F8 Arup Stage 2 Ecology Report 2014

Homes and Communities Agency

Northstowe

Stage 2 Ecology Report

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1 Executive Summary

The Homes and Communities Agency commissioned Arup to undertake ecological surveys in support of planning applications for Phase 2 of the proposed development of Northstowe, in South Cambridgeshire. This comprised bat emergence and return, badger bait-marking and great crested newt Habitat Suitability Index and presence/absence surveys that were required to supplement previous ecological surveys. A common toad survey was undertaken at the lake at Oakington Barracks and Airfield (Pond 3). Bat box inspections were also undertaken.

No roosting bats were recorded in the bat boxes, although three of the boxes contained old bat droppings. Confirmed and possible common pipistrelle roosts were recorded in buildings (B2, B5 and B56) and trees (WB 4 (T158) and WB 9) on and adjacent to the site and key pipistrelle foraging areas were recorded at Brookfield Farm and around the woodland blocks. A variety of bat species were recorded at the site, including soprano pipistrelle, Nathusius' pipistrelle, noctule, Leisler's bat, Daubenton's bat and brown long-eared bat, which have all been recorded at the site during previous surveys undertaken in 2013 and 2012.

An additional main badger sett was recorded within the Phase 2 site. A total of five badger clans were recorded. Most badger activity was recorded within Oakington Barracks and Airfield, particularly in the southeast corner (outside the site). The territories of the grey and yellow clans cover much of the Phase 2 site and the blue and orange clans cross the proposed road in the southern part of the barracks and off-site infrastructure area (OSIA). The territory of the red clan does not fall within the site; this clan roams across much of the OSIA to the south and southeast of the site.

The Habitat Suitability Index score for Pond 9 was calculated as 0.55, which falls within the below average suitability category. Great crested newt was recorded in Pond 4, which aligns with the results of the surveys undertaken in 2012 and 2013. Great crested newt was also recorded in Pond 5, where this species has not been recorded during previous surveys. No great crested newt eggs were recorded. Similarly, these were not observed during previous surveys. A small great crested newt population was recorded. Smooth newt was also observed in all of the surveyed ponds, along with common toad in Ponds 1, 2 and 7 and common frog in Ponds 4, 5 and 9. It is considered that the peripheral areas around the southern boundary of Oakington Barracks and Airfield provides valuable terrestrial habitat for great crested newt, but the ponds are not thought to provide important breeding habitat. However, the ponds are located within 500m of the proposed access road. A peak count of 88 common toads was recorded at the northwest edge of Pond 3, which equates to a low population.

It is recommended that the bat boxes and associated trees are retained and protected during the course of the proposed development. Where this is not possible, they should be relocated to a suitable tree following a check by a licensed bat worker. Further bat survey work is recommended on WB 4 (T158), B2, B55 and B56 to inform a European Protected Species (EPS) Mitigation licence application for bats. Further survey work should also be undertaken on the trees that could be affected by the proposed development, to assess the presence or likely absence of roosting bats and the status of any additional roosts. This

further work should be completed once the details regarding tree retention and removal have been defined, to build on the existing survey results.

The main badger sett that has been recorded within the site should be retained and incorporated into the proposed development. Suitable foraging habitat should be provided around the sett, including maintaining access to these habitats under the proposed roads. Should it not be possible to retain the main sett, it would be necessary to gain a licence from Natural England to build an artificial sett, ideally within the site, and to close the sett prior to works commencing. This licence would also cover any other works that may cause disturbance, including closing and using machinery near to other active setts. However, the badger setts should be retained wherever possible.

Due to the potential for the proposed developments to result in injury to great crested newt and the loss and fragmentation of terrestrial habitats, an approved EPS Mitigation Licence will be required for great crested newt prior to the commencement clearance and construction work. Connectivity should be maintained between Pond 3 and the surrounding habitats, particularly to the west, since breeding toads were recorded at the northwest edge. Connectivity to habitats to the east could be achieved through the installation of amphibian tunnels below the proposed road.

2 Introduction

The Homes and Communities Agency commissioned Arup to undertake ecological surveys in support of planning applications for Phase 2 of the proposed development of Northstowe, in South Cambridgeshire. An outline planning application for a mixed-use development is due to be submitted in the summer of 2014, in conjunction with a detailed planning application for associated infrastructure. These areas are collectively referred to as the 'site', with the Phase 2 site referring to the area of proposed built development in the northern part of the site.

Bat, badger *Meles meles*, great crested newt *Triturus cristatus* and common toad *Bufo bufo* surveys were carried out to supplement previous ecological surveys [1], in support of the planning applications. Invertebrate and fish surveys were also undertaken, the results of which are contained in Appendices A and B. A tree climbing survey was also carried out, to confirm the potential of scattered trees within and adjacent to the site to support roosting bats and identify any signs to indicate their presence. The results of the tree climbing survey are contained in Appendix C.

2.1 Previous Surveys

URS carried out ecology surveys during 2012, including great crested newt presence/absence, bat activity and badger scoping surveys [2]. Further work was undertaken by Arup between May and November 2013, including bat activity surveys, bat scoping and inspections surveys on trees and buildings, a badger *Meles meles* scoping survey and great crested newt Habitat Suitability Index (HSI) and presence/absence surveys. The results of this work and recommendations made for further work at that time are outlined below.

2.1.1 Bat Surveys

Activity surveys indicated that there are varying levels of bat activity across the site, including important foraging habitat along Long Lane and at the lake at Oakington Barracks and Airfield, with a total of 10 bat species recorded. The bat scoping and inspection survey identified the presence of trees and buildings within the site that have a potential to support roosting bats, including fresh droppings and feeding remains within B55 at Brookfield Farm (refer to Figure 1). It was considered likely that this building supports a brown long-eared bat *Plecotus auritus* roost. Emergence and return surveys were recommended on a total of 10 additional buildings across the site, at Brookfield Farm (four), Oakington Barracks and Airfield (four) and within farmland to the south (two).

Numerous trees were found to offer potential roosting habitat for bats, particularly in the northwestern part of Oakington Barracks and Airfield and within the belts of plantation woodland. Tree climbing surveys were subsequently conducted on 50 scattered trees within and adjacent to the site that could be affected by the proposed development. No signs to indicate the presence of roosting bats were recorded, although two trees could not be inspected on health and safety grounds. Eight of the trees were re-categorized as Category 3 trees, with a negligible potential to support roosting bats, in accordance with the Bat Conservation Trust (BCT) guidelines [2]. Further tree climbing surveys and/or emergence and return

surveys were recommended to confirm the presence or likely absence of roosting bats, as well as the nature of any roosts recorded, within trees and buildings that are likely to be affected by the proposed development.

2.1.2 Badger Survey

A total of 31 badger setts were recorded during the badger scoping survey, of which 25 were well-used, five were partially-used and one was disused. High levels of badger activity were recorded, including four main setts. Three of these were recorded within Oakington Barracks and Airfield, with the fourth recorded within the OSIA. Well-used setts with many entrance holes that are characteristic of main setts were recorded and it was clear that there are multiple social groups within the survey area. As such, it was recommended that a badger bait-marking survey be carried out, to verify the status of the setts and define the territories of the clans within the site.

2.1.3 Great Crested Newt Survey

The survey conducted by URS in 2012 identified great crested newt in Ponds 1, 2 and 4, with a peak count of 13 recorded in Pond 4 during the survey on 10th to 11th May 2012, equating to a medium population.

A great crested newt survey was conducted by Arup between May and June 2013 on Ponds 1 to 5 (refer to Figure 2), in addition to a further pond located in the farmland to the south of Oakington Barracks and Airfield. A small population of great crested newt was recorded in Pond 4. Only two surveys were carried out on Pond 5, with no surveys conducted on Ponds 7 or 9. Numerous common toad tadpoles were recorded in Pond 3, incidentally during these surveys.

It was recommended that Ponds 5, 7 and 9, as well as those within 500m of the site and connected by suitable habitat, are subject to four surveys between mid-March and mid-June 2014, including two surveys between mid-April and mid-May, with six surveys conducted should great crested newt be recorded.

2.2 Scope of Work and Objectives

In accordance with the recommendations set out above, further bat, badger and great crested newt surveys were conducted between March and June 2014.

Bat boxes were erected in 2011/2012 on trees across the northwestern part of Oakington Barracks and Airfield to provide mitigation for the demolition of buildings that were found to support roosting bats, under European Protection Species (EPS) Mitigation Licence EPSM2011-3249. These boxes were inspected to assess whether these supported roosting bats. Bat emergence and return surveys were conducted on the buildings and woodland blocks that have a potential to be affected by the proposed development, for example due to felling, lopping or lighting. The purpose of this work was to confirm the presence or absence of roosting bats within these features, as well as the nature of any roosts recorded.

A badger bait-marking survey was carried out on the main setts within and beyond the boundaries of the site, to confirm the status of badger setts within the site and the territorial boundaries of the social groups.

A great crested newt survey was conducted on Ponds 5, 7 and 9. In addition to this, the survey was repeated on Ponds 1 to 4, considering the late start to surveys in 2013 and inconsistencies with respect to the numbers of great crested newts recorded in 2012 and 2013. No access was obtained to ponds located outside of the site (refer to Section 3.3.2.1). The results of this work would confirm the presence or likely absence of great crested newts in the additional ponds and define the size of the population within the site. It would also be valuable to confirm breeding on the site.

This report outlines the results of these surveys and provides recommendations for mitigation that are applicable with respect to the proposed development.

2.3 Relevant Legislative and Biodiversity Context

2.3.1 Bats

All bat species are fully protected under the Wildlife and Countryside Act 1981 [5] (as amended) (WCA) and The Conservation of Habitats and Species Regulations 2010 [6] (as amended) (Habitats and Species Regulations), which together make it an offence to:

- Intentionally or recklessly capture, kill or injure bats;
- Deliberately disturb bats (including when they are outside their roosts) or intentionally or recklessly disturb roosting bats; or
- Damage or destroy their roosts or intentionally or recklessly obstruct access to their roosts (whether bats are present or not).

Under the Habitats and Species Regulations, disturbance includes in particular any disturbance which is likely to impair their ability to survive; breed or reproduce; rear or nurture their young; or hibernate or to affect significantly the local distribution or abundance of the species.

Some bat species are also listed under relevant Biodiversity Action Plans (BAP), which identify priorities for conservation as required under the Convention on Biological Diversity in 1992 [7]. The UK Post-2010 Biodiversity Framework [8] superseded the UK Biodiversity Action Plan [9], but the lists of priority species and habitats continue to provide valuable reference sources while a National Biodiversity Strategy and/or Action Plan (NBSAP) is being produced. Bat species listed under the former UK BAP that could be relevant to the site are noctule *Nyctalus noctula*, soprano pipistrelle *Pipistrellus pygmaeus* and brown long-eared bat. The UK BAP is relevant in the context of Section 40 of the Natural Environment and Rural Communities (NERC) Act 2006 [10], meaning that Priority Species and Habitats are material considerations in planning. These species are also of principal importance in conserving biodiversity in England [11], as required under Section 41 of the NERC Act 2006.

Pipistrelle bats *Pipistrellus* sp. are also listed under the Cambridgeshire and Peterborough (Local) BAP [12].

2.3.2 Badgers

The Protection of Badgers Act 1992 [13] makes it an offence to wilfully kill, take, possess or cruelly ill-treat a badger, or attempt to do so; interfere with a sett by damaging or destroying it; obstruct access to, or any entrance of, a badger sett; or disturb a badger when it is occupying a sett.

2.3.3 Amphibians

2.3.3.1 Great Crested Newt

Great crested newt is fully protected under the WCA and Habitats and Species Regulations, which together make it an offence to:

- Intentionally or recklessly capture, kill, injure or disturb great crested newts; and
- Damage or destroy a breeding site or resting place for great crested newt or intentionally or recklessly obstruct access to any structure or place used for shelter or protection.

Under the Habitats and Species Regulations, disturbance includes in particular any disturbance which is likely to impair their ability to survive; breed or reproduce; rear or nurture their young; or hibernate or to affect significantly the local distribution or abundance of the species.

Great crested newt is also listed under the former UK BAP and the Local BAP and is on the Section 41 list.

2.3.3.2 Common Amphibians

Common amphibians, including common toad, common frog *Rana temporaria* and smooth newt *Lissotriton vulgaris*, are only protected from sale under the WCA. Common toad is also listed under the former UK BAP and is on the Section 41 list of species of principal importance in conserving biodiversity.

3 Methods

3.1 Bat Survey

3.1.1 Bat Box Inspections

The bat boxes on and adjacent to the site (refer to Figure 1) were inspected on 20th May by a licensed bat worker (Natural England licence number 2014/CLS/0141 and 0142) and an assistant. The boxes are described in Table 1. These details are derived from Table 8 from the Stage 1 Ecology Report [1].

Table 1 Inspected Bat Boxes

Tree	Species	X Coordinates	Y Coordinates	Description
2	Poplar	540573	266603	Two bat boxes
3	Poplar	540573	266603	Adjacent tree with one bat box
21	Silver maple	540753	266265	East facing bat box
22	Silver maple	540753	266265	Two bat boxes (south and west facing) and flaking bark
29	Poplar	540809	266463	Southeast facing bat box
30	Poplar	540812	266468	Northwest facing bat box, chewed at entrance
31	Poplar	540798	266474	Northeast facing woodpecker hole and southwest facing bat box. Line of trees providing foraging and commuting habitat.
59	Poplar	540757	265731	Three bat boxes facing various directions
130	Poplar	541126	266343	Bat box with cobwebs over the entrance
131	Poplar	541130	266351	Bat box
132	Poplar	541131	266348	Bat box

The surveyors used a ladder and high-powered torch, as required, to inspect the boxes. Any signs to indicate the presence of roosting bats were recorded, as well as any bird's nests.

3.1.2 Emergence and Return Surveys

Bat emergence and return surveys were conducted on T52, which could not be climbed (refer to Appendix C), the Category 1 and 1* trees located within the woodland blocks and the low and moderate potential buildings, as well as the confirmed roost. The only exception to this is B22, as this building was surveyed to inform a planning application for A14 improvement works.

The surveys were undertaken in line with the BCT guidelines, although the full set of repeats were not undertaken in this tranche of work. The surveyed features are shown in Figure 1.

Between two and four surveyors were employed during each survey, with the number of surveyors varying depending on the number of trees being surveyed, their proximity to each other and size and complexity of the buildings . A single emergence or return survey was carried out on the Category 1 and 1* trees, moderate potential buildings and confirmed roost. A single survey was undertaken on the low potential buildings, generally comprising a dusk and dawn survey within the same 24 hour period.

The surveyors were positioned adjacent to the trees, woodland blocks and buildings, observing potential access/egress points for bats that were identified during the scoping survey. The surveyors recorded any bats emerging from or returning to the features, as well as any other commuting or foraging activity. The emergence surveys were carried out from approximately 15 minutes prior to sunset until up to two hours after sunset and the re-entry surveys from an hour and a half to two hours prior to sunrise until sunrise, or until it was completely light. The dates, times and weather conditions are shown in Table 2 below, along with the features that were assessed during each survey on the site (refer to Figure 1).

Table 2 Bat Emergence/Re-Entry and Activity Surveys on the Site

Date	Surveyed Feature	Survey Type	Sunset/ Sunrise Time	Start and End Times	Weather Conditions
06.05	Building (B) 5	Emergence	20:33	20:15 – 22:03	Minimum temperature 11°C, 4/8 cloud, light breeze, hail at 20:40, until 20:50, rain easing off during the survey.
07.05	B5	Return	05:18	03:30 – 05:18	Minimum temperature 10.4°C, 7/8 cloud, light to moderate breeze, brief drizzle at 04:07, otherwise dry.
07.05	B91	Emergence	20:34	20:15 - 22:34	Minimum temperature 11°C, 4/8 cloud, dry
08.05	B91	Return	05:18	03:30 – 05:25	Minimum temperature 7°C, 3/8 cloud, light wind, dry
12.05	Woodland block (WB) 4	Emergence	20:43	20:28 – 22:13	Minimum temperature 8°C, 7/8 cloud, dry, still.
13.05	WB 5	Return	05:08	03:36 – 05:08	Minimum temperature 5.8°C, 4/8 cloud, still, dry
13.05	B10	Emergence	20:44	20:29 – 22:14	Minimum temperature 7.4°C, still, 7/8 cloud, and dry at start, with brief light drizzle during survey. Thunder and lightning in the distance.
14.05	WB 10	Return	05:06	03:35 – 05:06	Minimum temperature 5.7°C, still, 1/8 cloud, dry.
20.05	B56	Emergence	20:55	20:25 -	Minimum temperature 16°C, 8/8 cloud, still to

				22:56	light breeze, dry
21.05	B56	Return	04:56	03:30 – 04:56	Minimum temperature 11°C, 3/8 cloud, still to light breeze, dry
21.05	B59	Emergence	20:56	20:40 – 22:26	Minimum temperature 15°C, 4/8 cloud, light drizzle at the end of the survey, still
28.05	WB 2	Emergence	21:03	20:48 – 22:33	Minimum temperature 13.9°C, 8/8 cloud, showers, light wind
29.05	WB 6	Return	04:47	03:15 – 04:47	Minimum temperature 13°C, 8/8 cloud, dry, light breeze
29.05	B64 and B66	Emergence	21:04	20:55 – 23:05	Minimum temperature 14°C, 8/8 cloud, dry, light breeze
30.05	B64 and B66	Return	04:45	03:00 – 05:00	Minimum temperature 12 °C, 8/8 cloud, drizzle, light breeze
02.06	WB 8	Emergence	21:12	20:57 - 22:44	Minimum temperature 15.1°C, 7/8 cloud, dry start with a little drizzle at the end of the survey, still.
03.06	WB 7	Return	04:43	03:00 – 04:43	Minimum temperature 12°C, 8/8 cloud, dry, still to light breeze
03.06	WB 9	Emergence	21:14	20:59 – 22:44	Minimum temperature 14.7°C, 8/8 cloud, still, dry at start and light drizzle from 22:00
04.06	B55	Return	04:42	03:07 – 04:42	Minimum temperature 11.6°C, 8/8 cloud, dry, still to light breeze
04.06	WB 1	Return	04:42	03:00 – 03:50	Minimum temperature 11.6°C, 8/8 cloud, dry, still to light breeze
04.06	B2	Return	04:42	04:00 – 04:42	Minimum temperature 11.6°C, 8/8 cloud, dry, still to light breeze
09.06	WB 3	Emergence	21:18	21:03 – 22:48	Minimum temperature 16°C, 8/8 cloud, still to light breeze, light to heavy rain until 22:20
09.06	B2	Emergence	21:18	21:03 – 22:48	Minimum temperature 16°C, 8/8 cloud, still to light breeze, light to heavy rain until 22:20
10.06	WB 9	Return	04:38	03:06 – 04:38	Minimum temperature 13.9°C, 2/8 cloud, still, rain overnight but dry during survey

10.06	T52	Return	04:38	03:06 – 04:38	Minimum temperature 13.9°C, 2/8 cloud, still, rain overnight but dry during survey
10.06	B26	Emergence	21:18	21:00 – 22:45	Minimum temperature 12°C, 4/8 cloud, light wind, dry
11.06	B26	Return	04:39	03:00 – 04:39	Minimum temperature 11°C, 4/8 cloud, still to light wind, dry

The surveyors were equipped with a Batbox Duet and an SM2BAT+ bat detector or Anabat SD1 or SD2 bat detector. The Anabat and SM2 data were analysed using Analook, with reference to current guidelines [14]. This software was used to analyse the recorded bat passes to identify species (where possible), type of bat call and the time of that call.

3.2 Badger Bait-Marking Survey

A scoping survey was conducted on 5th and 6th March 2014 to verify the status of the setts recorded in 2013 [1] and record the locations of dung pits and latrines. The aims of this work were to define which setts should be baited and a suitable route to walk during the survey.

The survey was carried out between 10th March and 8th April 2014 in accordance with Scottish Natural Heritage (SNH) guidelines [15]. Eleven setts within and surrounding the site were baited with a mixture of peanuts and golden syrup laced with different coloured pellets. In some cases, both the main and annexe setts were baited with the same colour, to encourage all members of the social groups to eat the bait. In total, eight different colours were employed. The sett locations are shown in Figure 3 and described in Table 7, both within the Stage 2 Confidential Badger Appendix.

The setts were baited for three days from 10th March. Between 25 and 30 shallow pits were dug around each sett and a spoonful of bait was laid in the pits and covered over. The setts were then baited and the dung pits and latrines checked for a further 11 days. The survey was completed following a further eight days of checks. Overall, the survey was carried out over 22 days, with the final check being carried out on 8th April.

During each check, the surveyors walked a set route around the survey area, incorporating the latrines and dung pits recorded during the previous scoping survey. Other areas were also surveyed intermittently to incorporate any new latrines created during the survey period. The surveyors recorded the number of droppings containing coloured pellets on a large scale map, as well as the Ordnance Survey (OS) National grid references. In conjunction with this, the surveyors noted whether a single dropping contained more than one colour of pellet, which would indicate that the badger had visited more than one sett.

3.3 Great Crested Newt Survey

3.3.1 Habitat Suitability Indices

Pond 9 (refer to Figure 2) was assessed for its potential to support great crested newt in accordance with Oldham *et al*. (2000) [16]. All of the other surveyed ponds were assessed against these criteria in 2013. The pond was scored under ten categories. These categories each have a bearing on the suitability of pond to support great crested newt. The scores were translated into Suitability Indices that were used to calculate a HSI for the pond.

3.3.2 Presence/Absence Survey

Between 1st April and 8th May 2014, a great crested newt presence/absence survey was undertaken on Ponds 1, 2, 4, 5, 7 and 9 by a licensed surveyor (Natural England licence numbers CLS001908 and CLS00709) and an assistant, with reference to the Great Crested Newt Mitigation Guidelines [17]. Three methods were employed, comprising bottle trapping, egg searching and torching.

Six survey visits were carried out on each pond. The ponds are identified on Figure 2 and the dates and weather conditions during the surveys are outlined in Table 3. The weather conditions during each of the surveys were suitable for carrying out great crested newt surveys, with night-time air temperatures remaining well above 5°C.

Table 3 Great Crested Newt Surveys on the Site

Visit	Date	Weather Conditions
1	01-02.04.	Air temperature 10.5°C, water temperature 12.1 to 13.9, dry
2	07-08.04	Air temperature 10°C, water temperature 12.5 to 13.7, light rain
3	15-16.04	Air temperature 9°C, water temperature 9.2 to 12.5, dry
4	22-23.04	Air temperature 11°C, water temperature 12.6 to 13.5, dry
5	28-29.04	Air temperature 12°C, water temperature 10.3 to 11.1, dry
6	07-08.05	Air temperature 11°C, water temperature 11.5 to 12.6, dry

3.3.2.1 Population Estimate

The great crested newt population on site was categorised according to the peak number of individuals identified during a survey visit in accordance with current guidelines [17].

3.4 Common Toad Survey

Adult toads were counted shortly after sunset using a high-powered torch at Pond 3 on 13th, 17th, 24th and 27th March 2014, in accordance with the Herpetofauna Workers' Manual [18]. Pond 3 is shown on Figure 2. The minimum temperature recorded was 4°C, with no rain noted during any of the surveys.

The population size was estimated based on the peak count recorded, with a count of less than 100 individuals being associated with a low population and count between 100 and 1000 representing a good population [18].

3.5 Limitations

Access could not be obtained to land outside the survey area (refer to Figure 4), meaning that it was not possible to search for latrines or badger setts within 40m of the site, or inspect the main sett recorded by WSP Environmental Ltd. (WSP) beyond the southeast boundary of the site [4]. It is therefore possible that some or all of the territories of the badger clans recorded within the site extend outside of the site. Conversely, it is also possible that badger clans centred at main setts outside the site extend into the site. This also meant that it was not possible to conduct great crested newt surveys on ponds within 500m of the site and connected by suitable habitat.

It was not possible to complete a full survey on WB 1, due to health and safety issues associated with cows near to the trees. This survey was attempted on 14th May (dusk), 4th June (dusk) and 9th June (dawn) and on each occasion the surveyors had to abandon the survey and survey a different feature. As such, the survey on B2 on 4th June was only a partial survey, with a complete survey on B2 undertaken on 9th June (dusk).

The majority of the surveys were undertaken in suitable weather conditions for undertaking bat surveys, with temperatures above 5°C (and the majority above 10°C) and no strong wind or rain. However, during the survey on 9th June (dusk) there were some heavy rain showers. Bat activity was nevertheless recorded during the survey, but there may have been less activity and bats may have emerged later to avoid the strongest showers. A dawn survey of B59 was planned on 22nd May, but had to be cancelled due to heavy rain. This was not considered to pose a significant constraint, due to the low levels of bat activity recorded during the dusk survey on 21st May.

4 Results

4.1 Bats

4.1.1 Bat Box Inspections

No roosting bats were recorded in the bat boxes, although some of the boxes contained collections of old droppings: 21; 59; and 130. All of the other boxes were empty. The bat box on Tree 30 was chewed at the entrance and that on Tree 59 had fallen to the ground. The others appeared to be in a good condition.

4.1.2 Emergence and Return Surveys

The following species were recorded:

- Common pipistrelle *Pipistrellus pipistrelles*;
- Soprano pipistrelle;
- Nathusius' pipistrelle *Pipistrellus nathusii*;
- Noctule;
- Leisler's bat *Nyctalus leisleri*;
- *Myotis* sp.;
- Daubenton's bat *Myotis daubentonii*; and
- Brown long-eared bat.

Possible or confirmed pipistrelle roosts were recorded in five locations, at B2, B5, B56, WB 4 (T158) and WB 9. Details regarding these locations are provided in Table 4.

Table 4 Possible or Confirmed Bat Roosts

Feature	Status	Species	Details
B2	Confirmed roost	Common pipistrelle	One bat seen returning to a gap in the brickwork on the northern façade at 04:29, 13 minutes prior to sunrise.
B5	Possible roost	Common pipistrelle	One bat seen flying along the southwest façade at 04:50, 28 minutes before sunrise. This bat flew out of the line of sight, but was not seen to return to the building.
B56	Confirmed roost	Common pipistrelle	One bat seen flying below the eave on the southwest façade at 04:22 and 04:23 (latest observation being 33 before sunrise) and then flying northwest away from the building.
WB 4(T158)	Confirmed roost	Common pipistrelle	One bat seen circling T158 at 21:15, 28 minutes after

			sunset, and flying southwest.
WB 9	Possible roost	Soprano and/or common pipistrelle	Soprano pipistrelle recorded from 21:23, nine minutes after sunset and possibly emerging from the woodland at 21:39. Common pipistrelle seen foraging within the woodland at 21:31.

Key pipistrelle foraging areas were recorded at Brookfield Farm and around the woodland blocks. Key results, in terms of possible or confirmed emergence from or return to roosts and areas of important foraging and commuting activity, are shown on Figure 1.

Bat activity recorded during each of the surveys is described in Appendix D.

4.2 Badger

The results of the badger bait-marking survey are outlined in the Stage 2 Confidential Badger Appendix. Figure 3 shows the badger signs recorded across the survey area. An additional main sett was recorded within the Phase 2 site, as well as a further sett within the OSIA. Further badger signs were also recorded across the survey area, principally comprising latrines and dung pits.

The results of the bait-marking survey are illustrated in Figure 4, which shows where the different coloured pellets were recorded within the dung pits and latrines across the survey area, as well as how much they were used.

4.3 Great Crested Newt

4.3.1 Habitat Suitability Index

The HSI score for Pond 9 was 0.55, which falls within the below average suitability category for great crested newts. Table 5 summarises the results of the survey.

Table 5 Pond 9 Habitat Suitability Index Calculations

HSI Factor	Criteria	HSI Scores
Location	Optimal	1
Pond area (m^2)	22	0.05
Pond drying	Annually	0.1
Water quality	Moderate	0.67
Shade	20%	1
Fowl	Absent	1
Fish	Absent	1
Ponds	Nine (2.9)	0.84
Terrestrial habitat	Good	1
Macrophytes	75%	1

4.3.2 Presence/Absence Survey

Table 6 details the results of the great crested newt presence/absence surveys. The ponds are identified in Figure 2.

Great crested newts were recorded in Ponds 4 and 5. Smooth newt, common frog and/or common toad were discovered in the remaining ponds. No newt eggs were recorded during the egg searches.

Table 6 Great Crested Newt Presence/Absence Survey Results

Visit	Pond 1	Pond 2	Pond 4	Pond 5	Pond 7	Pond 9
1	1 smooth newt (M) 2 smooth newt (F, 1 gravid) 1 common toad	7 common toads	-	**3 great crested newts (M, 1 sub-adult)** 1 smooth newt (F) Frogspawn and 100+ tadpoles	4 smooth newts (2M and 2F, 1 gravid)	3 smooth newts (2M and 1F, gravid)
2	3 smooth newt (2M and 1F)	1 smooth newt (F, gravid)	**3 great crested newts (2F and 1M)** 2 smooth newts (1M and 1F)	**2 great crested newts (1F, gravid and 1M)** 7 smooth newts (5M and 2F, 1 gravid) 3 common frogs	3 smooth newt 1 common toad	5 smooth newts (3M and 2F, gravid) 1 common frog
3	-	5 smooth newt (3F and 2M)	4 smooth newt (2M and 2F, gravid)	1 smooth newt (F, gravid) 50+ common toad and common frog tadpoles	-	Dry
4	-	-	12 smooth newts (8M, 4F)	Many froglets	-	Dry
5	1 smooth newt (gravid)	-	13 smooth newts (10M and 3F, 1 gravid) 2 frogs	Dry	-	Dry
6	-	-	-	Dry	-	Dry

4.3.3 Population Estimate

The great crested newt peak counts in Ponds 4 and 5 were three, recorded during visits 2 and 1 respectively. The peak count during a single visit was 5, which was recorded during visit 2. A peak count of 5 indicates that the great crested newt population on site is 'small'.

4.4 Common Toad

The results of the survey are provided in Table 7. The peak count was 88 toads, recorded on 17th March. This equates to a low population [18]. Spawn was recorded on 24th and 27th March. Common toads were only recorded around the western side of Pond 3.

Table 7 Results of Common Toad Survey

Date	Common Toad Count
13.03	7
17.03	88
24.03	62
27.03	0

5 Discussion

5.1 Bats

5.1.1 Bat Boxes

The presence of old bat droppings indicates that these boxes have been used in the past, but does not necessarily indicate an active roost. At the same time, the bat boxes containing old droppings were generally of a design that is likely to retain droppings, whereas other box types checked may not contain droppings even where bats have been or are present. The bat box on Tree 30 was chewed at the entrance, making it less suitable for roosting bats; the same applies to the box that was erected on Tree 59 that had fallen to the ground. The bat boxes were in suitable locations in terms of being used in the future; it can take many years for boxes to be used by bats.

5.1.2 Confirmed Roosts

5.1.2.1 WB 4 - T158

It is thought that T158 supports a common pipistrelle roost. The bat recorded during the survey on 12th May was not seen to emerge from this tree, but this is thought likely to be the case, considering the timing of this call (22 minutes after sunset) and since this bat was seen to circle T158, rather than fly from another location. It is also possible that this bat emerged from a tree nearby, within WB4. Only one common pipistrelle bat was recorded (either a lone male bat or non-breeding female), indicating that the tree supports a small roost of low conservation importance.

5.1.2.2 B2

B2 supports a common pipistrelle roost. A single bat was seen to return to a gap in the brickwork on the northern façade. This bat could be roosting in a narrow crevice in the brickwork, or it is possible that the hole in the brick leads into a wall void or any number of crevices within the building itself. The results indicate that this building supports one or two male or non-breeding female bats, which represents a roost of low conservation importance.

5.1.2.3 B55

No bats were recorded returning to this building during the survey on 4th June. The common pipistrelle activity recorded during the survey sounded close by, but was not observed. It is thought likely that bats were foraging to the east of B55, adjacent to B56 (refer to Appendix D), as the view to the east was obstructed by a tall hedge. The same also applies to the activity recorded close to dawn, with the last recording at 04:21 being 21 minutes prior to dawn.

Considering that bat droppings and feeding remains characteristic of brown long-eared bat were recorded within the roof void of this building during the internal inspection, it is nevertheless considered that this building supports roosting bats.

This species echolocates quietly, meaning that activity often goes undetected, particularly since this species typically returns to roost from approximately 60 minutes prior to sunrise [3], when it is still quite dark. Furthermore, a brown-long eared bat was seen flying towards B55 during the survey of B56 on 21st May at 03:36, one hour and 20 minutes prior to dawn. This species was also recorded during the survey of B64 and B66 on 30th May, at 03:45, an hour before dawn. Further survey work is required to confirm the status and conservation importance of this roost (refer to Section 6.2).

5.1.2.4 B56

B56 supports a common pipistrelle roost. Although the bat recorded flying below the eave on the southwest façade of the building was not seen to return to this building, the behaviour of the bat indicated that it had roosted in this building in the past and likely utilises a number of different roost sites depending on the time of year and local conditions. The roost is accessed via a hole in the wooden cladding below the eave, which is likely to lead to a void within the pitched roof of the extension to this building. It is considered that this building supports a small roost of one or two male or non-breeding female bats, which is of low conservation importance.

5.1.3 Possible Roosts

5.1.3.1 WB 9

The first bat recorded during the dusk survey on 3rd June was a soprano pipistrelle recorded at 21:23, nine minutes after sunset. A common pipistrelle was also observed flying within the woodland at 21:31. It is considered likely that these bats emerged from a tree or different trees within the woodland and then foraged along the woodland edges. It is suggested, therefore, that at least two bats are likely to roost within the woodland. It is possible that more than two bats roost within the wood, but emergence of a small number of common or soprano pipistrelle bats indicates a roost, or multiple roosts of low conservation importance, comprising male or non-breeding female bats.

5.1.3.2 B5

Common pipistrelle was recorded close to dusk and dawn during the surveys. The first bat observed during the dusk survey was recorded flying towards the building and was not thought to have emerged from the building. However, during the dawn survey, common pipistrelle was observed flying along the southwest façade of the building, at which it disappeared from view; it is possible that this bat returned to the building at 04:50, 28 minutes before sunrise.

5.1.3.3 Foraging and Commuting

Frequent activity was recorded during the WB 4 survey, which was mainly common pipistrelle, with occasional noctule, soprano pipistrelle and *Myotis* sp. calls. Considering the strength of these calls and since this activity was not observed, it is thought possible that some of this activity was associated with the

adjacent lake, which has been found to be of importance to these species during surveys in 2012 and 2013.

Common, soprano and Nathusius' pipistrelle bats were recorded foraging and commuting along the edges of the woodland blocks in the southern part of Oakington Barracks and Airfield (refer to Figure 1). It is thought likely that the woodlands provide shelter from the wind, such that along the woodland edges their insect prey is more abundant. The woodlands also provide a feature in the landscape along which bats can navigate.

The track through Brookfield Farm provides foraging and commuting habitat for common pipistrelle, with at least two bats observed at any one time. Brown long-eared bat has also been recorded in this part of the site, which is likely to be associated with a roost in B55. Common pipistrelle foraging activity was recorded near to dawn during the surveys of B55, B64 and B66, which indicates the presence of a roost nearby, which is likely to be associated with the roost in B56. Intense common pipistrelle foraging activity was also noted to the southeast and southwest of B5, which may also be associated with a roost in this building or nearby.

5.2 Badger

The badger territories are shown in Figure 5 within the Stage 2 Confidential Badger Appendix. A total of five badger clans were recorded. Most badger activity was recorded within Oakington Barracks and Airfield, particularly in the southeast corner. The territories of the grey and yellow clans cover much of the Phase 2 site and the blue and orange clans cross the proposed road in the southern part of Oakington Barracks and Airfield. The territory of the red clan does not fall within the site; this clan roams across much of the OSIA to the south and southeast of the site. The clans recorded within the survey area are discussed in the Stage 2 Confidential Badger Appendix.

Figure 4 shows that baited droppings were recorded across much of the survey area, with most activity recorded in the southeast corner of Oakington Barracks and Airfield. Badger territories stretch across most parts of the survey area, with the exception of the arable land in the northeast corner of the site, the central southern part of the barracks and the majority of the farmland to the south. One of the main setts is located within the boundary of the site, which is associated with the grey clan. However, the territories of the clans cross into the site at various locations apart from the red clan.

5.2.1 Blue Clan

The blue clan is located in the southeastern part of Oakington Barracks and Airfield between the orange and red clans. Particularly intense territorial activity was recorded along the northern boundary with the orange clan.

As indicated in Figure 4, there are no clear territorial boundaries between setts 7, 11, 17 and 18. Furthermore, in each case, latrines or dung pits have been recorded containing coloured pellets from more than one of these setts. As such, these setts have been attributed to a single clan. Most badger activity was recorded at sett 7, in terms of the uptake of the bait, number of active holes and presence of fresh

spoil, meaning that this has been defined as the main sett. The annexe setts are all well-used and are also considered to be important to the clan.

The presence of more than one sett that shows qualities normally associated with main setts within the territory of the blue clan indicates that a high density of badgers is present in this part of the survey area. This is likely to relate to the quality of the habitat, in terms of the presence of open short grassland that provides ideal foraging habitat and the woodlands that provide cover for sett-building.

The majority of the territory for the blue clan is located outside the boundary of the site, although it does cross the proposed link to the Cambridgeshire Guided Busway (CGB).

5.2.2 Orange Clan

The orange clan is located on the eastern boundary of the survey area, bordering the CGB between the grey and blue clans. Strong territorial activity was recorded on the southern border with the blue clan, with the main sett being located relatively close to this border. This clan also borders the yellow clan to the west. The territory for the orange clan crosses the proposed link to the CGB.

5.2.3 Grey Clan

The grey clan is located in the northwest corner of the survey area, bordering the orange and yellow clans to the south. The most intense territorial activity was recorded on the northern boundary, to the south of Brookfield Farm. Some dung pits and latrines were recorded in the northern part of the site (Figure 3), but no coloured pellets were noted. It is therefore considered likely that another badger clan is active around Brookfield Farm and beyond the northern site boundary. This is corroborated by the results of the badger survey work associated with the planning application for Northstowe Phase 1 [19].

Badgers associated with the grey clan roam across much of the Phase 2 site. Comparison with the proposed development plans indicates that the main sett is located within the grounds of a proposed primary school. There are extensive areas of proposed open space associated with the secondary school and waterpark to the east of this sett.

5.2.4 Yellow Clan

The yellow clan is located in the western part of the barracks and has a relatively extensive territory bordering the grey clan to the north, but also ranging into the arable habitats to the south. Most territorial activity was noted on the southwestern boundary of the territory, although this border does not currently appear to be contested by any of the other clans within the survey area.

The main sett of the yellow clan is located outside the site, but the territory extends into the Phase 2 site to the northeast and also crosses the roads between the Phase 2 site and Longstanton Road, as well as the proposed main road between Longstanton Road and Hatton’s Road.

5.2.5 Red Clan

The red clan is entirely contained within the arable habitats in the southern part of the survey area. Only one or two baited droppings were recorded in any one latrine or dung pit, indicating no strong territorial activity. The arable habitats are less favourable in terms of foraging opportunities, but there is ample habitat available that does not appear to be strongly contested by any other clans. The territory associated with the red clan is located entirely outside the site.

5.3 Great Crested Newt

Great crested newt was recorded in Pond 4, which aligns with the results of the surveys undertaken in 2012 [2] and 2013 [1]. Great crested newt was also recorded in Pond 5, where this species has not been recorded during previous surveys. However, this pond dried up during the surveys in 2013 and 2014, which decreases its potential value to breeding great crested newts. Pond 7 is the only pond within the site; this pond was not found to support great crested newt, although smooth newt and common toad were recorded.

No great crested newt eggs have been recorded during any of the surveys. However, the presence of a gravid female in Pond 5 during the survey on 7th to 8th May indicates that this species breeds within the site. This pond was dry prior to 28th May, indicating that any eggs laid in this pond would not have survived.

The results of the surveys undertaken in 2013 and 2014 are relatively consistent. The peak count of 1 recorded in 2013 (20th to 21st May and 3rd to 4th June) was similar to the peak count of 5 recorded in 2014; these both relate to a small population. The slightly higher peak count in 2014 and presence of great crested newts in Pond 5 could be attributed to the earlier commencement of the surveys, when Pond 5 remained dry for the majority of the surveys (four out of six visits).

The peak count of 13 observed on 10th to 11th May 2012 is higher than in 2012 and 2013, equating to a medium population. The site was considered to support a medium population following the surveys in 2013, on a precautionary basis due to the higher peak count recorded in 2012. However, the results of surveys undertaken in 2013 and 2014 were consistent and indicate that a small population is present on the site, which is the conclusion drawn here.

A total of 54 great crested newts were recorded in two garden ponds at The Drift during a single evening torching survey in March 2012 (Rob Mungovan; personal communication). This equates to a medium population, which is larger than the population recorded. These were recorded at Ordnance Survey grid reference TL 407 644, approximately 200m to the southeast of the site. There is a minor road (Longstanton Road) between the site and these ponds; however, this road is unlikely to prevent or significantly impede movement of great crested newts onto the site. It is possible that the population on the site is not self-sustaining, as it may be supplemented by breeding populations outside the survey area, including the ponds described above.

It is concluded that the peripheral areas in the southern part of Oakington Barracks and Airfield provide valuable terrestrial habitat for great crested newt, but that the ponds do not provide important breeding habitat. During a reptile survey in 2013, great crested newt was recorded under reptile mats around southern boundary of the barracks, with a peak count of two recorded on two

surveys [1]. The ephemeral nature of the ponds on the site and disturbance from poaching are likely to limit the potential for successful breeding on the site. There is therefore significant potential for the value of the site for great crested newt to increase, with the provision of improved breeding habitat.

Pond 4 is less than 500m from the proposed access road. There is therefore considered to be a potential for great crested newt to occur within the terrestrial habitats within the site, particularly the woodlands and scrub that may provide hibernacula during the winter and foraging habitat and refugia during the active season. Great crested newt has also been recorded in Ponds 1 and 2 [2], which are located on the opposite side of the proposed access road, also within 500m.

5.4 Common Toad

The peak count of individuals recorded was 88, indicating a low population overall. All of the common toads were recorded around the western edge of Pond 3, indicating that they commute from the west, likely from within and beyond the barracks over Longstanton Road. The belts of woodland and grassland at the barracks provide suitable terrestrial habitat for common toad.

6 Recommendations

6.1 Mitigation

6.1.1 Bats

6.1.1.1 Bat Boxes

It is recommended that the bat boxes are retained at the site, ideally in the same locations, where these trees are being protected during the course of the proposed development works. Where it is not possible to retain these trees, the bat boxes should be checked by a licensed bat worker, ideally during the spring or autumn. Assuming that they do not support an active roost, they should then be relocated to mature trees that will be retained and protected and not be subject to high levels of disturbance during the course of construction work, as well as the operation of the proposed development. Any damaged boxes should be repaired (or replaced) and fallen boxes reinstalled.

It would not be possible to relocate any boxes that support an active roost, unless these works take place under an approved EPS Mitigation Licence. To minimise the risk of recording a roost shortly prior to the commencement of clearance and construction work, it would be possible for a licensed bat worker to check the boxes and block them up ahead of works commencing.

6.1.1.2 Confirmed Roosts and EPS Licensing

An EPS Mitigation licence would need to be issued to and approved by Natural England once planning permission is granted but prior to the commencement of the work. The licence application would request permission to undertake works that would result in an offence under the WCA and Habitats and Species Regulations (refer to Section 2.3.1), which could include temporary or permanent disturbance as well as the loss of roosts. The scope of this document would be dependent on the results of the further survey work recommended in Section 6.2, but would cover T158, B2, B55 and B56 as a minimum.

The licence application would contain a full mitigation strategy, the details of which would be defined once the further surveys have been undertaken. Certain factors would also influence this strategy, including the proposed timings of works and opportunities for compensation and enhancement. Various measures would be employed, including programming the works to avoid the most sensitive times of year, excluding bats from the roost and/or conducting a soft-strip or soft felling under the guidance of a licensed bat worker. Bat boxes and/or bespoke bat houses would need to be installed prior to the commencement of these works to compensate for the loss of the roost.

6.1.1.3 Possible Roosts

It is possible that B5 supports a common pipistrelle roost, but this was not confirmed during the surveys. Precautionary measures should be employed during the demolition of this building, comprising a soft strip of features that could support roosting bats. Work would need to halt if roosting bats are recorded,

which could lead to delays. To avoid the potential for delays, an additional return survey could be undertaken on this building; should a roost be recorded, it would then be appropriate to include this building in the EPS Mitigation Licence application.

6.1.2 Badger

Only one of the main setts (sett 32, grey clan) is located within the Phase 2 site. It is recommended that this sett is retained and incorporated into the proposed development. The same applies to setts 21 and 36 that are located within the territorial boundaries of this clan. In order to maintain the grey clan in the long-term, it would also be necessary to maintain access for badgers to sufficient foraging habitat around the sett. Ideally this would comprise the existing territory as shown in Figure 5, but much of this land is proposed for residential development. The primary and secondary schools should be landscaped to provide foraging habitat for badger, as well as the waterpark to the east. This way, it could be possible to sustain this clan at the site. Tunnels would also be required to allow badgers to pass under the proposed road to the east of the primary school and beyond, to minimise mortality and discourage badgers from roaming around the private gardens. Badgers would need to be guided to the tunnels with the use of badger-proof fencing along the road.

Should it not be possible to retain the sett, it would be necessary to gain a licence from Natural England to build an artificial sett, ideally within the site, and to close the sett prior to works commencing. This licence would also cover any other works that would otherwise result in an offence under the Protection of Badgers Act 1992, including closing any other active setts and undertaking works within 30m of an active sett that may cause disturbance, such as the use of heavy machinery, or lighter machinery within 20m. Setts should be retained where possible, where these can be incorporated into green spaces that are connected to habitats outside the site.

6.1.3 Great Crested Newt

As described in the Stage 1 Ecology Report [1], due to the potential for the proposed developments to result in injury to great crested newt and the loss and fragmentation of terrestrial habitat for great crested newt, an approved EPS Mitigation Licence will be required prior to the commencement of clearance of works that could otherwise result in an offence under the WCA and Habitats and Species Regulations. This can only be obtained once planning permission has been granted. Further details regarding the licence application are detailed in the Stage 1 Report, along with mitigation measures recommended for common amphibians.

6.1.4 Common Toad

There is a potential for the proposed road to decrease connectivity for common toads between breeding habitat at Pond 3 and the surrounding terrestrial habitat. Connectivity should be maintained between Pond 3 and the surrounding habitats, particularly to the west, since breeding toads were recorded at the western edge of Pond 3. Connectivity to habitats to the east could be achieved through the

installation of amphibian tunnels below the proposed road, which may also benefit other species, such as great crested newt.

6.2 Further Survey Work

6.2.1 Bats

Emergence and return surveys or tree climbing surveys have been undertaken on all of the buildings and trees that could be affected by the proposed development, with the exception of T175 that could not be climbed due to health and safety issues. To inform EPS Mitigation licencing and build on the existing survey data, it is recommended that further surveys are undertaken on buildings and trees found to support roosting bats, as well as on the other trees, between May and August. Specific recommendations relating to each of these features are outlined below.

6.2.1.1 Confirmed Roosts

Further survey work should be undertaken on the buildings and trees that have been found to support roosting bats (WB 4 (T158), B2, B55 and B56) to inform an EPS Mitigation Licence application (refer to Section 6.1.1.2). A single survey has been undertaken on each of these features in May or June. A further two surveys should be undertaken, in each case including at least one dawn survey. T158 and the surrounding trees with bat potential in WB 4 could be climbed as an alternative to emergence and return surveys, providing that the relevant features can be climbed and inspected fully.

6.2.1.2 Trees

Further survey work should be undertaken on the trees to confirm the presence or likely absence of roosting bats and the status of any additional roosts, to inform requirements for mitigation. The specific requirements for further work would be informed by proposals for tree removal and retention and the potential for disturbance, particularly due to lighting.

In line with the recommendations set out in the Appendix C, the Category 1 and 1* scattered trees that could be affected by the proposed development should be subject to emergence and return surveys or be climbed prior to works commencing. The same applies to the Category 1 and 1* trees within the woodland blocks. Tree 175 could not be climbed due to health and safety issues, meaning that emergence/return surveys are the only option with respect to this tree.

Emergence/return surveys on scattered trees would comprise two surveys (including at least one dawn) on the Category 1 trees, with an additional survey on the Category 1* trees. Further to the surveys described in this report, one dusk or dawn survey should be undertaken on the woodland blocks containing Category 1 trees and two on those containing Category 1* trees. However, only one additional survey is recommended with respect to WB 9, which has already been subject to two surveys. In each case, this should include at least one dawn survey.

It is recommended that sufficient time is allowed to complete this work prior to the commencement of construction work on the site, to provide time for applying for an EPS Mitigation Licence and implementing any necessary mitigation measures before works start.

6.2.1.3 Buildings

B10 was considered to have a moderate potential to support roosting bats; however, very low levels of bat activity were recorded, meaning that no further survey work on this feature is recommended. It is also considered that adequate survey work has been undertaken on the buildings with a low potential to support roosting bats. As such, no further building surveys are required beyond that described in Section 6.2.1.1.

6.2.2 Badger

It is considered that no further badger survey work is necessary at this time. The results of the badger scoping and bait-marking surveys provide sufficient detail regarding the badger clans within the site and their territories to inform requirements for mitigation and assess the potential impacts of the proposed development. Further survey work will, however, be required prior to the commencement of site clearance activities, to inform the licence application and confirm the status of setts and identify any additional setts.

6.2.3 Great Crested Newt

Should it be possible to obtain access to ponds that are located within 500m of the site and connected to the site via suitable habitat, it is recommended that HSI and presence/absence survey work is undertaken. This would be valuable in terms of confirming the presence of more valuable breeding habitat for great crested newt outside the site (refer to Section 5.3).

References

[1] Ove Arup & Partner's Limited, (2014); 'Northstowe Ecology Report.'

[2] URS, (2013); 'Northstowe Protected Species Report. Version 5'

[3] Bat Conservation Trust (BCT), (2012); 'Bat Surveys; Good Practice Guidelines. Second Edition'

[4] WSP Environmental Ltd, (2007); 'Environmental Statement Appendix 10.'

[5] Her Majesties Stationary Office (HMSO), (1981); 'Wildlife and Countryside Act 1981.'

[6] HMSO, (2010); 'The Conservation of Habitats and Species Regulations 2010.'

[7] United Nations (UN), (1992); 'Convention on Biological Diversity.'

[8] JNCC and Defra (on behalf of the Four Countries' Biodiversity Group), (2012); 'UK Post-2010 Biodiversity Framework.'

[9] UK Biodiversity Partnership, (2011); 'UK Biodiversity Action Plan.' Available at: http://jncc.defra.gov.uk/page-5705.

[10] HMSO, (2006); 'Natural Environment and Rural Communities Act.'

[11] Secretary of State, (2010); 'Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 - Habitats and Species of Principal Importance in England.'

[12] Cambridgeshire and Peterborough Biodiversity Partnership, (2013); 'Cambridgeshire and Peterborough Biodiversity Action Plan.' Available at: http://www.cpbiodiversity.org.uk/.

[13] HMSO, (1992); 'Protection of Badgers Act 1992 (c. 51).'

[14] Jon Russ, (2012); 'British Bat Calls. A Guide to Species Identification.' Pelagic Publishing.

[15] Scottish Natural Heritage (SNH), (no date); 'Best Practice Badger Survey Guidance Note.

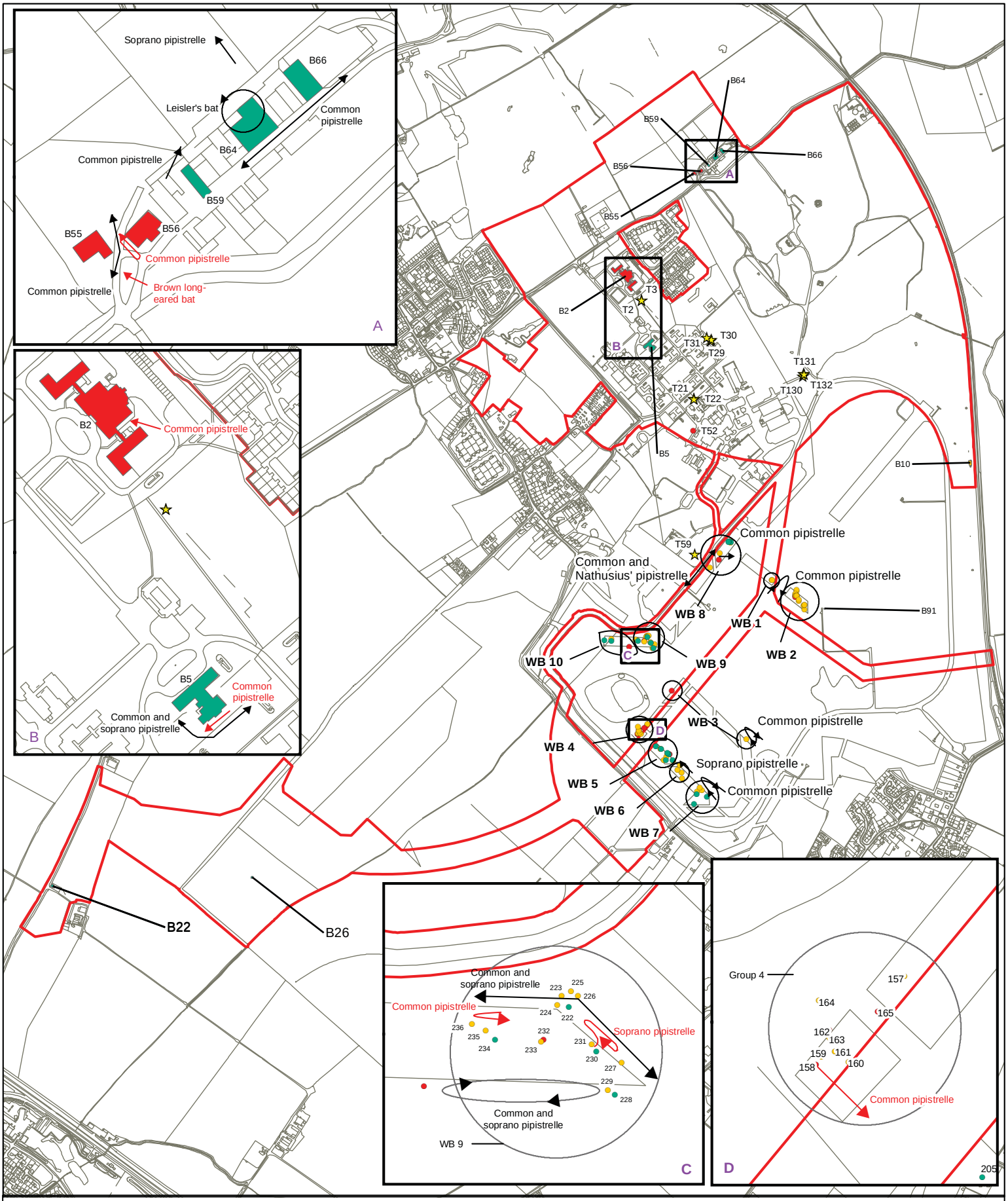
[16] Oldham, R.S., Keeble, J., Swan, M.J.S. & Jeffcote, M. (2000); 'Evaluating the suitability of habitat for the great crested newt (Triturus cristatus).' Herpetological Journal 10 (4), pp 143 – 155.

[17] English Nature, (2001); 'Great Crested Newt Mitigation Guidelines Version: August 2001.'

[18] Gent, A. H., and Gibson, S. D., *eds.* (1998); 'Herpetofauna Workers' Manual.' Peterborough, JNCC.

[19] Terence O'Rourke, (2012); 'Northstowe Phase 1 ES Technical Appendix C.'

Figures



Legend

Trees

- Category 1*
- Category 1
- Category 2

Buildings

- Confirmed
- Moderate
- Low

Bat box

Site boundary

Commuting

Foraging

Possible or confirmed emergence or return

Issue	Date	By	Chkd	Appd
P1	21/07/2014	ZW	GR	-

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Client
Homes and Communities Agency

Job Title
Northstowe

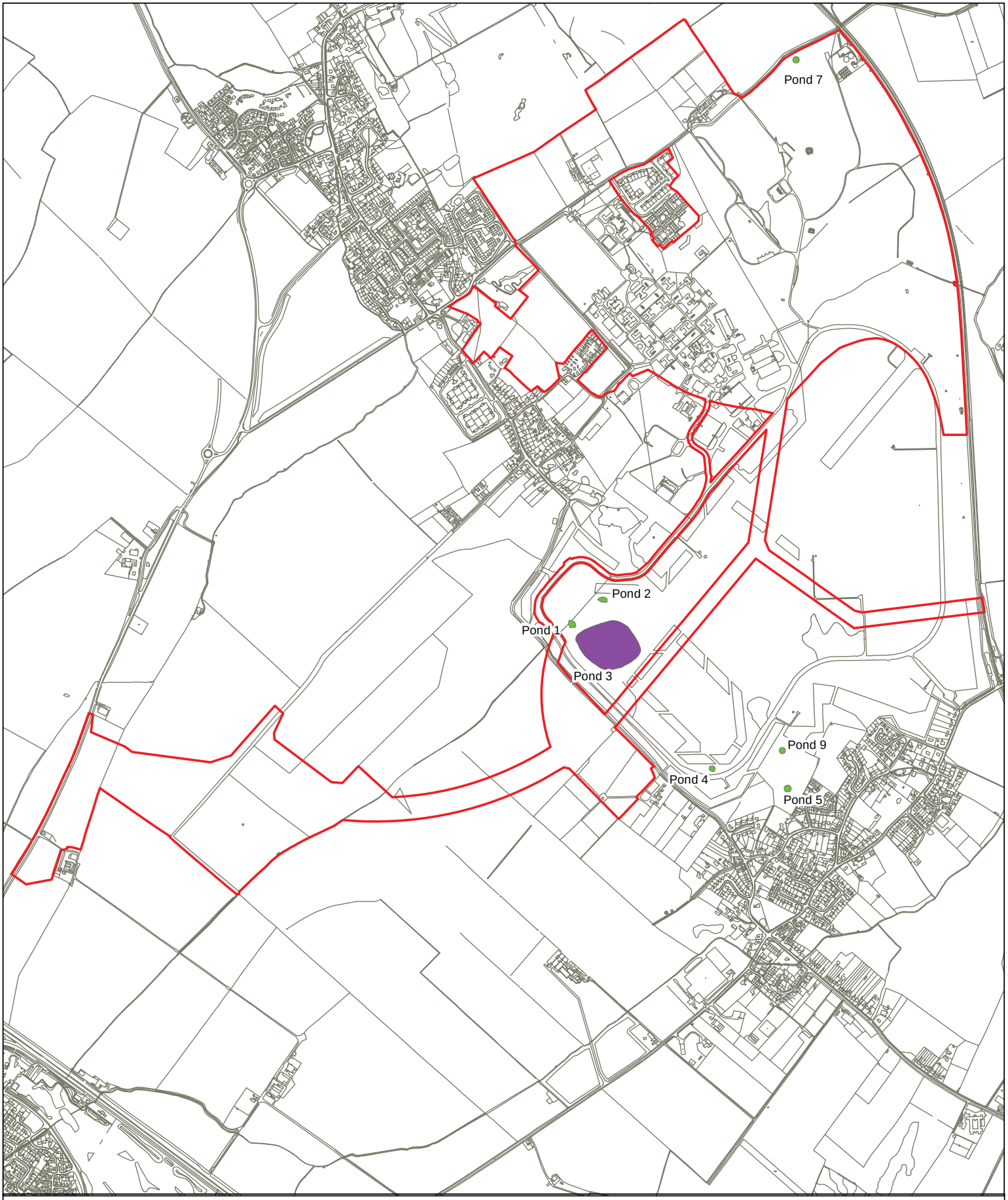
Metres
0 150 300 600

Figure 1:
Bat Survey Locations and Results

Scale at A3
1:12,000

Job No	Drawing Status
230781-05	**Issue**

Drawing No	Issue
001	**P1**



Legend

- Site boundary
- Ponds surveyed for common toad
- Ponds surveyed for great crested newt

Issue	Date	By	Chkd	Appd
P1	23/07/14	ZW	GR	-

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Job Title
Northstowe

Metres
0 150 300 600

Figure 2:
Surveyed Ponds

Scale at A3
1:12,000

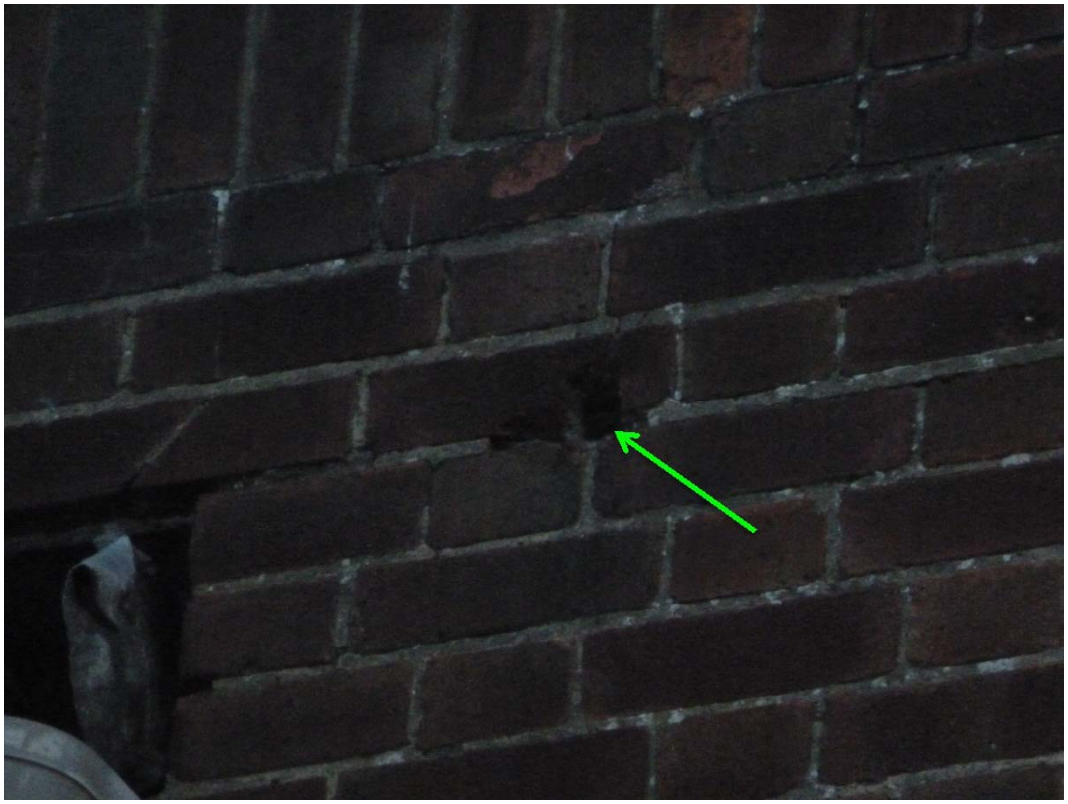
Job No	Drawing Status
230781-05	**Issue**

Drawing No	Issue
001	**P1**

Photographs

Photograph 1 T158 within WB 4

Photograph 2 B56, showing Pitched Roof Extension to the Southwest



Photograph 3 Egress Location on Southeast façade of B2

Photograph 4 Broad View of B2 and Egress Location

Appendix A

Stage 2 Invertebrate Report

INVERTEBRATE SURVEY OF NORTHSTOWE, CAMBRIDGESHIRE IN 2014:

REPORT ON AN INITIAL VISIT

MARK G. TELFER

30TH MAY 2014

THIS REPORT WAS PRODUCED FOR ARUP.

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This report should be quoted as:

Telfer, M.G. (2014). *Invertebrate survey of Northstowe, Cambridgeshire in 2014: report on an initial visit*. Report to Arup.

Contents

1 Summary

- An invertebrate survey was carried out at the Northstowe site in 2013 and reported in Telfer, M.G. (2013). *Invertebrate survey of Northstowe, Cambridgeshire*. Version 2. Report to Arup.
- A further survey was commissioned in 2014 to assess the conservation importance of the following habitats for invertebrates: (i) weedy disturbed ground, (ii) pasture with herbivore dung, and (iii) arable margins.
- Survey for grizzled skipper butterfly *Pyrgus malvae* was also commissioned in 2014.
- This short report presents the results of an initial survey visit on 29th April 2014.
- An area of apparently suitable habitat for grizzled skipper was found and surveyed. However, weather conditions were too poor for effective survey of butterflies. Thus, grizzled skipper could occur at the site but further survey would be required to assess the presence or absence of this species at the site.
- A total of 137 species of invertebrate was identified, including one Red Data Book species and four Nationally Scarce species.
- Recommendations for further survey work are made.

2 Introduction

2.1 BACKGROUND

The Northstowe site (hereafter referred to as 'the site') covers the Oakington Barracks and airfield and some adjacent farmland (**Error! Reference source not found.**). The site is proposed for the development of a new town.

Grizzled skipper butterfly *Pyrgus malvae* has been recorded locally at Over Railway Line County Wildlife Site at TL 38039 68804, approximately 2.8 km northwest of the site. The butterfly could thus potentially occur on the Northstowe site. This is a Section 41 species with a national conservation status of Vulnerable. This survey was thus commissioned to include targeted survey for this species.

Parts of the site and adjacent habitats were surveyed by the author and colleagues in 2013 (Telfer, 2013) targeting white-letter hairstreak butterfly *Satyrium w-album* and white-spotted pinion moth *Cosmia diffinis*. Further survey work was strongly recommended to assess the conservation importance of the following habitats on site for invertebrates: (i) arable margins and weedy disturbed ground, (ii) pasture with herbivore dung, and (iii) wetlands. The wetland habitats are located outside the site, in the southern part of Oakington Barracks and Airfield (Figure 1). As such, the priority habitats for survey were weedy disturbed ground and pasture with herbivore dung, followed by arable margins.

Legend

- Site boundary
- Survey area
- Suitable habitat for grizzled skipper

Issue	Date	By	Chkd	Appd
P1	02/06/2014	ZW	GR	NW

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Client
Homes and Communities Agency

Job Title
Northstowe

Metres
0 150 300 600

Figure 1:
2014 Invertebrate Survey Areas

Scale at A3
1:12,000

Job No	Drawing Status
230781-05	**Issue**

Drawing No	Issue
001	**P1**

2.2 GRIZZLED SKIPPER BUTTERFLY *PYRGUS MALVAE*

This butterfly occurs in a variety of habitats: in woodland rides and glades; on unimproved calcareous grassland on south-facing banks, cuttings and verges; and on a range of post-industrial sites such as disused mineral workings, spoil heaps and rubbish tips. It feeds on a range of plants from the Rosaceae family, such as agrimony *Agrimonia eupatoria*, creeping cinquefoil *Potentilla reptans* and wild strawberry *Fragaria vesca* where the foodplants grow in short vegetation (generally less than 10 cm tall) interspersed with bare ground and with sheltered topography or sheltering trees and shrubs. The butterfly is single brooded and adults are on the wing from the end of April until mid-June (Thomas and Lewington, 2010). Grizzled skipper was formerly widespread in southern Britain, extending into Scotland, but its range has contracted substantially, principally during the late 1900s. It remains widely but patchily distributed in southern England, favouring areas of calcareous geology (Asher *et al.*, 2001).

2.2.1 Legislation and Conservation Status

Grizzled skipper is listed in Section 41 of the Natural Environment and Rural Communities Act 2006 which lists species "of principal importance for the purpose of conserving biodiversity". Grizzled skipper is also listed as Vulnerable in Britain by Fox *et al*. (2010), indicating that on the best available evidence it is facing a high risk of extinction in the wild.

2.3 AIMS

The aims of the survey were:

- To survey for the presence of Grizzled skipper in suitable habitat;
- To survey weedy disturbed ground, a habitat which yielded four Nationally Scarce insects on the 2013 survey despite not being directly surveyed;
- To survey pasture habitat with herbivore dung, targeting dung-associated invertebrates including the Red Data Book rove-beetle *Oxytelus piceus*; and
- To survey arable margins, targeting the Section 41 and Red Data Book ground beetle *Harpalus froelichii*.

3 Methods

A single survey visit was carried out on 29th April 2014, covering the area indicated in Figure 1, though much of this area was only covered by reconnaissance rather than sampling.

The survey visit allocated some time to each of the aims (Section 2.3). The herb-rich cattle pasture adjacent to the guided bus way appeared to be potentially suitable for grizzled skipper; a walkover survey was conducted in this part of the site. The southern cattle pasture (with cattle present) adjacent to the guided bus way was briefly sampled, targeting dung invertebrates. The diverse areas of weedy, disturbed ground and abandoned gardens around the old barracks buildings and around the areas used for storage of straw bales were sampled by beating, sweeping and ground-searching. Finally, some arable margin habitats in the northern part of the site were reconnoitred.

3.1 CONSTRAINTS

Invertebrate activity is significantly affected by the weather, which can seriously diminish the effectiveness of some sampling techniques.

The weather on 29th April was overcast and cool, with a Slight Wind (F1). It was raining on arrival at 10:15 am and continued to rain lightly into the early afternoon. The afternoon was drier and occasionally brighter. Contrary to the weather forecast, 29th April was a poor day for invertebrate survey and especially for surveying butterflies.

This report was commissioned as a brief interim report and thus does not assess the importance of the site for invertebrates.

4 Results

4.1 GRIZZLED SKIPPER

Grizzled skipper was not recorded by this survey. An area of herb-rich grassland with scattered scrub was found (Figure 1; see also cover photograph) which appeared to provide suitable habitat for grizzled skipper, including frequent creeping cinquefoil, one of the butterfly's foodplants. In view of the poor weather conditions on the survey visit, there can be no confidence that the negative result of this survey is accurate. Grizzled skipper could occur at this site and further survey would be required to assess the presence or absence of this species at the site.

4.2 OTHER INVERTEBRATES

The survey identified 137 species of invertebrate (Appendix 2), including representatives of the following groups: woodlice, spiders, earwigs, planthoppers, bugs, beetles, ants, wasps, bees, flies, moths, butterflies, slugs and snails.

Amongst the 137 species recorded by this survey, there was one Red Data Book species and four Nationally Scarce (Na, Nb or N) species (Appendix 2).

5 Further Survey Work

Further survey work, addressing each of the aims of the survey (Section 2.3), is recommended, namely to survey for the presence of grizzled skipper in suitable habitat; and conduct further survey of weedy disturbed ground; pasture habitat targeting dung-associated invertebrates and weedy arable margins.

6 Acknowledgement

I would like to thank Gemma Russell for her help with arranging this survey.

7 References

Asher, J., Warren, M., Fox, R., Harding, P., Jeffcoate, G. and Jeffcoate, S. (2001). *The millennium atlas of butterflies in Britain and Ireland*. Oxford: Oxford University Press.

Fox, R., Warren, M.S., Brereton, T.M., Roy, D.B. and Robinson, A. (2010). A new Red List of British butterflies. *Insect Conservation and Diversity*, **4**, 159 - 172.

Hyman, P.S. (revised Parsons, M.S.) (1992). *A review of the scarce and threatened Coleoptera of Great Britain. Part 1.* U.K. Nature Conservation: 3. Peterborough: Joint Nature Conservation Committee.

Hyman, P.S. (revised Parsons, M.S.) (1994). *A review of the scarce and threatened Coleoptera of Great Britain. Part 2.* U.K. Nature Conservation: 12. Peterborough: Joint Nature Conservation Committee.

IUCN (2001). *IUCN Red List Categories and Criteria: version 3.1. Prepared by the IUCN Species Survival Commission*. Gland, Switzerland: International Union for Conservation of Nature.

Shirt, D.B. (ed.) (1987). *British Red Data Books: 2. Insects*. Peterborough: Nature Conservancy Council.

Telfer, M.G. (2013). *Invertebrate survey of Northstowe, Cambridgeshire*. Version 2. Report to Arup.

Thomas, J. and Lewington, R. (2010). *The butterflies of Britain and Ireland*. Gillingham: British Wildlife Publishing.

Appendix 1: British Conservation Status Categories – Definitions.

1.1 Status Categories and Criteria Version 1 (Shirt, 1987)

These status categories and criteria were introduced for British insects by Shirt (1987) and received some modifications by later authors (e.g. Hyman and Parsons (1992, 1994)).

Red Data Book category EXTINCT

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

Red Data Book category 1, Endangered

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

Red Data Book category 2, Vulnerable

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

Red Data Book category 3, Rare

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

Red Data Book category I, Indeterminate

Note: Best written as 'RDBi' rather than 'RDBI' as the latter is easily confused with 'RDB1' (Endangered).

Definition Species considered to be either Endangered, Vulnerable or Rare but with insufficient information to say which.

Red Data Book category K, Insufficiently Known

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

Nationally Scarce Category A, Na.

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

Nationally Scarce Category B, Nb.

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

Nationally Scarce, N.

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

1.2 STATUS CATEGORIES AND CRITERIA VERSION 2 (IUCN, 2001)

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

Critically Endangered (CR)

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

Endangered (EN)

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

Vulnerable (VU)

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

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

Data Deficient (DD)

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

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

Near Threatened (NT)

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

Least Concern (LC)

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

Appendix 2: List of invertebrates recorded at the Northstowe site in 2014 by Mark G. Telfer

Key Species and all BAP species are listed in red text. The table is in taxonomic sequence.

Full details of all records generated by this project are held in a computer database by the author that may be consulted if required to provide further information such as precise localities, grid references, quantity, sex and life-stage.

Class	Order	Family	Species (scientific name)	Species (English name)	Conservation Status
Malacostraca	Isopoda	Trichoniscidae	*Androniscus dentiger*	a woodlouse	None
Malacostraca	Isopoda	Philosciidae	*Philoscia muscorum*	Common Striped Woodlouse	None
Malacostraca	Isopoda	Platyarthridae	*Platyarthrus hoffmannseggii*	Ant Woodlouse	None
Malacostraca	Isopoda	Armadillidiidae	*Armadillidium vulgare*	Common Pill-woodlouse	None
Arachnida	Araneae	Dysderidae	*Dysdera erythrina*	a spider	None
Arachnida	Araneae	Pisauridae	*Pisaura mirabilis*	a spider	None
Insecta	Dermaptera	Forficulidae	*Forficula auricularia*	Common Earwig	None
Insecta	Hemiptera: Auchenorrhyncha	Delphacidae	*Asiraca clavicornis*	a planthopper	Nationally Scarce (Nb)
Insecta	Hemiptera: Heteroptera	Miridae	*Deraeocoris lutescens*	a mirid bug	None
Insecta	Hemiptera: Heteroptera	Miridae	*Stenodema laevigata*	a mirid bug	None
Insecta	Hemiptera: Heteroptera	Anthocoridae	*Anthocoris nemorum*	a flower bug	None
Insecta	Hemiptera: Heteroptera	Anthocoridae	*Cardiastethus fasciiventris*	a flower bug	None
Insecta	Hemiptera: Heteroptera	Lygaeidae	*Kleidocerys resedae*	a ground-bug	None
Insecta	Hemiptera: Heteroptera	Lygaeidae	*Heterogaster urticae*	a ground-bug	None
Insecta	Hemiptera: Heteroptera	Lygaeidae	*Stygnocoris fuligineus*	a ground-bug	None
Insecta	Hemiptera: Heteroptera	Lygaeidae	*Drymus sylvaticus*	a ground-bug	None
Insecta	Hemiptera: Heteroptera	Lygaeidae	*Megalonotus chiragra*	a ground-bug	None
Insecta	Hemiptera: Heteroptera	Lygaeidae	*Megalonotus emarginatus*	a ground-bug	None
Insecta	Hemiptera: Heteroptera	Coreidae	*Coreus marginatus*	Dock Bug	None
Insecta	Hemiptera: Heteroptera	Rhopalidae	*Rhopalus subrufus*	a rhopalid bug	None

Class	Order	Family	Species (scientific name)	Species (English name)	Conservation Status
Insecta	Hemiptera: Heteroptera	Pentatomidae	*Podops inuncta*	Knobbed Shieldbug	None
Insecta	Hemiptera: Heteroptera	Pentatomidae	*Dolycoris baccarum*	Hairy Shieldbug	None
Insecta	Coleoptera	Carabidae	*Notiophilus aquaticus*	a ground beetle	None
Insecta	Coleoptera	Carabidae	*Amara aenea*	a ground beetle	None
Insecta	Coleoptera	Carabidae	*Ophonus puncticeps*	a ground beetle	None
Insecta	Coleoptera	Carabidae	*Paradromius linearis*	a ground beetle	None
Insecta	Coleoptera	Carabidae	*Microlestes maurus*	a ground beetle	None
Insecta	Coleoptera	Hydrophilidae	*Cercyon analis*	a beetle	None
Insecta	Coleoptera	Hydrophilidae	*Cryptopleurum minutum*	a beetle	None
Insecta	Coleoptera	Ptiliidae	*Acrotrichis montandonii*	a featherwing beetle	None
Insecta	Coleoptera	Ptiliidae	*Acrotrichis sericans*	a featherwing beetle	None
Insecta	Coleoptera	Staphylinidae	*Lesteva longoelytrata*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Dropephylla ioptera*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Omalium rugatum*	a rove-beetle	Nationally Scarce
Insecta	Coleoptera	Staphylinidae	*Xylodromus depressus*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Micropeplus fulvus*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Sepedophilus nigripennis*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Tachyporus dispar*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Tachyporus hypnorum*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Tachyporus nitidulus*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Tachinus rufipes*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Amischa analis*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Amischa decipiens*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Alaobia trinotata*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Mocyta fungi agg.*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Dalotia coriaria*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Dimetrota atramentaria*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Dimetrota nigripes*	a rove-beetle	None

Class	Order	Family	Species (scientific name)	Species (English name)	Conservation Status
Insecta	Coleoptera	Staphylinidae	*Chaetida longicornis*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Acrotona parvula*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Aleochara bipustulata*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Aleochara lanuginosa*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Autalia rivularis*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Cypha longicornis*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Oligota punctulata*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Platystethus arenarius*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Anotylus tetracarinatus*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Stenus aceris*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Astenus lyonessius*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Leptacinus intermedius*	a rove-beetle	None
Insecta	Coleoptera	Staphylinidae	*Gyrohypnus fracticornis*	a rove-beetle	None
Insecta	Coleoptera	Elateridae	*Kibunea minuta*	a click-beetle	None
Insecta	Coleoptera	Elateridae	*Agriotes lineatus*	a click-beetle	None
Insecta	Coleoptera	Elateridae	*Agriotes obscurus*	a click-beetle	None
Insecta	Coleoptera	Cantharidae	*Cantharis rustica*	a soldier-beetle	LC
Insecta	Coleoptera	Dasytidae	*Dasytes aeratus*	a beetle	LC
Insecta	Coleoptera	Nitidulidae	*Epuraea biguttata*	a beetle	None
Insecta	Coleoptera	Nitidulidae	*Pocadius ferrugineus*	a beetle	None
Insecta	Coleoptera	Nitidulidae	*Meligethes aeneus*	Common Pollen Beetle	None
Insecta	Coleoptera	Nitidulidae	*Meligethes difficilis*	a pollen beetle	None
Insecta	Coleoptera	Nitidulidae	*Meligethes morosus*	a pollen beetle	None
Insecta	Coleoptera	Nitidulidae	*Glischrochilus hortensis*	a beetle	None
Insecta	Coleoptera	Monotomidae	*Monotoma brevicollis*	a beetle	None
Insecta	Coleoptera	Monotomidae	*Monotoma picipes*	a beetle	None
Insecta	Coleoptera	Silvanidae	*Ahasverus advena*	Foreign Grain-beetle	None
Insecta	Coleoptera	Phalacridae	*Olibrus affinis*	a beetle	None

Class	Order	Family	Species (scientific name)	Species (English name)	Conservation Status
Insecta	Coleoptera	Cryptophagidae	*Cryptophagus acutangulus*	a beetle	None
Insecta	Coleoptera	Cryptophagidae	*Cryptophagus punctipennis*	a beetle	None
Insecta	Coleoptera	Cryptophagidae	*Cryptophagus denticulatus*	a beetle	None
Insecta	Coleoptera	Cryptophagidae	*Atomaria linearis*	a beetle	None
Insecta	Coleoptera	Cryptophagidae	*Atomaria lewisi*	a beetle	None
Insecta	Coleoptera	Cryptophagidae	*Atomaria nitidula*	a beetle	None
Insecta	Coleoptera	Coccinellidae	*Rhyzobius litura*	a ladybird	None
Insecta	Coleoptera	Coccinellidae	*Chilocorus renipustulatus*	Kidney-spot Ladybird	None
Insecta	Coleoptera	Coccinellidae	*Harmonia axyridis*	Harlequin Ladybird	None
Insecta	Coleoptera	Coccinellidae	*Coccinella septempunctata*	7-spot Ladybird	None
Insecta	Coleoptera	Corylophidae	*Orthoperus aequalis*	a beetle	None
Insecta	Coleoptera	Corylophidae	*Orthoperus brunnipes*	a beetle	RDB3
Insecta	Coleoptera	Latridiidae	*Enicmus histrio*	a beetle	None
Insecta	Coleoptera	Latridiidae	*Enicmus transversus*	a beetle	None
Insecta	Coleoptera	Latridiidae	*Latridius porcatus*	a beetle	None
Insecta	Coleoptera	Latridiidae	*Cartodere bifasciata*	a beetle	None
Insecta	Coleoptera	Latridiidae	*Corticaria elongata*	a beetle	None
Insecta	Coleoptera	Latridiidae	*Corticaria serrata*	a beetle	None
Insecta	Coleoptera	Latridiidae	*Cortinicara gibbosa*	a beetle	None
Insecta	Coleoptera	Anthicidae	*Omonadus floralis*	an ant-like flower beetle	None
Insecta	Coleoptera	Scraptiidae	*Anaspis maculata*	a beetle	None
Insecta	Coleoptera	Cerambycidae	*Tetrops praeustus*	Plum Longhorn	None
Insecta	Coleoptera	Chrysomelidae	*Bruchus rufimanus*	a seed-beetle	None
Insecta	Coleoptera	Chrysomelidae	*Aphthona euphorbiae*	a flea-beetle	None
Insecta	Coleoptera	Chrysomelidae	*Longitarsus parvulus*	a flea-beetle	Nationally Scarce (Na)
Insecta	Coleoptera	Chrysomelidae	*Podagrica fuscipes*	a flea-beetle	Nationally Scarce (Na)
Insecta	Coleoptera	Chrysomelidae	*Chaetocnema concinna*	a flea-beetle	None

Class	Order	Family	Species (scientific name)	Species (English name)	Conservation Status
Insecta	Coleoptera	Rhynchitidae	*Tatianaerhynchites aequatus*	a weevil	None
Insecta	Coleoptera	Apionidae	*Aspidapion radiolus*	a weevil	None
Insecta	Coleoptera	Apionidae	*Aspidapion aeneum*	a weevil	None
Insecta	Coleoptera	Apionidae	*Malvapion malvae*	a weevil	None
Insecta	Coleoptera	Apionidae	*Protapion fulvipes*	White Clover Seed Weevil	None
Insecta	Coleoptera	Curculionidae	*Otiorhynchus singularis*	a weevil	None
Insecta	Coleoptera	Curculionidae	*Phyllobius pyri*	Common Leaf Weevil	None
Insecta	Coleoptera	Curculionidae	*Pachyrhinus lethierryi*	a weevil	None
Insecta	Coleoptera	Curculionidae	*Barypeithes pellucidus*	a weevil	None
Insecta	Coleoptera	Curculionidae	*Sitona lineatus*	a weevil	None
Insecta	Coleoptera	Curculionidae	*Anthonomus pomorum*	Apple Blossom Weevil	None
Insecta	Coleoptera	Curculionidae	*Tychius picirostris*	a weevil	None
Insecta	Coleoptera	Curculionidae	*Mecinus pascuorum*	a weevil	None
Insecta	Hymenoptera: Parasitica	Braconidae	*Perilitus coccinellae*	a braconid wasp	None
Insecta	Hymenoptera: Parasitica	Cynipidae	*Diplolepis spinosissimae*	a gall wasp	None
Insecta	Hymenoptera: Aculeata	Formicidae	*Lasius niger sens. str.*	an ant	None
Insecta	Hymenoptera: Aculeata	Formicidae	*Myrmica rubra*	an ant	None
Insecta	Hymenoptera: Aculeata	Apidae	*Bombus pascuorum*	Common Carder-bee	None
Insecta	Diptera	Syrphidae	*Rhingia campestris*	a hoverfly	None
Insecta	Diptera	Syrphidae	*Neoascia podagrica*	a hoverfly	None
Insecta	Diptera	Scathophagidae	*Scathophaga stercoraria*	a dung fly	None
Insecta	Diptera	Muscidae	*Mesembrina meridiana*	a house fly	None
Insecta	Lepidoptera	Pieridae	*Pieris napi*	Green-veined White	LC
Insecta	Lepidoptera	Pieridae	*Anthocharis cardamines*	Orange-tip	LC
Insecta	Lepidoptera	Noctuidae	*Paradrina clavipalpis*	Pale Mottled Willow	None
Gastropoda	Pulmonata	Agriolimacidae	*Deroceras reticulatum*	Netted Field Slug	None
Gastropoda	Pulmonata	Helicidae	*Cepaea nemoralis*	Brown-lipped Snail	None

Class	Order	Family	Species (scientific name)	Species (English name)	Conservation Status
Gastropoda	Pulmonata	Helicidae	*Cornu aspersum*	Garden Snail	None
Gastropoda	Pulmonata	Helicidae	*Cernuella virgata*	Striped Snail	None
Gastropoda	Pulmonata	Helicidae	*Monacha cantiana*	Kentish Snail	None
Gastropoda	Pulmonata	Limacidae	*Limacus maculatus*	Green Cellar Slug	None
Gastropoda	Pulmonata	Limacidae	*Limax maximus*	Leopard Slug	None
Gastropoda	Pulmonata	Valloniidae	*Vallonia excentrica*	Eccentric Grass-snail	None
Gastropoda	Pulmonata	Vertiginidae	*Vertigo pygmaea*	Common Whorl-snail	None