Highsted Park, South

Baseline Ecological Appraisal

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1 Introduction

1.1 Background

1.1.1 Aspect Ecology has been commissioned to advise in respect of ecological matters for Highsted Park, South, relating to land to the south-east of Sittingbourne, centred at grid reference TQ911621 (as shown on Plan 4657/ECO1), hereafter referred to as the 'site'. The site is proposed for large-scale mixed use development, highways infrastructure and provision of open space.

1.2 Site Overview

1.2.1 The site is located to the south east of Sittingbourne, and is set within a largely open farmland landscape, dominated by arable land and intensively managed orchards. The site covers a large area of land stretching from the M2 in the south to the A2 in the north. The existing settlement of Sittingbourne lies to the north west of the site, Bapchild lies to the north and Rodmersham Green to the south and east. The site is largely bounded on other sides by open farmland along with some woodland, whilst the existing development of Kent Science Park sits within the southern part of the site.

1.2.2 The site itself largely comprises arable land with intensively managed orchards in the central and northern parts of the site. Other habitats present include a disused quarry supporting a developing woodland and scrub mosaic (divided into three separate basins, identified as Quarries A, B and C on Plan 4657/ECO3), woodland blocks and wooded strips, grassland, hedgerows and trees, together with a number of groups of buildings. The quarry basins and an adjacent species-rich grassland area are subject to non-statutory designation as Highsted Quarries Local Wildlife Site (LWS), whilst Cromer's Wood LWS, which also comprises Ancient Woodland, is located adjacent to the site at the south east. Two further areas of Ancient Woodland are present within the site, both located in the southern half, namely Highsted Wood and Bex Wood. For ease of reference throughout this report the site has been subdivided into four areas as shown on Plans 4657/ECO3a-d. These are characterised as follows:

- Area A relates to areas surrounding Kent Science Park and to the south of Broadoak Road. This area largely comprises arable land and includes Bex Wood Ancient Woodland;
- Area B relates to land located between Broakoak Road to the south, and Highsted Road to the north-east. This area largely comprises arable land with a small area of commercial orchard and includes Quarries A and B and the adjacent species-rich grassland forming part of Highsted Quarries Local Wildlife Site (LWS) and Highsted Wood Ancient Woodland;
- Area C relates to land located between Highsted Road to the west and Church Street to the east. This area is dominated by commercial orchards with arable fields to the north and west;
- Area D relates to land located to the east of Church Street. This area is dominated by arable land and commercial orchards.

1.2.3 Whilst the existing Kent Science Park is included within the site, the main area of the Science Park will not be directly affected under the proposed development. As such, it has not been subject to specific survey as part of this baseline ecological appraisal.

1.3 Purpose of the Report

1.3.1 This report documents the methods and findings of the baseline ecology surveys and desktop study carried out in order to establish the existing ecological interest of the site, with an evaluation of the importance of the habitats and species present.

2 Methodology

2.1 Desktop Study

2.1.1 In order to compile background information on the site and its immediate surroundings, a number of recording organisations and online data sources were consulted.

2.1.2 To gather information on nearby ecological designations and known sites for protected and notable species, Kent and Medway Biological Records Centre (KMBRC) was contacted in 2017, with data requested for approximately a 2km radius from the site boundary. KMBRC also provided records held by Kent Bat Group (KBG), Kent Ornithological Society (KOS) and Kent Reptile and Amphibian Group (KRAG).The information received from these organisations is discussed in the text and reproduced, where appropriate, on Plan 4657/ECO2.

2.1.3 Information on statutory designations was obtained from the online Multi-Agency Geographic Information for the Countryside (MAGIC) database, which utilises data provided by Natural England, with an extended search radius (25km). In addition, the MAGIC database was searched to identify the known presence of any Priority Habitats within or adjacent the site. This information was refreshed in March 2021. Relevant information is reproduced at Appendix 4657/1 and on Plan 4657/ECO2, where appropriate.

2.1.4 In addition, the Woodland Trust database was searched for any records of ancient, veteran or notable trees within or adjacent to the site, most recently in March 2021.

2.2 Habitat Survey

2.2.1 The site was subject to habitat surveys between April 2017 and March 2018 in order to ascertain the general ecological value of the land contained within the boundaries of the site and provide a detailed assessment in relation to particular habitat types. An earlier visit was also made to the area of Highsted Quarries LWS in August 2016.

2.2.2 The survey was based on standard Phase 1 Habitat Survey methodology[1], whereby the habitat types present are identified and mapped, together with an assessment of the species composition of each habitat. This technique provides an inventory of the basic habitat types present and allows identification of areas of greater potential which require further survey. Any such areas identified can then be examined in more detail through Phase 2 surveys. This method was extended, in line with the Guidelines for Preliminary Ecological Appraisal[2] to record details on the actual or potential presence of any notable or protected species or habitats.

2.2.3 Using the above method, the site was classified into areas of similar botanical community types, with a representative species list compiled for each habitat identified. The nomenclature used for plant species is based on the Botanical Society for the British Isles (BSBI) Checklist.

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1 Joint Nature Conservation Committee (2010) *'Handbook for Phase 1 habitat survey: A technique for environmental audit.'*

2 Chartered Institute for Ecology and Environmental Management (CIEEM) (2013) '*Guidelines for Preliminary Ecological Appraisal.*'

2.2.4 For woodland, grassland, hedgerow and pond habitats in particular, detailed habitat descriptions and species lists were recorded to allow a comprehensive assessment of these habitat types. To supplement the survey information recorded, Google Earth's historical imagery timeline feature was utilised to provide further information regarding longevity of features, particularly in regard to woodland habitats. Where utilised, this is referenced in the report text.

2.2.5 A review of historical mapping has also been undertaken in regard to Ancient Woodland areas.

2.2.6 In addition to this, the disused quarries and adjacent species-rich grassland, which are designated as a LWS (namely Highsted Quarries LWS) along with Highsted Wood, which comprises Ancient Woodland, were subject to more detailed survey in May and June 2017 in accordance with the National Vegetation Classification (NVC) methodology. This involved the recording of all species within a 2x2m quadrat, with an assessment of abundance based on the 10 point Domin scale. 5 quadrat areas were recorded at Highsted Wood, within each of Quarries A and C and within the species-rich grassland adjacent to Quarry A, whilst 10 quadrats were surveyed within Quarry B. The quadrats were well dispersed within the areas. A list of other species recorded outside of quadrat areas was also compiled. The results of this survey work are provided at Appendix 4657/4.

2.2.7 Subsequently, an update walkover survey was undertaken in January 2021 to confirm the current extent of habitats within the survey area and identify any changes since the previous surveys.

2.3 Faunal Surveys

2.3.1 General faunal activity, such as mammals or birds observed visually or by call during the course of the surveys was recorded. Particular attention was also paid to the potential presence of any protected, rare or notable species, and specific survey work has been carried out in respect of bats, Badger *Meles meles,* Dormouse *Muscardinus avellanarius*, breeding and wintering birds, amphibians, reptiles and invertebrates, as detailed below.

2.3.2 Due to subsequent changes to the site boundary, a number of areas of land were not included as part of the specific faunal surveys. This is of particular relevance to bats and birds, with the additional habitat areas not considered to provide particular opportunities for Dormouse, amphibians, reptiles or invertebrates, whilst subsequent habitat surveys of these areas included survey for Badger. This is discussed further where relevant below.

Bats[3]

Visual Inspection Surveys

2.3.3 **Buildings.** Buildings and built structures within the site were subject to external inspection surveys as part of the habitat surveys between April 2017 and March 2018.

2.3.4 During the external inspections, particular attention was given to any potential roost features or access points, such as broken or lifted roof tiles, lifted lead flashing, soffit

[3] Based on: English Nature (2004) "Bat Mitigation Guidelines"; Bat Conservation Trust (BCT) (2012) "Bat Surveys – Good Practice Guidelines" 2nd edition; and Bat Conservation Trust (2016) "Bat Surveys for Professional Ecologists – Good Practice Guidelines" 3rd edition.

boxes, weatherboarding, hanging tiles, etc. and for any external signs of use by bats such as accumulations of bat droppings or staining. Binoculars were used to inspect any inaccessible areas more closely where appropriate.

2.3.5 Building groups B2, B3 and buildings B4 and B6 (identified at Plan 4657/ECO4) were also subject to detailed survey including internal inspections where enclosed roof voids were present in August 2018 and November 2018. During the internal inspections, evidence for the presence of bats was searched for with particular attention paid to any loft voids and relevant potential roost features and locations, such as ridge boards, rafters, purlins, gable walls, and mortise joints. Specific searches were made for bat droppings that can indicate present or past use and extent of use, whilst other signs that can indicate the possible presence of bats were also searched for, e.g. presence of stained areas, feeding remains, corpses, etc. Any droppings collected during the course of the surveys were visually assessed and attributed to a species where possible on the basis of size/shape/texture[4]. Where appropriate, samples of similar droppings were collected with gloved hands and put into labelled eppendorfs, and forwarded to the University of Warwick for DNA analysis.

2.3.6 **Trees**. As part of the habitat surveys between April 2017 and March 2018, trees were assessed for their suitability to support roosting bats based on the presence of features such as holes, cracks, splits or loose bark. Suitability for roosting bats was rated based on relevant guidance[5] as:

- Negligible;
- Low;
- Moderate; or
- High.

2.3.7 Any potential roost features identified were also inspected for any signs indicating possible use by bats, e.g. staining, scratch marks, bat droppings, etc.

Emergence/re-entry surveys and assessment of roosting activity

2.3.8 **Buildings and Trees.** Emergence/re-entry surveys of buildings B4 and B6 supporting elevated roosting potential and trees supporting moderate or high bat roosting potential identified as likely to be affected under the proposals[6] were undertaken during summer 2018.

2.3.9 Surveys of tree groups identified as potentially being impacted under the proposals were also undertaken, including TG2, TG3, TG4 and TG5. Due to the wooded character and number of trees present within areas TG2, TG4 and TG5, surveys of these areas were undertaken as walked transects, with two surveyors walking continuously around the area and focusing on identified trees to record any evidence of roosting activity, such as emerging or re-entering bats and swarming activity. Particularly at dawn, bats were followed to identify any roosts, and consideration has also been given to times the first/last bats were recorded relative to sunset/sunrise. Whilst this type of survey does not provide a comprehensive assessment of presence of roosts within

4 Stebbings, RE, Yalden DW and Herman, JS (2007). '*Which bat is it? A guide to bat identification in Great Britain and Ireland.*' The Mammal Society

5 Collins, J. (ed.) (2016) '*Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd edn).' Bat Conservation Trust

6 Surveys covered the majority of buildings and trees supporting elevated roosting potential likely to be affected based on current proposals at the time. However, due to subsequent changes to the scheme, not all features have been surveyed in detail.

individual trees, it provides an indication of whether significant roosting activity is present to inform an assessment of impacts, whilst more targeted surveys can be undertaken at the detailed stage.

2.3.10 Surveyors employed Echometer EM3 or EM Touch handheld bat detectors alongside BatBox Duet detectors to aid identification of any bats observed. At dusk, surveyors were in position 15-30 minutes prior to sunset, remaining in place for approximately 2 hours. At dawn, surveyors were in place approximately 1 hour 30 minutes to 2 hours before sunrise and remained in place until 15 minutes after sunrise. This survey method aims to identify any roosting bats emerging from or returning to potential roost sites.

2.3.11 This survey work was carried out during suitable weather conditions, as set out in Table 2.1 below.

Table 2.1: Emergence/re-entry survey details.

Date	Start & end times & time of sunset	Structure reference / location	Number of surveyors	Weather
19/07/2018 (Dusk)	Start time: 20:48 End time: 22:48 Sunset: 21:03	B4	4 surveyors	19°C, 80% cloud, BF1, dry
20/07/2018 (Dawn)	Start time: 03:19 End time: 05:04 Sunrise: 05:04	B4	4 surveyors	15°C, 80% cloud, BF1, dry
17/07/2018 (Dusk)	Start time: 20:51 End time: 22:51 Sunset: 21:06	B6	2 surveyors	19°C, 2% cloud, BF1, dry
18/07/2018 (Dawn)	Start time: 03:16 End time: 05:01 Sunrise: 05:01	B6	2 surveyors	14°C, 5% cloud, BF1, dry
13/08/2018 (Dusk)	Start time: 20:23 End time: 22:23 Sunset: 20:23	B6	2 surveyors	20°C, 100% cloud, BF1, occasional rain
14/08/2018 (Dawn)	Start time: 03:42 End time: 05:42 Sunrise: 05:42	B6	2 surveyors	16°C, 0% cloud, BF2, dry
25/06/2018 (Dusk)	Start time: 21:02 End time: 23:02 Sunset: 21:17	T7	1 surveyor	19°C, 0% cloud, BF1, dry
28/06/2018 (Dawn)	Start time: 02:58 End time: 04:43 Sunrise: 04:43	T7	1 surveyor	13°C, 100% cloud, BF3, dry
25/06/2018 (Dusk)	Start time: 21:02 End time: 23:02 Sunset: 21:17	T8	1 surveyor	19°C, 0% cloud, BF1, dry
28/06/2018 (Dawn)	Start time: 02:58 End time: 04:43 Sunrise: 04:43	T8	1 surveyor	13°C, 100% cloud, BF3, dry
26/06/2018 (Dawn)	Start time: 02:55 End time: 04:55 Sunrise: 04:40	T27	1 surveyor	14°C, 0% cloud, BF1, dry
27/07/2018 (Dusk)	Start time: 21:02 End time: 23:02 Sunset: 21:17	T27	1 surveyor	16°C, 10% cloud, BF2, dry
26/06/2018 (Dawn)	Start time: 02:55 End time: 04:55 Sunrise: 04:40	T28	1 surveyor	14°C, 0% cloud, BF1, dry
27/07/2018 (Dusk)	Start time: 21:02 End time: 23:02 Sunset: 21:17	T28	1 surveyor	16°C, 10% cloud, BF2, dry

Date	Start & end times & time of sunset	Structure reference / location	Number of surveyors	Weather
25/06/2018 (Dusk)	Start time: 21:02 End time: 23:02 Sunset: 21:17	T29	1 surveyor	19°C, 0% cloud, BF2, dry
16/07/2018 (Dusk)	Start time: 20:52 End time: 22:52 Sunset: 21:07	T29	1 surveyor	25°C, 30% cloud, BF1, dry
26/06/2018 (Dawn)	Start time: 02:55 End time: 04:55 Sunrise: 04:40	T31	1 surveyor	13°C, 0% cloud, BF2, dry
17/07/2018 (Dusk)	Start time: 20:54 End time: 22:51 Sunset: 21:06	T31	1 surveyor	18°C, 10% cloud, BF2, dry
26/06/2018 (Dawn)	Start time: 02:55 End time: 04:42 Sunrise: 04:40	T33	1 surveyor	13°C, 0% cloud, BF1, dry
18/07/2018 (Dawn)	Start time: 03:16 End time: 05:01 Sunrise: 05:01	T33	1 surveyor	14°C, 5% cloud, BF1, dry
26/06/2018 (Dusk)	Start time: 21:02 End time: 23:02 Sunset: 21:17	T35	1 surveyor	16°C, 5% cloud, BF1, dry
26/06/2018 (Dusk)	Start time: 21:02 End time: 23:02 Sunset: 21:17	T36	1 surveyor	16°C, 5% cloud, BF1, dry
26/06/2018 (Dusk)	Start time: 21:02 End time: 23:02 Sunset: 21:17	TG2 (parkland)	2 surveyors*	15°C, 0% cloud, BF3, dry
27/06/2018 (Dawn)	Start time: 02:57 End time: 04:42 Sunrise: 04:42	TG2 (parkland)	2 surveyors*	13°C, 100% cloud, BF3, dry
16/07/2018 (Dusk)	Start time: 20:52 End time: 22:52 Sunset: 21:07	TG2 (parkland)	2 surveyors*	25°C, 30% cloud, BF1, dry
17/07/2018 (Dawn)	Start time: 03:15 End time: 05:00 Sunrise: 05:00	TG2 (parkland)	2 surveyors*	17°C, 80% cloud, BF1, dry
25/06/2018 (Dusk)	Start time: 21:02 End time: 23:02 Sunset: 21:17	TG3	1 surveyor	19°C, 0% cloud, BF1, dry
17/07/2018 (Dawn)	Start time: 03:15 End time: 05:00 Sunrise: 05:00	TG3	1 surveyor	17°C, 80% cloud, BF1, dry
27/06/2018 (Dusk)	Start time: 21:02 End time: 23:02 Sunset: 21:17	TG4 (edge of Highsted Wood)	2 surveyors*	14°C, 100% cloud, BF4, dry
28/06/2018 (Dawn)	Start time: 02:58 End time: 04:43 Sunrise: 04:43	TG4 (edge of Highsted Wood)	2 surveyors*	14°C, 100% cloud, BF2, dry
14/08/2018 (Dusk)	Start time: 20:22 End time: 22:22 Sunset: 20:21	TG4 (edge of Highsted Wood)	2 surveyors*	18°C, 40% cloud, BF2, dry
15/08/2018 (Dawn)	Start time: 03:45 End time: 05:43 Sunrise: 05:43	TG4 (edge of Highsted Wood)	2 surveyors*	16°C, 30% cloud, BF2, dry
13/08/2018 (Dusk)	Start time: 20:22 End time: 22:22 Sunset: 20:21	TG5 (Quarry C)	2 surveyors*	21°C, 100% cloud, BF0, light rain
14/08/2018 (Dawn)	Start time: 03:45 End time: 05:43 Sunrise: 05:43	TG5 (Quarry C)	2 surveyors*	16°C, 0% cloud, BF0, dry

Date	Start & end times & time of sunset	Structure reference / location	Number of surveyors	Weather
25/09/2018 (Dusk)	Start time: 20:22 End time: 22:22 Sunset: 20:21	TG5 (Quarry C)	2 surveyors*	14°C, 0% cloud, BF0, dry
26/09/2018 (Dawn)	Start time: 03:45 End time: 05:43 Sunrise: 05:43	TG5 (Quarry C)	2 surveyors*	8°C, 10% cloud, BF1, dry

BF0 = calm, BF12 = hurricane force.
** Surveys of these tree groups were carried out as walked transects to provide an indication of roosting activity, as detailed above*

2.3.12 **Hibernation surveys.** A partially filled in tunnel linking Quarries B and C (identified as B5b on Plan 4657/ECO4) was noted to support potential opportunities for hibernating bats. As such, further investigations were undertaken comprising deployment of an SM4BAT ZC automated bat detector within the tunnel over winter to record any registrations of bats entering or leaving the tunnel. The detector was set out at the point at which the tunnel narrows, approximately 5m inside the entrance, and was left in place to record continuously between 20 December 2017 and 28 April 2018. The tunnel entrance was also closely inspected for any evidence of roosting bats (such as droppings) during the deployment and collection of the detector, and when batteries were changed on 7 February, 8 March and 26 March 2018.

Activity surveys

2.3.13 **Manual activity transects.** A series of dusk and dawn activity surveys were undertaken across the site between April and September 2017 to gather information on the use of the site by foraging and commuting bats. This involved surveyors walking a predetermined route around the site and recording the presence of bats using combinations of Echo Meter EM3 and Echo Meter Touch detectors, both while walking and at predetermined 'listening stops', noting down time, activity and species. The survey aimed to identify the species, location, distribution, abundance and activity of any bat activity within the site and so build up a pattern of bat activity across the area.

2.3.14 Due to the large area involved, the site was covered by 12 individual survey transects, as shown on Plan 4657/ECO5. Three transects (transects 1-3) covered habitats likely to be of elevated value for foraging/commuting bats including Highsted Quarries LWS, Highsted Wood, Bex Wood and Cromer Wood and were subject to monthly dusk and/or dawn surveys between April and September inclusive. The remainder of the site, supporting habitat of relatively low value for foraging/commuting bats being dominated by arable land and commercial orchards, was covered by nine further transects (Transects A-I), each of which were subject to three dusk and/or dawn surveys between May and September. Transect routes are shown on Plan 4657/ECO5, and dates of surveys are shown in Table 2.2 below.

2.3.15 The dusk activity surveys commenced at sunset and lasted until approximately 2 hours after sunset. The dawn activity surveys commenced approximately 2 hours before sunrise and terminated at sunrise. All survey work was undertaken during suitable weather conditions, as set out within Table 2.2 below.

Table 2.2. Walked transect survey details and weather conditions.

Date	Start & end times & time of sunset / sunrise	Transect / location	Equipment used	Weather
20/04/2017 (Dusk)	Start time: 20.04 End time: 22.04 Sunset: 20.04	Transects 1, 2 and 3 (Forwards) – 1st survey	Echo Meter EM3.	Dry, 70% cloud, BF1, 12°C
24/05/2017 (Dusk)	Start time: 20.55 End time: 22.55 Sunset: 20.55	Transects 1, 2 and 3 (Backwards) – 2nd survey	Echo Meter EM3.	Dry, 10% cloud, BF1, 18°C
25/05/2017 (Dawn)	Start time: 02.53 End time: 04.53 Sunset: 04.53	Transects 1, 2 and 3 (Backwards) – 2nd survey	Echo Meter EM3.	Dry, 0% cloud, BF2, 14°C
19/06/17 (Dusk)	Start time: 21.16 End time: 23.38 Sunset: 21.16	Transects A and B (Forwards) – 1st survey	Echo Meter EM3.	Dry, 15% cloud, BF2, 21°C
20/06/17 (Dawn)	Start time: 02.41 End time: 04.41 Sunrise: 04.41	Transects A and B (Forwards) – 1st survey	EM Touch and Echo Meter EM3.	Dry, 15% cloud, BF2, 15°C
20/06/17 (Dusk)	Start time: 21.17 End time: 23.17 Sunset: 21.17	Transect 2 (Forwards) – 3rd survey Transects C, D and E (Forwards) – 1st survey	Echo Meter EM3.	Dry, 100% cloud, BF3, 21°C
21/06/17 (Dawn)	Start time: 02.40 End time: 04.44 Sunrise: 04.44	Transect 2 (Forwards) – 3rd survey Transects C, D and E (Forwards) – 1st survey	Echo Meter EM3.	Dry, 10% cloud, BF1, 16°C
21/06/17 (Dusk)	Start time: 21.16 End time: 23.34 Sunrise: 21.16	Transects H and I (Forwards) – 1st survey	Echo Meter EM3.	Dry, 15% cloud, BF2, 24°C
22/06/17 (Dawn)	Start time: 02.40 End time: 04.44 Sunrise: 04.41	Transects H and I (Forwards) – 1st survey	Echo Meter EM3	Dry, 0% cloud, BF3, 19°C
22/06/2017 (Dusk)	Start time: 21.17 End time: 23.17 Sunset: 21.17	Transects 1 and 3 (Forwards) – 3rd survey Transects F and G (Forwards) – 1st survey	EM Touch and Echo Meter EM3.	Dry, 20% cloud, BF4, 22°C
23/06/2017 (Dawn)	Start time: 02.41 End time: 04.41 Sunset: 04.41	Transects 1 and 3 (Forwards) – 3rd survey Transects F and G (Forwards) – 1st survey	EM Touch and Echo Meter EM3.	Dry, 20% cloud, BF3, 15°C
17/07/2017 (Dusk)	Start time: 21.06 End time: 23.06 Sunset: 21.06	Transects A, B and C (Backwards) – 2nd survey	Echo Meter EM3.	Dry, 40% cloud, BF2, 19°C
18/07/2017 (Dawn)	Start time: 03.00 End time: 05.00 Sunset: 05.00	Transects A, B and C (Backwards) – 2nd survey	Echo Meter EM3.	Dry, 80% cloud, BF3, 14°C
18/07/2017 (Dusk)	Start time: 21.04 End time: 23.04 Sunset: 21.04	Transects D, E and F (Backwards) – 2nd survey	Echo Meter EM3.	Dry, 90% cloud, BF4, 17°C
19/07/2017 (Dusk)	Start time: 21.03 End time: 23.03 Sunset: 21.03	Transects G, H and I (Backwards) – 2nd survey	Echo Meter EM3.	Dry, 80% cloud, BF4, 21°C
25/07/2017 (Dusk)	Start time: 20.59 End time: 22.59 Sunset: 20.59	Transects 1, 2 and 3 (Backwards) – 4th survey	Echo Meter EM3.	Dry, 5% cloud, BF2, 21°C
26/07/2017 (Dawn)	Start time: 03.10 End time: 05.15 Sunset: 05.15	Transects 1, 2 and 3 (Backwards) – 4th survey	Echo Meter EM3.	Dry, 10% cloud, BF1, 16°C

Date	Start & end times & time of sunset / sunrise	Transect / location	Equipment used	Weather
14/08/2017 (Dusk)	Start time: 20.20 End time: 22.20 Sunset: 20.20	Transects 1, 2 and 3 (Forwards) – 5th survey	Echo Meter EM3.	Largely dry, some light rain between 20.48 and 20.55, 100% cloud, BF2, 19°C
15/08/2017 (Dusk)	Start time: 20.20 End time: 22.20 Sunset: 20.20	Transects A, B and C (Forwards) – 3rd survey	Echo Meter EM3.	Dry, 60% cloud, BF3, 14°C
16/08/2017 (Dusk)	Start time: 20.18 End time: 22.18 Sunset: 20.18	Transects D, E and F (Forwards) – 3rd survey	Echo Meter EM3.	Dry, 80% cloud, BF2, 16°C
20/09/2017 (Dusk)	Start time: 19.00 End time: 21.00 Sunset: 19.00	Transects 1, 2 and 3 (Backwards) – 6th survey	Echo Meter EM3.	Dry, 30% cloud, BF2, 16°C
21/09/2017 (Dusk)	Start time: 18.59 End time: 20.59 Sunset: 18.59	Transects G, H and I (Forwards) – 3rd survey	Echo Meter EM3.	Some light rain, 90% cloud, BF5, 17°C

*wind BF: 0 = calm, BF12 = hurricane force

2.3.16 Within the quarries, the presence of steep slopes and dense vegetation constrained routes that could be safely walked during bat activity surveys. A representative transect was possible within Quarry B, utilising the track which follows the perimeter of the quarry basin, whilst an accessible route was available along the base of the south-eastern slope within Quarry A. However, the route into the main quarry basins within Quarry C involves steep slopes and difficult terrain and was not safe to attempt after dark, such that the transect followed the perimeter of the quarry edge. In any event, additional information has been obtained during the focused roosting activity surveys of this quarry detailed above (with access initially undertaken in the light, allowing familiarisation with the route).

2.3.17 A small number of areas have not been included as part of the bat activity surveys due to subsequent changes to the site boundary, as evident from the transect routes shown at Plan 4657/ECO5. However, given these additional areas are dominated by intensive arable land and commercial orchards considered to be of low value to foraging/commuting bats, whilst habitats within the initial survey area are representative of these additional areas and an assessment can be made on this basis, it was not considered necessary to undertake further surveys.

2.3.18 **Automated activity surveys.** In addition to the walked activity surveys, static bat detectors were employed during 2017 to carry out remote recording of bats. 24 survey locations were used across the site (corresponding to 2 survey locations per activity transect). Those locations relating to transects 1-3 (higher quality habitat), namely static positions 1-6, were subject to monthly surveys between April and September 2017, whilst static positions 7-24 (relating to lower quality habitat) were subject to three surveys between May and August/October 2017, using Song Meter SM2BAT+ and SM4BAT ZC detectors. Automated detectors were typically deployed for at least five days on each deployment[7]. Further details of dates of deployment are provided at Appendix 4657/9 and the location of static recording points are shown on Plan 4657/ECO6.

2.3.19 As detailed at Appendix 4657/9, a small number of the static detector units failed to record on a small number of occasions. However, given the large amount of survey

[7] Albeit due to battery life some detectors did not record for the full 5 day period.

information available across the site during 2017, this is not considered to be a significant limitation to the survey.

Analysis of Bat Survey Recordings

2.3.20 All bat calls were analysed using BatSound v.3.30© and Analook W v3.7 to verify the species recorded during the survey work. Where recordings could not be reliably attributed to species (such as for *Myotis* species) or where overlaps between otherwise distinguishable species occur (such as in Pipistrelle bat calls around 40kHz or 50kHz) calls were identified to genus level; in the case of calls which could not be distinguished between *Nyctalus* sp. and Serotine, these have been labelled as 'unidentified big bat' species.

Badgers[8]

2.3.21 The site was searched thoroughly for evidence of Badger activity as part of visits to the site during 2017 and 2018, in order to build a picture of the use of the site by Badgers. Evidence recorded included the presence of any Badger setts, well-worn paths and push-throughs, snagged hair, footprints, latrines or foraging signs. The survey attempted to cover all habitats present, although particularly within the quarries where dense vegetation and steep slopes are present, all areas could not be fully searched.

2.3.22 For any setts that were encountered, each sett entrance was noted and plotted even if the entrance appeared disused. The following information was recorded:

- The number and location of well used or very active entrances; these are clear from any debris or vegetation and are obviously in regular use and may, or may not, have been excavated recently;
- The number and location of inactive entrances; these are not in regular use and have debris such as leaves and twigs in the entrance or have plants growing in or around the edge of the entrance;
- The number of disused entrances; these have not been in use for some time, are partly or completely blocked and cannot be used without considerable clearance. If the entrance has been disused for some time all that may be visible is a depression in the ground where the hole used to be and the remains of the spoil heap.

2.3.23 Based on the recorded level of activity and distribution of setts, each sett has been classified as a main, annex, subsidiary or outlier sett, and territory areas have been estimated.

2.3.24 Identified Badger setts were then rechecked during the update habitat survey in January 2021, whilst any additional evidence of Badger was recorded.

Dormouse[9]

2.3.25 Given the presence of potential Dormouse habitat within the site, a nest tube survey was undertaken to establish the presence / absence of Dormice within the site between June and November 2017 inclusive. Survey work followed methodology set out within the Dormouse Conservation Handbook 2006, whereby nesting tubes are

[8] Based on: Mammal Society (1989) "*Occasional Publication No. 9 – Surveying Badgers*"

[9] Based on: English Nature (2006) *"The Dormouse Conservation Handbook, 2nd Edition* and English Nature (2003) *"Surveying dormice using nest tubes: Results and experiences from the South West Dormouse Project"* – English Nature Research Reports NO. 524

attached to branches of trees and shrubs and checked on a regular basis for signs of use by Dormouse.

2.3.26 The guidance employs an indexation system to define survey effort, based on the number of tubes deployed and months over which these are in place and are checked for signs of use. Months in which use of nest tubes by Dormouse is more likely afford a higher number of points than months when there is a lower likelihood of use. The guidance recommends that determination of absence of Dormouse from a site should be based on a survey effort score of at least 20 points.

2.3.27 Accordingly, a total of 400 Dormouse nest tubes were deployed within wooded habitats within and bounding the site, as shown on Plan 4657/ECO8. Dormouse tubes were erected between 28 June and 4 July 2017 and were subsequently checked in August, September and November 2017, giving a total survey effort score of 144 points across the entire site.

2.3.28 All areas were checked during the August and September surveys, although the November survey focused only on transects where Dormice had not previously been recorded.

Breeding Birds[10]

2.3.29 The use of the site by breeding birds was assessed over three survey visits in May and June 2017. Birds present within the site were recorded using a method modified from the British Trust for Ornithology's (BTO's) Common Bird Census technique.

2.3.30 The survey walking a route across the site and recording all 'registrations' of birds either seen or heard. The sightings or 'registrations' were recorded on a site plan using standard BTO codes for each bird species and appropriate abbreviations.

2.3.31 This survey methodology has the advantage over other survey methods of mapping each registration to a specific point within the site and this therefore illustrates those areas containing the highest density and diversity of bird species. The survey dates, timings and weather conditions are set out in Table 2.3 below. Due to the large size of the site, each survey visit was conducted over two days, as indicated in the table below.

Table 2.3: Breeding bird survey dates and weather conditions.

Survey Date	Weather Conditions			
	Wind (BF)	Temp(°C)	Cloud Cover (%)	Precipitation
07-08/05/2017	1-3	8	40-100	Dry
22-23/05/2017	1-3	11-19	10-80	Dry
17-18/06/2017	1-2	18-29	10	Dry

*wind BF: 0 = calm, BF12 = hurricane force

2.3.32 Due to subsequent changes to the site boundary, a number of areas of land were not included as part of the survey (see Plan 4657/ECO9). However, given these additional areas are dominated by intensive arable land and commercial orchards considered to be of low value to breeding birds, whilst habitats within the initial survey area are representative of this additional area, it was not considered necessary to undertake

[10] Surveys based on methodology within: Baille *et al*. RA (2010) '*Breeding Birds in the Wider Countryside: their conservation status*', BTO Research Report No. 385, BTO, Thetford.

further surveys. Instead an estimate of additional territories likely to be supported by this area has been made based on habitat type and area where relevant.

Wintering Birds[11]

2.3.33 Three wintering bird surveys were initially conducted at the site in winter 2016/17 based around the methodology set out in Scottish Natural Heritage (SNH) Guidance, which although relating specifically to onshore windfarms sets out a number of methodologies for bird surveys that are applicable to a wide range of situations.

2.3.34 Three visits were made to the site during suitable weather between January and March 2017. On each survey an experienced ornithologist walked a circuitous route that took in all field margins. Most surveys either started or ended in the hours of darkness in order to record nocturnal species such as owls. The dates and times of each survey, together with a summary of the weather conditions are given in Table 2.4 below. Due to the large size of the site, each survey visit was conducted over two days, as indicated in the table below.

Table 2.4: 2016/17 wintering bird survey dates and weather conditions.

Survey Date	Weather Conditions			
	Wind (BF)	Temp(°C)	Cloud Cover (%)	Precipitation
13-14/02/2017	NW2-5	1 (max)	90-100	Severe winter weather, with snow and ice
17-18/02/2017	S0-1	7-10	50-100	Dry
05-06/03/2017	W2	9	50	Dry

*wind BF: 0 = calm, BF12 = hurricane force

2.3.1 As set out above, a number of areas of land were not included as part of the survey due to subsequent changes to the site boundary (see Plan 4657/ECO9). However, these habitats are similar to the initial survey area, such that they are unlikely to support any elevated wintering bird interest.

2.3.2 Given particular wintering bird interest was recorded in the northern part of the site around Rodmersham during the 2016/17 surveys, an additional 6 visits were undertaken within this area during winter 2018/19, based on the same methodology outlined above. The dates and times of each survey, together with a summary of the weather conditions are given in Table 2.5 below.

Table 2.5: 2018/19 wintering bird survey dates and weather conditions (focused on area around Rodmersham)

Survey Date	Weather Conditions			
	Wind (BF)	Temp(°C)	Cloud Cover (%)	Precipitation
27/10/2018	NW2	4	15	Dry
24/11/2018	E1	9	100	Dry
22/12/2018	SW2	11	15	Dry
19/01/2019	SE2-3	5	85	Dry
17/02/2019	S3	11	50	Dry
07/03/2019	S5	11	25	Dry

*wind BF: 0 = calm, BF12 = hurricane force

[11] Scottish Natural Heritage (2005) '*Survey Methods for the use in assessing the Impacts of Onshore Windfarms on Bird Communities*'

Great Crested Newt (*Triturus cristatus)*

2.3.3 Waterbodies were subject to specific survey work during 2017 to provide an assessment in relation to amphibian species, notably the European protected species Great Crested Newt.

2.3.4 This initially comprised a search of Ordnance Survey (OS) mapping to identify waterbodies within 500m of the site, whilst ponds within the site were identified from mapping and habitat survey.

2.3.5 Guidance set out within Natural England's Method Statement template, to be used when applying for a Great Crested Newt development licence, states that surveys of ponds within 500m of the site boundary but beyond 250m are only required when '(a) data indicates that the pond(s) has potential to support large Great Crested Newt population, (b) the footprint contains particularly favourable habitat, (c) the development would have a substantial negative effect on that habitat and (d) there is an absence of dispersal barriers.' An assessment of ponds was made on this basis.

2.3.6 As such, a review was undertaken of all ponds within 500m, although several of these were scoped out in terms of survey based on distance from site, presence of barriers to movement (such as the motorway) and poor suitability for Great Crested Newt, or were found to be no longer present or dry at the time of survey. Following this review, ponds considered to support potentially suitable habitat for Great Crested Newt were subject to environmental DNA survey to confirm presence/absence of Great Crested Newt (see below), subject to access being gained in the case of offsite ponds.

Environmental DNA (eDNA)

2.3.7 A method to detect eDNA in water samples was used to investigate the presence/absence of Great Crested Newt within waterbodies identified as supporting potentially suitable habitat, subject to access being granted by landowners.

2.3.8 The sampling method was undertaken in line with the methodology set out within the technical advice note provided by the Freshwater Habitats Trust (FHT) as approved by Natural England. Water sampling was undertaken on 29th June 2017, within the identified acceptable seasonal window set out by Natural England (15th April to 30th June), by Aspect Ecology staff who have previously received training on the sampling technique. Collected samples were returned to Fera Science Ltd. for processing and analysis.

Reptiles[12]

2.3.9 Given the presence of potentially suitable reptile habitat within the site, specific surveys were undertaken to establish the presence/absence of common reptile species between June and August 2017.

2.3.10 A total of 308 50x50cm sheets of thick roofing felt were placed within suitable areas across the site to act as artificial refugia between July and August 2017 (as shown on Plan 4657/ECO11). The refugia, or 'tins', provide shelter and heat up more quickly than their surroundings in the morning and can remain warmer than their surroundings in the late afternoon. Being ectothermic (cold blooded), reptiles use them to bask under and raise their body temperature, which allows them to forage earlier and later in the

[12] Surveys based on: Froglife Advice Sheet 10 (1999) '*Reptile Survey - an introduction to planning, conducting and interpreting surveys for snake and lizard conservation.*'

day. Therefore, checking the refugia at appropriate times of the day enables the presence/absence of common reptiles to be determined.

2.3.11 The refugia remained undisturbed for approximately 1-2 weeks to allow reptiles to find and start using them. Following this initial bedding-in period, refugia were checked at appropriate times of the day on seven occasions during suitable weather, as set out at Table 2.6 below.

Table 2.6: Reptile survey dates and weather conditions.

Survey Date	Weather Conditions			
	Wind (BF)*	Temp(c)	Cloud Cover (%)	Precipitation
12/07/2017	2	18.5	100	0
21/07/2017	4	18	40	0
26/07/2017	1	18	90	0
28/07/2017	2	18	90	0
01/08/2017	3	21	45	0
18/08/2017	3	18	30	0
23/08/2017	2	20	50	0

*wind BF: 0 = calm, BF12 = hurricane force

2.3.12 In addition, reptiles basking in the open or partial cover were actively searched for in suitable locations across the site through direct observation. Existing natural objects (e.g. logs and rocks) and artificial refugia (e.g. debris, tyres, etc.) were also searched, where present, for reptiles or evidence of reptiles (e.g. sloughed skin).

Invertebrates

2.3.13 A number of habitats within the site were considered to support habitat of potential value to invertebrates, namely the disused quarries, areas of woodland, species-rich grassland and the parkland at the south of the site. To provide an assessment of the value of these habitats for invertebrates, a specific invertebrate scoping survey was undertaken by Arachne Ecology Ltd. during July 2017. The survey was undertaken during warm and sunny conditions, and involved a detailed appraisal of habitats and ecological features at the site to determine likely importance for invertebrates and whether the development would have an impact on invertebrate ecology. A record of invertebrate species was also made by direct observation and active sampling methods, although this has not been examined in detail to inform the scoping survey.

2.3.14 Based on the findings of the scoping survey, further invertebrate survey work within these areas was recommended. As such, further invertebrate survey visits were undertaken in June and September 2018 to gather detailed species lists and provide an assessment of the species assemblages present. Further details are provided in the invertebrate survey reports at Appendix 4657/10.

2.4 Survey Constraints and Limitations

2.4.1 All of the species that occur in each habitat would not necessarily be detectable during survey work carried out at any given time of the year, since different species are apparent during different seasons. However, the Phase 1 habitat surveys were largely undertaken within the optimal seasonal period for botanical work, with only small areas of additional land surveyed outside of this period (as a result of changes in the site boundary), ensuring that detailed habitat information could be gathered during the appropriate botanical survey season for each habitat type. Notably, targeted survey in relation to woodlands and habitat mosaics in the disused quarries was carried out during the appropriate survey periods, in May and June 2017. The surveys

undertaken are therefore considered to allow a robust assessment of the ecological interest of the site to be made.

2.4.2 Attention was paid to the presence of any invasive species listed under Schedule 9 of the Wildlife and Countryside Act 1981 (as amended). However, the detectability of such species varies due to a number of factors, e.g. time of year, site management, etc., and hence the absence of invasive species should not be assumed even if no such species were detected during the Phase 1 survey.

2.4.3 Within the quarries, steep slopes and dense vegetation impeded survey access in parts. Whilst a robust survey in terms of habitats has been undertaken, a comprehensive Badger survey of all areas was not possible, and the presence of steep slopes and dense vegetation constrained routes that could be safely walked during bat activity surveys. A representative transect was possible within Quarry B, utilising the track which follows the perimeter of the quarry basin, whilst an accessible route was available along the base of the south-eastern slope within Quarry A. Information on Quarry C was gathered during subsequent roosting surveys in summer 2018.

2.4.4 A recognised limitation of the bat activity surveys is that bat detectors can only provide an index of activity rather than absolute numbers of bats. Therefore, the results of the bat activity surveys should only be considered indicative of the amount of use bats make of an area rather than the abundance of bats. In addition, some bat species, e.g. Brown Long-eared Bat, are difficult to detect due to their quiet echolocation calls.

2.4.5 As detailed above, there have been some amendments to the site boundary since the initial faunal surveys were undertaken. It was not considered necessary to undertake additional surveys within these areas due to the land being dominated by intensive arable land and commercial orchards supporting low quality habitat for faunal species, whilst an assessment of likely status within these parts of the site has been made on the basis of the survey work undertaken.

2.4.6 Aside from this, the specific Phase 2 surveys were undertaken at the appropriate time of year and during suitable weather conditions to an appropriate level of survey effort. Any specific limitations are noted in the relevant sections above or discussed in the results section, although no significant constraints were experienced.

2.4.7 It is noted that some of the faunal survey information is now several years old, and there may have been minor changes to the status of populations at the site. However, the assessment of faunal species has been informed by update habitat survey work, which recorded no particular changes to habitats at the site. As such, there are unlikely to have been any significant changes to the population status of faunal species at the site, and the previous survey information is considered to provide a robust baseline to inform the outline application. In any event, given the large scale nature of the site and outline nature of the application, it will be necessary to undertake further faunal surveys at an appropriate stage to inform the detailed layout and confirm mitigation and licensing requirements. It is proposed that such surveys are carried out in line with the phasing of development, rather than at the present time, to ensure that such information is current at the appropriate detailed stage.

2.5 Ecological Evaluation Methodology

2.5.1 The evaluation of ecological features and resources is based on professional judgement whilst also drawing on the latest available industry guidance and research. The approach taken in this report is based on that described by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2018)13, which involves identifying 'important ecological features' within a defined geographical context (i.e. international, national, regional, county, district, local or site importance). For full details refer to Appendix 4657/2.

[13] CIEEM (2018) '*Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine*', ver. 1.1, Chartered Institute of Ecology and Environmental Management, Winchester

3 Ecological Designations

3.1 Statutory Designations

3.1.1 The statutory designations of nature conservation interest that occur within the local area are shown on Plan 4657/ECO2.

3.1.2 No statutory ecological designations are present within the site. The closest statutory designation to the site is The Swale Site of Special Scientific Interest (SSSI), located approximately 1.5km to the north of the site. The SSSI is designated as the largest remaining freshwater grazing marsh in Kent, along with its estuarine habitats.

3.1.3 Part of The Swale SSSI is also subject to European designation as The Swale Special Protection Area (SPA) and Ramsar site. This is designated on the basis of significant populations of Dark-bellied Brent Goose *Branta bernicla bernicla* and Dunlin *Calidris alpina alpina*, together with notable assemblages of breeding birds and wintering waterbirds.

3.1.4 Part of this area is also subject to designation as Elmley National Nature Reserve (NNR), located approximately 3.8km to the north of the site. This NNR is designated on the basis of supporting grazing marsh with large numbers of overwintering birds.

3.1.5 A number of other European designations are located within 15km of the site, as set out at Table 3.1 below.

3.2 Non-statutory Designations

3.2.1 The non-statutory designations of nature conservation interest that occur within the local area are shown on Plan 4657/ECO2.

3.2.2 Highsted Quarries LWS is located within the site and forms three separate chalk quarry pits (identified as Quarries A, B and C). The quarries are now disused and have colonised with a mosaic of habitats including young woodland, scrub and grassland. An area of species-rich grassland and secondary woodland immediately to the east of Quarry A is also included within the LWS. The LWS was designated in 1985 and is described as three disused deep chalk pits which have been undisturbed for many years. The citation does not specify the reasons for the LWS designation, although the LWS is categorised as 'grassland, scrub and cliffs' and is described as being colonised by a variety of chalk loving herbs and shrubs including Common Spotted-orchid *Dactylorhiza fuchsii,* Twayblade *Neottia ovata* and Southern Marsh-orchid *Dactylorhiza praetermissa*. The site is also noted as likely to be of importance for birds. The citation is provided at Appendix 4657/3, although this has not been revised since 1985, apparently as permission for survey access was not secured. Further detail regarding the quarries and adjacent grassland is provided at Section 4.

3.2.3 Cromer's Wood LWS and Kent Wildlife Trust reserve is located adjacent to the site at the south-east, bordered by the site to the north, west and east as shown on Plan 4657/ECO2. This site is designated on the basis of its Ancient Woodland habitat.

3.2.4 The next nearest non-statutory designation of nature conservation interest to the site is Trundle Wood and High Wood, Bedmonton LWS, located approximately 1km to the south of the site. This LWS largely comprises Ancient Woodland.

3.3 Ancient Woodland

3.3.1 Two parcels of Ancient Woodland are present within the site, namely Highsted Wood and Bex Wood (see Plan 4657/ECO2). Both are characterised as ancient and semi-natural woodland (ASNW) and are described in more detail at Section 4 of this report. Cromer's Wood, located adjacent to the site, also comprises Ancient Woodland (ASNW). There are several further parcels of ASNW and ancient replanted woodland (ARW) within the surrounds of the site (see Plan 4657/ECO2), the closest being Birch Wood, located approximately 100m east of the site at the southernmost extent of the site.

3.4 Priority Habitats and Notable Trees

3.4.1 A search of the Woodland Trust 'Ancient Tree Hunt' database returned a record of an unverified Oriental Plane, which appears to relate to the large, mature specimen located adjacent to the footpath forming the north western boundary to the sports ground, to the north of Broadoak Road (T31 on Plan 4657/ECO4) (albeit the map on the website does not fully line up with this location, it is believed to refer to this tree). No other records of notable trees were returned relating to the site and its immediate surrounds.

3.4.2 The site contains various areas identified in MAGIC as the Priority Habitat 'Deciduous Woodland'. These correspond with the quarry and woodland areas discussed further within the relevant habitat sections in Chapter 4 below. The southern and central quarries (Quarry A and Quarry B) are also identified as 'Open Mosaic Habitat'. This is also discussed further in Chapter 4.

3.4.3 Three areas of 'Traditional Orchard' are also identified in MAGIC, to the east of Ruins Barn Road and adjacent to the M2 in Area A, immediately north of Rodmersham Farm and west of Church Street in Area C, and south-west of Dully Road at the eastern edge of Area D. No evidence of traditional orchard was evident in any of these areas during field surveys, comprising arable, open grassland or commercial orchard. This may be an error of aerial mapping interpretation, or former orchards which have since been cleared.

3.5 Summary

3.5.1 A summary of ecological designations within and surrounding the site is set out below at Table 3.1.

Table 3.1: Summary of ecological designations in the local area.

Site	Status	Description	Distance and Direction from Site	Level of Importance
International Designations (within 15km)				
The Swale	Special Protection Area (SPA) / Ramsar	Supports important populations of breeding and overwintering birds.	1.5km to N	International
Medway Estuary & Marshes	SPA / Ramsar	Supports important populations of breeding and overwintering bird species.	6.1km to N	International
Queendown Warren	SAC	Supports semi-natural dry grassland and scrubland facies on calcareous substrates.	6.2km to W	International

Site	Status	Description	Distance and Direction from Site	Level of Importance
North Downs Woodlands	SAC	Designated on the basis of supporting the Annex I habitats *Asperulo-Fagetum* beech forests and *Taxus baccata* woods of the British Isles, whilst the site also supports Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*)	9.4km to W	International
Thames Estuary and Marshes	SPA / Ramsar	Supports important populations of breeding and overwintering birds.	13.3km to NW	International
Outer Thames Marshes SPA	SPA	Supports important populations of Red-throated diver *Gavia stellata*, Common Tern *Sterna hirundo* and Little Tern *Sternula albifrons*.	11.2km to N	International
Blean Complex SAC	SAC	Designated on the basis of supporting the Annex I habitat Sub-Atlantic and medio-European oak or oak-hornbeam forests of the Capinion betuli (Oak-hornbeam forests)	15.2km to E	International
Other Statutory Designations (within 5km)				
The Swale	Site of Special Scientific Interest (SSSI)	Supports the largest remaining freshwater grazing marsh in Kent, along with its estuarine habitats.	1.5km to N	National
Elmley	National Nature Reserve (NNR)	Supports grazing marsh with significant overwintering bird populations	3.8km to N	National
Non-statutory Designations (within 3km)				
Highsted Quarries	Local Wildlife Site (LWS)	Complex of disused quarries colonised with chalk loving herbs and shrubs.	Located within the site, at the west	District
Cromer's Wood	LWS and Kent Wildlife Trust Reserve	Ancient Woodland	Adjacent to the site at the south-east	District
Trundle Wood and High Wood, Bedmonton	LWS	Comprises largely Ancient Woodland	1km to S	District
Stock Wood and Chalk Slope, Frinsted	LWS	Comprises largely Ancient Woodland	1.3km to S	District
Milton Creek, Sittingbourne	LWS	Tidal creek supporting saltmarsh and mudflats	1.8km to N	District
Church Marshes (Country Park)	LWS	Milton Creek Country Park supporting meadow, scrubland and wetland habitats	2.5km to N	District

4 Habitats and Ecological Features

4.1 Background Records

4.1.1 Data returned from KMBRC included records of several notable plant species including White Helleborine *Cephalanthera damasonium*, Lesser Butterfly Orchid *Platanthera bifolia*, Fly Orchid *Ophrys insectifera*, Pheasant's Eye *Adonis annua*, Basil Thyme *Clinopodium acinos*, Yellow Bird's-nest *Monotropa hypopitys*, Tower Mustard *Arabis glabra* and Cornflower *Centaurea cyanus*, all of which were recorded from within approximately 2km from the site, albeit none appear to relate to the site itself. Records of Basil Thyme relate to a 2km grid square which partially overlaps with the north of the site, and dated 1991-1999 albeit more specific location information was not available. The nearest record to the site is that of Fly Orchid and relates to Cromer's Wood, located approximately 120m west of the site boundary at its nearest point, and dated 1990. However, no evidence for the presence of any of these species was recorded within the site during the survey work undertaken.

4.2 Overview

4.2.1 The habitats and ecological features present within the site are described below and evaluated in terms of whether they constitute an important ecological feature and their level of importance. The value of habitats for the fauna they may support is considered separately in Section 5 below.

4.2.2 The following designated areas have been identified within the site:

- Highsted Quarries LWS
- Highsted Wood Ancient Woodland
- Bex Wood Ancient Woodland

4.2.3 Outside of these areas, the following habitats/ecological features were identified within/adjacent to the site:

- Arable;
- Orchards;
- Woodland and Wooded Strips;
- Parkland;
- Hedgerows / treelines;
- Scattered trees;
- Scrub;
- Grassland;
- Tall ruderal vegetation;
- Ponds;
- Buildings, built structures and hardstanding; and
- Invasive species.

4.2.4 The locations of these habitat types and features are illustrated on Plans 4657/ECO3a-d and described in detail below.

4.3 Priority Habitats

4.3.1 Section 40 of the Natural Environment and Rural Communities (NERC) Act 2006 places duties on public bodies to have regard to the conservation of biodiversity in the exercise of their normal functions. In particular, Sections 41 and 42 of the NERC Act require the Secretary of State to publish a list of habitats which are of principal importance for conservation in England and Wales, respectively. This list is largely derived from the 'Priority Habitats' listed under the former UK Biodiversity Action Plan (BAP), which continue to be regarded as priority habitats under the subsequent country-level biodiversity strategies.

4.3.2 Habitats within the site are considered to qualify under the UK BAP Priority Habitat descriptions for 'Lowland Mixed Deciduous Woodland', 'Wood-pasture and Parkland' and 'Hedgerows', whilst a small amount of land within Highsted Quarries may qualify as a poor example of 'Open Mosaic Habitat on Previously Developed Land'. A number of priority habitat types within Kent are also present within the site. This is discussed further below.

4.4 Highsted Quarries

Description

4.4.1 Three disused chalk quarry basins (labelled as A, B and C on Plans 4657/ECO3b-c) are present within the middle of the site, together with an area of species rich grassland and secondary woodland area adjacent to the south east of Quarry C, which together are subject to non-statutory designation as Highsted Quarries LWS. Based on a review of historical aerial photography, the northern and central quarries (Quarries B and C) were actively being quarried in 1940, whilst no excavation had yet been undertaken within Quarry A, this still forming orchard. By 1960, the northern quarry (Quarry C) was disused, whilst quarrying continued within Quarry B and had commenced within the northern part of Quarry A. Aerial photography from 1990 indicates all three quarry pits are disused, with Quarry C almost entirely wooded, whilst Quarry B is well colonised with developing woodland. Quarry A appears to be largely bare chalk substrate at this time, with only colonising woodland in the north and at the margins.

4.4.2 Each of the three quarry basins form steep sided pits approximately 12-15m deep, colonised largely by woodland along with some scrub and grassland in places. The topography of the quarry bases was recorded to be relatively undulating as a result of the presence of old spoil mounds from the previous use as a quarry, whilst the quarry sides largely comprise near vertical cliffs formed of chalk, with a relatively smooth surface lacking substantial cracks or fissures. For much of their length, these cliffs are vegetated with dense Ivy, together with Harts-tongue Fern *Phyllitis scolopendrium*, Male-fern *Dryopteris filix-mas* and colonising and overhanging wooded vegetation including Buddleja *Buddleja davidii*, whilst evidence of landslips was noted in places, with mounds at the cliff bases.

4.4.3 The three quarry basins and adjacent species rich grassland and secondary woodland forming the LWS are discussed in turn below, whilst the designation citation is

provided at Appendix 4657/3. Results of detailed NVC surveys of the quarries are provided at Appendix 4657/4.

Quarry A

4.4.4 The southernmost quarry basin, located to the south of Cromer Road, is the most recently quarried (since the 1960s) and as recently as 1990 was dominated by largely bare chalk substrate. The quarry basin now supports developing woodland within the north and east, along with a narrow strip of woodland along the west (identified as woodland W1 on Plan 4657/ECO3b), whilst the central part of the quarry is dominated by a bare ground and scrub mosaic. Near vertical cliffs form the northern and western boundaries of the quarry, whilst the south-eastern boundary is formed by a terraced slope, with steep earth banks and flatter areas supporting grassland and wooded vegetation. A tunnel is present at the north east corner, providing vehicle access beneath Cromer Road to Quarry B to the north. This is brick lined, and is blocked by wooded doors at either end.

4.4.5 The woodland in the north and east was recorded to be recently colonised, with a character and species composition largely the same as those recorded in the other quarry basins, comprising a low canopy of Willow *Salix* sp., Sycamore *Acer pseudoplatanus* and Ash *Fraxinus excelsior* and a dense understorey of Buddleja, Hawthorn *Crataegus monogyna*, Elder *Sambucus nigra*, Dogwood *Cornus sanguinea*, Spindle *Euonymus europaeus*, Wild Privet *Ligustrum vulgare* and *Cotoneaster* sp., and a loose scrub layer of Bramble *Rubus fruticosus agg.* The groundflora was noted to be relatively species-poor, comprising largely Common Nettle *Urtica dioica* with some other species recorded infrequently, including Dog's Mercury *Mercurialis perennis*, Ground Ivy *Glechoma hederacea*, Campion *Silene* sp., Stinking Iris *Iris foetidissima*, Harts Tongue Fern, Male Fern and occasional Helleborine *Orchidaceae* sp, whilst occasional specimens of Common Spotted-orchid *Dactylorhiza fuchsii*, Common Twayblade *Listera ovata*, Moschatel *Adoxa moschatellina*, Bluebell *Hyacinthoides non-scripta*, Germander Speedwell *Veronica chamaedrys* Dandelion *Taraxacum officinale agg.,* Garlic *Allium sativum* and Dock *Rumex* sp. were also recorded during the NVC surveys.

4.4.6 The main part of the quarry basin is formed by a bare ground and scrub mosaic, with a stony chalk substrate supporting frequent scattered trees and scrub, dominated by Silver Birch *Betula pendula* with Buddleja and Dogwood along with frequent Cotoneaster forming a dense shrubby ground layer. The ground flora was recorded to be relatively sparse, with species including Perforate St John's-wort *Hypericum perforatum*, Common Centaury *Centaurium erythraea*, Bird's-foot-trefoil *Lotus corniculatus*, Rosebay Willowherb *Chamerion angustifolium*, Common Twayblade and Yellow-wort *Blackstonia perfoliata*. Areas of established grassland are limited to a small clearing at the woodland edge to the north, supporting a relatively herb rich sward dominated by Ground Ivy, Violet *Viola* sp. and Bird's-foot-trefoil. Within a central strip and towards the margins of the quarry basin are areas of largely impenetrable dense shrubby vegetation, dominated by a mixture of Willow, Silver Birch, Dogwood, Elder and Buddleja with some Rosebay Willowherb.

4.4.7 The south-eastern slope supports some small areas of species-rich grassland on the flatter terraces, with species including Thyme Leaved Speedwell *Veronica serpyllifolia*, Perforate St John's-wort, Heath Speedwell *Veronica officinalis*, Sedges *Carex* sp., Yellow-wort, Bird's-foot-trefoil, Barren Strawberry *Potentilla sterilis* and Red Dead

Nettle *Lamium purpureum*. Elsewhere, the slope is dominated by shrub species including Willow, Silver Birch, Buddleja and Dogwood.

Quarry B

4.4.8 Quarry B forms the central quarry, located between Cromer Road to the south, and Highsted Road to the east. The quarry is bordered by near vertical cliffs along its entire boundary, with a narrow gap along the eastern edge providing road access to the quarry, beyond which the road leads down a graded slope to the quarry floor. The majority of the quarry basin is dominated by recolonising woodland (identified as woodland W2 on Plan 4657/ECO3b), although several open clearings are present, supporting a mosaic of grassland, tall ruderal and scrub habitats. In 2021 the understory of the woodland was recorded to have been thinned across much of the area with some new clearings in the middle. The north east and south east of the quarry were recorded to not have been subject to this thinning and as such comprise dense woodland.

4.4.9 The quarry is currently in use by an outdoor pursuits company, and as such contains an obstacle course and areas used for camping and other outdoor activities, whilst a number of portacabins and other temporary buildings are present. Areas of bare ground are present associated with the buildings, whilst a track leads around the basin perimeter. A tunnel is present at the southern edge, leading beneath Cromer Road to Quarry A (as noted above), whilst a collapsed tunnel entrance is present at the north-east corner, previously linking to Quarry C. A further U-shaped tunnel structure is also present within the cliff along the northern quarry edge in the north-eastern corner.

4.4.10 The woodland dominating the quarry was recorded to comprise recently established woodland (since the 1960s), largely dominated by young trees, generally characterised by Silver Birch (within the central areas) or Sycamore (within the west and around the margins of the quarry basin), together with Ash, Willow, Cherry *Prunus* sp., Elder, Dogwood and Hawthorn and occasional Hornbeam *Carpinus betulus*, Buddleja, Spindle and Cotoneaster, forming a relatively dense canopy at approximately 10-15m height. In 2018 the understorey was recorded to support a moderate density however this was recorded to have been thinned across much of the woodland during the 2021 survey, whilst the canopy trees were largely retained other than some felling for new clearances in the middle of the Quarry basin, and some tree felling at the south west.

4.4.11 A moderate ground flora was recorded, often dominated by Bramble, with other species including Enchanter's-nightshade *Circaea lutetiana*, Barren Strawberry, Wood False-brome *Brachypodium sylvaticum*, Common Nettle, Bracken *Pteridium aquilinum*, Wood Avens *Geum urbanum*, Stinking Iris, Violet sp., Hart's-tongue Fern, Male-fern, Campion sp., Tutsan *Hypericum androsaemum*, Cleavers *Galium aparine* and Helleborine sp. In places, the canopy is more open forming small clearings with ground flora similar to the main grassland areas within the quarry (see below), with species including Mint *Mentha* sp., Teasel *Dipsacus fullonum*, Perforate St John's-wort, Agrimony *Agrimonia eupatoria*, Wood False-brome, Hairy St John's-wort *Hypericum hirsutum*, Forget-me-not *Myosotis* sp., Creeping Cinquefoil *Potentilla reptans*, Willowherb *Epilobium* sp. and Common Nettle. During the NVC surveys Early Dog-violet *Viola reichenbachiana*, Red Currant *Ribes rubrum*, Primrose *Primula vulgaris*, Common Spotted Orchid, Common Twayblade, Wood Dock *Rumex sanguineus* and Honeysuckle *Lonicera periclymenum* were also recorded within Quarry B.

4.4.12 Within the south-eastern part of the quarry, mixed woodland and scrub vegetation is present, situated on large spoil mounds. Vegetation in this area generally appears more recently established (within the last 30 years or so) and supports a varying character with some areas dominated by dense young trees and others supporting a more open, scrubby character. Vegetation was generally recorded to be dominated by Ash with some Sycamore, Field Maple *Acer campestre*, Walnut *Juglans regia*, Spindle, Wayfaring Tree *Viburnum lantana*, Dogwood and Buddleja, whilst the areas of a more scrubby character were recorded to be dominated by Silver Birch with Buddleja, Bramble and Willow. Ground flora was recorded to be dominated by Common Nettle, with some Perforate St John's-wort, Wood Avens, Wild Strawberry *Fragaria vesca*, Ragwort *Senecio jacobaea*, Dogs Mercury and Ground Ivy.

4.4.13 Within the central part of the quarry are a number of open clearings, supporting grassland or tall ruderal vegetation. Identified as grasslands G1 and G2 on Plan 4657/ECO3b, the areas immediately west of the main building group were recorded to support relatively species-rich grassland, with a short sward height and high herb content, and species including Selfheal *Prunella vulgaris*, Trefoil *Lotus* sp., Common Centaury, Thyme Leaved Speedwell, Perforate St John's-wort, Hawkweed *Hieracium murorum agg. sp.,* Salad Burnet *Sanguisorba minor subsp. minor*, Mayweed *Matricaria* sp., Creeping Cinquefoil, Yellow-wort, Sedges, White Clover *Trifolium repens*, Ground Ivy and Helleborine sp. along with Yorkshire-fog *Holcus lanatus*, Soft-brome *Bromus hordeaceus* and fine-leaved grass species. Elsewhere, within the westernmost clearing and parallel to the main access track, are areas of less diverse, species-poor grassland. Towards the woodland margins and in the northern part of the main clearing, ruderal and scrub species were recorded to be more dominant, with species including Common Nettle, Rosebay Willowherb, Teasel, Ragwort, Creeping Thistle *Cirsium arvense*, Rose *Rosa sp.*, Willowherb sp., Mugwort *Artemisia vulgaris*, Hard Rush *Juncus inflexus*, Hemlock *Conium maculatum*, False Oat-grass *Arrhenatherum elatius*, Tufted Hair-grass *Deschampsia cespitosa*, Marsh Thistle *Cirsium palustre*, Burdock *Arctium minus* Buddleja, Silver Birch and Elder. The grassland was recorded to be subject to disturbance by vehicles which appear to drive over this area on occasion. The newly created clearings recorded in 2021 were recorded to largely support bare ground with some colonising mosses.

4.4.14 The buildings within the quarry comprise a number of temporary cabins, sheds and open fronted structures utilised by the outdoor pursuits company. The surrounding area is largely formed by gravel hardstanding, with some vegetation colonising from the adjacent areas of scrub and grassland, albeit they are largely devoid of vegetation.

Quarry C

4.4.15 The northernmost quarry, to the east of Highsted Road, forms another disused quarry basin bounded by near vertical cliffs on all sides. The quarry basin is divided into two main areas by a narrow strip of retained land, effectively forming a raised walkway which allows pedestrian access into the quarry. This supports steep slopes on either side, and effectively divides the quarry into a smaller northern basin and larger southern basin. A tunnel is present linking beneath Highsted Road to Quarry B, which retains an open entrance but is largely blocked with earth and rubble approximately 5m beyond the entrance, forming a narrow space which extends beneath the road. The quarry supports frequent evidence of recreational disturbance in the form of old camp fires, recently cut trees, graffiti and moderate amounts of litter.

4.4.16 The basins in Quarry C are both dominated by woodland (identified as woodland W3 on Plan 4657/ECO3c), which appears to be more established than the other quarries, with the quarry being at least partly vegetated in 1940. As such, although there is some minor variation in the woodland character, the mosaic of habitats that is present in the other quarries is absent, with a near continuous woodland canopy present. The woodland is typically characterised by a canopy up to 15m in height with a dense shrub layer, with species including Sycamore, Birch, Field Maple, Willow, Ash, Elder, Dogwood, Wild Privet and Hawthorn. The ground flora in the northern half of the basin was recorded to be relatively species poor, including Bramble, Ground Ivy, Common Nettle, Wood Avens, Harts-tongue Fern and Enchanters Nightshade, whilst the southern half supported a number of additional species including Tutsan, Barren Strawberry, Violet sp., Stinking Iris, Ground Ivy, Common Spotted Orchid and occasional other orchid species. During the NVC surveys Agrimony, Common Twayblade and Forget-me-not sp. were also recorded within Quarry C.

Adjacent species-rich grassland and secondary woodland

4.4.17 Also included within Highsted Quarries LWS designation is an area of grassland and secondary woodland adjacent to the south-eastern boundary of Quarry A (identified as grassland G3 and woodland W4 on Plan 4657/ECO3b). This grassland is situated on a shallow north-facing slope and is generally maintained by Rabbit *Oryctolagus cuniculus* grazing, with Bramble and Rose scrub scattered throughout, along with a number of small tree saplings. As such the area supports a moderately diverse topography created by rabbit burrows, small earth banks and grass tussocks, whilst occasional anthills were recorded. The sward was recorded to be diverse with some areas maintained as short sward through Rabbit grazing whilst other areas supported a long sward of approximately 50cm in height.

4.4.18 The grassland was recorded to be dominated by Yorkshire-fog, False Oat-grass and Common Bent whilst a number of other species were also recorded to be present including frequent Bramble, Black Medick *Medicago lupulina*, Perforate St John's-wort, Bird's-foot-trefoil, Selfheal, Agrimony, Ribwort Plantain *Plantago lanceolate* and Common Ragwort along with some Red Fescue *Festuca rubra*, White Clover, Wild Strawberry, Teasel, Common Knapweed *Centaurea nigra*, Lesser Stitchwort *Stellaria graminea*, Common Centaury, Rose, Cow Parsley *Anthriscus sylvestris*, Annual Meadow-grass *Poa annua*, Creeping Thistle, Violet sp., Cock's-foot *Dactylis glomerata*, Eyebright *Euphrasia officinalis agg.,* Early Forget-me-not *Myosotis ramosissima*, Smooth Tare *Vicia tetrasperma*, Fairy Flax *Linum catharticum*, Red Clover *Trifolium pratense*, Creeping Buttercup *Ranunculus repens* and Hogweed *Heracleum sphondylium*.

4.4.19 At the southern edge of grassland G3 is an area of secondary woodland. This appears to have originated from a former orchard, with a large number of defunct Cherry trees forming a low, scrubby woodland. Bramble dominates the ground flora together with Common Nettle. Further to the south, bounding the edges of the quarry basin, vegetation is dominated Hawthorn, Willow and Silver Birch, together with some English Oak and Ash, grading into the area of Highsted Wood.

Evaluation

4.4.20 An evaluation of Highsted Quarries LWS is set out below, based on assessment of the individual component habitats, followed by consideration of the overall value of the

designation, taking into account the mosaic of habitats present and the interest features for which it is designated.

Woodland

4.4.21 The surveys of Highsted Quarries LWS have found the quarry basins to be dominated by developing woodland, which appears to have largely established since the 1960s (or 1940s in the case of Quarry C). The developing woodland falls under the UK BAP priority habitat description for 'Lowland Mixed Deciduous Woodland', whilst 'Native Woodland' is also listed as a priority habitat in Kent, although these are broad definitions covering most types of semi-natural deciduous woodland, and are not indicative of habitat quality. Clear evidence is available to demonstrate that the quarries do not support ancient woodland, although presence of ancient woodland indicator species can be indicative of higher quality woodland. In this regard, a number of ancient woodland indicator species were recorded in each of the quarry basins, namely Stinking Iris, Hart's Tongue and Barren Strawberry within all basins, whilst Moschatel and Bluebell were recorded in Quarry A; Hornbeam, Field Maple, Primrose, Red Currant, Tutsan and Early Dog-violet were recorded in Quarry B; and Field Maple and Tutsan were recorded in Quarry C. However, given the areas of woodland comprise relatively recently colonised habitat with few large mature trees, it is considered that they do not form a high quality example of broadleaved woodland, and do not support the continuity of woodland cover which partly accounts for the value of more established woodlands. Nevertheless, the Highsted Quarries do support a large area of wooded habitat, providing a moderate habitat resource for woodland fauna and contributing to the network of wooded habitats at a landscape scale. As such, the woodland habitat is considered to be of at least local importance in itself, and contributes to the overall value of the LWS.

Species-rich grassland

4.4.22 A number of areas of species-rich grassland are present within the LWS, including two main areas within Quarry B, the grassland field to the east of Quarry A and small areas of grassland within Quarry A. These grassland areas support a moderate diversity of species (including several calcareous indicators such as Bird's-foot-trefoil, Salad Burnet, Eyebright, Fairy Flax, Yellow-wort and orchid species[15], albeit the grasslands are not strongly characteristic of calcareous grassland) and support a varied sward character, together with other features likely to contribute to their interest for wildlife including anthills, scattered scrub and patches of bare ground. The grassland field to the east of Quarry A may form unimproved grassland, with historical aerial photography showing the grassland to be present beneath orchards in 1940. The grassland areas within the quarries have established since cessation of quarrying activities, although appear to have been relatively undisturbed since.

4.4.23 On this basis, the areas of species-rich grassland within the LWS are considered to form a moderate quality example of the UK and Kent priority habitat type 'lowland meadows', which includes most forms of unimproved neutral grassland across the enclosed lowland landscapes of the UK. However, none of the grassland areas were noted to support a high diversity of species, nor were any particularly rare or notable species recorded, with the species supported by these areas generally common and widespread in nature. Notably, none of the notable species listed under the UK BAP

[15] Based on the list of wildflower indicator species for lowland calcareous grassland within the *Higher Level Stewardship: Farm Environment Plan Manual* (Natural England, March 2010)

priority habitat description were recorded. This is likely due to a lack of favourable management, particularly within the area east of Quarry A, favouring the growth of coarse grass species, or more recent establishment of the areas within the quarries. The grassland areas are also relatively small in extent. Nevertheless, species-rich grassland is scarce at both a national and local level (as highlighted by its priority habitat status) and is of value given its relatively long-established nature. The grassland areas also support a diverse habitat structure, supporting variations in sward length and character, and in association with adjacent habitats such as scrub and woodland, likely provide habitat for a range of species including invertebrates (such as bees and butterflies), birds and small mammals.

4.4.24 Overall therefore, the species-rich grassland is considered to be of district importance in terms of its intrinsic value and the opportunities it provides for wildlife, and contributes to the overall value of the LWS.

Open Habitat Mosaic

4.4.25 'Open Mosaic Habitat on Previously Developed Land' is listed as a S41 Priority Habitat type, and can be of particular value for their plant and invertebrate assemblages. Such habitats are characterised by a mosaic of open vegetation types, remaining relatively stable over time due to the edaptic (soil) conditions. The UK BAP priority habitat description sets out a number of criteria which must be met for an area to qualify as Open Mosaic Habitat:

1) The area of Open Mosaic Habitat is at least 0.25 ha in size.
2) Known history of disturbance at the site or evidence that soil has been removed or severely modified by previous use(s) of the site. Extraneous materials/substrates such as industrial spoil may have been added.
3) The site contains some vegetation. This will comprise early successional communities consisting mainly of stress-tolerant species (e.g. indicative of low nutrient status or drought). Early successional communities are composed of (a) annuals, or (b) mosses/liverworts, or (c) lichens, or (d) ruderals, or (e) inundation species, or (f) open grassland, or (g) flower-rich grassland, or (h) heathland.
4) The site contains unvegetated, loose bare substrate and pools may be present.
5) The site shows spatial variation, forming a mosaic of one or more of the early successional communities (a)–(h) above (criterion 3) plus bare substrate, within 0.25 ha.

4.4.26 Given that areas of bare substrate are required to qualify as open mosaic habitat, with this largely absent from Quarries B and C, these quarries are not considered to support this habitat type. However, the main part of Quarry A comprises an open mosaic with a stony chalk substrate supporting scattered tree and scrub vegetation, albeit this is becoming increasingly encroached with wooded vegetation. Consideration of this area under the relevant criteria is set out below:

1) The area of open mosaic within Quarry A measures approximately 3ha in size, and as such accords with the first criterion;
2) There is a known history of disturbance, with the area of habitat having been formed by previous quarrying activities, severely modifying the substrate present.

In the case of Quarry A, quarrying activities appear to have ceased at some point between 1960 and 1990;

3) The quarry basin has since developed successional vegetation communities typical of cleared land. The other quarry basins and parts of Quarry A are currently at a late stage of this process, being dominated by developing woodland, hence why the bulk of the LWS is not representative of this habitat type. However, the open mosaic area within Quarry A supports a mixture of early successional vegetation types including annuals (such as Common Centaury), ruderals and open grassland;

4) Unvegetated areas are present throughout the open mosaic area, in the form of a stony, chalk substrate;

5) Some spatial variation is present within the open mosaic area, with a mixture of bare ground and the early successional communities identified above.

4.4.27 As such, it is considered that the majority of the LWS does not conform with the Priority Habitat criteria, being dominated by developing woodland or lacking areas of bare substrate, although the area of open mosaic within Quarry A (measuring approximately 3ha) does accord with the criteria and is considered to be representative of Open Mosaic Habitat. However, this area is becoming increasingly dominated by scattered trees and scrub, such that without management, the open mosaic habitat would likely be lost within the next 10-20 years. Overshading by wooded vegetation is also likely to diminish its value for thermophilic invertebrate species, which require open areas for basking or nesting. The non-native invasive species Cotoneaster also dominates much of the ground cover, with a relatively sparse cover of flowering plants providing a nectar and pollen source for invertebrates. On this basis, this area is considered to form a relatively poor example of the priority habitat type, and is of only site importance in itself.

Other habitats

4.4.28 A number of other habitat types are present within the LWS, including species-poor grassland, scrub and tall ruderal vegetation. These habitats contribute to the overall value of the LWS and the mosaic of vegetation types present, although are dominated by common and widespread species and not considered to be of any intrinsic elevated value.

Overall assessment of Highsted Quarries LWS

4.4.29 Highsted Quarries LWS is considered to support a number of habitats which are of value in their own right, including woodland, species-rich grassland and open mosaic habitat (within Quarry A). Furthermore, the combination of habitats provides a rich mosaic of vegetation types in close proximity, forming suitable habitat for a range of faunal species, particularly reptiles and invertebrates. However, the LWS does not currently appear to be subject to any particular management, and is becoming increasingly dominated by secondary wooded vegetation at the expense of open grassland and scrub mosaic. Quarry B is subject to recreational activity, whilst Quarry A is subject to significant encroachment by Cotoneaster sp., potentially impacting on the conservation status of this designation further. As such, it is considered that habitats could be enhanced through an appropriate management regime. Overall, the

LWS is considered to constitute an important ecological feature, of value at the district level.

4.5 Highsted Wood

Description

4.5.1 Highsted Wood, located within the site to the south of Highsted Quarries, comprises Ancient Woodland, identified as woodland W5 on Plan 4657/ECO3b. Highsted Wood is largely characterised by Sweet Chestnut *Castanea sativa*, with some Hornbeam and Ash which appears to be managed by a rotation of coppicing. An understorey is present of coppiced Hazel *Corylus avellana* and Sweet Chestnut, along with Willow, and Elder. The groundflora was recorded to be diverse including species such as Bluebell, Wild Strawberry and Wood Anemone *Anemone nemorosa*. During the 2021 survey it was noted that the north eastern quarter of the woodland had been recently coppiced. As such this formed a relatively large area of coppice stools with some new growth, and some dead wood left on the ground. The boundary trees of the woodland have been retained uncut forming a screen to this coppice.

4.5.2 The NVC survey undertaken at Highsted Wood (see Appendix 4657/4) recorded the presence of 5 Ancient Woodland indicator species, namely Hornbeam, Bluebell, Wood Anemone, Moschatel and Early-purple Orchid *Orchis mascula*, with Bluebell and Wood Anemone being common, recorded at moderately high densities in each quadrat, whilst Moschatel and Early-purple Orchid were each recorded in a single quadrat, whilst in total 16 species were recorded in the ground flora.

Evaluation

4.5.3 Highsted Wood is a moderate sized Ancient Woodland, supporting a varied woodland structure and moderate diversity of woody and ground flora species, and is considered to form a relatively high quality example of Ancient Woodland. This woodland is however dominated by Sweet Chestnut, which was likely planted, and is therefore less natural than some of the other woodlands dominated by native species in the wider surrounds of the site.

4.5.4 As well as being Ancient Woodland, Highsted Wood also falls under the description for the UK BAP priority habitat type 'Lowland Mixed Deciduous Woodland', which covers most types of deciduous woodland, whilst 'Native Woodland' is also listed as a priority habitat in Kent.

4.5.5 In the context of wooded habitats at the site, Highsted Wood is of particular importance, largely due to its Ancient Woodland listing, providing long established, largely irreplaceable habitat, and therefore it is considered that Highsted Wood constitutes an important ecological feature, of value at the district level.

4.5.6 Potential for Highsted Wood to support faunal species such as roosting bats and invertebrates is discussed at Section 5 of this report.

4.6 Bex Wood

Description

4.6.1 Bex Wood is located in the southern part of the site, identified as woodland W6 on Plan 4657/ECO3a. The woodland is shown on Natural England's Magic Database as comprising Ancient Woodland, however a review of historical aerial photography has been undertaken and this has illustrated that much of this wood (aside from a small number of individual trees) was not present in 1960, whilst in 1940 it appears as though large trees are mostly absent, with the area likely forming dense scrub or developing woodland. As such it is considered likely that this wood has been felled at various points in the past. During the update phase 1 survey in 2021 it was noted that the south eastern most section of the woodland had been recently, with the coppice stools supporting approximately 1-2 years growth.

4.6.2 The southern part of Bex Wood was recorded to comprise semi-natural woodland of moderate quality, with a canopy of Ash and occasional Oak, Hornbeam and Cherry, together with a predominantly Hazel understorey. Other species noted included Field Maple, Elder and Hawthorn. The majority of trees are young in age, although some established Ash coppice stools were noted, whilst several mature Oaks are present along the boundaries. The ground flora in this area was relatively diverse, including Moschatel, Lesser Celandine, Wood Anemone, Bluebell and Dog's Mercury.

4.6.3 Further to the north, the woodland is heavily dominated by Larch, and appears to have been restocked in the past. Some broadleaved trees still occur, although largely as young regrowth or understorey species, and ground flora is much reduced, with only scattered patches of Bluebell and Dog's Mercury.

Evaluation

4.6.4 Bex Wood is considered to be of moderate quality, forming an established wooded habitat contributing to wildlife corridors throughout the wider landscape. However, restocking of the northern part of the woodland with conifers has degraded its interest, whilst the woodland is relatively small in extent.

4.6.5 Bex Wood is considered to fall under the description for the UK BAP priority habitat type 'Lowland Mixed Deciduous Woodland', with the southern part forming a moderate example of this habitat type, whilst this wood is also considered to conform to the Kent priority habitat 'Native Woodland'.

4.6.6 On this basis, Bex Wood is considered to constitute an important ecological feature at the local level. Potential for Bex Wood to support faunal species such as roosting bats and invertebrates is discussed at Section 5 of this report.

4.7 Arable

Description

4.7.1 The majority of the site comprises land under arable cultivation, with large fields many of which are lacking in boundary features, as shown on Plans 4657/ECO3a-d. Arable

fields were largely used for growing oil-seed rape during the survey period, with a number used for cereal crops.

4.7.2 The arable habitat was noted to be intensively cultivated, with little vegetation present within the cultivated area save for the crops themselves. Field margins were generally present and relatively narrow, dominated by coarse grasses such as False Oat-grass, Cock's-foot and Annual Mercury *Poa annua*, along with tall ruderal vegetation, with species such as Cleavers, Red Dead Nettle, Germander Speedwell, Bittercress *Cardamine* sp., Crane's-bill *Geranium* sp., Goose Foot *Chenopodium* sp., Mayweed *Matricaria* sp., Docks *Rumex* sp., Hemlock, Creeping Thistle *Cirsium arvense*, Common Nettle, Hogweed, Cow Parsley, Mugwort *Artemisia vulgaris*, Sow-thistle *Sonchus* sp., Common Mallow *Malva sylvestris* and Spear Thistle *Cirsium vulgare*.

Evaluation

4.7.3 The arable fields within the site appear to be intensively managed, with few arable weed species present. A small number of field margins were noted, although these were recorded to be dominated by common and widespread ruderal species, with no notable arable species observed. 'Arable Field Margins' is a priority habitat in England, although in order to qualify under this priority habitat, the field margins are required to be managed specifically to provide benefits to wildlife. On this basis, the field margins are not considered to qualify as a priority habitat and are not considered to be of value outside of a site context. Other features such as bare ground likely provide some additional opportunities for wildlife species such as birds and invertebrates, albeit in the context of the site, these areas are small in extent and are unlikely to be of elevated importance. As such, it is considered that arable does not constitute an important ecological feature.

4.8 Orchards

Description

4.8.1 A number of orchards are present across the site, particularly within the central and eastern areas (see Plans 4657/ECO3a-d). These are all similar in character, being intensively managed for commercial crop production, and as such form fields of tightly planted rows of fruit trees, which appear to largely form Apple *Malus pumila*, Pear *Pyrus communis* and Cherry *Prunus* sp. trees. Management appears to be intensive with the groundflora dominated by short mown, improved grassland comprising fine leaved grasses and a small number of herbs including Dandelion and Greater Plantain *Plantago major*. Some of these orchards located within the south of area C were noted during the 2021 update survey to have been felled with the land now used as arable.

Evaluation

4.8.2 The orchards at the site comprise intensively managed, commercial features with little value for ecology. The trees are of a uniform age, planted in uniform rows, the groundflora is maintained as species poor semi-improved/amenity grassland of a very short sward, whilst the orchards are also likely subject to numerous inputs such as pesticides and fertiliser, whilst there was also evidence of watering. As such the orchards are not considered form an important ecological feature.

4.9 Woodland and Wooded Strips

Description

4.9.1 Aside from the areas of Ancient Woodland and secondary woodland within Highsted Quarries LWS (described separately above), a number of small areas of woodland occur within the site. These include several established wooded strips or small wooded areas within the southern part of the site, identified as woodlands W7-W10 on Plans 4657/ECO3a-b.

4.9.2 Woodlands W7 and W8 comprise two wooded strips within the south-eastern part of the site adjacent to the M2, as shown on Plan 4657/ECO3a. These appear to be relatively established features, dominated by Ash together with Oak, Silver Birch, Hornbeam and Field Maple, forming a canopy height of approximately 15m. A small number of trees were recorded to be larger and more mature, notably along the southern boundary. A relatively dense understory is present dominated by Dogwood and Elder with some Hazel, Spindle, Blackthorn, Cherry and Rose. The groundflora was recorded to be relatively continuous but not particularly diverse with species including Bramble, Wood Avens, Wood False-brome, Dogs Mercury, St John's-wort, Violet, Docks, Ivy, Stinking Iris, and Red Campion *Silene dioica* with some Bluebells. The westernmost of these strips was recorded to appear to be a more substantial area of wooded habitat with a number of mature trees noted, some Hazel coppice stools, Holly, Butcher's-broom *Ruscus aculeatus* and *Sorbus* sp. recorded in the understorey, along with a groundflora supporting a higher proportion of indicator species including Bluebell and occasional Wood Anemone, Moschatel and Wood Speedwell.

4.9.3 Woodland W9 comprises a small extension to Bex Wood, located outside of the Ancient Woodland boundary. This appears to be secondary woodland located on a possible former pit or small quarry, dominated by Sycamore with some Hornbeam, Hazel and Ash. The ground flora is generally dominated by Common Nettle with some Ground Ivy, Wood Speedwell, Lords-and-Ladies, Cleavers and Ivy.

4.9.4 Woodland W10 is located to the north of Kent Science Park, and appears to have formed from an area of former parkland, appearing as scattered trees in 1940, prior to the land to the east and west being converted to arable land. The northern and southern halves of the wooded strip appear to form different characters. The northern half is dominated by mature Sycamore along with Oak *Quercus* sp. and Ash, whilst the understorey is relatively loose and sparse comprising Elder and Hawthorn. Ground flora was recorded to be absent from areas associated with Rabbit activity and anthropogenic disturbance, whilst other areas supported Speedwell sp. and Bluebell along with areas dominated by ruderal vegetation including Cow Parsley and Common Nettle. The southern half was dominated by young Sycamore along with young and semi-mature Birch, Oak, Ash and Field Maple with a relatively dense understorey comprising younger saplings of the above species along with some Yew *Taxus baccata*, and a ground flora dominated by ruderal species such as Alexanders *Smyrnium olusatrum*, Common Nettle, Cow Parsley and Hemlock along with Lesser Celandine *Ranunculus ficaria*, Lords-and-ladies, Violet and Wood Avens.

4.9.5 Elsewhere, recent woodland planting is present along the embankments of the M2, dominated by young trees with species including Hawthorn, Oak, Field Maple, Cherry, Elder, Hazel, Hornbeam and Ash along with a planted line of Poplar *Populus* sp. trees

in the west. The groundflora was recorded to be sparse and dominated by ruderal species such as Common Nettle and Ivy.

4.9.6 To the north of this, within Area A, is a small plantation woodland, supporting a monoculture of coniferous trees of a uniform age, planted in rows, with no understorey or groundflora recorded, likely as a result of the shading from the densely planted rows of trees (see Plan 4657/ECO3a).

Evaluation

4.9.7 The other wooded habitats at the site (outside of Highsted Quarries LWS, Highsted Wood and Bex Woods, described above) generally comprise narrow wooded strips or small woodland areas and are relatively limited in extent. However, particularly W7 and W8 support some established woodland interest, and these woodland blocks add to the diversity and extent of wooded habitat within the site, providing additional corridors for movement of wildlife, particularly within the central and western parts of the site. These woodlands also all showed signs of varying levels of previous clearance, and contained moderate to high levels of ruderal species in the groundflora suggesting nutrient enrichment and/or direct human disturbance. Nevertheless, the majority of these woodlands also contained evidence of some level of historic continuity such as a small number of mature trees, and as such it is considered that they have capacity to be enhanced through the commencement of appropriate management measures.

4.9.8 All of the established woodlands and wooded strips (W7-W10) fall under the description for the UK BAP priority habitat type 'Lowland Mixed Deciduous Woodland', which covers most types of deciduous woodland. 'Native Woodland' is also listed as a priority habitat in Kent, which covers all of the woodland within the site.

4.9.9 On this basis, the wooded habitat within and adjacent to the site is considered to constitute an important ecological feature. Woodlands W7-W10 appreciably enrich the local biodiversity resource, and are considered to be of importance at the local level. Other wooded areas are considered to be of importance at the site level only.

4.9.10 Potential for these wooded areas to support faunal species such as roosting bats and invertebrates is discussed at Section 5 of this report.

4.10 Parkland

Description

4.10.1 A single area of parkland is present at the southwest of the site, shown in Area A on Plan 4657/ECO3a. This area was recorded to comprise an open area of short sward, sheep grazed semi-improved grassland, with a number of associated mature trees.

4.10.2 The grassland was recorded to be short sward and species poor, being dominated by fine-leaved grasses with few herbs, largely limited to common and ruderal species including Creeping Buttercup, Creeping Thistle and Common Nettle. The associated trees were largely recorded to be mature and of a substantial size, although a line of younger specimens is present at the eastern edge. Species were recorded to include Oak, Horse Chestnut *Aesculus hippocastanum* and Beech. Two trees were recorded to have fallen during the 2021 survey.

4.10.3 A review of historical aerial photography has shown that Parkland PL1 comprised woodland in 1940, although since 1960 this area appears to have been broadly similar in character.

Evaluation

4.10.4 The parkland at the site, in combination with other wooded areas, provides additional woodland interest at the site. These features are likely to fall under the habitat description for the UK BAP priority habitat type 'Wood-pasture and Parkland' (albeit this area is not highlighted on Natural England's MAGIC database as supporting any Priority Habitats), along with the Kent BAP habitat 'Lowland Wood-pasture and Parkland'. The presence of mature trees, some of which display varying levels of decay, are likely to be of value to a range of saproxylic invertebrates and fungi, whilst providing opportunities for roosting bats and nesting birds. However, the area covered by this habitat is relatively small and the grassland habitat is species poor and relatively uniform, with little in the way of other semi-natural habitats present such as scrub, such that this parkland and associated scattered trees are considered to form only a moderate examples of this habitat type. On this basis, the parkland and scattered trees within the site is considered to be form an important ecological feature of value at the local level.

4.10.5 Potential for this habitat to support faunal species such as roosting bats and invertebrates is discussed at Section 5 of this report.

4.11 Hedgerows / Treelines

Description

4.11.1 A number of hedgerows and treelines are present across the site, as shown on Plans 4657/ECO3a-d. These generally support a range of woody species although are variable in character and quality, ranging from recently planted hedges to established boundary features, with several forming substantial treelines. Descriptions of individual hedgerows are given at Appendix 4657/5.

Evaluation

4.11.2 All of the native hedgerows within the site are likely to qualify as a Priority Habitat based on the standard definition[16], which includes all hedgerows (>20m long and <5m wide) consisting predominantly (≥80%) of at least one native woody species. It has been estimated that approximately 84% of countryside hedgerows in Great Britain qualify as a Priority Habitat under this definition.[16] Ancient and / or Species-rich Hedgerows are also listed as a Priority Habitat in Kent.

4.11.3 A small number of hedgerows are considered to possibly qualify as important under the Hedgerows Regulations 1997, as detailed at Appendix 4657/5, although the vast majority are not considered to qualify.

4.11.4 Together with the woodland areas, the hedgerows and treelines within the site form a valuable habitat network, providing connectivity for movement of wildlife across the

[16] Based on: Biodiversity Reporting and Information Group (2011) '*UK Biodiversity Action Plan (BAP) Priority Habitat Descriptions',* ed. Ant Maddock

site, in addition to providing a nesting and foraging resource for species such as bats, Dormice, birds and invertebrates.

4.11.5 On this basis, the native hedgerows and treelines within the site are considered to form an important ecological feature, although given the relatively species-poor nature of hedgerows present, are only of importance at the local level.

4.12 Scattered trees

Description

4.12.1 A number of scattered trees are present within the site, generally associated with the hedgerow network and along woodland margins, whilst also occurring in a number of places as in-field trees, notably within Areas A and B, along with a number of trees described above within the area of parkland (see Plans 4657/ECO3a-d).

4.12.2 The vast majority of trees present along hedgerow and woodland margins, as well as in-field trees are Oaks, with a large proportion of semi-mature and mature specimens. Other species recorded include Sweet Chestnut, Ash, London Plane *Platanus hispanica* and Lime *Tilia* sp..

Evaluation

4.12.3 A number of likely veteran tree specimens are present within the site, which are considered to individually form features of ecological importance at the local level. Notably, a large mature London Plane is located north of the Sports Centre in Area B, which has an information board stating it is the 13th largest London Plane in the country, whilst five other likely veteran trees are present, as indicated at Plan 4657/ECO3. Descriptions of these are given in relation to bat roosting potential at Appendix 4657/7.

4.12.4 Other scattered trees outside of the hedgerow and woodland network are relatively limited in extent. As such, they are not considered to be of value outside of a site context and do not constitute an important ecological feature.

4.13 Scrub

Description

4.13.1 Large areas of scrub are present within Highsted Quarries LWS (as described above), whilst other small areas of scrub are also present across the site, as shown on Plans 4657/ECO3a-d. These generally form either areas of dense scrub, or are more scattered in nature. Denser areas of scrub are present at the south and east of Area A, and at the within Area D, to the west of Dully Road. These areas comprise dense Blackthorn thickets with other scrub species such as Elder, Blackthorn and Hawthorn also colonising. Other areas of scrub occur across the site and are generally scattered in nature, largely associated with field boundaries, trees and woodland, and largely comprise Bramble, Blackthorn, Willow, Hawthorn and Rose.

Evaluation

4.13.2 Scrub does not constitute a priority habitat type and is relatively limited in extent. However, it does provide additional wooded habitat within the site, creating

additional cover for a range of native wildlife, including birds. Nonetheless, scrub habitat is not considered to be of value outside of a site context and does not form an important ecological feature.

4.14 Grassland

Description

4.14.1 Grassland habitats are scatted throughout the site. These can be broadly divided into three categories, namely species-rich grassland (which is detailed above in relation to Highsted Quarries), semi-improved/rough grassland (species-poor) and amenity grassland, as shown on Plan4657/ECO3a-d.

Semi-improved/Rough Grassland (Species-poor)

4.14.2 Areas of species-poor semi-improved grassland are scattered throughout the site, associated with the parkland in Area A and the orchards located across the site. In addition, this habitat is located at the east of Area A, adjacent to Cromer's Wood, to the south of Highsted Wood in Area B, to the east of Highsted Quarries LWS in Area C, at the north of Area D, along with smaller strips located at field boundaries, as shown on Plans 4657/ECO3a-d. The majority of this habitat is left to grow to a long sward, and is associated with ruderal vegetation (see below), forming rough grassland strips along with areas of moderate-long sward, rough grassland. This grassland is generally grass-dominated, with species such as Yorkshire-fog, Cock's-foot, False Oat-grass *Arrhenatherum elatius* and Perennial Rye-grass *Lolium perenne* recorded to be dominating with less frequent grasses recorded to include Soft-brome, with occasional herb species including Creeping Buttercup *Ranunculus repens*, Yarrow *Achillea millefolium*, Creeping Cinquefoil *Potentilla reptans*, Crane's-bill sp., Cleavers, Red Dead Nettle, White Dead-nettle *Lamium album*, Ribwort Plantain, Ground-ivy, Vetch *Vicia* sp., Dandelion *Taraxacum officinale agg.*, with infrequent herbs including Red Campion and Common Knapweed, and frequent tall ruderal species such as Creeping Thistle, Cow Parsley, Docks, Hogweed, Teasel, Hemlock and Common Nettle, along with some encroaching Bramble.

Amenity Grassland

4.14.3 Amenity grassland is present in Area A, associated with Sittingbourne Football Club, along with a small number of residential gardens throughout the site (see Plans 4657/ECO3a-d). These areas were recorded to be maintained at a short sward through mowing, and are species poor, dominated by grasses with infrequent common herbs including Dandelion, Clover *Trifolium* sp. and Greater Plantain.

Evaluation

4.14.4 The semi-improved and amenity grassland areas were recorded to be dominated by a low diversity of common and widespread species, providing limited botanical interest. These areas provide some opportunities for wildlife, although do not constitute a priority habitat type and are typical of habitats within the surrounding area. As such, semi-improved and amenity grassland are not considered to be of value outside of a site context and do not form an important ecological feature.

4.14.5 Nevertheless, these grasslands were observed to support a low diversity of habitat structure, supporting variations in sward length and character, and in association with

adjacent habitats such as scrub and woodlands, are likely to provide habitat for a range of common and widespread species including invertebrates (such as bees and butterflies), birds and small mammals.

4.15 Tall Ruderal Vegetation

Description

4.15.1 Areas of tall ruderal vegetation are present throughout the site, largely along arable field margins or associated with developing scrub and rough grassland habitats, as shown on Plans 4657/ECO3a-d. Tall ruderal vegetation is dominated by Common Nettle, with occasional Hogweed *Heracleum sphondylium*, Mugwort *Artemisia vulgaris*, Thistles, Willowherb *Epilobium* sp., Teasel *Dipsacus* sp., Hemlock and Bracken.

Evaluation

4.15.2 Tall ruderal vegetation does not constitute a priority habitat type and areas within and adjacent to the site do not support any particular botanical interest. As such, tall ruderal vegetation and Bracken is not considered to be of value outside of a site context and does not form an important ecological feature.

4.16 Ponds

Description

4.16.1 A single pond is located within Highsted Quarries LWS, identified as pond P1 on Plan 4657/ECO3b. This was recorded to form a previous excavation, likely associated with the previous use of the area as a quarry, with steep sides on the east and west banks, although the north and south had sloping margins. The substrate was recorded to comprise chalk banks with some shingle, earth and moss. The hollow supported a moderate depth of water with a low-moderate level of turbidity at time of the 2021 update Phase 1 survey, although had been recorded to be dry on other visits. Aquatic vegetation was not evident at time of this January survey, whilst small amounts of Buddleja and Bramble scrub were recorded to provide a small amount of shade.

4.16.2 Other small ephemeral pools were present with the quarry. These appeared likely to form seasonal puddles in small excavation pits which comprised shallow, muddy hollows. A further water feature is present within the quarry associated with the assault course and forms an artificial feature with a raised wooden frame and surrounded by gravel. Duckweed was recorded to cover the surface. This appears likely to be subject to regular disturbance as part of the use of the area as an assault course.

4.16.3 Pond P2 is located within the Kent Science Park. This is an ornamental pond, with a concrete edge, surrounded by close mown amenity grass. Some waterlilies were noted within the pond, whilst it was recorded to support fish.

4.16.4 Pond P3 is located within a residential garden adjacent to Church Street. The pond is relatively large and steep sided and supports carp. Some waterlilies were noted within the pond.

Evaluation

4.16.5 The ponds within the site are considered to be of poor habitat quality, with P2 and P3 being largely ornamental features supporting fish, whilst P1 is ephemeral and lacks substantial aquatic vegetation. On this basis, the ponds are not considered to qualify under the Priority Habitat description for ponds, and are not considered to form an important ecological feature.

4.17 Buildings, Built Structures and Hardstanding

Description

4.17.1 Kent Science Park is located within the southern part of the site, forming a large area of commercial/industrial buildings surrounded by hardstanding, trees and amenity planting. The Science Park was not subject to specific survey as it is not directly affected under the proposals.

4.17.2 A small number of buildings and structures are present within the remainder of the site, identified as buildings/building groups B1 to B8 on Plan 4657/ECO4. These include industrial and warehouse buildings, old farmyard barns and agricultural buildings and two residential properties. A number of tunnels are also located within Highsted Quarries. These buildings and built structure are detailed further at Appendix 4657/7.

4.17.3 Hardstanding is present occasionally across the site, largely comprising tarmac roads and small access tracks. These areas of hardstanding were recorded to support little in the way of botanical interest, save for occasional colonising weeds.

Evaluation

4.17.4 These areas are considered to loosely accord with the Kent BAP habitat 'Built-up Areas and Gardens', however this definition is very broad and these habitats at the site are not considered to comprise elevated ecological value. The buildings / built structures and hardstanding areas support negligible botanical value, and as such are not considered to form an important ecological feature. The potential for buildings / built structures to support faunal species such as bats is discussed at Section 5 following.

4.18 Exotic / Invasive species included on Schedule 9 Part II of the Wildlife and Countryside Act 1981

Description

4.18.1 A large stand of Japanese Knotweed *Fallopia japonica* was recorded in Quarry Basin B. The stand, which was recorded to measure approximately 20m by 20m, located to the north east of the scrub mosaic within Quarry B, adjacent to the edge of the developing woodland. No further stands were recorded within the site. Cotoneaster sp. was also recorded to be dominant within Quarry Basin A.

Evaluation

4.18.2 It is an offence to cause plant species listed on Schedule 9 of the Wildlife and Countryside Act 1981 to grow in the wild.

4.18.3 Japanese Knotweed in particular has a particularly aggressive and invasive growth form. Japanese Knotweed reproduces vegetatively and can regenerate from small fragments of rhizomes (roots) or above ground parts of the plant that may be broken off and transported to other locations. The species is particularly persistent; forming stands with rhizomes reaching down into the soil up to three metres in depth and up to a distance of seven metres laterally out from the main stand. These rhizomes can persist underground and importantly on potential development sites can push up through two inches of tarmac, in a worst-case scenario. This species is known to out compete native vegetation and thus reduces the overall diversity of vegetation in any area it dominates. This dominance may be aided and exacerbated by the release of chemicals that suppress the growth of other plant species in the immediate vicinity of the Japanese Knotweed plant. As such, Japanese Knotweed is considered to be detrimental to ecology at the site.

4.19 Habitat Evaluation Summary

4.19.1 On the basis of the above, the following habitats within and adjacent to the site are considered to form important ecological features:

Table 4.1: Summary of habitat evaluation.

Habitat	Level of Importance
Highsted Quarries LWS	District
Highsted Wood	District
Bex Wood	Local
Woodlands W7-W10	Local
Other woodland	Site
Parkland	Local
Hedgerows / Treelines	Local
Veteran trees	Local

4.19.2 Other habitats present within the site include arable, commercial orchards, scrub, semi-improved grassland (species-poor), amenity grassland, tall ruderal vegetation, ponds, scattered trees, buildings, built structures and hardstanding, and invasive species. However, these habitats do not form important ecological features and are not considered to be of importance outside the context of the site.

5 Faunal Use Of The Site

5.1 Overview

5.1.1 During the survey work, general observations were made of any faunal use of the site with specific attention paid to the potential presence of protected or notable species. Specific survey work was undertaken in respect of bats, Badger, Dormouse, birds, Great Crested Newt, reptiles and invertebrates, with the results described below.

5.2 Priority Species

5.2.1 Section 40 of the Natural Environment and Rural Communities (NERC) Act 2006 places duties on public bodies to have regard to the conservation of biodiversity in the exercise of their normal functions. In particular, Sections 41 and 42 of the NERC Act require the Secretary of State to publish a list of species which are of principal importance for conservation in England and Wales, respectively. This list is largely derived from the 'Priority Species' listed under the former UK Biodiversity Action Plan (BAP), which continue to be regarded as priority species under the subsequent country-level biodiversity strategies.

5.2.2 During the survey work undertaken, the UK Priority Species Soprano Pipistrelle *Pipistrellus pygmaeus*, Noctule *Nyctalus noctula*, Brown Long-eared bat *Plecotus auritus*, Dormouse *Muscardinus avellanarius,* Common Lizard *Zootoca vivipara* and Slow-worm *Anguis fragilis*, along with a number of bird species were recorded within the site. This is discussed further below.

5.3 Bats

5.3.1 **Legislation:** All British bats are classed as European Protected Species under the Conservation of Habitats and Species Regulations 2010 (as amended) and are also listed under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). As such, both bats and their roosts (breeding sites and resting places) receive full protection under the legislation (see Appendix 4657/6 for detailed provisions). If proposed development work is likely to result in an offence a licence may need to be obtained from Natural England which would be subject to appropriate measures to safeguard bats. A number of bat species are also listed as Priority Species.

5.3.2 **Background Records:** The desktop study returned records of a number of bats from within or adjacent to the site. This includes records of an individual / small numbers of Common Pipistrelle *Pipistrellus Pipistrellus*, Soprano Pipistrelle, Noctule *Nyctalus noctula*, Brown Long-eared bat *Plecotus auritus*, and *Myotis* sp. from within the site. The most recent of these relates to a Brown Long-eared bat recorded in 2007 from within the quarry.

5.3.3 A number of records of other bat species were returned from KBG within the wider surrounds of the site, including Serotine Bat *Eptesicus serotinus*, Bechstein's bat *Myotis bechsteinii*, Daubenton's bat *Myotis daubentonii* and Natterer's bat *Myotis nattereri*.

5.3.4 **Survey Results – Roosting**

Buildings / Built Structures

5.3.5 A number of buildings and built structures, are present within the site, as shown on Plan 4657/ECO4.

5.3.6 These structures were subject to external daytime inspection, where access was available, to provide an assessment of bat roosting potential and record any evidence of bat roosting potential. The results of this are set out at Appendix 4657/7. The majority of buildings within the site form barns, sheds and industrial units, recorded to support negligible or negligible-low opportunities for roosting bats due to the nature and condition of the structures. In line with standard guidance, these buildings were not subject to further emergence / re-entry survey work.

5.3.7 A small number of buildings, namely buildings B4, B6 and B7 were recorded to support opportunities for roosting bats with features such as accessible loft voids, lifted tiles and hanging tiles. Buildings B4 and B6, identified as likely to be affected under the proposals, were therefore subject to internal inspections and emergence/re-entry surveys, whilst survey work was also undertaken in relation to a tunnel between Quarries B and C, as detailed further below.

Building B4

5.3.8 Building B4 comprises a large sports centre building. Internal inspections recorded a scattering of c.100-200 bat droppings within the south-eastern roof void, confirmed to be Brown Long-eared bat based on DNA analysis.

5.3.9 The building was subject to emergence/re-entry surveys on dusk 19 July and dawn 20 July 2018. These surveys did not record any emerging or re-entering bats, with mostly low levels of Common Pipistrelle activity within the surrounds of the building.

5.3.10 Based on the number of droppings recorded, the building is considered to support a non-breeding Brown Long-eared roost of low conservation status.

Building B6

5.3.11 Building B6 comprises 'Goldenwood' house, located to the east of the quarries. Internal inspections recorded c.600-800 droppings within the main roof void, confirmed to be Brown Long-eared bat based on DNA analysis. It is understood that these had accumulated since reinsulation works 9 months prior to the inspection.

5.3.12 The building was subject to emergence/re-entry surveys on dusk 17 July, dawn 18 July, dusk 13 August and dawn 14 August 2018. A summary of the survey findings are set out in table 5.1 below.

Table 5.1: Results of emergence/re-entry surveys of building B6

Date	Emerging/re-entering bats	Summary of other activity
17/07/2018 (dusk)	Soprano Pipistrelle emerged under ledge above the 1st floor window on the right side of the building (21:39)	Low levels of activity by Common Pipistrelle, Soprano Pipistrelle, big bats and likely Brown Long-eared, together with occasional Myotis.
18/07/2018 (dawn)	Two unidentified bats (likely Brown Long-eared) returned into the building along the southern elevation (04:11)	
13/08/2018 (dusk)	Two bats (likely Brown Long-eared) emerged from the beams under the 2nd floor at the south gable end (20:50)	
14/08/2018 (dawn)	Two Brown Long-eared returned into a gap in the wall next to the 2nd floor window in the south gable end (05:11, 05:13), one Soprano Pipistrelle returned under a roof tile on the south gable (05:18)	

5.3.13 On the basis of the survey results, building B6 is considered likely to support a small Brown Long-eared maternity roost, given the accumulation of droppings in the roof void and small numbers of this species recorded emerging/re-entering the building. The building is also considered to support a low level of roosting activity by Soprano Pipistrelle.

Highsted Quarry Tunnels

5.3.14 Two tunnels are present associated with the Highsted Quarries, connecting the basins through structures extending beneath the road (identified as structures B5a and B5b on Plan 4657/ECO4). Whilst the tunnel connecting Quarry A with Quarry B (B5a) was not considered to provide any particular bat roosting opportunities, the tunnel connecting Quarry B with Quarry C (B5b) is largely collapsed with an open entrance within Quarry C, and forms a potential hibernation space. The tunnel entrance was closely inspected for any evidence of bats on a number of occasions, and no evidence such as droppings was recorded. To provide an indication of any hibernation activity, an automated bat detector was placed in the tunnel entrance between 20 December 2017 and 28 April 2018 to record any bat activity over the period.

5.3.15 The detector recorded no calls for the entire period between 20 December 2017 and 14 February 2018. A small number of calls were recorded on 15 February, with fairly regular activity then recorded between 9 March and 7 April, with no further calls following this. The majority of calls recorded (72%) appeared characteristic of Brown Long-eared calls, with a further 20% appearing to be social calls, again most representative of Brown Long-eared. A further 8% of calls were more characteristic of Myotis species. Calls were mostly recorded as only periodic bouts of activity, largely during the evening period (between 7pm and 9pm) and very occasional at dawn. A definite peak of activity was recorded on 11 March 2018 between 8pm and 10pm (around 2 hours after sunset), comprising 60% of all calls.

5.3.16 Given the location of the detector at the tunnel entrance, it is possible that much, if not all of the activity recorded, comprised foraging or exploratory behaviour by bats entering from the tunnel entrance (and roosting elsewhere). This would also correspond with the bouts of activity recorded, rather than intermittent calls expected if hibernating bats were emerging from the tunnel. Limited activity was recorded at

dawn indicating a lack of any re-entries to the tunnel (during the winter some bats will leave hibernation roosts to forage overnight and return, particularly during warmer periods). However, the activity recorded cannot be ruled out as indicative of hibernation activity, particularly given the period of calls corresponds with when bats would likely be leaving hibernation roosts. As such, the tunnel is considered to potentially support a low level of winter roosting activity by Brown Long-eared bat.

Trees

5.3.17 Trees within the site were inspected for presence of features offering potential for roosting bats, such as rot holes, cracks, splits, loose bark or dense Ivy cover, following the methodology outlined in the Bat Conservation Trust survey guidelines.

5.3.18 Where trees supporting bat roosting potential occur as infield trees or standards along hedgerows, these have been mapped and categorised based on their bat roosting potential, as shown on Plan 4657/ECO4. Areas of woodland and tree groups identified as potentially affected under the proposals were also subject to detailed assessment to identify individual trees supporting bat roosting potential, with these also mapped on Plan 4657/ECO4. Within remaining woodland areas, a general assessment was undertaken to identify if trees with bat roosting potential were present within such areas, although given such features are generally to be retained and due to difficulties mapping individual trees, specific trees with bat roosting potential have generally not been plotted. Descriptions of individual trees are provided at Appendix 4657/7.

5.3.19 A number of trees and tree groups were also subject to specific emergence/re-entry or roosting surveys, as detailed at Table 2.1 in the methodology section. A summary of the survey results is set out at Table 5.2 below.

Table 5.2: Results of emergence/re-entry surveys and roosting surveys of trees and tree groups

Tree/Tree Group	Emerging/re-entering bats	Summary of other activity
T7	None	Occasional Common Pipistrelle activity
T8	None	Occasional Common Pipistrelle, Soprano Pipistrelle and big bat activity
T27	None	Occasional Common Pipistrelle activity
T28	None	Occasional Common Pipistrelle activity
T29	None	Occasional Common Pipistrelle and Soprano Pipistrelle activity
T31	None	Very low levels of Common Pipistrelle activity
T33	None	Low levels of Common Pipistrelle and Soprano Pipistrelle activity
T35	None	Low levels of Common Pipistrelle activity
T36	None	Low levels of Common Pipistrelle and big bat activity

Tree/Tree Group	Emerging/re-entering bats	Summary of other activity
TG2 (parkland)	Possible emergence of single Common and Soprano Pipistrelle from trees but not confirmed	Regular Common Pipistrelle and Soprano Pipistrelle activity with occasional big bat and Myotis
TG3	None	Low levels of Common Pipistrelle and big bat activity
TG4 (edge of Highsted Wood)	Possible emergence of single Common Pipistrelle from trees but not confirmed	Regular Common Pipistrelle and Soprano Pipistrelle activity with occasional big bat and Myotis
TG5 (Quarry C)	3 Noctules emerged from TG5b (20:28), 1 Noctule returned to TG5b (21:57) potentially interacting with another bat visible at the roost entrance	Regular Common Pipistrelle and Soprano Pipistrelle activity with occasional big bat and Myotis

5.3.20 Accordingly a single confirmed tree roost was recorded, namely TG5b, with three Noctules recorded emerging from the tree. This may comprise a small maternity roost. Potential roosting activity by small numbers of bats was recorded associated with tree groups TG2 and TG4 although no activity indicating the presence of large roosts was recorded.

5.3.21 **Evaluation – Roosting**

5.3.22 Survey work at the site has recorded a likely Brown Long-eared maternity roost at building B6, a non-breeding Brown Long-eared roost at building B4, non-breeding Soprano Pipistrelle roost at building B6 and possible Noctule maternity roost at tree TG5b. The tunnel within Quarry C at HIghsted Quarries LWS was also recorded to support some potential hibernation activity by Brown Long-eared bat. These roosts all support common and widespread species, and are considered to be of importance at a local level.

5.3.23 The site also supports numerous other trees and buildings offering bat roosting potential, and is considered to form a potential roosting resource of importance at the local level.

5.3.24 **Survey Results – Foraging and Commuting**

5.3.25 The site is dominated by arable land and intensively managed orchards, of limited value to foraging and commuting bats. However, habitats of elevated value are present within the site in the form of established woodland, parkland, treelines and hedgerows, along with areas of species rich grassland.

5.3.26 As such, further survey work in the form of manual and automated bat activity surveys were undertaken at the site between April and October 2017. The results of the survey work undertaken are summarised below and at Plans 4657/ECO5 and 4657/ECO6, with full results set out at Appendices 4657/8 and 4657/9.

Manual surveys

5.3.27 A total of six species or species groups[17] were recorded during the manual activity surveys. Across the site as a whole, activity was dominated by Common Pipistrelle (75.48% of all registrations), with frequent Soprano Pipistrelle (9.82%) and occasional Noctule or other big bat species (3.04%) and Brown Long-eared (2.62%), together with very occasional Myotis spp. (0.42%) and Nathusius' Pipistrelle (0.07%).

5.3.28 Activity was relatively widespread across the site, with similar average passes per minute recorded across all transects (varying between 0.07 passes per minute at transect B and 0.56 passes per minute at transect G). Areas of highest activity were generally associated with woodland edges or more established treelines, and only very low levels of activity were recorded across much of the arable and commercial orchard dominated areas. Big bats and Brown Long-eared bats were recorded along the majority of transects, although Myotis was only recorded in a few locations, namely at transects 3, G and H.

Automated surveys

5.3.29 The automated surveys recorded similar activity to the manual transects, with activity dominated by Common Pipistrelle (84.38% of all registrations), together with frequent Soprano Pipistrelle (12.16%) and occasional Noctule or other big bat species (2%), Brown Long-eared (0.74%), Myotis spp. (0.36%) and Nathusius' Pipistrelle (0.25%).

5.3.30 Static detector locations with the highest average bat registrations per night (see Plan 4657/ECO6) do not appear to closely correspond to general habitat type, with detectors located within arable and orchard areas recording some of the highest levels of activity, whereas detectors within the woodland and quarry areas recorded relatively low levels of activity. This is likely a result of the specific habitat features where detectors were located, with hedgerows and treelines supporting more frequent activity than the surrounding landscape, although indicates that edge habitats generally supported the highest levels of activity.

5.3.31 Based on the static detector recordings, big bats were relatively widely distributed across the site, occurring with bat registrations per night (BRPN) of more than 1 at most locations. Brown Long-eared and Myotis were more restricted, with the former species occurring with a BRPN of more than 1 at static locations 2, 4, 9, 11, 12, 13, 19 and 23, and the latter only at static locations 5 and 11. With the exception of static locations 19 and 23, these are generally associated with wooded areas, indicating a strong association for these species with the more wooded areas.

5.3.32 **Evaluation – Foraging and Commuting**

5.3.33 Overall, low to moderate levels of activity were recorded within the site, with at least six species (or species groups) recorded during the surveys including Common Pipistrelle, Soprano Pipistrelle, Nathusius' Pipistrelle, big bat, Myotis sp. and Brown Long-eared. Activity was generally widespread across the site, with woodland edges and more established treelines appearing to support the highest levels of activity.

[17] *Myotis* sp. and *Nyctalus/Eptesicus* sp. (big bats) are difficult to separate based on analysis of calls alone, and have therefore been identified to species group level only. It is likely several different species within each group are present at the site.

5.3.34 Common Pipistrelle was most frequently recorded, together with Soprano Pipistrelle and occasional big bat and Brown Long-eared. Myotis sp. and Nathusius' Pipistrelle were recorded only very occasionally, indicating that the site is unlikely to be of high importance for these species.

5.3.35 Guidance on evaluation of the overall assemblage of bats at a site (Wray et al., 2010)[18] sets out a scoring system based on the rarity of species recorded, number of individuals, proximity to roosts and habitat character. The results of this scoring exercise are set out below for the bat species recorded within the site:

Table 5.3: Evaluation of bat species recorded at the site

Species	Rarity	Number of bats	Roosts/potential roosts nearby	Foraging habitat characteristics	Total score
Common Pipistrelle	Common (2)	Small number of bats (10)	Moderate number/ not known (4)	Larger or connected woodland blocks, mixed agriculture (4)	20
Soprano Pipistrelle	Common (2)	Individual bats (5)	Moderate number/ not known (4)	Larger or connected woodland blocks, mixed agriculture (4)	15
Brown Long-eared	Common (2)	Individual bats (5)	Moderate number/ not known (4)	Larger or connected woodland blocks, mixed agriculture (4)	15
Other species	Rarer (5)	Individual bats (5)	Moderate number/ not known (4)	Larger or connected woodland blocks, mixed agriculture (4)	18

5.3.36 Based on this scoring system, the site scores between 15 and 20 points, which equates to a district, local or parish level of value. Given the scores obtained are at the higher end of this range, it is considered that overall the population of bats associated with the site is of importance at the district level.

5.4 Badger

5.4.1 **Legislation:** Badger receive legislative protection under the Protection of Badgers Act 1992 (see Appendix 4657/6 for detailed provisions), and as such should be assessed as an important ecological feature. However, the legislation aims to protect the species from persecution, rather than being a response to an unfavourable conservation status, as the species is in fact common over most of Britain. It is the duty of planning authorities to consider the conservation and welfare impacts of development upon Badger and issue permissions accordingly.

5.4.2 Licences can be obtained from Natural England for development activities that would otherwise be unlawful under the legislation. Guidance on the types of activity that should be licensed is laid out in the relevant best practice guidance. [19, 20]

5.4.3 **Background Records:** A number of records of Badger were returned from the LRC including a small number from adjacent to and within the site, including a record from within Cromer's Wood dated from 2014.

5.4.4 **Survey Results:** A number of Badger setts have been identified within the site and its nearby surrounds, labelled **S1-S23** on Plan 4657/ECO7. Badger setts can be classified

[18] S. Wray, D. Wells, E. Long & T. Mitchell-Jones (December 2010). *Valuing Bats in EcIA.* In Practice, IEEM.
[19] English Nature (2002) '*Badgers and Development'*
[20] Natural England (2011) '*Badgers and Development: A Guide to Best Practice and Licensing'*, Interim Guidance Document

according to their usage by Badgers[21]: a 'main sett' is usually in continuous use with a large number of entrances; an 'annex sett' located close to the main sett with several entrances but not usually in continuous use; a 'subsidiary sett' is located some distance from the main sett (e.g. over 50m[22]) comprising a small number of entrances and not usually in continuous use; and an 'outlier sett' is located some distance from the main setts, usually comprising one or two entrances and subject to sporadic use. A description of individual setts and classification on this basis is set out in Table 5.4 below.

Table 5.4: Badger survey results

Sett reference	Description	Status
S1	2 entrances recorded, one located at boundary, the other 2m into the field. Some spoil and Badger hair noted. Recorded to be disused in 2021. Abundant Rabbit activity and no evidence for the continued presence of Badger.	Disused Outlier
S2	Lots of Rabbit activity but single entrance appears to be in use by Badger. Appears active but no recent evidence of use. In 2021 recorded to comprise an active three entrance sett.	Outlier
S3	Approximately 15 entrances located throughout the woodland, in five main groupings. All appeared to be inactive/disused in 2018 with no recent evidence of Badger. In 2021 however, the setts located at the east of Bex Wood (S3B-E) were recorded to have been brought back into active use.	-
	A) Single entrance to north west, continued to be disused in 2021.	Disused Outlier
	B) 5 entrances with an accumulation of leaf litter in 2021 indicating inactivity, however these could be very easily cleared by Badger.	Annex
	C) 9 active entrances recorded in 2021.	Main
	D) 3 active entrances recorded in 2021.	Annex
	E) 2 active entrances recorded in 2021.	Annex
S4	Single active entrance with fresh spoil. No change was recorded to this sett in 2021.	Outlier
S5	Single entrance, appears active but with no fresh spoil or bedding.	Annex
S6	Large sett with 14 active, 4 partially used and 3 disused entrances recorded. Large amounts of spoil present together with Badger hairs and clear pathways. In 2021 this sett was recorded to continue to be active and largely as previously recorded. Fewer active entrances (9) were noted, whilst abundant field signs were associated with the setts including a number of latrines.	Main
S7	Two entrance sett, with active entrance at boundary of woodland, and inactive entrance c.6m into woodland. Droppings recorded by active sett entrance. In 2021 this sett was recorded to support an inactive entrance which contained brash and leaf litter. Further entrances in the area showed evidence of use by rabbit.	Outlier

[21] Thornton, P.S. (1998) Density and distribution of badgers in south-west England – a predictive model. *Mammal review*, **18**, 11-23.

[22] Natural England (December 2010) *Badgers and Development – A guide to best practice and licensing*.

Sett reference	Description	Status
S8	Single entrance dug into steep slope at entrance to quarry. Likely to be active with pathways leading to entrance. This sett was recorded to be unchanged in 2021.	Outlier
S9	Relatively large sett with at least 5 active entrances, although further entrances may be hidden in dense scrub. Large spoil mounds, bedding and scratch marks present. In 2021 the area surrounding S9 was largely inaccessible and surrounded by dense bramble, however one active entrance was clearly visible. It is considered likely to be broadly as previously recorded but this could not be fully verified.	Subsidiary
S10	Single entrance sett, appears active. This was recorded unchanged and active in 2021.	Outlier
S11	Single entrance sett, appears active. In 2021 it appeared that the previously recorded entrance had collapsed with a single new entrance excavated slightly to the south, at the edge of the fence marking the quarry boundary.	Outlier
S12	Single entrance sett, appears active. This was recorded unchanged and active in 2021.	Outlier
S13	Associated with a bank on the western side of a double hedgerow and footpath. Recorded to comprise 16 entrances (although it could be two separate setts with 3 and 13 entrances, respectively) showing clear signs of activity, associated with many latrines and a clear pathway along the hedgerow. This was recorded to be largely unchanged in 2021. 15 active entrances were recorded and it was noted that further active entrances could be located within the denser sections of the hedgerow.	Main
S14	Located within arable field. 7 entrances recorded, associated with large spoil heaps, evidence of bedding and a number of latrines. A clear path connects the entrances and leads away to the south-east and north-west.	Subsidiary
S15	Comprises 11 active entrances within the hedgerow, with a further 3 entrances within the arable field to the south. The sett was recorded to be associated with a number of latrines and a clear pathway running along the hedgerow and connecting the entrances. In 2021 this was recorded to be largely unchanged in status. Access was not available to the south, however 6 active entrances were visible within the hedgerow along with a well-used pathway also located along the hedgerow. It was further noted that a ditch has been excavated in close proximity to this sett and the spoil may have obscured further entrances.	Main
S16	2 entrances located within hedgerow. Active with spoil, fresh bedding and Badger hairs recorded.	Outlier
S17	Likely former Badger sett with spoil mound but now appears disused.	Disused Outlier
S18	4 active entrances associated with treeline. Spoil heaps, bedding and Badger hairs recorded, whilst further burrows in this area were recorded to be associated with characteristics indicating use by Foxes, and as such it is considered that both Fox and Badger have burrows within this treeline.	Subsidiary

Sett reference	Description	Status
S19	Numerous entrances located at edge of small wooded area. Several appear to be in use by Rabbit, but likely 4 entrances in use by Badger (with hairs and latrines present), together with 5-6 potential inactive entrances.	Subsidiary
S20	Single entrance sett recorded in 2021. Appears active.	Outlier
S21	8 holes in total although only 3 or 4 recorded to be partially active in 2018. Spoil mounds and clear network of paths present.	Subsidiary
S22	2 active entrances and one partially used entrance recorded in 2018 during surveys of quarry.	Outlier
S23	Single sett entrance with large spoil heap recorded in 2018	Outlier

5.4.5 As Table 5.4 details, the site appears to support three main setts (S6, S13 and S15), together with a number of annex, subsidiary and outlier setts. On this basis, the site is likely to support territory for three separate Badger groups.

5.4.6 In terms of foraging habitat, habitats across the site are likely to provide good foraging opportunities for Badger in the form of woodland and grassland pasture.

5.4.7 **Evaluation:** Three main setts and a number of annex, subsidiary and outlier setts have been recorded at the site. As such, it is considered likely that the site and its nearby surrounds forms core habitat for three Badger territories, with habitats across the site providing potential foraging habitat. On this basis, the population of Badgers associated with the site is considered to form an important ecological feature, of value at the local level.

5.5 Dormouse

5.5.1 **Legislation:** Dormouse is fully protected under the Wildlife and Countryside Act 1981 (as amended) and is a European Protected Species under the Conservation of Habitats and Species Regulations 2010 (as amended). Such legislation affords protection to individuals of the species and their breeding sites and places of rest (see Appendix 4657/6 for detailed provisions). Dormouse is also a Priority Species. On this basis, Dormouse is considered to form an important ecological feature.

5.5.2 **Background Records:** The desktop study returned a number of records of Dormouse from within the search area, including a number of records from adjacent to or within the site, located within Cromer's Wood, at the eastern edge of the Kent Science Park development and within the wooded strip associated with the southern edge of the M2, the most recent of which is dated 2014.

5.5.3 **Survey Results:** The site provides good opportunities for Dormouse, particularly in the form of areas of woodland, hedgerows and, to a lesser extent, scrub throughout the site. The majority of the site however is dominated by arable land and intensive orchards, which are unsuitable for Dormouse.

5.5.4 Given the presence of potential Dormouse habitat within the site, specific Dormouse survey work was undertaken at the site throughout 2017. The results of this survey are shown at Plan 4657/ECO8.

5.5.5 Nest tube surveys undertaken at the site in 2017 confirmed the presence of Dormouse within the site, with evidence in the form of nests and individual Dormice associated with Highsted Wood and with hedgerows and wooded strips at the south and north of the site, as shown on Plan 4657/ECO8 and at Table 5.5, below.

Table 5.5: Dormouse survey results.

Survey Date	Dormouse Evidence	Location
15-16 August 2017	**Characteristic Dormouse nest (fresh)**	Tube reference X12, located within hedgerow at the south west of the site
	Potential Dormouse nest (early stage nest)	Tube reference Y7, located within hedgerow at the south west of the site
	Characteristic Dormouse nest (fresh)	Tube reference Y4, located within hedgerow at the south west of the site
	Characteristic Dormouse nest (fresh)	Tube reference AA5, Located within hedgerow at the south of the site
20-21 September 2017	**Potential Dormouse nest (early stage nest)**	Tube reference B, located within hedgerow at the north east of the site
	Characteristic Dormouse nest (fresh)	Tube reference D10, located within hedgerow at the north east of the site
	Characteristic Dormouse nest with a single female, non-breeding juvenile Dormouse	Tube reference R15, located within Highsted Wood
	Characteristic Dormouse nest (fresh)	Tube reference X12, located within hedgerow at the south west of the site
	Characteristic Dormouse nest (fresh)	Tube reference Y7, located within hedgerow at the south west of the site
	Characteristic Dormouse nest with a single adult Dormouse	Tube reference Z1, located within hedgerow at the south west of the site
	Characteristic Dormouse nest (fresh)	Tube reference Z3, located within hedgerow at the south west of the site
	Characteristic Dormouse nest with two adult Dormice	Tube reference AA5, located within hedgerow at the south west of the site
	Characteristic Dormouse nest with a single adult Dormouse	Tube reference AA12, located within hedgerow at the south west of the site
28 November 2017	No additional Dormouse evidence recorded (only transects not previously found to support Dormice surveyed)	-

5.5.6 **Evaluation:** Evidence for the presence of Dormouse within the site was recorded during the course of the survey work. A number of established woodlands are present within the site and its surrounds, some of which are listed as Ancient Woodland, and were recorded to support a range of tree and shrub species and diverse understorey vegetation. As such, it is considered that these woodlands are of high value to Dormouse, and are likely to form core habitat for the local Dormouse population. Furthermore a network of hedgerows is present across the site forming secondary habitat and corridors for commuting and dispersal for this species.

5.5.7 Evidence for the presence of Dormouse within the site was recorded within Highsted Wood, hedgerows at the north east of the site, and within hedgerows, treelines and wooded strips at the south west of the site, as detailed on Plan 4657/ECO8. In addition to this, it is known that Dormouse are present with Cromer's Wood, located adjacent to the site boundary at the south (see Plan 4657/ECO8). The remaining areas of woodland within the site, namely Bex Wood and the developing woodland within the quarries were not recorded to support Dormouse.

5.5.8 Given the connectivity of wooded habitats across the site, it is considered likely that Dormouse are present within the majority of woodlands at the site, whilst the hedgerows and wooded strips are likely to be subject to low levels of use on an occasional basis, as commuting corridors. However, no Dormice have been recorded within the Highsted Quarries, and it is considered that populations may not have established within these areas given the relatively recent development of woodland.

5.5.9 Kent is located within the core distribution area for Dormouse, and the species is relatively widespread across the county[23]. As such, the population supported by the site is considered to form an important ecological feature, of value at the district level.

5.6 Other Mammals

5.6.1 **Legislation:** A number of other UK mammal species do not receive direct legislative protection relevant to development activities but may receive protection against acts of cruelty (e.g. under the Wild Mammals (Protection) Act 1996). In addition, a number of these mammal species including Hedgehog *Erinaceus europaeus*, Brown Hare *Lepus europaeus*, Harvest Mouse *Micromys minutus* and Polecat *Mustela putorius* are Priority Species, and should be assessed as important ecological features.

5.6.2 **Background Records:** The desktop study returned numerous records of Hedgehog, Otter *Lutra lutra*, Water Vole *Arvicola amphibius*, Muntjac *Muntiacus reevesi*, Polecat *Mustela putorius*, Weasel *Mustela nivalis*, Stoat *Mustela erminea*, Pygmy Shrew *Sorex minutus* and Common Shrew *Sorex araneus* from within the search area. A record of Hedgehog relates to the north east of the site and is dated 2007, whilst records of Common and Pygmy Shrew relate to the south of the site and are dated 2002 and 2006.

5.6.3 **Survey Results:** Evidence of a number of common mammal species was recorded across the site and wider survey area, including Fox *Vulpes vulpes*, Rabbit *Oryctolagus cuniculus* and Wood Mouse *Apodemus sylvaticus* recorded during the surveys of the site.

5.6.4 Habitats within the site provide potential for priority species including Hedgehog, Brown Hare, with small numbers of Brown Hare recorded during surveys of the site. However, areas of suitable rough grassland at the site are relatively small in extent and unlikely to support significant numbers of Harvest Mouse.

5.6.5 **Evaluation:** Species including Fox, Rabbit, Roe Deer and Wood Mouse are common and widespread and are not subject to any legislative protection relevant to

[23] Mammal Watch South East (2015) *South East Mammal Atlas: covering Hampshire, Surrey, Sussex, Kent and the Isle of Wight*

development activities. As such, these species are not considered to form important ecological features, and are not of importance outside of a site context.

5.6.6 The site was recorded to support the priority mammal species Brown Hare. Furthermore, there is also some potential for other priority mammal species including Hedgehog to be present, although this species remains relatively common, whilst habitats are unlikely to be of importance in a local context, particularly given the intensive nature of the arable farming and commercial orchards. On this basis, such species are considered to be of potential importance at a site level only.

5.7 Birds

5.7.1 **Legislation:** All wild birds and their nests receive protection under Section 1 of the Wildlife and Countryside Act 1981 (as amended) in respect of killing and injury, and their nests, whilst being built or in use, cannot be taken, damaged or destroyed. Species included on Schedule 1 of the Act receive greater protection and are subject to special penalties (see Appendix 4657/6 for detailed provisions).

5.7.2 **Conservation Status:** The conservation importance of British bird species is categorised based on a number of criteria including the level of threat to a species' population status[24]. Species are listed as Green, Amber or Red. Red Listed species are considered to be of the highest conservation concern being either globally threatened and or experiencing a high/rapid level of population decline (>50% over the past 25 years). A number of birds are also Priority Species. Red and Amber listed species and priority species should be assessed as important ecological features.

5.7.3 **Background Records:** A number of records of Schedule 1 species were returned from the data search. Of these, records for Honey Buzzard *Pernis apivorus*, Red Kite *Milvus milvus*, Osprey *Pandion Haliaetus*, Barn Owl *Tyto alba*, Fieldfare *Turdus pilaris*, Common Crossbill *Loxia curvirostra* and Snow Bunting *Plectrophenax nivalis* could originate from within the site itself, albeit due to the resolution of the location reference, it is not possible to determine the precise locations of these records.

5.7.4 Records of several priority bird species were also returned from within the search area, including Corn Bunting *Emberiza calandra*, Reed Bunting *Emberiza schoeniclus*, Yellowhammer *Emberiza citrinella*, Hawfinch *Coccothraustes coccothraustes*, Bullfinch *Pyrrhula pyrrhula*, Lesser Redpoll *Acanthis cabaret*, Linnet *Linaria cannabina*, Tree Sparrow *Passer montanus*, House Sparrow *Passer domesticus*, Starling *Sturnus vulgaris*, Willow Tit *Parus montanus*, Marsh Tit *Parus palustris*, Spotted Flycatcher *Muscicapa striata*, Song Thrush *Turdus philomelos*, Ring Ouzel *Turdus torquatus*, Dunnock *Prunella modularis*, Skylark *Alauda arvensis*, Tree Pipit *Anthus trivialis*, Yellow Wagtail *Motacilla flava*, Nightjar *Caprimulgus europaeus*, Arctic Skua *Stercorarius parasiticus*, Curlew *Numenius arquata*, Black-tailed Godwit *Limosa limosa*, Stone-curlew *Burhinus oedicnemus*, Lesser Spotted Woodpecker *Dryobates minor*, Cuckoo *Cuculus canorus*, Turtle Dove *Streptopelia turtur*, Herring Gull *Larus argentatus*, Lapwing *Vanellus vanellus* and Grey Partridge *Perdix perdix*. None of these records were confirmed to originate from within the site or its immediate surrounds, however due to the resolution of the location reference, largely relating to either 1km or 2km grid squares, the following species may have been recorded within the site: Lapwing,

[24] 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 the Isle of Man'* British Birds *108*, pp.708-746

Arctic Skua, Herring Gull, Turtle Dove, Cuckoo, Lesser Spotted Woodpecker, Tree Pipit, Ring Ouzel, Marsh Tit, Willow Tit, Hawfinch, Yellowhammer and Corn Bunting, which were recorded between 1971 (Cuckoo) and 2014 (Yellowhammer).

5.7.5 **Survey Results:** The site offers a range of opportunities for bird species, particularly in the form of wooded habitats, hedgerows and farmland, which offer foraging areas and potential nesting areas for a range of bird species. Accordingly, wintering bird surveys were carried out at the site during January to March 2017 and October 2018 to March 2019, and breeding bird surveys were carried out at the site during May to June 2017.

5.7.6 A total of 71 bird species were recorded during the surveys, of which 35 were recorded to be breeding or probably breeding within the site, whilst a further ten were possibly breeding (i.e. habitat suitable to support the species is present). The remaining 23 species were either breeding in adjacent areas, recorded as migrants or flying over the site, or represented only by non-breeding individuals, including 13 that were only recorded during the winter. A full list of species recorded is included at Table 5.6 below, whilst the distribution of birds recorded to be breeding and main wintering flocks within / adjacent to the site survey area are shown at Plan 4657/ECO9.

Table 5.6. Results of breeding and wintering bird surveys

Species	Qualifying Status	Conservation Status	Estimated number (breeding pairs)*	Max winter population*	Notes
Pheasant (PH) *Phasianus colchicus*			3	4	
Red-legged partridge (RL) *Alectoris rufa*			1	19	
Grey partridge (P.) *Perdix perdix*		Red, S41	2	2	
Quail (Q.) *Coturnix coturnix*		Amber, Sch1	0-1		In the east.
Marsh harrier (MR) *Circus aeruginosus*	2B	Amber, Sch1		1	A female over in February, and a male in March, both in the east.
Buzzard (BZ) Buteo buteo			0-1	3	
Sparrowhawk (SH) Accipiter nisus			0-1	1	
Moorhen (MH) *Gallinula chloropus*	4B 8B		0		On the pond at Ashgorse house (outside the site).
Lapwing (L.) *Vanellus vanellus*	3W 4B 6W 8B	Red, S41		64	Only recorded in January 2017.
Curlew (CU) *Numenius arquata*	3W 4W 6W 7W	Red, S41		100	100 in January, three in February 2017, 90 in Oct 2018 and 2 in Nov 2018
Redshank (RK) Tringa totanus	2W 3W 4BW 7W 8B	Amber		1	With lapwing in January 2017.
Snipe (SN) *Gallinago gallinago*		Amber		1	A presumed migrant in the east in March 2017.
Black-headed gull (BH) *Chroicocephalus ridibundus*	6B	Amber	0	220	Foraging or flying over.
Mediterranean gull (MU) *Larus melanocephalus*	2B 6B	Amber, Sch1	0	20	Foraging or flying over.
Common gull (CM) *Larus canus*		Amber		25	Foraging or flying over.

Species	Qualifying Status	Conservation Status	Estimated number (breeding pairs)*	Max winter population*	Notes
Lesser black-backed gull (LB) Larus fuscus		Amber	0		Recorded flying over in the spring.
Herring gull (HG) Larus argentatus		Red, S41	0	2	Flying over in the spring.
Feral pigeon (FP) Columba livia			1		
Stock dove (SD) *Columba oenas*		Amber	2	17	
Woodpigeon (WP) *C. palumbus*			25	500	
Turtle dove (TD) *Streptopelia turtur*		Red, S41	0-1		
Collared dove (CD) *S. decaocto*				3	Also 80 just offsite to the northeast in February 2017.
Barn owl (BO) *Tyto alba*		Sch1	0-1		Hunting at Bapchild in May and June 2017.
Little owl (LO) *Athene noctua*			2-3	2	Especially in the west.
Short-eared Owl (SE) *Asio flammeus*	4BW	Amber		4	Roosting in strip of rough grassland in Feb/Mar.
Swift (SI) Apus apus		Amber	0		One flew over in June 2017.
Green woodpecker (G.) *Picus viridis*			3	2	
Great spotted woodpecker (GS) *Dendrocopos major*			0-2	1	
Kestrel (K.) *Falco tinnunculus*		Amber		2	One in January 2017.
Hobby (HY) *Falco subbuteo*		Sch1	0		One on 8th May 2017, presumably a migrant.
Jay (J.) *Garrulus glandarius*			0-1	3	
Magpie (MG) Pica pica			2	6	
Jackdaw (JD) *Corvus monedula*			0-1	500	500 in January 2017, otherwise very few.
Rook (RO) *Corvus frugilegus*			0	200	200 in January 2017. A small rookery lies just offsite to the north.
Carrion crow (C.) *Corvus corone*			4	10	
Raven (RN) *Corvus corax*				1	One flew over in March 2017.
Goldcrest (GC) Regulus regulus			1		
Blue tit (BT) *Cyanistes caeruleus*			6	5	
Great tit (GT) *Parus major*			6	7	
Coal tit (CT) *Periparus ater*			0	2	Recorded in March and June 2017.
Skylark (S.) *Alauda arvensis*	8B	Red, S41	16	26	Few present in winter.
Swallow (SL) *Hirundo rustica*			1		
Long-tailed tit (LT) *Aegithalos caudatus*			2	2	

Species	Qualifying Status	Conservation Status	Estimated number (breeding pairs)*	Max winter population*	Notes
Chiffchaff (CC) *Phylloscopus collybita*			6		
Blackcap (BC) *Sylvia atricapilla*			10		
Garden warbler (GW) *Sylvia borin*			1		
Lesser whitethroat (LW) *S. curruca*			1		
Whitethroat (WH) *Sylvia communis*			18		
Treecreeper (TC) *Certhia familiaris*			1	2	Resident in the west.
Wren (WR) *Troglodytes troglodytes*			31	8	
Starling (SG) *Sturnus vulgaris*		Red, S41	0-1	1500	Especially in orchards during winter.
Blackbird (B.) *Turdus merula*			27	10	
Redwing (RE) *Turdus iliacus*		Red, Schedule 1		100	Especially in orchards.
Song thrush (ST) *Turdus philomelos*		Red, S41	9	15	
Fieldfare (FF) *Turdus pilaris*		Red, Schedule 1		420	Especially in orchards.
Mistle thrush (M.) *Turdus viscivorus*		Red	2	6	
Robin (R.) *Erithacus rubecula*			16	5	
Stonechat (SC) *Saxicola rubicola*				2	In strip of rough grassland
Dunnock (D.) *Prunella modularis*		Amber, S41	17	2	
House sparrow (HS) *Passer domesticus*		Red, S41	6	10	Associated with housing.
Yellow wagtail (YW) *Motacilla flava*	8B	Red, S41	1		In the east.
Pied wagtail (PW) *Motacilla alba*			0		Recorded flying over.
Meadow pipit (MP) *Anthus pratensis*	8B	Amber		20	
Chaffinch (CH) *Fringilla coelebs*			28	25	
Bullfinch (BF) *Pyrrhula pyrrhula*		Amber, S41	0-1		
Greenfinch (GR) *Chloris chloris*			1		
Linnet (LI) *Linaria cannabina*		Red, S41	6	100	Autumn flock in October 2018
Goldfinch (GO) *Carduelis carduelis*			5	5	
Corn bunting (CB) *Emberiza. calandra*		Red, S41	1-3	16	In the east.
Reed bunting (RB) *E. schoeniclus*		Amber, S41		1	
Yellowhammer (Y.) E. citrinella		Red, S41		2	

**A blank box indicates that the species was not recorded during the respective season. A zero indicates that the species was recorded but not breeding. Numbers in brackets indicate birds recorded within the wider survey area*

Qualifying Status
1 Species listed as an individual qualifying feature for The Swale SPA (based on the European Site Conservation Objectives, 21 February 2019, v3)
2 Species listed as an individual qualifying feature for The Swale SPA (based on 2001 JNCC SPA Review)
3 Species listed as part of waterfowl assemblage for The Swale SPA (based on 2001 JNCC SPA Review)
4 Other species noted in relation to The Swale SPA (under 1993 citation)
5 Species listed as qualifying species for The Swale Ramsar (Information Sheet on Ramsar Wetlands, updated May 2005)
6 Species listed as noteworthy fauna for The Swale Ramsar (Information Sheet on Ramsar Wetlands, updated May 2005)
7 Species listed as a notified feature for The Swale SSSI (https://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=S1003678, 'NVC, GCR, species and other features', viewed May 2021)
8 Other species noted on The Swale SSSI citation
B = breeding, W = wintering

Conservation Status
Amber = amber listed
Red = red listed
S41 = Section 41 priority species
Sch1 = listed under Schedule 1 of WCA1981

5.7.7 Based on the survey results, the site is considered to support a modest assemblage of breeding birds, with the majority of activity recorded associated with the woodland and hedgerow habitats, with less activity recorded associated with the arable fields and intensive orchards which dominate the habitats at the site. The most notable species recorded during the survey included 2 breeding pairs of Grey partridge, 0-1 breeding pairs of Turtle Dove, 0-1 breeding pairs of Barn Owl and 16 breeding pairs of Skylark (13 located within the site), all of which were associated with the arable and grassland habitats, largely within the central and north eastern part of the site, although one Grey Partridge was recorded within the south west. Otherwise, only moderate numbers of notable species were recorded, largely associated with the network of wooded habitats at the site, including the woodland, hedgerows and wooded strips.

5.7.8 Based on the additional areas of the site not included within the bird survey area, a small number of additional breeding pairs may be supported by the site. Notably, based on c.75ha of arable land supporting an average of 1 Skylark territory per 10ha (based on the average density within the site), an additional 8 Skylark territories may be present. An estimated 2 additional pairs of Linnet and 2 pairs of Grey Partridge could also be present. Other species appear to be associated with habitat types that are limited within the additional survey area, including woodlands, hedgerows and rough grassland, or are associated with large territory areas, such that the recorded numbers are likely to be broadly representative of the total population sizes.

5.7.9 A total of 50 species were recorded during wintering bird surveys including red listed Grey Partridge, Lapwing, Curlew, Skylark, Starling, Redwing, Song Thrush, Fieldfare, Mistle Thrush, House Sparrow and Corn Bunting, and amber listed Marsh Harrier, Redshank, Snipe, Black-headed Gull, Mediterranean Gull, Common Gull, Stock Dove, Kestrel, Dunnock, Meadow Pipit and Reed Bunting. A number of these species were recorded within large flocks, foraging over the arable fields. Notable, winter maximums of 64 Lapwing, 100 Curlew, 1500 Starling, 100 Redwing and 420 Fieldfare (all of which are red listed species) were recorded, although the large flocks of Lapwing and Curlew were only recorded during severe winter weather on one and two visits respectively, indicating large numbers of these species do not make regular use of the site.

5.7.10 **Evaluation:** Overall, the site is considered to support a moderate bird assemblage including a medium number of more notable species, whilst large flocks of some notable species were recorded using the site over winter. In this regard, two notable groups are identified, namely those species listed as qualifying species for The Swale SPA and Ramsar, and declining farmland birds.

5.7.11 A discussion of qualifying SPA species is set out in the Report to Inform a Habitats Regulations Assessment (HRA) which forms a separate appendix to the Environmental Statement accompanying the planning application. Such species were generally recorded in only small numbers, or appeared to make only sporadic use of the site and it does not appear to provide a significant habitat resource, due to poor suitability of habitat and distance from the designation. As such, the site is only considered to be of local importance for such species.

5.7.12 A number of declining farmland birds were recorded at the site, including Grey Partridge, Turtle Dove, Skylark, Yellow Wagtail, Linnet and Corn Bunting, albeit these were only recorded in low numbers, the most numerous being Skylark. This is not exceptional given the large size of the site. On this basis, these species are individually considered to form important ecological features, of value at the local level.

5.7.13 Otherwise, bird species recorded are generally common and widespread and typical of the habitats present within the wider area. On this basis, the overall assemblage of birds supported by the site is considered to form an important ecological feature, of value at the local level.

5.8 Amphibians

5.8.1 **Legislation.** All British amphibian species receive a degree of protection under the Wildlife and Countryside Act 1981 (as amended). Great Crested Newt is protected under the Act and is also classed as a European Protected Species under the Conservation of Habitats and Species Regulations 2010 (as amended). As such, both Great Crested Newt and habitats utilised by this species are afforded protection (see Appendix 4657/6 for detailed provisions). Great Crested Newt is also a Priority Species, as are Common Toad *Bufo bufo*, Natterjack Toad *Epidalea calamita*, and Pool Frog *Pelophylax lessonae*. As such, these species should be assessed as important ecological features.

5.8.2 **Background Records.** KMBRC returned records of Smooth Newt *Lissotriton Vulgaris*, Palmate Newt *Lissotriton helveticus*, Great rested Newt, Common Toad and Edible Frog *Pelophylax esculentus* from within the search area, including records of Smooth Newt and Common Toad from within the site. A number of records of Great Crested Newt were returned from Cromer's Wood, the most recent of which was dated from 2016.

5.8.3 **Survey Results.** 14 ponds were identified using online mapping within 500m of the site, identified as P1-P14 on Plan 4657/ECO10. Of the ponds identified from OS mapping, five are located beyond 250m of the site (ponds P4, P5, P6, P9 and P13) and were scoped out of survey given they are located outside of the routine migratory distance, are separated by substantial barriers to movement, or based on an initial habitat review were not considered to be of high suitability for newts. A further pond P14 is located 235m from the site boundary following a revision to the site boundary after the 2017 survey work, although given a landscape buffer will be maintained along

this boundary and built development will not be located within 250m, it was not considered necessary to survey this pond. Of the remaining ponds, P11 was recorded to be dry during the Great Crested Newt breeding season, whilst P12 was considered to be unsuitable for Great Crested Newts, forming a muddy hollow with significant disturbance by poultry. As such, these ponds were not subject to further survey.

5.8.4 The remaining ponds, namely P1, P2, P3, P7, P8 and P10 (divided into P10a and P10b, with a small connecting channel between the two), were all subject to eDNA survey in June 2017. Samples obtained from Pond P7, located within Cromer's Wood approximately 100m from the site boundary, found traces of Great Crested Newt eDNA, whilst all of the remaining ponds returned negative results for Great Crested Newt.

5.8.5 **Evaluation:** Great Crested Newt were found to be present within pond P7, located within Cromer Wood LWS, approximately 100m from the site. This species was found to be absent from all other ponds within the site and its immediate surrounds. As such it is considered that this species may make some use of the site where located within the vicinity of pond P7, however suitable habitat in this area is largely limited to the narrow field margins, with arable land considered to be sub-optimal habitat for Great Crested Newt forming the remainder of the on-site habitat within 250m of this pond. It is unlikely that this species is present within the remainder of the site. As such, Great Crested Newt are considered to be an important ecological feature, albeit they are likely to be very restricted in their distribution in relation to the site, and as such are considered to be of value at the site level only.

5.8.6 The site may also support small numbers of other amphibian species, including Smooth Newt and Common Toad, for which records were returned during the desktop study. Such species are considered to be of importance at the site level.

5.9 Reptiles

5.9.1 **Legislation**: All six species of British reptile are listed under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended), which protects individuals against intentional killing or injury. Sand Lizard *Lacerta agilis* and Smooth Snake *Coronella austriaca* receive additional protection under the Conservation of Habitats and Species Regulations 2010 (as amended); refer to Appendix 4657/6 for detailed provisions. All six reptile species are also Priority Species. As such, all reptile species should be assessed as important ecological features.

5.9.2 **Background Records:** KMBRC returned records of Common Lizard *Zootoca vivipara*, Slow-worm *Anguis fragilis* and Adder *Vipera berus*, dated 2012, 2011 and 2005 respectively, which could originate from within the site itself. However, due to the resolution of the location references, it is not possible to determine their precise location. A number of records of Grass Snake *Natrix natrix* were also returned by KMBRC as part of the desktop study, the nearest of which was located 390m to the north of the site boundary, dated from 2009.

5.9.3 **Survey Results:** The majority of the site, being dominated by arable land and intensively managed commercial orchards, is of low suitability for reptile species. However, suitable habitat is present at the site in the form of the open areas of habitat mosaic within the quarry basins, the species rich grassland to the south of the quarries and areas of rough grassland together with some field margins.

5.9.4 Given the presence of potential reptile habitat within the site and wider survey area, specific reptile survey work was undertaken during July and August 2017, the results of which are set out in Table 5.7 below and shown on Plan 4657/ECO11.

Table 5.7: Results of reptile presence/absence survey work undertaken within the site.

Survey	Date	Common Lizard		Slow-worm		Grass Snake		Other Species
		Adult	Juv.	Adult	Juv.	Adult	Juv.	
1	12/07/2017	3	2	3	0	0	0	0
2	21/07/2017	0	4	9	1	0	0	0
3	26/07/2017	22	33	35	19	0	0	0
4	28/07/2017	10	19	17	8	0	0	0
5	01/08/2017	7	7	14	5	0	0	0
6	18/08/2017	3	10	26	8	0	0	0
7	23/08/2017	8	46	34	15	0	0	0
Peak Adult Count		**22**		**35**		**0**		**0**

5.9.5 As set out above in Table 5.7, peak counts of 22 adult Common Lizard and 35 adult Slow Worm were recorded during the course of the survey work, whilst no other reptile species were recorded. These reptiles were recorded at various densities within the suitable habitat at the site. The highest densities of reptiles were recorded associated with the quarries, species rich grassland and parkland, along with some semi-improved, long sward grassland to the east of Cromer's Wood, and at the far south of the site (see Plan 4657/ECO11 for specific peak counts at each transect). Conversely, much of the north of the site was recorded to support no more than low numbers of reptiles, or did not support suitable habitat.

5.9.6 **Evaluation:** The majority of the site is considered unsuitable for reptiles, being dominated by arable land and intensively managed orchards, although opportunities are provided by habitat mosaics in the quarries, species rich grassland, parkland and the longer-sward grassland at the margins of woodland and hedgerows.

5.9.7 Following, guidance set out within 'Froglife Advice Sheet 10 – Reptile Survey', the populations of Common Lizard and Slow Worm supported by the Site are considered to be 'exceptional'. However, this assessment does not take into account the density of reptile mats within suitable reptile habitat, and the large size of the area surveyed. Based on an approximate field margin width of 2m, plus approximately 10ha of grassland and mosaic habitat, suitable reptile habitat within the Site totals approximately 11ha, equating to a refugia density of approximately 28 per hectare (at least three times the recommended 5-10 per hectare). As such, the Common Lizard and Slow Worm population estimate is considered to represent an over estimate, and is more appropriately described as a 'good' population within the quarries, species rich grassland, parkland and far south of the site. As such it is considered the reptile populations at the site represent an important ecological feature, however given such species are common and widespread in Kent, it is considered that the population of reptiles supported by the site is of value at the local level.

5.10 Invertebrates

5.10.1 **Legislation:** A number of invertebrate species are listed under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). In addition, Large Blue Butterfly

Maculinea arion, Fisher's Estuarine Moth *Gortyna borelii lunata* and Lesser Whirlpool Ram's-horn Snail *Anisus vorticulus* receive protection under the Conservation of Habitats and Species Regulations 2010 (as amended); refer to Appendix 4657/6 for detailed provisions. A number of invertebrates are also Priority Species. Where such species are present, they should be assessed as important ecological features.

5.10.2 **Background Records:** A number of records of Stag Beetle *Lucanus Cervus* were returned from within or adjacent to the site, the most recent record of which was dated from 1998.

5.10.3 **Survey Results:** A number of common invertebrate species were recorded during habitat and other faunal surveys at the site including Ruddy Darter *Sympetrum sanguineum*, Fritillary *Nymphalidae sp.*, Brimstone *Gonepteryx rhamni*, Speckled Wood *Pararge aegeria*, Gatekeeper *Pyronia tithonus*, Marbled White *Melanargia galathea*, Meadow Brown *Maniola jurtina* and Skipper *Hesperiidae sp.*.

5.10.4 In addition, during the course of the Phase 1 survey, the potential for habitats within the site to support any significant invertebrate assemblage was appraised, in accordance with English Nature and Natural England guidance[25,26].

5.10.5 The site is dominated by arable and intensively managed orchards. Such habitats are not identified as typically supporting elevated invertebrate interest, lacking a varied habitat structure and diverse floral assemblage. Notably, a review of these areas in accordance with the 'Key to identify habitat for invertebrates' from the Farm Environment Plan (FEP) Manual[27] does not record any micro-habitat features indicating elevated invertebrate interest (such as a variable topography with areas of vertical exposed soil, areas of species-rich semi-natural vegetation, variable vegetation structure with frequent patches of tussocks combined with short turf, free-draining light soils, walls with friable mortar or fibrous dung). As such, specific invertebrate survey of these areas was not undertaken.

5.10.6 Other habitats within the site including woodland, parkland (supporting mature trees), species rich grassland and the mosaic habitat within the quarry basins are recognised as being of elevated potential for invertebrates, and may support notable or rare invertebrate species as discussed below:

- Woodland and parkland – areas of woodland support a moderately varied habitat structure, mature trees and some diversity within ground flora. Flowering plants within the ground flora provide a nectar source for species such as butterflies, whilst mature trees provide a dead wood resource for species such as Stag Beetle;
- Species rich grassland – flowering plants within this habitat provide a rich pollen and nectar resource for bees and butterflies, whilst patches of bare ground provide potential nesting opportunities; and
- Scrub mosaic within the quarries – the habitat mosaic within the quarries provides a moderate diversity of opportunities within a relatively small space providing potential opportunities for a diversity of species, along with opportunities for various life stages of the same species.

25 English Nature (2005) *Organising surveys to determine site quality for invertebrates: a framework guide for ecologists.*
26 Natural England (2010) 'Higher Level Stewardship – Farm Environment Plan (FEP) Manual', 3rd Edition
27 Natural England (2010) 'Higher Level Stewardship – Farm Environment Plan (FEP) Manual', 3rd Edition

5.10.7 The potential interest of these areas for invertebrate species is reflected in the elevated ecological value assigned to these habitats (as set out in Section 4). Furthermore, to provide a detailed assessment of invertebrate interest in these areas, an invertebrate scoping survey was undertaken on 28 July 2017 by Arachne Ecology Ltd, followed by further invertebrate surveys in June and September 2018. Reports of these surveys are provided at Appendix 4657/10.

5.10.8 The invertebrate surveys recorded a minimum of 258 invertebrate taxa from the site as a whole, with 247 of these identified to species level. There were no legally protected or Red Listed species recorded but one Near Threatened/Nationally Rare beetle *Dasytes virens*, was found in the central pit of Highsted Quarries (Quarry B), together with 11 other species of notable conservation status. Habitats were also assessed in terms of their habitat quality assessment, scoring between 0 and 3 under nine assessment criteria (i.e. up to a maximum score of 27). Table 5.8 below provides a summary of the survey findings for the main habitat areas.

Table 5.8: Summary of invertebrate survey results

Habitat area	Habitat Quality Assessment scoring	Species richness (no. of species recorded)	Notable species recorded
Highsted Quarries southern pit (Quarry A)	11	52	*Ballus chalybeius* NS
Highsted Quarries central pit (Quarry B)	19	119	*Tyria jacobaeae* S41, *Dasytes virens* NR/NT *Hippodamia variegata* Nb*
Highsted Quarries northern pit (Quarry C)	10	38	*Tyria jacobaeae* S41
Highsted Quarries species rich grassland	10	62	*Tyria jacobaeae* S41 *Hippodamia variegata* Nb* *Lygus pratensis* RDB3 (Rare)* *Polydrusus formosus* Na*
Highsted Wood	14	81	*Rhagonycha lutea* NS *Tropiphorus elevatus* Nb
Bex Wood	10	61	*Pterostichus longicollis NS* *Rhagonycha lutea* NS
Parkland	8	82	*Ballus chalybeius NS* *Theridion pinastri NS* *Psylliodes chalcomera NS* *Rhagonycha lutea NS* *Rhinocyllus conicus Na**
Cromers Wood	19	Not subject to detailed survey	Not subject to detailed survey

Key:
S41 – section 41 (research only)
NR/NT – Nationally Rare/Near Threatened
NS – Nationally Scarce
RDB3 – Red Data Book 3
Na – Notable A
Nb – Notable B
** Denotes conservation status is over 20 years out of date and would be unlikely to qualify on the basis of current knowledge*

5.10.9 An assessment of the species communities using the Pantheon tool recorded the majority of species to be associated with the tall sward and scrub habitat type, although the species quality index (SQI) is low at 103 (100 being the lowest SQI). Slightly higher SQIs were recorded for short sward/bare ground and shaded woodland floor habitats (115 and 116 respectively), whilst the highest SQI was recorded for arboreal canopy (147), this supporting the majority of notable species recorded. It is noted that natural succession within the Highsted Quarries would result in improved conditions for tall sward and scrub species at the expense of short sward/bare ground species.

5.10.10 **Evaluation:** The majority of the site, comprising arable and intensively managed orchards, provides limited opportunities for invertebrates, lacking a varied habitat structure and diverse floral assemblage, and is not considered to be of importance in terms of this species group.

5.10.11 However, a number of habitats are considered to be of elevated value, including the ancient woodland, parkland, species rich grassland and mosaic habitats within the quarries. A total of 12 notable species were recorded during invertebrate surveys, with the highest number of species overall recorded from the central quarry (Quarry B). This quarry basin was also recorded to support the Near Threatened/Nationally Rare beetle *Dasytes virens*, which if resident within the quarry (rather than visiting to utilise the flower resources), would represent 8% of the known British population and indicates the central basin is of national importance. The parkland area was recorded to support four Nationally Scarce species and is of county importance. The other habitats are considered to be of local importance in terms of the invertebrate populations present.

5.11 Faunal Evaluation Summary

5.11.1 On the basis of the above, the following species supported by or associated with the site and its immediate surrounds are considered to form important ecological features:

Table 5.8: Summary of habitat evaluation

Faunal Species / Group	Level of Importance
Roosting bats	Local
Foraging and commuting bats	District
Badger	Local
Dormouse	District
Other mammals (including Hedgehog and Brown Hare)	Site
Birds	Local
Amphibians (including Great Crested Newt)	Site
Reptiles (Common Lizard and Slow-worm)	Local
Invertebrates (within woodland, parkland, species-rich grassland and quarries)	National (Quarry B), County (parkland), Local (remainder of Highsted Quarries LWS and Ancient Woodlands)

6 Conclusions

6.1 Aspect Ecology has been commissioned to advise in respect of ecological matters relating to land at Highsted Park, South, located to the south-east of Sittingbourne, Kent.

6.2 A desk study has been undertaken and the site surveyed based around extended Phase 1 methodology as recommended by Natural England, with specific NVC survey work undertaken in respect of woodlands, mosaic habitats and grassland. A general appraisal of faunal species has also been undertaken to record the potential presence of any protected, rare or notable species, with specific surveys conducted in respect of bats, Badger, Dormouse, breeding and wintering birds, Great Crested Newt, reptiles and invertebrates.

6.3 **Ecological Designations.** A number of ecological designations are present within the surrounds of the site, including Highsted Quarries LWS, located within the site itself, whilst Cromer's Wood LWS, which comprises Ancient Woodland, is located adjacent to the site at the south east. Two further areas of Ancient Woodland are also present within the site, namely Highsted Wood and Bex Wood. The nearest statutory designation to the site is The Swale Site of Special Scientific Interest (SSSI), located approximately 1.5km to the north of the site.

6.4 **Habitats.** The site is dominated by arable and intensively managed orchards. Other habitats present within the site include established woodland, parkland, hedgerows / treelines, scattered trees, scrub, grassland, tall ruderal vegetation, ponds, buildings, bare ground and hardstanding. A summary of habitats considered to form important ecological features within and adjacent to the site is given in Table 6.1 below:

Table 6.1: Summary of habitat evaluation.

Habitat	Level of Importance
Highsted Quarries LWS	District
Highsted Wood	District
Bex Wood	Local
Woodlands W7-W10	Local
Other woodland	Site
Parkland	Local
Hedgerows / Treelines	Local
Veteran trees	Local

6.5 **Faunal Species.** Surveys of the site have recorded evidence of a number of protected and notable faunal species including roosting, foraging and commuting bats, Badger, Dormouse and reptiles together with a moderate assemblage of bird species, some notable invertebrates associated with Highsted Quarries LWS, Highsted Wood, Bex Wood and the parkland, whilst Great Crested Newt are known to be present within an offsite pond within Cromer's Wood, located approximately 100m from the site boundary. A summary of species considered to form important ecological features

which are supported by or associated with the site and its immediate surrounds is given in Table 6.2 below:

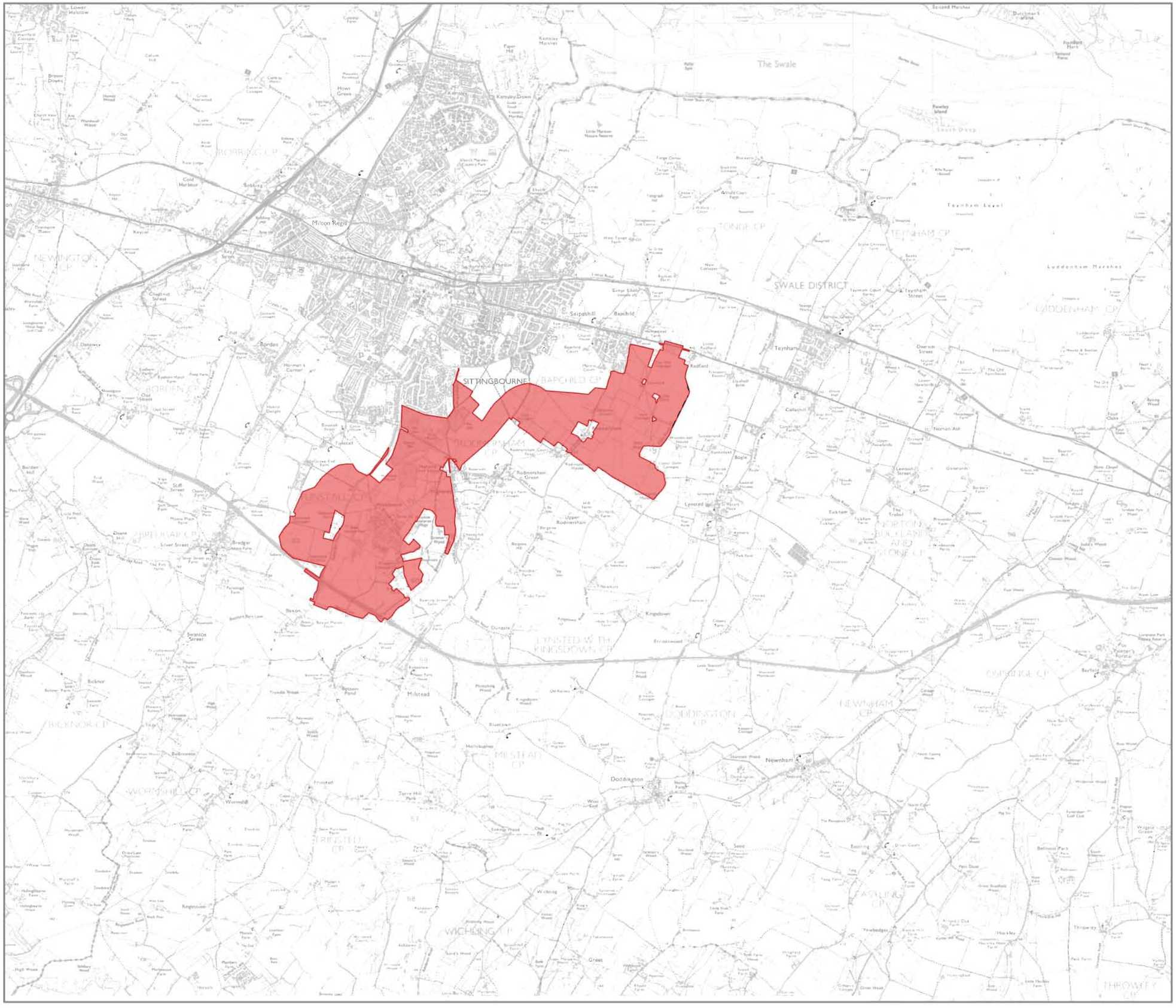
Table 6.2: Summary of faunal species evaluation.

Faunal Species / Group	Level of Importance
Roosting bats	Local
Foraging and commuting bats	District
Badger	Local
Dormouse	District
Other mammals (including Hedgehog and Brown Hare)	Site
Birds	Local
Amphibians (including Great Crested Newt)	Site
Reptiles (Common Lizard and Slow-worm)	Local
Invertebrates (within woodland, parkland, species-rich grassland and quarries)	National (Quarry B), County (parkland), Local (remainder of Highsted Quarries LWS and Ancient Woodlands)

6.6 **Conclusion.** The information in this report provides details of the ecological baseline position at the site, setting out the habitat types and species present and evaluating their ecological importance in the context of the site. The information in this report is considered to provide a sound ecological baseline, which can be utilised to inform any future proposals relating to the site.

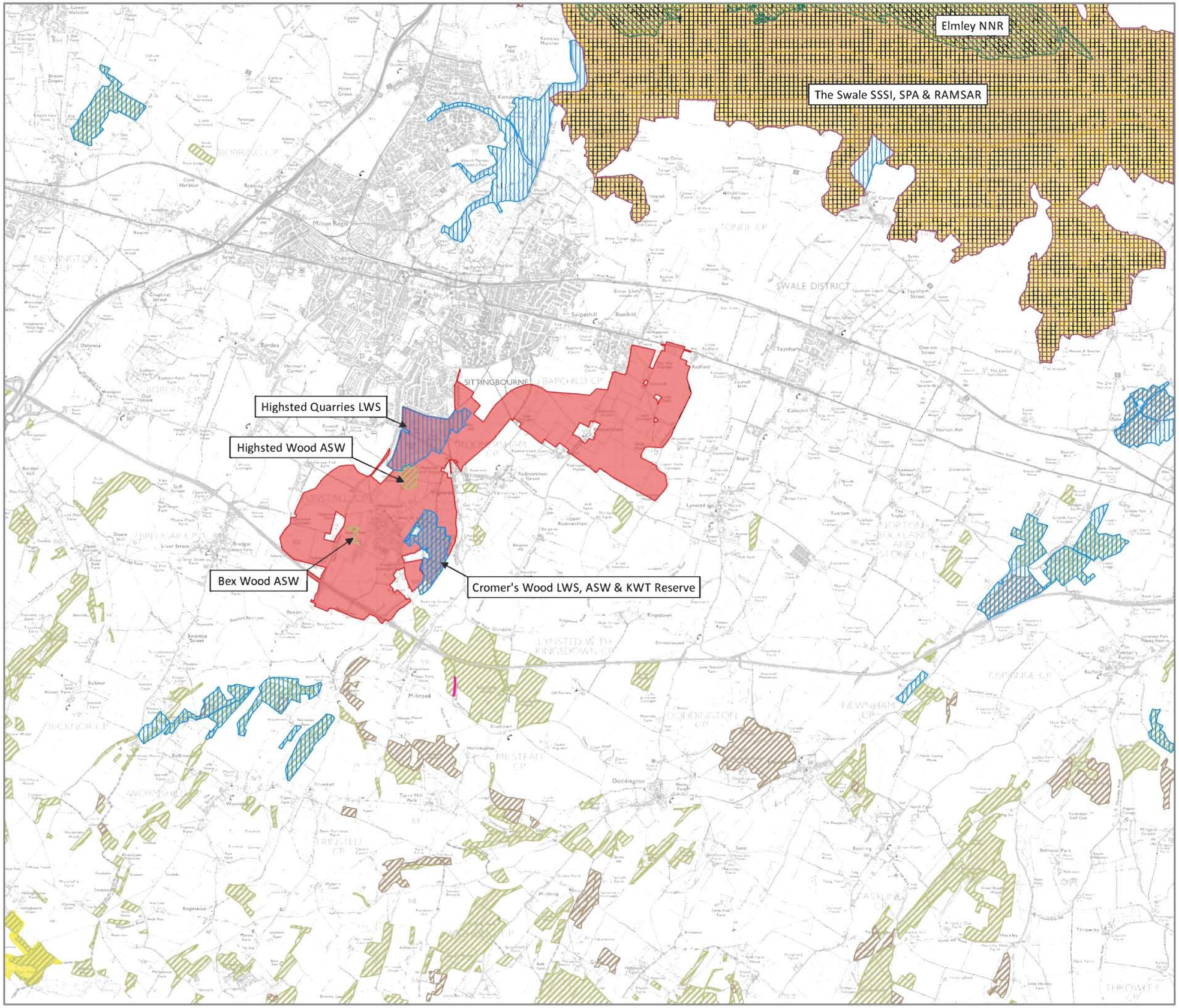
Plan 4657/ECO1:

Site Location



Plan 4657/ECO2:

Ecological Designations



Key:

- Site Boundary
- Special Protection Area (SPA)
- Ramsar
- Site of Special Scientific Interest (SSSI)
- National Nature Reserve (NNR)
- Local Nature Reserve (LNR)
- Local Wildlife Site (LWS)
- Kent Wildlife Trust (KWT) Reserve
- Roadside Nature Reserve (RNR)
- Ancient & Semi-Natural Woodland (ASW
- Ancient Replanted Woodland (ARW)

aspect ecology

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Highsted Park, South	PROJECT
Ecological Designations	TITLE
4657/ECO2	DRAWING NO.
-	REV
June 2021	DATE

Plan 4657/ECO3:

Habitats and Ecological Features

Key:

- Site Boundary
- Highsted Quarries LWS
- Ancient & Semi-Natural Woodland
- Woodland
- Commercial Orchard
- Plantation Woodland
- Arable
- Semi-Improved Grassland
- Improved Grassland
- Species Rich Grassland
- Amenity Grassland
- Parkland
- Tall Ruderal
- Ruderal Mosaic
- Dense Scrub
- Open Scrub Mosaic
- Open Birch Scrub
- Pond
- Bare Ground
- Building
- Hardstanding
- Residential Garden
- Hedgerow/Treeline
- Quarry Cliff Edge
- Tree
- Veteran Tree
- Young Tree
- Scattered Scrub
- Existing Kent Science Park

aspect ecology

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Highsted Park, South	PROJECT
Habitats and Ecological Features	TITLE
4657/ECO3a	DRAWING NO.
-	REV
June 2021	DATE

Key:

- Site Boundary
- Highsted Quarries LWS
- Ancient & Semi-Natural Woodland
- Woodland
- Commercial Orchard
- Plantation Woodland
- Arable
- Semi-Improved Grassland
- Improved Grassland
- Species Rich Grassland
- Amenity Grassland
- Parkland
- Tall Ruderal
- Ruderal Mosaic
- Dense Scrub
- Open Scrub Mosaic
- Open Birch Scrub
- Pond
- Bare Ground
- Building
- Hardstanding
- Residential Garden
- Hedgerow/Treeline
- Quarry Cliff Edge
- Tree
- Veteran Tree
- Young Tree
- Scattered Scrub
- Existing Kent Science Park

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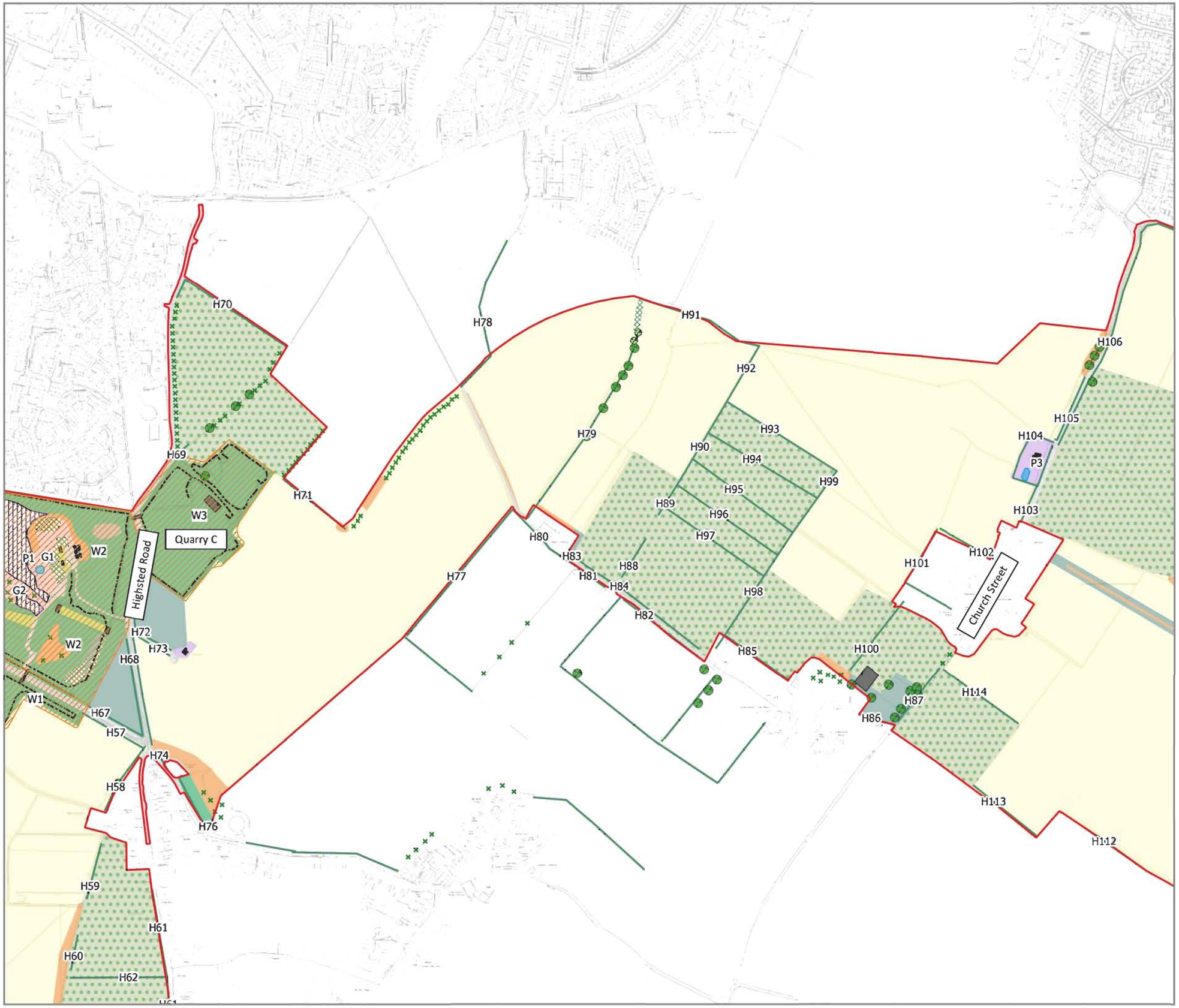
Highsted Park, South	PROJECT
Habitats and Ecological Features	TITLE
4657/ECO3b	DRAWING NO
-	REV
June 2021	DATE



Key:

- Site Boundary
- Highsted Quarries LWS
- Ancient & Semi-Natural Woodland
- Woodland
- Commercial Orchard
- Plantation Woodland
- Arable
- Semi-Improved Grassland
- Improved Grassland
- Species Rich Grassland
- Amenity Grassland
- Parkland
- Tall Ruderal
- Ruderal Mosaic
- Dense Scrub
- Open Scrub Mosaic
- Open Birch Scrub
- Pond
- Bare Ground
- Building
- Hardstanding
- Residential Garden
- Hedgerow/Treeline
- Quarry Cliff Edge
- Tree
- Veteran Tree
- Young Tree
- Scattered Scrub
- Existing Kent Science Park

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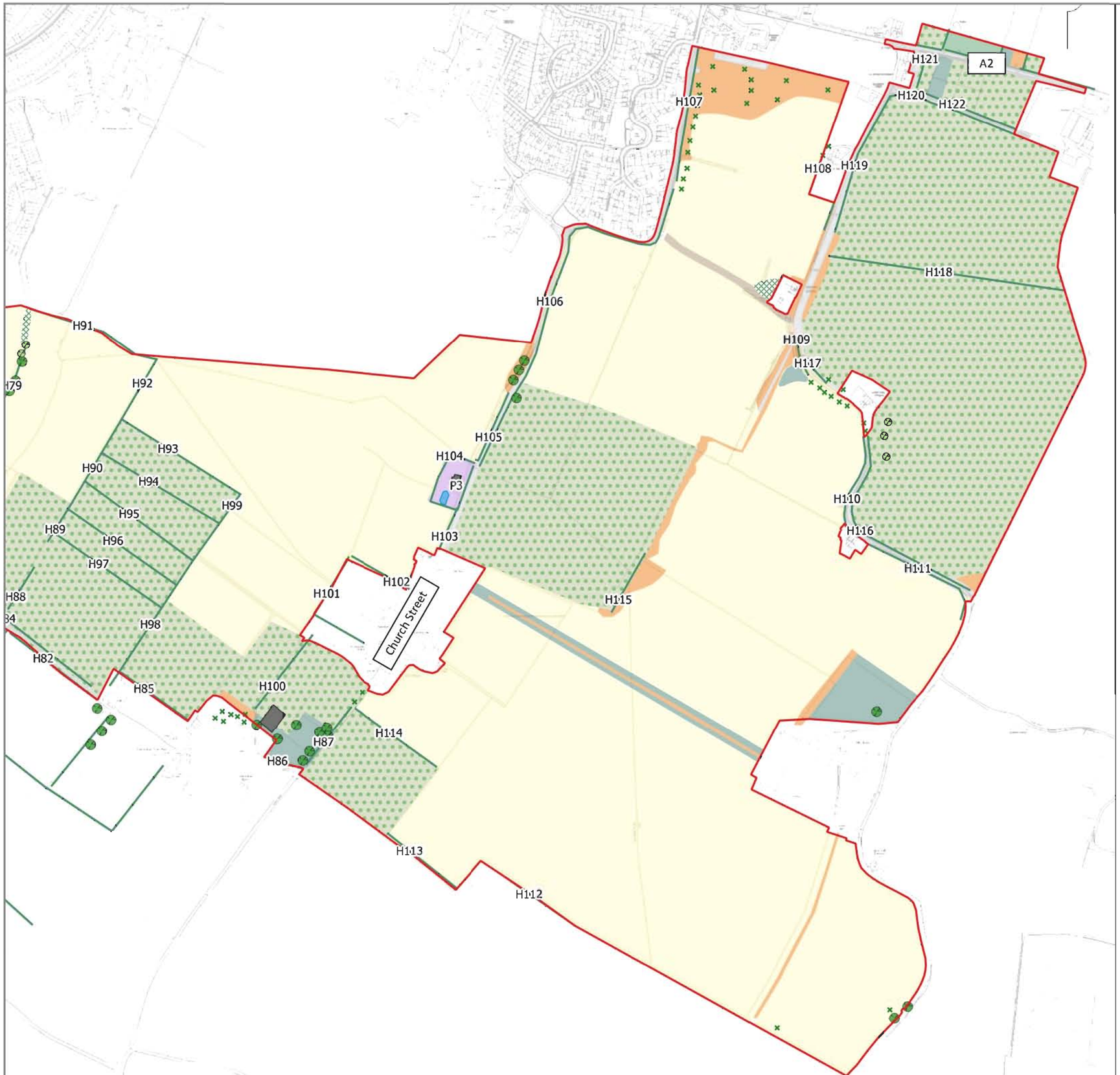
Highsted Park, South	PROJECT
Habitats and Ecological Features	TITLE
4657/ECO3c	DRAWING NO.
-	REV
June 2021	DATE



Key:

- Site Boundary
- Highsted Quarries LWS
- Ancient & Semi-Natural Woodland
- Woodland
- Commercial Orchard
- Plantation Woodland
- Arable
- Semi-Improved Grassland
- Improved Grassland
- Species Rich Grassland
- Amenity Grassland
- Parkland
- Tall Ruderal
- Ruderal Mosaic
- Dense Scrub
- Open Scrub Mosaic
- Open Birch Scrub
- Pond
- Bare Ground
- Building
- Hardstanding
- Residential Garden
- Hedgerow/Treeline
- Quarry Cliff Edge
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- Veteran Tree
- Young Tree
- Scattered Scrub
- Existing Kent Science Park

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Highsted Park, South	PROJECT
Habitats and Ecological Features	TITLE
4657/ECO3d	DRAWING NO.
-	REV
June 2021	DATE

Plan 4657/ECO4

Bat Survey Results - Roosting

Key:

- Site Boundary

Building (Bat Roosting Potential)

- Confirmed Roost
- High
- Moderate
- Low
- Negligible - Low
- Negligible

Tree (Bat Roosting Potential)

- Confirmed Roost
- High
- Moderate - High
- Moderate
- Low - Moderate
- Low

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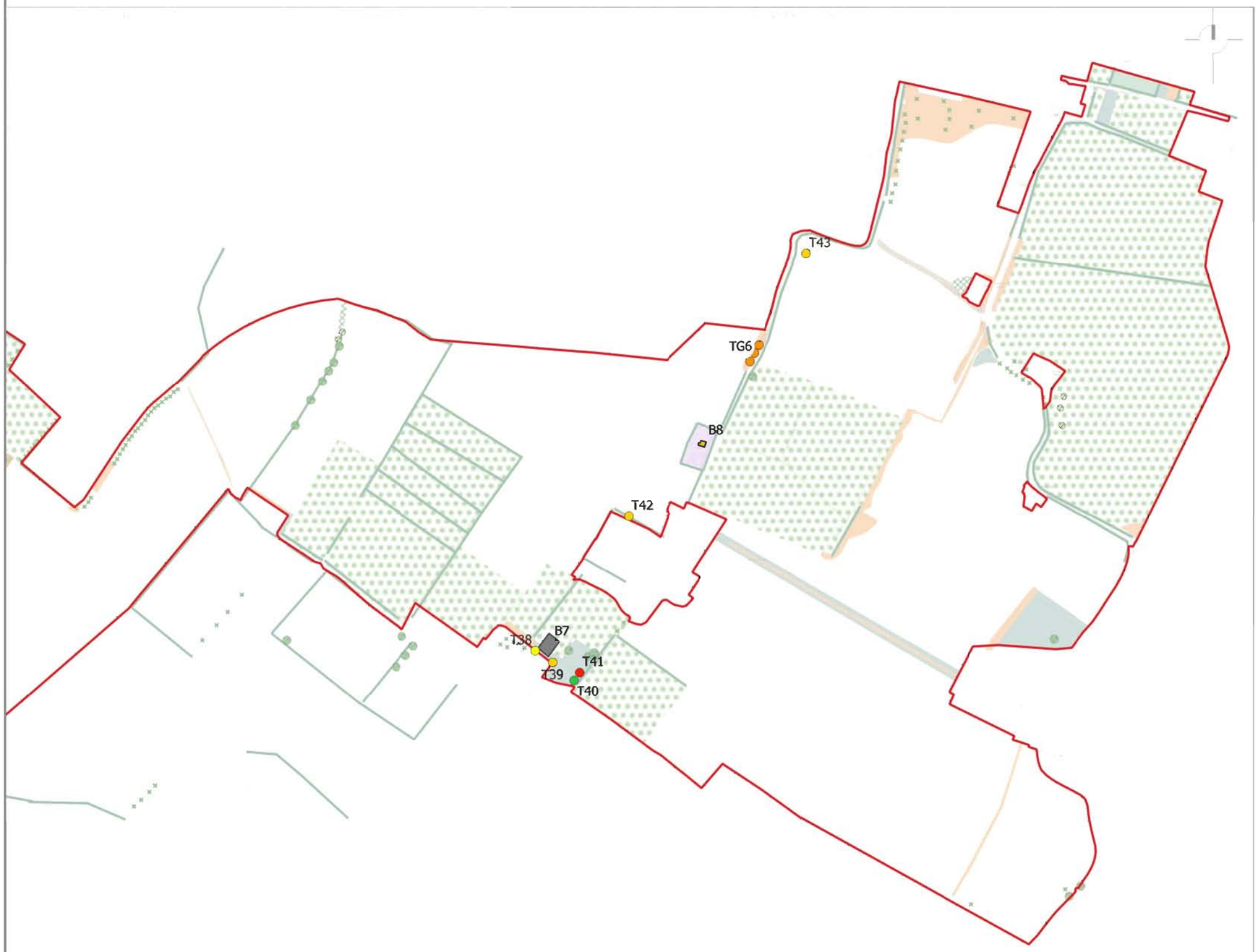
Highsted Park, South	PROJECT
Bat Survey Results - Roosting	TITLE
4657/ECO4a	DRAWING NO.
-	REV
June 2021	DATE



Key:

Site Boundary

Building (Bat Roosting Potential)

- Confirmed Roost
- High
- Moderate
- Low
- Negligible - Low
- Negligible

Tree (Bat Roosting Potential)

- Confirmed Roost
- High
- Moderate - High
- Moderate
- Low - Moderate
- Low

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Highsted Park, South	PROJECT
Bat Survey Results - Roosting	TITLE
4657/ECO4b	DRAWING NO.
-	REV
June 2021	DATE

Plan 4657/ECO5

Bat Survey Results – Activity (Manual)

Key:

- Site Boundary
- Transect 1
- Transect 2
- Transect 3
- Transect A
- Transect B
- Transect C
- Transect D

Average Bat Activity Index

At Listening Points*

- 0 - 0.10 Registrations per Minute
- 0.11 - 0.30 Registrations per Minute
- 0.31 - 0.50 Registrations per Minute
- >0.51 Registrations per Minute

Between Listening Points*

- 0 - 0.10 Registrations per Minute
- 0.11 - 0.30 Registrations per Minute
- 0.31 - 0.50 Registrations per Minute
- >0.51 Registrations per Minute

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Highsted Park, South	PROJECT
Bat Survey Results - Activity (Manual)	TITLE
4657/ECO5a	DRAWING NO.
-	REV.
June 2021	DATE

Key:

- Site Boundary
- Transect E
- Transect F
- Transect G
- Transect H
- Transect I

Average Bat Activity Index

At Listening Points*

- 0 - 0.10 Registrations per Minute
- 0.11 - 0.30 Registrations per Minute
- 0.31 - 0.50 Registrations per Minute
- >0.51 Registrations per Minute

Between Listening Points*

- 0 - 0.10 Registrations per Minute
- 0.11 - 0.30 Registrations per Minute
- 0.31 - 0.50 Registrations per Minute
- >0.51 Registrations per Minute

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Highsted Park, South	PROJECT
Bat Survey Results - Activity (Manual)	TITLE
4657/ECO5b	DRAWING NO.
-	REV.
June 2021	DATE

Plan 4657/ECO6

Bat Survey Results – Activity (Statics)

Key:

- Site Boundary
- Static Detector Location

Average Bat Registrations Per Night

- 0 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- 200 - 400
- 400 - 800

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Highsted Park, South	PROJECT
Bat Survey Results - Activity	TITLE
4657/ECO6	DRAWING NO.
-	REV
June 2021	DATE

Plan 4657/ECO7

Badger Survey Results

This page has been redacted

Plan 4657/ECO8

Dormouse Survey Results

Key:

- Site Boundary
- Transect
- Number of Dormouse Tubes on Transect
- Dormouse recorded
- Characteristic Dormouse nest recorded
- Potential Dormouse nest recorded

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Highsted Park, South	PROJECT
Dormice Survey Results	TITLE
4657/ECO8	DRAWING NO.
-	REV.
June 2021	DATE

Plan 4657/ECO9

Bird Survey Results

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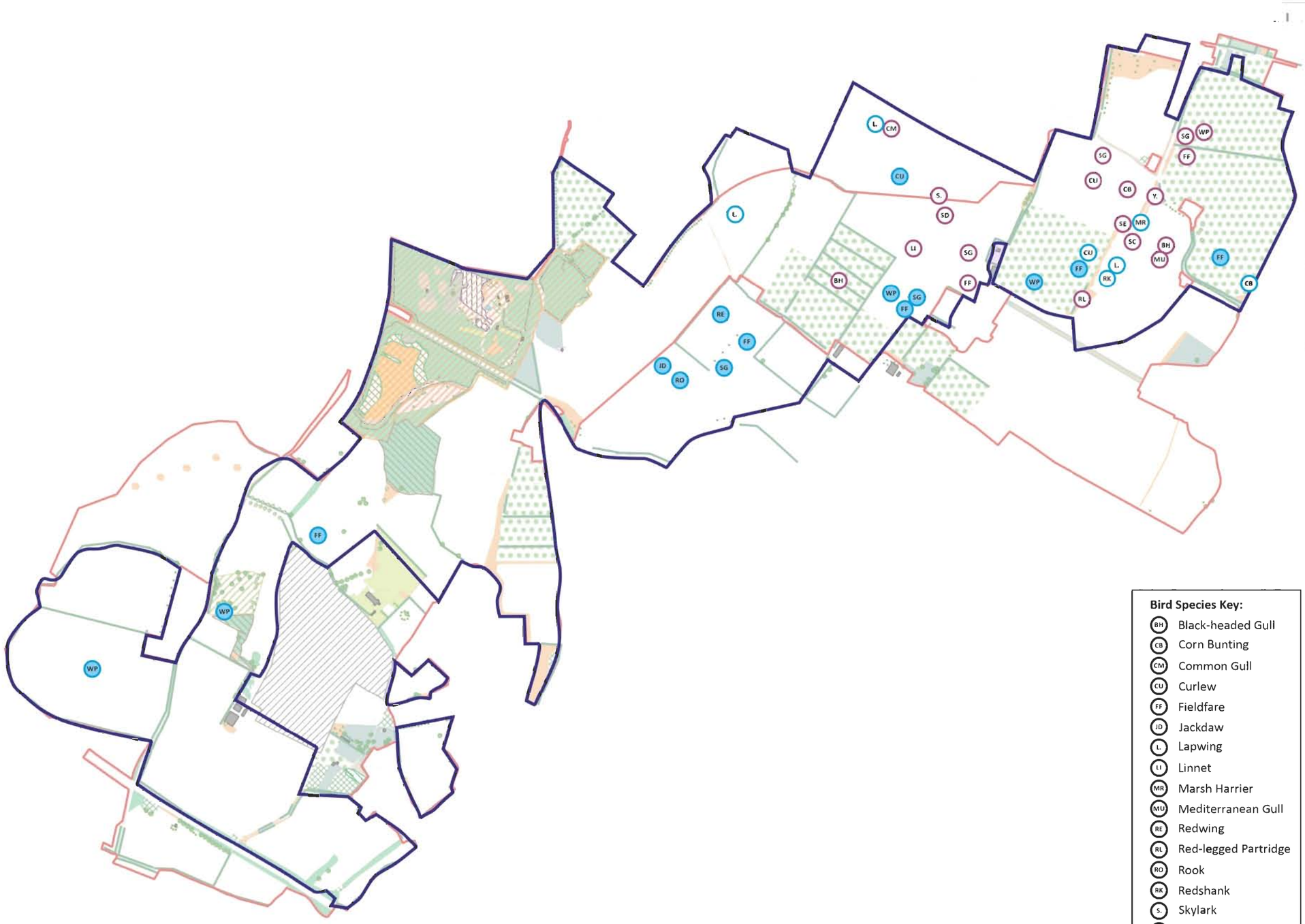

KEY:

- Site Boundary
- Bird Survey Area
- JD — Large flocks of wintering birds recorded winter 2016/17 (100+ birds)
- L. — Significant species and smaller flocks of wintering birds recorded winter 2016/17
- WP — Significant species and flocks of wintering birds recorded winter 2018/19

Bird Species Key:

- BH — Black-headed Gull
- CB — Corn Bunting
- CM — Common Gull
- CU — Curlew
- FF — Fieldfare
- JD — Jackdaw
- L. — Lapwing
- LI — Linnet
- MR — Marsh Harrier
- MU — Mediterranean Gull
- RE — Redwing
- RL — Red-legged Partridge
- RO — Rook
- RK — Redshank
- S. — Skylark
- SC — Stonechat
- SD — Stock Dove
- SE — Short-eared Owl
- SG — Starling
- WP — Wood Pigeon
- Y. — Yellowhammer

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Highsted Park, South — PROJECT

Wintering Bird Survey Results — TITLE

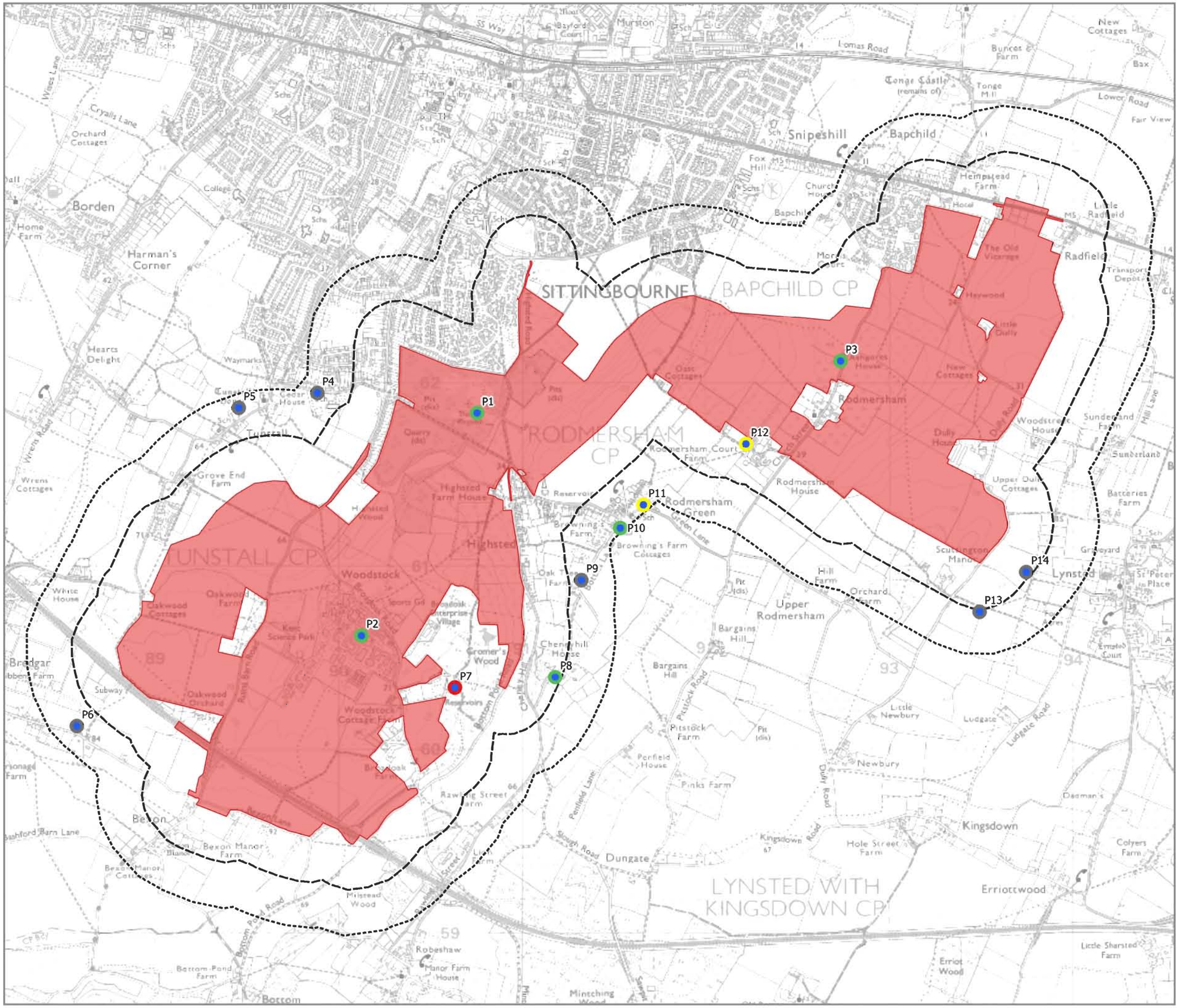
4657/ECO9b — DRAWING NO.

\- — REV.

June 2021 — DATE

Plan 4657/ECO10

Great Crested Newt Survey Results



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Highsted Park, South	PROJECT
Great Crested Newt Survey	TITLE
4657/ECO10	DRAWING NO.
-	REV
June 2021	DATE

Plan 4657/ECO11

Reptile Survey Results

Key:

- Site Boundary
- Transect
- Number of Reptile Mats per Transect
- Peak Common Lizard Figures
- Peak Slow Worm Figures

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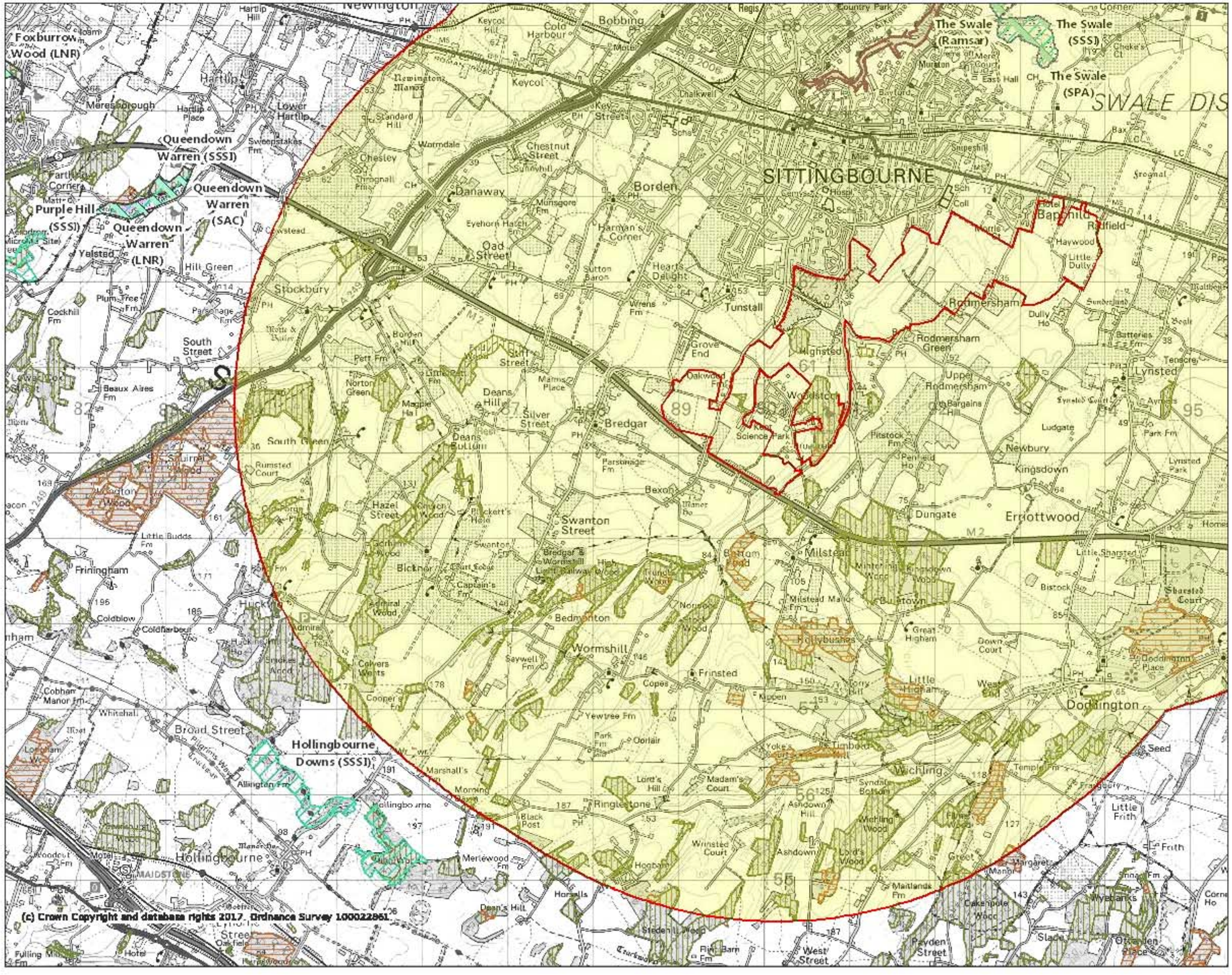
Highsted Park, South	PROJECT
Reptile Survey Results	TITLE
4657/ECO11	DRAWING NO.
-	REV.
June 2021	DATE

Appendix 4657/1:

Information obtained from Multi-Agency Geographic Information for the Countryside (MAGIC) online database

MAGIC

ECO4657 Designated Sites 5000m South West



Legend

- Local Nature Reserves (England)
- National Nature Reserves (England)
- Ramsar Sites (England)
- Sites of Special Scientific Interest (England)
- Special Areas of Conservation (England)
- Special Protection Areas (England)

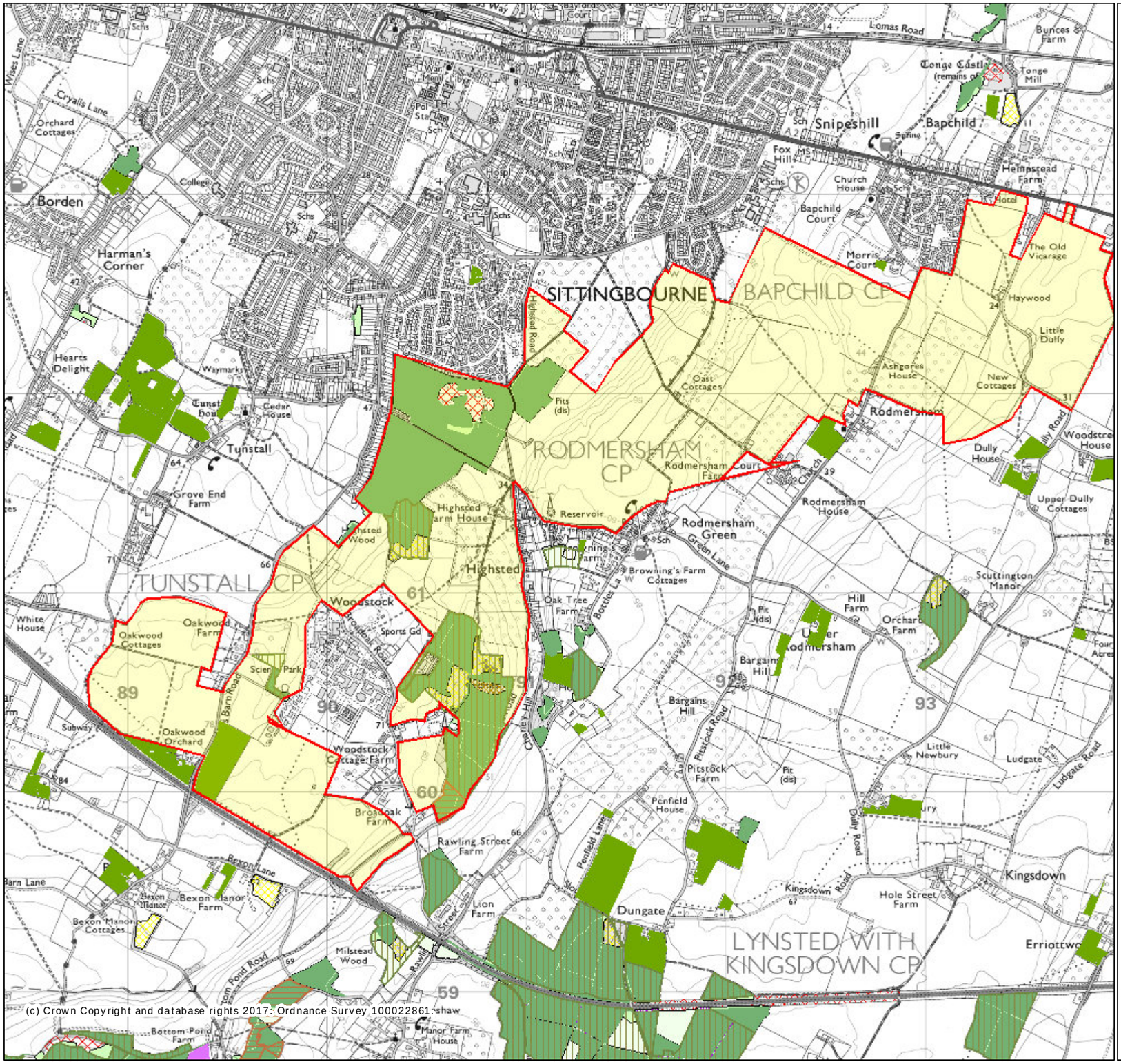
Ancient Woodland (England)

- Ancient and Semi-Natural Woodland
- Ancient Replanted Woodland

Projection = OSGB36
xmin = 576900
ymin = 159100
xmax = 599500
ymax = 165100
Map produced by MAGIC on 13 July, 2017.

MAGIC

KSP Priority Habitats



(c) Crown Copyright and database rights 2017. Ordnance Survey 100022861-shaw

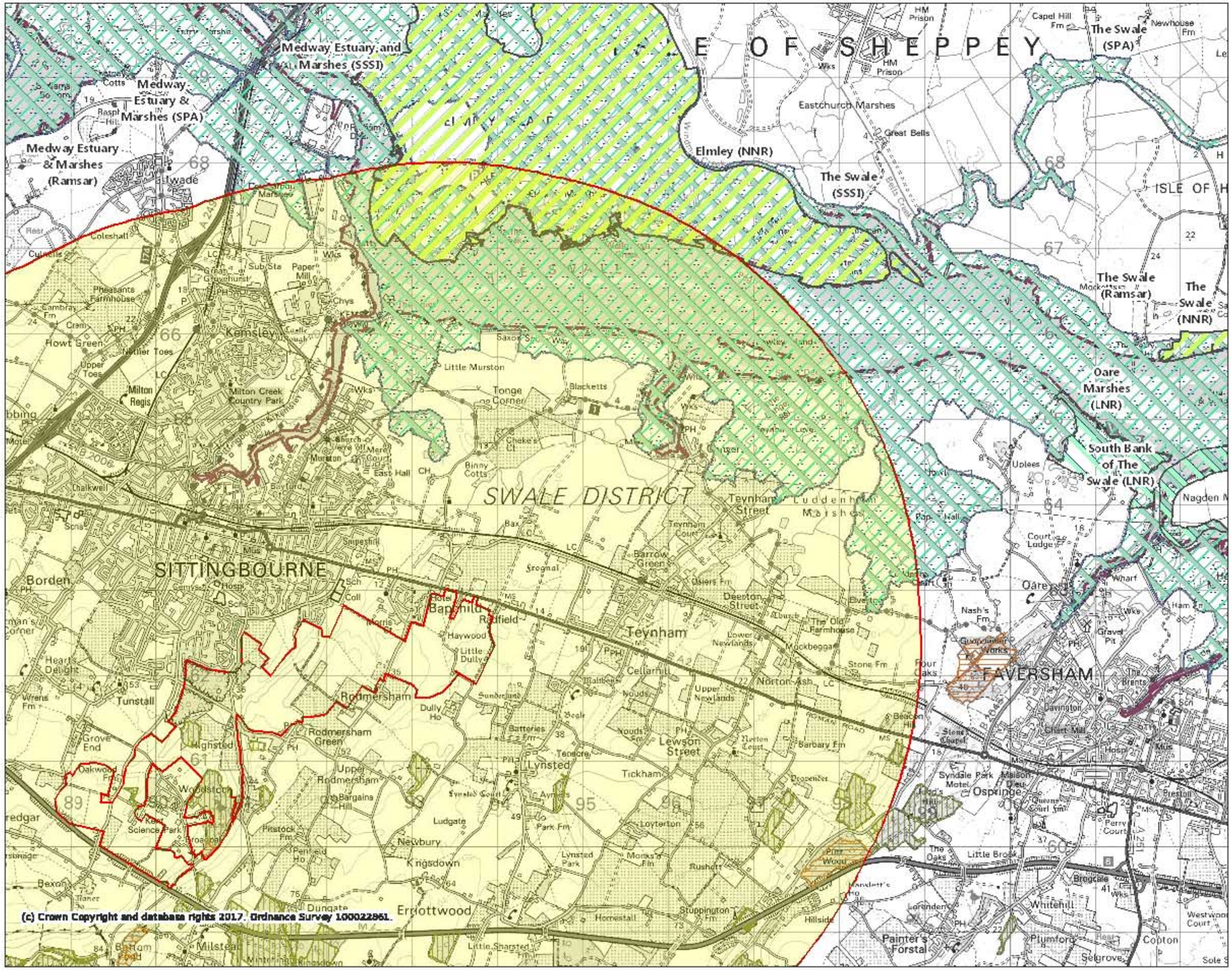
Legend

- Priority Habitat Inventory - Coastal Saltmarsh (England)
- Priority Habitat Inventory - Coastal Sand Dunes (England)
- Priority Habitat Inventory - Coastal Vegetated Shingle (England)
- Priority Habitat Inventory - Maritime Cliffs and Slopes (England)
- Priority Habitat Inventory - Mudflats (England)
- Priority Habitat Inventory - Saline Lagoons (England)
- Saline Lagoons (Wales)
- Saltmarsh (Wales)
- Sand Dunes (Wales)
- Priority Habitat Inventory - Calaminarian Grassland (England)
- Priority Habitat Inventory - Coastal and Floodplain Grazing Marsh (England)
- Priority Habitat Inventory - Good quality semi-improved grassland (Non Priority) (England)
- Priority Habitat Inventory - Lowland Calcareous Grassland (England)
- Priority Habitat Inventory - Lowland Dry Acid Grassland (England)
- Priority Habitat Inventory - Lowland Meadows (England)
- Priority Habitat Inventory - Purple Moor Grass and Rush Pasture (England)
- Priority Habitat Inventory - Upland Calcareous Grassland (England)
- Priority Habitat Inventory - Upland Hay Meadows (England)
- Priority Habitat Inventory - Lowland Heathland (England)
- Priority Habitat Inventory - Mountain Heaths and Willow Scrub (England)
- Priority Habitat Inventory - Upland Heathland (England)
- Priority Habitat Inventory - Limestone Pavements (England)

Projection = OSGB36
xmin = 585800
ymin = 158700
xmax = 596600
ymax = 163900

Map produced by MAGIC on 19 April, 2017.

ECO4657 Designated Sites 5000m North East



Legend

- Local Nature Reserves (England)
- National Nature Reserves (England)
- Ramsar Sites (England)
- Sites of Special Scientific Interest (England)
- Special Areas of Conservation (England)
- Special Protection Areas (England)

Ancient Woodland (England)

- Ancient and Semi-Natural Woodland
- Ancient Replanted Woodland

Projection = OSGB36
xmin = 584100
ymin = 157700
xmax = 608700
ymax = 170700
Map produced by MAGIC on 13 July, 2017.

Appendix 4657/2

Principles of ecological evaluation

Principles of Ecological Evaluation

1. The evaluation of ecological features and resources is based on professional judgement whilst also drawing on the latest available industry guidance and research. The approach taken in this report is based on that described by the Chartered Institute of Ecology and Environmental Management (CIEEM) 'Guidelines for Ecological Impact Assessment in the UK and Ireland' (2016)[1].

Importance of Ecological Features

2. Various characteristics contribute to the importance of ecological features, including:

- Naturalness;
- Animal or plant species, sub-species or varieties that are rare or uncommon, either internationally, nationally or more locally, including those that may be seasonally transient;
- Ecosystems and their component parts, which provide the habitats required by important species, populations and/or assemblages;
- Endemic species or locally distinct sub-populations of a species;
- Habitat diversity;
- Habitat connectivity and/or synergistic associations;
- Habitats and species in decline;
- Rich assemblages of plants and animals;
- Large populations of species or concentrations of species considered uncommon or threatened in a wider context;
- Plant communities (and their associated animals) that are considered to be typical of valued natural/semi-natural vegetation types, including examples of naturally species-poor communities; and
- Species on the edge of their range, particularly where their distribution is changing as a result of global trends and climate change.

3. As an objective starting point for identifying important ecological features, European, national and local governments have identified sites, habitats and species which form a key focus for biodiversity conservation in the UK, supported by policy and legislation. These are summarised by CIEEM guidance as follows:

Designated Sites

- Statutory sites designated or classified under international conventions or European legislation, for example World Heritage Sites, Biosphere Reserves, Wetlands of International Importance (Ramsar sites), Special Areas of Conservation (SAC), Special Protection Areas (SPA);
- Statutory sites designated under national legislation, for example Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR) and Local Nature Reserves (LNR);
- Locally designated wildlife sites, e.g. Local Wildlife Sites (LWS).

[1] Chartered Institute of Ecology and Environmental Management (CIEEM) (2016) '*Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal*'

Biodiversity Lists

- Habitats and species of principal importance for the conservation of biodiversity in England and Wales (largely drawn from UK BAP priority habitats and priority species), often referred to simply as Priority Habitats / Species;
- Local BAP priority species and habitats.

Red Listed, Rare, Legally Protected Species

- Species of conservation concern, Red Data Book (RDB) species;
- Birds of Conservation Concern;
- Nationally rare and nationally scarce species;
- Legally protected species.

4. In addition to this list, other features may be considered to be of importance on the basis of local rarity, where they enable effective conservation of other important features, or play a key functional role in the landscape.

<u>Assigning Level of Importance</u>

5. The importance of an ecological feature should then be considered within a defined geographical context. Based on CIEEM guidance, the following frame of reference is used:

- International (European);
- National;
- Regional;
- County;
- District;
- Local (e.g. Parish or Neighbourhood);
- Site (not of importance beyond the immediate context of the site).

6. Features of 'local' importance are those considered to be below a district level of importance, but are considered to appreciably enrich the nature conservation resource or are of elevated importance beyond the context of the site.

7. Where features are identified as 'important' based on the list of key sites, habitats and species set out above, but are very limited in extent or quality (in terms of habitat resource or species population) and do not appreciably contribute to the biodiversity interest beyond the context of the site, they are considered to be of site importance.

8. In terms of assigning the level of importance, the following considerations are relevant:

Designated Sites

9. For designated sites, importance should reflect the geographical context of the designation (e.g. SAC/SPA/Ramsar sites are designated at the international level whereas SSSIs are designated at the national level). Consideration should be given to multiple designations as appropriate (where an area is subject to differing levels of nature conservation designations).

Habitats

10. In certain cases, the value of a habitat can be measured against known selection criteria, e.g. SAC selection criteria, 'Guidelines for the selection of biological SSSIs' and the Hedgerows Regulations 1997. However, for the majority of commonly encountered sites, the most relevant habitat evaluation will be at a more localised level and based on relevant factors such as antiquity, size, species-diversity, potential, naturalness, rarity, fragility and typicalness (Ratcliffe, 1977). The ability to restore or re-create the habitat is also an important consideration, for example in the case of ancient woodland.

11. Whether habitats are listed as priorities for conservation at a national level in accordance with Sections 41 and 42 of the Natural Environment and Rural Communities Act (NERC) 2006, so called 'Habitats of Principal Importance' or 'Priority Habitats', or within regional or local Biodiversity Action Plans (BAPs) is also relevant, albeit the listing of a particular habitat under a BAP does not in itself imply any specific level of importance.

12. Habitat inventories (such as habitat mapping on the MAGIC database) or information relating to the status of particular habitats within a district, county or region can also assist in determining the appropriate scale at which a habitat is of importance.

Species

13. Deciding the importance of species populations should make use of existing criteria where available. For example, there are established criteria for defining nationally and internationally important populations of waterfowl. The scale within which importance is determined could also relate to a particular population, e.g. the breeding population of common toads within a suite of ponds or an otter population within a catchment.

14. When determining the importance of a species population, contextual information about distribution and abundance is fundamental, including trends based on historical records. For example, a species could be considered particularly important if it is rare and its population is in decline. With respect to rarity, this can apply across the geographic frame of reference and particular regard is given to populations where the UK holds a large or significant proportion of the international population of a species.

15. Whether species are listed as priorities for conservation at a national level in accordance with Sections 41 and 42 of the Natural Environment and Rural Communities Act (NERC) 2006, so called 'Species of Principal Importance' or 'Priority Species', or within regional or local Biodiversity Action Plans (BAPs) is also relevant, albeit the listing of a particular species under a BAP does not in itself imply any specific level of importance.

16. Species populations should also be considered in terms of the potential zone of influence of the proposals, i.e. if the entire species population within the site and surrounding area were to be affected by the proposed development, would this be of significance at a local, district, county or wider scale? This should also consider the foraging and territory ranges of individual species (e.g. bats roosting some distance from site may forage within site whereas other species such as invertebrates may be more sedentary).

Appendix 4657/3

Highsted Quarries LWS citation

KENT LOCAL WILDLIFE SITE

KWT File No: 910620

Site Name:	Highsted Quarries	**Site Ref. No:**	SW05
LPA:	Swale	**Central Grid Ref:**	TQ 910620 TQ 907619 TQ 904616
Parish:	Tunstall / Rodmersham	**Category:**	Grassland, scrub and cliffs.
Owner:	Private	**Natural Area:**	North Kent Plain
Area:	38.95 ha	**AONB:**	No
Date first notified:	1985	**TPO:**	No
Dates revised:			

DESCRIPTION

The site consists of three disused deep chalk pits which have been worked out and have been undisturbed for many years.

They have been colonised by a variety of chalk loving herbs and shrubs including many common orchids such as common spotted-orchid *Dactylorhiza fuchsii*, twayblade *Neottia ovata* and southern marsh-orchid [1] *Dactylorhiza praetermissa*.

The central parts of the pits are still very bare, with a thin cover of herbaceous vegetation, but the edges are colonised by tall shrubs such as goat willow *Salix caprea*, sallow *Salix cinerea* subsp. *oleifolia*, hawthorn *Crataegus monogyna*, wayfaring-tree *Viburnum lantana*; birch *Betula* spp. and sycamore *Acer pseudoplatanus* are also present. The sheltered scrubby areas have interesting ground lichens present.

The site is likely to be important for birds. Jackdaws are apparently breeding on the cliffs and all common warblers occur.

The site contrasts strongly with surrounding countryside which has few hedges and woodland, and is intensively farmed. It is likely to increase in interest.

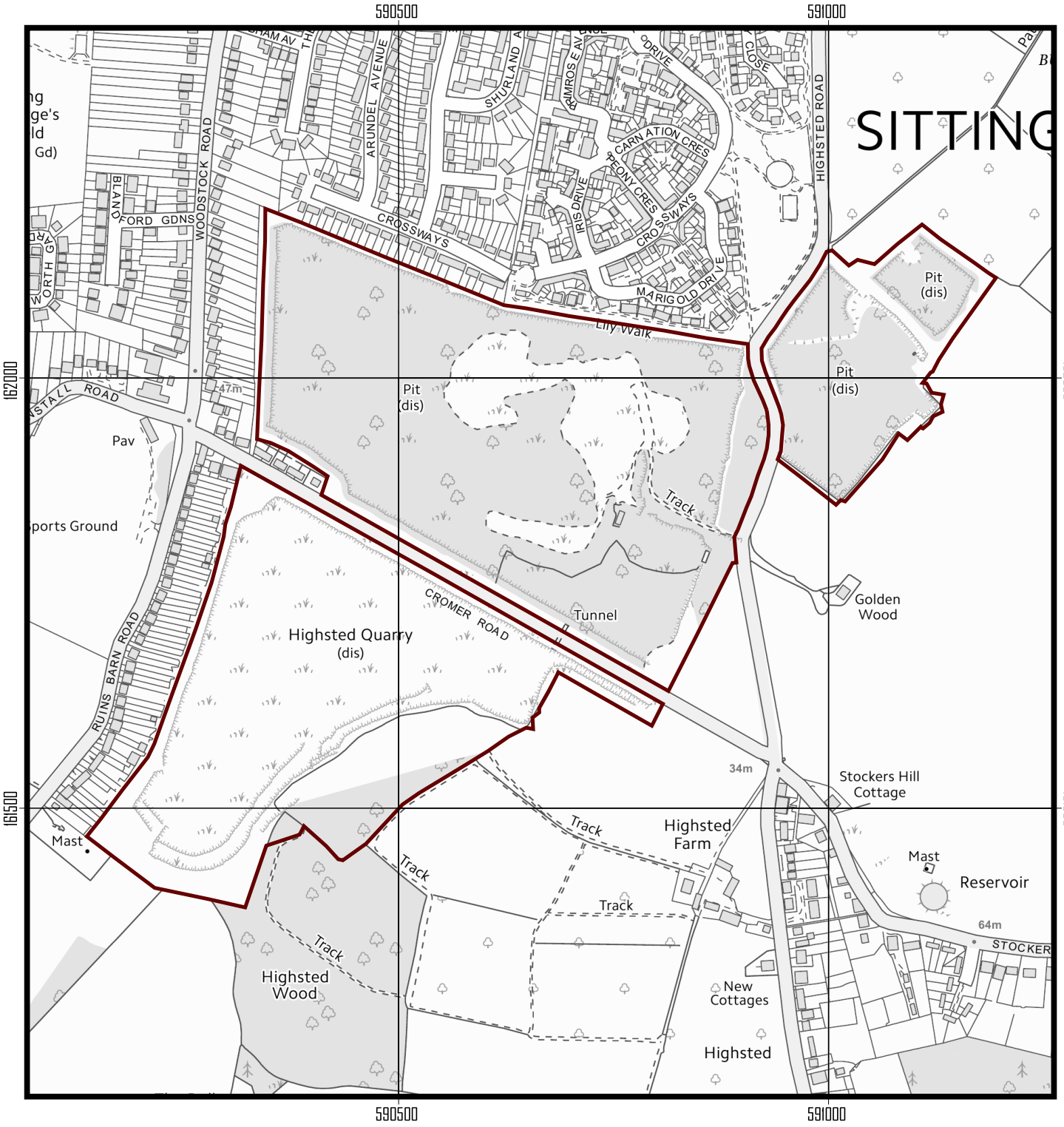
[1] County Scarce. Atlas of Kent Flora. Philp 1982

KENT LOCAL WILDLIFE SITE

Site Ref No: **SW05**

Site: HIGHSTED QUARRIES

Map ref: TQ 910620
TQ 907619
TQ 904616



Appendix 4657/4

NVC survey results

NVC Survey Results - Woodland Habitat

Species		Quarry A						Quarry B											Quarry C						Highsted Wood					
		Quadrat number (domin scale)					Presence	Quadrat number (domin scale)										Presence	Quadrat number (domin scale)					Presence	Quadrat number (domin scale)					Presence
Common Name	Latin Name	1	2	3	4	5		1	2	3	4	5	6	7	8	9	10		1	2	3	4	5		1	2	3	4	5	
Ground layer																														
Agrimony	*Agrimonia eupatoria*							4										10				3		20						
Bindweed sp.	*Convolvulaceae sp.*																												2	20
Bluebell	*Hyacinthoides non-scripta*			1			20																		8	9	5	10	9	100
Bramble	*Rubus fruticosus agg.*					2	20	2		2				7	4	2		50				4		20	3					20
Cleavers	*Galium aparine*													4				10										4	2	40
Common Dog-violet	*Viola riviniana*	4	2		4	7	80		2						4			20			2			20					3	20
Common Nettle	*Urtica dioica*	7	6	4	7		80	1	8		1	9	8		5		8	70	6	7	7	4	5	100	3				2	40
Common Spotted-orchid	*Dactylorhiza fuchsii*		2			6	40										1	10												
Common Twayblade	*Listera ovata*		3			2	40									2		10		5	2			40						
Creeping Cinquefoil	*Potentilla reptans*																					5		20						
Creeping Thistle	*Cirsium arvense*																					2		20	2					20
Dandelion	*Taraxacum officinale agg.*	1					20																							
Dock	*Rumex sp.*	2					20																		3				3	40
Dog's Mercury	*Mercurialis perennis*														2			10									5			20
Early Dog-violet	*Viola reichenbachiana*							8	6	9	6			8	6	6	3	80												
Early-purple Orchid	*Orchis mascula*																										1			20
Enchanter's-nightshade	*Circaea lutetiana*	2	6				40		4		4	5	4		4	7	5	70	5	5	3	4		80						
Figwort sp.	*Scrophularia sp.*																								4					20
Forget-me-not sp.	Myosotis sp.				1		20	2							2			20				3		20						
Garlic	*Allium sativum*			5			20																							
Germander Speedwell	*Veronica chamaedrys*	2					20																		2					20
Grass sp.								4	2						5			30							5					20
Ground-ivy	*Glechoma hederacea*				5		20				8		5		2	5	6	50	7	7	2	3		80						
Hairy St John's-wort	*Hypericum hirsutum*	2					20	5	5	2				4				40												
Hart's-tongue	*Phyllitis scolopendrium*																		1					20						
Hawkbit sp.	*Leontodon sp.*							1										10												
Ivy	*Hedera helix*													2	4			20												
Lesser Celandine	*Ranunculus ficaria*																													
Lords-and-Ladies	*Arum maculatum*			1			20				2	2			4			30			1		2	40						
Male fern	*Dryopteris filix-mas*											1						10												
Moschatel	*Adoxa moschatellina*		4				20																		4					20
Moss sp.						5	20	6	4	7	8	4	5	2	5	5		90												
Perforate St John's-wort	*Hypericum perforatum*				2		20																							
Primrose	*Primula vulgaris*													4				10												
Red Campion	*Silene dioica*																				5			20						
Red Currant	*Ribes rubrum*								2									10												
Rose sp.	*Rosa sp.*									1					3			20												
Rosebay Willowherb	*Chamerion angustifolium*					4	20	5		2						7	3	40				4		20						
Stinking Iris	*Iris foetidissima*									2				2				20												
Sweet Violet	*Viola odorata*												5					10				5		20						
Thyme-leaved Speedwell	*Veronica serpyllifolia*																													
Tree saplings		6		3	7	6	80	7	5	4	4	4	3	6	5	4	4	100	5	4		7		60	3		4	4	2	80
Tutsan	*Hypericum androsaemum*	2					20	1										10												
Wild Strawberry	*Fragaria vesca*					4	20	6	5	7	5			5	4	3	2	80				4		20	5					20
Willowherb sp.	*Epilobium sp.*							2		2	2			2	2			50												
Wood Anemone	*Anemone nemorosa*																								7	7	8	3	9	100
Wood Avens	*Geum urbanum*	3	3				40				1			4	4			30	3			2		40						
Wood Dock	*Rumex sanguineus*													2			4	20												
Wood False Brome	*Brachypodium sylvaticum*													4				10												
Tree Understorey																														
Ash	*Fraxinus excelsior*	3					20	3	3				1	3	3		3	60	4			4		40			5			20
Birch sp.	*Betula sp.*	1	7			7	60	8	7	8	7	2	5	8	8	6	2	100	7	7	6	7		80	3	2			5	60
Buddleja	*Buddleja sp.*	2					20																							
Wild Cherry	*Prunus avium*	4					20		4		1							20												
Currant sp.	*Ribes sp.*																											2		20
Dog-rose	*Rosa canina*									2			1					20												
Dogwood	*Cornus sanguinea*	6	7	6	5	5	100	6	5	5	3		7	4	7	5	5	90	6	4	4	4		80			3			20
Elder	*Sambucus nigra*	4		2	3		60		5				2	4	3		4	50	5	4	4	5	4	100	4		4	4	4	80
Elm	*Ulmus sp.*																													
Field Maple	*Acer campestre*															2		10												
Goat Willow	*Salix caprea*		6	5	6	6	80	4	4	4	3	4	7	4		6	7	90	5	4	3			60						
Hawthorn	*Crataegus monogyna*	4	4	4	2		80		2	2	1	2	2	3	4		5	80	5	3		5		60						
Hazel	*Corylus avellana*																								3		6			40
Honeysuckle	*Lonicera periclymenum*										3	1						20									3			20
Hornbeam	*Carpinus betulus*																								6			4		40
English Oak	*Quercus robur*																								2					20
Rowan	*Sorbus aucuparia*																													
Spindle	*Euonymus europaeus*	3					20				4	4	2			3		40												
Sweet Chestnut	*Castanea sativa*																								9	10	7	9	9	100
Sycamore	*Acer pseudoplatanus*	7		1	4	6	80	5	5	5	7	7	2	4	6	6	3	100	6	7	8	6	2	100			2	2		40
Wayfaring tree	*Viburnum lantana*																													
Wild Privet	*Ligustrum vulgare*	5				3	40												3			3		40						
Tree Canopy																														
Ash	*Fraxinus excelsior*			2			20					1						10					5	20						
Birch sp.	*Betula spp.*				1		20					2						10												
Wild Cherry	*Prunus avium*											2						10												
Field Maple	*Acer campestre*											1						10												
Rowan	*Sorbus aucuparia*																													
Sycamore	*Acer pseudoplatanus*			2	4		40					8						10					8	20						
Wild Privet	*Ligustrum vulgare*																													

Green shaded species indicate Ancient Woodland Indicators

NVC Survey Results - Grassland Habitat (G3)

Species		Quadrat number (domin scale)					Presence
Common Name	**Latin Name**	**1**	**2**	**3**	**4**	**5**	
Agrimony	*Agrimonia eupatoria*	5			3		40
Annual Meadow-grass	*Poa annua*			4	4	4	60
Autumn Hawkbit	*Leontodon autumnalis*						P
Bird's-foot Trefoil	*Lotus corniculatus*			5	3	4	60
Black Medick	*Medicago lupulina*		4	4	4	5	80
Bramble	*Rubus fruticosus agg.*		4	2	4	2	80
Bristly Ox-tongue	*Picris echioides*						P
Common Bent	*Agrostis capillaris*	4		4	5	4	80
Common Centaury	*Centaurium erythraea*			3	3		40
Common Figwort	*Scrophularia nodosa*						P
Common Knapweed	*Centaurea nigra*						P
Common Ragwort	*Senecia jacobaea*	1	4	5	3	4	100
Cow Parsley	*Anthriscus sylvestris*	3	4				40
Creeping Buttercup	*Ranunculus repens*		3		2	4	60
Creeping Thistle	*Cirsium arvense*	4		3		4	60
Daisy	*Bellis perennis*						P
Dogwood/Birch/Hawthorn Scrub							P
Early Forget-me-not	*Myosotis ramosissima*	3		2			40
Eyebright	*Euphrasia officinalis agg.*			3	2		40
Fairy Flax	*Linum catharticum*				5		20
False Oat-grass	*Arrhenatherum elatius*	8	8	4	2	5	100
Goat's-beard	*Tragopogon pratensis*						P
Goosefoot	*Chenopodium sp.*		3				20
Ground-ivy	*Glechoma hederacea*						P
Hogweed	*Heracleum sphondylium*		2				20
Lesser Stitchwort	*Stellaria graminea*	1	2				40
Perforate St. John's-wort	*Hypericum perforatum*	1		4	7	3	80
Red Clover	*Trifolium pratense*				2		20
Red Fescue	*Festuca rubra*					3	20
Ribwort Plantain	*Plantago lanceolata*	1		1	1		60
Rose	*Rosa sp.*		2	3		1	60
Selfheal	*Prunella vulgaris*	2		6	6	5	80
Smooth Tare	*Vicia tetrasperma*	2	3	2			60
Teasel	*Dipsacus fullonum*				3	3	40
Violet sp.	*Viola sp.*				3		20
White Campion	*Silene latifolia*						P
White Clover	*Trifolium repens*			2	3		40
Wild Strawberry	*Fragaria vesca*	2		5	4		60
Yorkshire-fog	*Holcus lanatus*	4	4	8	7	8	100
Species per quadrat		**14**	**12**	**19**	**21**	**15**	

P indicates species recorded within the wider grassland area

Appendix 4657/5

Hedgerow survey results

Hedgerow / Treeline Survey Results

No.	Height	Continuity / absence of gaps	Dominant woody species	Other woody species	Standard trees	Description including structure, associated features and woodland species in ground flora	Likelihood of qualification under Hedgerows Regs.
H1	2m	Good	Hawthorn	Hazel, Ash, Rose, Field Maple	-	Low bushy hedgerow, maintained at approximately 2m height.	Unlikely
H2	2m	Moderate	Hawthorn	Field Maple, Rose, Blackthorn	-	Low bushy hedgerow, maintained at approximately 2m height. Some gaps formed by tall ruderal vegetation.	Unlikely
H3	4m	Good	Cherry	Elder	-	Tall hedgerow managed to prevent encroachment but unmanaged at the top. Dominated by Cherry with Ivy, Bramble and Elder mixed in together with Hops.	Unlikely
H4	2m	Moderate	-	Field Maple, Rose sp., Elder	-	Well managed, box cut hedgerow, which becomes a tree line to the east.	Unlikely
H5	20m	Moderate	Italian Alder	-	Italian Alder treeline	Line of well managed young to semi-mature Italian Alder species planted at 1m intervals with Bindweed, and Elder in the understorey.	Unlikely
H6	20m	Moderate	Italian Alder	-	Italian Alder treeline	Line of well managed young to semi-mature Italian Alder species planted at 1m intervals with Bindweed, and Elder in the understorey.	Unlikely
H7	2m	Moderate	Field Maple, Hazel	Dogwood, Rose sp. Hawthorn, Blackthorn, Spindle	-	Well managed box cut hedgerow associated with a post and wire fence. Two large gaps were recorded to be present where the hedge has been cut back or a tractor had been driven through which are dominated by Bramble. Ground flora includes species such as Woody Nightshade and Cleavers	Unlikely
H8	8-10m	Moderate	Italian Alder	Rose, Sycamore, Elder, Field Maple	Italian Alder treeline	Treeline along road embankment, with trees at approximately 0.5m spacing. Some Clematis.	Unlikely
H9	15m	Moderate	Italian Alder	Field Maple, Wayfaring Tree, Elder, Cherry, Oak	Italian Alder treeline	Southern section located adjacent to wooded strip on road embankment. Further north comprises Italian Alder treeline along fenceline with some Bramble and Clematis growth and occasional Field Maple and Oak. Loose and defunct in parts.	Unlikely
H10	15-20m	Good	Poplar sp.	Rose sp., Hawthorn, Elder	Poplar treeline	Line of Poplar trees with dense Rose sp. growth in the understorey with occasional Hawthorn and Elder. Heavily managed with understorey tightly cropped back to the line of trees such that it forms an A-section hedge at the base.	Unlikely
H11	3-4m	Good	-	Sycamore, Elder, Rose sp.	Ash	Fairly tightly clipped species poor hedgerow transitioning to a tightly clipped box cut section 1m in width. Ground flora predominantly ruderal species, dominated by Common Nettle.	Unlikely
H12	15m	Moderate	Sycamore	Hornbeam, Elder, Rose, Spindle, Hawthorn, Field Maple, Oak, Cherry, Ash	Forms line of semi-mature trees	Line of semi-mature trees dominated by Sycamore with species rich understorey and a ground flora dominated by ruderal species such as Common Nettle, Cow Parsley, and Cleavers.	Possible
H13	5-6m	Good	Hawthorn, Apple	Elder, Blackthorn, Holly, Spindle, Rose sp., Alder	-	Similar in structure as H103, and only classed as a separate hedgerow due to the presence of a gap which exceeds 20m	Possible

No.	Height	Continuity / absence of gaps	Dominant woody species	Other woody species	Standard trees	Description including structure, associated features and woodland species in ground flora	Likelihood of qualification under Hedgerows Regs.
H14	5-6m	Good	Field Maple	Blackthorn, Hazel, Holly, Spindle, Hawthorn, Rose sp., Alder	-	Good quality species rich hedgerow with a rounded bushy structure adjacent to a track. Forms double hedgerow either side of track in southern part. A large amount of Clematis is present throughout forming tangled sections. Ground flora lacks botanical interest being dominated by a mixture of Cow Parsley, Hogweed, and Lords-and-Ladies.	Possible
H15	5-6m	Good	-	Field Maple, Elder, Dogwood, Blackthorn, Hazel, Spindle, Hawthorn	-	Fairly well established, species rich, bushy, intact hedgerow running along the south side of a track and managed on the southern side through strimming such that it forms a high A-shaped hedge. The ground flora appeared to be relatively poor consisting of Cow Parsley, Cleavers, coarse grasses and Nettles.	Possible
H16	5-6m	Poor	Hawthorn	Elder, Field Maple, Holly	-	Similar shape and structure to H105, but with more gaps present and less diversity.	Unlikely
H17	5m	Good	Cypress	-	-	Ornamental hedgerow forming residential curtilage	Unlikely
H18	2m	Moderate	-	Elder, Wayfaring Tree, Field Maple, Hazel, Hawthorn, Dogwood, Blackthorn	-	Tightly managed box cut hedgerow situated atop a slight bank. Relatively species rich but ground flora dominated by tall ruderal species such as Cleavers and Nettles.	Possible
H19	4m	Poor	Elder	-	-	Short strip of Elder hedgerow under a flyover.	Unlikely
H20	6-8m	Poor	-	Field Maple, Blackthorn	Lime	Hedgerow formed by line of young trees. Gappy in parts, formed by Bramble scrub with Bracken.	Unlikely
H21	5m	Moderate	-	Hazel, Elder, Cherry, Holly		Bushy hedgerow with some Bramble and Ivy.	Unlikely
H22	6-8m	Moderate	Holly, Blackthorn	Cherry		Outgrown hedgerow with encroaching Bramble.	Unlikely
H23	6m	Good	Cypress	-	-	Ornamental hedgerow bordering barn.	Unlikely
H24	2m	Good	Hawthorn	-	Willow sp.	Short section of box cut hedgerow.	Unlikely
H25	10m	Good	Cypress	Ash	-	Cypress tree line	Unlikely
H26	2m	Moderate	-	Hazel, Hawthorn, Holly, Field Maple	-	Low scrubby hedgerow dominated by Bramble. Some Lords-and-Ladies, Common Nettle and Ivy in ground flora.	Unlikely
H27	6m	Poor	-	Willow sp, Cherry, Hazel, Rose sp.	-	Defunct hedgerow with covering of Ivy and numerous gaps filled with Bramble scrub.	Unlikely
H28	6m	Poor	Blackthorn	Cherry	Cherry	Newly planted hedgerow which consists of individual blackthorn bushes and some young Cherry.	Unlikely
H29	2m	Moderate	Holly, Field Maple	Hazel, Rose sp., Elm, Blackthorn,	-	Box cut hedgerow with numerous small gaps and a ground flora consisting of ruderal and herb species such as Woody Nightshade, Speedwell, Clematis, Cleavers and Stinging Nettle	Unlikely
H30	8m	Moderate	Hazel	Ash, Blackthorn, Field Maple, Rose sp.	-	Tall hedgerow with covering of Ivy and Hops. Ground flora includes species such as Enchanter's Nightshade, Speedwell, Cleavers and Stinging Nettle	Unlikely

No.	Height	Continuity / absence of gaps	Dominant woody species	Other woody species	Standard trees	Description including structure, associated features and woodland species in ground flora	Likelihood of qualification under Hedgerows Regs.
H31	12m	Moderate	-	Ash, Beech, Hawthorn, Cherry, Blackthorn, Sycamore, Field Maple, Rose sp. Spindle, Yew, Elder, Hazel, Hornbeam	Horse Chestnut, Oak	Hedgerow associated with a line of young to semi-mature trees. Becomes more managed further along its length to ensure it does not encroach into the road. A number of mature Oak and Horse Chestnut standards are present along the hedgerow. Ground flora is dominated by ivy, with Cow Parsley, Dog's Mercury and Docks.	Possible
H32	10m	Moderate	Sycamore, Beech	Dogwood, Hornbeam	Sycamore and Beech treeline	Hedgerow dominated by young to semi-mature Sycamore and Beech trees becoming a small wooded strip to the north. Ground flora is dominated by Ivy with Cow Parsley, and Docks. A small amount of Cotoneaster sp. is present in the understorey	Unlikely
H33	2-3m	Moderate	-	Hornbeam, Blackthorn, Hawthorn, Dogwood	-	Box cut hedge which thins to the south from 2m to 1m. Ground flora consisting of Common Nettle, Cow Parsley, Garlic Mustard, Dandelion, and an ornamental Bluebell.	Unlikely
H34	20m	Moderate	Italian Alder	Dogwood, Poplar sp., Wayfaring Tree, Field Maple, Cherry, Hornbeam	Italian Alder treeline	Line of young to semi-mature trees with an understorey consisting of Dogwood and bramble. Ground flora is dominated by Common Nettle, with cleavers and Red Dead Nettle.	Unlikely
H35	20m	Moderate	Italian Alder, Poplar sp.	Ash, Elder, Holly	Italian Alder and Poplar treeline	Initially a line of Italian Alder trees becoming entirely Poplar trees approximately two thirds of the way along. Large Leaf Cotoneaster present in the understorey.	Unlikely
H36	4-10m	Poor	-	Alder, Ash, Elder, Guelder Rose, Blackthorn, Hornbeam, Field Maple, Dogwood	-	6m wide poorly structured hedgerow located on a bank adjacent to a post and rail fence which forms the boundary of the site. Ground flora includes species such as Ground Ivy, Bramble and White Dead Nettle	Unlikely
H37	20m	Poor	Poplar sp.	Elder, Rose sp.	Poplar treeline	Single line of planted young to semi-mature Poplar trees with scarce ground flora with species such as Pink Thistle. A 30m gap is present consisting of bare ground. Associated with the trees at one end of the gap is a two entrance Badger sett.	Unlikely
H38	20m	Moderate	Poplar sp.	Elder, Rose sp.	Poplar treeline	Single line of planted young to semi-mature Poplar trees with scarce ground flora with species such as Pink Thistle.	Unlikely
H39	20m	Moderate	Italian Alder	-	Italian Alder treeline	Single line of planted Italian Alder trees, with little in the way of ground flora.	Unlikely
H40	5-10m	Good	Holly	Beech, Cypress	-	Hedgerow forming residential curtilage dominated by Holly with Beech trees growing above and Cypress present at one end.	Unlikely
H41	15m	Moderate	Poplar sp.	Wayfaring Tree	Poplar treeline, Oak	Single line of planted young to semi-mature trees which have been pollarded in the past. Single mature Oak tree present where this treeline meets TL4.	Unlikely
H42	15m	Moderate	Pine sp.	Cypress	Pine treeline	Mix of coniferous trees forming residential curtilage, dominated by Pine sp. with Cypress trees. Variegated Yellow Archangel was recorded in the ground flora.	Unlikely
H43	10-15m	Moderate	Hornbeam, Poplar sp.	Elder	Hornbeam and Poplar treeline	Line of trees dominated by hornbeam with a heavy covering of Ivy and Elder in the understorey for the first half after which it becomes another Poplar tree line.	Unlikely

No.	Height	Continuity / absence of gaps	Dominant woody species	Other woody species	Standard trees	Description including structure, associated features and woodland species in ground flora	Likelihood of qualification under Hedgerows Regs.
H44	20m	Poor	Poplar sp.	Hawthorn, Dogwood, Willow sp.	Poplar treeline	Single line of Poplar trees with numerous 5-10m wide gaps present along its length.	Unlikely
H45	10m	Poor	-	Ash, Beech, Hawthorn, Cherry, Blackthorn, Sycamore, Field Maple, Rose sp. Spindle, Yew, Elder	Beech, Ash	Formed by trees with understorey vegetation between. Ground flora dominated by Ivy with Cow Parsley, Docks, Lords-and-Ladies, Dogs Mercury, Stitchwort and Dandelion	Possible
H46	4-6m	Good	Blackthorn	Field Maple, Rose, Hazel	-	Variable height hedgerow at corner of field, adjacent to wooded area and widening to north. Ivy, Bramble and Annual Mercury noted.	Unlikely
H47	4-6m	Moderate	Blackthorn, Hawthorn	Hazel, Elder	-	Double hedgerow along field boundary. Some Ivy and Bramble noted.	Unlikely
H48	10m	Good	-	Rowan, Beech, Field Maple, Lime, Blackthorn, Rose sp., Hawthorn, Birch, Cherry, Horse Chestnut	Mixed treeline, Beech	Diverse line of trees, with no one species dominating, forming the boundary to an arable field. Appears to be lightly managed on the field side. Initially starts as a 6-8m wide feature but quickly thins becoming more of a hedgerow structure. Ground flora dominated by tall ruderal species including Cleavers, Common Nettle, White Dead Nettle and Cow Parsley.	Possible
H49	10m	Poor	Beech	Horse Chestnut	Beech treeline	Line of Beech trees and Horse Chestnut scrub with numerous gaps present.	Unlikely
H50	10m	Poor	Beech	Horse Chestnut	Ash	Line of Beech trees and Horse Chestnut scrub with some Ash standards present. Structure was recorded to be loose with numerous gaps present. Ground flora dominated by tall ruderal species.	Unlikely
H51	10m	Poor		Beech, Horse Chestnut, Sycamore, Ash	Mixed treeline	Mixed treeline. Structure was recorded to be loose with numerous gaps present. Ground flora dominated by tall ruderal species.	Unlikely
H52	20m	Moderate	Poplar sp.	Cypress, Elder, Field Maple	Poplar treeline	Tall Poplar treeline with an understorey of Elder with Cypress developing throughout going eastward. The ground flora consists of Bramble and tall ruderal species but is otherwise relatively bare.	Unlikely
H53	10m	Good	-	Beech, Silver Birch, Cypress, Sweet Chestnut, Elder	Mixed treeline, Sweet Chestnut	Large line of trees, 10m wide with mixture of species. A large mature Sweet Chestnut tree with some bat potential present within the treeline itself. Understorey is dominated by a dense growth of Cypress, which has resulted in a sparse ground flora.	Unlikely
H54	20m	Moderate	Poplar sp.	Oak	Poplar treeline	Line of tall semi-mature Poplar trees with sparse understorey consisting of oak saplings.	Unlikely
H55	15m	Moderate	Poplar sp.	Apple, Holly, Elder, Hawthorn, Elm	Poplar treeline, occ. Ash	Line of young to semi-mature Poplar trees, regularly spaced at intervals of 1m. Largely species poor with an understorey consisting of occasional Apple, and a ground flora of Cleavers and Nettles. Moving east the treeline changes, becoming more defunct with diseased trees.	Unlikely

No.	Height	Continuity / absence of gaps	Dominant woody species	Other woody species	Standard trees	Description including structure, associated features and woodland species in ground flora	Likelihood of qualification under Hedgerows Regs.
H56	8-10m	Moderate	Italian Alder	-	-	Line of Italian Alder trees similar to previous, managed to a height of 8-10m, which starts to be encroached by defunct Cherry orchard to south.	Unlikely
H57	8-10m	Moderate	Italian Alder	Blackthorn, Hawthorn	-	Relatively intact line of planted Italian Alders with understorey of Hawthorn and Blackthorn. The ground flora is largely dominated by coarse grasses with species such as Soft Brome and Cow Parsley also present.	Unlikely
H58	4m	Moderate	Italian Alder	-	-	Planted tightly box cut hedgerow with few other species present.	Unlikely
H59	3m	Good	Blackthorn, Italian Alder	-	-	Box cut hedgerow present after a 30m gap from previous Hedgerow, with a dense intact structure. Initially starts as Blackthorn dominated becoming more Italian Alder along its length.	Unlikely
H60	3m	Poor	Blackthorn	Rose sp., Holly, Yew	-	Narrow hedgerow which becomes relatively gappy along its length. Ground flora largely consists of species similar to the semi-improved grassland adjacent.	Unlikely
H61	1-2m	Moderate	Hazel	-	Ash	Low narrow managed hedgerow with some gaps present and dominated by Hazel.	Unlikely
H62	4m	Good	Italian Alder	Rose sp.	-	Managed hedgerow forming boundary within an orchard. Gap recorded to be present stopping the hedgerow being connected to those adjacent. Ground flora dominated by tall ruderal vegetation such as Cow Parsley, Cleavers, and Common Nettle.	Unlikely
H63	4m	Good	Italian Alder	Rose sp., Elder	-	Managed hedgerow forming boundary within an orchard. Gap recorded to be present stopping the hedgerow being connected to those adjacent. Ground flora dominated by tall ruderal vegetation such as Cow Parsley, Cleavers, and Common Nettle.	Unlikely
H64	10m	Moderate	Alder	Norway Maple, Cherry	Young treeline	Line of young trees dominated by Alder forming the southern boundary of the arable field.	Unlikely
H65	1-2m	Poor	-	Rose sp., Norway Maple, Sycamore, Blackthorn	-	Loose unmanaged hedgerow with dense Bramble thicket spilling out into the field, becoming a treeline described below to the south.	Unlikely
H66	10m	Moderate	-	Ash, Field Maple	Mixed treeline	Line of trees connected to the south of H12 with a heavy Ivy covering.	Unlikely
H67	8m	Moderate	Rose sp., Prunus sp.	Blackthorn, Apple, Field Maple	Field Maple	Hedgerow consisting of fairly mature fruit trees spaced at 5m intervals along a barbed wire fence forming the boundary to a road. Moving west the hedgerow becomes gappier and more defunct.	Unlikely
H68	3m	Good	Hawthorn	Blackthorn, Elder	Ash	Hedgerow opposite H13 with better continuity, situated on a bank to the north and with a ground flora dominated by Common Nettle. A number of semi-mature ash standards are present along its length.	Unlikely
H69	4-6m	Poor	-	Spindle, Ash, Sycamore, Hawthorn, Rose sp., Hazel	Walnut, Oak	Small stretch of hedgerow forming the southern part of a loose feature comprising largely trees and scrub. Two hedgerows run parallel to each other forming a double feature.	Unlikely

No.	Height	Continuity / absence of gaps	Dominant woody species	Other woody species	Standard trees	Description including structure, associated features and woodland species in ground flora	Likelihood of qualification under Hedgerows Regs.
H70	4m	Moderate	Italian Alder, Poplar, Blackthorn	Oak, Elder, Rose sp., Dogwood	Oak	Western section dominated by Italian Alder and Poplar sp. until approximately two thirds of the way along at which point it becomes dominated by Blackthorn. Small section of Blackthorn dominated vegetation also extends south along roadside.	Unlikely
H71	5-6m	Moderate	Poplar sp.	Elder	-	Well managed Poplar hedgerow with an understorey of Bramble and Elder.	Unlikely
H72	5-6m	Moderate	-	Sycamore, Ash, Blackthorn, Hawthorn, Hazel	Sycamore, Ash	Outgrown hedgerow with numerous small trees.	Unlikely
H73	2m	Poor	-	Sycamore, Blackthorn, Ash, Willow sp., Holly, Rose	Ash	Loose gappy hedgerow set on a bank forming the boundary to an arable field. A young to semi-mature Ash standard is present at the northern end.	Unlikely
H74	3-4m	Good	Blackthorn	Holly	Oak, Sycamore	Short section of hedgerow forming the boundary of an arable field and adjacent to a residential property.	Unlikely
H75	3-4m	Good	Blackthorn	Holly	Oak, Sycamore	Short section of hedgerow forming the boundary of an arable field and adjacent to a residential property.	Unlikely
H76	3-8m	Good	Moderate	Holly, Cherry, Elder, Willow sp., Field Maple, Dogwood	Oak, Sycamore	Hedgerow starts as a very wide and dense feature associated with an area of scrub and grassland, before becoming a more standard hedgerow feature approximately halfway along its length. This second section was recorded to be unmanaged and spills out into the field at points. A ditch is associated with the hedgerow but was noted to be shallow and dry	Possible
H77	4m	Moderate	Poplar sp.	Italian Alder	-	Poplar hedgerow that had been pollarded at a height of 4m with sparse understorey consisting almost entirely of bramble and a ground flora formed of ruderal species such as Cow Parsley, Cleavers and Common Nettle.	Unlikely
H78	8m	Moderate	Field Maple	Spindle, Ivy, Hazel, Blackthorn	-	Tall, unmanaged hedgerow overhanging a footpath associated with a main active badger sett.	Unlikely
H79	4-5m	Poor	Prunus sp.	Rose sp., Blackthorn, Hawthorn, Hazel, Elder	Oak, Ash	Well established, unmanaged, slightly defunct hedgerow associated with a bridleway. Northern section loses continuous hedgerow structure becoming occasional Elder and Rose sp. shrubs. The ground flora is dominated by tall ruderal vegetation such as Cleavers and Cow Parsley with other herbs such as Greater Stitchwort and Dead-Nettle.	Possible
H80	4m	Moderate	Poplar sp.	Alder, Blackthorn	Oak, Ash	Poplar hedgerow that had been pollarded at a height of 4m with sparse understorey consisting almost entirely of bramble and a ground flora formed of ruderal species such as Cow Parsley, Cleavers and Common Nettle. Hedgerow associated with a defunct ditch feature that runs partially along its length.	Unlikely
H81	4m	Moderate	Poplar	Apple, Blackthorn, Elder	-	Relatively well established hedgerow consisting of pollarded trees, with a heavy covering of Ivy.	Unlikely
H82	4-5m	Moderate	Alder	Plum, Rose, Elder	-	Established, tightly trimmed, fairly intact hedgerow with a large amount of Ivy.	Unlikely
H83	6-7m	Moderate	Blackthorn	Plum	Oak, Sycamore	Tall, outgrown, bushy hedgerow with single standard semi-mature Oak tree.	Unlikely

No.	Height	Continuity / absence of gaps	Dominant woody species	Other woody species	Standard trees	Description including structure, associated features and woodland species in ground flora	Likelihood of qualification under Hedgerows Regs.
H84	2m	Poor	Apple sp.	-	-	Somewhat defunct hedgerow situated on a raised bank with a large amount of ruderal vegetation at the base including species such as Nettles, Cow Parsley, rank grasses and Cleavers	Unlikely
H85	3-4m	Moderate	Poplar sp.	Blackthorn, Hawthorn	-	Box cut narrow hedgerow formed from pollarded trees.	Unlikely
H86	3m	Good	Beech	-	-	Box cut Beech hedgerow forming residential curtilage.	Unlikely
H87	5-8m	Poor	Cherry	Holly	Evergreen Oak, Sycamore, Lime	Outgrown hedgerow with numerous trees, some encroaching from adjacent orchard.	Unlikely
H88	3m	Poor	Italian Alder	Apple sp.	-	Line of Italian Alder trees with a loose structure becoming a more intact hedgerow of largely Apple sp.	Unlikely
H89	3m	Moderate	Poplar sp.	Hawthorn	-	Line of pollarded trees spaced every 1m with loose structure and associated with wide strip of tall ruderals including Hemlock, Cleavers, Nettles and Cow Parsley.	Unlikely
H90	15m	Poor	Poplar sp.	-	Poplar treeline	Tall, well established line of semi-mature trees with limited understorey vegetation associated with a 1m wide strip of tall ruderal vegetation at the base.	Unlikely
H91	20m	Poor	Poplar sp.	Elder, Field Maple, Blackthorn	Poplar treeline	Established line of Poplar trees with Blackthorn saplings growing at the base and ground flora consisting of tall ruderal vegetation such as Nettles, Cow Parsley and cleavers, with other herbs such as Garlic Mustard.	Unlikely
H92	2-3m	Moderate	Poplar sp.	-	-	Line of pollarded trees spaced every 1m with loose structure and associated with wide strip of tall ruderals including Hemlock, Cleavers, Nettles and Cow Parsley.	Unlikely
H93	3m	Moderate	Goat Willow, Hazel, Italian Alder	-	-	Double line hedgerow the southern of which consists of alternating Goat Willow and hazel, while the northern consists of alternating Italian Alder and Hazel	Unlikely
H94	3m	Moderate	Goat Willow, Hazel	-	-	Formed by line of alternating young Goat Willow and Hazel of roughly 5-10 years	Unlikely
H95	3m	Moderate	Goat Willow, Hazel	-	-	Formed by line of alternating young Goat Willow and Hazel of roughly 5-10 years	Unlikely
H96	3m	Moderate	Goat Willow, Hazel	-	-	Formed by line of alternating young Goat Willow and Hazel of roughly 5-10 years	Unlikely
H97	3m	Moderate	Goat Willow, Hazel	-	-	Formed by line of alternating young Goat Willow and Hazel of roughly 5-10 years	Unlikely
H98	2m	Poor	Sycamore	Elder, Apple,	-	Gappy, defunct hedgerow consisting of occasional bushes every 10m between largely strips of tall ruderal vegetation with scattered Elder scrub	Unlikely
H99	3m	Moderate	Goat Willow, Hazel	-	-	Formed by line of alternating young Goat Willow and Hazel of roughly 5-10 years	Unlikely
H100	2m	Moderate	Poplar sp.	-	-	Newly planted hedgerow consisting of young poplar trees spaced every metre.	Unlikely
H101	6-7m	Good	Hawthorn, Elder	Plum sp., Silver Birch	Sycamore, Cherry	Outgrown 5m wide hedge which encroaches into the adjacent field. The hedgerow has been straight trimmed along one side giving a fairly rectangular profile and has a moderately diverse ground flora including Stinking Iris, Lesser Celandine and Lords-and-Ladies.	Unlikely
H102	10m	Poor	Italian Alder	Hawthorn, Elder	Italian Alder treeline, some Sycamore	Line of Italian Alder trees at 1m intervals.	Unlikely
H103	2m	Moderate	Ivy	Elder, Sycamore, Blackthorn	-	Low box cut hedgerow predominantly consisting of Ivy which has grown up along an old fence line. The ground flora was not of botanical interest with the exception of a single patch of Bluebell was noted at the base.	Unlikely

No.	Height	Continuity / absence of gaps	Dominant woody species	Other woody species	Standard trees	Description including structure, associated features and woodland species in ground flora	Likelihood of qualification under Hedgerows Regs.
H104	4m	Good	Cypress	-	-	Ornamental hedgerow forming residential curtilage.	Unlikely
H105	3m	Moderate	Poplar sp.	Hazel, Dogwood, Blackthorn, Elder, Field Maple, Rose sp., Apple	-	Hedgerow is initially almost entirely dominated by Poplar with a 1m wide strip of tall ruderal vegetation at the base consisting of Nettles, Cleavers and some Hemlock. Moving along the hedgerow becomes more native in structure before becoming Poplar dominated again.	Possible
H106	5m	Good	-	Sycamore, Hawthorn, Blackthorn, Ash, Elder, Field Maple, Cherry	Ash	Diverse hedgerow situated on an embankment and associated with a post and rail fence. Initially starts 5m wide and unmanaged but quickly narrows and shortens to a 3.5m tall and 2m wide box cut hedgerow. Ground flora is dominated by Cleavers with other ruderal and grass species such as lords-and-ladies, Cow Parsley, White Dead Nettle, Barron Brome, Hogweed and Cut Leafed Cranes Bill.	Possible
H107	6m	Good	Hawthorn	Hazel, Blackthorn, Cherry, Rose sp., Willow sp.	Oak	Scrubby, outgrown hedgerow which is managed on the roadside to prevent encroachment but was recorded to be left on the field side such that it was spilling out into the field. Ground flora dominated by ruderals such as Common Nettle.	Unlikely
H108	3-4m	Good	Hawthorn	Holly, Elder, Yew,	-	Dense, well managed, box cut hedgerow forming a residential curtilage.	Unlikely
H109	2-6m	Moderate	Elm	Blackthorn, Field Maple	Ash	Narrow hedge situated on a small bank and associated with a post and wire fence with a height of 2m initially raising to 6m along its length. Ivy and a number of Ash standards were also recorded to be within the hedgerow.	Unlikely
H110	1.5m	Good	Blackthorn	-	-	Well managed tightly box cut hedgerow with a large amount of Clematis and Ivy, recorded to become dominated by Bramble moving along.	Unlikely
H111	2-8m	Poor	-	Blackthorn, Dogwood, Rose, Hawthorn, Elm, Elder	Elm, Poplar	Low box cut hedgerow along roadside. Western section with Elm treeline, mostly dead/diseased.	Unlikely
H112	3-4m	Moderate	Hawthorn	Spindle	-	Slightly outgrown hedgerow.	Unlikely
H113	2m	Moderate	Blackthorn			Box cut managed hedgerow. Situated on a raised bank. Narrow margin with grass and ruderal species.	Unlikely
H114	3m	Good	Italian Alder	-	-	Well managed hedgerow formed by pollarded trees.	Unlikely
H115	20m	Moderate	Field Maple	-	Field Maple treeline	Small line of young to semi-mature Field Maple trees associated with a Badger sett.	Unlikely
H116	2-3m	Good	Blackthorn, Dogwood	Elder, Rose sp., Field Maple, Cherry, Hawthorn	-	Initially quite tall and drawn out with no dominant species, but recorded to become Blackthorn dominated and then Dogwood dominated along its length. In places the hedgerow became encroached by Bramble scrub.	Unlikely
H117	2-6m	Moderate	Elm	Blackthorn, Field Maple	Ash	Narrow hedge situated on a small bank and associated with a post and wire fence with a height of 2m initially raising to 6m along its length. Ivy also recorded to be within the hedgerow.	Unlikely

No.	Height	Continuity / absence of gaps	Dominant woody species	Other woody species	Standard trees	Description including structure, associated features and woodland species in ground flora	Likelihood of qualification under Hedgerows Regs.
H118	2m	Moderate	Italian Alder, Willow sp.	Hazel	-	Young, narrow well managed hedgerow which was recorded to be dominated by Italian Alder for the initially 30m before being dominated by Willow sp. for the remainder.	Unlikely
H119	2m	Moderate	Blackthorn	-	-	Bushy unmanaged hedgerow dominated by Blackthorn.	Unlikely
H120	2m	Poor	Italian Alder	Hazel, Willow sp.	-	Young, narrow line of Italian Alder trees which are yet to become a defined feature. Ruderals are present in the understorey, with Bindweed present within the hedgerow itself.	Unlikely
H121	3m	Moderate	Willow	Alder	-	Short section of bushy hedgerow.	Unlikely
H122	2m	Poor	Italian Alder	Hazel, Willow sp.	-	Young, narrow line of Italian Alder trees which are yet to become a defined feature. Ruderals are present in the understorey, with Bindweed present within the hedgerow itself.	Unlikely

Appendix 4657/6

Legislation Summary

LEGISLATION SUMMARY

1. In England and Wales primary legislation is made by the UK Parliament, and in Scotland by the Scottish Parliament, in the form of Acts. The main piece of legislation relating to nature conservation in the UK is the Wildlife and Countryside Act 1981 (as amended).

2. Acts of Parliament confer powers on Ministers to make more detailed orders, rules or regulations by means of secondary legislation in the form of statutory instruments. Statutory instruments are used to provide the necessary detail that would be too complex to include in an Act itself[1]. The provisions of an Act of Parliament can also be enforced, amended or updated by secondary legislation.

3. In summary, the key pieces of legislation relating to nature conservation in the UK are:

    - Wildlife and Countryside Act 1981 (as amended)
    - Protection of Badgers Act 1992
    - Hedgerows Regulations 1997
    - Countryside and Rights of Way (CRoW) Act for England and Wales 2000
    - Natural Environment and Rural Communities Act 2006
    - Conservation of Habitats and Species Regulations 2017

4. A brief summary of the relevant legislation is provided below. The original Acts and instruments should be referred to for the full and most up to date text of the legislation.

5. **Wildlife and Countryside Act 1981 (as amended)**. The WCA Act provides for the notification and confirmation of Sites of Special Scientific Interest (SSSIs) identified for their flora, fauna, geological or physiographical features. The Act contains strict measures for the protection and management of SSSIs.

6. The Act also refers to the treatment of UK wildlife including protected species listed under Schedules 1 (birds), 5 (mammals, herpetofauna, fish, invertebrates) and 8 (plants).

7. Under Section 1(1) of the Act, all wild birds are protected such that is an offence to intentionally:

    - Kill, injure or take any wild bird;
    - Take, damage or destroy the nest of any wild bird whilst in use* or being built;
    - Take or destroy an egg of any wild bird.

    * The nests of birds that re-use their nests as listed under Schedule ZA1, e.g. Golden Eagle, are protected against taking, damage or destruction irrespective of whether they are in use or not.

8. Offences in respect of Schedule 1 birds are subject to special, i.e. higher, penalties. Schedule 1 birds also receive greater protection such that it is an offence to intentionally or recklessly:

    - Disturb any wild bird included in Schedule 1 while it is building a nest or while it is in, on or near a nest containing eggs or young;
    - Disturb dependent young of such a bird.

[1] http://www.parliament.uk/business/bills-and-legislation/secondary-legislation/statutory-instruments/

9. Under Section 9(1) of the Act, it is an offence to:

- Intentionally kill, injure or take any wild animal included in Schedule 5.

10. In addition, under Section 9(4) it is an offence to intentionally or recklessly:

- Obstruct access to, any structure or place which any wild animal included in Schedule 5 uses for shelter or protection; or
- Disturb any wild animal included in Schedule 5 while occupying a structure or place which it uses for that purpose.

11. Under Section 13(1) it is an offence:

- To intentionally pick, uproot or destroy any wild plant listed in Schedule 8; or
- Unless the authorised person, to intentionally uproot any wild plant not included in Schedule 8.

12. The Act also contains measures (S.14) for preventing the establishment of non-native species that may be detrimental to native wildlife, prohibiting the introduction into the wild of animals (releases or allows to escape) and plants (plants or causes to grow) listed under Schedule 9.

13. **Protection of Badgers Act 1992.** The Act aims to protect the species from persecution, rather than being a response to an unfavourable conservation status, as the species is in fact common over most of Britain. It should be noted that the legislation is not intended to prevent properly authorised development. Under the Act it is an offence to:

- Wilfully kill, injure, take, possess or cruelly ill-treat* a Badger, or attempt to do so;
- To intentionally or recklessly interfere with a sett# (this includes disturbing Badgers whilst they are occupying a sett, as well as damaging or destroying a sett or obstructing access to it).

* the intentional elimination of sufficient foraging area to support a known social group of Badgers may, in certain circumstances, be construed as an offence

\# A sett is defined as "*any structure or place which displays signs indicating current use by a Badger*". Natural England advice (June 2009) is that a sett is protected so long as such signs remain present, which in practice could potentially be for some time after the last actual occupation by Badger. Interference with a sett includes blocking tunnels or damaging the sett in any way

14. Licences can be obtained from the Statutory Nature Conservation Organisation (SNCO) for development activities that would otherwise be unlawful under the legislation, provided there is suitable justification. The SNCO for England is Natural England.

15. **Hedgerows Regulations 1997**. 'Important' hedgerows (as defined by the Regulations) are protected from removal (up-rooting or otherwise destroying). Various criteria specified in the Regulations are employed to identify 'important' hedgerows for wildlife, landscape or historical reasons.

16. **Countryside and Rights of Way (CRoW) Act for England and Wales 2000.** The CRoW Act provides increased measures for the management and protection of SSSIs and strengthens wildlife enforcement legislation. Schedule 12 of the Act amends the species provisions of the WCA 1981, strengthening the legal protection for threatened species. The Act also introduced a duty on Government to have regard to the conservation of biodiversity and maintain lists of species and habitats for which conservation steps should be taken or promoted, in accordance with the Convention on Biological Diversity.

17. **Natural Environment and Rural Communities Act 2006.** Section 41 of the NERC Act requires the Secretary of State to publish a list of habitats and species that are of principal importance for the conservation of biodiversity in England. The S41 list is used to guide decision-makers such as local planning authorities, in implementing their duty under Section 40 of the Act, to have regard to the conservation of biodiversity in England, when exercising their normal functions. 56 habitats and 943 species of principal importance are included on the S41 list. These are all the habitats and species in England that were identified as requiring action in the UK Biodiversity Action Plan (BAP).

18. **Conservation of Habitats and Species Regulations 2017 (as amended).** The Regulations enact the European Union's Habitats Directive (92/43/EEC) in the UK. The Habitats Directive was designed to contribute to the maintenance of biodiversity within member states through the conservation of sites, known in the UK as Special Areas of Conservation (SACs), containing habitats and species selected as being of EC importance (as listed in Annexes I and II of the Habitats Directive respectively). Member states are required to take measures to maintain or restore these natural and semi-natural habitats and wild species at a favourable conservation status.

19. The Regulations also require the compilation and maintenance of a register of European sites, to include SACs and Special Protection Areas (SPAs)[2] classified under Council Directive 79/409/EEC on the Conservation of Wild Birds (the Birds Directive). These sites constitute the Natura 2000 network. The Regulations impose restrictions on planning decisions likely to significantly affect SPAs or SACs.

20. The Regulations also provide protection to European Protected Species of animals that largely overlaps with the WCA 1981, albeit the provisions are generally stricter. Under Regulation 43 it is an offence, *inter alia*, to:

- Deliberately capture, injure or kill any wild animal of a European Protected Species;
- Deliberately disturb any wild animals of any such species, including in particular any disturbance likely to impair their ability to survive, to breed or reproduce, to rear or nurture their young, to hibernate or migrate, or which is likely to affect significantly their local distribution or abundance;
- Deliberately take or destroy the eggs of such an animal;
- Damage or destroy a breeding site or resting place of such an animal.

21. Similar protection is afforded to European Protected Species of plants, as detailed under Regulation 47.

22. The Regulations do provide a licensing system that permits otherwise illegal activities in relation to European Protected Species, subject to certain tests being fulfilled.

[2] Special Protection Areas (SPAs) are protected sites classified in accordance with Article 4 of the EC Directive on the Conservation of Wild Birds (79/409/EEC) (aka the Birds Directive), which came into force in April 1979. SPAs are classified for rare and vulnerable birds (as listed on Annex I of the Directive), and for regularly occurring migratory species.

Appendix 4657/7

Building and tree survey results

Building Descriptions

Feature	Description	Bat Roosting Potential
B1	Old corrugated metal shed bordered by dense scrub, with southern and western faces entirely scrubbed over. Constructed of corrugated metal with a sloping corrugated metal roof. Some storage although appears disused. No enclosed voids and nature of construction largely unsuitable for bats.	Negligible
B2	Collection of industrial workshops and sheds forming part of Science Park: A. Large metal storehouse. B. Brick and concrete structure used for storage of farm equipment. Pitched roof of corrugated metal which is open internally. C. Brick and concrete structure with pitched roof of corrugated metal. Largely open internally although partly enclosed with false ceiling at eastern end. Skylights present within roof. D. Open metal clad barn structure with concrete frame and metal capping. Heavily colonising with vegetation but entirely open on west side. E. Metal structure with domed roof, in active use and with no enclosed void. F. Brick structure with corrugated roof, either asbestos cladding or tarnished metal. In active use with no void. G. 1 storey brick built shed with metal cladding and a corrugated metal roof, however was not accessible for inspection. H. Corrugated metal structure with domed corrugated metal roof. I. Corrugated metal structure with wooden doors. J. Corrugated metal structure with domed corrugated metal roof. K. Series of metal lean-to's, sheds and a metal container. L. Substation, brick-built, metal clad, corrugated metal or asbestos roof. Ivy colonising the walls, young saplings on roof however in regular use, not accessible to survey. None of the buildings were recorded to support any particular bat roosting potential, and overall, given the nature of construction, lack of enclosed roof voids and active use of buildings, roosting opportunities are considered to be limited.	Negligible to low
B3	Collection of small workshops and sheds. Buildings A to D are sheds made of pre-fabricated material on a metal frame, with corrugated metal roofs, or occasional breeze block and metal/corrugated metal walls. Some in active use as stables or workshops. Caravan also present. Given the nature of construction, lack of enclosed roof voids and active use of buildings, roosting opportunities are considered to be limited. Buildings E-L are small sheds or other structures which are in a poor state of repair. These buildings are either wooden sheds, brick based with wooden cladding or have corrugated metal walls. Roofs are either prefabricated, corrugated metal, corrugated asbestos or pitched and in some cases sloping. No evidence of bats recorded and due to dilapidated state of buildings, with exposed interiors, considered to provide limited bat roosting potential.	Negligible to low
B4	Sports centre building. Largely brick built single storey structure with a double pitched roof formed by interlocking tiles. A number of external features such as metal chimneys and vents, together with metal flashing above windows and wooden soffits were recorded. Overall the building is in good condition and well sealed, although some holes in soffits and at fascias provide potential access to interior. Internally the building has a number of voids, two laterally across the building, which each divided into two main sections. The north-eastern void is a large, open space, not cluttered and with some pipes and vents. Features rafters with felt lining and	Confirmed Brown Long-eared bats roosting in south-eastern void

Feature	Description	Bat Roosting Potential
	interlocking tiles above, however these are well sealed and clean with not much visible light other than around pipes. It is split in half by a brick partition wall. No evidence of bats recorded in this section. The north-western void is similar to the north-eastern void, however is more used for storage with more pipes and vents, along with numerous cobwebs. Pipe entry points from the roof have made gaps but otherwise there are no major entry points. Level of cobwebbing suggests it is unlikely this void is used. Again there is a partition wall, with a water tank beyond. No evidence of bats recorded in this section. The south-eastern void is similar in size again, with a partition wall. The southern part was recorded to support a scattering of droppings under the central ridge beam, approximately 100-200 droppings confirmed by DNA analysis as Brown Long-eared. To the north of the partition, a similar scattering of droppings was recorded, approximately 100-200, underneath a torn section of felt, likely same individuals as the other section due to hatch access. The south-western void is similar again, and appeared to be well sealed with no external entry points.	
B5	Structure A comprises an open tunnel connecting the central and southern quarries, allowing for vehicle/pedestrian access. The tunnel is brick-built/brick-lined and inside seems to be fairly well pointed, with no particular gaps however on the northern entrance there are some gaps and cracks around the northern facing.	Low
	Structure B comprises a tunnel dug into the rock between the central and northern quarries. This is open at the eastern end into the northern quarry, although appears largely collapsed at the western end. At the eastern entrance, there is a large opening, beyond which the ground rises and the tunnel constricts to less than 1m in height, approximately 5m beyond the entrance. The opening could be fully investigated and no evidence of bats such as droppings was evident. However, the tunnel cannot be accessed beyond where it constricts, and given the underground location likely to support stable environmental conditions, it could be suitable for hibernation. Subject to placement of static detectors during winter 2017/18 with likely Brown Long-eared bats recorded indicating possible hibernation roost present.	Possible Brown Long-eared hibernation roost
	Structure C comprises the remains of old quarry buildings, largely reduced to just the lower sections of the walls with dense Ivy cover. No particular roosting features noted.	Negligible
	The remaining buildings within the central quarry comprise a series of portacabins, storage crates and other temporary structures in use by the outdoor pursuits company.	Negligible
B6	'Goldenwood' house, comprising a traditional brick built two-storey house with pitched tiled roof. This building features a T shaped void which is approximately 2.5m tall at its apex and 5-4m wide, with wood rafters and wooden sarking, some gaps and a chimney. Scattered droppings were recorded throughout the void, largely under the central ridge, with approximately 600-800 droppings in total, confirmed as Brown Long-eared by DNA analysis. The roof is understood to have been reinsulated 9 months prior to the inspection, such that this represents a recent accumulation of droppings. Some external features also present under tiles and roof flashing. Subject to emergence/re-entry surveys in 2018 which also recorded small numbers of Soprano Pipistrelle emerging from under roof tiles and a window ledge.	Confirmed Brown Long-eared bat roost in main void and Soprano Pipistrelle associated with external features

Feature	Description	Bat Roosting Potential
B7	Large warehouse/barn building, brick built with a corrugated asbestos roof and skylights in the roof on all elevations. There are also two smaller brick built buildings that are one storey each with corrugated metal roofs and metal barge boards together with associated containers. Due to nature of construction, lack of enclosed voids and active use, considered to provide negligible bat roosting potential.	Negligible
B8	A residential property, which is a traditional two storey brick built structure with a pitched roof. The roof is built into with gable windows but is likely to be a small roof void above this. The building is generally in good condition but likely has some bat roosting potential. The double garage building to the south has a double tiled pitch roof which is likely open internally to the roof. Not subject to internal inspections.	Moderate

Tree Descriptions

Feature	Description	Bat Roosting Potential
TG1	Group of predominantly old Cherry trees, likely forming remnant orchard feature. Trees support some deadwood features including cavities, rot holes, woodpecker holes, fallen limbs and lifted bark. However, majority of features are relatively exposed or do not form substantial cavities.	Low to moderate
TG2	Group of mature Oak trees forming parkland habitat. Trees generally in good health, although many support dead wood features including stag heading, fallen limbs, rot holes and lifted bark.	Moderate to high
TG3	Mature Sweet Chestnut trees subject to varying levels of decay, with numerous rot holes, woodpecker holes and cracks in limbs.	Low to moderate
TG4	Area of likely former orchard and woodland edge adjacent to quarries: A. Mature Oak with occasional knot holes (low-moderate) B. Old coppices with large rot holes close to ground (low) C. Mature Oak with some dead branches/knot holes (moderate) D. Defunct mature Cherry with numerous holes/splits (moderate-high) E. Old Cherry with holes/splits (low-moderate) F. Old Cherry with holes/splits (low) G. Old Cherry with holes/splits (low) H. Mostly dead Cherry with holes/splits (moderate-high) I. Old Cherry with central cavity (moderate) J. Old Cherry with holes/splits (low) K. Old Cherry with holes/splits and loose bark (moderate)	Varying bat roosting potential.
TG5	Trees within northern quarry basin: A. Semi-mature Ash with woodpecker hole at c.15m height (low-moderate) B. Semi-mature Sycamore with three woodpecker holes and central rot in lower part of tree. Confirmed to support Noctule roost during activity surveys (confirmed roost) C. Young Silver Birch tree in poor condition with holes/cavities at 2-6m height (moderate) D. Young Silver Birch tree in poor condition with holes/cavities at 6-8m height (moderate) E. Young Goat Willow with splits and broken branches (low) F. Semi-mature tree with large cavity at 6-8m height and some rot holes on smaller limbs (moderate) G. Tree with some lifted bark and fire damage (low) H. Tree with some lifted bark and fire damage (low) I. Silver Birch in poor condition with numerous cavities, rot holes (moderate) J. Sycamore with large knot hole at 5-6m height (low) K. Ash growing into side of quarry face with large root mass offering potential crevices (moderate) L. Sycamore burnt out at base with woodpecker hole at 1m height with cobwebs (low) M. Goat Willow with cavity/hole at 1.5m height, broken split on main trunk at around 6m (low-moderate)	Varying bat roosting potential. Confirmed Noctule roost at tree B.
TG6	Four Beech pollards, in reasonable health but with some flaking bark and old knot holes with potential cavities. The southern tree has a long vertical knot hole with three woodpecker holes.	Moderate to high
T1	Mature Oak with some minor deadwood and crevices.	Low
T2	Mature Oak with some minor deadwood and crevices.	Low
T3	Mature Ash with some dead sections in the upper part of the tree with woodpecker holes, along with several knot holes on the eastern side with potential recesses leading to the central cavity.	High
T4	Oak, large example with a sizeable cracked limb high up in the tree with associated	Moderate

Feature	Description	Bat Roosting Potential
	splits, as well as other splits and cracks in the tree.	
T5	Mature Oak with some dead wood and rot holes.	Moderate
T6	Poplar tree with a woodpecker hole.	Moderate
T7	Beech, large mature example with some branches dying off, with associated splits, as well as peeling bark on outer limbs and a number of small cavities.	Moderate
T8	Ash, mature example however mostly dead within the central trunk and with large cavities, woodpecker holes and peeling bark.	High
T9	Oak, large mature example with several knot holes and potential holes within, but generally in good health.	Low
T10	Oak, mature with several split limbs on the upper parts of the tree, along with cracks.	Moderate to High
T11	Beech featuring a dead central cavity, with the main part of a branch cut off around 6m up. A Kestrel appeared to fly out from this tree, thus could be nesting or roosting within the tree.	Low
T12 (V)	Sweet Chestnut, veteran status, large in size with a lightning strike on the southern main trunk and large woodpecker holes, along with a likely large internal cavity	Moderate to High
T13	Sycamore with a number of holes in the body of the tree which appears to go up and into the tree.	Moderate
T14	Tree with minor features.	Low
T15	Ash, large example with dense ivy coverage.	Low
T16	Numerous trees with dense ivy coverage.	Low
T17	Cherry tree, semi-mature with some deadwood and gaps in the bark.	Low
T18	Oak tree which overhangs the site boundary, and features a small hole in one of the branches.	Low
T19	Oak, evergreen mature example, while managed still features a number of holes in the trunks.	Moderate
T20	Beech which features a number of holes where limbs have fallen, three of reasonable size at 5m height.	Moderate
T21	Beech with some fallen limbs and a crack going down one of the limbs.	Moderate
T22	Beech with a fallen limb and some holes on the eastern side.	Moderate
T23	Sycamore, very large mature specimen however in the process of dying, and featuring a previously fallen top, some split limbs, a large cavity 7m up and a smaller hole 3m up, and a further big hole in one of the branches.	High
T24	Sycamore, partly fallen with lots of deadwood and rot present, along with a couple of holes.	Moderate
T25	Tree with at least 3 woodpecker holes and deadwood further up the tree.	Moderate
T26	Dead tree with a cavity and a knot hole from a fallen branch.	Moderate
T27 (V)	Field Maple of veteran status.	Low
T28	Oak with minor features present.	Low
T29	Oak, semi-mature with some deadwood, which looks to be a limb which has split and partially fallen previously. Other possible bat roosting features not visible. A branch with very narrow slits at the base, and a cavity present on the south-eastern side about 6m up, looks to be in use by insects, as well as a woodpecker hole on a higher branch.	Moderate
T30	Dead tree.	Moderate
T31 (V)	London Plane, likely veteran status, considerable size. Information board near tree informs that this is the largest example of its type in Kent and 13th largest in the country.	Low
T32	Horse Chestnut, looks diseased and dying, with bark stripped back and coming away from the trunk.	Low

Feature	Description	Bat Roosting Potential
T33	Pine tree, featuring old lightning strike damage and multiple woodpecker holes emerging on the south side.	Moderate to High
T34	Willow featuring a woodpecker hole.	Low
T35 (V)	Sweet Chestnut, large veteran status mature tree with some stripped bark, a few small holes and a recently fallen limb.	Low to Moderate
T36 (V)	Sweet Chestnut, veteran status with deadwood, peeled bark and lots of holes in the tree, along with two woodpecker holes visible on the northernmost extent.	Moderate
T37 (V)	Ash, veteran status, mature, large in size and almost pollarded in its structure, around 4-5m up a lot of deadwood, large knots and growth, along with a large cavity in access via holes are apparent.	High
T38	Lime tree with scrappy growth on it, and with a hole in the main trunk which could potentially lead to a cavity.	Low to Moderate
T39	Sweet Chestnut, mature in age and large however dying.	Moderate
T40	Sycamore, mature tree with some small holes in it.	Moderate
T41	Sycamore, with one hole on the bottom of a branch on the southern side of the tree, along with a woodpecker hole on the northern side of the tree about 8 metres up. At the base of the tree on the northern side a hole that goes into a cavity. Some stripped bark as well.	High
T42	Elder, large decaying trunk with various holes, splits and cavities.	Moderate
T43	Large semi-mature to mature Ash tree, with high ivy coverage and a couple of rot holes.	Moderate

Appendix 4657/8

Bat survey results: activity surveys

Transect	Survey date	Total Registrations																	Passes per minute
		Common Pipistrelle		Soprano Pipistrelle		Pipistrelle sp.		Nathusius' pipistrelle		Brown Long-eared		Unidentified bat sp.		All big bat		Myotis sp.		All bat species	
		Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	
1	20/04/2017 (dusk)	17	80.95%	1	4.76%	3	14.29%											21	0.16
	24/05/2017 (dusk)	31	81.58%	7	18.42%													38	0.32
	25/05/2017 (dawn)	13	65.00%	7	35.00%													20	0.19
	22/06/2017 (dusk)	31	88.57%	1	2.86%					2	5.71%	1	2.86%					35	0.23
	23/06/2017 (dawn)	89	84.76%	12	11.43%	2	1.90%	2	1.90%									105	0.86
	25/07/2017 (dusk)	26	78.79%	4	12.12%					3	9.09%							33	0.27
	26/07/2017 (dawn)	22	64.71%	10	29.41%	2	5.88%											34	0.27
	14/08/2017 (dusk)	4	100.00%															4	0.03
	Average per survey	**29.13**	**80.54%**	**5.25**	**14.25%**	**0.88**	**2.76%**	**0.25**	**0.24%**	**0.63**	**1.85%**	**0.13**	**0.36%**	**0.00**	**0.00%**	**0.00**	**0.00%**	**36.25**	**0.29**
2	20/04/2017 (dusk)	18	46.15%	21	53.85%													39	0.31
	24/05/2017 (dusk)	31	86.11%	1	2.78%	4	11.11%											36	0.21
	25/05/2017 (dawn)	17	100.00%															17	0.14
	20/06/2017 (dusk)	15	78.95%	2	10.53%					1	5.26%			1	5.26%			19	0.13
	21/06/2017 (dawn)	4	100.00%															4	0.04
	25/07/2017 (dusk)	36	67.92%	15	28.30%					2	3.77%							53	0.39
	26/07/2017 (dawn)	22	100.00%															22	0.20
	14/08/2017 (dusk)	17	58.62%	1	3.45%					1	3.45%			10	34.48%			29	0.18
	Average per survey	**20.00**	**79.72%**	**5.00**	**12.36%**	**0.50**	**1.39%**	**0.00**	**0.00%**	**0.50**	**1.56%**	**0.00**	**0.00%**	**1.38**	**4.97%**	**0.00**	**0.00%**	**27.38**	**0.20**
3	20/04/2017 (dusk)	23	62.16%	8	21.62%									6	16.22%			37	0.31
	24/05/2017 (dusk)	12	57.14%	7	33.33%									2	9.52%			21	0.14
	25/05/2017 (dawn)	5	100.00%															5	0.04
	22/06/2017 (dusk)	3	100.00%															3	0.02
	23/06/2017 (dawn)	2	100.00%															2	0.02
	25/07/2017 (dusk)	16	76.19%	4	19.05%									1	4.76%			21	0.14
	26/07/2017 (dawn)	4	100.00%															4	0.03
	14/08/2017 (dusk)	41	83.67%			2	4.08%							4	8.16%	2	4.08%	49	0.35
	Average per survey	**13.25**	**84.90%**	**2.38**	**9.25%**	**0.25**	**0.51%**	**0.00**	**0.00%**	**0.00**	**0.00%**	**0.00**	**0.00%**	**1.63**	**4.83%**	**0.25**	**0.51%**	**17.75**	**0.13**
A	19/06/2017 (dusk)	14	100.00%															14	0.10
	20/06/2017 (dawn)	20	100.00%															20	0.17
	17/07/2017 (dusk)	34	100.00%															34	0.23
	18/07/2017 (dawn)	22	91.67%	1	4.17%					1	4.17%							24	0.19
	15/08/2017 (dusk)	50	84.75%			5	8.47%							4	6.78%			59	0.44
	Average per survey	**28.00**	**95.28%**	**0.20**	**0.83%**	**1.00**	**1.69%**	**0.00**	**0.00%**	**0.20**	**0.83%**	**0.00**	**0.00%**	**0.80**	**1.36%**	**0.00**	**0.00%**	**30.20**	**0.23**
B	19/06/2017 (dusk)	28	90.32%	1	3.23%			1	3.23%	1	3.23%							31	0.19
	20/06/2017 (dawn)	2	66.67%							1	33.33%							3	0.02
	17/07/2017 (dusk)	2	22.22%			5	55.56%					2	22.22%					9	0.06
	18/07/2017 (dawn)	3	42.86%	1	14.29%	2	28.57%					1	14.29%					7	0.04
	15/08/2017 (dusk)	2	66.67%									1	33.33%					3	0.03
	Average per survey	**7.40**	**57.75%**	**0.40**	**3.50%**	**1.40**	**16.83%**	**0.20**	**0.65%**	**0.40**	**7.31%**	**0.80**	**13.97%**	**0.00**	**0.00%**	**0.00**	**0.00%**	**10.60**	**0.07**
C	20/06/2017 (dusk)	26	81.25%	3	9.38%					2	6.25%					1	3.13%	32	0.17
	21/06/2017 (dawn)	13	61.90%	5	23.81%	1	4.76%			2	9.52%							21	0.19
	17/07/2017 (dusk)	8	80.00%											2	20.00%			10	0.07
	18/07/2017 (dawn)	7	77.78%											2	22.22%			9	0.08
	15/08/2017 (dusk)	23	100.00%															23	0.17
	Average per survey	**15.40**	**80.19%**	**1.60**	**6.64%**	**0.20**	**0.95%**	**0.00**	**0.00%**	**0.80**	**3.15%**	**0.00**	**0.00%**	**0.80**	**8.44%**	**0.20**	**0.63%**	**19.00**	**0.14**

Transect	Survey date	Total Registrations																	Passes per minute
		Common Pipistrelle		Soprano Pipistrelle		Pipistrelle sp.		Nathusius' pipistrelle		Brown Long-eared		Unidentified bat sp.		All big bat		Myotis sp.		All bat species	
		Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	
D	20/06/2017 (dusk)	30	78.95%	3	7.89%							1	2.63%	4	10.53%			38	0.26
	21/06/2017 (dawn)	42	68.85%	16	26.23%	1	1.64%							2	3.28%			61	0.51
	18/07/2017 (dusk)	35	89.74%							1	2.56%			3	7.69%			39	0.29
	16/08/2017 (dusk)	33	82.50%	7	17.50%													40	0.31
	Average per survey	**35.00**	**80.01%**	**6.50**	**12.91%**	**0.25**	**0.41%**	**0.00**	**0.00%**	**0.25**	**0.64%**	**0.25**	**0.66%**	**2.25**	**5.37%**	**0.00**	**0.00%**	**44.50**	**0.34**
E	20/06/2017 (dusk)	3	50.00%									3	50.00%					6	0.04
	21/06/2017 (dawn)	1	100.00%															1	0.01
	18/07/2017 (dusk)	1	6.67%									14	93.33%					15	0.10
	16/08/2017 (dusk)	57	90.48%	3	4.76%	2	3.17%					1	1.59%					63	0.46
	Average per survey	**15.50**	**61.79%**	**0.75**	**1.19%**	**0.50**	**0.79%**	**0.00**	**0.00%**	**0.00**	**0.00%**	**4.50**	**36.23%**	**0.00**	**0.00%**	**0.00**	**0.00%**	**21.25**	**0.15**
F	22/06/2017 (dusk)	19	82.61%	4	17.39%													23	0.15
	23/06/2017 (dawn)	2	50.00%	2	50.00%													4	0.03
	18/07/2017 (dusk)	32	84.21%	4	10.53%	1	2.63%							1	2.63%			38	0.23
	16/08/2017 (dusk)	10	83.33%	2	16.67%													12	0.10
	Average per survey	**15.75**	**75.04%**	**3.00**	**23.65%**	**0.25**	**0.66%**	**0.00**	**0.00%**	**0.00**	**0.00%**	**0.00**	**0.00%**	**0.25**	**0.66%**	**0.00**	**0.00%**	**19.25**	**0.13**
G	22/06/2017 (dusk)	27	72.97%	8	21.62%	1	2.70%			1	2.70%							37	0.26
	23/06/2017 (dawn)	118	93.65%	7	5.56%					1	0.79%							126	1.08
	19/07/2017 (dusk)	64	70.33%	1	1.10%					9	9.89%			17	18.68%			91	0.64
	20/07/2017 (dawn)	23	76.67%	4	13.33%					1	3.33%					2	6.67%	30	0.25
	Average per survey	**58.00**	**78.41%**	**5.00**	**10.40%**	**0.25**	**0.68%**	**0.00**	**0.00%**	**3.00**	**4.18%**	**0.00**	**0.00%**	**4.25**	**4.67%**	**0.50**	**1.67%**	**71.00**	**0.56**
H	21/06/2017 (dusk)	2	100.00%															2	0.01
	22/06/2017 (dawn)	18	94.74%			1	5.26%											19	0.17
	19/07/2017 (dusk)	5	22.73%	10	45.45%	1	4.55%			3	13.64%			1	4.55%	2	9.09%	22	0.14
	20/07/2017 (dawn)	3	75.00%							1	25.00%							4	0.03
	Average per survey	**7.00**	**73.12%**	**2.50**	**11.36%**	**0.50**	**2.45%**	**0.00**	**0.00%**	**1.00**	**9.66%**	**0.00**	**0.00%**	**0.25**	**1.14%**	**0.50**	**2.27%**	**11.75**	**0.09**
I	21/06/2017 (dusk)	7	53.85%	3	23.08%							1	7.69%	2	15.38%			13	0.09
	22/06/2017 (dawn)	7	63.64%	2	18.18%	1	9.09%			1	9.09%							11	0.09
	19/07/2017 (dusk)	11	50.00%	1	4.55%	2	9.09%					7	31.82%	1	4.55%			22	0.16
	20/07/2017 (dawn)	11	68.75%			1	6.25%					4	25.00%					16	0.13
	Average per survey	**9.00**	**59.06%**	**1.50**	**11.45%**	**1.00**	**6.11%**	**0.00**	**0.00%**	**0.25**	**2.27%**	**3.00**	**16.13%**	**0.75**	**4.98%**	**0.00**	**0.00%**	**15.50**	**0.12**
	Total average		**75.48%**		**9.82%**		**2.94%**		**0.07%**		**2.62%**		**5.61%**		**3.04%**		**0.42%**		

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Bat survey results: static detector surveys

SD	Month/deployment	Start date	End date	No. of nights	Total bat registrations								
					Big bat	Noctule	Brown Long-eared	Myotis	Pipistrelle sp.	Common Pipistrelle	Soprano Pipistrelle	Naths Pipistrelle	Total
1	April	21/04/2017 (dusk)	26/04/2017 (dawn)	5	1	19			1	42	34		97
1	May	26/05/2017 (dusk)	02/06/2017 (dawn)	7						364	7	1	372
1	June	29/06/2017 (dusk)	04/07/2017 (dawn)	5	9					218	38		265
1	July	24/07/2017 (dusk)	28/07/2017 (dawn)	4	12	5	1			629	104	4	755
1	August	16/08/2017 (dusk)	18/08/2017 (dawn)	2		2				33	2		37
1	September	13/09/2017 (dusk)	20/09/2017 (dawn)	7	9	34	13		1	102	26		185
1	**Total registrations**				**31**	**60**	**14**	**0**	**2**	**1388**	**211**	**5**	**1711**
1	**Proportion of total registrations**				**1.81%**	**3.51%**	**0.82%**	**0.00%**	**0.12%**	**81.12%**	**12.33%**	**0.29%**	
2	April	21/04/2017 (dusk)	26/04/2017 (dawn)	5		4	1			8	5	1	19
2	May	19/05/2017 (dusk)	25/05/2017 (dawn)	6		1				5			6
2	June	22/06/2017 (dusk)	28/06/2017 (dawn)	6		44	4			25	18	4	95
2	July	19/07/2017 (dusk)	26/07/2017 (dawn)	7	4	46	11	2		209	27	3	302
2	August	16/08/2017 (dusk)	23/08/2017 (dawn)	7	10	103	31	3		58	13	12	230
2	September	13/09/2017 (dusk)	19/09/2017 (dawn)	6	4	16	20			8		1	49
2	**Total registrations**				**18**	**214**	**67**	**5**	**0**	**313**	**63**	**21**	**701**
2	**Proportion of total registrations**				**2.57%**	**30.53%**	**9.56%**	**0.71%**	**0.00%**	**44.65%**	**8.99%**	**3.00%**	
3	April	21/04/2017 (dusk)	02/05/2017 (dawn)	11				1		1161	1		1163
3	June	28/06/2017 (dusk)	04/07/2017 (dawn)	7	8	5	1	10	1	430	47		502
3	July	19/07/2017 (dusk)	21/07/2017 (dawn)	2	9	10	2	1		512	55	1	590
3	August	16/08/2017 (dusk)	19/08/2017 (dawn)	3	2		1	1		71	15		90
3	September	13/09/2017 (dusk)	23/09/2017 (dawn)	10	7	7	6	9		408	32	1	470
3	**Total registrations**				**26**	**22**	**10**	**22**	**1**	**2582**	**150**	**2**	**2815**
3	**Proportion of total registrations**				**0.92%**	**0.78%**	**0.36%**	**0.78%**	**0.04%**	**91.72%**	**5.33%**	**0.07%**	
4	April	21/04/2017 (dusk)	01/05/2017 (dawn)	10	4		2	2		674	154		836
4	May	19/05/2017 (dusk)	23/05/2017 (dawn)	4	4	62				105	10	2	183
4	June	22/06/2017 (dusk)	04/07/2017 (dawn)	12	20	6	4	2	1	4810	100	36	4979
4	July	19/07/2017 (dusk)	21/07/2017 (dawn)	2	1	1	2			61	2		67
4	August	16/08/2017 (dusk)	19/08/2017 (dawn)	3	2		1	1		195	18		217
4	September	13/09/2017 (dusk)	23/09/2017 (dawn)	10	4	4	55	9		175	50		297
4	**Total registrations**				**35**	**73**	**64**	**14**	**1**	**6020**	**334**	**38**	**6579**
4	**Proportion of total registrations**				**0.53%**	**1.11%**	**0.97%**	**0.21%**	**0.02%**	**91.50%**	**5.08%**	**0.58%**	
5	April	26/04/2017 (dusk)	02/05/2017 (dawn)	6	2	26	1			18	6	2	55
5	May	26/05/2017 (dusk)	03/06/2017 (dawn)	8	10	28	1	3		343	61	7	453
5	June	22/06/2017 (dusk)	28/06/2017 (dawn)	6	2	5	1	5		757	31	6	807
5	July	19/07/2017 (dusk)	22/07/2017 (dawn)	3	2		1	2		92	10	1	108
5	August	23/08/2017 (dusk)	25/08/2017 (dawn)	2			5	2		23	18		48
5	September	20/09/2017 (dusk)	27/09/2017 (dawn)	7	13	61	5	34	10	317	90	6	536
5	**Total registrations**				**29**	**120**	**14**	**46**	**10**	**1550**	**216**	**22**	**2007**
5	**Proportion of total registrations**				**1.44%**	**5.98%**	**0.70%**	**2.29%**	**0.50%**	**77.23%**	**10.76%**	**1.10%**	
6	April	29/04/2017 (dusk)	02/05/2017 (dawn)	3		2				6	1		9
6	May	26/05/2017 (dusk)	02/07/2017 (dawn)	7	2	1				52	12	1	68
6	June	22/06/2017 (dusk)	28/06/2017 (dawn)	6	10	20	6			122	18		176
6	July	26/07/2017 (dusk)	30/07/2017 (dawn)	4	5	18	5			468	10	1	507
6	August	23/08/2017 (dusk)	25/08/2017 (dawn)	2	1	1	1	2		35	12	7	59
6	September	20/09/2017 (dusk)	22/09/2017 (dawn)	2	1	7	4	9		191	11	5	228
6	**Total registrations**				**19**	**49**	**16**	**11**	**0**	**874**	**64**	**14**	**1047**
6	**Proportion of total registrations**				**1.81%**	**4.68%**	**1.53%**	**1.05%**	**0.00%**	**83.48%**	**6.11%**	**1.34%**	

Bat registrations per night							
All big bats	Brown Long-eared	Myotis	Pipistrelle sp.	Common Pipistrelle	Soprano Pipistrelle	Naths Pipistrelle	Total
4.00			0.20	8.40	6.80		23.40
				52.00	1.00	0.14	53.14
1.80				43.60	7.60		54.80
4.25	0.25			157.25	26.00	1.00	193.00
1.00				16.50	1.00		19.50
6.14	1.86		0.14	14.57	3.71		32.57
2.87	**0.35**	**0.00**	**0.06**	**48.72**	**7.69**	**0.19**	**62.74**
0.80	0.20			1.60	1.00	0.20	4.60
0.17				0.83			1.17
7.33	0.67			4.17	3.00	0.67	23.17
7.14	1.57	0.29		29.86	3.86	0.43	50.29
16.14	4.43	0.43		8.29	1.86	1.71	49.00
3.33	3.33			1.33		0.17	11.50
5.82	**1.70**	**0.12**	**0.00**	**7.68**	**1.62**	**0.53**	**23.29**
		0.09		105.55	0.09		105.73
1.86	0.14	1.43	0.14	61.43	6.71		73.57
9.50	1.00	0.50		256.00	27.50	0.50	304.50
0.67	0.33	0.33		23.67	5.00		30.67
1.40	0.60	0.90		40.80	3.20	0.10	48.40
2.68	**0.42**	**0.65**	**0.03**	**97.49**	**8.50**	**0.12**	**112.57**
0.40	0.20	0.20		67.40	15.40		84.00
16.50				26.25	2.50	0.50	62.25
2.17	0.33	0.17	0.08	400.83	8.33	3.00	417.08
1.00	1.00			30.50	1.00		34.50
0.67	0.33	0.33		65.00	6.00		73.00
0.80	5.50	0.90		17.50	5.00		30.50
3.59	**1.23**	**0.27**	**0.01**	**101.25**	**6.37**	**0.58**	**116.89**
4.67	0.17			3.00	1.00	0.33	13.83
4.75	0.13	0.38		42.88	7.63	0.88	61.38
1.17	0.17	0.83		126.17	5.17	1.00	135.67
0.67	0.33	0.67		30.67	3.33	0.33	36.67
	2.50	1.00		11.50	9.00		24.00
10.57	0.71	4.86	1.43	45.29	12.86	0.86	87.14
3.64	**0.67**	**1.29**	**0.24**	**43.25**	**6.50**	**0.57**	**59.78**
0.67				2.00	0.33		3.67
0.43				7.43	1.71	0.14	10.14
5.00	1.00			20.33	3.00		34.33
5.75	1.25			117.00	2.50	0.25	132.50
1.00	0.50	1.00		17.50	6.00	3.50	30.50
4.00	2.00	4.50		95.50	5.50	2.50	118.00
2.81	**0.79**	**0.92**	**0.00**	**43.29**	**3.17**	**1.07**	**54.86**

SD	Month/deployment	Start date	End date	No. of nights	Total bat registrations									Bat registrations per night							
					Big bat	Noctule	Brown Long-eared	Myotis	Pipistrelle sp.	Common Pipistrelle	Soprano Pipistrelle	Naths Pipistrelle	Total	*All big bats*	Brown Long-eared	Myotis	Pipistrelle sp.	Common Pipistrelle	Soprano Pipistrelle	Naths Pipistrelle	Total
7	May	02/05/2017 (dusk)	08/05/2017 (dawn)	6						381	1	2	384					63.50	0.17	0.33	64.00
7	June	28/06/2017 (dusk)	04/07/2017 (dawn)	6						1454	33		1487					242.33	5.50		247.83
7	August	09/08/2017 (dusk)	12/08/2017 (dawn)	3		1	1	1		213	30	3	249	*0.33*	0.33	0.33		71.00	10.00	1.00	83.33
7	**Total registrations**				**0**	**1**	**1**	**1**	**0**	**2048**	**64**	**5**	**2120**	***0.11***	**0.11**	**0.11**	**0.00**	**125.61**	**5.22**	**0.44**	**131.72**
7	**Proportion of total registrations**				**0.00%**	**0.05%**	**0.05%**	**0.05%**	**0.00%**	**96.60%**	**3.02%**	**0.24%**										
8	May	02/05/2017 (dusk)	18/05/2017 (dawn)	16	66	3	4	1		824	14	9	921	*4.31*	0.25	0.06		51.50	0.88	0.56	61.88
8	June	28/06/2017 (dusk)	04/07/2017 (dawn)	6			1	3		2854	168	1	3027		0.17	0.50		475.67	28.00	0.17	504.50
8	August	09/08/2017 (dusk)	16/08/2017 (dawn)	7	5	16	14	2		230	18		285	*3.00*	2.00	0.29		32.86	2.57		43.71
8	**Total registrations**				**71**	**19**	**19**	**6**	**0**	**3908**	**200**	**10**	**4233**	***2.44***	**0.81**	**0.28**	**0.00**	**186.67**	**10.48**	**0.24**	**203.36**
8	**Proportion of total registrations**				**1.68%**	**0.45%**	**0.45%**	**0.14%**	**0.00%**	**92.32%**	**4.72%**	**0.24%**										
9	May	02/05/2017 (dusk)	08/05/2017 (dawn)	6	6					934	20		960	*1.00*				155.67	3.33		161.00
9	July	04/07/2017 (dusk)	12/07/2017 (dawn)	8	8	14	23		1	2587	28	1	2662	*2.75*	2.88		0.13	323.38	3.50	0.13	335.50
9	August	23/08/2017 (dusk)	30/08/2017 (dawn)	7	5	28	9	10	4	2622	92		2770	*4.71*	1.29	1.43	0.57	374.57	13.14		400.43
9	**Total registrations**				**19**	**42**	**32**	**10**	**5**	**6143**	**140**	**1**	**6392**	***2.82***	**1.39**	**0.48**	**0.23**	**284.54**	**6.66**	**0.04**	**298.98**
9	**Proportion of total registrations**				**0.30%**	**0.66%**	**0.50%**	**0.16%**	**0.08%**	**96.10%**	**2.19%**	**0.02%**										
10	May	09/05/2017 (dusk)	17/05/2017 (dawn)	8		3	2	1		45	6	1	58	*0.38*	0.25	0.13		5.63	0.75	0.13	7.63
10	July	04/07/2017 (dusk)	11/07/2017 (dawn)	7		1				13		1	15	*0.14*				1.86		0.14	2.29
10	October	06/10/2017 (dusk)	11/10/2017 (dawn)	5		3	1	4		229	3		240	*0.60*	0.20	0.80		45.80	0.60		48.60
10	**Total registrations**				**0**	**7**	**3**	**5**	**0**	**287**	**9**	**2**	**313**	***0.37***	**0.15**	**0.31**	**0.00**	**17.76**	**0.45**	**0.09**	**19.50**
10	**Proportion of total registrations**				**0.00%**	**2.24%**	**0.96%**	**1.60%**	**0.00%**	**91.69%**	**2.88%**	**0.64%**										
11	June	14/06/2017 (dusk)	22/06/2017 (dawn)	8	30	15	22	8	2	958	80	5	1120	*5.63*	2.75	1.00	0.25	119.75	10.00	0.63	145.63
11	July	04/07/2017 (dusk)	11/07/2017 (dawn)	7	21		32	41	5	458	16		573	*3.00*	4.57	5.86	0.71	65.43	2.29		84.86
11	**Total registrations**				**51**	**15**	**54**	**49**	**7**	**1416**	**96**	**5**	**1693**	***4.31***	**3.66**	**3.43**	**0.48**	**92.59**	**6.14**	**0.31**	**115.24**
11	**Proportion of total registrations**				**3.01%**	**0.89%**	**3.19%**	**2.89%**	**0.41%**	**83.64%**	**5.67%**	**0.30%**										
12	June	14/06/2017 (dusk)	22/06/2017 (dawn)	8	23	11	19	9		58	2		122	*4.25*	2.38	1.13		7.25	0.25		19.50
12	July	04/07/2017 (dusk)	08/07/2017 (dawn)	4	8	5	3	2		52			70	*3.25*	0.75	0.50		13.00			20.75
12	August	30/08/2017 (dusk)	01/09/2017 (dawn)	2						5			5					2.50			2.50
12	**Total registrations**				**31**	**16**	**22**	**11**	**0**	**115**	**2**	**0**	**197**	***2.50***	**1.04**	**0.54**	**0.00**	**7.58**	**0.08**	**0.00**	**14.25**
12	**Proportion of total registrations**				**15.74%**	**8.12%**	**11.17%**	**5.58%**	**0.00%**	**58.38%**	**1.02%**	**0.00%**										
13	June	14/06/2017 (dusk)	21/06/2017 (dawn)	7	2					241	15		258	*0.29*				34.43	2.14		37.14
13	July	12/07/2017 (dusk)	19/07/2017 (dawn)	7	35	27	59	4	2	1759	31	2	1919	*8.86*	8.43	0.57	0.29	251.29	4.43	0.29	283.00
13	September	07/09/2017 (dusk)	13/09/2017 (dawn)	6	7		6	1	13	3637	3773	3	7440	*1.17*	1.00	0.17	2.17	606.17	628.83	0.50	1241.17
13	**Total registrations**				**44**	**27**	**65**	**5**	**15**	**5637**	**3819**	**5**	**9617**	***3.44***	**3.14**	**0.25**	**0.82**	**297.29**	**211.80**	**0.26**	**520.44**
13	**Proportion of total registrations**				**0.46%**	**0.28%**	**0.68%**	**0.05%**	**0.16%**	**58.61%**	**39.71%**	**0.05%**										
14	June	14/06/2017 (dusk)	20/06/2017 (dawn)	6	3	18	1	2		296	18	1	339	*3.50*	0.17	0.33		49.33	3.00	0.17	60.00
14	July	12/07/2017 (dusk)	15/07/2017 (dawn)	3	2		1			45	42		90	*0.67*	0.33			15.00	14.00		30.67
14	September	07/09/2017 (dusk)	12/09/2017 (dawn)	5	1	3	7	1		12	6		30	*0.80*	1.40	0.20		2.40	1.20		6.80
14	**Total registrations**				**6**	**21**	**9**	**3**	**0**	**353**	**66**	**1**	**459**	***1.66***	**0.63**	**0.18**	**0.00**	**22.24**	**6.07**	**0.06**	**32.49**
14	**Proportion of total registrations**				**1.31%**	**4.58%**	**1.96%**	**0.65%**	**0.00%**	**76.91%**	**14.38%**	**0.22%**										
15	June	03/06/2017 (dusk)	05/06/2017 (dawn)	2	1					1	2	1	5	*0.50*				0.50	1.00	0.50	3.00
15	July	12/07/2017 (dusk)	19/07/2017 (dawn)	7	1	7	3			45	4		60	*1.14*	0.43			6.43	0.57		9.71
15	September	07/09/2017 (dusk)	13/09/2017 (dawn)	6		4				38	16		58	*0.67*				6.33	2.67		10.33
15	**Total registrations**				**2**	**11**	**3**	**0**	**0**	**84**	**22**	**1**	**123**	***0.77***	**0.14**	**0.00**	**0.00**	**4.42**	**1.41**	**0.17**	**7.68**
15	**Proportion of total registrations**				**1.63%**	**8.94%**	**2.44%**	**0.00%**	**0.00%**	**68.29%**	**17.89%**	**0.81%**										

SD	Month/deployment	Start date	End date	No. of nights	Total bat registrations								
					Big bat	Noctule	Brown Long-eared	Myotis	Pipistrelle sp.	Common Pipistrelle	Soprano Pipistrelle	Naths Pipistrelle	Total
16	June	03/06/2017 (dusk)	08/06/2017 (dawn)	5						5	2		7
16	July	13/07/2017 (dusk)	16/07/2017 (dawn)	3	2			1	1	31	7		42
16	**Total registrations**				**2**	**0**	**0**	**1**	**1**	**36**	**9**	**0**	**49**
16	**Proportion of total registrations**				**4.08%**	**0.00%**	**0.00%**	**2.04%**	**2.04%**	**73.47%**	**18.37%**	**0.00%**	
17	June	03/06/2017 (dusk)	08/06/2017 (dawn)	5	3	5	1		1	17	11		38
17	July	26/07/2017 (dusk)	02/08/2017 (dawn)	7		1	1			30	8	1	41
17	September	20/09/2017 (dusk)	22/09/2017 (dawn)	2		1		1		97	60		159
17	**Total registrations**				**3**	**7**	**2**	**1**	**1**	**144**	**79**	**1**	**238**
17	**Proportion of total registrations**				**1.26%**	**2.94%**	**0.84%**	**0.42%**	**0.42%**	**60.50%**	**33.19%**	**0.42%**	
18	June	01/06/2017 (dusk)	08/06/2017 (dawn)	7		1	2			573	72	1	649
18	July	26/07/2017 (dusk)	01/08/2017 (dawn)	6				2		438	39		479
18	September	27/09/2017 (dusk)	03/10/2017 (dawn)	6				1		32	13		46
18	**Total registrations**				**0**	**1**	**2**	**3**	**0**	**1043**	**124**	**1**	**1174**
18	**Proportion of total registrations**				**0.00%**	**0.09%**	**0.17%**	**0.26%**	**0.00%**	**88.84%**	**10.56%**	**0.09%**	
19	June	01/06/2017 (dusk)	08/06/2017 (dawn)	7	2	1		2		2077	93		2175
19	August	03/08/2017 (dusk)	07/08/2017 (dawn)	4		5	11			319	77	2	414
19	**Total registrations**				**2**	**6**	**11**	**2**	**0**	**2396**	**170**	**2**	**2589**
19	**Proportion of total registrations**				**0.08%**	**0.23%**	**0.42%**	**0.08%**	**0.00%**	**92.55%**	**6.57%**	**0.08%**	
20	June	01/06/2017 (dusk)	08/06/2017 (dawn)	7	2	2		4		282	33		323
20	August	03/08/2017 (dusk)	06/08/2017 (dawn)	3	1	2	1			268	13		285
20	September	27/09/2017 (dusk)	03/10/2017 (dawn)	6	19	6	8	4		261	32	8	338
20	**Total registrations**				**22**	**10**	**9**	**8**	**0**	**811**	**78**	**8**	**946**
20	**Proportion of total registrations**				**2.33%**	**1.06%**	**0.95%**	**0.85%**	**0.00%**	**85.73%**	**8.25%**	**0.85%**	
21	June	08/06/2017 (dusk)	14/06/2017 (dawn)	6						156	3		159
21	August	03/08/2017 (dusk)	09/08/2017 (dawn)	6	11	13	7	2		6059	62	1	6155
21	September	27/09/2017 (dusk)	02/10/2017 (dawn)	5		6		1		4366	38		4411
21	**Total registrations**				**11**	**19**	**7**	**3**	**0**	**10581**	**103**	**1**	**10725**
21	**Proportion of total registrations**				**0.10%**	**0.18%**	**0.07%**	**0.03%**	**0.00%**	**98.66%**	**0.96%**	**0.01%**	
22	June	12/06/2017 (dusk)	14/06/2017 (dawn)	2						16			16
22	August	03/08/2017 (dusk)	07/08/2017 (dawn)	4	3		3	2		1724	20	1	1753
22	October	06/10/2017 (dusk)	10/10/2017 (dawn)	4		13	8			91	3		115
22	**Total registrations**				**3**	**13**	**11**	**2**	**0**	**1831**	**23**	**1**	**1884**
22	**Proportion of total registrations**				**0.16%**	**0.69%**	**0.58%**	**0.11%**	**0.00%**	**97.19%**	**1.22%**	**0.05%**	
23	June	08/06/2017 (dusk)	14/06/2017 (dawn)	6	6				19	1221	1294		2540
23	August	09/08/2017 (dusk)	12/08/2017 (dawn)	3	21	1	6	3	1	165	22	2	221
23	October	06/10/2017 (dusk)	10/10/2017 (dawn)	4	3		5			9	1		18
23	**Total registrations**				**30**	**1**	**11**	**3**	**20**	**1395**	**1317**	**2**	**2779**
23	**Proportion of total registrations**				**1.08%**	**0.04%**	**0.40%**	**0.11%**	**0.72%**	**50.20%**	**47.39%**	**0.07%**	
24	June	08/06/2017 (dusk)	14/06/2017 (dawn)	6	1	2	4	8		217	15	1	248
24	October	06/10/2017 (dusk)	11/10/2017 (dawn)	5		2	1	1		14	3	1	22
24	**Total registrations**				**1**	**4**	**5**	**9**	**0**	**231**	**18**	**2**	**270**
24	**Proportion of total registrations**				**0.37%**	**1.48%**	**1.85%**	**3.33%**	**0.00%**	**85.56%**	**6.67%**	**0.74%**	
	All registrations				**456**	**758**	**451**	**220**	**63**	**51186**	**7377**	**150**	**60661**
	Proportion of all registrations				**0.75%**	**1.25%**	**0.74%**	**0.36%**	**0.10%**	**84.38%**	**12.16%**	**0.25%**	

Bat registrations per night							
All big bats	Brown Long-eared	Myotis	Pipistrelle sp.	Common Pipistrelle	Soprano Pipistrelle	Naths Pipistrelle	Total
				1.00	0.40		1.40
0.67		0.33	0.33	10.33	2.33		14.67
0.33	**0.00**	**0.17**	**0.17**	**5.67**	**1.37**	**0.00**	**8.03**
1.60	0.20		0.20	3.40	2.20		9.20
0.14	0.14			4.29	1.14	0.14	6.00
0.50		0.50		48.50	30.00		80.00
0.75	**0.11**	**0.17**	**0.07**	**18.73**	**11.11**	**0.05**	**31.73**
0.14	0.29			81.86	10.29	0.14	92.86
		0.33		73.00	6.50		79.83
		0.17		5.33	2.17		7.67
0.05	**0.10**	**0.17**	**0.00**	**53.40**	**6.32**	**0.05**	**60.12**
0.43		0.29		296.71	13.29		311.14
1.25	2.75			79.75	19.25	0.50	104.75
0.84	**1.38**	**0.14**	**0.00**	**188.23**	**16.27**	**0.25**	**207.95**
0.57		0.57		40.29	4.71		46.71
1.00	0.33			89.33	4.33		96.00
4.17	1.33	0.67		43.50	5.33	1.33	60.50
1.91	**0.56**	**0.41**	**0.00**	**57.71**	**4.79**	**0.44**	**67.74**
				26.00	0.50		26.50
4.00	1.17	0.33		1009.83	10.33	0.17	1029.83
1.20		0.20		873.20	7.60		883.40
1.73	**0.39**	**0.18**	**0.00**	**636.34**	**6.14**	**0.06**	**646.58**
				8.00			8.00
0.75	0.75	0.50		431.00	5.00	0.25	439.00
3.25	2.00			22.75	0.75		32.00
1.33	**0.92**	**0.17**	**0.00**	**153.92**	**1.92**	**0.08**	**159.67**
1.00			3.17	203.50	215.67		424.33
7.33	2.00	1.00	0.33	55.00	7.33	0.67	81.00
0.75	1.25			2.25	0.25		5.25
3.03	**1.08**	**0.33**	**1.17**	**86.92**	**74.42**	**0.22**	**170.19**
0.50	0.67	1.33		36.17	2.50	0.17	41.83
0.40	0.20	0.20		2.80	0.60	0.20	4.80
0.45	**0.43**	**0.77**	**0.00**	**19.48**	**1.55**	**0.18**	**23.32**

** Yellow shading indicates BRPN above 1, light orange above 2 and dark orange above 5*

Appendix 4657/10

Invertebrate survey reports

Report of a scoping assessment of invertebrate habitat at Kent Science Park, Sittingbourne, Kent.

2017

PAUL LEE MSc FRES CEcol CEnv MCIEEM

(Commissioned by Matthew Davey of Aspect Ecology Ltd.)

September 22nd 2017

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EXECUTIVE SUMMARY

- This report was prepared as a rapid habitat assessment of the potential quality of the invertebrate habitat in eight land parcels around Kent Science Park, Sittingbourne. The purpose was to identify habitat features of potential value to invertebrate species assemblages, identify the presence of any noteworthy invertebrate species and to assess the need for further survey of the invertebrate fauna of the site.

- A field visit was undertaken on 28th July 2017. The quality of the invertebrate habitat was assessed subjectively by consideration of individual elements of value to invertebrates. The invertebrate survey involved the ad hoc collection of samples from each land parcel by spot sampling and sweep netting at the same time as the habitat assessment was completed.

- Only 35 invertebrate species were identified from the land parcels. No legally protected invertebrate species, Red Listed, Nationally Rare or Nationally Scarce invertebrates were noted during the site visit. One species of principal importance for biodiversity in England, the Cinnabar moth *Tyria jacobaeae*, was recorded from the central and north pits of Highsted Quarries local wildlife site.

- Highsted Quarries includes areas of the s41 habitat 'Open mosaic habitats on previously developed land' and is potentially an important site for its invertebrate communities. Where such sites are due to be developed, altered or management undertaken further invertebrate survey is recommended (Lush *et al*., 2013).

- Highsted Wood and the parkland and woodland west of Kent Science Park have the the potential to support important communities of invertebrates dependent on decaying timber.

- Further detailed invertebrate surveys would be required to inform any of the habitat management and enhancement options outlined.

Report of a scoping assessment of invertebrate habitat at Kent Science Park, Sittingbourne, Kent.

INTRODUCTION

Scope

This report has been prepared in accord with the standard approach detailed in the Guidelines for Ecological Report Writing prepared by the Chartered Institute of Ecology and Environmental Management (CIEEM) (CIEEM, 2015)

In July 2017, Arachne Ecology Ltd was commissioned by Aspect Ecology Ltd to undertake a scoping assessment of a site centred on the Kent Science Park to the south of Sittingbourne, Kent (OS grid reference at Park entrance TQ899609). Three sections of disused chalk quarry, two woodlands, an area of parkland and an area of species rich grassland within the site had been identified as potentially supporting invertebrate interest (see figure 1) and thus requiring assessment. Additionally, an assessment of Cromer's Wood, a Kent Wildlife Trust reserve lying adjacent to the site boundary was requested.

The field survey, including identification of species, and the preparation of this report was carried out by Paul Lee MSc FRES CEcol CEnv MCIEEM, an ecological consultant of 20 years standing and with 40 years of experience in invertebrate ecology.

Purpose

The purpose of the reported work was to: -

- provide an overview of each of the highlighted areas of potential importance identifying the presence of any habitat features of high potential value to invertebrate species assemblages;
- provide a list of species recorded from each of the areas at the time of the field survey and highlight any invertebrate species of conservation importance present including legally protected species, species of principal importance for biodiversity in England (s41 species), Red Listed / Red Data Book species and Nationally Rare or Scarce invertebrates;
- provide management / enhancement proposals for habitat in the highlighted areas assuming they are to be retained as open space;
- assess any need for further survey.

The site

The study area is mostly within the parish of Tunstall, south of the Sittingbourne urban area and north of the M2 motorway. It lies on the North Downs dip slope and the underlying chalk is largely covered by clay-with-flints producing gentle slopes in the west of the area but a dry chalk valley in the east produces steeper slopes. This is reflected in the Swale Borough Council landscape character assessment where the bulk of the study area falls with the Tunstall Farmlands landscape area but the eastern fringe is within the Rodmersham and Milstead Dry Valley area (Jacobs Engineering UK Ltd, 2011).

Chalk deposits have been exploited at the three pits forming Highsted Quarries in the north of the study area. Active mining ceased in the middle of the twentieth century. The central pit has been used by various groups for training activities but this has not prevented development

of secondary woodland in each pit. Highsted Quarries, including the species rich grassland adjacent to the south pit, are now designated a Local Wildlife Site.

Of more importance as woodland is Highsted Wood on the southern edge of the southern pit. This is an area of ancient woodland. Although outside the study area, Cromers Wood lies directly adjacent to its eastern boundary and so was included in the study for the purposes of habitat assessment. Cromers Wood is ancient woodland managed as sweet chestnut coppice. It is a Local Wildlife Site and a Kent Wildlife Trust reserve.

A remnant of a deer park can be found to the west of the Kent Science Park but scattered veteran oak trees mark out all that remains.

METHODS

Scope of assessment

This report uses the following baseline survey information to assess the potential value of each highlighted area as invertebrate habitat using: -

- a desktop study undertaken by Aspect Ecology Ltd.;
- an assessment of habitat features of value to invertebrates carried out on 28th July 2017; and
- a limited field survey of terrestrial invertebrates carried out on 28th July 2017.

Desk study

A desktop study conducted by Aspect Ecology Ltd. found no records of invertebrate species of conservation importance from the survey areas (email from Matthew Davey of Aspect Ecology Ltd. dated 23 May 2017).

One limitation of this type of data is that usually these records are based on *ad hoc* recording by volunteers on land with public access. As a result, it cannot be assumed that the absence of a species record for any of the highlighted areas, most of which do not have public access, means that it does not occur there.

Field survey

A site visit was completed by the author on 28th July 2017. The visit commenced at 10.00 and was completed at 16.30. On arrival, the air temperature was 18ºC and eventually rose to 20ºC, well above the recommended minimum of 13ºC for surveying flying insects in the clear, sunny conditions that prevailed. There was no more than a light breeze at first but this strengthened to a fresh breeze through the morning bringing increasingly overcast skies and showers by noon. Although the air temperature dropped no lower than 16ºC through the afternoon, the degenerating weather conditions (heavy cloud cover, wind and rain) were unsuitable for surveying insects by spot sampling and sweep netting in Bex Wood and the adjoining parkland by Kent Science Park, the last two areas assessed.

Habitat assessment

At each of the highlighted areas a proxy invertebrate habitat quality assessment was conducted. These assessments followed a protocol devised for assessing the potential of a site as invertebrate habitat by John Dobson of the Dipterists' Forum. The protocol was developed over several years in collaboration with members of Invertebrate Link and was introduced to a wider audience at a joint meeting of the Royal Entomological Society and CIEEM in April

2011 (see www.nfbr.org.uk/wiki/images/1/1d/RES-IEEM_NJ_8_3_11.pdf for agenda). The protocol was intended to capture basic invertebrate habitat quality data that can then be incorporated into Extended Phase 1 Habitat Survey. The method is based on a semi-quantitative assessment of nine distinct habitat elements. Although by no means a comprehensive portrayal of invertebrate habitats, these elements are generally recognised as being of key importance to invertebrates across a wide geographical area. The assessment process requires no identification of species and took place during an initial walkover survey of each of the highlighted areas.

The elements assessed were:

- Decaying timber
- Rotational management
- Nectar sources
- Botanically-poor wetland features
- Structural patchwork
- Still air habitat
- Connectivity
- Ecoclines
- Bare earth

The system also allows a competent entomologist to record the presence of a tenth element - any important invertebrate micro-habitat where the feature does not fit well within any of the nine defined elements.

Each of these elements was assigned a score of between zero and three using clearly defined criteria for guidance (see Appendix 1). In circumstances where there were difficulties in assigning a score for a habitat feature i.e. where it fell between grades according to the given guidelines, the lower of the two grades was applied by default. This approach helps to clearly distinguish better quality examples of the scored habitats. The scores for each of the elements were entered on a simple recording form (see Appendix 2). If any of the elements are given a score of three it indicates there is likely to be a need for further species-based assessment of the site.

Highlighted sample areas

Figure 1 shows a map of the site with the highlighted sample locations marked.

Highsted Quarries, north pit

The smallest of the three quarries is centred at OS grid reference TQ910620. It is approximately half the area of the south pit and one third the area of the central pit. The north pit sits in arable fields at the base of a west facing downland slope. To the west, the pit is bounded by Highsted Road and beyond that the southern extremity of the Sittingbourne urban area. To the north is an orchard. The pit is dry and dominated by secondary woodland with little field layer. It appears to be well used by some of the public with evidence of fly tipping and disturbance of the floor of the pit.

Highsted Quarries, central pit

The largest of the three pits of Highsted Quarries, central pit is centred at OS grid reference TQ906619. It is approximately twice the area of the south pit and three times the area of the north pit. It is bounded by Sittingbourne urban area to the north and west, by Highsted Road to the east and by Cromer Road to the south. These roads separate the pit from the other pits

that make up Highsted Quarries. There is a mix of scrubby woodland and more mature secondary woodland. The scrubby woodland includes stands of willows *Salix* spp. in wetter areas. Some pools of open water appear to have been produced by design. Use of the quarry for training activities by Challenger Troop has created and maintained open areas increasing the diversity of the field layer. Security fencing has prevented public access to the pit.

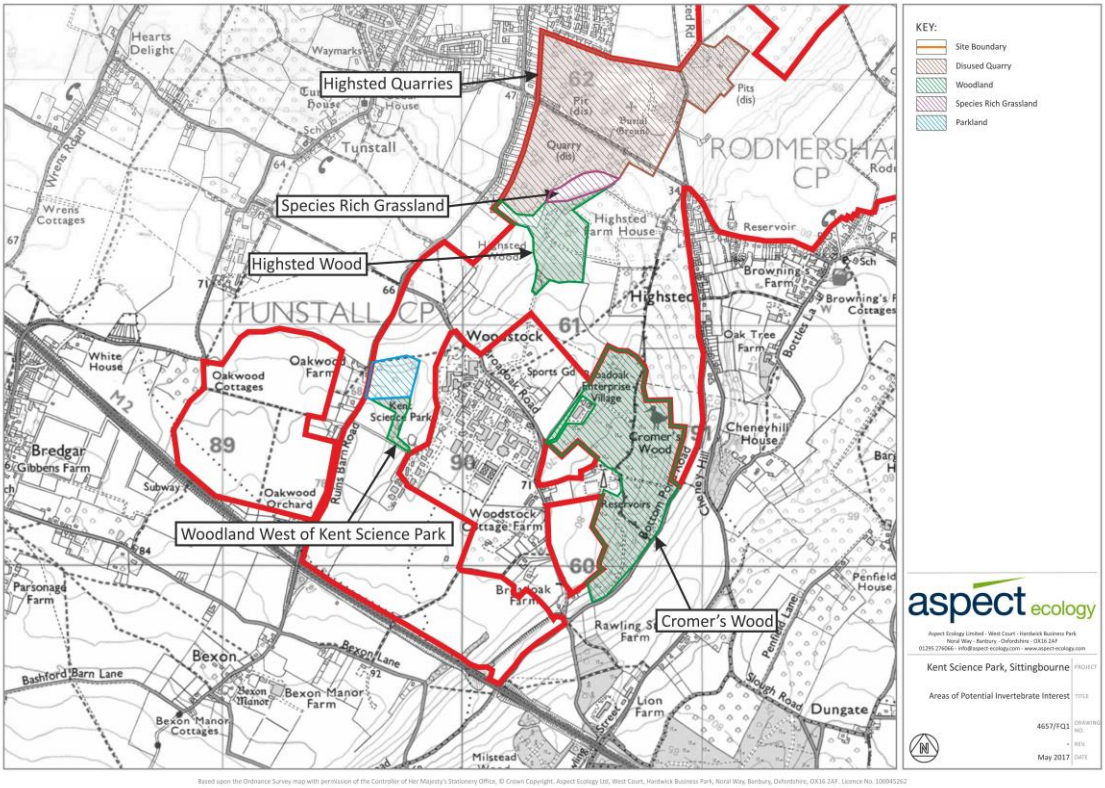

Figure 1: Invertebrate sample areas at Kent Science Park

Highsted Quarries, south pit

The southernmost section of the quarry complex is centred at OS grid reference TQ903616. It is approximately triangular in shape, the north-eastern boundary formed by Cromer Road and the central pit beyond. A ribbon of houses along Ruins Barn Road forms the north-western boundary. On the southern lip of the pit is an area of unimproved grassland and the ancient woodland of Highsted Wood. The floor of the pit is dominated by scrubby woodland including silver birch *Betula pendula* in drier areas and willows in wetter parts. The field layer shows low diversity.

Highsted Quarries, species rich grassland

An area of species rich grassland centred at OS grid reference TQ905614 is sandwiched between the south quarry and Highsted Wood. The grassland has a north-facing slope and although bounded by gappy hawthorn hedgerows, is open and exposed to the wind. Rabbit grazing appeared to have produced lawns of short sward within the taller vegetation but had not kept down scrub invasion. At the time of the field visit the most obvious species in flower was ragwort *Senecio jacobaea*.

Highsted Wood

Highsted Wood is an area of ancient woodland centred at OS grid reference TQ904613. Stands of sweet chestnut *Castanaea sativa* are being managed as coppice. More mature

standard trees are present but no veteran trees were noted. The field layer within the woodland is limited as the trees are growing densely and there are few open rides or glades.

Cromers Wood
Cromers Wood is a semi-natural ancient woodland centred at OS grid reference TQ906604. It lies between the eastern edge of the study area and Bottom Pond Road on the slope of a dry chalk valley. The woodland is a Kent Wildlife Trust site and the organisation has restored sweet chestnut coppice and standards management to most of the woodland in closest proximity to the study area. Elsewhere the trees include ash pollards. The wood supports a rich ground flora and a pond adds to the diversity.

Parkland west of Kent Science Park
This remnant of a once much larger deer park occupying the site of what is now Kent Science Park is centred at OS grid reference TQ897607. Less than twenty veteran oak *Quercus robur* remain.

Bex Wood (woodland west of Kent Science Park)
Bex Wood is a small area of woodland within arable fields. It is centred at OS grid reference TQ897606. To the north it directly adjoins the parkland remnant. There is evidence of some management by coppicing.

Invertebrate survey
During the walkover habitat assessment of the Highsted Quarries, the species rich grassland and Highsted Wood, the invertebrate species present at the time of the visit were sampled. The deterioration in the weather prevented sampling of invertebrates in the parkland and the woodland west of Kent Science Park. It would have prevented sampling in Cromers Wood also but as permission to collect had not been obtained from the Kent Wildlife Trust this was not planned.

The sampling carried out was not a full invertebrate survey. Within the limited time available in each area it was not feasible to assemble a representative list of the species present within even one of the more obvious taxonomic groups such as butterflies. The timing of the survey was a further limitation as only some of the species within any group are active and identifiable in July. This limitation applies to any single visit survey and some of the species recorded in July would not be recorded during visits earlier or later in the year. Some identification of invertebrates was carried out in the field but others required collection and were identified in the laboratory. Where possible specimens were identified to species.

<u>Survey techniques</u>
No attempt was made to sample the invertebrate fauna of the canopy or ground layer on this occasion. The fauna of the field layer was sampled through a combination of spot sampling / observation and sweep netting. Drake *et al*. (2007) describe standardised protocols for these techniques but to implement these across all highlighted areas was not feasible within the time available. Instead sampling continued for as long as it took to complete the habitat assessment, between 30 and 60 minutes.

Spot sampling involved using a net to collect large and active species (or simple observation of readily identifiable species). Collecting points included plants in flower and areas of bare earth where insects were searching for nesting burrows, prey or basking in the sunshine.

Sweep netting involved rapidly sweeping a heavy canvas net from side to side through herbaceous vegetation and inspecting and emptying the net after every ten to twenty sweeps. The canvas net is best used for beetles, bugs and spiders. A lighter net is more suitable for flies, bees and wasps. The latter was not used because of the high risk of the net being torn by brambles and other woody vegetation.

BASELINE CONDITIONS

Habitat

The full results of the habitat quality assessment survey are given in Appendices 3 to 10.

The assessment suggests a major resource that could support an important saxproxylic invertebrate fauna, one associated with decaying wood, is present in the form of veteran oak trees in the parkland west of Kent Science Park and in the form of veteran ash pollards in Cromers Wood. Although Highsted Wood has a less important standing timber resource there are some mature standards with signs of decay and combined with the volume of fallen timber it could also support a good saproxylic fauna. The remaining wooded areas will each support some saproxylic species but the fauna is unlikely to be of high conservation quality.

A limited abundance and range of insect pollinated flowering plants was observed during the field survey. This is partly a limitation of assessing the pollen and nectar resources in high summer when it is the availability of spring and autumn sources that is vital to many species. Cromers Wood is expected to have a good pollinator fauna as it is known for its displays of spring flowers. The species rich grassland has the potential to be an important habitat for pollinators but the exposed site is not conducive to flying insects. Of the seven locations within the study area, the central pit of Highsted Quarries has the greatest potential to support a rich pollinator fauna. Good pollen and nectar resources combine synergistically with the major bare ground resource to further increase the potential value of this habitat to ground nesting pollinators.

Bare ground heats up quickly, especially on south-facing slopes. Kent has long been known to support invertebrate species found nowhere else in Britain, species that are able to survive here because of these warm microclimates. The number of such species is increasing as more invertebrates are expending their ranges across Europe with changes in climate, especially temperatures. In addition, friable bare earth provides potential nesting sites for burrowing invertebrates. The central pit of Highsted Quarries was judged to have a major bare ground resource as not only was a good quantity present but ground nesting solitary bees were observed to make use of it. Assessment as a major resource does require observed invertebrate activity and the poor weather probably prevented the bare ground in Cromers Wood from being judged so highly. Possibly this limitation applied to the assessment of other areas. The area of bare ground in the species rich grassland was unexpectedly low. Rabbit scrapes were expected to produce more.

Rotational management and structural diversity. Coppicing in ancient woodlands seen to best effect in Cromers. Natural regrowth in pits has provided little structural diversity but management activities in central pit beneficial resulting in habitat mosaic.

Wetland features are a minor component of the areas surveyed and are unlikely to support a significant aquatic invertebrate community but they do add to the overall diversity.

The assessment confirms the importance of Cromers Wood as a high quality invertebrate habitat. The Highsted Quarries complex was designated a local wildlife site on the basis of its chalk flora but the habitat assessment suggests the invertebrate fauna, especially of the central pit, is likely to be of similar importance. The parkland west of Kent Science Park and Highsted Wood could be important specifically for invertebrates associated with decaying timber.

Invertebrates

All the invertebrate specimens collected from the highlighted areas during the field survey were identified to species level. All species and their conservation statuses are listed in Appendix 11.

A combined total of 35 invertebrate species was recorded from all the highlighted areas. This is a very low number of species considering the total area surveyed, the range of habitats and the geographical location. The reasons for this are given in the limitations below. The greatest diversity of species, 25, was recorded from the central pit of Highsted Quarries. This could be explained by the area being larger than any of the others so most time was required to assess the habitat giving greater opportunity to record species, the high diversity of habitats within the pit that likely supported a greater range of species and the good weather conditions while this area was being assessed that encouraged insects to be active and hence more easily recorded.

No legally protected species, Red Listed, Nationally Rare or Nationally Scarce species were recorded from any of the highlighted areas on this occasion. One of the common species, the Cinnabar moth *Tyria jacobaeae*, recorded from both the north and central pits of Highsted Quarries is listed in section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 as a species of principal importance for the conservation of biodiversity in England. As noted the moth is common and its caterpillars feed on a common plant, Ragwort. It is listed as requiring consideration in the decision making and activities of public bodies because it represents a larger assemblage of invertebrates associated with a plant that is often removed from sites under the Ragwort Control Act 2003 without regard to its impact on wildlife.

LIMITATIONS

The deterioration in the weather conditions prevented the sampling of the invertebrate fauna of the parkland and woodland west of Kent Science Park. The range of collecting techniques was limited. The two techniques employed sampled only the field layer and provided no information on the invertebrates of the ground layer, shrub layer and canopy of the habitats surveyed. The sampling protocol was not standardised. A standardised procedure involving the collection of multiple samples from each of the highlighted areas is necessary to provide a more comprehensive picture of the invertebrate fauna of each area and to allow valid comparisons to be made between the areas. The survey was conducted on a single day and therefore could only provide a snapshot of the invertebrate fauna present on the site. This would have been so whenever the fieldwork was undertaken. More comprehensive information on the actual quality of the invertebrate species assemblages present rather than the potential quality of the habitat can only be obtained through fieldwork over three or more visits through the season.

RECOMMENDATIONS FOR HABITAT MANAGEMENT AND ENHANCEMENT

Habitat management and enhancement for invertebrates aims to improve the supply of resources required by those invertebrates. Any procedure should only be implemented after careful consideration of its likely impacts across all species using the habitat. Many invertebrates will move between habitats to find the different resources they require for survival and it may not be necessary to enhance a site by ensuring all the required resources are available within its boundaries. These resources may be very specific to individual invertebrates and not easy to provide for without gathering a great deal of new knowledge of the species or taxonomic group in question. When habitat management and enhancement is attempted it more often aims to provide more general resources that are likely to benefit many species.

Highsted Quarries

All the pits within the Highsted Quarries complex have been disused for a sufficient period that over much of the quarry floor succession to woodland has occurred. Lowland mixed deciduous woodland is a habitat of principal importance for the conservation of biodiversity in England under section 41 of the NERC Act 2006, but it is not usually considered a priority in the restoration of mineral extraction sites. Disused quarries are more usually valued for their mosaic of early successional habitats also considered of principal importance for the conservation of biodiversity in England under section 41 of the NERC Act 2006. Where such sites are due to be developed, altered or management undertaken, further invertebrate survey is recommended (Lush *et al*., 2013).

As natural succession has already taken place a decision is required on whether to retain the wooded areas or attempt some clearance to restore early successional stages. It should not be assumed that either would be more beneficial to invertebrates and biodiversity overall would need to be considered. An assessment of the conservation value of the existing woodland and the remaining open habitat would provide a strong evidence base for such a decision. Detailed species surveys would be needed for the assessment and the needs of a range of different taxa will need to be considered. Although the conservation value of invertebrate communities and chalk flora may be greater in more open habitat retaining the woodland may favour the value of the site to mammals. Ultimately the decision will have to take into account the resources available for any management. Clearance would require significant initial management input but both woodland and early successional habitats would require ongoing resourcing for rotational management to control succession. The dense, uniformly structured woodland that results from non-intervention is a very poor invertebrate habitat. Some of the methods described below in the section for Highsted Wood would need reproducing in the quarries if woodland was the favoured habitat.

Whatever the decision on clearance it would be essential to assess the remaining early successional habitat to ensure on the one hand that no important areas were destroyed in the clearance activities or on the other that the management plan for the woodland included rotational management to control succession in the key remaining areas of open habitat. The assessment should map the existing bare earth resource within the pits including the quarry faces. Area, aspect and slope should be catalogued and invertebrate activity noted. Even if the wooded areas are retained these bare earth patches will remain an important element of the habitat and consideration could be given to improving their total area and quality. Clearing vegetation from quarry faces, scraping more open parts of the quarry floor to reveal the

substrate where it will be subject to high insolation levels and creating banks or mounds of substrate with south-facing slopes are options for enhancement. Ongoing resourcing for rotational management to control succession in these areas would be required.

Bare ground will provide a nesting resource for many species likely to be found within the pits but not all invertebrates use bare ground in this way. Hollow plant stems, vegetation tussocks and holes in dead wood are just a few of the alternative sites that may be used. It is unrealistic to attempt to catalogue and add to all such possible nest sites within Highsted Quarries. As invertebrates may occupy all consumer levels of a food chain the range of food resources utilized is also very great and impossible to micro-manage. A site management plan should ensure that managers are aware that all such resources have value and that activities that might destroy them are avoided where possible. For example, ivy and bramble should not be cut back without good reason, dead wood should not be moved and flowering plants should not be cut back at least until it has flowered and produced seed.

Species rich grassland

A serious issue for many species rich grasslands is the encroachment of scrub and ultimate succession to woodland. Although small amounts of scrub can add to the diversity of grassland the hawthorn hedgerows surrounding grassland south of Highsted Quarries provide sufficient diversity and action is needed to remove the invasive scrub. The existing hedgerows are very gappy in places and restoring these hedgerows is recommended as a method of increasing the shelter provided to insects using the site.

Highsted Wood

Highsted Wood has the potential to support an important saproxylic fauna. Before any action is considered to enhance the habitat the quality of the existing saproxylic fauna should be investigated. If habitat enhancement is then considered appropriate several actions are possible.

There are techniques available for ‘veteranising’ a tree but these are best used where a gap in the age structure of the trees exists. In such situations, the death of existing veterans would result in the permanent loss of species assemblages that often have very poor powers of dispersal. Some mature standard trees were seen in Highsted Wood on 28th July 2017 but none of those were veteran trees. As there does not appear to be a gap in the age structure of the trees in Highsted Wood ‘veteranisation’ probably is not appropriate. The only procedure that might be considered appropriate is the pollarding of some trees. This is a traditional management technique in the local area as evinced by the ancient ash pollards in Cromers Wood.

Measures helping the older trees to grow and ultimately develop into veterans could be considered. The more mature trees in the woodland are in competition for light, soil moisture and nutrients with their younger neighbours, competition that could be beneficially reduced. Clearance of the surrounding young trees, so called halo clearance would achieve this end but should not be attempted without care. Any damage to the root system of the mature tree may possibly outweigh the benefits of reduced competition. The clearance would also need to be phased over several years following Ancient Tree Forum guidance to allow the mature tree to become acclimatized to the changing conditions.

A very important element of any woodland habitat is the woodland edge ecocline. Many invertebrates are associated with open, sunny woodland edge, many more than with heavily

shaded, dense woodland interiors. Woodland edge is found not just on the outside of a wood but also around clearings and along rides in the interior. Highsted Wood has a very limited amount of edge habitat in the interior. The existing rides are overgrown and could readily be opened up and widened and possibly new rides could be created. Ideally a ride should be sufficiently wide to allow an ecocline from the central grassland through tall herbaceous plants and scrub to the tree canopy at either side of the ride. Even if it is not possible for the ride to be this wide along its whole length then short sections on alternate sides of the ride could be widened to create a 'scalloped' effect. This 'scalloping' has the added advantage of preventing the development of a wind tunnel, a situation detrimental to woodland edge insects that are often weak flyers and reliant on their habitat for shelter. If a uniform width ride is created then it should not be straight for the same reason.

Woodland edge can also be created by clearing open glades within a woodland. This may not be feasible within a working wood but when the wood is being coppiced clearings are created as part of the management. Clear felling large areas should be avoided to maintain the level of shelter provided.

Much of the southern half of Highsted Wood shares a boundary with arable fields. Arable margins are often sown to generate pollen and nectar rich habitats but an alternative use at Highsted would be to create a new transitional margin between woodland and arable field. Instead of the abrupt divide between the two habitats that currently exists an ecocline similar to that of the proposed rides would be more sympathetic to both landscape and biodiversity.

Parkland and woodland west of Kent Science Park

Parkland is another habitat of principal importance for the conservation of biodiversity in England under section 41 of the NERC Act 2006. The veteran trees of this habitat may support a rich invertebrate fauna but even if they do the invertebrates have little chance of long term survival as there are no younger replacement trees present. Although tree planting should be considered as long term habitat creation, it is not going to solve the problem of the age structure as it will take too long for replacements to grow. An alternative might be to consider the benefits of clearing areas of the adjacent woodland to creature new pasture woodland and then 'veteranising' some of the older trees. Such a plan would require a detailed survey of the saproxylic invertebrates of both parkland and woodland before further consideration. Any management operations in the woodland would also need to be phased over several years as for the halo clearance mentioned above. A grazing arrangement would also need to be negotiated for any new pasture woodland.

CONCLUSIONS

This rapid assessment of the invertebrate habitat quality of areas around Kent Science Park identified the dead wood, pollen and nectar and bare earth resources as the major ecological features likely to support a diverse assemblage of invertebrates.

The saproxylic invertebrate fauna of Cromers Wood is expected to have a high conservation value at least in a county context if not regionally. The parkland and woodland west of Kent Science Park and Highsted Wood require further investigation but these habitats have the potential to support important assemblages of saproxylic invertebrates. The wooded areas of the quarries may support some saproxylic species but it is very unlikely that an important assemblage of species is present.

The pollinator fauna of the species rich grassland would require checking in suitable weather conditions at a more suitable time of year but the exposed nature of the site means the quality of the fauna may not be high. The central pit at Highsted Quarries is more sheltered and the species noted on 28th July 2017 suggest that a wide range of pollinators may be present. Further survey would be required to determine the conservation value of this fauna.

The invertebrate species recorded from the habitats on 28th July 2017 were all common and widespread and would not appear to support the conclusion that the habitat is important for invertebrates. However, the limitations of the reported visit as an invertebrate survey, rather than an invertebrate habitat assessment, are enough to explain the apparent discrepancy. A minimum of a detailed invertebrate survey of the central pit at Highsted Quarries, Highsted Wood and the parkland and woodland west of Kent Science Park is recommended.

A detailed invertebrate survey would involve field visits at peak times for recording the species likely to be present in each habitat, would provide a more complete list of the species present and enable a more meaningful analysis of the data. Drake *et.al* (2007) recommend monthly site visits from April to September as the ideal recording effort for a full invertebrate survey. However, they concede that three visits are more realistic financially. The visits should be timed to ensure the highest probability of detecting any species of principal importance for the conservation of biodiversity in England, Red Listed, Nationally Rare or Nationally Scarce species throughout the field season. If only three visits are feasible then the ideal time for the first of these visits would be late April or the first half of May as the most productive time to record ground beetles and early pollinators. A second visit in June would allow a wide range of taxa to be recorded and would be the ideal time for recording spiders. The final visit would be later in July or early August before conditions become too dry and unproductive for many taxa. Despite the conditions there will still be a different range of taxa active in late August and September that would not be recorded by a three-visit survey.

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APPENDIX 1: HABITAT QUALITY ASSESSMENT CRITERIA

SUMMARY OF SCORING CRITERIA (A crib-sheet for surveyors)

1. Scoring Criteria for Decaying Timber		
Habitat could not be reliably assessed (e.g. due to lack of access)	Unknown	**k**
Decaying Timber habitat insignificant or undetectable	Zero	**0**
Standing or fallen decaying timber observed or thought likely to provide (in terms of quality or quantity) a minor saproxylic resource (e.g. woodpiles of stacked sawn logs)	Minor	**1**
A number of living mature native or archaeophyte trees showing signs of decay; *or* A quantity of standing or fallen decaying timber observed or thought likely to provide (in terms of quality or quantity) a significant saproxylic resource	Moderate	**2**
A number of living large or post-mature native or archaeophyte trees with heart rot, rot holes, large decaying branches; and broken branches; *or*: Veteran trees present within semi-natural habitat	Major	**3**
2. Scoring Criteria for Rotational Management		
Habitat could not be reliably assessed (e.g. due to lack of access)	Unknown	**k**
No- or negligible evidence of Rotational Management	Zero	**0**
Clearly observable but relatively minor evidence of Rotational Management	Minor	**1**
Evidence that some degree of Rotational Management is in play, either by design or as an unintended consequence of other activities	Moderate	**2**
Evidence that Rotational Management is a key management strategy, and that it is performed in such a way that it is likely to promote invertebrate habitat quality	Major	**3**
3. Scoring Criteria for Spring- and Autumn Nectar-Sources		
Habitat could not be reliably assessed (e.g. due to lack of access)	Unknown	**k**
DAFOR Rare: or no significant Spring or Autumn nectar sources observed.	Zero	**0**
DAFOR Occasional	Minor	**1**
DAFOR Frequent	Moderate	**2**
DAFOR Dominant or Abundant	Major	**3**
4. Scoring Criteria for Botanically Poor Wetland Features		
Habitat could not be reliably assessed (e.g. due to lack of access)	Unknown	**k**
Botanically-poor wetland habitat insignificant, or not meeting the given criteria	Zero	**0**
Botanically-poor wetland habitat present as a significant but minor component	Minor	**1**
A moderate amount of stable or semi-stable botanically-poor wetland habitat	Moderate	**2**
Significant area of stable/semi-stable botanically-poor wetland habitat present	Major	**3**
5. Scoring Criteria for Structural Patchwork		
Habitat could not be reliably assessed (e.g. due to lack of access)	Unknown	**k**
Structural patchwork component insignificant or absent	Zero	**0**
A true structural patchwork present, but comprising <20% of the parcel	Minor	**1**
A small-medium scale patchwork of structurally diverse habitats occurring as a significant element (20-50%) of the survey parcel) alongside more uniform elements	Moderate	**2**
More than 50% of the survey parcel comprising a small-medium scale patchwork of structurally diverse habitats	Major	**3**

6. Scoring Criteria for Still Air Habitats		
Habitat could not be reliably assessed (e.g. due to lack of access)	Unknown	**k**
No readily apparent structural conformations likely to lead to significant formation of still air habitat (*Featureless and exposed survey parcels*)	Zero	**0**
Structural conformations present which are considered likely to give rise to the formation of still air habitat(s) usable by invertebrates, but not compliant with the prescribed criteria for 2 or 3 (*Applies to most survey parcels*).	Minor	**1**
Structural conformations present which comply with at least one of the prescribed criteria, recorded in the absence of significant observed invertebrate activity believed likely to be associated with the habitat element (Surveyor also to Target Note on map)	Moderate	**2**
Structural conformations present which comply with at least one of the prescribed criteria, along with significant observed invertebrate activity believed likely to be associated with the habitat element. (Surveyor also to Target Note on map) (*NB: this is only observable 'on the right day' so expect it to be an uncommon observation under most circumstances*)	Major	**3**
7. Scoring Criteria for Connectivity		
Habitat could not be reliably assessed (e.g. due to lack of access)	Unknown	**k**
Ecologically isolated parcel without significant connectivity to similar and/or complementary semi-natural habitat with an area similar to or greater than the survey parcel	Zero	**0**
Ecologically semi-isolated parcel with minor but apparently genuine connectivity to an area of similar and/or complementary semi-natural habitat with an area similar to or greater than the survey parcel	Minor	**1**
Parcel directly connected with-, or closely adjacent (no substantial ecological barriers) to an area of similar and/or complementary semi-natural habitat less than three-times the area of the survey parcel in question. or Parcel connected indirectly (by reason of distance or moderate ecological barriers) to an area of similar and/or complementary semi-natural habitat at least three-times the area of the survey parcel in question	Moderate	**2**
Parcel directly connected with-, or closely adjacent (no substantial ecological barriers) to areas including similar and/or complementary semi-natural habitat at least three-times the area of the survey parcel in question	Major	**3**
8. Scoring Criteria for Ecoclines		
Habitat could not be reliably assessed (e.g. due to lack of access)	Unknown	**k**
No significant ecoclines present in the parcel	Zero	**0**
Ecocline(s) present but either small, significantly fragmented or of questionable quality	Minor	**1**
Ecocline(s) clearly present as a moderate-significant component. Good-quality (as assessed in the local context) semi-natural habitat either absent or a minor component. If ecocline(s) extensive then moderately fragmented or lacking clear gradation	Moderate	**2**
Ecocline(s) clearly present as a significant component, or if less extensive occurring as a clear gradation between habitats, at least one of which is a good-quality (as assessed in the local context) semi-natural habitat	Major	**3**
9. Scoring Criteria for Bare Earth		
Habitat could not be reliably assessed (e.g. due to lack of access)	Unknown	**k**
Bare Earth component insignificant or does not meet qualifying criteria	Zero	**0**
Minor qualifying bare earth component present	Minor	**1**
A moderate amount of qualifying bare earth component is present. This may include relatively small areas which are observed- or thought likely to be in usage	Moderate	**2**
Habitat is present which is observed- or thought likely to support a diverse assemblage of Bare Earth invertebrates. This habitat may be localised (in which case a Target Note can be added, in addition to scoring) or dispersed	Major	**3**

APPENDIX 2: HABITAT QUALITY ASSESSMENT RECORDING FORM

1. Decaying Timber		***2. Rotational Management***	
3. Nectar Sources		***4. Botanically-poor Wetland features***	
5. Structural Patchwork		***6. Still Air Habitat***	
7. Connectivity		***8. Ecoclines***	
9. Bare Earth		***10. [Other]***	

Total scoring k	***Total scoring 0***	***Total scoring 1***	***Total scoring 2***	***Total scoring 3***
Brief Description and Reasoned Justification for 10. [Other]				

APPENDIX 3: COMPLETED HABITAT QUALITY ASSESSMENT RECORDING FORM FOR HIGHSTED QUARRIES, NORTH PIT

1. Decaying Timber	**2**	***2. Rotational Management***	**2**
3. Nectar Sources	**0**	***4. Botanically-poor Wetland features***	**0**
5. Structural Patchwork	**0**	***6. Still Air Habitat***	**2**
7. Connectivity	**2**	***8. Ecoclines***	**1**
9. Bare Earth	**1**	***10. [Other]***	

Total scoring k	***Total scoring 0***	***Total scoring 1***	***Total scoring 2***	***Total scoring 3***
0	**3**	**2**	**4**	**0**
Brief Description and Reasoned Justification for 10. [Other]				

APPENDIX 4: COMPLETED HABITAT QUALITY ASSESSMENT RECORDING FORM FOR HIGHSTED QUARRIES, CENTRAL PIT

1. Decaying Timber	**2**	***2. Rotational Management***	**2**
3. Nectar Sources	**2**	***4. Botanically-poor Wetland features***	**1**
5. Structural Patchwork	**3**	***6. Still Air Habitat***	**2**
7. Connectivity	**2**	***8. Ecoclines***	**2**
9. Bare Earth	**3**	***10. [Other]***	

Total scoring k	***Total scoring 0***	***Total scoring 1***	***Total scoring 2***	***Total scoring 3***
0	**0**	**1**	**6**	**2**
Brief Description and Reasoned Justification for 10. [Other]				

APPENDIX 5: COMPLETED HABITAT QUALITY ASSESSMENT RECORDING FORM FOR HIGHSTED QUARRIES, SOUTH PIT

1. Decaying Timber	**1**	***2. Rotational Management***	**0**
3. Nectar Sources	**1**	***4. Botanically-poor Wetland features***	**1**
5. Structural Patchwork	**2**	***6. Still Air Habitat***	**1**
7. Connectivity	**2**	***8. Ecoclines***	**1**
9. Bare Earth	**2**	***10. [Other]***	

Total scoring k	***Total scoring 0***	***Total scoring 1***	***Total scoring 2***	***Total scoring 3***
0	**1**	**5**	**3**	**0**
Brief Description and Reasoned Justification for 10. [Other]				

APPENDIX 6: COMPLETED HABITAT QUALITY ASSESSMENT RECORDING FORM FOR HIGHSTED QUARRIES, SPECIES RICH GRASSLAND

1. Decaying Timber	**0**	***2. Rotational Management***	**2**
3. Nectar Sources	**2**	***4. Botanically-poor Wetland features***	**0**
5. Structural Patchwork	**2**	***6. Still Air Habitat***	**0**
7. Connectivity	**3**	***8. Ecoclines***	**1**
9. Bare Earth	**0**	***10. [Other]***	

Total scoring k	***Total scoring 0***	***Total scoring 1***	***Total scoring 2***	***Total scoring 3***
0	**4**	**1**	**3**	**1**
Brief Description and Reasoned Justification for 10. [Other]				

APPENDIX 7: COMPLETED HABITAT QUALITY ASSESSMENT RECORDING FORM FOR HIGHSTED WOOD

1. Decaying Timber	**3**	***2. Rotational Management***	**2**
3. Nectar Sources	**1**	***4. Botanically-poor Wetland features***	**0**
5. Structural Patchwork	**1**	***6. Still Air Habitat***	**2**
7. Connectivity	**2**	***8. Ecoclines***	**1**
9. Bare Earth	**2**	***10. [Other]***	

Total scoring k	***Total scoring 0***	***Total scoring 1***	***Total scoring 2***	***Total scoring 3***
0	**1**	**3**	**4**	**1**
Brief Description and Reasoned Justification for 10. [Other]				

APPENDIX 8: COMPLETED HABITAT QUALITY ASSESSMENT RECORDING FORM FOR CROMERS WOOD

1. Decaying Timber	**3**	***2. Rotational Management***	**3**
3. Nectar Sources	**3**	***4. Botanically-poor Wetland features***	**1**
5. Structural Patchwork	**3**	***6. Still Air Habitat***	**2**
7. Connectivity	**0**	***8. Ecoclines***	**2**
9. Bare Earth	**2**	***10. [Other]***	

Total scoring k	***Total scoring 0***	***Total scoring 1***	***Total scoring 2***	***Total scoring 3***
0	**1**	**1**	**3**	**4**
Brief Description and Reasoned Justification for 10. [Other]				

APPENDIX 9: COMPLETED HABITAT QUALITY ASSESSMENT RECORDING FORM FOR PARKLAND WEST OF KENT SCIENCE PARK

1. Decaying Timber	**3**	***2. Rotational Management***	**0**
3. Nectar Sources	**1**	***4. Botanically-poor Wetland features***	**0**
5. Structural Patchwork	**1**	***6. Still Air Habitat***	**1**
7. Connectivity	**1**	***8. Ecoclines***	**1**
9. Bare Earth	**0**	***10. [Other]***	

Total scoring k	*Total scoring 0*	*Total scoring 1*	*Total scoring 2*	*Total scoring 3*
0	**3**	**5**	**0**	**1**
Brief Description and Reasoned Justification for 10. [Other]				

APPENDIX 10: COMPLETED HABITAT QUALITY ASSESSMENT RECORDING FORM FOR WOODLAND WEST OF KENT SCIENCE PARK

1. Decaying Timber	**2**	***2. Rotational Management***	**2**
3. Nectar Sources	**1**	***4. Botanically-poor Wetland features***	**0**
5. Structural Patchwork	**1**	***6. Still Air Habitat***	**1**
7. Connectivity	**1**	***8. Ecoclines***	**1**
9. Bare Earth	**1**	***10. [Other]***	

Total scoring k	***Total scoring 0***	***Total scoring 1***	***Total scoring 2***	***Total scoring 3***
0	**1**	**6**	**2**	**0**
Brief Description and Reasoned Justification for 10. [Other]				

APPENDIX 11: INVERTEBRATE SPECIES RECORDED ON 28TH APRIL 2017 FROM KENT SCIENCE PARK SURVEY AREA.

Common name	Species	Status	Location				
			1	2	3	4	5
Garden spider	*Araneus diadematus*	Common		●			
Labyrinth spider	*Agelena labyrinthica*	Common	●				
Common darter	*Sympetrum striolatum*	Common		●			
Cinnabar moth	*Tyria jacobaeae*	Common/s41	●	●			
Small white	*Pieris rapae*	Common	●	●		●	●
Meadow brown	*Maniola jurtina*	Common		●		●	
Gatekeeper	*Pyronia tithonus*	Common		●	●	●	●
Dark green fritillary	*Argynnis aglaja*	Common		●			
Red admiral	*Vanessa atalanta*	Common	●	●			
Painted lady	*Vanessa cardui*	Common	●				
Common blue	*Polyommatus icarus*	Common		●		●	
Red soldier beetle	*Rhagonycha fulva*	Common		●			
Thick-legged flower beetle	*Oedemera nobilis*	Common				●	
Black and yellow longhorn	*Rutpela maculata*	Common					●
Yellow-face bee	*Hylaeus communis*	Common		●			
Short-fringed mining bee	*Andrena dorsata*	Common				●	
Chalk furrow bee	*Lasioglossum fulvicorne*	Common		●			
Patchwork leafcutter bee	*Megachile centuncularis*	Common		●			
Red-tailed bumblebee	*Bombus lapidarius*	Common	●	●		●	●
White-tailed bumblebee	*Bombus lucorum/terrestris* agg.	Common		●	●	●	●
Common carder bee	*Bombus pascuorum*	Common		●	●	●	●
Buff-tailed bumblebee	*Bombus terrestris s.s.*	Common		●			
Honey bee	*Apis mellifera*	Common		●		●	
Thick-headed fly	*Sicus ferrugineus*	Common					●
Tachinid fly	*Eriothrix rufomaculata*	Common				●	
Marmalade hoverfly	*Episyrphus balteatus*	Common	●	●			
Long hoverfly	*Sphaerophoria scripta*	Common				●	
Hoverfly	*Cheilosia pagana*	Common		●			
Plain-faced dronefly	*Eristalis arbustorum*	Common				●	
Common dronefly	*Eristalis tenax*	Common		●		●	
Common tiger-hoverfly	*Helophilus pendulus*	Common		●		●	
Lesser hornet hoverfly	*Volucella inanis*	Common		●	●		●
Pellucid hoverfly	*Volucella pellucens*	Common					●
Hornet hoverfly	*Volucella zonaria*	Common		●			
Brown-lipped Snail	*Cepaea nemoralis*	Common		●			

The status given for each species is based on information from the Pantheon tool and NHM website (http://www.nhm.ac.uk/ourscience/data/ukspecies/species/index.html.) 'Search for a Species'.

The locations are:
1. Highsted Quarries, north pit
2. Highstead Quarries, central pit
3. Highsted Quarries, south pit
4. Highsted Quarries, species rich grassland
5. Highsted Wood

Report of an assessment of invertebrate habitat at Kent Science Park, Sittingbourne, Kent.

2018

PAUL LEE MSc FRES CEcol CEnv MCIEEM

(Commissioned by Matthew Davey of Aspect Ecology Ltd.)

November 12th 2018

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EXECUTIVE SUMMARY

- This report was prepared as part of an ecological impact assessment of a development affecting invertebrate species and habitats in seven land parcels around Kent Science Park, Sittingbourne. The purpose was to evaluate the conservation quality of the species and habitats present, to identify likely significant impacts of the development, to propose mitigation for any impacts and to suggest compensation measures for any residual impacts including opportunities for habitat enhancement.

- Full details of the planned development were not available, but three aspects were considered. The proposed corridor of a new link road between the M2 south of Kent Science Park at Woodstock and the A2 east of Sittingbourne formed the spine of the development. A new housing development was not detailed but its proposed location to the west of this road in the northernmost part of the Highsted Quarries complex allowed for an outline consideration of impacts. Finally, the remaining sections of Highsted Quarries on the northern margins of the road corridor were earmarked as public open space. Comment was invited on the devolpment of these areas to enhance their value to invertebrates.

- A scoping visit was undertaken on 28th July 2017. The quality of the invertebrate habitat was assessed subjectively by consideration of individual elements of value to invertebrates. Some *ad hoc* surveying by spot sampling and sweep netting was undertaken. Standardised sampling was completed by beating, hand searching, spot sampling, suction sampling and sweep netting during visits on 18th /19th June 2018 and 17th/18th /19th September 2018. All invertebrates were identified to species where this was possible. The species lists were analysed using Natural England's Pantheon tool to determine the conservation value of the communities present.

- If the road is constructed as planned it will likely result in a decline in invertebrate diversity and abundance in the surrounding habitats due to increased mortality of invertebrates attempting to cross the road, pollution from traffic fumes and road de-icing chemicals and due to the repellent effect of roads on some species. This may be mitigated in part by the benefits some species gain from new road verge habitat.

- The road corridor will destroy invertebrate habitat along its route, notably the species rich calcareous grassland adjoining Highsted Wood that will likely be lost in its entirety. This habitat loss cannot be mitigated but translocation of turfs to road verges may provide partial compensation. It may be possible to mitigate the impact of habitat losses in other areas by small changes to the route. In particular, moving the route further north into Highsted Quarries south pit would save more of Highsted Wood.

- Street lighting and other artificial lighting along the road corridor and within the residential area will increase insect mortality. This could be mitigated by good design and adopting the most recent technology.

- The invertebrate habitat in the Highsted Quarries pits would benefit from some clearance of the secondary woodland. Some prelimary work is required to ensure that this does not cause damage to existing species and communities, especially in the central pit where a Nationally Rare / Near Threatened beetle was recorded.

Report of an assessment of invertebrate habitat at Kent Science Park, Sittingbourne, Kent.

INTRODUCTION

Scope

This report has been prepared in accord with the standard approach detailed in the Guidelines for Ecological Report Writing Second Edition prepared by the Chartered Institute of Ecology and Environmental Management (CIEEM) (CIEEM, 2017)

In July 2017, Arachne Ecology Ltd was commissioned by Aspect Ecology Ltd to undertake a scoping assessment of a site centred on the Kent Science Park to the south of Sittingbourne, Kent (OS grid reference at Park entrance TQ899609). Three sections of disused chalk quarry, two woodlands, an area of parkland and an area of species rich grassland within the site had been identified as potentially supporting invertebrate interest (see figure 1) and thus requiring assessment. In May 2018, based on the findings of the scoping assessment, further, detailed survey of each of the seven areas of interest was commissioned.

The field survey, including identification of species, and the preparation of this report was carried out by Paul Lee MSc FRES CEcol CEnv MCIEEM, an ecological consultant of 20 years standing and with 40 years of experience in invertebrate ecology.

Purpose

The purpose of the reported work was to: -

- collect representative samples of the invertebrate species present in each of the seven habitat areas in order to provide an overview of the importance of the invertebrate communities within each area;
- provide a list of species recorded from each of the habitat areas at the time of the field survey visits and highlight any invertebrate species of conservation importance present including legally protected species, species of principal importance for biodiversity in England (s41 species), Red Listed / Red Data Book species and Nationally Rare or Scarce invertebrates;
- identify the likely impacts of the outline proposals for development on invertebrates and their habitats and assess the significance of these impacts;
- consider options for the mitigation of any significant impacts identified;
- provide management / enhancement proposals for habitat in the highlighted areas assuming they are to be retained as public open space.

The site

The study area is mostly within the parish of Tunstall, south of the Sittingbourne urban area and north of the M2 motorway. It lies on the North Downs dip slope and the underlying chalk is largely covered by clay-with-flints producing gentle slopes in the west of the area but a dry chalk valley in the east produces steeper slopes. This is reflected in the Swale Borough Council landscape character assessment where the bulk of the study area falls with the Tunstall Farmlands landscape area but the eastern fringe is within the Rodmersham and Milstead Dry Valley area (Jacobs Engineering UK Ltd, 2011).

Chalk deposits have been exploited at the three pits forming Highsted Quarries in the north of the study area. Active mining ceased in the middle of the twentieth century. The central pit has been used by various groups for training activities, but this has not prevented development of secondary woodland in each pit. Highsted Quarries, including the species rich grassland adjacent to the south pit, are now designated a Local Wildlife Site. Of more importance as woodland is Highsted Wood on the southern edge of the southern pit and a remnant of a deer park to the west of the Kent Science Park.

METHODS

Scope of assessment

This report uses the following baseline information as context for assessment of the likely impacts of the outline development proposals: -

- a desktop study undertaken by Aspect Ecology Ltd.;
- a limited field survey of terrestrial invertebrates carried out on 28th July 2017 and
- field surveys of terrestrial invertebrates carried out on 18th/19th June, and 17th/18th/19th September 2018.

Desk study

A desktop study conducted by Aspect Ecology Ltd. found no records of invertebrate species of conservation importance from the survey areas (email from Matthew Davey of Aspect Ecology Ltd. dated 23 May 2017).

One limitation of this type of data is that usually any records that a desk study produces are based on *ad hoc* recording by volunteers on land with public access. As a result, it cannot be assumed that the absence of a species record for any of the highlighted areas, most of which do not have public access, means that it does not occur there.

Field surveys

Target invertebrate groups for survey

Attempting to assemble a total inventory of the invertebrate species present on any site is neither feasible nor necessary. To assess the invertebrate fauna of the mix of habitats present within the survey area Drake *et al*. (pp.58-60 and 70-71, 2007) recommend recording Mollusca (slugs and snails), Orthoptera (grasshoppers), Coleoptera (beetles), Hemiptera (true bugs), Lepidoptera (butterflies), aculeate Hymenoptera (bees, wasps and ants), Diptera (especially hoverflies) and Araneae (spiders). This restriction of the diversity of taxa surveyed is not treated as a limitation as these taxa are considered most likely to prove representative of the quality of the invertebrate fauna overall. In addition, other invertebrate taxa outside the target groups were identified where feasible within the limited timescale available.

All invertebrates were identified to species where this was possible. Species identification often required examination of collected specimens under the microscope but where possible species were identified in the field and released. Taxonomic keys and other literature used in the identification of each invertebrate group are listed in Appendix 3.

Survey locations

Figure 1 shows a map of the Kent Science Park area annotated with the seven habitat areas surveyed.

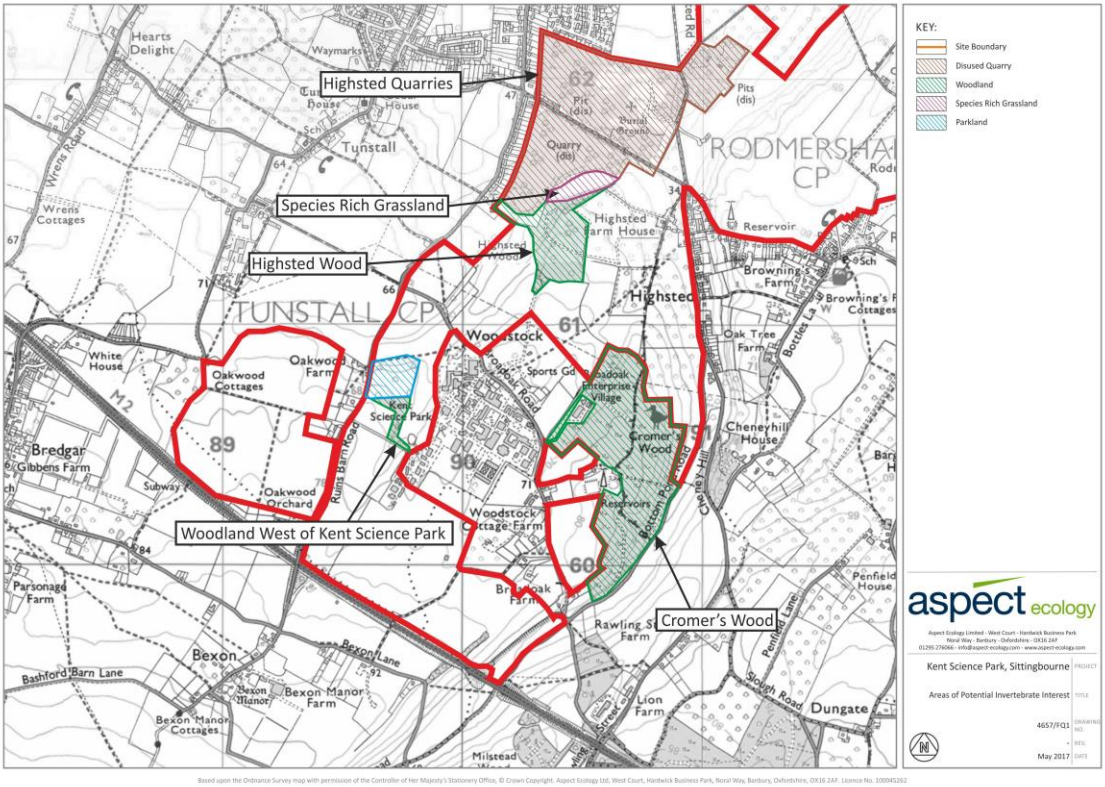

Figure 1: Invertebrate survey areas at Kent Science Park

Highsted Quarries, north pit

The smallest of the three quarries is centred at OS grid reference TQ910620. It is approximately half the area of the south pit and one third the area of the central pit. The north pit sits in arable fields at the base of a west facing downland slope. To the west, the pit is bounded by Highsted Road and beyond that the southern extremity of the Sittingbourne urban area. To the north is an orchard. The pit is dry and dominated by secondary woodland with little field layer. It appears to be well used by some of the public with evidence of fly tipping and disturbance of the floor of the pit.

Highsted Quarries, central pit

The largest of the three pits of Highsted Quarries, central pit is centred at OS grid reference TQ906619. It is approximately twice the area of the south pit and three times the area of the north pit. It is bounded by Sittingbourne urban area to the north and west, by Highsted Road to the east and by Cromer Road to the south. These roads separate the pit from the other pits that make up Highsted Quarries. There is a mix of scrubby woodland and more mature secondary woodland. The scrubby woodland includes stands of willows *Salix* spp. in wetter areas. Some pools of open water appear to have been produced by design. Use of the quarry for training activities by Challenger Troop has created and maintained open areas increasing the diversity of the field layer. Security fencing has prevented public access to the pit.

Highsted Quarries, south pit

The southernmost section of the quarry complex is centred at OS grid reference TQ903616. It is approximately triangular in shape, the north-eastern boundary formed by Cromer Road and the central pit beyond. A ribbon of houses along Ruins Barn Road forms the north-western boundary. On the southern lip of the pit is an area of unimproved calcareous grassland and the woodland of Highsted Wood. The floor of the pit is dominated by scrubby woodland including

silver birch *Betula pendula* in drier areas and willows in wetter parts. The field layer shows low diversity.

Highsted Quarries, species rich grassland
An area of species rich calcareous grassland centred at OS grid reference TQ905614 is sandwiched between the south quarry and Highsted Wood. The grassland has a north-facing slope and although bounded by gappy hawthorn hedgerows, is open and exposed to the wind. In 2017 rabbit grazing had produced lawns of short sward within the taller vegetation but had not prevented scrub invasion and rabbit activity was less evident in 2018 resulting in a more even, ranker sward.

Highsted Wood
Highsted Wood is an area of broadleaved woodland centred at OS grid reference TQ904613. Stands of sweet chestnut *Castanaea sativa* are being managed as coppice. More mature standard trees are present, but no veteran trees were noted. The field layer within the woodland is limited as the trees are growing densely and there are few open rides or glades.

Parkland west of Kent Science Park
This remnant of a once much larger deer park occupying the site of what is now Kent Science Park is centred at OS grid reference TQ897607. Less than twenty large trees, mainly oak *Quercus robur*, remain.

Bex Wood (woodland west of Kent Science Park)
Bex Wood is a small area of dense, mixed coniferous and deciduous woodland within arable fields. It is centred at OS grid reference TQ897606. To the north it adjoins the parkland remnant. There is evidence of some intermittent management by coppicing.

Survey schedule
Site visits were undertaken by the author on 28th July 2017, 18th and 19th June 2018 and 17th, 18th and 19th September 2018. The recommended minimum air temperature for surveying flying insects in clear, sunny conditions is 13ºC and ideal wind conditions are 3 or below on the Beaufort Scale. In cloudy conditions a higher minimum temperature of 15ºC is advised. Provided conditions are dry and there is no more than a gentle breeze, surveying for diurnal flying insects is usually restricted to the period between 10.00 and 16.00 to ensure suitable air temperatures. However, in the unusually hot and dry conditions of summer 2018 it was decided that, as daily nectar flow would reduce in the extreme heat, an earlier start, but no earlier than 09.00, allowing more survey time in the cooler morning, would be beneficial. Surveying for invertebrates at ground level can be undertaken outside of the conditions ideal for flying insects although long, dry spells will reduce the surface activity of many species. On a daily basis, poor light levels provide the major restriction on the sample period. On all visits, all surveying was completed by 17.00 at the latest.

The sampling carried out on 28th July 2017 was not a full invertebrate survey. It took place during a walkover habitat assessment of the Highsted Quarries complex, the species rich grassland and Highsted Wood. The invertebrates of Bex Wood and the parkland west of Kent Science Park were not sampled on this occasion. Even within the areas surveyed work was restricted to sampling the invertebrate fauna of the field layer; no attempt was made to sample the canopy or ground layer on this occasion. Further, no attempt was made to use standardised protocols and sampling continued for as long as it took to complete the habitat assessment of an area, between 30 and 60 minutes.

A structured invertebrate survey of all seven of the habitat areas using standardised sampling techniques was completed in 2018. Six of the seven areas were sampled during both June and September, but the north pit area of Highsted Quarries was sampled in September only.

The survey was conducted over two or three consectutive days on three occasions and therefore only provides a snapshot of the invertebrate fauna present on the site during these times.

Survey techniques

Drake *et al*. (2007) developed guidelines to ensure the standardised collection of invertebrate data that would provide robust results for species assemblage identification and evaluation when analysed by Natural England's (NE) computer application, ISIS (Webb and Lott, 2006). ISIS is now incorporated within another NE analytical tool, Pantheon (Webb *et al*., 2017). NE is no longer promoting the protocols developed for ISIS as it's standard guidance on invertebrate sampling techniques. However, in the professional opinion of the author and in the absence of alternative guidance from NE the survey guidance described by Drake *et al*. (2007) remains the most suitable available and so formed the basis of the field survey.

These guidelines suggest a minimum of four samples can provide the necessary information on the invertebrates living in each stratum of a site. Lott *et al*. (2010) later demonstrated that robust results could be obtained based on taking three samples per stratum within a location where the habitat stratum was reasonably uniform. The strata and sample locations targeted for invertebrate sampling within each of the habitat areas were selected using professional judgement to identify the features of greatest potential for supporting species considering the habitat structure, the time each sample was taken and the weather conditions. This approach to selecting sample points was a more efficient method of achieving the objectives of the survey rather than an approach based on random sampling.

The most appropriate techniques were selected for sampling the targeted invertebrate groups in each of the habitat areas (see Table 1) using Drake *et al*. (2007). Standardisation of these sampling techniques involves their use for a set period to collect a single sample. Using the same length of time to collect all samples by a technique then makes for improved comparibility between surveys. However, in the reported work, resource constraints resulted in the duration of sampling using each technique being reduced to a level below that recommended. Further details are given under the description of each technique. While this reduces the comparibilty of the results with those from other surveys, it does not affect the comparison of habitat areas reported here.

The following five sampling techniques were used in the survey.

Beating

A broom handle was used to rap sharply against the lower branches and stems of trees and climbers to dislodge invertebrates on buds, flowers, fruit, leaves, branches and twigs so that they fell into a sweep net held below the branches. The ends of branches on shrubs closer to the ground were inserted into the net and shaken. A representative range of the woody species present in the location were beaten to produce a sample. The time devoted to beating in each location was reduced to 15 minutes from the suggested 30 minutes.

Hand searching

Hand searching involved turning surface debris such as logs and stones and sieving or sorting through leaf litter. The standard protocol suggests selecting six representative (in terms of

substrate, humidity etc.) spots in the sampling location to search for five minutes each. The time devoted to hand searching in each location was reduced to 15 minutes. No attempt was made to divide this time into shorter sub-samples, but a representative selection of points was searched.

Table 1. Survey techniques used for sampling in each habitat area following a standardised (•) or ad hoc (o) approach

	Beating	Hand searching	Spot sampling	Suction	Sweeping
Quarry, north	•	•	o		
Quarry, central	•	•	•	•	•
Quarry, south	•	o	o		•
Grassland			•		•
Highsted Wood	•	•	o		o
Parkland	•	o			•
Bex Wood	•	•			

Spot sampling

This method involved a combination of observation of readily identifiable species and stalking individual insects with a fine insect net. Collecting points mainly comprised stands of plants in flower, sheltered woodland edge and areas of bare substrate where insects were searching for nesting burrows, prey or basking in the sunshine. The time devoted to spot sampling in each location was reduced to 15 minutes from the suggested 30 minutes.

Suction sampling

A converted garden leaf blower was used to vacuum invertebrates from bare ground and short, calcareous grassland. The vacuum was swept slowly over the substrate and pushed into any vegetation tussocks during a slow walk around the sample area. Drake *et al*. (2007) suggested this be continued for 2 minutes to complete a sample but the recommended sample period was increased later to 3 minutes (Martin Drake, pers.comm.). In this survey suction sampling was conducted for 3 minutes per sample.

Sweep netting

Samples were collected with a heavy canvas sweep net swept rapidly from side to side while walking through herbaceous vegetation. The net contents were inspected and invertebrates removed for immediate identification or for preservation after every ten to twenty sweeps. Drake *et al*. (2007) suggested this be continued for 10 minutes to complete a sample but Natural England's Senior Invertebrate Specialists later recommended to contractors that the length of time be increased to 20 minutes. In this survey sweep netting was restricted to 10 minutes per sample.

Assessment methods

Having identified the invertebrates collected from each of the seven habitat areas, the species lists were analysed using NE's Pantheon tool (Webb *et al*., 2017). The Pantheon tool provides an approach to identifying the invertebrate communities present provided high quality data from standardised surveys are available. A series of nested groupings associated with increasingly specific habitat resources are clustered within four broad biotope types, namely open habitats, tree-associated, wetland and coastal. Species counts, the conservation status of individual species (both rarity and threat) and the fidelity of specialist species to characteristic environmental conditions are then used to generate four scores for each of the groupings. Firstly, the number of species on a site list allocated to a grouping is counted. Next, any of the species with a national rarity or threat status (see Appendix 2 for detail) are identified. Thirdly,

a percentage representation score is calculated as the ratio of the number of species on the site list allocated to a grouping to the total number of species allocated to that grouping in the Pantheon database. Finally, a version of the Species Quality Index (SQI) (Eyre and Rushton, 1989) is calculated for each grouping. A numerical score is given to each species based on its rarity and threat status. The scores for the species within a grouping are summed and the average score per species calculated to two decimal places. This figure is multiplied by 100 to get the SQI. As with any of the systems developed for assessing the quality of an invertebrate fauna, the results produced by Pantheon are to some extent dependent on sampling effort and the length of species lists. For this reason, although the system will recognise groupings containing fewer species, a minimum threshold of fifteen species is recommended when calculating a quality score. For the whole Kent Science Park study area and for each of the constituent habitat areas surveyed, the four types of score were used to evaluate the relative conservation importance of the invertebrate fauna.

When considering ecological constraints on any development plans it was assumed that the loss of invertebrate habitat would be the most significant impact and that any impact would be greatest on communities and individual species with the highest conservation value. The Pantheon analaysis enabled consideration of the conservation value of the invertebrate communities but comparable surveys from other local, county, regional and national sites are needed to provide a reliable geographical context for the results, especially below national level. Although Kent is a county with an active community of entomologists, there are few published surveys available that have used standardised techniques. In the absence of such survey data, the Kent Red Data Book and Kent Biodiversity Action Plan were consulted in an attempt to provide some geographical context for the evaluation.

Limitations

The most significant limitation of the survey was the resource constraint that required the standardised sampling periods to be reduced below those recommended by Drake *et al*. (2007) for some techniques. Although NE no longer give support to the standardised methods of Drake *et al*. (2007), it has provided no alternative guidance and the comparable samples necessary to provide input data for Pantheon still require standardised techniques. The comparability of the outcomes of the analysis using Pantheon was limited such that samples collected by the author from other sites could not be used to give context to the results. However, the comparability of samples between the seven habitat areas was not affected.

The timing of the survey was a limitation as only a proportion of the species within each group are active and identifiable in the period from June to September. This period does span what is considered the most productive period for invertebrate survey in Britain and would not be considered a significant limitation in most years. However, the exceptionally warm and dry conditions in summer 2018 would have reduced the number and diversity of invertebrates recorded, especially in the open habitats (Drake *et al.*, 2007).

Low air temperatures were not a limitation during surveying but a strengthening wind on the afternoon of 28th July 2017 and wind speeds reaching 4-5 on the Beaufort Scale during 18th and 19th September 2018 were sub-optimal for surveying insects by spot sampling and sweep netting. Increasingly heavy cloud cover and rain showers on 28th July 2017 eventually cut short the survey preventing any sampling within Bex Wood and the parkland on this visit.

Although Reed (2017) questioned the validity of combining invertebrate survey data from different years, the use of data from 2017 and 2018 is not considered a limitation. The nature

of invertebrate life cycles means that species may spend most of their life as immature stages undetected by the usual survey techniques. A survey would need to extend over several years to detect these species and the use of data from two field seasons could be seen as a weakness as the survey period was not long enough. Lott et al. (2010) considered an acceptable compromise between costs and the robustness of the study to be a three-year survey period but even this is probably unrealistic for most projects not involving academic research. A more valid criticism would be the sampling protocol was not standardised in 2017. This was due to the preliminary nature of the work intended to establish what would be required by way of further survey. It does mean that the 2017 data lack comparibility with those collected the following year but discarding them would have reduced the information available on which to base the assessments.

The survey only provides a snapshot of the invertebrate fauna present on the site during the days when sampling was taking place. It cannot provide a comprehensive listing of the species present within the study area and even species of conservation concern will have been overlooked. Although an increased number of visits would have increased the species richness recorded, the number of visits made are considered an acceptable compromise with increasing costs and the data obtained are representative of the fauna present.

The range of collecting techniques employed during the survey was limited. No trapping techniques were employed partly because of problems of the public accessing all of the habitat areas apart from the central pit of Highsted Quarries and partly because of the significant increase in costs of dealing with trap samples. Also, the use of suction sampling was limited to the central pit of Highsted Quarries. This technique could have been informative if used in the south pit of Highsted Quarries and the adjacent grassland but would have required carrying relatively heavy equipment over rough footpaths to get there and would have doubled the number of trips required as equipment for the other sampling techniques could not be carried at the same time.

BASELINE CONDITIONS

Invertebrate species

Most of the invertebrate specimens collected from the site during the field survey were identified to species level but some could be determined only to genus or species aggregate as the specimens were immature (15 spiders and one millipede), female (one leafhopper, one bee and one woodlouse), the taxonomic situation is currently unclear (one snail) or the specimen required dissection for certain identification (three slugs). A minimum of 258 invertebrate taxa was recorded from the site as a whole; 247 of these were identified to species. All species and their conservation statuses are listed in Appendix 1.

There were no legally protected or Red Listed species recorded but one Near Threatened/Nationally Rare beetle, *Dasytes virens*, was found in the central pit of Highsted Quarries. Table 2 provides a list of all species recorded that have an official designation making them species of conservation concern and Table 3 shows the habitat areas where these species were found. The designations of five of these species, *Hippodamia variegata*, *Polydrusus formosus*, *Rhinocyllus conicus*, *Tropiphorus elevatus* and *Lygus pratensis*, are over 20 years out of date and, on the basis of current knowledge, only the weevil *T. elevatus* would retain its designation.

Dasytes virens is a soft-winged flower beetle usually found by sweep-netting in tall flowery grasslands. The larvae are unknown but probably they develop in the hollow stems of taller herbaceous plants such as umbellifers and thistles (Alexander, 2014). It is designated Nationally Rare as it has been recorded from fewer than 15 hectads since 1980, mainly in Surrey and Kent. Furthermore, it has a threat category of Near Threatened due to the limited number of sites it is known from and an inferred continuing decline in sites. A single specimen was swept from vegetation in the central pit of Highsted Quarries in June 2018. Ideally the status of the population should be investigated to determine if the beetle is resident in the quarry or visiting to utilise the flower resources. A resident population in the Highsted Quarry site would represent more than 8% of the known British populations.

Table 2: Summary of species of conservation concern recorded in Kent Science Park study area (see appendix 2 for full explanations of the conservation designations)

Common name	Scientific name	Conservation status
A jumping spider	*Ballus chalybeius*	Nationally Scarce
A comb-footed spider	*Theridion pinastri*	Nationally Scarce
Cinnabar moth	*Tyria jacobaeae*	s41 (research only)
A flower beetle	*Dasytes virens*	Nationally Rare / Near Threatened
Adonis' Ladybird	*Hippodamia variegata*	Notable B
A weevil	*Polydrusus formosus*	Notable A
A flea beetle	*Psylliodes chalcomera*	Nationally Scarce
A ground beetle	*Pterostichus longicollis*	Nationally Scarce
A soldier beetle	*Rhagonycha lutea*	Nationally Scarce
A weevil	*Rhinocyllus conicus*	Notable A
A weevil	*Tropiphorus elevatus*	Notable B
A plant bug	*Lygus pratensis*	RDB3 (Rare)

Two of the spiders recorded and three of the beetles have been designated Nationally Scarce, i.e. they are believed to occur in fewer than 100 hectads, in recent status reviews commissioned by Natural Resources Wales (Harvey *et al.*, 2017) or Natural England (Alexander, 2014; Hubble, 2014; Telfer, 2016). None of these species are considered threatened.

The jumping spider *Ballus chalybeius* and the comb-footed spider *Theridion pinastri* have been collected almost exclusively from broadleaved trees and shrubs. Typically, *B. chalybeius* is beaten from young or scrubby oak *Quercus robur*, most often in woodland but can occur on trees in open sites as well. *T. pinastri* favours broadleaved trees in open sites in wood pasture, acid grassland and heath (Bee *et al.*, 2017). The British distribution of both spiders is centred on SE England, *T. pinastri* being the more restricted, and recorded mainly from Kent and Essex.

Single specimens of each species were beaten from oak in the parkland and a further specimen of *B. chalybeius* was beaten, atypically from scrubby silver birch, in the south pit of Highsted Quarries.The jumping spider is likely to occur in Bex and Highsted Woods at least and quite possibly in all the habitat areas. By contrast, its habitat preferences mean that *T. pinastri* is unlikely to be found away from the parkland.

Table 3: Summary of species diversity and officially designated species of conservation concern recorded in each habitat area. Species in brackets are no longer considered to merit designation and are expected to be downgraded when next reviewed.

Habitat area	**Minimum species richness**	**Species of conservation concern**
Highsted Quarries, north pit	38	*Tyria jacobaeae*
Highsted Quarries, central pit	119	*Tyria jacobaeae, Dasytes virens, [Hippodamia variegata]*
Highsted Quarries, south pit	52	*Ballus chalybeius*
Species rich grassland	62	*Tyria jacobaeae, [Hippodamia variegata], [Lygus pratensis], [Polydrusus formosus]*
Highsted Wood	81	*Rhagonycha lutea, Tropiphorus elevatus*
Parkland west of Kent Science Park	82	*Ballus chalybeius, Theridion pinastri, Psylliodes chalcomera, Rhagonycha lutea, [Rhinocyllus conicus]*
Bex Wood	61	*Pterostichus longicollis, Rhagonycha lutea*

Rhagonycha lutea is typical of open woodland, wood edge and scrub and it may have benefited from the restoration of coppicing in recent years (Alexander, 2003). As with the spiders, this soldier beetle is a species of SE England. Several specimens were collected from trees in Bex and Highsted Woods, the parkland and the south pit of Highsted Quarries. With the possible exception of the grassland, *R. lutea* could be expected to occur in all of the habitat areas.

The flea beetle *Psylliodes chalcomera* is found in a variety of habitats including woodland edges and rides, grassland and disturbed ground, mainly in southern England and East Anglia (Cox, 2007). It is usually swept from thistles (*Cirsium* and *Carduus* spp.) where the adult beetles are feeding on the leaves (Duff, 2016). A single specimen was swept from a stand of thistles *Cirsium* sp. in the parkland in September 2018. Further survey effort would likely detect the beetle in other habitat areas, especially the two larger pits, with good stands of thistle.

The ground beetle *Pterostichus longicollis* is usually found on bare ground near freshwater, often on chalk, mainly in southern England and East Anglia (Luff, 1998). The single specimen of *P. longicollis* found amongst leaf litter on the edge of Bex Wood in June 2018 therefore appears atypical. Duff (2012) states that the beetle occurs "in damp litter, under logs and stones" but again makes the point that it is usually found near water. It would seem that *P. longicollis* should not be considered part of the invertebrate community of Bex Wood. Probably the specimen found was a temporary immigrant possibly benefiting from the cooler, damper conditions of the woodland edge as downland ponds dried out in the extreme heat.

The conservation status of the weevil *Tropiphorus elevatus* was last assessed in 1992 when it was believed widespread but local in broad-leaved woodland throughout England with isolated Scottish locations and consequently designated Notable B (Hyman and Parsons, 1992). It usually occurs in the ground layer or on low vegetation. Duff (2016) repeats the suggestion of some earlier British coleopterists that the weevil is possibly associated with Dog's Mercury

Mercurialis perennis (Duff, 2016). However, Dieckmann (1983) found that, in Germany, the adults would not accept Dog's Mercury as food and Germann and Bolt (2015) demonstrated that Wild Garlic *Allium ursinum* was a food plant in a Swiss woodland. Morris 1997) suggested the weevil was polyphagous and probably utilised the dominant vegetation of the herb layer. Recent, confirmed records of *T. elevatus* are almost all from extreme SE England and the number of records mean that the weevil would merit a Nationally Scarce designation if its conservation status was reassessed now. *T. elevatus* was recorded from leaf litter in Highsted Wood in June 2018. It may occur in the other woodland habitat areas also.

The Cinnabar moth *Tyria jacobaeae*, a common species recorded from both the north and central pits of Highsted Quarries is listed in section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 as a species of principal importance for the conservation of biodiversity in England. Its caterpillars feed on a common plant, Ragwort *Senecio jacobaea*. It was listed due to concerns over population declines associated with widespread removal of the hostplant, considered necessary to protect livestock, under the Ragwort Control Act 2003 without regard to its impact on wildlife.

At a county level the Kent Red Data Book (Waite, 2000) provides no further assessment of the county level importance of the species recorded. The only one of the species recorded in this survey that merits a separate entry in the publication is *Lygus pratensis* and the Kent status merely repeats the national status of RDB3. As noted above, this designation is no longer merited at a national level and the same applies at county level. The seven beetles, *Dasytes virens*, *Harmonia variegata*, *Polydrusus formosus*, *Psylliodes chalcomera*, *Pterostichus longicollis*, *Rhagonycha lutea* and *Tropiphorus elevatus* are listed as Nationally Notable species known to occur in Kent but no further comment is made. The weevil *Rhinocyllus conicus* is not listed, presumably because no records were known to the author at that time. The publication includes no equivalent list of Nationally Notable spiders known to occur in the county. The Kent Biodiversity Action Plan (Kent Biodiversity Action Plan Steering Group, 1997) includes species action plans for three butterflies but no other terrestrial invertebrate. None of these butterflies were recorded during the survey.

The Highsted Quarries complex is a Local Wildlife Site (LWS) but this provides no context for assessing its invertebrate fauna at the local level as the site was designated on the basis of its chalk flora, not its invertebrates. Also, the desk study provided no invertebrate records from the Highsted Quarries LWS or the Cromer's Wood LWS on the eastern boundary of the study area that could be used for this purpose (Matthew Davey, pers. comm.).

Species communities

Although the species data from the individual habitat areas was limited in some cases, an attempt to identify any important invertebrate species communities present was made using the Pantheon tool. Table 4 shows the species associations recognised by Pantheon from the field survey species list in Appendix 1. Of the 247 species identified only 240 contribute to the analysis as the traits of the remaining species are not yet fully incorporated into the database. A further issue is that Pantheon is still a tool in development and the information on traits used for some species is only partial leading to anomalies such as the apparent presence of five peatland species on the site, a group comprising three hoverflies and two spiders. The three hoverflies are common in many habitats and their larvae develop in wet conditions with high levels of organic matter including peat bogs but also farmland puddles and even animal carcasses. Both spiders can be found in waterside vegetation but are common in a wide range of habitats including woodland and calcareous grassland. All five species should probably be

considered ubiquitous. Such anomalies do not change the overall picture of invertebrate species communities on the site.

Table 4: Invertebrate species groupings identified by Pantheon from all species recorded from Kent Science Park study area. (Bracketed figures are the number of species associated with that grouping.)

Broad Biotope	Habitat type	Percentage Representation	SQI	Specific Assemblage	Percentage Representation	SQI
Open habitats (134)	Tall sward & scrub (107)	4	103	-	-	-
	Short sward & bare ground (21)	2	115	Bare sand & chalk (2)	< 1	-
				Open short sward (3)	2	-
	-	-	-	Rich flower resource (11)	5	-
		-	-	Scrub edge (9)	4	-
		-	-	Scrub-heath and moor (3)	< 1	-
Tree-associated (61)	Arboreal canopy (34)	3	147	-	-	-
	Shaded woodland floor (19)	2	116	-	-	-
	Decaying wood (8)	< 1	-	Bark & sapwood decay (6)	1	-
Wetland (7)	Peatland (5)	< 1	-	-	-	-
	Marshland (2)	< 1	-	-	-	-

The invertebrate fauna of the Kent Science Park study area is numerically dominated by a community of species associated with tall sward and scrub but the quality of this community, as measured by the SQI score, is low. Most of the species in this community are common producing an SQI close to 100. The community associated with short sward and bare ground is far less significant numerically but appears to be of higher quality than the tall sward and scrub community. However, the number of species on which the SQI is based is not much above the recommended threshold and so should be treated with caution. Much of the invertebrate interest of old mineral workings is associated with a mosaic of short vegetation and bare ground that will rapidly warm (Lush *et al*., 2013). This mosaic of early successional habitats is considered of principal importance for the conservation of biodiversity in England under section 41 of the NERC Act 2006. Natural succession within the Highsted Quarry complex would reduce the amount of unshaded ground and improve conditions for the tall sward and scrub species at the expense of the short sward and bare ground species. The survival of a few species of conservation value associated with the latter community would be enough to prevent the SQI falling to 100 but there is no way of knowing how much higher the score might have been previously.

The tree-associated biotope is numerially less important than than of open habitats but the aboreal canopy community had the highest SQI score of any community identified from the study area. A high proportion of the species within this grouping were of conservation concern. The decaying wood community was poorly represented in the survey data but this can be a difficult group of invertebrates to sample, without the use of trapping techniques that were not employed at Kent Science Park.

Table 5 shows the species associations recognised by Pantheon from analysis of 31species collected in the north pit of Highsted Quarries. One other species did not contribute to the analysis. The small sample size was sufficient for the recognition of species groupings but not for the calculation of any SQI scores. If there had been time to sample the habitat area in June 2018, the recorded species richness of the area would have increased. However, as all species recorded were common (even the s41 Cinnabar moth) and based on the initial assessment in July 2017 of the low value to invertebrates of the habitat features present, an increase in recording effort would not be expected to produce SQI scores much above 100.

Table 5: Invertebrate species groupings identified by Pantheon from species recorded in Highsted Quarries, north pit. (Bracketed figures are the number of species associated with that grouping.)

Broad Biotope	**Habitat type**	**Percentage Representation**	**SQI**	**Specific Assemblage**	**Percentage Representation**	**SQI**
Open habitats (14)	Tall sward & scrub (13)	< 1	-	-	-	-
	-	-	-	Rich flower resource (1)	< 1	-
				Scrub edge (1)	< 1	-
Tree-associated (5)	Arboreal canopy (3)	< 1	-	-	-	-
	Shaded woodland floor (2)	< 1	-	-	-	-

Table 6: Invertebrate species groupings identified by Pantheon from species recorded in Highsted Quarries, central pit. (Bracketed figures are the number of species associated with that grouping.)

Broad Biotope	**Habitat type**	**Percentage Representation**	**SQI**	**Specific Assemblage**	**Percentage Representation**	**SQI**
Open habitats (69)	Tall sward & scrub (55)	2	100	-	-	-
	Short sward & bare ground (12)	< 1	-	Bare sand & chalk (1)	< 1	-
				Open short sward (2)	1	-
	-	-	-	Rich flower resource (9)	4	-
				Scrub edge (6)	3	-
				Scrub-heath and moor (1)	< 1	-
Tree-associated (15)	Arboreal canopy (8)	< 1	-	-	-	-
	Shaded woodland floor (5)	< 1	-	-	-	-
	Decaying wood (2)	< 1	-	Bark & sapwood decay (2)	< 1	-
Wetland (4)	Peatland (3)	< 1	-	-	-	-
	Marshland (1)	< 1	-	-	-	-

Table 6 shows the species associations recognised by Pantheon from analysis of 109 species collected in the central pit of Highsted Quarries. One other species did not contribute to the analysis. The dominance of the tall sward and scrub community is especially obvious here as despite the large sample only this grouping is represented by sufficient species to produce a robust SQI score. Although woodland is becoming well established in the pit, the results show

that the field layer invertebrates have not been excluded from the site and conditions are not suitable as yet for many woodland invertebrates to colonise. Wetland communities are even more a minor component of the habitat area than the data suggests at first sight. As mentioned above, the recognition of a peatland community is the result of anomalies within Pantheon and only the dragonly *Sympetrum striolatum* is a true wetland species. This pit is where the Nationally Rare beetle *Dasytes virens* was collected but its high conservation value has not influenced any SQI scores as its ecology is too unclear to link it to any community type.

Table 7 shows the species associations recognised by Pantheon from analysis of 43 species collected in the south pit of Highsted Quarries. One other species did not contribute to the analysis. As in the other pits, the tall sward and scrub community was dominant. The small sample size meant that only this grouping was sufficiently well represented to produce a quality score. However, the only species of conservation concern recorded here, the jumping spider *Ballus chalybeius*, was associated with the arboreal canopy community. The low representation of the short sward and bare ground community is probably more a result of low sampling effort rather than reality. The use of suction sampling in this pit would have increased the species richness recorded from this community. As mentioned above, the recognition of a peatland community is the result of anomalies within Pantheon.

Table 7: Invertebrate species groupings identified by Pantheon from species recorded in Highsted Quarries, south pit. (Bracketed figures are the number of species associated with that grouping.)

Broad Biotope	**Habitat type**	**Percentage Representation**	**SQI**	**Specific Assemblage**	**Percentage Representation**	**SQI**
Open habitats (18)	Tall sward & scrub (17)	< 1	100	-	-	-
	Short sward & bare ground (2)	< 1	-	-	-	-
	-	-	-	Rich flower resource (1)	< 1	-
				Scrub edge (2)	< 1	-
Tree-associated (11)	Arboreal canopy (7)	< 1	-	-	-	-
	Shaded woodland floor (3)	< 1	-	-	-	-
	Decaying wood (1)	< 1	-	Bark & sapwood decay (1)	< 1	-
Wetland (1)	Peatland (1)	< 1	-	-	-	-

Table 8 shows the species associations recognised by Pantheon from analysis of 53 species collected in the species rich grassland adjoining Highsted Wood. Four other species did not contribute to the analysis. Lowland calcareous grassland such as this is a habitat of principal importance for the conservation of biodiversity in England under section 41 of the NERC Act 2006. As was to be expected from the observed habitat structure, the tall sward and scrub community dominates the fauna in this habitat area. The analysis identified a small tree-associated community, but the species involved did not require the adjacent woodland to survive. All could be expected to occur in the hedgerows enclosing the grassland and on the taller shrubs within the grassland. Four species, ostensibly, of conservation concern were identified from this habitat area including the common but s41 listed Cinnabar moth, the distictive larvae of which were feeding on ragwort in the tall sward. The remaining three species no longer merit their official status; Adonis' Ladybird *Harmonia variegata* and the bug *Lygus pratensis*, both members of the tall sward and scrub community, and the weevil

Polydrusus formosus, an arboreal canopy species. As mentioned above, the recognition of a peatland community is the result of anomalies within Pantheon.

Table 8: Invertebrate species groupings identified by Pantheon from species recorded in species rich grassland adjoining Highsted Wood. (Bracketed figures are the number of species associated with that grouping.)

Broad Biotope	Habitat type	Percentage Representation	SQI	Specific Assemblage	Percentage Representation	SQI
Open habitats (40)	Tall sward & scrub (30)	1	100	-	-	-
	Short sward & bare ground (6)	< 1	-	Open short sward (2)	1	-
	-	-	-	Rich flower resource (5)	2	-
				Scrub edge (4)	2	-
				Scrub-heath and moor (3)	< 1	-
Tree-associated (6)	Arboreal canopy (3)	< 1	-	-	-	-
	Shaded woodland floor (1)	< 1	-	-	-	-
	Decaying wood (2)	< 1	-	Bark & sapwood decay (1)	< 1	-
Wetland (4)	Peatland (4)	< 1	-	-	-	-

Table 9 shows the species associations recognised by Pantheon from analysis of 71 species collected in Highsted Wood. Three other species did not contribute to the analysis. Although the balance in species numbers between the open habitat biotope and tree-associated biotope is more even than in any of the other habitat areas, the former grouping is still numerically the richest. This is due largely to anomalies within Pantheon that assigns many of the mollusc species that are collected most frequently by searching the leaf litter on shaded woodland floors to the tall sward and scrub assemblage. Lowland mixed deciduous woodland such as Highsted Wood is a habitat of principal importance for the conservation of biodiversity in England under section 41 of the NERC Act 2006.

Table 9: Invertebrate species groupings identified by Pantheon from species recorded in Highsted Wood. (Bracketed figures are the number of species associated with that grouping.)

Broad Biotope	Habitat type	Percentage Representation	SQI	Specific Assemblage	Percentage Representation	SQI
Open habitats (28)	Tall sward & scrub (26)	< 1	100	-	-	-
	Short sward & bare ground (2)	< 1	-	-	-	-
	-	-	-	Rich flower resource (2)	< 1	-
				Scrub edge (2)	< 1	-
Tree-associated (23)	Arboreal canopy (10)	< 1	-	-	-	-
	Shaded woodland floor (10)	< 1	-	-	-	-
	Decaying wood (3)	< 1	-	Bark & sapwood decay (3)	< 1	-

The Sweet Chestnut *Castanea sativa* coppice is typical of many woodlands in Kent and if the coppicing rotation is maintained can support a high quality invertebrate community. Both of the species of conservation concern recorded from this area are part of the tree-associated community. The soldier beetle *Rhagonycha lutea* belongs to the arboreal canopy community and the weevil *Tropiphorus elevatus* belongs to the shaded woodland floor community.

Table 10 shows the species associations recognised by Pantheon from analysis of 76 species collected in the parkland west of Kent Science Park. Two other species did not contribute to the analysis. Wood pasture and parkland is a habitat of principal importance for the conservation of biodiversity in England under section 41 of the NERC Act 2006 and mature trees can support a deadwood invertebrate community typical of lowland woodland. The techniques employed in this habitat area, sweep netting the taller herbaceous vegetation and beating the lower branches of the mature trees, were expected to produce a species list from which a tall sward and scrub community and an arboreal canopy community could be recognised.

Table 10: Invertebrate species groupings identified by Pantheon from species recorded in parkland west of Kent Science Park. (Bracketed figures are the number of species associated with that grouping.)

Broad Biotope	**Habitat type**	**Percentage Representation**	**SQI**	**Specific Assemblage**	**Percentage Representation**	**SQI**
Open habitats (39)	Tall sward & scrub (22)	1	109	-	-	-
	Short sward & bare ground (4)	< 1	-	Bare sand & chalk (1)	< 1	-
				Open short sward (1)	< 1	-
	-	-	-	Scrub edge (3)	1	-
				Scrub-heath and moor (1)	< 1	-
Tree-associated (23)	Arboreal canopy (19)	1	168	-	-	-
	Shaded woodland floor (3)	< 1	-	-	-	-
	Decaying wood (1)	< 1	-	Bark & sapwood decay (1)	< 1	-
Wetland (1)	Peatland (1)	< 1	-	-	-	-

The quality of these groupings, as measured by the SQI score, was not as expected. Caution in interpretation of the quality scores is advised as the number of species in each grouping is not too much above the recommended minimum of 15 but the SQI of 168 for the arboreal canopy community does appear particularly noteworthy. This high score is due to the inclusion of three species of conservation concern; the spiders *Ballus chalybeius* and *Theridion pinastri* and the soldier beetle *Rhagonycha lutea*. Two other species of conservation were collected both of which are associated with thistles; the flea beetle *Psylliodes chalcomera* and the weevil *Rhinocyllus conicus*. Pantheon assigns the former to the tall sward and scrub community and the later to the short sward and bare ground community. This is probably an error and both species shoul be assigned to the tall sward and scrub community increasing the SQI to 122. As mentioned above, the recognition of a peatland community is the result of anomalies within Pantheon.

Table 11 shows the species associations recognised by Pantheon from analysis of 53 species collected in Bex Wood. Two other species did not contribute to the analysis. As with Highstead Wood, the tall sward and scrub community appears more important than any of the tree associated communities but here no sweeping was undertaken. Although typical of shaded woodland floors, many of the species collected by searching the leaf litter are assigned to the tall sward and scrub assemblage by Pantheon. Beating along the woodland edge produced a number of species associated with scrub in more open situations including a specimen of the Nationally Scarce beetle *Ragonycha lutea*. As mentioned above, the apparent presence of a peatland community is the result of anomalies within Pantheon but, the marshland community is recognised because of the inclusion of the ground beetle *Pterostichus longicollis* on the species list for the habitat area. This Nationally Scarce beetle is discussed further above.

Table 11: Invertebrate species groupings identified by Pantheon from species recorded in Bex Wood. (Bracketed figures are the number of species associated with that grouping.)

Broad Biotope	**Habitat type**	**Percentage Representation**	**SQI**	**Specific Assemblage**	**Percentage Representation**	**SQI**
Open habitats (26)	Tall sward & scrub (22)	< 1	100	-	-	-
	Short sward & bare ground (2)	< 1	-	-	-	-
Tree-associated (13)	Arboreal canopy (4)	< 1	-	-	-	-
	Shaded woodland floor (6)	< 1	-	-	-	-
	Decaying wood (3)	< 1	-	Bark & sapwood decay (2)	< 1	-
Wetland (2)	Peatland (1)	< 1	-	-	-	-
	Marshland (1)	< 1	-	-	-	-

Although the SQI scores allow some comparison of the conservation value of the invertebrate communities within the habitat areas they do not allow for the value of these communities to be assessed in a wider geographical context. A nationwide systematic survey using standardised methods would be required to provide the database on which thresholds for importance at local, county, regional and national level could be set.

Summary

The survey recorded 11 species with official conservation status designations and one s41 species, a species of principal importance for biodiversity in England. The conservation designations of six of the species are out of date and only one of these is still considered of conservation importance. The Cinnabar moth, an s41 listed species, was recorded from the north and central pits of Highsted Quarries and the species rich grassland adjoining Highsted Wood. Despite it being a common species, as it is s41 listed, the presence of Cinnabar moth has to be considered in any planning decision. For this reason, the three habitat areas it was recorded from (and probably the south pit where it is likely to occur) should be considered of at least local importance. Nationally Rare or Scarce species were recorded from the central and south pits of Highsted Quarries, Highsted Wood, the parkland west of Kent Science Park and Bex Wood. The enormous diversity of invertebrates means that a Nationally Scarce species of one sort or another is encountered more frequently than is the case with much less diverse taxonomic groupings. The presence of a single Nationally Scarce invertebrate is not of itself an indication that an area of habitat is of national importance. However, it should be taken to

indicate that these habitat areas are at least of local importance. The parkland west of Kent Science Park supported three Nationally Scarce species associated with the canopy of the parkland trees and at least one species of similar value associated with thistles. The Nationally Scarce spider *Theridion pinastri* is very much a parkland specialist, part of the arboreal canopy community and almost restricted to sites in Kent and Essex. The parkland habitat area is at least of county importance for invertebrates. The species of highest conservation value was the beetle *Dasytes virens* associated with the field layer of the more open areas in the central pit of Highsted Quarries. If the beetle is resident in the quarry, then this represents 8% of the known British population and the central pit is invertebrate habitat of national importance.

Table 12: Summary of assessment of geographical level of importance of invertebrate habitat in Kent Science Park study area

Habitat area	Importance	Justification
Highsted Quarries, central pit	National	Resident population would constitute 8% of known British sites for *Dasytes virens*. Cinnabar moth (s41) recorded.
Parkland west of Science Park	County	Four Nationally Scarce or equivalent species recorded including *Theridion pinastri*, mostly restricted to Kent and Essex.
Bex Wood	Local	Two Nationally Scarce species recorded.
Highsted Wood	Local	Two Nationally Scarce species recorded.
Highsted Quarries, south pit	Local	One Nationally Scarce species recorded. Cinnabar moth (s41) likely to be present.
Highsted Quarries, north pit	Local	Cinnabar moth (s41) recorded.
Species rich grassland	Local	Cinnabar moth (s41) recorded.

IMPACTS

Full details of the proposed development were not available at the time of writing but the effects of the likely route of the planned main road corridor through the study area, a proposed housing development and the establishment of two areas proposed as public open spaces were considered.

Road corridor

The road is planned to connect the M2 to Sittingbourne via a new motorway junction south of Woodstock. From the motorway junction the road corridor would be routed north between Kent Science Park and Bex Wood to a new roundabout at the current entrance to the Science Park on Broadoak Road. The corridor then would be routed in a north easterly direction to join the A2 east of Bapchild. This route would take the road between Highsted Wood and the south pit of Highsted Quarries, through the species rich grassland and across the south eastern corner of the central pit.

The loss of invertebrate habitat will be the most immediate impact of the road corridor, both long-term losses to the infrastructure itself and short-term losses associated with construction activities. The significance of any habitat losses will be determined by the amount of habitat

lost and by the quality of that habitat in terms of its importance to invertebrate conservation. The planned route will likely result in complete loss of invertebrate habitat in the species rich grassland area but should not impact on the north pit of Highsted Quarries. Losses elsewhere will depend on the precise placement of the corridor but as it stands the road would be built through a small section of Bex Wood in its south east corner. It should avoid the parkland but would remove habitat on the north western margin of Highsted Wood and along the south eastern margin of the south pit of Highsted Quarries where it adjoins the grassland. Finally, a section of habitat in the south eastern corner of the central pit would be lost. Habitat losses due to construction activities are more difficult to identify. Some of the invertebrate habitat areas will be able to better cope with short term disturbance than others. If any of the areas surveyed had to be used, for example to establish site offices or storing construction materials and machinery, then the more resilient habitats should be considered first. This issue is further explored under mitigation.

Loss of the species rich grassland invertebrate habitat to the road corridor is likely to be complete. Overall, this habitat area was evaluated as low quality (of local importance) for invertebrates but the assessment may have under estimated the quality due to the negative effect of the hot, dry summer of 2018 on invertebrates such as bees and hoverlies. However, lowland calcareous grassland is a s41 habitat of principal concern for biodiversity in England. The presence of Cinnabar moth is a further constraint as although common, it is a s41 species and, as with the habitat, must be considered in the planning process. Even without the possibility that the habitat quality is higher than observed, this means that the loss of the species rich grassland habitat is a significant impact.

The route of the road corridor as planned would appear to lead to minor habitat loss in Bex Wood, Highsted Wood, and the south and central pits of Highsted Quarries. The landscape plan (Appendix 4) shows a very small area of Bex Wood would be lost. The invertebrate habitat quality of Bex Wood was evaluated as low (of local importance) and combined with the poor structure of the woodland, means that the habitat loss here is not a significanct impact.

Lowland mixed deciduous woodland is a s41 habitat, a habitat that must be considered in making planning decisions. Thus, although the invertebrate habitat quality of Highsted Wood was evaluated as low (of local importance) and the landscape plan (Appendix 4) shows habitat loss restricted to the margin of the wood adjoining Highsted Quarries, the impact is significant.

The mosaic of early successional habitats within the south pit of Highsted Quarries also constitue an s41 habitat but the landscape plan (Appendix 4) appears to show that the road corridor would run through the margin of the pit where succession to scrubby woodland has already taken place. If this is the case, as the invertebrate habitat quality of the pit was evaluated as low (of local importance), this means that the habitat loss here is not significant.

The central pit of Highsted Quarries was evaluated as potentially being invertebrate habitat of national importance. This is based on the specimen of the Nationally Rare beetle *Dasytes virens* recorded representing a resident population. According to the landscape plan (Appendix 4), the route of the road corridor would lead to a small amount of habitat loss in an area of dense scrubby woodland in the southernmost corner of the pit. It is not possible to be precise from the plan supplied but the point at which the beetle was recorded was in a clearing in open, silver birch woodland that appears to lie north of the planned new slip road connecting Cromer Road with Highsted Road. The ecology of the beetle is not fully understood but both adults and larvae are believed to require tall herbaceous vegetation (Alexander, 2014) and so are very unlikely

to make use of the area that would be destroyed by the road corridor. Cinnabar moth was present in the pit also, but its food plant would not be growing in the dense scrub so as far as it is possible to say from the landscape plan, the direct loss of habitat in the central pit is an impact of low significance. If the road corridor strayed further northwards onto the floor of the central pit or if construction activities resulted in habitat destruction or damage in this area then, however minor the habitat loss, due to the presence of *Dasytes virens*, the impact would be highly significant unless further targeted survey demonstrated that the beetle was not resident in the pit.

The landscape plan (Appendix 4) appears to show the road corridor passing to the east of the parkland habitat area and so there would be no impacts arising from habitat loss. However, the invertebrate habitat quality of this area was evaluated as of county importance and parkland is a habitat of principal importance for the conservation of biodiversity in England. Therefore, if the road corridor strayed further west into the parkland or if construction activities resulted in habitat destruction or damage in this area then, however minor the habitat loss, the impact would be significant.

The impacts of the road corridor on invertebrates would not stop once construction was complete. Transport infrastructure has been shown to act to as a barrier to wildlife movements in many studies (van der Ree *et al*., 2015) although until recently most work on the impacts of roads as barriers and mitigation have related to vertebrates. Invertebrate movements may involve mass migrations or small scale dispersal. Movements may be triggered by factors such as the search for food, the need to find a mate, or a search for over-wintering sites. Muñoz *et al.* (2014) have shown that a road creates a barrier effect in two ways. Firstly, a road has a repellent effect on many species that avoid crossing or living close to it thus reducing the amount of available habitat beyond that already lost directly to the road corridor. This would potentially cause the impact of the planned road corridor on both the parkland habitat and the central pit to become significant. Secondly, the road would create a barrier through increased mortality amongst species that do attempt to cross. The mortality increases further as traffic volumes increase (Martin et al., 2018). Air pollutants from vehicles and de-icing salt used for the road maintenance will negatively impact insects also (Muñoz *et al*., 2014). These impacts will reduce both the number of individual insects and the number of species in the vicinity of the road.

A suite of potentially significant impacts that will depended on the final design of the road scheme relate to the use of street lighting. Artificial lighting may potentially impact invertebrate populations of a wide range of species in several different ways (Bruce-White and Shardlow, 2011). Some insects are strongly attracted to artificial light sources, most especially short wavelength visible light and UV light. This can lead to increased mortality rates when insects contact hot surfaces but also increases susceptibility to predation. A very high proportion of the local moth population can be attracted to a street light over distances of several tens of metres on a dark, moonless night and attraction of sensitive species to a source of high intensity light can occur over distances of 0.5km or more (Frank, 1988). Some invertebrates will be repelled by artificial lighting thus producing a negative impact by reducing the area of habitat available to them. Artificial lighting will also interfere with day-night behaviours potentially reducing the feeding time available or making species more vulnerable to predators. Also, artificial lighting can interfere with the breeding patterns of some species that rely on light clues to detect mates.

Light reflection from road surfaces potentially is a further issue. Smooth asphalt road surfaces when wet may polarize the light they reflect. This is a particular hazard for aquatic insects such as water beetles that may attempt to lay eggs on the surface in the mistaken belief they have found a water body. As wetland communities were not a major component of the habitats surveyed this would not be expected to be a significant issue.

Housing development

Although full details were not available, it is understood that a residential development is proposed for the north pit of Highsted Quarries and habitat loss would likely be complete This area did not show any of the characteristics of a s41 early successional mosaic habitat as was seen in the other pits of the Highsted Quarries complex and the invertebrate community was evaluated as low quality (of local importance). However, the presence of Cinnabar moth is a constraint as although common, it is a s41 species and must be considered in the planning process. Therefore, the habitat loss has to be considered a significant impact.

As with the road corridor, the development would create potential post-construction impacts associated with light. Street lighting would have the same significant impacts on invertebrates as outlined above in connection with the road corridor. Additionally, there would be potential impacts from other light sources and light reflected from built surfaces. Security lights, some security CCTV systems and other external lighting generate short wavelength light pollution to which some insects are strongly attracted with the consequences outlined above. Light reflected from specific paint colours is attractive to different pollinating insects. Thus, the insects' foraging behaviour is altered with the likely impact of declining populations. Polarized light reflected from wet road surfaces and car parks can be a problem but also other highly polished surfaces, including solar panels and windows, may polarize the light they reflect attracting many aquatic insects in particular.

Public open spaces

The current plans are for those areas of Highsted Quarries in the south and central pits that are not lost to the road corridor to form public open space. As both pits contain areas of the s41 early successional mosaics habitat, these plans potentially produce significant impacts. Simply allowing public access is not in itself a problem as, by its nature, early successional habitat requires a degree of regular disturbance to maintain its value to invertebrates and other organisms. However, public access would not be feasible without some work to ensure the safety of visitors. It is not possible to assess the impacts of the intended use without detailed plans of this safety work and any landscaping that might be planned. There is the further issue of the potential national importance of the central pit that may restrict further any changes that could be made. These areas are discussed in more detail in the Enhancement section below.

MITIGATION

Road corridor

Where feasible in engineering terms, slight alterations to the route of the road corriodor could further reduce its impact on invertebrate habitats and species. In the first section running north from the M2, keeping the route as far to east as possible when passing Bex Wood and the parkland would reduce the habitat loss in Bex Wood and reduce the risk of accidental damage to the parkland habitat from construction activities. It would also reduce the repellent effect of the road (Muñoz *et al.*, 2014) on the invertebrate community of the parkland.

Where the road corridor passes between Highsted Wood and the south pit of Highsted Quarries, moving the route further north into the pit would concentrate habitat loss in the pit and reduce loss of the s41 Lowland mixed deciduous woodland habitat of Highsted Wood. The potentially more interesting s41 Early successional mosaic habitat in the pit occurs further north and the extra habitat loss is likely to be within scrubby woodland of lesser invertebrate value. A small part of the species rich grassland may also be preserved with this route. This re-routing should not be considered if it would mean any greater habitat loss in the central pit of Highsted Quarries.

Any dead wood produced in the course of habitat removal is itself a resource for invertebrates. As much of the dead wood as possible should be retained on site and incorporated into the remaining woodland habitat or hedgerows. This may assist any saproxylic insects already present in the area as such species often spend several years within wood in the larval stage and fewer individuals of these species would be able to move to new habitat than of species with an annual life cycle.

Although there are many examples of road crossings including bridges and tunnels being used in mitigation of barrier impacts of roads on vertebrate populations (van der Ree *et al.*, 2015), the use of such structures by invertebrates is unknown generally. Without evidence of their effectiveness, consideration of these mitigation measures for invertebrates alone cannot be justified.

Construction activities

Temporary habitat loss to construction traffic access roads and site offces / yards should avoid the habitat areas surveyed if at all possible. Where it is not possible to avoid impacts on the areas surveyed, site design should ensure that land take is minimal and is restricted as far as possible to the more resilient habitats. Habitat continuity over decades or even centuries is essential for invertebrate communites of conservation value to establish in woodland, parkland or even species rich grassland but early successional mosaic habitats require regular disturbance to maintain their invertebrate interest. In general, the invertebrate communities of these habitats will re-establish quickly following disturbance. It is in Highsted Quarries that temporary disturbance would do least damage and may potentially provide benefits. However, until the status of *Dasytes virens* in the central pit has been ascertained, even temporary construction activities should be avoided here. In addition to good site design it will be necessary to ensure that contractors are aware of habitat that should be avoided at all costs.

Road corridor and residential development

Where street lighting is to be installed, either along the road corridor or on the housing development, it would be advisable to use longer wavelength, warm, white-light, Light Emitting Diode (LED) light sources. These LEDs produce little or no UV so insects will not be attracted. Also, security CCTV is available that uses infra-red LEDs further reducing the UV pollution. External lighting of any sort on buildings can be made directional using only fittings that have a cut-off at 70 degrees to the vertical plane, that is 20 degrees below the horizontal plane producing very little light spill and attracting fewer insects.

The impact of reflection from road surfaces and car parks can be mitigated by reducing the area of such surfaces in a development and by using alternative materials e.g. gravel in parking areas. Alternatively, light scattering granules can be incorporated into the surface layer of asphalt (Horváth *et al.*, 2010).

If the use of photovoltaics cannot be avoided, the impact of reflection from solar panels can be mitigated by the use of modern designs with anti-reflective coatings or surface texturing. The impact of reflection from windows can be reduced by using non-reflective window glass with an invisible thermal coating. Furthermore, window openings can be recessed so direct reflected light is less of a problem than normal.

Residual impacts

Habitat losses from construction of the link road cannot be avoided. The species rich calcareous grassland habitat will likely be lost in its entirety. Small areas of scrubby woodland in Bex Wood and the central pit of Highsted Quarries will be lost. Depending on the final route there will be varying amounts of lowland mixed deciduous woodland lost in Highsted Wood and / or the south pit of Highsted Quarries.

Once the new road is constructed there will be increased invertebrate mortality through increased traffic volumes and increased invertebrate habitat fragmentation.

COMPENSATION

As mitigating the loss of the species rich grassland appears not to be possible, the establishment of alternative areas of grassland can be considered. Translocation of soil turfs from the existing grassland may be beneficial in terms of saving the flora and this in turn may cause insects dependent on those species to follow. However, there is no evidence of such translocations being beneficial in maintaining invertebrate communities. Most such translocations that have been attempted have been aimed at saving particular species e.g. the whorl snail *Vertigo moulinsiana* threatened by the A34 Newbury bypass or wood ants *Formica* spp. threatened by the A9 dualing in the Cairngorms. Even then, the success of these exercises is disputed.

Despite the impacts of road traffic in increasing mortality rates in many insect species it has to be recognised that road verges may be important habitat for many species (Anderssen *et al*., 2017). Translocation of soil turfs from the existing grassland may serve a useful purpose here in rapidly creating invertebrate habitat that would take much longer to established through seeding. However, as not all insects associated with the grassland will take to a roadside habitat, there is likely to be a net loss. Whether translocated turfs or seed mixes are used to establish verge habitats a management plan will need to be established, funded and adhered to if these habitats are to retain their value to flora and fauna. The cutting regime in particular will need to be tightly prescribed to prevent the vegetation becoming too rank but at the same time to allow key chalk grassland plants to flower and set seed providing resources for invertebrates.

ENHANCEMENT

Habitat management and enhancement for invertebrates aims to improve the supply of resources required by those invertebrates. Any procedure should only be implemented after careful consideration of its likely impacts across all species using the habitat. Many invertebrates will move between habitats to find the different resources they require for survival and it may not be necessary to try and enhance a site to ensure that all the required resources are available within its boundaries. These resources may be very specific to individual invertebrates and not easy to provide for without gathering a great deal of new knowledge of the species or taxonomic group in question. When habitat management and enhancement is

attempted it more often aims to provide more general resources that are likely to benefit many species.

Highsted Quarries

Disused mineral extraction sites such as Highsted Quarries are usually of value because of the mosaic of habitats that they provide to invertebrates but the more open, early successional phases including bare ground are generally seen to be of greatest value. All the pits within the Highsted Quarries complex have been disused for a sufficient period that succession to scrub or young woodland has occurred over large areas. As natural succession has already taken place a decision is required on whether to retain the wooded areas or attempt some clearance to restore early successional stages. It cannot be assumed that either would be more beneficial to invertebrates and biodiversity overall would need to be considered. However, the surveys in 2018 suggest that despite the succession that has taken place, it is still the invertebrate community associated with the field layer habitats, including bare ground, that retain the greatest conservation value. This was especially notable in the central pit. Therefore, the invertebrate habitat in both pits would benefit from some clearance of the secondary woodland.

It would be essential to assess the remaining early successional habitat to ensure no important areas were destroyed in the clearance activities (Lush *et al.*, 2013). This would be particularly important in the central pit where a targeted survey aimed at the beetle *Dasytes virens* is necessary to determine whether it is resident in the pit and if so, which areas are being utilised. Clearing vegetation from quarry faces, scraping more open parts of the quarry floor to reveal the substrate where it will be subject to high insolation levels and creating banks or mounds of substrate with south-facing slopes are options for enhancement but only if this will not be detrimental to existing communities associated with the early successional mosaic.

Bare ground will provide a nesting resource for many species likely to be found within the pits but not all invertebrates use bare ground in this way. Hollow plant stems, vegetation tussocks and holes in dead wood are just a few of the alternative sites that may be used. The larvae of *Dasytes virens* for example possibly use the former (Alexander, 2014). It is unrealistic to attempt to catalogue and add to all such possible nest sites within Highsted Quarries. As invertebrates may occupy all consumer levels of a food chain the range of food resources utilized is also very great and impossible to micro-manage. A site management plan should ensure that managers are aware that all such resources have value and that activities that might destroy them are avoided where possible. For example, ivy and bramble should not be cut back without good reason, dead wood should not be removed and flowering plants should not be cut back at least until after flowering and seed production. Ongoing resourcing to implemennt the plan and to undertake rotational management to control succession would be required.

Highsted Wood

Highsted Wood has the potential to support an important saproxylic fauna but specialist trapping techniques are required to determine the extent of the existing fauna. The richest saproxylic communities are associated with veteran trees but there appear to be no veterans in Highsted Wood. There are techniques available for ‘veteranising’ a tree but these are best used where a gap in the age structure of the trees exists. As there does not appear to be a gap in the age structure of the trees in Highsted Wood ‘veteranisation’ probably is not appropriate. The only procedure that might be considered appropriate is the pollarding of some trees. This is a traditional management technique in the local area as evinced by the ancient ash pollards in Cromer’s Wood.

Measures helping the older trees to grow and ultimately develop into veterans could be considered. The more mature trees in the woodland are in competition for light, soil moisture and nutrients with their younger neighbours, competition that could be beneficially reduced. Clearance of the surrounding young trees, so called halo clearance would achieve this end but should not be attempted without care. Any damage to the root system of the mature tree may possibly outweigh the benefits of reduced competition. The clearance would also need to be phased over several years following Ancient Tree Forum guidance to allow the mature tree to become acclimatized to the changing conditions.

A very important element of any woodland habitat is the woodland edge ecocline. Many invertebrates are associated with open, sunny woodland edge, many more than with heavily shaded, dense woodland interiors. Woodland edge is found not just on the outside of a wood but also around clearings and along rides in the interior. Highsted Wood has a very limited amount of edge habitat in the interior. The existing rides are overgrown and could readily be opened up and widened and possibly new rides could be created. Ideally a ride should be sufficiently wide to allow an ecocline from the central grassland through tall herbaceous plants and scrub to the tree canopy at either side of the ride. Even if it is not possible for the ride to be this wide along its whole length then short sections on alternate sides of the ride could be widened to create a 'scalloped' effect. This 'scalloping' has the added advantage of preventing the development of a wind tunnel, a situation detrimental to woodland edge insects that are often weak flyers and reliant on their habitat for shelter. If a uniform width ride is created then it should not be straight for the same reason.

Woodland edge can also be created by clearing open glades within a woodland. This may not be feasible within a working wood but when the wood is being coppiced clearings are created as part of the management. Clear felling large areas should be avoided to maintain the level of shelter provided.

Much of the southern half of Highsted Wood shares a boundary with arable fields. Arable margins are often sown to generate pollen and nectar rich habitats but an alternative use at Highsted would be to create a new transitional margin between woodland and arable field. Instead of the abrupt divide between the two habitats that currently exists an ecocline similar to that of the proposed rides would be more sympathetic to both landscape and biodiversity.

Parkland and Bex Wood

The parkland trees support a rich invertebrate fauna, but the survival of the community is threatened as there are no younger replacement trees present. Although tree planting could be considered as habitat creation, in the longer term it is not going to solve the problem of the age structure as it will take too long for replacements to grow. An alternative might be to consider the benefits of clearing areas of the adjacent Bex Wood to create new pasture woodland and then 'veteranising' some of the older trees. Such a plan would require a detailed survey of the saproxylic invertebrates of the parkland before further consideration using specialist trapping techniques. It is important to ensure that existing communities would not be damaged by management. Any management operations in the woodland would also need to be phased over several years as for the halo clearance mentioned above. A grazing arrangement would also need to be negotiated for any new pasture woodland.

CONCLUSIONS

If the new link road is constructed as proposed it will likely result in a net loss of invertebrate abundance and species diversity across the study area. Invertebrate habitat on the direct route of the road will be lost during construction resulting in increased mortality and in invertebrates being driven from the area. The greatest impact of habitat loss will occur in the species rich calcareous grassland that will likely be totally destroyed. Even if turfs from the grassland are translocated to road verges as compensation, there will be net losses in abundance and diversity.

The volume of road traffic will increase mortality amongst invertebrates attempting to cross the road and drive more sensitive species away from its vicinity. Some species will benefit from new habitat created on road verges but there is likely to be a net loss in abundance and species diversity.

If housing is built in the north pit of Highsted Quarries the invertebrate habitat here will be lost resulting in increased invertebrate mortality and in invertebrates being driven from the area.

Artificial lighting on the new road and within the housing development has the potential to increase insect mortality but this can be mitigated with the use of the right technology and careful design.

Opening up the south and central pits of Highsted Quarries, if undertaken after secondary woodland clearance, has the potential to increase the value of the invertebrate habitat. However, the impact on the Nationally Rare / Near Threatened beetle *Dasytes virens* in the central pit is unknown.

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APPENDIX 1: INVERTEBRATE SPECIES RECORDED FROM KENT SCIENCE PARK SURVEY AREA.

COMMON NAME	SPECIES	RARITY STATUS	THREAT STATUS	HABITAT AREA						
				1	2	3	4	5	6	7
Spiders										
Comb-footed spider	*Achaearanea sp.*								●	
Gorse orbweaver	*Agalenatea redii*	C	LC				●			
Labyrinth spider	*Agelena labyrinthica*	C	LC	●						
Wolf spider	*Alopecosa sp.*				●					
Meshweb spider	*Amaurobius fenestralis*	C	LC							●
Comb-footed spider	*Anelosimus vittatus*	C	LC						●	
Buzzing spider	*Anyphaena sp.*			●	●	●		●		●
Garden spider	*Araneus diadematus*	C	LC		●					
Cucumber spider	*Araniella sp.*					●			●	●
Cucumber spider	*Araniella cucurbitana*	C	LC					●		
Jumping spider	*Ballus chalybeius*	NS	LC			●			●	
Money spider	*Bathyphantes gracilis*	C	LC						●	●
Sac spider	*Cheiracanthium sp.*						●			
Sac spider	*Clubiona sp.*				●	●	●			●
Sac spider	*Clubiona brevipes*	C	LC						●	
Sac spider	*Clubiona comta*	C	LC					●		
Orbweaver	*Cyclosa conica*	C	LC			●				
Green crab spider	*Diaea dorsata*	C	LC						●	
Meshweb spider	*Dictyna sp.*					●				
Meshweb spider	*Dictyna arundinacea*	C	LC		●		●		●	
Meshweb spider	*Dictyna latens*	C	LC		●		●		●	
Money spider	*Diplostyla concolor*	C	LC							●
Candy-stripe spider	*Enoplognatha ovata*	C	LC		●	●		●	●	
Money spder	*Erigone atra*	C	LC		●		●	●	●	
Money spider	*Erigone dentipalpis*	C	LC		●				●	●
Woodlouse spider	*Harpactea hombergi*	C	LC					●		
Jumping spider	*Heliophanus sp.*						●		●	
Jumping spider	*Heliophanus flavipes*	C	LC		●					
Money spider	*Helophora insignis*	C	LC	●	●	●				
Furrow orbweaver	*Larinioides cornutus*	C	LC				●		●	
Meshweb spider	*Lathys humilis*	C	LC			●		●	●	●
Money spider	*Lepthyphantes minutus*	C	LC						●	
Money spider	*Linyphia sp.*							●		
Money spider	*Linyphia hortensis*	C	LC			●				
Money spider	*Linyphia triangularis*	C	LC	●	●	●				
Money spider	*Macrargus rufus*	C	LC	●						
Orb-web spider	*Mangora acalypha*	C	LC		●	●				
Autumn orbweaver	*Metellina segmentata*	C	LC	●	●	●		●	●	●
Money spider	*Micrargus herbigradus*	C	LC		●					
Money spider	*Microneta viaria*	C	LC							●
Flower crab spider	*Misumena vatia*	C	LC	●			●			
Comb-footed spider	*Neottiura bimaculate*	C	LC			●				●
Comb-footed spider	*Paidiscura pallens*	C	LC						●	
Wolf spider	*Pardosa nigriceps*	C	LC				●		●	
Wolf spider	*Pardosa pullata*	C	LC		●					
Wolf spider	*Pardosa saltans*	C	LC					●		
Running crab spider	*Philodromus sp.*			●	●	●		●		
Running crab spider	*Philodromus albidus*	C	LC				●			●
Running crab spider	*Philodromus cespitum*	C	LC						●	
Comb-footed spider	*Phylloneta sisyphia*	C	LC		●					
Nursery-web spider	*Pisaura mirabilis*	C	LC		●		●		●	
Money spider	*Tenuiphantes sp.*				●					

COMMON NAME	SPECIES	RARITY STATUS	THREAT STATUS	HABITAT AREA						
				1	2	3	4	5	6	7
Spiders (cont.)										
Money spider	*Tenuiphantes tenuis*	C	LC			●			●	
Money spider	*Tenuiphantes zimmermanni*	C	LC	●						●
Comb-footed spider	*Theridion sp.*					●	●			
Comb-footed spider	*Theridion pinastri*	NS	LC						●	
Comb-footed spider	*Theridion varians*	C	LC					●	●	
Running crab spider	*Tibellus oblongus*	C	LC				●			
Funnel web spider	*Tegenaria sp.*									●
Long-jawed spider	*Tetragnatha sp.*			●					●	
Long-jawed spider	*Tetragnatha montana*	C	LC		●	●				●
Money spider	*Walckenaeria atrotibialis*	C	LC			●				
Crab spider	*Xysticus sp.*			●	●					
Crab spider	*Xysticus cristatus*	C	LC			●	●		●	
Window spider	*Zygiella x-notata*	C	LC		●					
False scorpions										
Common chthonid	*Chthonius ischnocheles*	C						●		
Moss neobisid	*Neobisium carcinoides*	C						●		
Harvestmen										
Harvestman	*Dicranopalpus caudatus/ramosus*				●					●
Zoro harvestman	*Dicranopalpus ramosus*	C				●			●	
Harvestman	*Leiobunum blackwalli*	C		●						
Harvestman	*Nemastoma bimaculatum*	C			●					
Harvestman	*Oligolophus tridens*	C			●					
Harvestman	*Paroligolophus agrestis*	C		●	●	●		●	●	●
Harvestman	*Platybunus triangularis*	C						●		
Dragonflies										
Common darter	*Sympetrum striolatum*	C	LC		●					
Earwigs										
Common earwig	*Forficula auricularia*	C	LC	●	●	●	●	●	●	●
Grasshoppers & Crickets										
Field grasshopper	*Chorthippus brunneus*	C	LC				●			
Meadow grasshopper	*Chorthippus parallelus*	C	LC		●		●		●	
Speckled bush-cricket	*Leptophyes punctatissima*	C	LC		●	●	●	●	●	
Oak bush-cricket	*Meconema thalassinum*	C	LC		●				●	
Scorpion Flies										
Scorpion fly	*Panorpa communis*	C				●			●	
Butterflies & Moths										
Ringlet	*Aphantopus hyperantus*	C	LC		●					
Dark green Fritillary	*Argynnis aglaja*	C	LC		●					
Brimestone	*Gonepteryx rhamni*	C	LC			●		●		
Meadow Brown	*Maniola jurtina*	C	LC		●		●		●	
Small White	*Pieris rapae*	C	LC	●	●		●	●		
Common Blue	*Polyommatus Icarus*	C	LC		●		●			
Gatekeeper	*Pyronia tithonus*	C	LC		●	●	●	●		
Cinnabar moth	*Tyria jacobaeae*	C / s41		●	●		●			
Red Admiral	*Vanessa Atalanta*	C	LC	●	●					
Painted Lady	*Vanessa cardui*	C	LC	●						
Beetles										
Ground beetle	*Abax parallelepipedus*	C	LC					●		●
10-spot ladybird	*Adalia decempunctata*	C							●	
Click beetle	*Agriotes acuminatus*	C								●
Sunshiner beetle	*Amara ovata*	C	LC							●
Weevil	*Anthonomus rubi*	C			●					
Woodworm beetle	*Anobium fulvicorne*	C	LC					●	●	
Click beetle	*Athous bicolor*	C			●				●	
Click beetle	*Athous haemorrhoidalis*	C						●	●	●
Beetle	*Brachypterus glaber*	C			●					
Pea weevil	*Bruchus loti*	C	LC		●		●			

COMMON NAME	SPECIES	RARITY STATUS	THREAT STATUS	HABITAT AREA						
				1	2	3	4	5	6	7
Beetles (cont.)										
Raspberry beetle	*Byturus tomentosus*	C						●		
Sailor beetle	*Cantharis nigricans*	C	LC						●	
7-spot ladybird	*Coccinella septempunctata*	C		●	●	●		●	●	
Malachite beetle	*Cordylepherus viridis*	C	LC				●		●	
Flea beetle	*Cryptocephalus moraei*	C	LC		●					
Flea beetle	*Cryptocephalus pusillus*	C	LC					●		
Acorn weevil	*Curculio glandium*	C							●	
Flower beetle	*Dasytes virens*	NR	NT		●					
Ground beetle	*Demetrias atricapillus*	C	LC			●		●	●	●
Click beetle	*Denticollis linearis*	C					●			
Weevil	*Eutrichapion vorax*	C				●		●		
Weevil	*Exomias pellucidus*	C								●
Weevil	*Hadroplontus litura*	C					●			
Harlequin Ladybird	*Harmonia axyridis*	Nat		●	●	●			●	
Adonis' ladybird	*Hippodamia variegata*	Nb			●		●			
Weevil	*Ischnopterapion loti*	C			●					
Malachite beetle	*Malachius bipustulatus*	C	LC				●			
Soldier beetle	*Mathodes minimus*	C	LC							●
Pollen beetle	*Meligethes aeneus*	C				●	●	●	●	●
Ground beetle	*Nebria brevicollis*	C	LC		●					
Nettle weevil	*Nedyus quadrimaculatus*	C			●				●	
Devil's coach horse	*Ocypus olens*	C								●
Flower beetle	*Oedemera lurida*	C	LC				●			
Thick-legged flower beetle	*Oedemera nobilis*	C	LC		●		●			
Vine weevil	*Otiorhynchus sulcatus*	C			●					
Weevil	*Oxystoma pomonae*	C		●				●	●	
Ground beetle	*Paradromius linearis*	C						●		
Weevil	*Phyllobius pomaceus*	C			●					
Weevil	*Phyllobius viridaeris*	C					●			
Weevil	*Polydrusus formosus*	Na					●			
14-spot ladybird	*Propylea quattuordecimpunctata*	C			●				●	
Flea beetle	*Psylliodes chalcomera*	NS	LC						●	
22-spot ladybird	*Psyllobora vigintiduopunctata*	C			●					
Ground beetle	*Pterostichus longicollis*	NS	LC							●
Ground beetle	*Pterostichus melanarius*	C	LC					●		
Red soldier beetle	*Rhagonycha fulva*	C	LC		●	●				
Soldier beetle	*Rhagonycha lutea*	NS	LC					●	●	●
Weevil	*Rhinocyllus conicus*	Na							●	
Ladybird	*Rhyzobius litura*	C					●			
Longhorn beetle	*Rutpela maculata*	C						●		
Weevil	*Sciaphilus asperatus*	C						●		
Pea & bean weevil	*Sitona lineatus*	C			●		●		●	
Beetle	*Stilbus testaceus*	C						●		●
24-spot ladybird	*Subcoccinella vigintiquattuorpunctata*	C					●			
Rove beetle	*Tachyporus dispar*	C								●
Rove beetle	*Tachyporus hypnorum*	C			●					●
Weevil	*Temnocerus nanus*	C			●					
Weevil	*Tropiphorus elevatus*	Nb						●		
Rove beetle	*Xantholinus lineatus*	C								●
True Bugs										
Hawthorn shieldbug	*Acanthosoma haemorrhoidale*	C	LC					●		
Capsid bug	*Adelphocoris lineolatus*	C			●					
Bishop's mitre bug	*Aelia acuminate*	C	LC			●	●	●		
Leafhopper	*Anaceratagallia c.f. ribauti*	C			●					
Treehopper	*Aphrophora alni*	C				●		●		
Capsid bug	*Apolygus lucorum*	C							●	
Flower bug	*Anthocoris nemoralis*	C						●		

COMMON NAME	SPECIES	RARITY STATUS	THREAT STATUS	HABITAT AREA						
				1	2	3	4	5	6	7
True Bugs (cont.)										
Capsid bug	*Capsus ater*	C					●			
Potato capsid bug	*Closterotomus norwegicus*	C			●		●		●	
Denticulate leatherbug	*Coriomeris denticulatus*	C	LC				●			
Sloe bug	*Dolycoris baccarum*	C	LC	●	●	●	●	●		
Ground bug	*Drymus sylvaticus*	C		●	●					
Birch shieldbug	*Elasmostethus interstinctus*	C	LC	●	●					
Parent bug	*Elasmucha grisea*	C	LC		●	●	●	●		
Brassica bug	*Eurydema oleracea*	C	LC	●						
Nettle ground bug	*Heterogaster urticae*	C							●	
Tree damsel bug	*Himacerus apterus*	C				●		●	●	●
Ant damsel bug	*Himacerus mirmicoides*	C							●	
Leafhopper	*Iassus lanio*	C							●	
Birch catkin bug	*Kleidocerys resedae*	C		●	●	●		●		
Capsid bug	*Liocoris tripustulatus*	C				●			●	
Green capsid bug	*Lygocoris pabulinus*	C							●	●
Plant bug	*Lygus pratensis*	RDB3					●			
Tarnished plant bug	*Lygus rugulipennis*	C			●					
Capsid bug	*Megaloceroea recticornis*	C							●	
Grass bug	*Notostira elongate*	C					●		●	
Ground bug	*Nysius senecionis*	C			●					
Flower bug	*Orius laevigatus*	C								●
Capsid bug	*Orthops basalis*	C							●	●
Green shieldbug	*Palomena prasina*	C	LC		●		●			
Forest bug	*Pentatoma rufipes*	C	LC		●	●			●	
Ground bug	*Peritrechus geniculatus*	C				●				
Froghopper	*Philaenus spumarius*	C							●	●
Capsid bug	*Pinalitus cervinus*	C	LC						●	
Nettle capsid bug	*Plagiognathus arbustorum*	C							●	
Capsid bug	*Psallus varians*	C							●	
Glazier bug	*Rhopalus subrufus*	C	LC				●			
Ground bug	*Scolopostethus affinis*	C			●					
Grass bug	*Stenodema laevigata*	C			●	●				
Glazier bug	*Stictopleurus punctatonervosus*	Nat	NA		●					
Bronze shieldbug	*Troilus luridus*	C	LC						●	
Bees, Ants & Wasps										
Short-fringed mining bee	*Andrena dorsata*	C					●			
Knopper gall wasp	*Andricus quercuscalicis*	C							●	
Honey bee	*Apis mellifera*	C			●		●			
Red-tailed bumblebee	*Bombus lapidarius*	C		●	●		●	●		
White-tailed bumblebee	*Bombus lucorum/terrestris* agg.	C			●	●	●	●		
Common carder bee	*Bombus pascuorum*	C			●	●	●	●		
Buff-tailed bumblebee	*Bombus terrestris s.s.*	C			●					
Black ant	*Formica fusca*	C			●					
Welted mason bee	*Hoplitis claviventris*	C			●					
Yellow-face bee	*Hylaeus communis*	C			●					
Bloomed furrow bee	*Lasioglossum albipes*	C			●					
Common furrow bee	*Lasioglossum calceatum*	C					●			
Chalk furrow bee	*Lasioglossum fulvicorne*	C			●					
Pavement ant	*Lasius niger s.s.*	C			●	●			●	
Patchwork leafcutter bee	*Megachile centuncularis*	C			●					
Red ant	*Myrmica rubra*	C		●	●					
Red ant	*Myrmica ruginodis*	C			●	●	●	●	●	●
Red ant	*Myrmica sabuleti*	C							●	
Red ant	*Mytmica scabrinodus*	C				●			●	
Small red ant	*Stenamma debile*	C								●
Small red ant	*Temnothorax nylanderi*	C			●	●		●		●
Common wasp	*Vespula vulgaris*	C						●	●	

COMMON NAME	SPECIES	RARITY STATUS	THREAT STATUS	HABITAT AREA						
				1	2	3	4	5	6	7
True Flies										
Hoverfly	*Cheilosia pagana*	C	LC		●					
Hoverfly	*Dasysyrphus tricinctus*	C	LC		●					
Marmalade hoverfly	*Episyrphus balteatus*	C	LC	●	●				●	
Tachinid fly	*Eriothrix rufomaculata*	C					●			
Plain-faced dronefly	*Eristalis arbustorum*	C	LC				●			
Common dronefly	*Eristalis tenax*	C	LC		●		●			
Common tiger-hoverfly	*Helophilus pendulus*	C	LC		●		●			
Cranefly	*Nephrotoma appendiculate*	C							●	
Cranefly	*Nephrotoma cornicina*	C								●
Thick-headed fly	*Sicus ferrugineus*	C						●		
Long hoverfly	*Sphaerophoria scripta*	C	LC				●			
Thick-legged hoverfly	*Syritta pipiens*	C	LC		●					
Glass-winged hoverfly	*Syrphus vitripennis*	C	LC		●					
Thick-headed fly	*Tachina fera*	C					●			
Cranefly	*Tipula paludosa*	C			●				●	
Lesser hornet hoverfly	*Volucella inanis*	C	LC		●	●		●		
Pellucid hoverfly	*Volucella pellucens*	C	LC					●	●	
Hornet hoverfly	*Volucella zonaria*	C	LC		●					
Slugs & Snails										
Waxy glass snail	*Aegopinella nitidula*	C	LC		●			●		●
Copse snail	*Arianta arbustorum*	C	LC		●			●		
Durham slug	*Arion c.f. flagellus*	C						●		
Dusky slug	*Arion fuscus/subfuscus*	C						●		
Large red slug	*Arion rufus*	C	LC	●	●			●		
Slug	*Arion c.f. silvaticus*	C						●		
Worm slug	*Boettgerilla pallens*	Nat	NA		●					
Wrinkled snail	*Candidula intersecta*	C	LC		●		●			
White-lipped snail	*Cepaea hortensis*	C	LC					●	●	●
Brown-lipped snail	*Cepaea nemoralis*	C	LC		●			●		●
Door snail	*Clausilia bidentate*	C	LC		●					
Slippery moss snail	*Cochlicopa c.f. lubrica*	C	LC		●					●
Door snail	*Cochlodina laminate*	C	LC					●		
Field slug	*Deroceras reticulatum*	C	LC		●					●
Disc snail	*Discus rotundatus*	C	LC	●	●			●		●
Tree slug	*Lehmannia marginata*	C	LC	●	●					
Green cellar slug	*Limacus maculatus*	Nat	NA		●					
Leopard slug	*Limax maximus*	C	LC					●		●
Kentish snail	*Monacha cantiana*	C	LC						●	
Garlic snail	*Oxychilus alliarius*	C	LC					●		●
Land winkle	*Pomatias elegans*	C	LC					●		
Strawberry snail	*Trochulus striolatus*	C	LC	●	●					●
Centipedes										
Centipede	*Cryptops hortensis*	C	LC		●			●		
Stone centipede	*Lithobius forficatus*	C	LC	●				●		●
Stone centipede	*Lithobius melanops*	C	LC							●
Stone centipede	*Lithobius microps*	C	LC					●		●
Stone centipede	*Lithobius variegatus*	C	LC					●	●	
Millipedes										
Club-tail millipede	*Cylindroiulus punctatus*	C	LC					●		
Pill millipede	*Glomeris marginata*	C	LC					●		●
Flat-back millipede	*Polydesmus sp.*									●
Flat-back millipede	*Polydesmus angustus*	C	LC					●		
False flat-back millipede	*Nanogona polydesmoides*	C	LC							●
Black snake millipede	*Tachypodoiulus niger*	C	LC		●	●		●		
Woodlice										
Pill woodlouse	*Armadillidium vulgare*	C	LC		●			●		●
Shiny woodlouse	*Oniscus asellus*	C	LC	●	●			●		

COMMON NAME	SPECIES	RARITY STATUS	THREAT STATUS	HABITAT AREA						
				1	2	3	4	5	6	7
Woodlice (cont.)										
Striped woodlouse	*Philoscia muscorum*	C	LC					●		●
Striped woodlouse	*Philoscia c.f. muscorum*	C		●	●	●				
Rough woodlouse	*Porcellio scaber*	C	LC	●	●			●		●
Pygmy woodlouse	*Trichoniscus pusillus*	C	LC	●				●		●

The status given for each species is based on information from the Pantheon tool and NHM website (http://www.nhm.ac.uk/ourscience/data/ukspecies/species/index.html.) 'Search for a Species'.

The locations are:
1. Highsted Quarries, north pit
2. Highstead Quarries, central pit
3. Highsted Quarries, south pit
4. Highsted Quarries, species rich grassland
5. Highsted Wood
6. Parkland
7. Bex Wood

APPENDIX 2: CONSERVATION STATUS DESIGNATIONS

IUCN Red Lists

The conservation status designations used in this report are based on the latest published information for each taxonomic group. JNCC Species Status has encouraged Natural England and Natural Resources Wales to commission a series of status reviews using the most recent IUCN guidelines (IUCN, 2012a,b, 2013) to identify those species at greatest risk of extinction and to identify the key threats to the survival of each species in Britain. Five criteria are used when assessing the level of risk of extinction and whether a species should be Red Listed. The criteria are relatively complex and often require information that is difficult to obtain for invertebrate species but in summary a species may be Red Listed if:

- a population reduction of at least 30% can be demonstrated;
- the species has a geographical range of less than 20 000km^2 plus the range or the number of sub-populations is declining and/or the range is fragmented and/or the range or the number of sub-populations undergoes extreme fluctuations;
- the species population is less than 10 000 mature individuals and is continuing to decline;
- the species population is less than 1 000 mature individuals or is present in less than five locations with a plausible threat that may cause it to become extinct very quickly;
- quantitative population models show at least a 10% chance of the species becoming extinct over the next 100 years.

Using these criteria a Red Listed species can be assigned to one of three categories in decreasing order of threat.

CRITICALLY ENDANGERED (CR)

ENDANGERED (EN)

VULNERABLE (VU)

Species that have been evaluated but cannot be shown to meet any of the criteria will still have been assigned to a category but these species are not said to be Red Listed.

NEAR THREATENED (NT)
A species is Near Threatened when it does not qualify for Red Listing now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

LEAST CONCERN (LC)
A species is Least Concern when it does not qualify for Red Listing or Near Threatened status. Widespread and abundant species are designated LC.

DATA DEFICIENT (DD)
A species is Data Deficient when there is inadequate information to assess its risk of extinction. It is possible that future research will show that the species qualifies for a threatened category.

This assessment can be undertaken at different scales. Taxonomic groups have been assessed and Red Lists produced at global, European, national, and local level. The IUCN guidelines allow national level variations in the definitions of the non-threatened categories. The

Nationally Rare and Nationally Scarce categories are unique to Britain and have been applied in all Species Status reports commissioned since 2010.

NATIONALLY RARE (NR)
A native species is Nationally Rare if it has been recorded from no more than 15 hectads (10km squares) of the Ordnance Survey grid since 1990 and is unlikely to be found more widely even with increased recording effort.

NATIONALLY SCARCE (NS)
A native species is Nationally Scarce if it has been recorded from between 16 and 100 hectads (10km squares) of the Ordnance Survey grid since 1990 and is unlikely to be found in more than 100 hectads even with increased recording effort.

NOT ASSESSED (NA)
Species outside their natural range in Britain are not assessed using the IUCN criteria.

Red Data Books
Where a JNCC Species Status review is not yet available for a taxonomic group it is necessary to rely on British Red Data Books (Shirt, 1987; Bratton, 1991) and status reviews published prior to 2010. These publications use similar names for the categories to those above but the definitions differ and this can lead to confusion. Most of the major invertebrate groups have Species Status work underway and the following categories will fall out of use before long.

RED DATA BOOK CATEGORY 1 (RDB1) – ENDANGERED
A RDB1 species is in danger of extinction and its survival is unlikely if the current threat factors continue to operate. It may be known from a single population in one hectad of the Ordnance Survey grid, be restricted to five or fewer hectads following a rapid and continuous decline over the last twenty years or be restricted to especially vulnerable habitats. This category also covers species believed to be extinct but which would need protection if rediscovered.

RED DATA BOOK CATEGORY 2 (RDB2) - VULNERABLE
A RDB2 species is thought likely to become Endangered in the near future if the current threat factors continue to operate. It may have a low population, live in a vulnerable habitat or be declining throughout its range.

RED DATA BOOK CATEGORY 3 (RDB3) - RARE
A RDB3 species is one with small populations that are not at present Endangered or Vulnerable, but are at risk. These species are usually localised within restricted geographical areas or habitats, or are thinly scattered over a more extensive range and are not likely to exist in more than fifteen hectads (10km squares) of the Ordnance Survey grid. This criterion may be relaxed where populations are likely to exist in over fifteen hectads but occupy small areas of especially vulnerable habitats.

RED DATA BOOK CATEGORY K (RDBK) - INSUFFICIENTLY KNOWN
A RDBK species is suspected of falling within categories 1 to 3, but there is insufficient information to be certain. It may be recently discovered or recognised; belong to an under-recorded group of organisms; be difficult to identify; or live in habitats where it is likely to be overlooked. There may be doubts about whether a recently discovered species is native or has been recently introduced by man, and this uncertainty could result in the species being placed in category K.

NATIONALLY NOTABLE CATEGORY A (Na)
A Notable A species does not fall within any of the RDB categories but has been recorded from no more than 30 hectads (10km squares) of the Ordnance Survey grid or, for less well-recorded groups, within seven or fewer vice-counties.

NATIONALLY NOTABLE CATEGORY B (Nb)
A Notable B species does not fall within any of the RDB categories but has been recorded from between 31 and 100 hectads (10km squares) of the Ordnance Survey grid or, for less well-recorded groups, between eight and twenty vice-counties.

NATIONALLY NOTABLE (N)
For some less well-recorded groups and species, it was not been possible to determine which of the Nationally Notable categories (A or B) is most appropriate for scarce species. These species were assigned to an undivided Nationally Notable category.

COMMON (C)
Common species have been recorded from more than 100 hectads (10km squares) of the Ordnance Survey grid or, for less well-recorded groups more than twenty vice-counties.

NATURALISED (NAT)
A non-native species that has become acclimatised and is surviving outdoord away from human habitation in Britain.

Other conservation designations
A small number of British invertebrates gain protection under national or European legislation.

NERC ACT 2006 SECTION 41 SPECIES / BAP PRIORITY SPECIES – (S41)
The only piece of legislation relevant to species recorded in this survey is the Natural Environment and Rural Communities (NERC) Act 2006 which in Section 41 lists "species of principal importance for the conservation of biodiversity in England". As far as invertebrates are concerned these are the same ones that were listed previously as Biodiversity Action Plan (BAP) Priority Species. Each species has an action plan in place to ensure its survival and must be considered a "significant ecological feature" in any planning application.

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APPENDIX 3: TAXONOMIC KEYS AND LITERATURE REFERRED TO IN THE IDENTIFICATION OF INVERTEBRATES

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APPENDIX 4: LANDSCAPING PLAN FOR PROPOSED NEW MOTORWAY JUNCTION AND LINK ROAD, COMMERCIAL AND RESIDENTIAL DEVELOPMENT, KENT SCIENCE PARK, SITTINGBOURNE

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