*, perennial wall rocket and the invasive non-natives butterfly bush and wall cotoneaster.

FIGURES



KEY

Vascular Plant Species

- Divided Sedge
- Slender Hare's-Ear
- Townsend's Cord-Grass
- Borrer's Saltmarsh-Grass
- Sea Barley
- Green-flowered Helleborine
- Round-leaved Wintergreen
- Wintergreen

Lichen and Fungi Species

- *Peltigera rufescens*
- Verdigris Navel

2003 Date of Record

It should be noted that species locations are approximate - based on at least 6 figure grid references with an accuracy of 100m

0 250 500 m

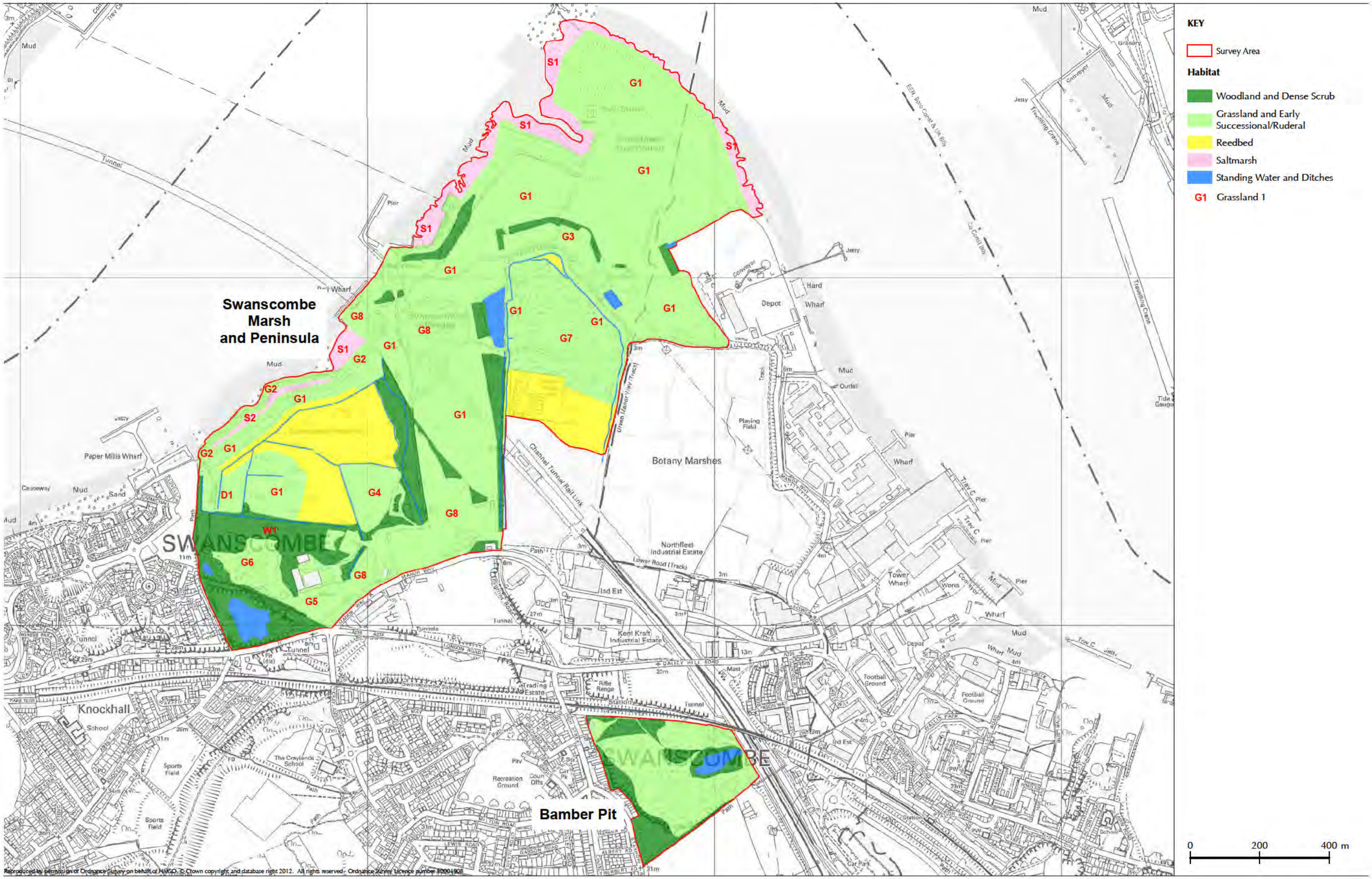
CHRIS BLANDFORD ASSOCIATES
environment landscape planning

JUNE 2012

LONDON PARAMOUNT
Botanical Survey Report

N

FIGURE 1
Notable Plant, Lichen and Fungi Records (based on desk-top study data provided by KMBRC)



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JUNE 2012

LONDON PARAMOUNT
Botanical Survey Report

FIGURE 2
Area/Habitats Surveyed

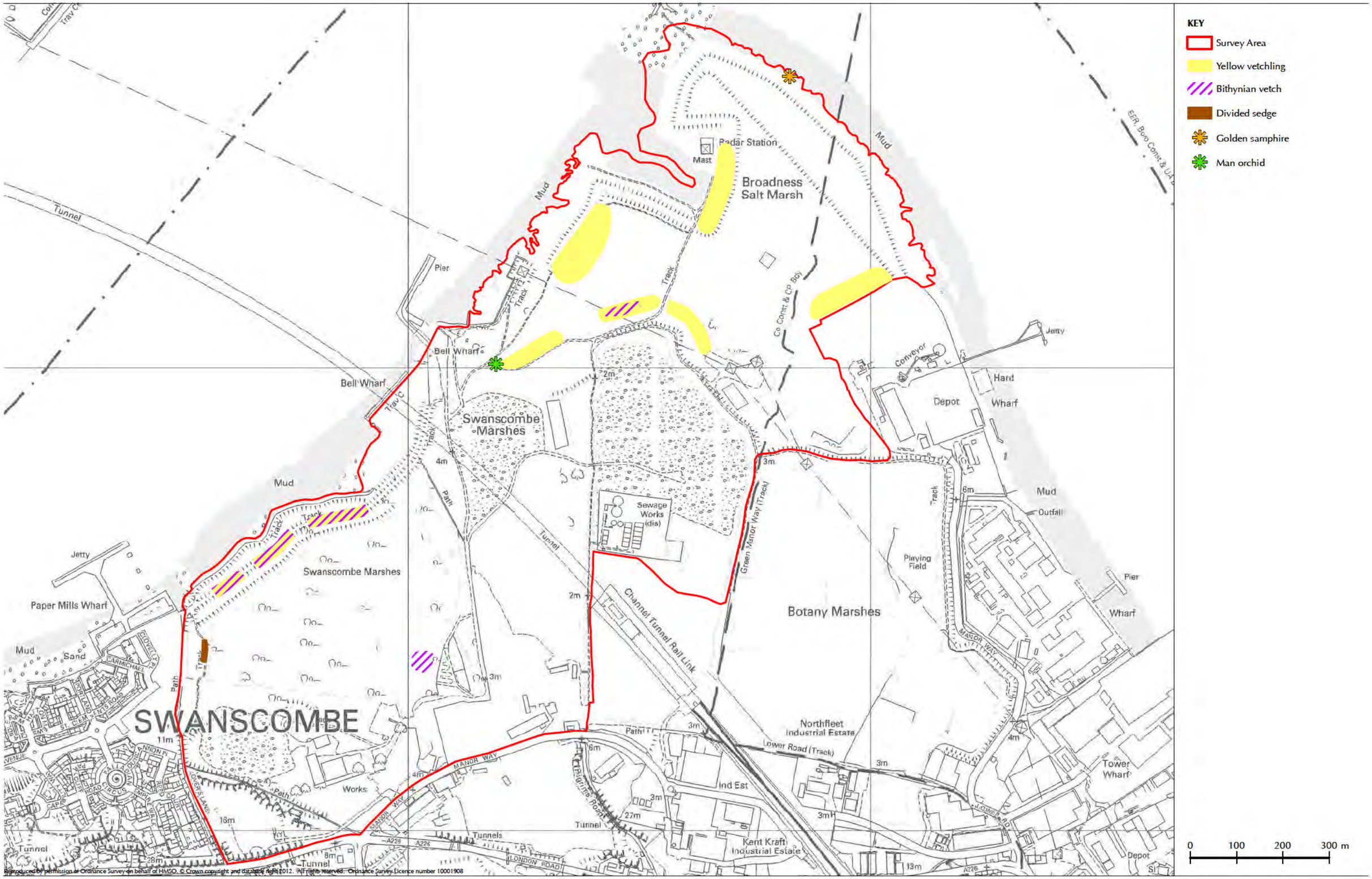

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FIGURE 3
Location of Nationally Scarce Plant Species (recorded during the 2012 survey)

APPENDICES

APPENDIX A

Total Species Lists with Relative Frequency and Abundance

Swanscombe Marsh and Peninsula

DAFOR Scale = Dominant, **A**bundant, **F**requent, **O**ccasional, **R**are (L = Locally or Patchily)

Habitat : Grassland and Early Successional/Ruderal

Scientific Name	Common Name	G1	G2	G3	G4	G5	G7	G8
Agrostis stolonifera	Creeping bent					O		O
Anisantha sterilis	Barren brome	O/LA	R					R
Arrhenatherum elatius	False oat-grass	F/LA or D	F/LA	O	F/LA	A	F/LA	F
Brachypodium sylvaticum	Wood false-brome		LA					
Bromus hordaceous	Soft brome	O	F	R	R			F
Catapodium rigidum	Fern grass		R		R			O
Dactylis glomerata	Cocksfoot	F/LA	F/LA	F/LA				O
Elytrigia pycnanthus	Sea couch	F/LA or D	O/LF	F/LA				O
Elytrigia repens	Common couch	F/LA or D	F/LA	O/LA		F/LA	O/LA	
Schedonorus arundinaceus	Tall fescue	O/LF	O					O
Festuca rubra	Red fescue	O/LA	F/LA	A	F/LA	F/LA		F
Holcus lanatus	Yorkshire fog	F			O	O	O	F
Lolium perenne	Perennial rye-grass				R		O	
Phleum bertolonii	Small cat's-tail	O/LA						
Phragmites australis	Common reed							R
Poa pratensis	Smooth meadow-grass	O	O	O	R			O
Poa trivialis	Rough meadow-grass	O	O		R			R
Puccinellia distans	Reflexed saltmarsh grass	O/LA						
Vulpia bromoides	Squirrel-tail fescue				F		F	O/LF
Carex flacca	False fox sedge							R
Carex otrubae	Glaucus sedge		R					
Juncus inflexus	Hard rush	R						

Scientific Name	Common Name	G1	G2	G3	G4	G5	G7	G8
Aceras anthropophorum	Man orchid	R						
Achillea millefolium	Yarrow	O	O			O		
Agrimonia eupatoria	Common agrimony					R		
Anacamptis pyramidalis	Pyramidal orchid	R						
Anthyllis vulneraria	Kidney vetch	R	R					
Arctium sp.	Burdock	R						
Arenaria serpyllifolium	Thyme-leaved sandwort				O			
Artemisia vulgaris	Mugwort	O					R	O
Ballota nigra	Black horehound	R						
Bellis perennis	Daisy		O/LF					
Beta vulgaris	Sea beet	O						
Blackstonia perfoliata	Yellowort	O	R	O	O			O
Centaurea nigra	Common knapweed	R		LA		F/LA		
Centaurium erythraea	Common centaury							O
Centrantus rubra	Red valerian		R					O
Cerastium fontanum	Comon mouse-ear		O					O
Chenopodium rubrum	Red goosefoot	R						
Cirsium arvense	Creeping thistle	O/LF	O				R	
Cirsium vulgare	Spear thistle	R						
Conyza canadensis	Canadian fleabane							O/LF
Crepis vesicaria	Beaked hawksbeard	O/LF	O/LF		R	R		F
Dactylorrhiza fuchsii	Common spotted orchid	R			R			
Daucus carota	Wild carrot	F	F	F/LA	F	F		F
Diplotaxis tenuifolia	Perennial wall rocket	O	O					F
Dipsacus fullonum	Teasel	R						
Euphrasia nemerosa	Common eyebright				O			
Galega officinalis	Goat's rue							R
Galium aparine	Cleavers	R						
Galium album	Hedge bedstraw					F		
Geranium dissectum	Cut-leaved cranesbill	R		F				
Geranium molle	Dove's-foot cranesbill		R					
Heracleum mantegazzianum	Giant hogweed	LA						

Scientific Name	Common Name	G1	G2	G3	G4	G5	G7	G8
Heracleum sphodyllium	Hogweed		R					
Hieracium sp.	Hawkweed				R			
Hirschfeldia incana	Hoary mustard		R					F
Hypericum perforatum	Perforate St. John's-wort	R			F	F		O
Inula conyzae	Shepherd's spikenard					R		
Lactuca serriola	Prickly lettuce					O		R
Lathyrus aphaca	Yellow vetchling	O/LA	O/LA	O				
Lathyrus latifolius	Broad-leaved everlasting pea	R						
Lathyrus nissiola	Grass vetchling		O/LF					
Lathyrus pratensis	Meadow vetchling		F/LA			LA		
Lathyrus sylvestris	Narrow-leaved everlasting pea	R						
Leontodon hispidus	Rough hawkbit					R		
Leucanthemum vulgare	Ox-eye daisy	O	F	O				O
Linaria purpurea	Purple toadflax	R						R
Linaria vulgaris	Common toadflax	R			R			R
Lotus corniculatus	Bird's-foot trefoil	R	F	R	R			O
Lotus tenuis	Narrow-leaved bird's foot trefoil	O	F/LA	O	F/LA		A	F/LA
Malva sylvestris	Common mallow	R						R
Medicago arabica	Spotted medick		O					R
Medicago lupulina	Black medick		F	R	F/LA	F/LA		O
Medicago sativa ssp. varia	Sand lucerne	O/LF	O/LF		O		F/LA	F
Melilotus albus	White melilot	O	R		O			F
Melilotus altissimus	Tall melilot	O	R		O			F
Odontites verna	Red bartsia		O	O	O			
Ophrys apifera	Bee orchid	R		R				
Origanum vulgare	Wild marjoram	O/LF	R	O	O/LF	F/LA		O
Orobanche minor	Common broomrape		R					
Papaver rhoeas	Common poppy		R					R
Picris echioides	Bristly oxtongue	O		O		R		
Picris hieracioides	Hawkweed oxtongue	F	F	O	F	O		F/LA
Pilosella officinarum	Mouse-ear hawkweed							

Scientific Name	Common Name	G1	G2	G3	G4	G5	G7	G8
Plantago coronopus	Bucks-horn plantain							R
Plantago lanceolata	Ribwort plantain		F/LA	R	F			F
Potentilla reptans	Cinquefoil	O/LA				O/LA		O
Ranunculus acris	Meadow buttercup	R						
Ranunculus bulbosus	Bulbous buttercup		O					
Ranunculus flammula	Lesser spearwort							R
Ranunculus repens	Creeping buttercup	R						
Rapiastrum rugosum	Bastard mustard							LF
Reseda lutea	Mignonette							R
Rumex obtusifolius	Broad-leaved dock	R	R					O
Senecio erucifolius	Hoary ragwort	O	F	O	O	F		O
Senecio jacobaea	Common ragwort	O	O/LF		O	O		O
Senecio squalidus	Oxford ragwort							F
Senecio vulgaris	Groundsel							O
Silene latifolia	White campion		R					
Silene vulgaris	Bladder campion		R					
Smyrnium olusatrum	Alexanders	R						
Sonchus arvensis	Perennial sowthistle	R						
Sonchus asper	Prickly sowthistle		R	R				
Sonchus olraceous	Smooth sowthistle							
Spergularia marina	Lesser sea spurrey	LF						
Taraxacum officinale agg.	Dandelion	O	O					F
Torilis japonica	Upright hedge parsley					O		
Trifolium arvense	Hare's-foot clover				R			
Trifolium campestre	Hop trefoil	O/LA	R	F/LA	F			O
Trifolium dubium	Lesser hop trefoil	R	R	R				
Trifolium pratense	Red clover	O	F/LA		F	F/LA	F/LA	O
Trifolium repens	White clover	O/LF	O/LF		O	O	F/LA	O
Tussilago farfara	Coltsfoot		O				R	
Urtica dioica	Nettle	O						
Veronica arvensis	Wall speedwell		R					
Veronica catenata	Pink water speedwell							R

Scientific Name	Common Name	G1	G2	G3	G4	G5	G7	G8
Veronica chamaedrys	Germander speedwell		R					
Vicia bithyinica	Bithynian vetch	R	O/LA	O	LA			
Vicia hirsuta	Hairy tare		O					
Vicia sativa	Common vetch	O	F			O		O
Vicia tetrasperma	Smooth tare	O	O					
Vicia villosa	Fodder vetch		R	O	O		O	R

Nationally Scarce species

Invasive non-native species - listed in Schedule 9 of the Wildlife and Countryside Act 1981 (as amended)

Habitat: Woodland

Scientific Name	Common Name	W1
Canopy		
Acer pseudoplatanus	Sycamore	A
Betula pendula	Silver birch	O
Fraxinus excelsior	Ash	O
Populus tremula	Aspen	R
Shrub		
Acer pseudoplatanus	Sycamore	F/LA
Buddleia davidii	Butterfly bush	O/LA
Cornus sanguinea	Dogwood	F
Crataegus monogyna	Hawthorn	O
Fraxinus excelsior	Ash	F/LA
Ligustrum vulgare	Wild privet	F
Quercus ilex	Holm oak	R
Sambucus nigra	Elder	O
Viburnum lantana	Wayfaring tree	R
Field		
Brachypodium sylvaticum	Wood false-brome	O
Geranium robertianum	Herb robert	O/LF
Hedera helix	Ivy	A/LD
Lamium album	White deadnettle	R
Rubus fruticosus	Bramble	F/LA
Stachys sylvatica	Hedge woundwort	R
Urtica dioica	Nettle	O

Habitat: Saltmarsh

Scientific Name	Common Name	S1	S2
Aster tripolum	Sea aster	F/LA	O/LF
Atriplex portulacoides	Sea purslane	O	
Atriplex prostrata	Spear-leaved orache	O/LF	
Beta vulgaris	Sea beet	O	
Bolboeschoenus maritimus	Sea club-rush	LD	
Cochleria anglica	English scurvygrass	O	
Elytrigia pycnanthus	Sea couch	LD	O/LA
Festuca rubra	Red fescue	R	O/LF
Glaux maritima	Sea milkwort	O	
Inula crithmoides	Golden samphire	R	
Juncus gerardii	Saltmarsh rush	LF	F/LA
Juncus maritimus	Sea rush	R	
Phragmites australis	Common reed		F/LA
Plantago maritima	Sea plantain	F/LA	A
Puccinellia distans	Reflexed saltmarsh-grass	LA	
Puccinellia maritima	Common saltmarsh-grass	A/LD	
Spartina anglica	Cord grass	O	
Spergularia marina	Lesser sea spurrey	O/LF	O/LF
Triglochon maritima	Sea arrowgrass	F/LA	F/LA

Nationally Scarce species

Bamber Pit

DAFOR Scale = Dominant, **A**bundant, **F**requent, **O**ccasional, **R**are (L = Locally or Patchily)

Habitat: Grassland and Ruderal

Scientific Name	Common Name	Grassland	Ruderal
Agrostis stolonifera	Creeping bent	F/LA	O
Anisantha sterilis	Barren brome	R	R
Arrhenatherum elatius	False oat-grass	F/LA	O/LA
Bromus hordaceous	Soft brome	R	R
Dactylis glomerata	Cocksfoot	F/LA	O
Elytrigia repens	Common couch	R	
Festuca rubra	Red fescue	O/LA	
Holcus lanatus	Yorkshire fog	F/LA	R
Hordeum murinum	Meadow barley	R	
Lolium perenne	Perennial rye-grass	O	R
Phragmites australis	Common reed		R
Poa annua	Annual meadow grass	O/LA	O
Poa pratensis	Smooth meadow-grass	R	
Poa trivialis	Rough meadow-grass	R	
Vulpia bromoides	Squirrel-tail fescue	R	
Achillea millefolium	Yarrow	O	
Agrimonia eupatoria	Common agrimony	O	
Anacamptis pyramidalis	Pyramidal orchid	R	
Arctium sp.	Burdock	O	
Armoracia rusticana	Horse radish	R	
Arenaria serpyllifolium	Thyme-leaved sandwort	O/LA	
Artemisia vulgaris	Mugwort	O	
Ballota nigra	Black horehound	O	
Calystegia sepium	Hedge bindweed	O/LA	
Centaurea nigra	Common knapweed	O/LA	
Centaurium erythraea	Common centaury	O	
Cerastium fontanum	Comon mouse-ear	O	
Cirsium arvense	Creeping thistle	O/LA	
Conium maculatum	Hemlock	O	O/LA
Crepis vesicaria	Beaked hawksbeard	O	
Daucus carota	Wild carrot	O	
Diplotaxis tenuifolia	Perennial wall rocket	F	
Dipsacus fullonum	Teasel	F/LA	F/LA
Echium vulgare	Viper's bugloss	O/LF	
Euphrasia nemerosa	Common eyebright	R	
Foeniculum vulgare	Fennel	R	
Galega officinalis	Goat's rue	O/LA	O/LA
Galium mollugo	Hedge bedstraw	O	
Geranium dissectum	Cut-leaved cranesbill	O	
Geranium molle	Dove's-foot cranesbill	O	
Glechoma hederacea	Ground ivy	O/LA	LA
Hirschfeldia incana	Hoary mustard	O/LA	A/LD
Hypericum perforatum	Perforate St. John's-wort	F/LA	O/LA

Scientific Name	Common Name	Grassland	Ruderal
Iris pseudoacorus	Yellow Iris	R	
Lathyrus latifolius	Broad-leaved everlasting pea	R	
Lathyrus pratensis	Meadow vetchling	O	
Lathyrus sylvestris	Narrow-leaved everlasting pea	R	
Lepidium draba	Hoary cress	O/LA	O/LA
Leucanthemum vulgare	Ox-eye daisy	O	
Linaria vulgaris	Common toadflax	R	
Lotus corniculatus	Bird's-foot trefoil	R	
Lotus tenuis	Narrow-leaved bird's foot trefoil	O/LA	
Malva sylvestris	Common mallow	F	O/LF
Medicago arabica	Spotted medick	O/LA	
Medicago lupulina	Black medick	F/LA	F/LA
Medicago sativa ssp. varia	Sand lucerne	R	
Melilotus altissimus	Tall melilot	R	
Myosotis arvensis	Field forget-me-not	LF	
Odontites verna	Red bartsia	F/LA	O
Ononis repens	Restharrow	R	
Ophrys apifera	Bee orchid	R	
Origanum vulgare	Wild marjoram	R	
Papaver rhoeas	Common poppy	R	
Pastinaca sativa	Wild parsnip	R	
Picris echioides	Bristly oxtongue		O
Picris hieracioides	Hawkweed oxtongue	F/LA	O
Plantago lanceolata	Ribwort plantain	F/LA	
Potentilla reptans	Cinquefoil	O/LA	O/LA
Prunella vulgaris	Self-heal	O	
Ranunculus repens	Creeping buttercup	O	
Rumex obtusifolius	Broad-leaved dock	O/LA	
Sagina procumbens	Procumbent pearlwort	O/LA	
Senecio jacobaea	Common ragwort	F/LA	
Silene latifolia	White campion	O	
Sonchus asper	Prickly sowthistle	R	O
Torilis japonica	Upright hedge parsley		R
Trifolium campestre	Hop trefoil	O	
Trifolium pratense	Red clover	R	
Trifolium repens	White clover	O/LA	
Tussilago farfara	Coltsfoot	R	
Urtica dioica	Nettle	O/LA	O/LA
Verbascum thapsus	Great mullein	O	
Veronica arvensis	Wall speedwell	R	
Veronica chamaedrys	Germander speedwell	R	
Vicia tetrasperma	Smooth tare	R	

Habitat: Scrub and Woodland

Scientific Name	Common Name	Abundance
Acer pseudoplatanus	Sycamore	O
Betula pendula	Silver birch	O/LA
Buddleia davidii	Butterfly bush	F/LA
Castanea sativa	Sweet chestnut	R
Cornus sanguinea	Dogwood	F/LA
Cotoneaster horizontalis	Wall cotoneaster	O
Crataegus monogyna	Hawthorn	F
Fraxinus excelsior	Ash	O
Laburnum sp.	Laburnum	R
Ligustrum vulgare	Wild privet	O
Malus sp.	Apple	R
Populus tremula	Aspen	LA
Prunus spinosa	Blackthorn	O/LA
Quercus ilex	Holm oak	R
Quercus robur	Pedunculate oak	R
Rhamnus catharticus	Buckthorn	R
Robinia pseudoacacia	False acacia	R
Rosa canina	Dog rose	F
Salix caprea	Goat willow	O
Salix cinerea	Grey willow	O/LA
Sambucus nigra	Elder	F
Syringa vulgaris	Lilac	R
Tamarix sp.	Tamarisk	R
Tillia x europaea	Common lime	R
Viburnum lantana	Wayfaring tree	O
Yucca sp.	Yucca	R

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