

The results of the bat activity on site during the transect survey on the 22nd September 2021 are summarised below in **Figure 3.6**. The survey started at listening stop 12 and continued in reverse numerical order to listening stop 1. Five bat species were recorded during the survey: soprano pipistrelle, common pipistrelle, brown long-eared, myotis sp. and noctule. Common and soprano pipistrelles were the most common species recorded, with foraging activity noted along the edge of the woodland strip between the NE field and the Network Rail field as well as constant activity on the northern woodland of the Network Rail field. Activity was recorded at all listening stops except stops 2 and 3 in the southeast corner of the NE field. Listening stops 6, 7, 8, 9 and 10 provided the most activity in one place, with constant pipistrelle activity.

Table 3.6 Dusk Transect Survey 22nd September 2021

Survey Start	Survey End	Sunset	Temp Start	Temp End	Precipitation	Wind speed (Beaufort)
18:59	20:59	18:59	20	18	None	2

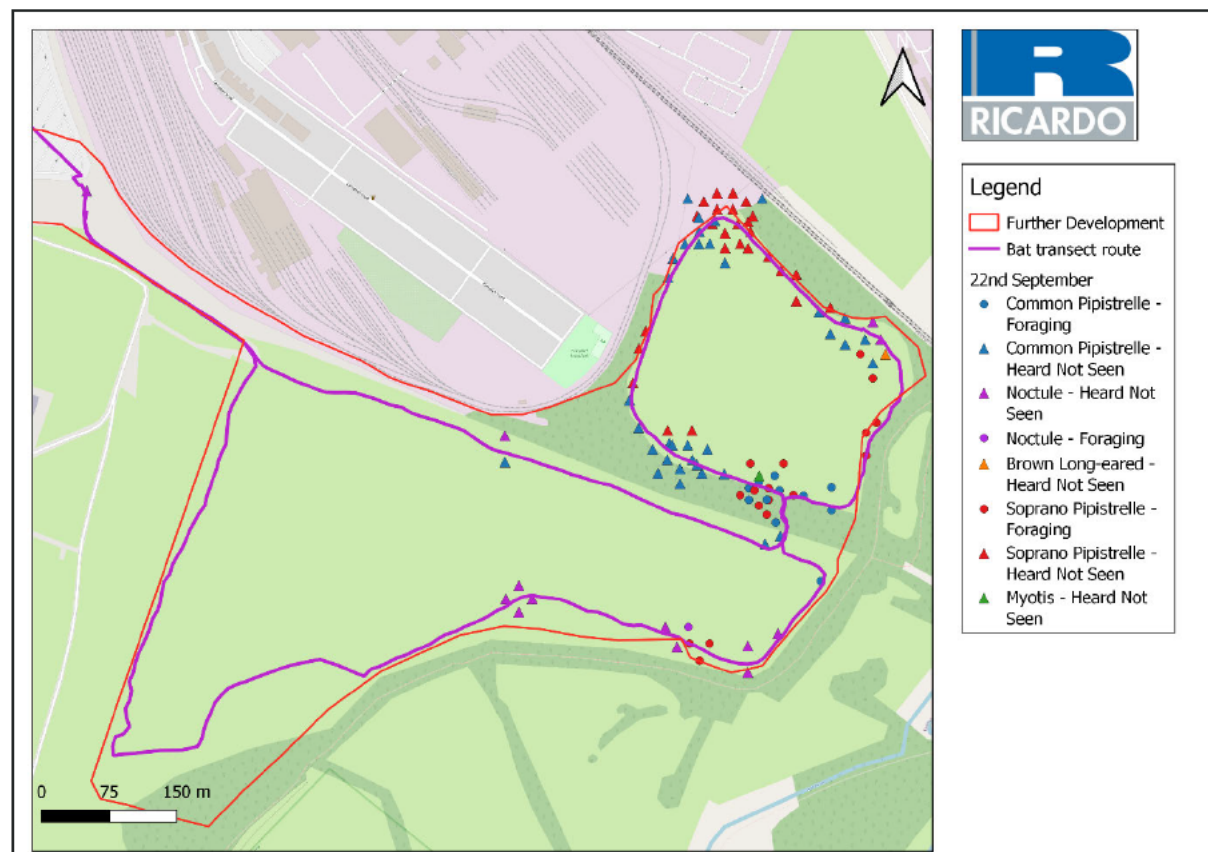


Figure 3.6 Bat Activity Dusk Transect Survey 22nd September 2021

3.1.2 October transect surveys

The results of the bat activity on site during the transect survey on the 7th October 2021 are summarised below in **Figure 3.7**. The survey started at listening stop 1 and continued in numerical order to listening stop 12. Five bat species were recorded during the survey: soprano pipistrelle, common pipistrelle, brown long-eared, myotis sp. and noctule. Common pipistrelles were the most common species recorded, with foraging activity noted along the edge of the woodland strip between the NE field and the Network Rail field as well as activity on the northern woodland of the Network Rail field. Activity was recorded at all listening stops except stops 11 and 12 on the northern boundary of the NE field. Listening stops 7, 8 and 9 provided the most activity in one place, with constant pipistrelle and noctule activity.

Table 3.7 Dusk Transect Survey 7th October 2021

Survey Start	Survey End	Sunset	Temp Start	Temp End	Precipitation	Wind speed (Beaufort)
18:29	20:29	18:25	16	10	None	2

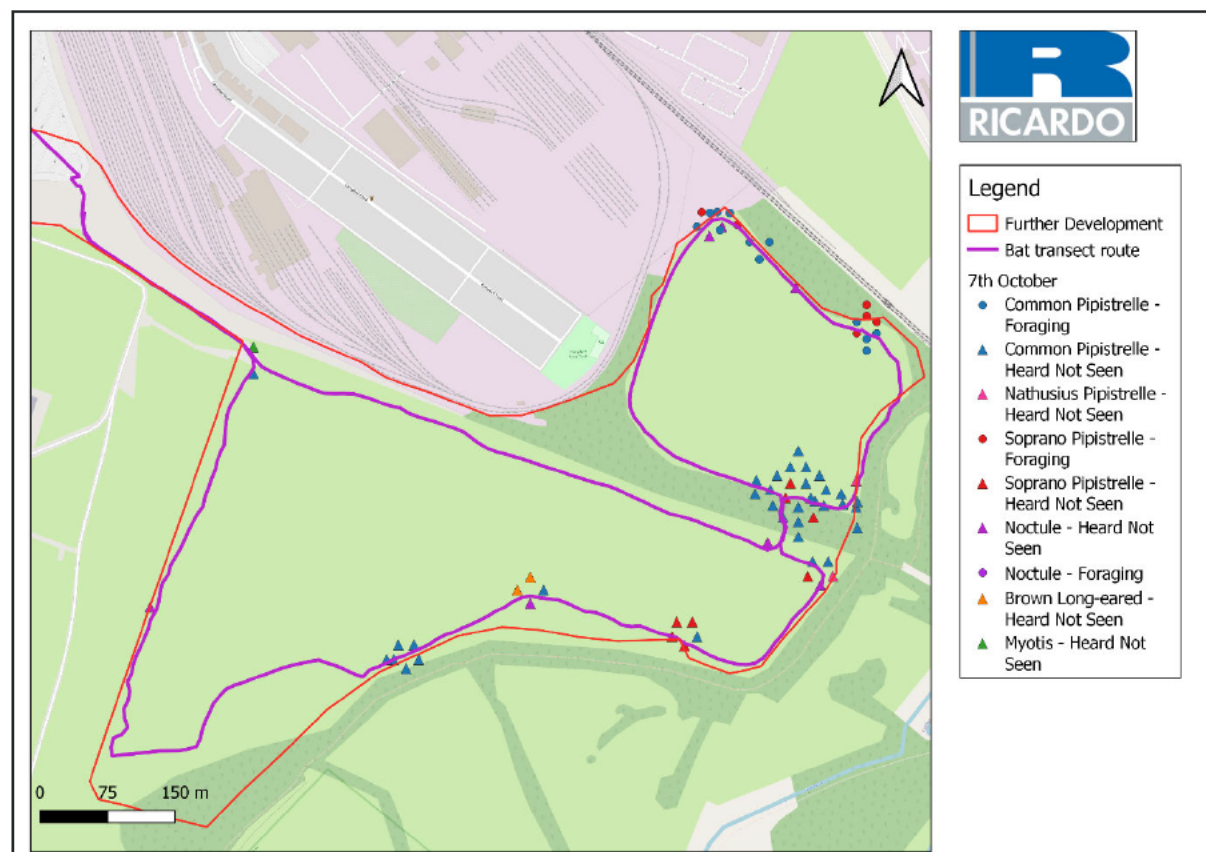


Figure 3.7 Bat Activity Dusk Transect Survey 7th October 2021

The results of the bat activity on site during the transect survey on the 19th October 2021 are summarised below in **Figure 3.8**. The survey started at listening stop 12 and continued in reverse numerical order to listening stop 1. Three bat species were recorded during the survey: soprano pipistrelle, common pipistrelle and myotis sp. Soprano pipistrelles were the most common species recorded, with foraging activity noted along the edge of the woodland strip between the NE field and the Network Rail field. Activity was recorded at all listening stops except stops 1, 2, 3, 8, 9, 11 and 12. Listening stops 6, 7 and 10 provided the most activity in one place, with constant pipistrelle activity.

Table 3.8 Dusk Transect Survey 19th October 2021

Survey Start	Survey End	Sunset	Temp Start	Temp End	Precipitation	Wind speed (Beaufort)
18:04	20:04	18:04	18	15	None	1

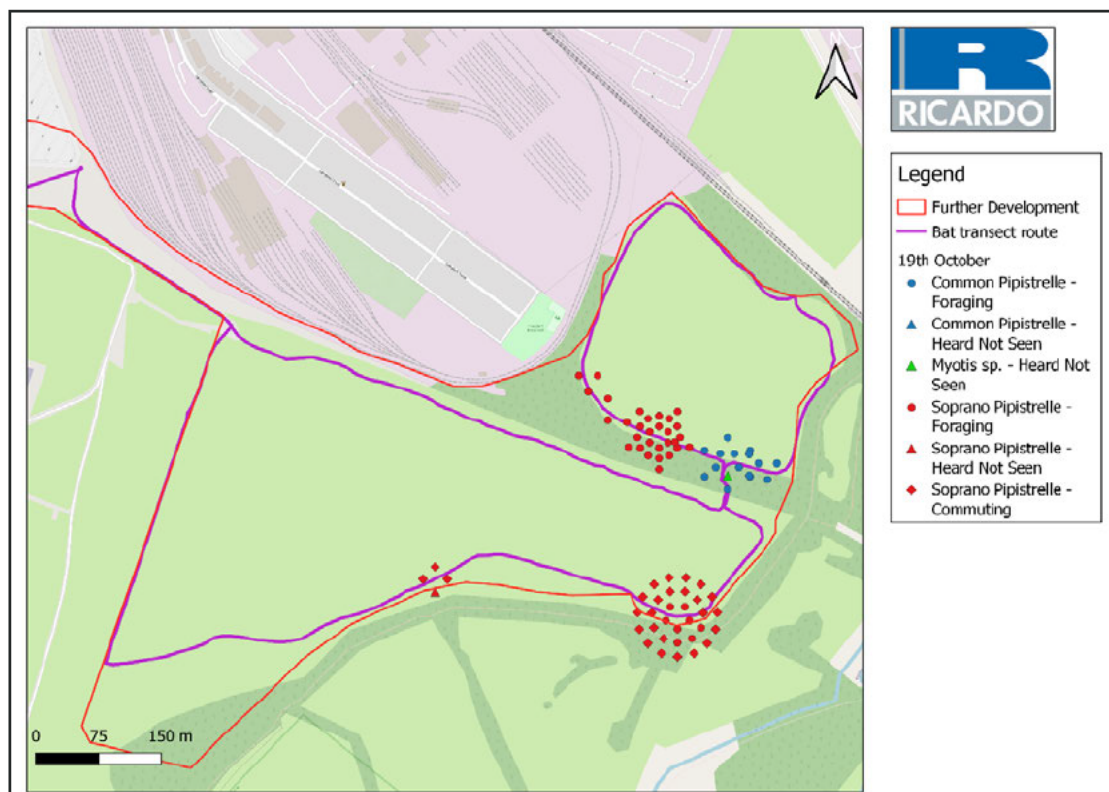


Figure 3.8 Bat Activity Dusk Transect Survey 19th October 2021

3.1.3 May transect surveys

The results of the bat activity on site during the transect survey on the 10th May 2022 are summarised below in **Figure 3.9**. The survey started at listening stop 1 and continued in numerical order to listening stop 12. Three bat species were recorded during the survey: soprano pipistrelle, common pipistrelle, and a noctule. Common pipistrelles were the most common species recorded, with foraging activity noted along the edge of the woodland strip between the NE field and the Network Rail field. Activity was recorded at all listening stops except stop 3 in the south east corner of the NE field. Listening stop 7 provided the most activity in one place, with constant pipistrelle activity.

Table 3.9 Dawn Transect Survey 10th May 2022

Survey Start	Survey End	Sunrise	Temp Start	Temp End	Precipitation	Wind speed (Beaufort)
03:23	05:23	05:36	14°C	14°C	None	1

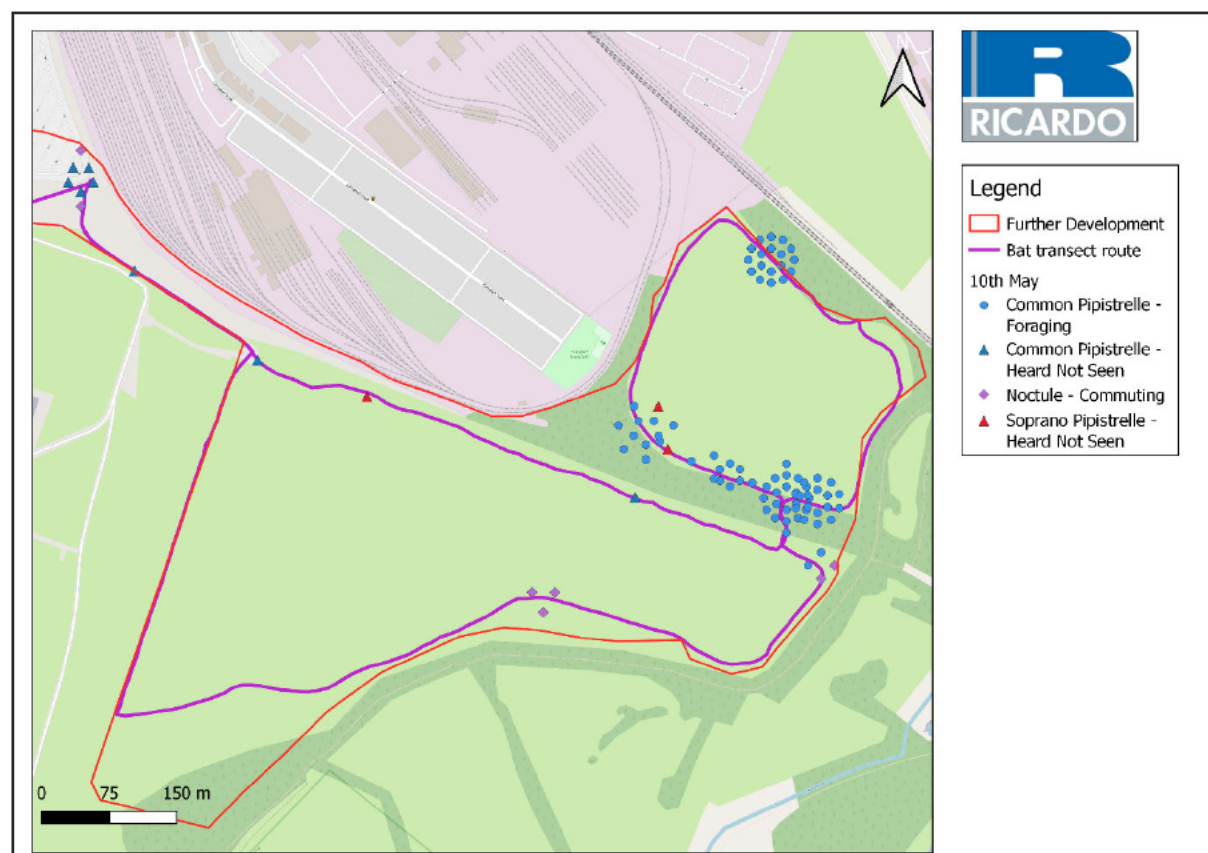


Figure 3.9 Bat Activity Dawn Transect Survey 10th May 2022

The results of the bat activity on site during the transect survey on the 26th May 2022 are summarised below in **Figure 3.10**. The survey started at listening stop 12 and continued in reverse numerical order to listening stop 1. Four bat species were recorded during the survey: soprano pipistrelle, common pipistrelle, a myotis species and a noctule. Pipistrelles were the most common species recorded, with foraging activity noted along the edge of the woodland strip between the NE field and the Network Rail field. Activity was recorded at all listening stops except stop 3 in the southeast corner of the NE field. Listening stop 7 provided the most activity in one place, with constant pipistrelle activity.

Table 3.10 Dusk Transect Survey 26th May 2022

Survey Start	Survey End	Sunset	Temp Start	Temp End	Precipitation	Wind speed (Beaufort)
21:03	23:02	21:03	17°C	15°C	None	3

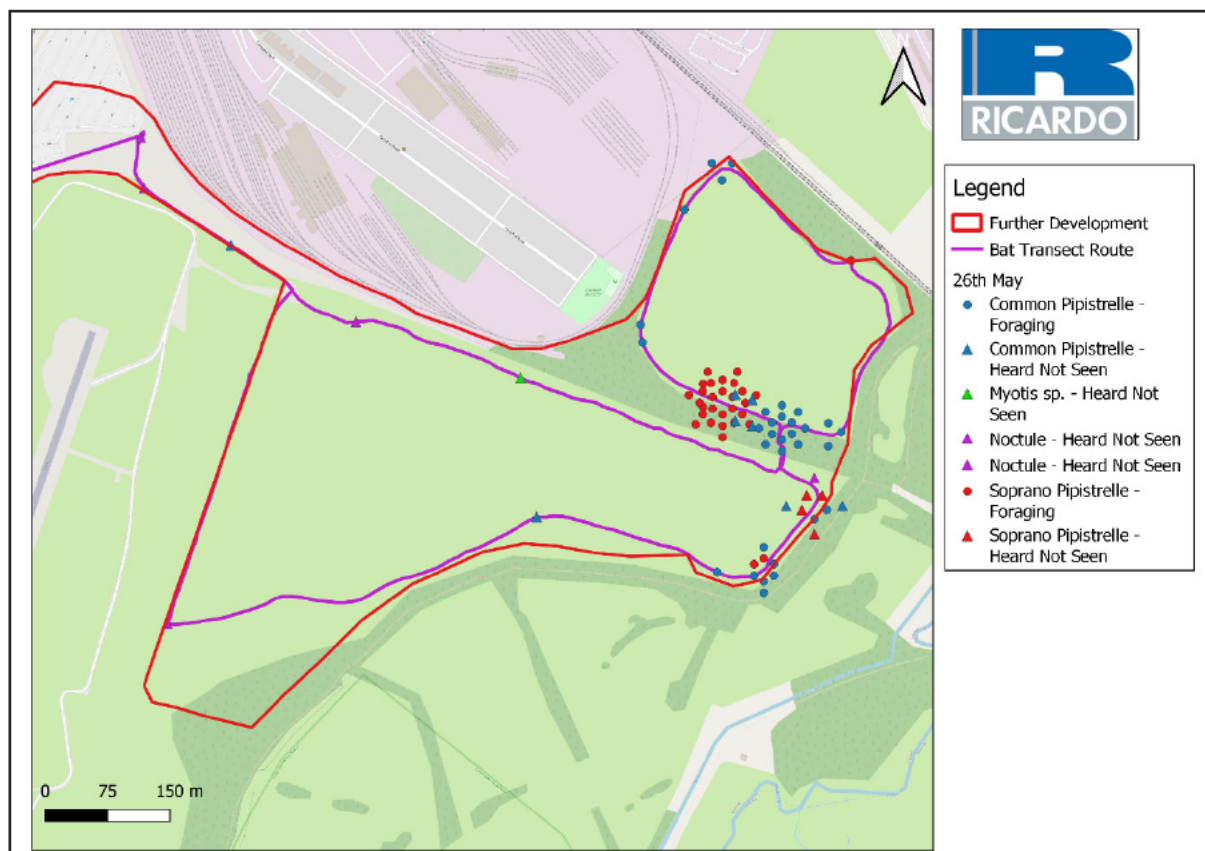


Figure 3.10 Bat Activity Dusk Transect Survey 26th May 2022

3.1.4 June transect surveys

The results of the bat activity on site during the transect survey on the 10th May 2022 are summarised below in **Figure 3.11**. The survey started at listening stop 1 and continued in numerical order to listening stop 12. Five bat species were recorded during the survey: soprano pipistrelle, common pipistrelle, grey long-eared*, brown long-eared and noctule. Common pipistrelles were the most common species recorded, with foraging activity noted along the edge of the woodland strip between the NE field and the Network Rail field. Activity was recorded at all listening stops except stop 3 in the south east corner of the NE field. Listening stop 7 provided the most activity in one place, with constant pipistrelle activity.

* Grey long-eared bat records as determined by kaleidoscope auto id.

Table 3.11. Dusk Transect Survey 9th June 2022

Survey Start	Survey End	Sunset	Temp Start	Temp End	Precipitation	Wind speed (Beaufort)
21:15	23:15	21:17	16°C	15°C	21:20 – light rain	1

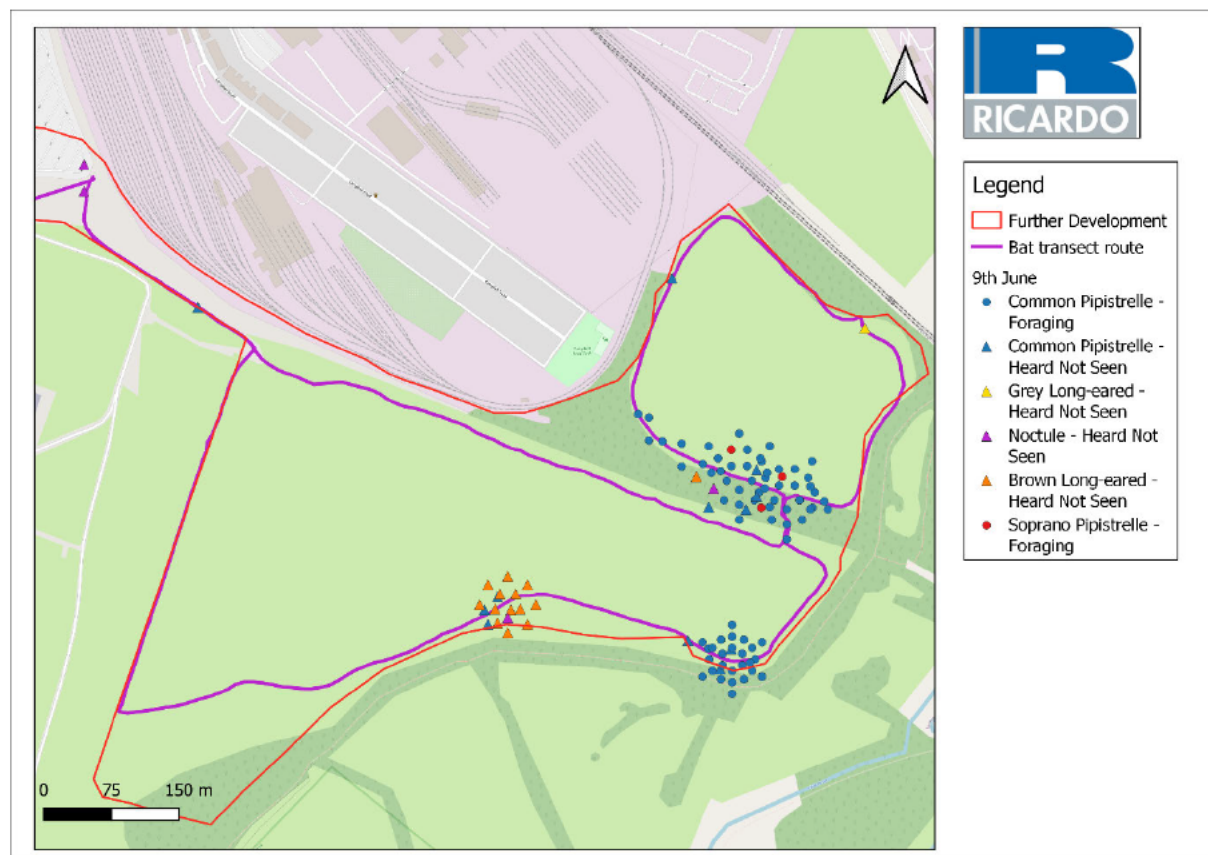


Figure 3.11 Bat Activity Dusk Transect Survey 9th June 2022

The results of the bat activity on site during the transect survey on the 23rd June 2022 are summarised below in **Figure 3.12**. The survey started at listening stop 12 and continued in reverse numerical order to listening stop 1. Six bat species were recorded during the survey: soprano pipistrelle, common pipistrelle, nathusius pipistrelle *Pipistrellus nathusii*, leisler's, a myotis species and a noctule. Common pipistrelles were the most common species recorded, with foraging activity noted along the edge of the woodland strip between the NE field and the Network Rail field. Activity was recorded at all listening stops except stops 2 and 3 on the eastern edge of the NE field closest to the airport. Listening stop 7 provided the most activity in one place, with constant pipistrelle activity.

Table 3.12 Dusk Transect Survey 23rd June 2022

Survey Start	Survey End	Sunset	Temp Start	Temp End	Precipitation	Wind speed (Beaufort)
21:19	23:20	21:23	16	15	None	1

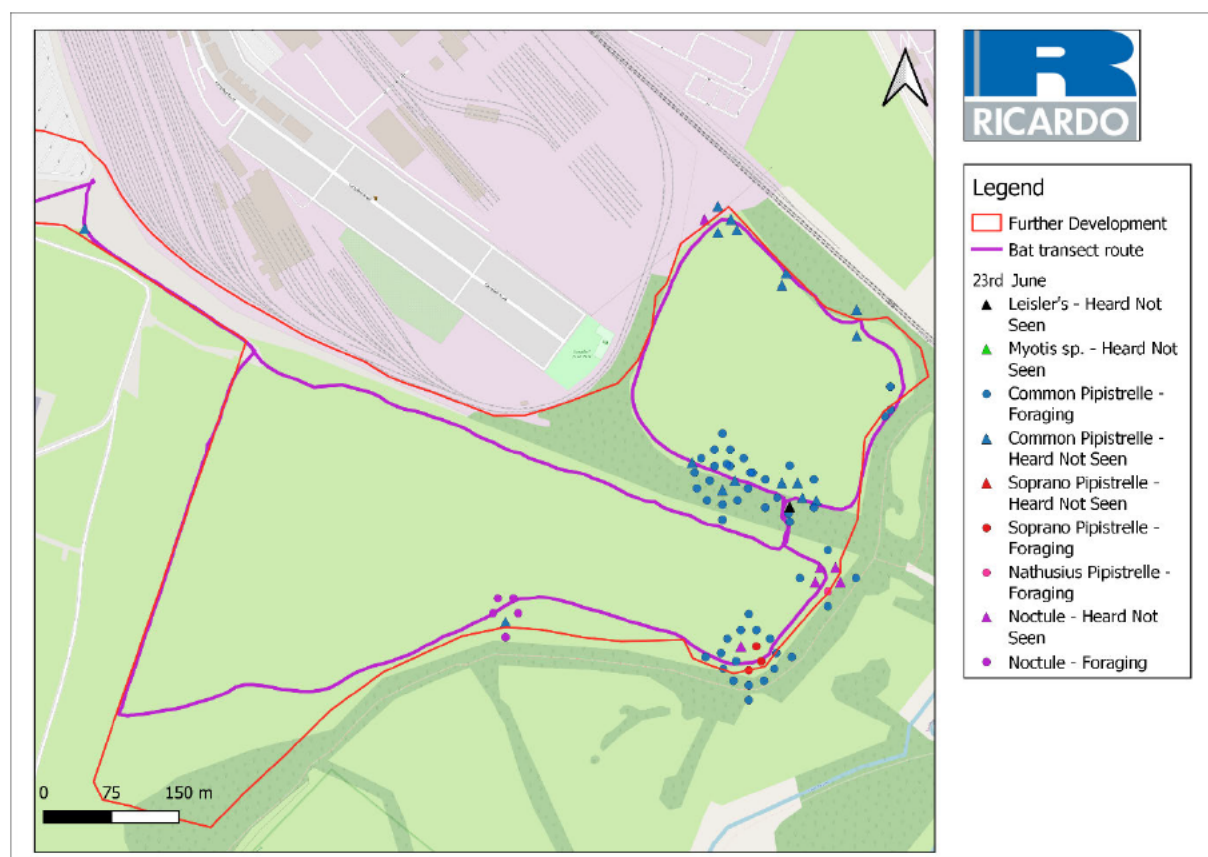


Figure 3.12 Bat Activity Dusk Transect Survey 23rd June 2022

3.1.5 Summary of transect surveys

Figures 3.13, 3.14 and 3.15 summarise the data collected on the transect surveys. The data clearly shows the site has high levels of bat activity, and that activity being focussed on the areas of woodland and associated foraging habitat. Similarly, the figures highlight that the further away from the bright lights associated with the airport and Network Rail depot the more bat activity occurs. The woodland between the NE field and the Network Rail field has the highest bat activity and the lowest light pollution while offering suitable foraging habitat.

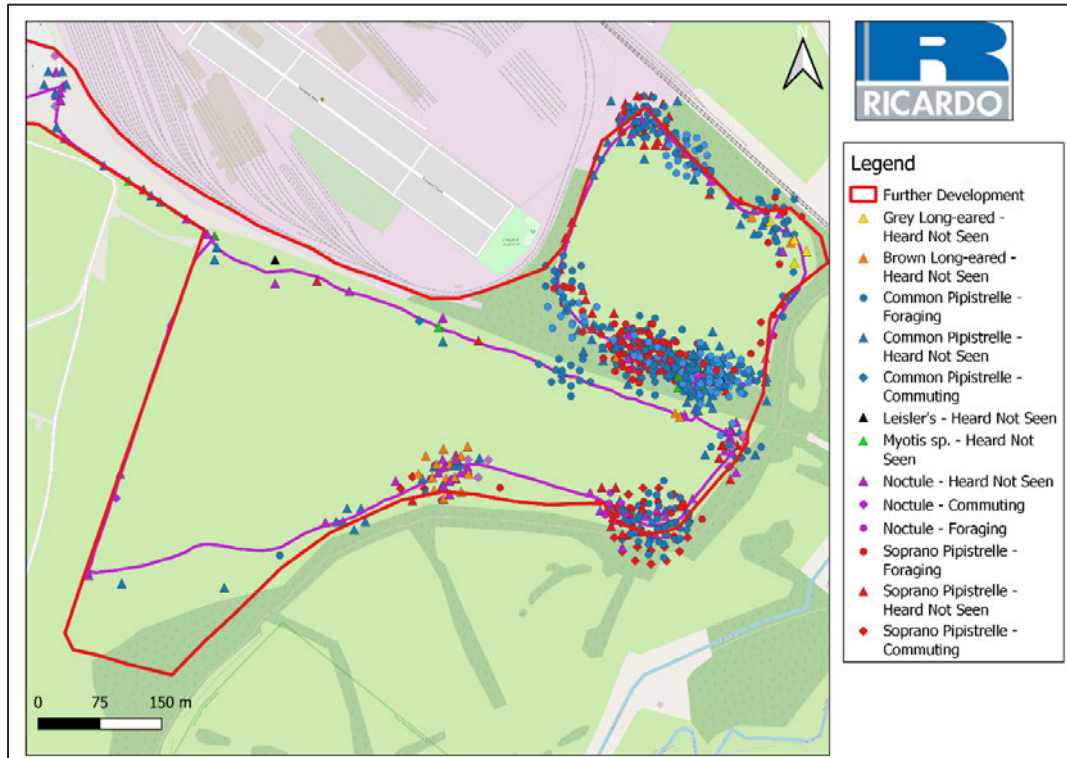


Figure 3.13 Summary of Bat Activity across all the transect surveys

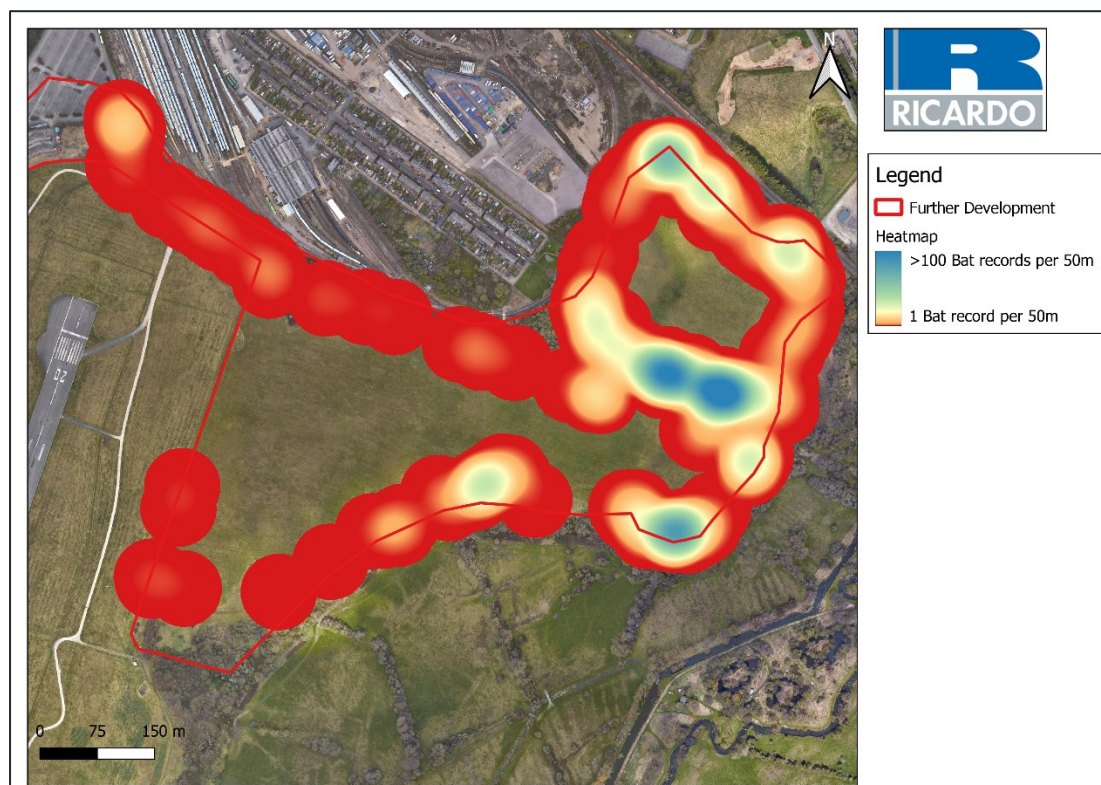


Figure 3.14 Summary of Bat activity across all transect surveys displayed in a heatmap.

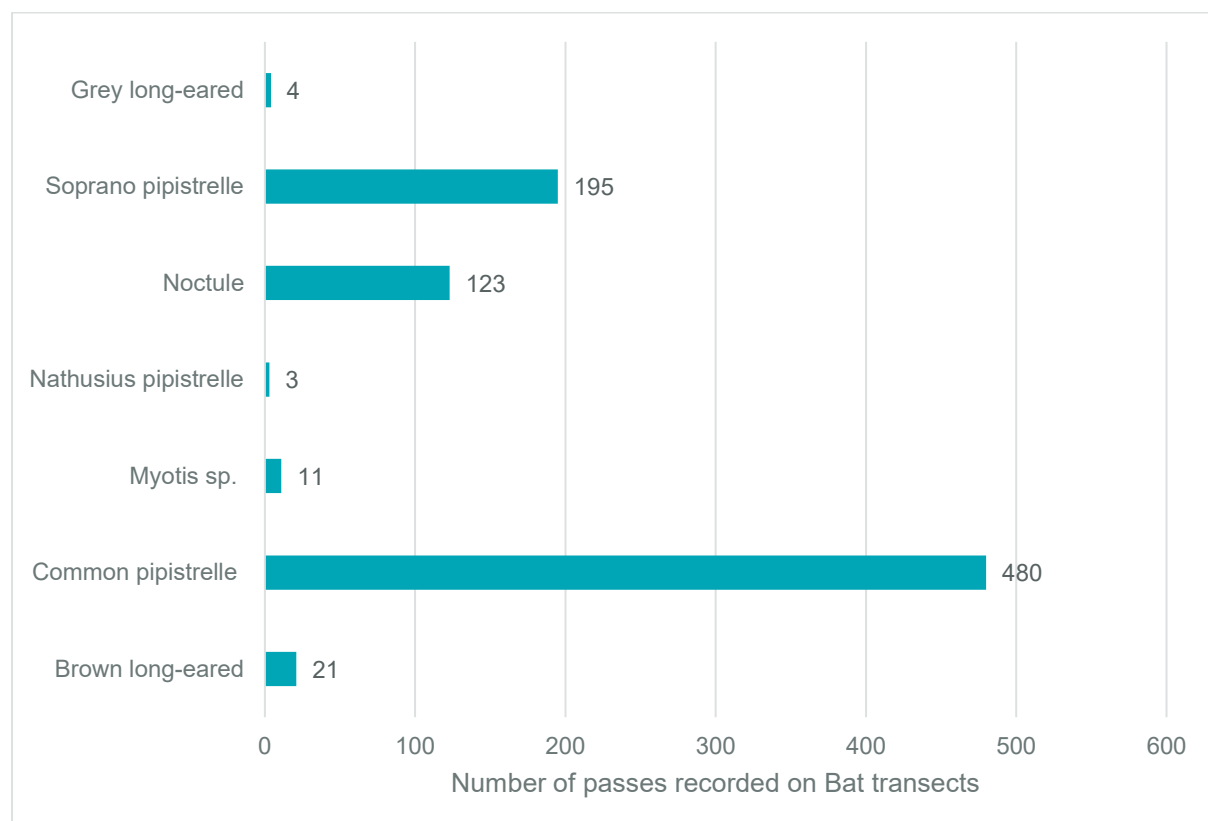


Figure 3.15 A bar chart showing the number of passes across all transect surveys for each species

3.2 STATIC DETECTORS

3.2.1 Static Surveys July

Static detectors were located in the same location over both rounds of static surveys in July (see **Figure 2.2**) with results shown in **Table 3.13 – 3.15**. Common pipistrelle was the most common species recorded during the July static surveys with over 7,000 records over the 17 days of recordings. Each static recorded a high amount of activity, with each static recorder reaching over 1,000 recordings. There was only one round of static surveys in the month but a cumulative 17 days is more than suitable for two surveys worth of data. Nine different bat species were recorded over the survey period through July.

Table 3.13 Static 1 Tree in southern tree line of NE field 13th – 30th July 2021 Results

Species	Serotine	Leisler's	Noctule	Myotis sp.	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	Brown long-eared	Grey long-eared
No. of recordings	2	8	476	25	876	137	14	2	-

Table 3.14 Static 2 Tree within the woodland between the two fields 13th – 30th July 2021 Results

Species	Serotine	Leisler's	Noctule	Myotis sp.	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	Brown long-eared	Grey long-eared
No. of recordings	3	35	53	67	4,255	421	165	18	15

Table 3.15 Static 3 Tree nearby the long stay car park 13th – 30th July 2021 Results

Species	Serotine	Leisler's	Noctule	Myotis sp.	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	Brown long-eared	Grey long-eared
No. of recordings	6	5	66	21	2,037	273	13	2	7

3.2.2 Static Surveys August

Tables 3.16 – 3.20 show the static detector data for August. Static 1 recorded no data in the first round of surveying. However, the rest of the surveys collected data across the site. Overall Common pipistrelle was the most common species recorded during the August static surveys due to static 2 in the second survey round recording 987 passes. The volume of recordings fluctuated a lot in the August surveys with low activity in the first round but much higher activity in the second round. Static 2 on the second survey round recorded the most overall bat activity. Nine different bat species were recorded over the survey period through August.

Table 3.16 Static 2 Tree in northern boundary of Network Rail field 17th August – 20th August 2021 Results

Species	Serotine	Leisler's	Noctule	Myotis sp.	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	Brown long-eared	Grey long-eared
No. of recordings	-	1	23	1	15	9	-	-	-

Table 3.17 Static 3 Tree on eastern boundary of NE field 17th August – 21st August 2021 Results

Species	Serotine	Leisler's	Noctule	Myotis sp.	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	Brown long-eared	Grey long-eared
No. of recordings	-	-	12	-	12	8	-	1	-

Table 3.18 Static 1 Tree in northern boundary of NE field 24th August – 29th August 2021 Results

Species	Serotine	Leisler's	Noctule	Myotis sp.	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	Brown long-eared	Grey long-eared
No. of recordings	5	2	194	4	71	32	1	1	-

Table 3.19 Static 2 Tree nearby the long stay car park 24th August – 29th August 2021 Results

Species	Serotine	Leisler's	Noctule	Myotis sp.	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	Brown long-eared	Grey long-eared
No. of recordings	-	-	36	21	987	208	1	6	3

Table 3.20 Static 3 Tree on eastern boundary of Network Rail field 24th August – 29th August 2021 Results

Species	Serotine	Leisler's	Noctule	Myotis sp.	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	Brown long-eared	Grey long-eared
No. of recordings	1	1	8	10	84	96	-	8	12

3.2.3 Static Surveys September

Tables 3.21 – 3.23 show static detector data for September. Static detectors were located in the same location for both rounds of surveying in September however only 5 days of data was collected. Common pipistrelle was the most common species recorded during the September static surveys, although static 2 recorded more soprano pipistrelles over the survey period. Static 3 recorded a high amount of activity reaching over 1,000 recordings in total, with the other two detectors amassing over 200 bat recordings. Static 3 recorded the most overall bat activity. Eight different bat species were recorded over the survey period in September.

Table 3.21 Static 1 Tree nearby the long stay car park 22nd September – 28th September 2021 Results

Species	Serotine	Leisler's	Noctule	Myotis sp.	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	Brown long-eared	Grey long-eared
No. of recordings	1	-	23	11	219	58	3	2	3

Table 3.22 Static 2 Tree in southern tree line of NE field 22nd September – 28th September 2021 Results

Species	Serotine	Leisler's	Noctule	Myotis sp.	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	Brown long-eared	Grey long-eared
No. of recordings	-	-	37	8	31	128	1	1	-

Table 3.23 Static 3 Tree in southern tree line of Network Rail field 22nd September – 28th September 2021 Results

Species	Serotine	Leisler's	Noctule	Myotis sp.	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	Brown long-eared	Grey long-eared
No. of recordings	-	-	36	21	987	208	1	6	3

3.2.4 Static Surveys October

Tables 3.24 and 3.25 show static detector data for October. Statics were located in the same location for both rounds of surveying in October. Static 3 did not record due to a malfunction. Common pipistrelle was the most common species recorded during the October static surveys. Each static recorded a high amount of activity with each static reaching over 500 recordings. Nine different bat species were recorded over the survey period through October.

Table 3.24 Static 2 Tree in southern tree line of NE field 7th October – 17th October 2021 Results

Species	Serotine	Leisler's	Noctule	Myotis sp.	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	Brown long-eared	Grey long-eared
No. of recordings	2	1	3	25	397	101	19	5	1

Table 3.25 Static 3 Tree on eastern boundary of Network Rail field 7th October – 13th October 2021 Results

Species	Serotine	Leisler's	Noctule	Myotis sp.	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	Brown long-eared	Grey long-eared
No. of recordings	1	1	8	35	570	282	5	7	14

3.2.5 Static Surveys May-June

Tables 3.26 – 3.31 show static detector data for May-June. Common pipistrelle was the most common species recorded during the May and June static surveys. Static 2 in the second round of static surveys recorded the least bat activity with Common pipistrelle recorded the most and one pass from a Noctule. Static 1 on the second survey round recorded the most overall bat activity. Seven different bat species were recorded over the survey period through May and into the beginning of June.

Table 3.26 Static 1 Tree in northern boundary of Network Rail field 10th May 2022 – 26th May 2022 Results

Species	Serotine	Leisler's	Noctule	Myotis sp.	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	Brown long-eared	Grey long-eared
No. of recordings	-	3	131	-	387	93	10	-	-

Table 3.27 Static 2 Tree in north west boundary of NE field 10th May 2022 – 26th May 2022 Results

Species	Serotine	Leisler's	Noctule	Myotis sp.	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	Brown long-eared	Grey long-eared
No. of recordings	-	18	145	12	484	167	1	3	3

Table 3.28 Static 3 Tree on eastern boundary of NE field 10th May 2022 – 26th May 2022 Results

Species	Serotine	Leisler's	Noctule	Myotis sp.	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	Brown long-eared	Grey long-eared
No. of recordings	-	1	-	1	94	19	1	-	-

Table 3.29 Static 1 Tree in north west boundary of NE field 26th May – 31st May 2022 Results

Species	Serotine	Leisler's	Noctule	Myotis sp.	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	Brown long-eared	Grey long-eared
No. of recordings	-	1	19	4	484	51	2	1	7

Table 3.30 Static 2 Tree on eastern boundary of NE field 26th May – 31st May 2022 Results

Species	Serotine	Leisler's	Noctule	Myotis sp.	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	Brown long-eared	Grey long-eared
No. of recordings	-	-	1	4	6	-	-	-	-

Table 3.31 Static 3 Tree in southern tree line of NE field 26th May – 31st May Results

Species	Serotine	Leisler's	Noctule	Myotis sp.	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	Brown long-eared	Grey long-eared
No. of recordings	-	-	17	2	356	38	51	5	7

3.2.6 Static Surveys June-July

Tables 3.32 – 3.35 show static detector data for June-July. Common pipistrelle was the most common species recorded during the June to July static surveys. Each static recorded a high amount of activity with each static reaching over 1,000 recordings of Common pipistrelle each. Static 2 on the first survey round recorded the most overall bat activity. Nine different bat species were recorded over the survey period through June and into the beginning of July.

Table 3.32 Static 1 Tree in south eastern tree line of NE field 9th June – 23rd June 2022 Results

Species	Serotine	Leisler's	Noctule	Myotis sp.	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	Brown long-eared	Grey long-eared
No. of recordings	4	6	13	6	1,205	55	15	1	-

Table 3.33 Static 2 Tree in eastern boundary of NE field 9th June – 23rd June 2022 Results

Species	Serotine	Leisler's	Noctule	Myotis sp.	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	Brown long-eared	Grey long-eared
No. of recordings	-	1	25	2	3,162	54	9	-	-

Table 3.34 Static 1 Tree in southern tree line of NE field 23rd June – 7th July 2022 Results

Species	Serotine	Leisler's	Noctule	Myotis sp.	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	Brown long-eared	Grey long-eared
No. of recordings	2	5	42	5	1,011	146	19	9	1

Table 3.35 Static 2 Tree in eastern boundary of Network Rail field 23rd June – 7th July 2022 Results

Species	Serotine	Leisler's	Noctule	Myotis sp.	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	Brown long-eared	Grey long-eared
No. of recordings	7	4	77	23	1,570	902	18	1	-

3.2.7 Summary of static surveys

As displayed in Figure 3.16 and Table 3.36, the static surveys recorded high levels of bat activity over the course of monitoring, and it can be concluded that the site offers high suitability for a range of bat species. The most abundant species across the surveys was the common pipistrelle, with substantial recordings of soprano pipistrelle and noctule. Nine species were recorded overall with some much rarer species recorded. Both serotine *Eptesicus serotinus* and leisler's *Nyctalus leisleri* bats were recorded across the surveys with the latter being a rare bat species and a significant record. Both species being red list species based on IUCN guidelines with serotine being "vulnerable" and Leisler's being "near threatened".

The data identified for rarer bat species was subject to additional scrutiny, with the Leisler's records cross-referenced against the data distribution, habitat and call structure, which concluded that the records fall into an area of the site most suitable to Leisler's. However, it has not been possible to rule

out other species entirely such as the more common and abundant noctule. In addition, the grey long-eared records were determined by the auto id on the Kaleidoscope bat software used in the data analysis. The differentiation to the brown long-eared recordings are extremely difficult to detect and therefore it cannot be fully confirmed that grey long-eared bats are present on site. If grey long-eared bats are confirmed on site this would be considered a rare bat species. The rarer species records should be analysed further by bat specialists to verify the species of bat if possible.

Table 3.36 All static detectors across all surveys 2021-2022 Results

Species	Serotine	Leisler's	Noctule	Myotis sp.	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	Brown long-eared	Grey long-eared *
No. of recordings	34	93	1,445	308	19,300	3,486	349	79	76

*Grey long-eared bat records as determined by kaleidoscope auto id.

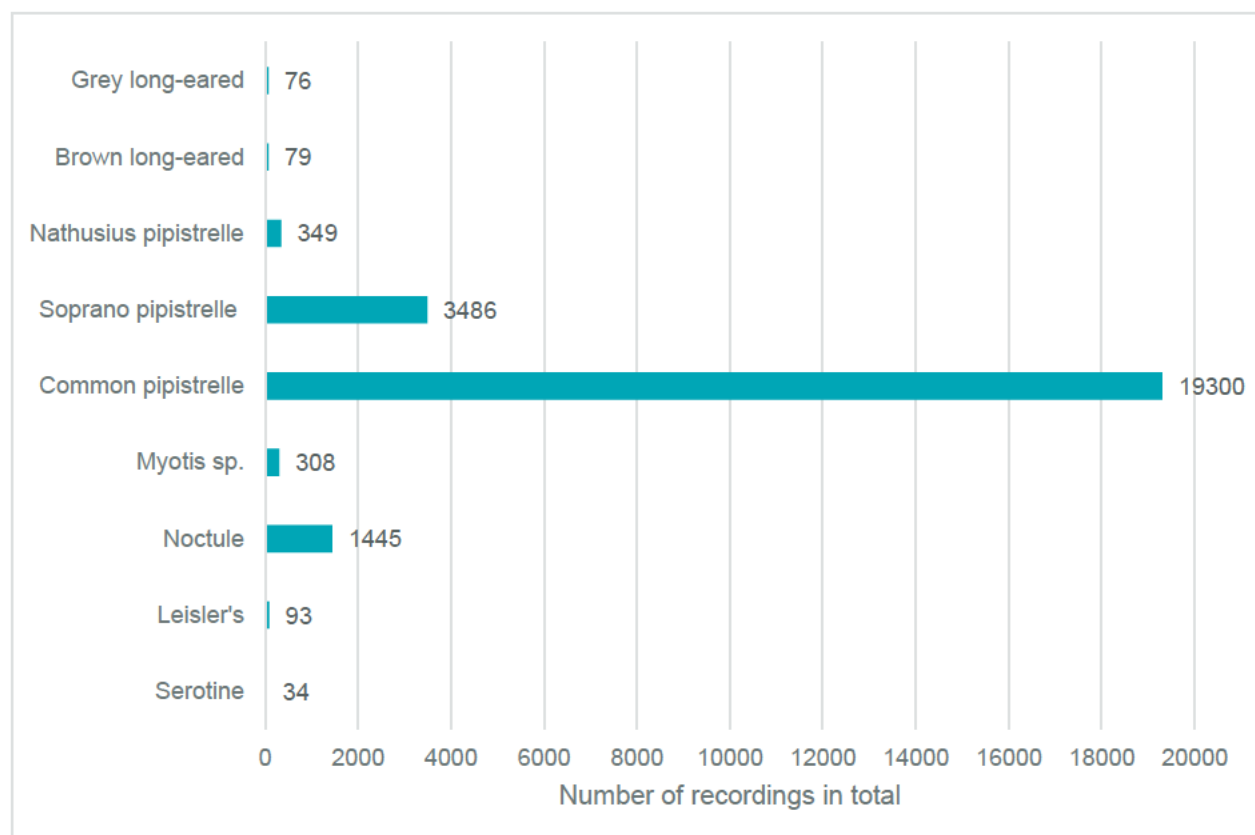


Figure 3.16 Summary statistics of species across all static surveys

4 SUMMARY OF FINDINGS AND RECOMMENDATIONS

4.1 STATUS OF BATS ON SITE

Figure 3.13 shows the distribution of bats recorded during the transect surveys undertaken throughout May to October, which shows the site is highly suitable for foraging bats. Common, soprano pipistrelle and Noctule were widespread across the site with the woodland margins, especially the woodland between the NE field and Network Rail field being areas of high activity. Listening stops 5, 7, 8 and 9 regularly recorded bats foraging along the woodland edge of the site. Listening point 7 provided the highest levels of bat activity consisting mainly of pipistrelle species with the occasional noctule, brown long-eared bat and *Myotis* sp. The reason for this high activity level is most likely due to the area being well connected for commuting along the tree lines to the surrounding areas of good habitat, including the Itchen Valley Park, as well as providing a safe, darker foraging area due to the area being enclosed by trees with an open area of grassland.

The static surveys echoed the findings of the transect surveys with high levels of bat activity across the site with the areas of woodland being hotspots. Nine bat species were recorded mainly consisting of common pipistrelle, soprano pipistrelle and noctule. Notably rarer bat species including Leisler's and grey long-eared bat were likely recorded on site indicating the site is an important area for bats.

No further bat activity surveys are recommended.

4.2 MITIGATION REQUIREMENTS AND ENHANCEMENTS

In the ongoing design of the Navigator Quarter development, it is important that bat habitat is considered within the design scope. Areas of woodland buffer are important and must be maintained and if possible enhanced through the site design reflecting the hotspot areas of foraging bats across the site highlighted in **Figure 3.13**. The implementation of bat boxes within the development site and surrounding woodland are recommended to enhance the site for bat suitability. Additionally sympathetic lighting and noise design should be implemented within the site between dusk and dawn periods to reduce disturbance towards bats. Full details of mitigation will be included in a Biodiversity Mitigation and Enhancement Plan. If impacts to bats cannot be avoided through site design then additional surveys and a Natural England licence may be required.

Appendices

Appendix 1 – Legislation and Planning Policy

The Wildlife & Countryside Act 1981 (as amended)

Provides for **designation** and protection of Sites of Special Scientific Interest (SSSI), which are areas that represent the most valuable habitats in the UK for nature conservation.

The Act creates the following **offences**:

- To intentionally kill, injure, or take any wild bird or their eggs or nests (with exception to species listed in Schedule 2). Special penalties are available for offences related to birds listed on Schedule 1, for which there are additional offences of disturbing these birds at their nests, or their dependent young.
- To intentionally or recklessly kill, injure, or take, possess, or trade in any wild animal listed in Schedule 5, and intentionally or recklessly interfere with places used for shelter or protection, or disturb animals occupying such places.
- Certain methods of killing, injuring, or taking wild animals listed in Schedule 6.
- To pick, uproot, trade in, or possess (for the purposes of trade) any wild plant listed in Schedule 8, and prohibits the unauthorised intentional uprooting of such plants.
- The release of certain non-native animals and planting of plants listed in Schedule 9.

It also provides a mechanism making any of the above offences legal through the granting of licences by the appropriate authorities.

Conservation of Habitats and Species Regulations 2017

The principal means by which the European Habitats Directive is transposed in England and Wales.

Provide for the **designation** and protection of a network of 'European Sites' (also termed Natura 2000), including Special Areas of Conservation (SAC) and Special Protection Areas (SPA).

Regulation 43 creates the following offences relating to European Protected Species (EPS):

- deliberately capture, injure or kill any wild animal of a European Protected Species;
- deliberately disturb animals of any such species in such a way as to be likely to:
 - impair their ability to survive, breed, rear or nurture their young, hibernate or migrate, or
 - significantly affect the local distribution or abundance of the species to which they belong;
- deliberately take or destroy the eggs of such an animal; or
- damage or destroy a breeding site or resting place of such an animal.

The Regulations also make it an offence (subject to exceptions) to deliberately pick, collect, cut, uproot, destroy, or trade in the plants listed in Schedule 5.

However, the actions listed above can be made lawful through the granting of licences (European Protected Species Licence) by the appropriate authorities (Natural England in England). Licences may be granted for a number of purposes, but only after the appropriate authority has determined that the following regulations are satisfied:

- the works under the licence are being carried out for the purposes of 'preserving public health and public safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment'.
- there is 'no satisfactory alternative'
- the action 'will not be detrimental to the maintenance of the population of the species concerned at favourable conservation status in their natural range'.

To apply for a licence, the following information is required:

- The species concerned.
- The relative size of the population at the site (note this may require a survey to be carried out at a particular time of the year).
- The impact(s) (if any) that the development is likely to have upon the populations.

- What measures will be conducted to mitigate for the impact(s).

Natural Environment & Rural Communities (NERC) Act 2006

Section 40 of NERC carries an extension of the earlier CRoW Act biodiversity **duty to public bodies and statutory undertakers** to ensure due regard to the conservation of biodiversity. Section 41 requires the Secretary of State, as respects England, to publish a list of species and habitats which are of 'principal importance for the purpose of conserving biodiversity'. These lists generally reflect the species and habitats previously listed as priorities under the UK Biodiversity Action Plan.

The Protection of Badgers Act 1992

This makes it an offence to wilfully kill, injure, take, possess or cruelly ill-treat a badger, or to attempt to do so and to intentionally or recklessly interfere with a sett. Sett interference includes disturbing badgers whilst they are occupying a sett, as well as damaging or destroying a sett or obstructing access to it.

Under Section 10 (1)(d) of the Protection of Badgers Act 1992, a licence may be granted by Natural England to interfere with a badger sett for the purpose of development, as defined by Section 55(1) of the Town & Country Planning Act 1990.

The Wild Mammals (Protection) Act 1996

The Wild Mammals (Protection) Act 1996 makes it an offence for any person to mutilate, kick, beat, nail or otherwise impale, stab, burn, stone, crush, drown, drag or asphyxiate any wild mammal with intent to inflict unnecessary suffering.

The Animal Welfare Act 2006

This imposes a duty of care on anyone responsible for an animal to take reasonable steps to ensure that the animal's needs are met. This means that a person has to look after the animal's welfare and ensure that it does not suffer. The Act says that an animal's welfare needs include:

- a suitable environment;
- a suitable diet;
- the ability to exhibit normal behaviour patterns;
- any need it has to be housed with, or apart from, other animals; and
- protection from pain, suffering, injury and disease.

With regards to development, this may have implications when capture and translocations of animals are proposed.

National Planning Policy Framework

This framework replaces Planning Policy Statement 9: Biodiversity and Geological Conservation (PPS 9) (ODPM 2005b) and sets out the view of central Government on how planners should balance nature conservation with development.

The NPPF states that development plan policies and planning decisions should be based upon up-to-date information about the environmental characteristics of their areas, including biodiversity. It also states that the aim of planning decisions should be to prevent harm to biodiversity conservation interests and to 'promote the preservation, restoration and re-creation of priority habitats, ecological networks and the recovery of priority species'.

Where determining planning applications, local planning authorities should aim to conserve and enhance biodiversity by applying the following principals; 'if significant harm resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused'; and, 'planning permission should be refused for development resulting in the loss or deterioration of irreplaceable habitats, including ancient woodland and the loss of aged or veteran trees found outside ancient woodland, unless the need for, and benefits of, the development in that location clearly outweigh the loss'.

This means that full ecological surveys should be carried out and suitable mitigation measures proposed prior to any planning application being submitted.

Biodiversity 2020: A strategy for England's wildlife and ecosystem services

This biodiversity strategy for England builds on the Natural Environment White Paper and the earlier UK Biodiversity Action Plan. It provides a comprehensive picture of how Government is implementing our international and EU commitments and sets out the strategic direction for biodiversity policy up to 2020. Its mission is to:

“halt overall biodiversity loss, support healthy well-functioning ecosystems and establish coherent ecological networks, with more and better places for nature for the benefit of wildlife and people.”

In relation to planning and development its priority is to:

“take a strategic approach to planning for nature within and across local areas. This approach will guide development to the best locations, encourage greener design and enable development to enhance natural networks. We will retain the protection and improvement of the natural environment as core objectives of the planning system”



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NAVIGATION QUARTER: WOODLAND STRIP

Preliminary Ground Level Roost Assessment Report

Report for: Southampton International Airport Limited

Ref. 84006885

Ricardo ref. ED15367104

Issue: 1

20/12/2022

Customer:

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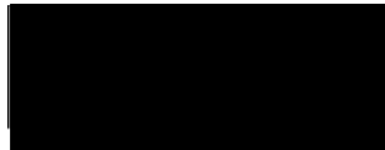
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1. INTRODUCTION

1.1 BACKGROUND

Southampton International Airport Limited has commissioned ecological surveys within the Navigation Quarter woodland boundary. Ricardo Energy & Environment (Ricardo) was commissioned by Southampton International Airport Limited to undertake a Preliminary Ground Level Roost Assessment (PGLRA) in March 2022 to determine the presence of suitable bat roost features within the trees identified as having the potential to be impacted by works.

The visual PGLRA assessment recommended a range of works required to further assess the presence of bats in the woodland. The tree work recommended can be divided into two components:

1. An endoscope assessment for 5 trees
2. A climb and inspect survey for 28 trees

1.2 AIMS & OBJECTIVES

The purpose of this report is to inform the client of the confirmed and/or potential utilisation of the site by bats. Detailed objectives are to:

- Confirm the presence or likely absence of roosting bats.
- Record the location of any bat roosting sites should they be present.
- Identify and assess the magnitude of impacts on bats which are likely to result from tree works.
- Describe any measures necessary to avoid, reduce or compensate for impacts so that there is no net harm to bats.
- Identify any further surveys required.

1.3 LEGISLATION CONTEXT

All 18 native UK bat species and their breeding sites or resting sites (roosts) are protected under Schedule 5 of the Wildlife and Countryside Act 1981 (WCA) (as amended) and Schedule 2 of the Conservation of Habitats and Species Regulations 2017 (as amended) which makes each a European Protected Species (EPS).

The Countryside and Rights of Way Act 2000 (CROW) has amended the WCA in England and Wales and this Act adds additional enforcement.

Together these legislations make it illegal to:

- Deliberately kill, injure or capture bats.
- Deliberately disturb bats whether in a roost or not, disturbance includes anything that is likely to impair their ability to survive, breed, reproduce or rear their young, or impair their ability to hibernate or migrate.
- Intentionally or recklessly disturb roosting bats or obstruct access to their roosts.
- Damage or destroy a bat roosting place (even if bats are not occupying the roost at the time).
- Possess or transport a bat or any part of a bat unless acquired legally.
- Sell or exchange bats, or parts of bats.

Barbastelle *Barbastella barbastellus*, Bechstein's bat *Myotis bechsteinii*, greater horseshoe bat *Rhinolophus ferrumequinum* and lesser horseshoe bat *R. hipposideros* are also listed on Annex II of

the Habitats Directive, which means that Special Areas of Conservation (SAC) may be attributed to internationally important roosts and foraging areas of these species.

Certain bat species are also Species of Principal Importance for the purpose of conserving biodiversity under Section 41 (England) of the Natural Environment and Rural Communities (NERC) Act 2006. These species need to be taken into consideration by a public body when performing any of its functions. The priority bat species are: greater horseshoe bat, lesser horseshoe bat; Bechstein's bat, noctule *Nyctalus noctula*, soprano pipistrelle *Pipistrellus pygmaeus*, brown long-eared bat *Plecotus auritus* and barbastelle.

1.4 STUDY AREA AND LOCATION

The location of the 2022 PGLRA is shown by the yellow line boundary in **Figure 1.1** below. The site is located to the north of Southampton Airport, and south of the Network Rail Eastleigh Railway Depot. The Network Rail Field site (approximate central NGR: SU4637617800) is located on the north east side of Southampton Airport, north of the Itchen Valley park and south east of Barton Park industrial estate in Eastleigh, Southampton.



Figure 1.1 Study Area of PGLRA

Base map sources: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

2. METHODOLOGY

2.1 DESK STUDY

A review was undertaken of the PEA produced by Ricardo in 2021 as well as the previous PGLRA reports (Ricardo, 2019a¹; Ricardo, 2019b² and Ricardo, 2020³) and bat survey report (Ricardo, 2019c⁴) issued to Southampton International Airport Limited to identify previous bat records associated within 2km of the site and within functionally linked habitat.

Information on internationally, nationally and locally designated sites of nature conservation importance and records of notable and protected species were obtained within a 2km radius of the nearby Fire Training Ground (FTG) site (central NGR: SU 44398 16350) from Hampshire Biodiversity Information Centre (HBIC) in June 2021. It is considered that this data is sufficient to inform this report. These records were supplemented with internet-based resources such as Multi-Agency Geographic Information for the Countryside (MAGIC), National Biodiversity Network (NBN) and Google Maps. Searches of these databases were carried out within a 2km radius of the Freeport site.

These combined records were analysed to determine their relevance to the site and the proposed works, taking into consideration the conservation objectives of designated nature conservation sites, the dates and locations of each record and the sensitivity of the recorded feature to likely impacts.

The findings of this desk study and ecological considerations are shown in **Table 3.1** below.

The trees in the survey were categorised into three categories of bat roost potential after assessment. This includes trees with low potential, moderate potential and high potential.

2.2 FIELD SURVEY

2.2.1 Preliminary Ground Level Roost Assessment (PGLRA)

A PGLRA was undertaken located along the boundaries of the Network Rail Field and the Airport North East Field on the 15th and 16th March 2022 in relation to the woodland trees. The survey involved assessing trees from the ground for their potential to support bat roosts, following current best practice guidance (Collins, 2016)⁵. The surveys were undertaken by an experienced ecologist Laurence David (BSc, ACIEEM).

The assessment was undertaken using close focussing binoculars to search for potential roost features (PRF) suitable for use by roosting bats such as, but are not limited to, crevices, flaking bark, split limbs, woodpecker holes, rot holes, and dense ivy growth. The survey also involved searching for signs of bat activity such as scratch marks, staining and droppings.

The trees surveyed were categorised using the assessment criteria in Table 4.1 of the 3rd edition of the Bat Conservation Trust (BCT) Guidelines (Collins, 2016):

¹ Ricardo 2019a. Marlhill Copse, Southampton: Preliminary Ground-level Roost Assessment & Climb and Inspect Survey for Bats. Report for Southampton International Airport Limited.

² Ricardo 2019b. Marlhill Copse, O2 Landing Lights and North of River Itchen sites, Southampton: Preliminary Ground-level Roost Assessment. Report for Southampton International Airport Limited.

³ Ricardo 2020. Marlhill Copse, Southampton: Area 1 Preliminary Ground-level Roost Assessment & Climb and Inspect Survey for Bats. Report for Southampton International Airport Limited.

⁴ Ricardo 2019c. Marlhill Copse, O2 Landing Lights and North of River Itchen sites, Southampton: Further Bat Surveys Report. Report for Southampton International Airport Limited.

⁵ Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London. ISBN-13 978-1-872745-96-1

• Known or confirmed bat roost:	Evidence of bats present (e.g. droppings, live or dead bats) and/or desk study record.
• High potential:	Structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitats.
• Moderate potential:	Structure or tree with one or more potential roost sites that could be used by several bats due to their size, shelter, protection, conditions and surrounding habitats, but unlikely to support a roost of high conservation concern.
• Low potential:	Structure or tree with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity / hibernation).
• Negligible potential:	Structure or tree with no potential to support bats.

These categories have been used to inform the recommendations of this report (see **Section 4**).

2.3 LIMITATIONS

There were no limitations to the survey.

Table 3.1 – Summary of ecological features, potential impacts and recommendations

Sites: Navigation Quarter and Network Rail Field Sites NGR: Approximate central grid reference – SU 46093 17643		PROJECT NAME: Southampton Freepoint, Southampton Airport	
Ecological and Status	Features Description: Presence (actual or potential), level of potential (high, medium, low, negligible), distance and direction from site, locations within site, relevant habitat features and connectivity, etc.	Potential Impacts:	Recommendations: Requirement for further survey and/or assessment.
Bats Protected by law: • The Conservation of Habitats and Species Regulations 2017 (as amended) • Wildlife & Countryside Act 1981 (as amended) Listed under: • NERC Act 2006	Data returned from HBIC contained records for a number of species within the search area, including common pipistrelle, <i>Pipistrellus pipistrellus</i>, Nathusius's pipistrelle, <i>Pipistrellus nathusii</i>, soprano pipistrelle, <i>Pipistrellus pygmaeus</i>, noctule, <i>Nyctalus noctula</i>, Natterer's bat, <i>Myotis nattereri</i>, whiskered bat, <i>Myotis mystacinus</i>, brown long-eared bat, <i>Plecotus auritus</i>, serotine, <i>Eptesicus serotinus</i> and Daubenton's bat, <i>Myotis daubentonii</i>. The woodland along the edge of the North East Field and Network Rail site provides suitable foraging opportunities for bats however, no on-site trees had features suitable for supporting roosting bats. A number of willow trees to the east of the site offered potential roosting opportunities. The site was well-connected to additional supporting habitats within the surrounding wider area.	The woodland and wetland habitats adjacent to the site have the potential to support an assemblage of bat species and therefore the site was assessed as being high potential for bats⁷. Foraging and commuting habitat may be impacted by the proposed works along with loss of foraging habitats. The site was assessed as having suitable foraging habitat. Lighting during works has potential to deter bats from foraging or using roosts within the immediate vicinity. No structures or trees within the site were assessed as having bat roosting potential.	It is recommended that bat activity surveys are undertaken to assess the number and key areas of the site utilised by bats. Two visits are required per month between April – October (14 visits in total) where a transect route will be walked by surveyors recording bats and their movements. Static bat detectors will also be left on the site. If trees are required to be removed a PGLRA survey should be undertaken to assess bat roosting features and further surveys which may be required. Works should be undertaken during daylight hours only and no artificial lighting used.

3. RESULTS

3.1 DESK STUDY

The PEA (Ricardo, 2021) reported that data returned from HBIC contained records for a number of species within the search area, including common pipistrelle, *Pipistrellus pipistrellus*, Nathusius's pipistrelle, *Pipistrellus nathusii*, soprano pipistrelle, *Pipistrellus pygmaeus*, noctule, *Nyctalus noctula*, Natterer's bat, *Myotis nattereri*, whiskered bat, *Myotis mystacinus*, brown long-eared bat, *Plecotus auritus*, serotine, *Eptesicus serotinus* and Daubenton's bat, *Myotis daubentonii*.

The woodland and wetland habitats adjacent to the site have the potential to support an assemblage of bat species and therefore the site was assessed as being high potential for bats. Foraging and commuting habitat may be impacted by the proposed works along with loss of foraging habitats. The site was assessed as having suitable foraging and roosting habitat.

3.2 NAVIGATION QUARTER WOODLAND BOUNDARY PGLRA

The site consisted of a mixed semi-natural woodland and the tree species recorded included English oak *Quercus robur*, ash *Fraxinus excelsior* and horse chestnut *Aesculus hippocastanum*.

All trees within the site boundary (**Figure 1.1**) were surveyed however not all were tagged or counted therefore just the trees within the site with bat roosting potential were recorded. A total of 33 individual trees were assessed as having bat potential during the survey in March 2022. The findings and associated suitability categories are presented as follows:

- 13 trees were assessed as **low** potential.
- Five trees were assessed as **low/moderate** potential
- 15 trees were assessed as **moderate** potential

No confirmed roosts were identified during the PGLRA survey.

Survey results for these trees, including locations of moderate risk trees are shown in **Appendix 1**.

4. RECOMMENDATIONS

4.1 NAVIGATION QUARTER WOODLAND BOUNDARY

The results of the PGLRA revealed 13 trees as low potential, five trees of low/moderate potential and 15 trees of moderate potential for roosting bats.

The proposed felling and/or remedial works of those trees identified as having potential for bat roosts would cause adverse direct impacts upon bats through the loss of roosting opportunities and through killing and injuring bats which may be present within the PRFs identified.

Recommendations for further surveys, mitigation measures and enhancement opportunities are provided below.

4.2 FURTHER SURVEYS – NAVIGATION QUARTER WOODLAND BOUNDARY

4.2.1 Climb and Inspect and Ground Based Endoscope Survey

It is recommended that further PRFs inspection surveys are undertaken to fully assess the suitability of the PRFs and search for signs of bat activity. Further bat roost inspection surveys should include, climb and inspect, and ground-based endoscope surveys of the trees assessed as low/moderate or high suitability.

The surveys will involve climbing the trees to facilitate closer inspection of features identified as being of moderate/high roosting potential during the PGLRA survey. Inspection of PRFs will be undertaken using an endoscope to fully assess their extent, suitability for use by bats, and search for any signs of occupation and/or previous use by bats. The tree categories and survey effort required will be revised if necessary following closer inspection during the climb and inspection surveys.

The survey should be undertaken by a pair of qualified tree climbers and led by a licenced bat surveyor.

Two separate methodologies should be considered, depending on the tree works priority, as identified by the visual tree assessment report, to ensure that the tree works do not result in any net harm to bats, despite the health & safety considerations.

Trees requiring an endoscope inspection survey

It is recommended that tree endoscope inspection surveys for five trees identified as low to moderate potential, see **Appendix 1**. Not all trees identified within the survey will be impacted therefore once detailed design has been confirmed the number of trees requiring an endoscope survey may be lower.

If no bat roost is identified and the PRFs are downgraded to negligible following these further surveys, then no further surveys are required. Works should follow the mitigation advice provided in Section 4.2.

If a PRF has been verified and confirmed as moderate or high suitability for bats, or evidence of bats is found, dusk emergence and/or dawn re-entry surveys to inform the use of the PRF should be undertaken between May and September 2023 as presented in **Table 4.1**.

Trees requiring a climb inspection survey

It is recommended that tree climb inspection surveys are undertaken on the twenty-eight trees identified as low to moderate potential and not subject to endoscope surveys, see **Appendix 1**. Not all trees identified within the survey will be impacted therefore once detailed design has been confirmed the number of trees requiring a climb and inspect survey may be lower.

The required survey effort to ascertain that there is no net harm to bats should include:

- Initial tree climbing survey to assess the suitability of the PRF and either downgrade or confirm its suitability for bats roosting or the presence of bat roosts / bat signs.
- If the PRF has been downgraded to negligible potential following the initial tree climbing survey, then no further survey would be required. Works should follow the mitigation advice provided in **Section 4.2**.
- If a PRF has been verified and confirmed as moderate or high suitability for bats, or evidence of bats is found, dusk emergence and/or dawn re-entry surveys to inform the use of the PRF should be undertaken between May and September 2023 as presented in **Table 4.1**.
- If a bat roost is confirmed as a result of further survey, then an EPS licence application to Natural England will be required, the recommended surveys will provide the information required to inform a licence application.

Dusk Emergence/Dawn Re-entry Survey

Tree of moderate priority for tree works

If a PRF cannot be fully inspected during the tree climbing survey and/or ground-based endoscope survey, it may be necessary to undertake dusk emergence and/or dawn re-entry surveys during the summer active period (May – September). These surveys would involve surveyors watching for bats emerging from or re-entering the features identified within this report. The required survey effort and timings based on the roost suitability identified are provided in **Table 4.1** below.

If a PRF has been verified and confirmed as moderate or high suitability for bats, or evidence of bats is found, further dusk emergence and/or dawn re-entry surveys should be undertaken between May and September 2023 to inform the use of the PRF. The required survey effort and timings based on the roost suitability identified are provided in **Table 4.1** below.

If a bat roost is confirmed as a result of further survey, then an EPS licence application to Natural England will be required, the recommended surveys will provide the information required to inform a licence application.

Table 4-1: Survey requirements for dusk emergence/dawn re-entry surveys (Collins, 2016)

Negligible and low roost suitability	Moderate roost suitability	High roost suitability
No further survey required. See Section 4.2 for mitigation recommendations.	Two separate survey visits. One dusk emergence and a separate dawn re-entry survey. Surveys should be conducted between May and September with at least one visit being between May and August. Surveys should be at least two weeks apart.	Three separate survey visits. At least one dusk emergence and a separate dawn re-entry survey. The third visit could be either dusk or dawn. Surveys should be conducted between May and September with at least two visits being between May and August. Surveys should be at least two weeks apart.

4.3 MITIGATION

In trees, it is very difficult to have confidence that roosts are absent and therefore, even where no bats are found, it may still be necessary to apply precautionary measures when carrying out felling and pruning activities where suitable features (PRFs) are present. The following recommendations are considered suitably precautionary:

Timing of the works

Seasonally restricted and staged clearance of vegetation to minimise loss of habitat during the active bat season (April to October) inclusive.

Ecological Clerk of Works (ECoW)

An ECoW with relevant bat experience should be present on site to provide advice and support to contractors in relation to bats and other species as necessary. This would include ensuring the recommendations within this report are implemented on site.

Tree identified as moderate or high suitability

The trees identified as having moderate suitability for roosting bats should be subject to further surveys (as set out in Section 4.1) (if a climbing survey is unsuccessful or PRF confirmed to be of moderate or high suitability then two or three dusk emergence/dawn re-entry surveys should be undertaken) prior to felling/pruning.

If no bats are identified through the surveys outlined in **Sections 4.2.1** then the tree can be felled. In this situation it is recommended that the tree is soft felled during the winter months. Soft-felling involves the careful lowering of sections of tree with suitable roost features to the ground. These sections should then be left for one night before being processed further to allow any bats present to escape.

If bats are identified through the surveys outlined in **Sections 4.2.1** then an EPS licence application to Natural England will be required. A specific methodology will be included within the licence application, but key aspects are likely to include:

- The installation of exclusion devices to allow bats to leave the roost but prevent their return.
- The timing of felling/pruning works during the winter months.
- The erection of bat boxes on nearby trees, prior to felling works, to provide continuity of habitat for bats. Features should conform to published roost replacement guidance provided by the Bat Conservation Trust.

4.4 ENHANCEMENT OPPORTUNITIES

It is recommended that bat boxes are provided within the woodland as well as creating veteranisation features (through chainsaw cuts) where possible within the remaining trees and monoliths. Where possible, monoliths should be left as tall as possible (ideally at least 4 metres tall) so that veteranisation features can be created at a suitable height for bats and where they will be unlikely to be interfered with by members of the public.

It is recommended that bat boxes are erected, at a height of at least 4 metres, on semi-mature and mature trees throughout the woodland. If placed on the southern side of suitable trees, the boxes would receive sunlight throughout the day and placing them higher than 4m would minimise the risk of them being vandalised.

5. CONCLUSIONS

A PGLRA survey was completed in March 2022 within the woodland present within the proposed Navigator Quarter site. All trees within the boundary were assessed and individual trees were recorded which presented PRF's. The surveys recorded 13 trees of low potential, five trees of low - moderate potential and 15 of moderate potential.

It is recommended that further PRFs inspection surveys are undertaken to fully assess the suitability of the PRFs and search for signs of bat activity. Surveys proposed are as follows:

- Tree climbing surveys for 28 trees have been identified.
- Endoscope inspection surveys for five trees have been identified.

If no bats are identified through the surveys, then the tree can be soft felled during the winter months as described in **Section 4.2**.

If bats are identified through the surveys, then an EPS licence application to Natural England will be required and specific methodology will be included within the licence application.

Appendices

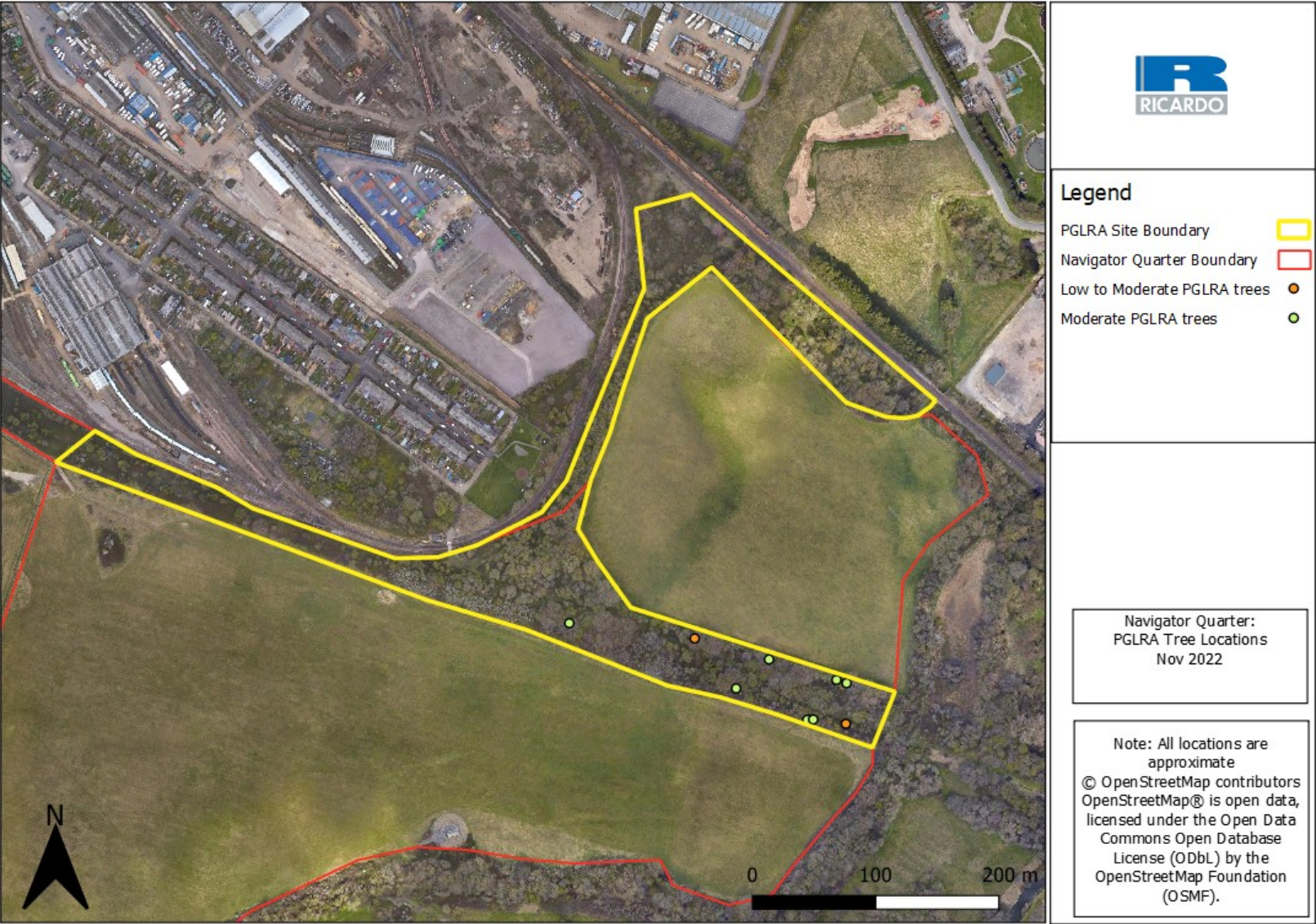
Appendix 1: Table of results – PGLRA Navigation Quarter Woodland Boundary

Tree No.	Observation	Recommendation	Bat Potential (Ground Assessment)	Notes
174	Torn limbs, moderate ivy coverage, split in branch	Endoscope	Low	-
171	Large oak, tear in limb, holes in canopy, moderate ivy coverage	Climb	Moderate	Difficult to see holes in canopy
382	Low features, torn limb and dead wood.	Endoscope	Low	-
383	Large tree, dense ivy coverage.	Endoscope	Low - Moderate	-
384	Large oak, some knot holes in canopy, difficult to see from ground.	Climb	Low	Only climb if impacted
385	Large tree, knot holes north east facing	Climb	Low - Moderate	Only climb if impacted
386	Large tree, multiple splits in stems, dead wood in canopy	Climb	Moderate	Only climb if impacted
388	Large tree, dead limbs in canopy, moderate ivy coverage, snapped limbs, difficult to see holes.	Climb	Low	Only climb if impacted
399	Dense ivy coverage, difficult to see any features.	Climb	Moderate	Only climb if impacted
394	Dense ivy coverage, dead wood in canopy, difficult to see any features.	Climb	Moderate	Only climb if impacted
788	North facing hole on secondary stem.	Endoscope	Low	Only climb if impacted
789	East facing hole on primary stem and deadwood.	Endoscope	Moderate	-
791	East facing large oak, holes on secondary stems, rot holes and splits in stems in canopy.	Climb	Moderate	-
790	Various rot holes in multiple stems.	Climb	Low	Only climb if impacted
792	Large oak, rot holes in multiple stems in canopy.	Climb	Moderate	-

Tree No.	Observation	Recommendation	Bat Potential (Ground Assessment)	Notes
793	Multiple dead limbs, split bark, torn branches.	Climb	Low - Moderate	May not be able to be climbed due to dead wood.
794	Large tree, multiple stems with torn limbs, rot holes, difficult to see from ground.	Climb	Moderate	-
795	East facing large tree, split in main stem, rot holes, difficult to see from ground.	Climb	Moderate	-
400	Thick ivy, large tree, difficult to see features from ground.	Climb	Low	Only climb if impacted
262	Split bark in canopy, rot holes, tear in limbs, multiple features.	Climb	Low - Moderate	-
257	Split stems, dead wood in canopy, lifted bark.	Climb	Moderate	-
256	Dead wood in canopy, lifted bark, rot holes.	Climb	Moderate	-
246	Dense ivy around trunk and branches, features obscured.	Climb	Low	Only climb if impacted
290	Two limb tears (south and north facing), lifted bark.	Climb	Moderate	-
291	Rot holes (south facing and north facing), limb tears and large split, large oak.	Climb	Moderate	-
293	Hole in limb in canopy, dead wood in canopy.	Climb	Low	Only climb if impacted
294	Hole in main stem (SW facing) potential holes in canopy, need further inspection to confirm.	Climb	Low	Only climb if impacted
287	Potential features in canopy, dense ivy on stems, dead wood in canopy, large oak.	Climb	Moderate	-
283	Some potential holes in canopy.	Climb	Low	Only climb if impacted
148	Tear in limb (SW facing), rot hole.	Climb	Low	

Tree No.	Observation	Recommendation	Bat Potential (Ground Assessment)	Notes
152	Potential split in main stem, difficult to see from ground.	Climb	Low	Only climb if impacted
195	Dense ivy, hard to see from ground, w=dead wood in canopy, lifted bark.	Climb	Moderate	-
156	Hole in one limb facing north.	Climb	Low - Moderate	-

Appendix 2: Map of Tree Locations





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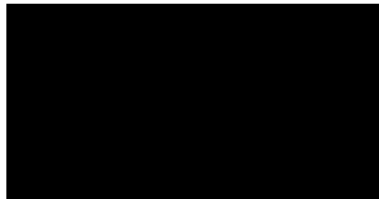
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1. INTRODUCTION

1.1 BACKGROUND

Southampton International Airport Limited has commissioned ecological surveys within the Navigation Quarter woodland boundary. Ricardo Energy & Environment (Ricardo) was commissioned by Southampton International Airport Limited to undertake a Preliminary Ground Level Roost Assessment (PGLRA) in March 2022 to determine the presence of suitable bat roost features within the trees identified as having the potential to be impacted by works.

The visual PGLRA assessment recommended a range of works required to further assess the presence of bats in the woodland. The tree work recommended can be divided into two components:

1. An endoscope assessment for 5 trees
2. A climb and inspect survey for 28 trees

1.2 AIMS & OBJECTIVES

The purpose of this report is to inform the client of the confirmed and/or potential utilisation of the site by bats. Detailed objectives are to:

- Confirm the presence or likely absence of roosting bats.
- Record the location of any bat roosting sites should they be present.
- Identify and assess the magnitude of impacts on bats which are likely to result from tree works.
- Describe any measures necessary to avoid, reduce or compensate for impacts so that there is no net harm to bats.
- Identify any further surveys required.

1.3 LEGISLATION CONTEXT

All 18 native UK bat species and their breeding sites or resting sites (roosts) are protected under Schedule 5 of the Wildlife and Countryside Act 1981 (WCA) (as amended) and Schedule 2 of the Conservation of Habitats and Species Regulations 2017 (as amended) which makes each a European Protected Species (EPS).

The Countryside and Rights of Way Act 2000 (CROW) has amended the WCA in England and Wales and this Act adds additional enforcement.

Together these legislations make it illegal to:

- Deliberately kill, injure or capture bats.
- Deliberately disturb bats whether in a roost or not, disturbance includes anything that is likely to impair their ability to survive, breed, reproduce or rear their young, or impair their ability to hibernate or migrate.
- Intentionally or recklessly disturb roosting bats or obstruct access to their roosts.
- Damage or destroy a bat roosting place (even if bats are not occupying the roost at the time).
- Possess or transport a bat or any part of a bat unless acquired legally.
- Sell or exchange bats, or parts of bats.

Barbastelle *Barbastella barbastellus*, Bechstein's bat *Myotis bechsteinii*, greater horseshoe bat *Rhinolophus ferrumequinum* and lesser horseshoe bat *R. hipposideros* are also listed on Annex II of

the Habitats Directive, which means that Special Areas of Conservation (SAC) may be attributed to internationally important roosts and foraging areas of these species.

Certain bat species are also Species of Principal Importance for the purpose of conserving biodiversity under Section 41 (England) of the Natural Environment and Rural Communities (NERC) Act 2006. These species need to be taken into consideration by a public body when performing any of its functions. The priority bat species are: greater horseshoe bat, lesser horseshoe bat; Bechstein's bat, noctule *Nyctalus noctula*, soprano pipistrelle *Pipistrellus pygmaeus*, brown long-eared bat *Plecotus auritus* and barbastelle.

1.4 STUDY AREA AND LOCATION

The location of the 2022 PGLRA is shown by the yellow line boundary in **Figure 1.1** below. The site is located to the north of Southampton Airport, and south of the Network Rail Eastleigh Railway Depot. The Network Rail Field site (approximate central NGR: SU4637617800) is located on the north east side of Southampton Airport, north of the Itchen Valley park and south east of Barton Park industrial estate in Eastleigh, Southampton.



Figure 1.1 Study Area of PGLRA

Base map sources: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

2. METHODOLOGY

2.1 DESK STUDY

A review was undertaken of the PEA produced by Ricardo in 2021 as well as the previous PGLRA reports (Ricardo, 2019a¹; Ricardo, 2019b² and Ricardo, 2020³) and bat survey report (Ricardo, 2019c⁴) issued to Southampton International Airport Limited to identify previous bat records associated within 2km of the site and within functionally linked habitat.

Information on internationally, nationally and locally designated sites of nature conservation importance and records of notable and protected species were obtained within a 2km radius of the nearby Fire Training Ground (FTG) site (central NGR: SU 44398 16350) from Hampshire Biodiversity Information Centre (HBIC) in June 2021. It is considered that this data is sufficient to inform this report. These records were supplemented with internet-based resources such as Multi-Agency Geographic Information for the Countryside (MAGIC), National Biodiversity Network (NBN) and Google Maps. Searches of these databases were carried out within a 2km radius of the Freeport site.

These combined records were analysed to determine their relevance to the site and the proposed works, taking into consideration the conservation objectives of designated nature conservation sites, the dates and locations of each record and the sensitivity of the recorded feature to likely impacts.

The findings of this desk study and ecological considerations are shown in **Table 3.1** below.

The trees in the survey were categorised into three categories of bat roost potential after assessment. This includes trees with low potential, moderate potential and high potential.

2.2 FIELD SURVEY

2.2.1 Preliminary Ground Level Roost Assessment (PGLRA)

A PGLRA was undertaken located along the boundaries of the Network Rail Field and the Airport North East Field on the 15th and 16th March 2022 in relation to the woodland trees. The survey involved assessing trees from the ground for their potential to support bat roosts, following current best practice guidance (Collins, 2016)⁵. The surveys were undertaken by an experienced ecologist Laurence David (BSc, ACIEEM).

The assessment was undertaken using close focussing binoculars to search for potential roost features (PRF) suitable for use by roosting bats such as, but are not limited to, crevices, flaking bark, split limbs, woodpecker holes, rot holes, and dense ivy growth. The survey also involved searching for signs of bat activity such as scratch marks, staining and droppings.

The trees surveyed were categorised using the assessment criteria in Table 4.1 of the 3rd edition of the Bat Conservation Trust (BCT) Guidelines (Collins, 2016):

¹ Ricardo 2019a. Marlhill Copse, Southampton: Preliminary Ground-level Roost Assessment & Climb and Inspect Survey for Bats. Report for Southampton International Airport Limited.

² Ricardo 2019b. Marlhill Copse, O2 Landing Lights and North of River Itchen sites, Southampton: Preliminary Ground-level Roost Assessment. Report for Southampton International Airport Limited.

³ Ricardo 2020. Marlhill Copse, Southampton: Area 1 Preliminary Ground-level Roost Assessment & Climb and Inspect Survey for Bats. Report for Southampton International Airport Limited.

⁴ Ricardo 2019c. Marlhill Copse, O2 Landing Lights and North of River Itchen sites, Southampton: Further Bat Surveys Report. Report for Southampton International Airport Limited.

⁵ Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London. ISBN-13 978-1-872745-96-1

• Known or confirmed bat roost:	Evidence of bats present (e.g. droppings, live or dead bats) and/or desk study record.
• High potential:	Structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitats.
• Moderate potential:	Structure or tree with one or more potential roost sites that could be used by several bats due to their size, shelter, protection, conditions and surrounding habitats, but unlikely to support a roost of high conservation concern.
• Low potential:	Structure or tree with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity / hibernation).
• Negligible potential:	Structure or tree with no potential to support bats.

These categories have been used to inform the recommendations of this report (see **Section 4**).

2.3 LIMITATIONS

There were no limitations to the survey.

Table 3.1 – Summary of ecological features, potential impacts and recommendations

Sites: Navigation Quarter and Network Rail Field Sites NGR: Approximate central grid reference – SU 46093 17643		PROJECT NAME: Southampton Freepoint, Southampton Airport	
Ecological and Status	Features Description: Presence (actual or potential), level of potential (high, medium, low, negligible), distance and direction from site, locations within site, relevant habitat features and connectivity, etc.	Potential Impacts:	Recommendations: Requirement for further survey and/or assessment.
Bats Protected by law: • The Conservation of Habitats and Species Regulations 2017 (as amended) • Wildlife & Countryside Act 1981 (as amended) Listed under: • NERC Act 2006	Data returned from HBIC contained records for a number of species within the search area, including common pipistrelle, <i>Pipistrellus pipistrellus</i>, Nathusius's pipistrelle, <i>Pipistrellus nathusii</i>, soprano pipistrelle, <i>Pipistrellus pygmaeus</i>, noctule, <i>Nyctalus noctula</i>, Natterer's bat, <i>Myotis nattereri</i>, whiskered bat, <i>Myotis mystacinus</i>, brown long-eared bat, <i>Plecotus auritus</i>, serotine, <i>Eptesicus serotinus</i> and Daubenton's bat, <i>Myotis daubentonii</i>. The woodland along the edge of the North East Field and Network Rail site provides suitable foraging opportunities for bats however, no on-site trees had features suitable for supporting roosting bats. A number of willow trees to the east of the site offered potential roosting opportunities. The site was well-connected to additional supporting habitats within the surrounding wider area.	The woodland and wetland habitats adjacent to the site have the potential to support an assemblage of bat species and therefore the site was assessed as being high potential for bats⁷. Foraging and commuting habitat may be impacted by the proposed works along with loss of foraging habitats. The site was assessed as having suitable foraging habitat. Lighting during works has potential to deter bats from foraging or using roosts within the immediate vicinity. No structures or trees within the site were assessed as having bat roosting potential.	It is recommended that bat activity surveys are undertaken to assess the number and key areas of the site utilised by bats. Two visits are required per month between April – October (14 visits in total) where a transect route will be walked by surveyors recording bats and their movements. Static bat detectors will also be left on the site. If trees are required to be removed a PGLRA survey should be undertaken to assess bat roosting features and further surveys which may be required. Works should be undertaken during daylight hours only and no artificial lighting used.

3. RESULTS

3.1 DESK STUDY

The PEA (Ricardo, 2021) reported that data returned from HBIC contained records for a number of species within the search area, including common pipistrelle, *Pipistrellus pipistrellus*, Nathusius's pipistrelle, *Pipistrellus nathusii*, soprano pipistrelle, *Pipistrellus pygmaeus*, noctule, *Nyctalus noctula*, Natterer's bat, *Myotis nattereri*, whiskered bat, *Myotis mystacinus*, brown long-eared bat, *Plecotus auritus*, serotine, *Eptesicus serotinus* and Daubenton's bat, *Myotis daubentonii*.

The woodland and wetland habitats adjacent to the site have the potential to support an assemblage of bat species and therefore the site was assessed as being high potential for bats. Foraging and commuting habitat may be impacted by the proposed works along with loss of foraging habitats. The site was assessed as having suitable foraging and roosting habitat.

3.2 NAVIGATION QUARTER WOODLAND BOUNDARY PGLRA

The site consisted of a mixed semi-natural woodland and the tree species recorded included English oak *Quercus robur*, ash *Fraxinus excelsior* and horse chestnut *Aesculus hippocastanum*.

All trees within the site boundary (**Figure 1.1**) were surveyed however not all were tagged or counted therefore just the trees within the site with bat roosting potential were recorded. A total of 33 individual trees were assessed as having bat potential during the survey in March 2022. The findings and associated suitability categories are presented as follows:

- 13 trees were assessed as **low** potential.
- Five trees were assessed as **low/moderate** potential
- 15 trees were assessed as **moderate** potential

No confirmed roosts were identified during the PGLRA survey.

Survey results for these trees, including locations of moderate risk trees are shown in **Appendix 1**.

4. RECOMMENDATIONS

4.1 NAVIGATION QUARTER WOODLAND BOUNDARY

The results of the PGLRA revealed 13 trees as low potential, five trees of low/moderate potential and 15 trees of moderate potential for roosting bats.

The proposed felling and/or remedial works of those trees identified as having potential for bat roosts would cause adverse direct impacts upon bats through the loss of roosting opportunities and through killing and injuring bats which may be present within the PRFs identified.

Recommendations for further surveys, mitigation measures and enhancement opportunities are provided below.

4.2 FURTHER SURVEYS – NAVIGATION QUARTER WOODLAND BOUNDARY

4.2.1 Climb and Inspect and Ground Based Endoscope Survey

It is recommended that further PRFs inspection surveys are undertaken to fully assess the suitability of the PRFs and search for signs of bat activity. Further bat roost inspection surveys should include, climb and inspect, and ground-based endoscope surveys of the trees assessed as low/moderate or high suitability.

The surveys will involve climbing the trees to facilitate closer inspection of features identified as being of moderate/high roosting potential during the PGLRA survey. Inspection of PRFs will be undertaken using an endoscope to fully assess their extent, suitability for use by bats, and search for any signs of occupation and/or previous use by bats. The tree categories and survey effort required will be revised if necessary following closer inspection during the climb and inspection surveys.

The survey should be undertaken by a pair of qualified tree climbers and led by a licenced bat surveyor.

Two separate methodologies should be considered, depending on the tree works priority, as identified by the visual tree assessment report, to ensure that the tree works do not result in any net harm to bats, despite the health & safety considerations.

Trees requiring an endoscope inspection survey

It is recommended that tree endoscope inspection surveys for five trees identified as low to moderate potential, see **Appendix 1**. Not all trees identified within the survey will be impacted therefore once detailed design has been confirmed the number of trees requiring an endoscope survey may be lower.

If no bat roost is identified and the PRFs are downgraded to negligible following these further surveys, then no further surveys are required. Works should follow the mitigation advice provided in Section 4.2.

If a PRF has been verified and confirmed as moderate or high suitability for bats, or evidence of bats is found, dusk emergence and/or dawn re-entry surveys to inform the use of the PRF should be undertaken between May and September 2023 as presented in **Table 4.1**.

Trees requiring a climb inspection survey

It is recommended that tree climb inspection surveys are undertaken on the twenty-eight trees identified as low to moderate potential and not subject to endoscope surveys, see **Appendix 1**. Not all trees identified within the survey will be impacted therefore once detailed design has been confirmed the number of trees requiring a climb and inspect survey may be lower.

The required survey effort to ascertain that there is no net harm to bats should include:

- Initial tree climbing survey to assess the suitability of the PRF and either downgrade or confirm its suitability for bats roosting or the presence of bat roosts / bat signs.
- If the PRF has been downgraded to negligible potential following the initial tree climbing survey, then no further survey would be required. Works should follow the mitigation advice provided in **Section 4.2**.
- If a PRF has been verified and confirmed as moderate or high suitability for bats, or evidence of bats is found, dusk emergence and/or dawn re-entry surveys to inform the use of the PRF should be undertaken between May and September 2023 as presented in **Table 4.1**.
- If a bat roost is confirmed as a result of further survey, then an EPS licence application to Natural England will be required, the recommended surveys will provide the information required to inform a licence application.

Dusk Emergence/Dawn Re-entry Survey

Tree of moderate priority for tree works

If a PRF cannot be fully inspected during the tree climbing survey and/or ground-based endoscope survey, it may be necessary to undertake dusk emergence and/or dawn re-entry surveys during the summer active period (May – September). These surveys would involve surveyors watching for bats emerging from or re-entering the features identified within this report. The required survey effort and timings based on the roost suitability identified are provided in **Table 4.1** below.

If a PRF has been verified and confirmed as moderate or high suitability for bats, or evidence of bats is found, further dusk emergence and/or dawn re-entry surveys should be undertaken between May and September 2023 to inform the use of the PRF. The required survey effort and timings based on the roost suitability identified are provided in **Table 4.1** below.

If a bat roost is confirmed as a result of further survey, then an EPS licence application to Natural England will be required, the recommended surveys will provide the information required to inform a licence application.

Table 4-1: Survey requirements for dusk emergence/dawn re-entry surveys (Collins, 2016)

Negligible and low roost suitability	Moderate roost suitability	High roost suitability
No further survey required. See Section 4.2 for mitigation recommendations.	Two separate survey visits. One dusk emergence and a separate dawn re-entry survey. Surveys should be conducted between May and September with at least one visit being between May and August. Surveys should be at least two weeks apart.	Three separate survey visits. At least one dusk emergence and a separate dawn re-entry survey. The third visit could be either dusk or dawn. Surveys should be conducted between May and September with at least two visits being between May and August. Surveys should be at least two weeks apart.

4.3 MITIGATION

In trees, it is very difficult to have confidence that roosts are absent and therefore, even where no bats are found, it may still be necessary to apply precautionary measures when carrying out felling and pruning activities where suitable features (PRFs) are present. The following recommendations are considered suitably precautionary:

Timing of the works

Seasonally restricted and staged clearance of vegetation to minimise loss of habitat during the active bat season (April to October) inclusive.

Ecological Clerk of Works (ECoW)

An ECoW with relevant bat experience should be present on site to provide advice and support to contractors in relation to bats and other species as necessary. This would include ensuring the recommendations within this report are implemented on site.

Tree identified as moderate or high suitability

The trees identified as having moderate suitability for roosting bats should be subject to further surveys (as set out in Section 4.1) (if a climbing survey is unsuccessful or PRF confirmed to be of moderate or high suitability then two or three dusk emergence/dawn re-entry surveys should be undertaken) prior to felling/pruning.

If no bats are identified through the surveys outlined in **Sections 4.2.1** then the tree can be felled. In this situation it is recommended that the tree is soft felled during the winter months. Soft-felling involves the careful lowering of sections of tree with suitable roost features to the ground. These sections should then be left for one night before being processed further to allow any bats present to escape.

If bats are identified through the surveys outlined in **Sections 4.2.1** then an EPS licence application to Natural England will be required. A specific methodology will be included within the licence application, but key aspects are likely to include:

- The installation of exclusion devices to allow bats to leave the roost but prevent their return.
- The timing of felling/pruning works during the winter months.
- The erection of bat boxes on nearby trees, prior to felling works, to provide continuity of habitat for bats. Features should conform to published roost replacement guidance provided by the Bat Conservation Trust.

4.4 ENHANCEMENT OPPORTUNITIES

It is recommended that bat boxes are provided within the woodland as well as creating veteranisation features (through chainsaw cuts) where possible within the remaining trees and monoliths. Where possible, monoliths should be left as tall as possible (ideally at least 4 metres tall) so that veteranisation features can be created at a suitable height for bats and where they will be unlikely to be interfered with by members of the public.

It is recommended that bat boxes are erected, at a height of at least 4 metres, on semi-mature and mature trees throughout the woodland. If placed on the southern side of suitable trees, the boxes would receive sunlight throughout the day and placing them higher than 4m would minimise the risk of them being vandalised.

5. CONCLUSIONS

A PGLRA survey was completed in March 2022 within the woodland present within the proposed Navigator Quarter site. All trees within the boundary were assessed and individual trees were recorded which presented PRF's. The surveys recorded 13 trees of low potential, five trees of low - moderate potential and 15 of moderate potential.

It is recommended that further PRFs inspection surveys are undertaken to fully assess the suitability of the PRFs and search for signs of bat activity. Surveys proposed are as follows:

- Tree climbing surveys for 28 trees have been identified.
- Endoscope inspection surveys for five trees have been identified.

If no bats are identified through the surveys, then the tree can be soft felled during the winter months as described in **Section 4.2**.

If bats are identified through the surveys, then an EPS licence application to Natural England will be required and specific methodology will be included within the licence application.

Appendices

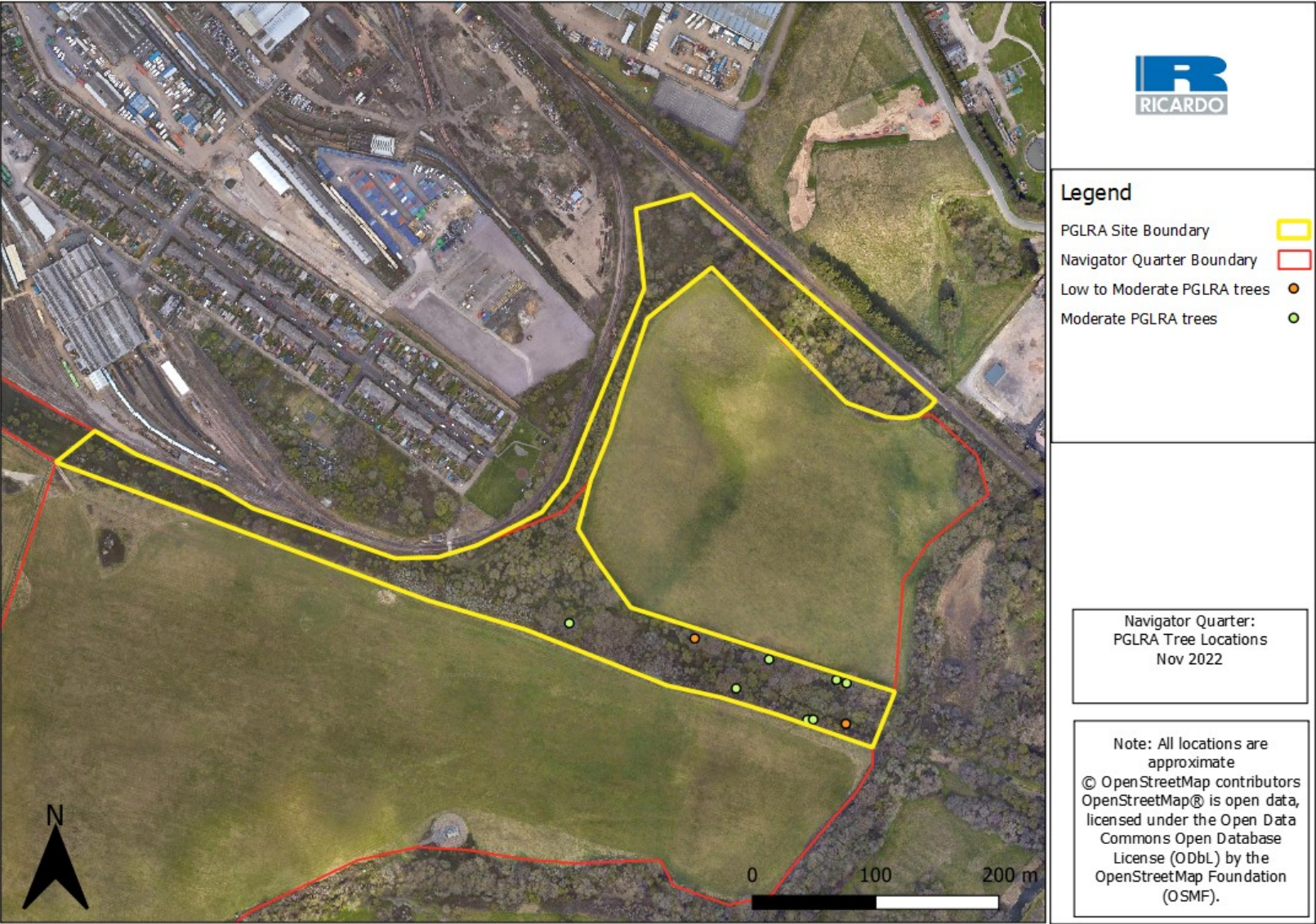
Appendix 1: Table of results – PGLRA Navigation Quarter Woodland Boundary

Tree No.	Observation	Recommendation	Bat Potential (Ground Assessment)	Notes
174	Torn limbs, moderate ivy coverage, split in branch	Endoscope	Low	-
171	Large oak, tear in limb, holes in canopy, moderate ivy coverage	Climb	Moderate	Difficult to see holes in canopy
382	Low features, torn limb and dead wood.	Endoscope	Low	-
383	Large tree, dense ivy coverage.	Endoscope	Low - Moderate	-
384	Large oak, some knot holes in canopy, difficult to see from ground.	Climb	Low	Only climb if impacted
385	Large tree, knot holes north east facing	Climb	Low - Moderate	Only climb if impacted
386	Large tree, multiple splits in stems, dead wood in canopy	Climb	Moderate	Only climb if impacted
388	Large tree, dead limbs in canopy, moderate ivy coverage, snapped limbs, difficult to see holes.	Climb	Low	Only climb if impacted
399	Dense ivy coverage, difficult to see any features.	Climb	Moderate	Only climb if impacted
394	Dense ivy coverage, dead wood in canopy, difficult to see any features.	Climb	Moderate	Only climb if impacted
788	North facing hole on secondary stem.	Endoscope	Low	Only climb if impacted
789	East facing hole on primary stem and deadwood.	Endoscope	Moderate	-
791	East facing large oak, holes on secondary stems, rot holes and splits in stems in canopy.	Climb	Moderate	-
790	Various rot holes in multiple stems.	Climb	Low	Only climb if impacted
792	Large oak, rot holes in multiple stems in canopy.	Climb	Moderate	-

Tree No.	Observation	Recommendation	Bat Potential (Ground Assessment)	Notes
793	Multiple dead limbs, split bark, torn branches.	Climb	Low - Moderate	May not be able to be climbed due to dead wood.
794	Large tree, multiple stems with torn limbs, rot holes, difficult to see from ground.	Climb	Moderate	-
795	East facing large tree, split in main stem, rot holes, difficult to see from ground.	Climb	Moderate	-
400	Thick ivy, large tree, difficult to see features from ground.	Climb	Low	Only climb if impacted
262	Split bark in canopy, rot holes, tear in limbs, multiple features.	Climb	Low - Moderate	-
257	Split stems, dead wood in canopy, lifted bark.	Climb	Moderate	-
256	Dead wood in canopy, lifted bark, rot holes.	Climb	Moderate	-
246	Dense ivy around trunk and branches, features obscured.	Climb	Low	Only climb if impacted
290	Two limb tears (south and north facing), lifted bark.	Climb	Moderate	-
291	Rot holes (south facing and north facing), limb tears and large split, large oak.	Climb	Moderate	-
293	Hole in limb in canopy, dead wood in canopy.	Climb	Low	Only climb if impacted
294	Hole in main stem (SW facing) potential holes in canopy, need further inspection to confirm.	Climb	Low	Only climb if impacted
287	Potential features in canopy, dense ivy on stems, dead wood in canopy, large oak.	Climb	Moderate	-
283	Some potential holes in canopy.	Climb	Low	Only climb if impacted
148	Tear in limb (SW facing), rot hole.	Climb	Low	

Tree No.	Observation	Recommendation	Bat Potential (Ground Assessment)	Notes
152	Potential split in main stem, difficult to see from ground.	Climb	Low	Only climb if impacted
195	Dense ivy, hard to see from ground, w=dead wood in canopy, lifted bark.	Climb	Moderate	-
156	Hole in one limb facing north.	Climb	Low - Moderate	-

Appendix 2: Map of Tree Locations





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NAVIGATOR QUARTER

Dormouse Survey: Link Road Site

Report for: Southampton International Airport Limited

Ref. 84004775

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Issue: 1

04/11/2022

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APPENDIX 1 – LEGISLATION AND PLANNING POLICY

1. INTRODUCTION

1.1 BACKGROUND

Ricardo Energy & Environment were commissioned by Southampton International Airport Limited to undertake a dormouse survey in relation to proposals to implement a development in the Southampton Navigator Quarter area and submit a planning application.

A Preliminary Ecological Appraisal (PEA), including a Phase 1 walkover survey and desk study was undertaken in June 2021 and the results were presented in a formal PEA report. This report provided general advice on ecological constraints associated with this project and included recommendations for detailed dormouse (*Muscardinus avellanarius*) presence/absence surveys of the working area and immediate surroundings, the results of which are presented in this report.

The objectives of the study were to undertake a series of robust dormouse survey visits, to understand whether this species is present on the site or likely to be absent. If found to be present, to confirm the distribution of dormouse and their usage of habitats around the site and where, and how they could be impacted by the proposed works.

1.2 DORMOUSE ECOLOGY AND SIGNIFICANCE

It was recommended in the PEA that a dormouse survey be undertaken to determine presence or likely absence. The surveys were undertaken throughout September 2021 to June 2022 and included 6 separate survey dates, as detailed in **Table 3.2**. Where dormouse are confirmed as present on a site, a mitigation plan would be required.

The hazel dormouse (*Muscardinus avellanarius*) is a small nocturnal mammal that is predominantly an arboreal species that mainly inhabits deciduous woodland and scrub. It is a very selective feeder; it feeds on hazel (*Corylus avellana*) nuts, flowers, pollen, fruit and insects. All these foods are available at different times of year; as a result, dormice must select habitats rich in all these food sources. Except for hibernation, they rarely descend to the ground and are reluctant to cross open spaces¹. The hazel dormouse has declined both in range and numbers across the UK, largely as a consequence of habitat loss and fragmentation arising from changes in woodland management and development.

The proposed development works have the potential to kill, injure or disturb dormice, or damage/destroy/obstruct access to their habitat. Consequently, dormouse surveys were recommended in the PEA in 2021 to determine the presence/ likely absence of this species and, if present, to inform appropriate mitigation which may require a European Protected Species (EPS) mitigation licence.

1.3 STUDY AREA AND LOCATION

The Mitchell Way Link Road site (approximate central NGR: SU4582417830) is located on the north west side of the Airport runway, north west of the Itchen Valley park and south of Barton park industrial estate in Eastleigh, Southampton and is shown in **Figure 1.1**. This site is the access route from the airport terminal to the long stay car park, and beyond to the proposed Navigator Quarter area to the north east of the airport. Due to the linked nature of the different areas of development, the study area of the dormouse survey covered the entirety of the Mitchell Way Link Road plus the Navigator Quarter sites.

The study area broadly comprised the following Phase 1 Habitat Survey classification habitats:

- Semi-improved grassland
- Broadleaved plantation woodland
- Dense scrub
- Scrub
- Scrub woodland
- Hard standing

¹ The dormouse conservation handbook, English Nature, second edition (2014).

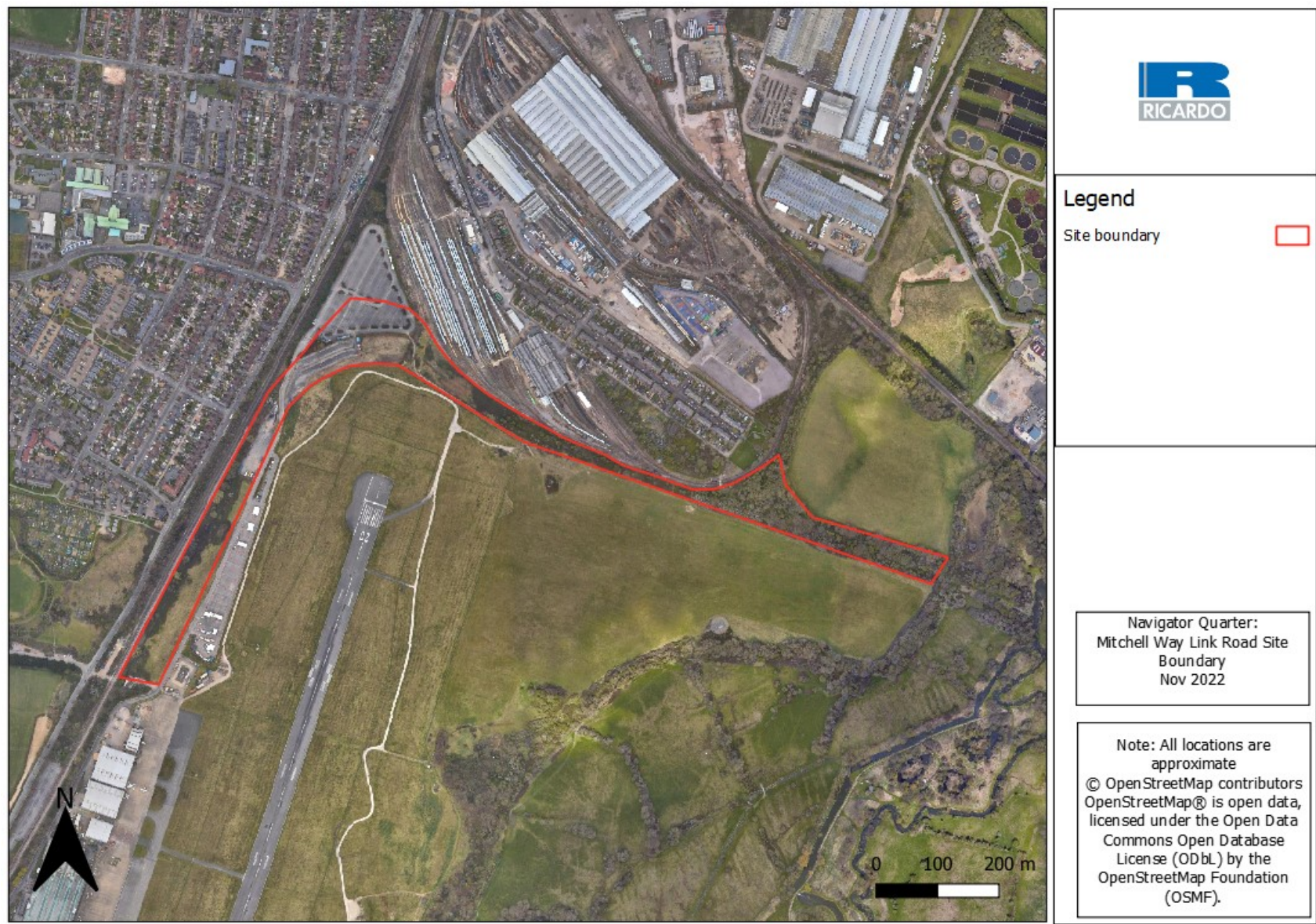


Figure 1.1 – Map of site boundary – Mitchell Way Link Road Site

2. METHODOLOGY

2.1 DESK STUDY

As part of the PEA, information on internationally, nationally and locally designated sites of nature conservation importance and records of notable and protected species were obtained within a 2km radius of the site (central NGR: SU 44398 16350) from Hampshire Biodiversity Information Centre (HBIC) in June 2021. These records were supplemented with internet-based resources such as Multi-Agency Geographic Information for the Countryside (MAGIC), National Biodiversity Network (NBN) and Google Maps. Searches of these databases were carried out within a 2km radius of the Navigator Quarter site.

These combined records were analysed to determine their relevance to the site and the proposed works, taking into consideration the conservation objectives of designated nature conservation sites, the dates and locations of each record and the sensitivity of the recorded feature to likely impacts.

The findings of this desk study and ecological considerations for dormice are shown in **Table 3.1** below.

2.2 FIELD SURVEY

Surveying for dormice involved the use of survey nest tubes to find evidence of nesting and potential nests occupied by dormice at the time of survey.

Sixty-five nest tubes were installed around the Navigator Quarter survey site, in accordance with the protocol outlined in The Dormouse Conservation Handbook at approximately 20m intervals between 0.5m and 2.0m above ground level sampling the key scrub and woodland areas within the site. A minimum of 50 survey tubes is required for a robust survey.

Survey effort for dormice is based on the index of probability scoring system in The Dormouse Conservation Handbook, where different months have a varying likelihood of dormice being detected, with nest tubes most likely to be occupied during May and August/September (See **Table 2.1** below for details of the scoring system). Based upon a minimum of 50 nest tubes, at least 20 points need to be accrued to ensure sufficient survey effort has been undertaken to determine likely absence.

The survey nest tubes were installed on the 02/08/2022 by licenced dormouse ecologist Laurence David and were inspected for signs of dormouse occupation on a monthly basis from September through to June 2022.

A map showing the location and numbers of dormouse tubes specific to the site is shown in **Figure 2.1**.

Table 2.1 – Index of probability scoring system cited in the Dormouse Conservation Handbook

Month	Index of Probability
April	1
May	4
June	2
July	2
August	5
September	7
October	2
November	2

2.3 LIMITATIONS

Tube number 58 was unable to be found of subsequent surveys after installation. Due to using 65 tubes within the site (over the minimum of 50 tubes) this is not considering a significant limitation.

This report deals with matters of legal significance but does not constitute professional legal advice. The client may wish to seek professional legal interpretation of the relevant wildlife legislation cited in this document, which is summarised in **Appendix 1**.

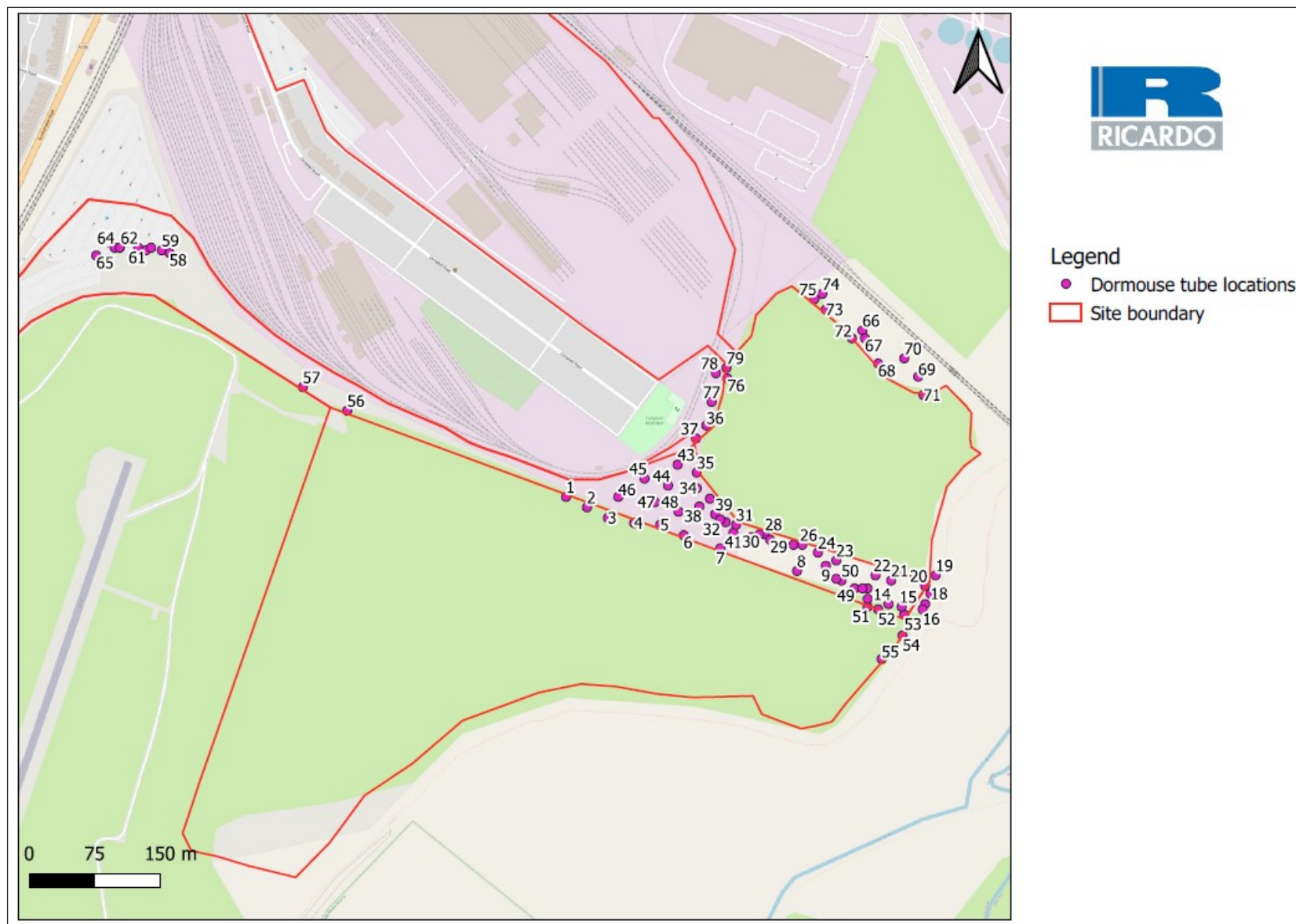


Figure 2.1 – Map of the 65 dormouse tubes deployed across the Navigator Quarter site

3. RESULTS

3.1 DESK STUDY

The findings of this desk study and ecological considerations related to dormouse presence are shown in **Table 3.1** below.

Data returned from HBIC included 11 records of hazel dormouse within the 2km search area. Monks Brook Greenway SINC is situated 1.5km south west at its closest point to the red line boundary and is designated for dormouse. However, there is no suitable habitat connectivity between these records and the site.

Dormouse nest in dense above-ground cover. This was noted throughout the woodland that makes up the majority of the Link Road site. There are also some fallen trees, dense bramble and leaf litter which could provide suitable refuge and hibernation habitat for dormice during the winter months.

The site is considered suitable for dormouse due to their habitat requirements of areas of woodland and connecting hedgerows/scrub to sustain a population.

Table 3.1 – Summary of dormouse features, potential impacts and recommendations from the PEA

Sites: Mitchell Way Link Road NGR: Approximate central grid reference – SU4637617800		PROJECT NAME: Southampton Freeport, Southampton Airport SURVEY DATE: 18/06/2021 SURVEYORS: Laurence David and Tom Clayton	
Ecological Features and Status <i>(see Appendix 1 for legislation summary)</i>	Description: Presence (actual or potential), level of potential (high, medium, low, negligible), distance and direction from site, locations within site, relevant habitat features and connectivity, etc.	Potential Impacts:	Recommendations: Requirement for further survey and/or assessment.
Dormouse (<i>Muscardinus avellanarius</i>) Protected by law: - The Conservation of Habitats and Species Regulations 2017 (as amended) - Wildlife & Countryside Act 1981 (as amended) Listed under: NERC Act 2006	HBIC provided 11 records of hazel dormouse within the search area. Monks Brook Greenway SINC is situated 1.5km south west at its closest point to the red line boundary and is designated for dormouse. However, there is no suitable habitat connectivity between these records and the site. Dormouse nest in dense above-ground cover. This was noted throughout the woodland that makes up the majority of the Link Road site. There are also some fallen trees, dense bramble and leaf litter which could provide suitable refuge and hibernation habitat for dormice during the winter months. Honeysuckle <i>Lonicera periclymenum</i> , a species favoured by dormice for use as nesting material, was noted in the woodland section along the eastern edge of the site boundary.	Given the nearby records of dormouse within the wider area in addition to the supporting vegetation present on site and its connectivity with abundant suitable vegetation within the wider landscape, it is possible that the site may support dormouse and as such this species may be impacted by the proposed works. Dormice are typically active from April/May to October/November and prefer to commute and forage amongst deciduous trees with dense and overlapping canopies and scrub understories. The loss of a small area of trees is unlikely to severely affect habitat connectivity within the context of the wider landscape as arboreal connectivity will be retained by trees, shrubs and	Dormouse are sensitive to various operations relating to tree works and ground disturbance depending on the time of year. It is recommended a dormouse survey is undertaken to establish the presence of dormouse in the woodland and scrub present within the site. Dormouse nest tubes (65 no.) should be set up within the suitable habitat within the north-east field site and checked over the peak season (April – November) to confirm presence or likely absence. Within the Lakeside Country Park site 50 dormouse tubes should be installed within the hedgerow within the eastern boundary of the site.

		bramble scrub to the east of the site. Dormice could also hibernate in accumulations of leaf litter (typically between November and April/May) within the site. Therefore, impacts to dormouse are possible throughout the entire year as a result of the proposed works (in the absence of mitigation).	
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3.2 FIELD SURVEY

No dormice or evidence of dormice was found. It is considered that a robust survey has been undertaken, which has determined likely absence of dormice within the site. The details and results of the dormouse survey are summarised in **Table 3.2**. Numerous wood mouse (*Apodemus sylvaticus*) were identified during the survey.

Table 3.2 Dormouse survey results

Visit	Date	Survey Score (running total)	Dormice	Comments
Set-up	02/08/2021	-	-	-
1	01/09/2021	5	-	5 wood mouse (box no. 55, 61 (3 individuals) and 64).
2	07/10/2021	12	-	4 wood mouse (box no. 1, 2 5 and 6). 3 wood mouse nests (box no.1, 59 and 60). 2 wood mouse food cache (box no. 54 and 55).
3	09/11/2021	14	-	4 wood mouse (box no. 2 (two individuals), 3 and 50). 4 wood mouse nests (box no.1, 61, 62 and 63). 2 wood mouse food cache (box no. 5 and 55).
4	09/12/2021	16	-	1 wood mouse (box no. 5) 3 wood mouse nests (box no. 1, 2 and 46).
5	19/05/2022	17	-	1 wood mouse (box no. 4).
6	17/06/2022	21	-	1 wood mouse (box no. 4).

4. SUMMARY OF FINDINGS AND RECOMMENDATIONS

4.1 STATUS OF DORMICE ON SITE

No dormice or evidence of dormice was recorded during the survey. It can therefore be concluded that dormice are likely absent within the survey area and as such no further surveys or specific mitigation measures are recommended regarding the species. Numerous wood mouse were identified during the survey therefore demonstrating the suitability of the site for rodents.

4.2 POTENTIAL MITIGATION AND ENHANCMENT REQUIREMENTS

No dormice or evidence of dormice was recorded during the visits therefore no specific mitigation is required.

If any dormice nests or individuals are suspected or encountered during works, the work should cease as soon as it is safe to do so, and an ecologist be promptly contacted for the most appropriate course of action. Due to the suitability of the site for rodents, it is recommended post construction wooden dormouse nest boxes are installed within the woodland on site to offer additional nesting resources.

APPENDICES

Appendix 1 – Legislation and Planning Policy

The Wildlife & Countryside Act 1981 (as amended)

Provides for **designation** and protection of Sites of Special Scientific Interest (SSSI), which are areas that represent the most valuable habitats in the UK for nature conservation.

The Act creates the following **offences**:

- To intentionally kill, injure, or take any wild bird or their eggs or nests (with exception to species listed in Schedule 2). Special penalties are available for offences related to birds listed on Schedule 1, for which there are additional offences of disturbing these birds at their nests, or their dependent young.
- To intentionally kill, injure, or take, possess, or trade in any wild animal listed in Schedule 5 (including the hazel dormouse), and interference with places used for shelter or protection, or intentionally disturbing animals occupying such places.
- Certain methods of killing, injuring, or taking wild animals listed in Schedule 6.
- To pick, uproot, trade in, or possess (for the purposes of trade) any wild plant listed in Schedule 8, and prohibits the unauthorised intentional uprooting of such plants.
- The release of certain non-native animals and planting of plants listed in Schedule 9.

It also provides a mechanism making any of the above offences legal through the granting of licences by the appropriate authorities.

Conservation of Habitats and Species Regulations 2017

The principal means by which the European Habitats Directive is transposed in England and Wales.

Provide for the **designation** and protection of a network of 'European Sites' (also termed Natura 2000), including Special Areas of Conservation (SAC) and Special Protection Areas (SPA).

Regulation 41 creates the following offences relating to European Protected Species (EPS) (including the hazel dormouse):

- deliberately capture, injure or kill any wild animal of a European Protected Species;
- deliberately disturb animals of any such species in such a way as to be likely to:
- impair their ability to survive, breed, rear or nurture their young, hibernate or migrate, or
- significantly affect the local distribution or abundance of the species to which they belong;
- deliberately take or destroy the eggs of such an animal; or
- damage or destroy a breeding site or resting place of such an animal.

The Regulations also make it an offence (subject to exceptions) to deliberately pick, collect, cut, uproot, destroy, or trade in the plants listed in Schedule 5.

However, the actions listed above can be made lawful through the granting of licences (European Protected Species Licence) by the appropriate authorities (Natural England in England). Licences may be granted for a number of purposes, but only after the appropriate authority has determined that the following regulations are satisfied:

- the works under the licence are being carried out for the purposes of 'preserving public health and public safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment'.
- there is 'no satisfactory alternative'
- the action 'will not be detrimental to the maintenance of the population of the species concerned at favourable conservation status in their natural range'.

To apply for a licence, the following information is required:

- The species concerned.
- The relative size of the population at the site (note this may require a survey to be carried out at a particular time of the year).
- The impact(s) (if any) that the development is likely to have upon the populations.
- What measures will be conducted to mitigate for the impact(s).

The Animal Welfare Act 2006

This imposes a duty of care on anyone responsible for an animal to take reasonable steps to ensure that the animal's needs are met. This means that a person has to look after the animal's welfare and ensure that it does not suffer. The Act says that an animal's welfare needs include:

- a suitable environment;
- a suitable diet;
- the ability to exhibit normal behaviour patterns;
- any need it has to be housed with, or apart from, other animals; and
- protection from pain, suffering, injury and disease.



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NAVIGATOR QUARTER

Dormouse Survey: Network Rail Field Site

Report for: Southampton International Airport Limited

Ref. 84004775

Ricardo ref. ED15367100

Issue: 1

04/11/2022

Customer:

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04/11/2022

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APPENDIX 1 – LEGISLATION AND PLANNING POLICY

1. INTRODUCTION

1.1 BACKGROUND

Ricardo Energy & Environment were commissioned by Southampton International Airport Limited to undertake a dormouse survey in relation to proposals to implement a development in the Southampton Navigator Quarter area and submit a planning application.

A Preliminary Ecological Appraisal (PEA)), including a Phase 1 walkover survey and desk study was undertaken in June 2021 and the results were presented in a formal PEA report. This report provided general advice on ecological constraints associated with this project and included recommendations for detailed dormouse (*Muscardinus avellanarius*) presence/absence surveys of the working area and immediate surroundings, the results of which are presented in this report.

The objectives of the study were to undertake a series of robust dormouse survey visits, to understand whether this species is present on the site or likely to be absent. If found to be present, to confirm the distribution of dormouse and their usage of habitats around the site and where, and how they could be impacted by the proposed works.

1.2 DORMOUSE ECOLOGY AND SIGNIFICANCE

It was recommended in the PEA that a dormouse survey be undertaken to determine presence or likely absence. The surveys were undertaken throughout September 2021 to June 2022 and included six separate survey dates, as detailed in **Table 3.2**. Where dormouse are confirmed as present on a site, a mitigation plan would be required.

The hazel dormouse (*Muscardinus avellanarius*) is a small nocturnal mammal that is predominantly an arboreal species that mainly inhabits deciduous woodland and scrub. It is a very selective feeder; it feeds on hazel (*Corylus avellana*) nuts, flowers, pollen, fruit and insects. All these foods are available at different times of year; as a result, dormice must select habitats rich in all these food sources. Except for hibernation, they rarely descend to the ground and are reluctant to cross open spaces¹. The hazel dormouse has declined both in range and numbers across the UK, largely as a consequence of habitat loss and fragmentation arising from changes in woodland management and development.

The proposed development works have the potential to kill, injure or disturb dormice, or damage/destroy/obstruct access to their habitat. Consequently, dormouse surveys were recommended in the PEA in 2021 to determine the presence/ likely absence of this species and, if present, to inform appropriate mitigation which may require a European Protected Species (EPS) mitigation licence.

1.3 STUDY AREA AND LOCATION

The Network Rail Field site (approximate central NGR: SU4637617800) is located on the north east side of Southampton Airport, north of the Itchen Valley park and south of Barton Park industrial estate in Eastleigh, Southampton and is shown in **Figure 1.1**. It is further north than the North East Field also included in this development.

The study area broadly comprised the following Phase 1 Habitat Survey classification habitats:

- Semi-improved grassland
- Broadleaved woodland
- Scrub woodland.

¹ The dormouse conservation handbook, English Nature, second edition (2014).

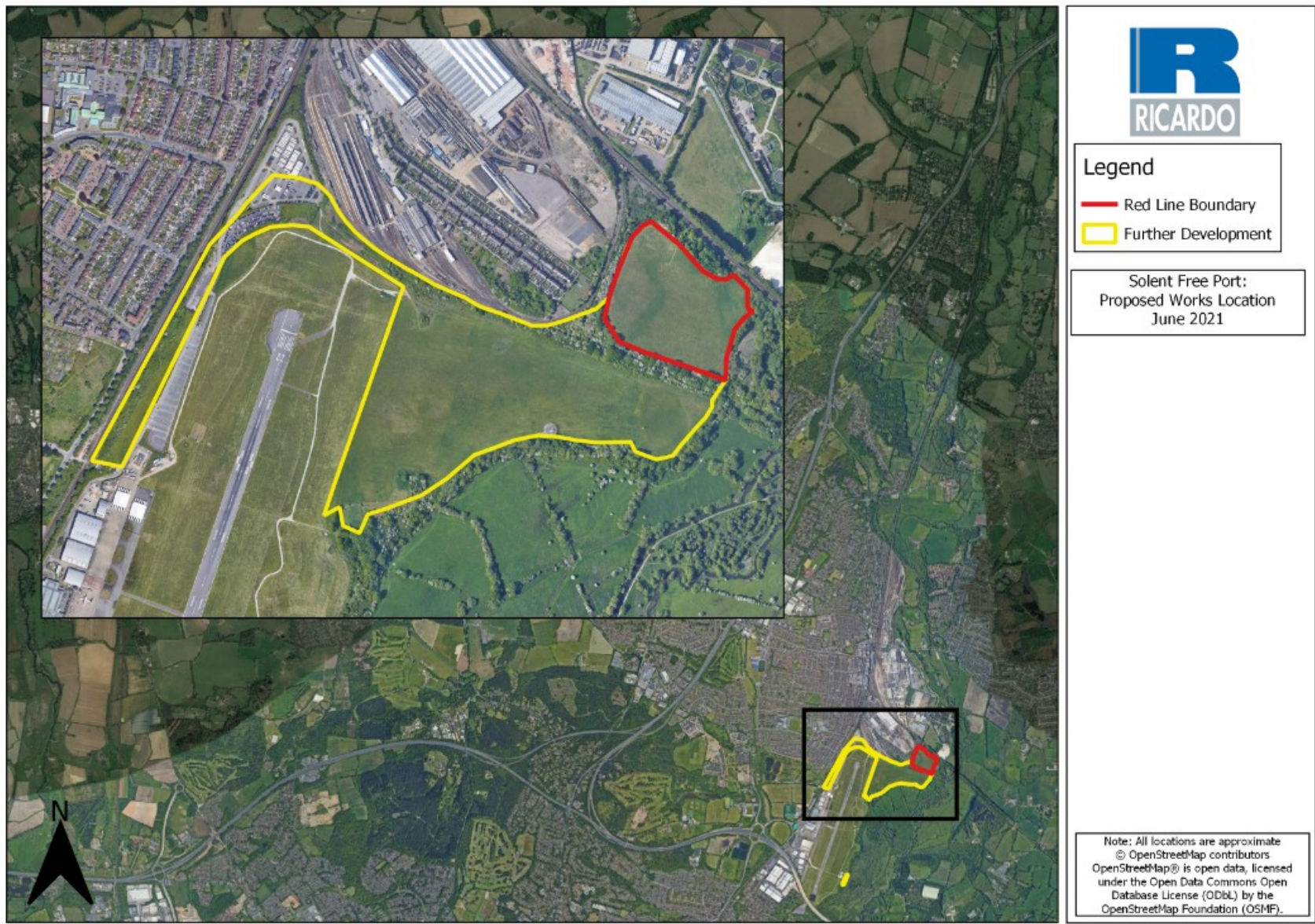


Figure 1.1 – Map of site boundary – Network Rail Field Site (shown in red)

2. METHODOLOGY

2.1 DESK STUDY

As part of the PEA, information on internationally, nationally and locally designated sites of nature conservation importance and records of notable and protected species were obtained within a 2km radius of the site (central NGR: SU 44398 16350) from Hampshire Biodiversity Information Centre (HBIC) in June 2021. These records were supplemented with internet-based resources such as Multi-Agency Geographic Information for the Countryside (MAGIC), National Biodiversity Network (NBN) and Google Maps. Searches of these databases were carried out within a 2km radius of the Navigator Quarter site.

These combined records were analysed to determine their relevance to the site and the proposed works, taking into consideration the conservation objectives of designated nature conservation sites, the dates and locations of each record and the sensitivity of the recorded feature to likely impacts.

The findings of this desk study and ecological considerations for dormice are shown in **Table 3.1** below.

2.2 FIELD SURVEY

Surveying for dormice involved the use of survey nest tubes to find evidence of nesting and potential nests occupied by dormice at the time of survey.

Sixty-five nest tubes were installed around the Navigator Quarter survey site, in accordance with the protocol outlined in The Dormouse Conservation Handbook at approximately 20m intervals between 0.5m and 2.0m above ground level sampling the key scrub and woodland areas within the site. A minimum of 50 survey tubes is required for a robust survey.

Survey effort for dormice is based on the index of probability scoring system in The Dormouse Conservation Handbook, where different months have a varying likelihood of dormice being detected, with nest tubes most likely to be occupied during May and August/September (See **Table 2.1** below for details of the scoring system). Based upon a minimum of 50 nest tubes, at least 20 points need to be accrued to ensure sufficient survey effort has been undertaken to determine likely absence.

The survey nest tubes were installed on the 02/08/2022 by licenced dormouse ecologist Laurence David and were inspected for signs of dormouse occupation on a monthly basis from September through to June 2022.

A map showing the location and numbers of dormouse tubes specific to the site is shown in **Figure 2.1**.

Table 2.1 – Index of probability scoring system cited in the Dormouse Conservation Handbook

Month	Index of Probability
April	1
May	4
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2.3 LIMITATIONS

Tube number 58 was unable to be found of subsequent surveys after installation. Due to using 65 tubes within the site (over the minimum of 50 tubes) this is not considering a significant limitation.

This report deals with matters of legal significance but does not constitute professional legal advice. The client may wish to seek professional legal interpretation of the relevant wildlife legislation cited in this document, which is summarised in **Appendix 1**.

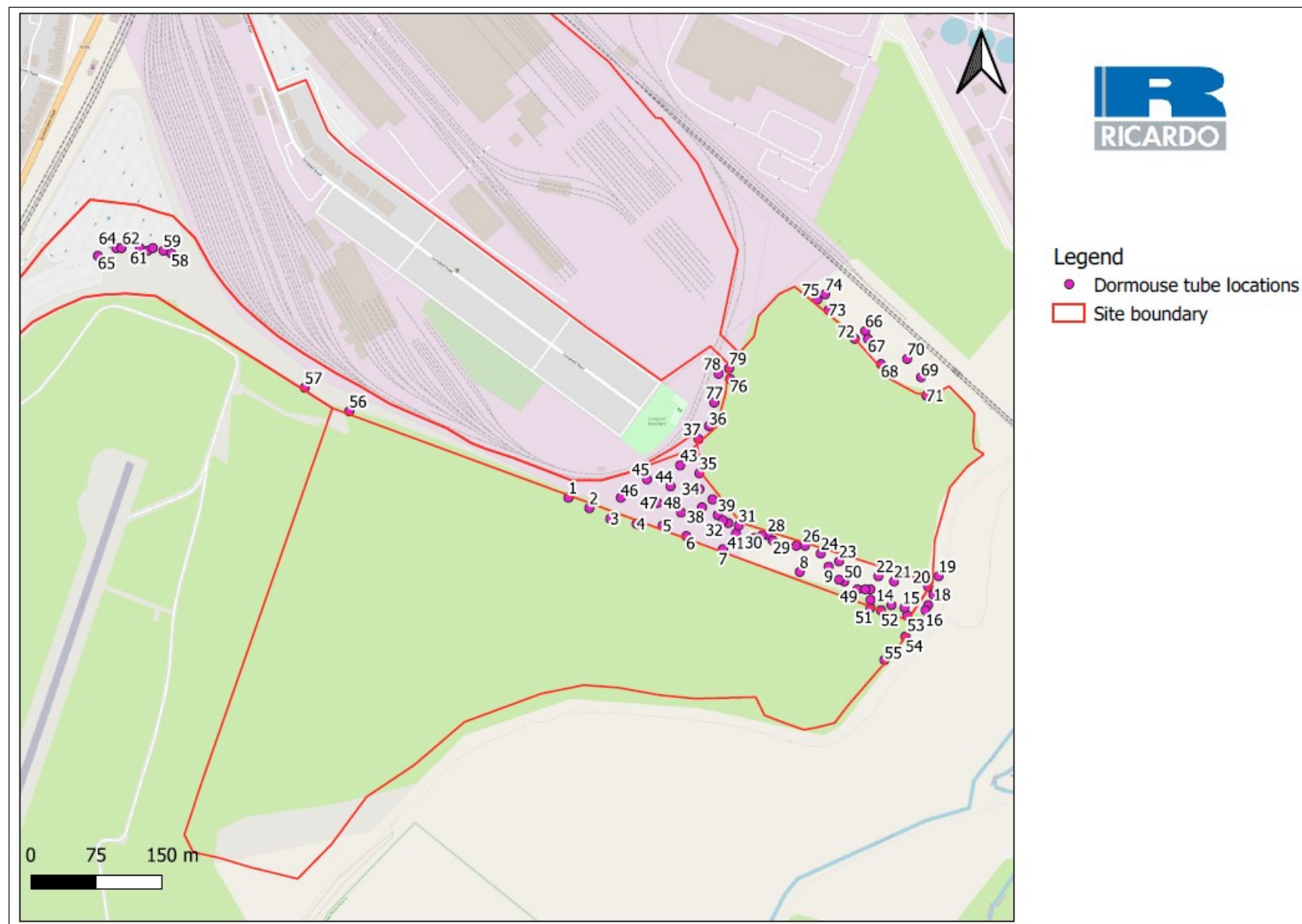


Figure 2.1 – Map of the 65 dormouse tubes deployed across the Navigator Quarter site

3. RESULTS

3.1 DESK STUDY

The findings of this desk study and ecological considerations related to dormouse presence are shown in **Table 3.1** below.

Data returned from HBIC included 11 records of hazel dormouse within the 2km search area. Monks Brook Greenway SINC is situated 1.5km south west at its closest point to the red line boundary and is designated for dormouse. However, there is no suitable habitat connectivity between these records and the site.

Dormouse nest in dense above-ground cover. This was noted throughout the woodland that makes up the majority of the Link Road site. There are also some fallen trees, dense bramble and leaf litter which could provide suitable refuge and hibernation habitat for dormice during the winter months.

The site is considered suitable for dormouse due to their habitat requirements of areas of woodland and connecting hedgerows/scrub to sustain a population.

Table 3.1 – Summary of dormouse features, potential impacts and recommendations from the PEA

Sites: Mitchell Way Link Road NGR: Approximate central grid reference – SU4637617800		PROJECT NAME: Southampton Freeport, Southampton Airport SURVEY DATE: 18/06/2021 SURVEYORS: Laurence David and Tom Clayton	
Ecological Features and Status <i>(see Appendix 1 for legislation summary)</i>	Description: Presence (actual or potential), level of potential (high, medium, low, negligible), distance and direction from site, locations within site, relevant habitat features and connectivity, etc.	Potential Impacts:	Recommendations: Requirement for further survey and/or assessment.
Dormouse (<i>Muscardinus avellanarius</i>) Protected by law: - The Conservation of Habitats and Species Regulations 2017 (as amended) - Wildlife & Countryside Act 1981 (as amended) Listed under: NERC Act 2006	HBIC provided 11 records of hazel dormouse within the search area. Monks Brook Greenway SINC is situated 1.5km south west at its closest point to the red line boundary and is designated for dormouse. However, there is no suitable habitat connectivity between these records and the site. Dormouse nest in dense above-ground cover. This was noted throughout the woodland that makes up the majority of the Link Road site. There are also some fallen trees, dense bramble and leaf litter which could provide suitable refuge and hibernation habitat for dormice during the winter months. Honeysuckle <i>Lonicera periclymenum</i> , a species favoured by dormice for use as nesting material, was noted in the woodland section along the eastern edge of the site boundary.	Given the nearby records of dormouse within the wider area in addition to the supporting vegetation present on site and its connectivity with abundant suitable vegetation within the wider landscape, it is possible that the site may support dormouse and as such this species may be impacted by the proposed works. Dormice are typically active from April/May to October/November and prefer to commute and forage amongst deciduous trees with dense and overlapping canopies and scrub understories. The loss of a small area of trees is unlikely to severely affect habitat connectivity within the context of the wider landscape as arboreal connectivity will be retained by trees, shrubs and	Dormouse are sensitive to various operations relating to tree works and ground disturbance depending on the time of year. It is recommended a dormouse survey is undertaken to establish the presence of dormouse in the woodland and scrub present within the site. Dormouse nest tubes (65 no.) should be set up within the suitable habitat within the north-east field site and checked over the peak season (April – November) to confirm presence or likely absence. Within the Lakeside Country Park site 50 dormouse tubes should be installed within the hedgerow within the eastern boundary of the site.

		bramble scrub to the east of the site. Dormice could also hibernate in accumulations of leaf litter (typically between November and April/May) within the site. Therefore, impacts to dormouse are possible throughout the entire year as a result of the proposed works (in the absence of mitigation).	
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3.2 FIELD SURVEY

No dormice or evidence of dormice was found. It is considered that a robust survey has been undertaken, which has determined likely absence of dormice within the site. The details and results of the dormouse survey are summarised in **Table 3.2**. Numerous wood mouse (*Apodemus sylvaticus*) were identified during the survey.

Table 3.2 Dormouse survey results

Visit	Date	Survey Score (running total)	Dormice	Comments
Set-up	02/08/2021	-	-	-
1	01/09/2021	5	-	5 wood mouse (box no. 55, 61 (3 individuals) and 64).
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4	09/12/2021	16	-	1 wood mouse (box no. 5) 3 wood mouse nests (box no. 1, 2 and 46).
5	19/05/2022	17	-	1 wood mouse (box no. 4).
6	17/06/2022	21	-	1 wood mouse (box no. 4).

4. SUMMARY OF FINDINGS AND RECOMMENDATIONS

4.1 STATUS OF DORMICE ON SITE

No dormice or evidence of dormice was recorded during the survey. It can therefore be concluded that dormice are likely absent within the survey area and as such no further surveys or specific mitigation measures are recommended regarding the species. Numerous wood mouse were identified during the survey therefore demonstrating the suitability of the site for rodents.

4.2 POTENTIAL MITIGATION REQUIREMENTS

No dormice or evidence of dormice was recorded during the visits therefore no specific mitigation is required.

If any dormice nests or individuals are suspected or encountered during works, the work should cease as soon as it is safe to do so, and an ecologist be promptly contacted for the most appropriate course of action. Due to the suitability of the site for rodents an ecologist it is recommended post construction wooden dormouse nest boxes are installed within the woodland on site to offer additional nesting resources.

APPENDICES

Appendix 1 – Legislation and Planning Policy

The Wildlife & Countryside Act 1981 (as amended)

Provides for **designation** and protection of Sites of Special Scientific Interest (SSSI), which are areas that represent the most valuable habitats in the UK for nature conservation.

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- To intentionally kill, injure, or take any wild bird or their eggs or nests (with exception to species listed in Schedule 2). Special penalties are available for offences related to birds listed on Schedule 1, for which there are additional offences of disturbing these birds at their nests, or their dependent young.
- To intentionally kill, injure, or take, possess, or trade in any wild animal listed in Schedule 5 (including the hazel dormouse), and interference with places used for shelter or protection, or intentionally disturbing animals occupying such places.
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- deliberately disturb animals of any such species in such a way as to be likely to:
- impair their ability to survive, breed, rear or nurture their young, hibernate or migrate, or
- significantly affect the local distribution or abundance of the species to which they belong;
- deliberately take or destroy the eggs of such an animal; or
- damage or destroy a breeding site or resting place of such an animal.

The Regulations also make it an offence (subject to exceptions) to deliberately pick, collect, cut, uproot, destroy, or trade in the plants listed in Schedule 5.

However, the actions listed above can be made lawful through the granting of licences (European Protected Species Licence) by the appropriate authorities (Natural England in England). Licences may be granted for a number of purposes, but only after the appropriate authority has determined that the following regulations are satisfied:

- the works under the licence are being carried out for the purposes of 'preserving public health and public safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment'.
- there is 'no satisfactory alternative'
- the action 'will not be detrimental to the maintenance of the population of the species concerned at favourable conservation status in their natural range'.

To apply for a licence, the following information is required:

- The species concerned.
- The relative size of the population at the site (note this may require a survey to be carried out at a particular time of the year).
- The impact(s) (if any) that the development is likely to have upon the populations.
- What measures will be conducted to mitigate for the impact(s).

The Animal Welfare Act 2006

This imposes a duty of care on anyone responsible for an animal to take reasonable steps to ensure that the animal's needs are met. This means that a person has to look after the animal's welfare and ensure that it does not suffer. The Act says that an animal's welfare needs include:

- a suitable environment;
- a suitable diet;
- the ability to exhibit normal behaviour patterns;
- any need it has to be housed with, or apart from, other animals; and
- protection from pain, suffering, injury and disease.



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NAVIGATOR QUARTER

Dormouse Survey: North East Field Site

Report for: Southampton International Airport Limited

Ref. 84004775

Ricardo ref. ED15367100

Issue: 1

04/11/2022

Customer:

Southampton International Airport Limited

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APPENDIX 1 – LEGISLATION AND PLANNING POLICY

1. INTRODUCTION

1.1 BACKGROUND

Ricardo Energy & Environment were commissioned by Southampton International Airport Limited to undertake a dormouse survey in relation to proposals to implement a development in the Southampton Navigator Quarter area and submit a planning application.

A Preliminary Ecological Appraisal (PEA), including a Phase 1 walkover survey and desk study was undertaken in June 2021 and the results were presented in a formal PEA report. This report provided general advice on ecological constraints associated with this project and included recommendations for detailed dormouse (*Muscardinus avellanarius*) presence/absence surveys of the working area and immediate surroundings, the results of which are presented in this report.

The objectives of the study were to undertake a series of robust dormouse survey visits, to understand whether this species is present on the site or likely to be absent. If found to be present, to confirm the distribution of dormouse and their usage of habitats around the site and where, and how they could be impacted by the proposed works.

1.2 DORMOUSE ECOLOGY AND SIGNIFICANCE

It was recommended in the PEA that a dormouse survey be undertaken to determine presence or likely absence. The surveys were undertaken throughout September 2021 to June 2022 and included six separate survey dates, as detailed in **Table 3.2**. Where dormouse are confirmed as present on a site, a mitigation plan would be required.

The hazel dormouse (*Muscardinus avellanarius*) is a small nocturnal mammal that is predominantly an arboreal species that mainly inhabits deciduous woodland and scrub. It is a very selective feeder; it feeds on hazel (*Corylus avellana*) nuts, flowers, pollen, fruit and insects. All these foods are available at different times of year; as a result, dormice must select habitats rich in all these food sources. Except for hibernation, they rarely descend to the ground and are reluctant to cross open spaces¹. The hazel dormouse has declined both in range and numbers across the UK, largely as a consequence of habitat loss and fragmentation arising from changes in woodland management and development.

The proposed development works have the potential to kill, injure or disturb dormice, or damage/destroy/obstruct access to their habitat. Consequently, dormouse surveys were recommended in the PEA in 2021 to determine the presence/ likely absence of this species and, if present, to inform appropriate mitigation which may require a European Protected Species (EPS) mitigation licence.

1.3 STUDY AREA AND LOCATION

The North East Field site (approximate central NGR: SU 46093 17643) is located on the north east side of the Airport runway north of the Itchen Valley Country Park and south of Barton park industrial estate in Eastleigh, Southampton and is shown in **Figure 1.1**.

The study area broadly comprised the following Phase 1 Habitat Survey classification habitats:

- Semi-improved grassland
- Broadleaved plantation woodland
- Dense Scrub
- Scrub
- Scrub woodland

¹ The dormouse conservation handbook, English Nature, second edition (2014).

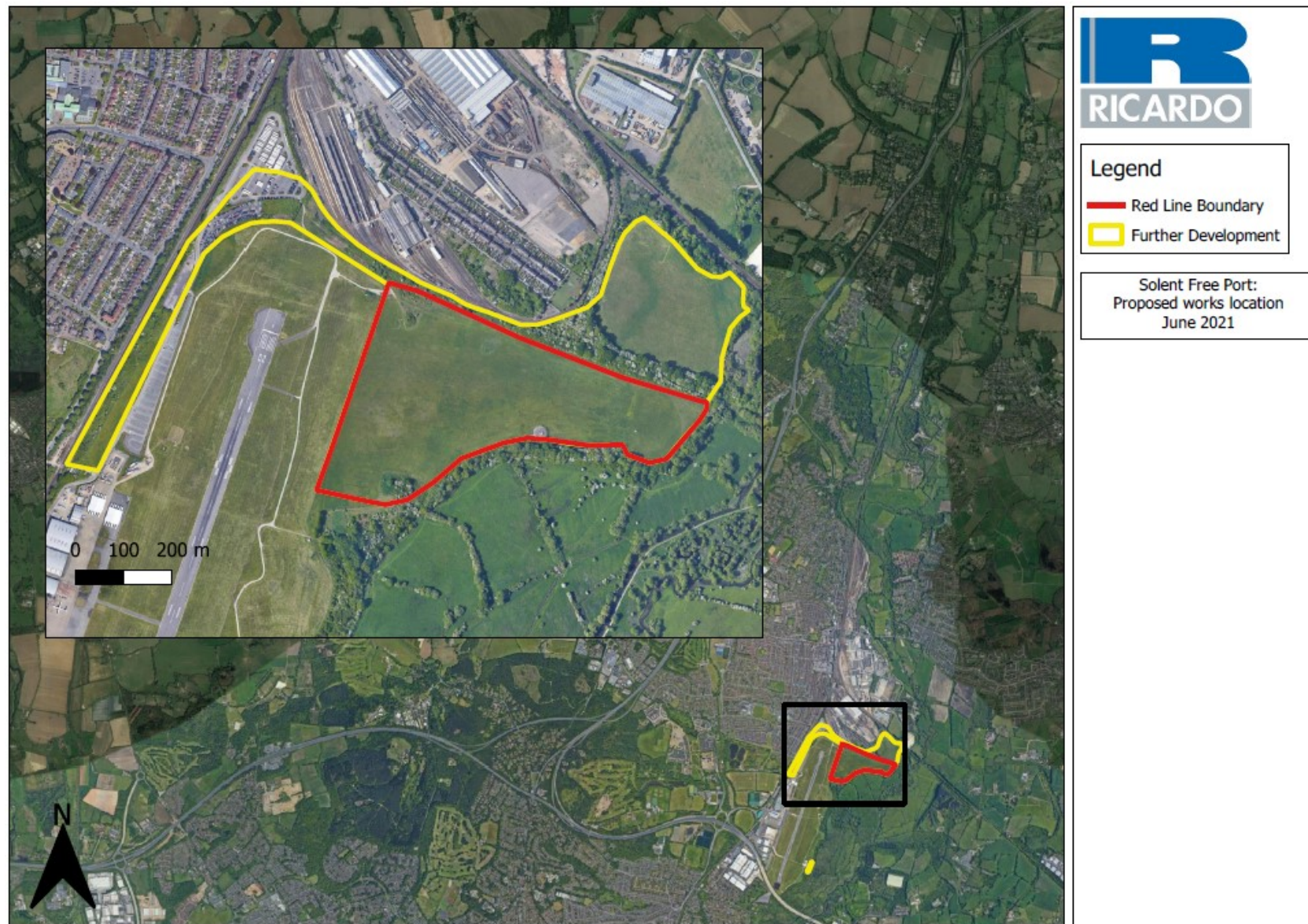


Figure 1.1 – Map of site boundary – North East Field Site (shown in red)

2. METHODOLOGY

2.1 DESK STUDY

As part of the PEA, information on internationally, nationally and locally designated sites of nature conservation importance and records of notable and protected species were obtained within a 2km radius of the site (central NGR: SU 44398 16350) from Hampshire Biodiversity Information Centre (HBIC) in June 2021. These records were supplemented with internet-based resources such as Multi-Agency Geographic Information for the Countryside (MAGIC), National Biodiversity Network (NBN) and Google Maps. Searches of these databases were carried out within a 2km radius of the Navigator Quarter site.

These combined records were analysed to determine their relevance to the site and the proposed works, taking into consideration the conservation objectives of designated nature conservation sites, the dates and locations of each record and the sensitivity of the recorded feature to likely impacts.

The findings of this desk study and ecological considerations for dormice are shown in **Table 3.1** below.

2.2 FIELD SURVEY

Surveying for dormice involved the use of survey nest tubes to find evidence of nesting and potential nests occupied by dormice at the time of survey.

Sixty-five nest tubes were installed around the Navigator Quarter survey site, in accordance with the protocol outlined in The Dormouse Conservation Handbook at approximately 20m intervals between 0.5m and 2.0m above ground level sampling the key scrub and woodland areas within the site. A minimum of 50 survey tubes is required for a robust survey.

Survey effort for dormice is based on the index of probability scoring system in The Dormouse Conservation Handbook, where different months have a varying likelihood of dormice being detected, with nest tubes most likely to be occupied during May and August/September (See **Table 2.1** below for details of the scoring system). Based upon a minimum of 50 nest tubes, at least 20 points need to be accrued to ensure sufficient survey effort has been undertaken to determine likely absence.

The survey nest tubes were installed on the 02/08/2022 by licenced dormouse ecologist Laurence David and were inspected for signs of dormouse occupation on a monthly basis from September through to June 2022.

A map showing the location and numbers of dormouse tubes specific to the site is shown in **Figure 2.1**.

Table 2.1 – Index of probability scoring system cited in the Dormouse Conservation Handbook

Month	Index of Probability
April	1
May	4
June	2
July	2
August	5
September	7
October	2
November	2

2.3 LIMITATIONS

Tube number 58 was unable to be found of subsequent surveys after installation. Due to using 65 tubes within the site (over the minimum of 50 tubes) this is not considering a significant limitation.

This report deals with matters of legal significance but does not constitute professional legal advice. The client may wish to seek professional legal interpretation of the relevant wildlife legislation cited in this document, which is summarised in **Appendix 1**.

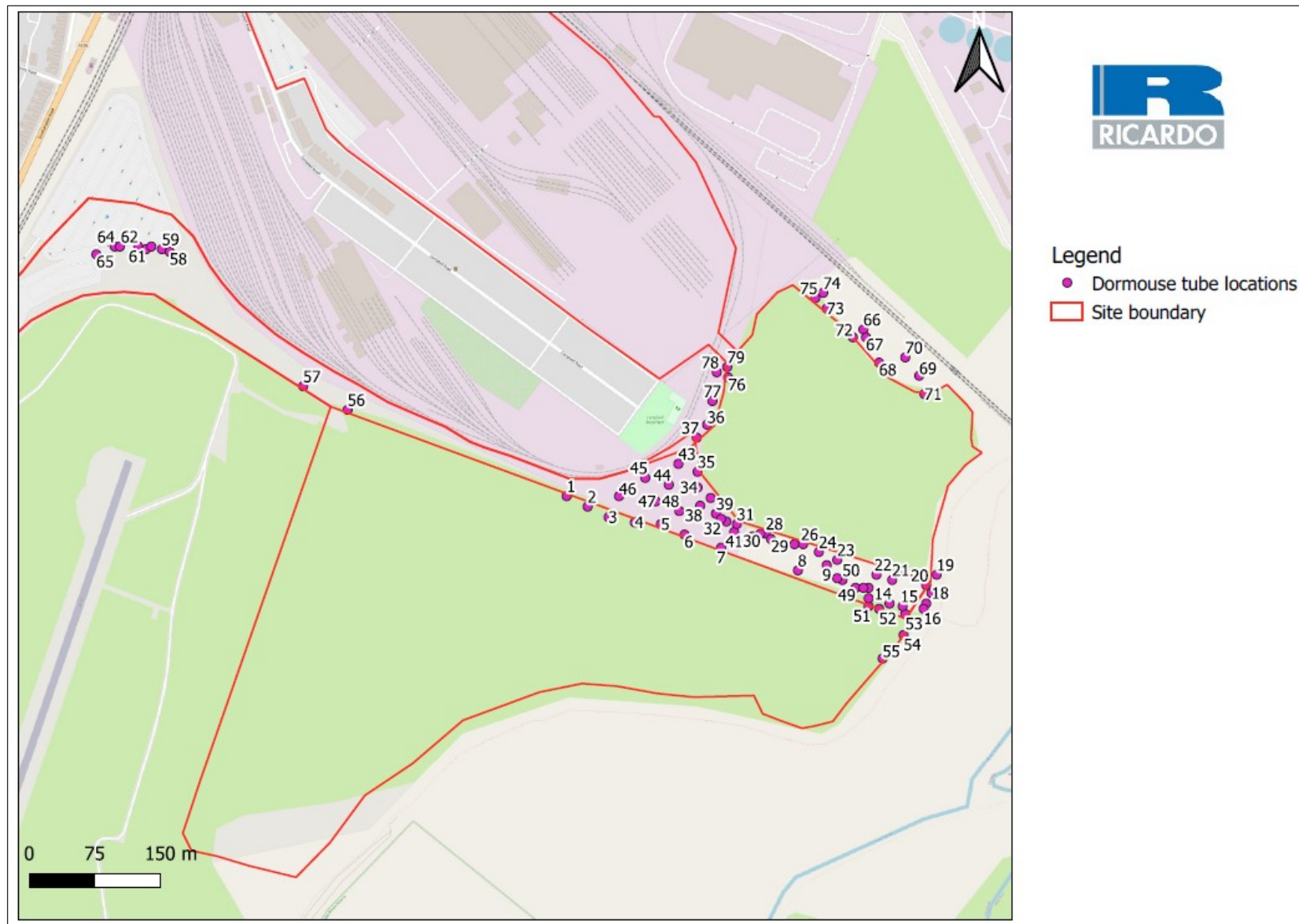


Figure 2.1 – Map of the 65 dormouse tubes deployed across the Navigator Quarter site

3. RESULTS

3.1 DESK STUDY

The findings of this desk study and ecological considerations related to dormouse presence are shown in **Table 3.1** below.

Data returned from HBIC included 11 records of hazel dormouse within the 2km search area. Monks Brook Greenway SINC is situated 1.5km south west at its closest point to the red line boundary and is designated for dormouse. However, there is no suitable habitat connectivity between these records and the site.

Dormouse nest in dense above-ground cover. This was noted throughout the woodland that makes up the majority of the Link Road site. There are also some fallen trees, dense bramble and leaf litter which could provide suitable refuge and hibernation habitat for dormice during the winter months.

The site is considered suitable for dormouse due to their habitat requirements of areas of woodland and connecting hedgerows/scrub to sustain a population.

Table 3.1 – Summary of dormouse features, potential impacts and recommendations from the PEA

Sites: Mitchell Way Link Road NGR: Approximate central grid reference – SU4637617800		PROJECT NAME: Southampton Freeport, Southampton Airport SURVEY DATE: 18/06/2021 SURVEYORS: Laurence David and Tom Clayton	
Ecological Features and Status <i>(see Appendix 1 for legislation summary)</i>	Description: Presence (actual or potential), level of potential (high, medium, low, negligible), distance and direction from site, locations within site, relevant habitat features and connectivity, etc.	Potential Impacts:	Recommendations: Requirement for further survey and/or assessment.
Dormouse (<i>Muscardinus avellanarius</i>) Protected by law: - The Conservation of Habitats and Species Regulations 2017 (as amended) - Wildlife & Countryside Act 1981 (as amended) Listed under: NERC Act 2006	HBIC provided 11 records of hazel dormouse within the search area. Monks Brook Greenway SINC is situated 1.5km south west at its closest point to the red line boundary and is designated for dormouse. However, there is no suitable habitat connectivity between these records and the site. Dormouse nest in dense above-ground cover. This was noted throughout the woodland that makes up the majority of the Link Road site. There are also some fallen trees, dense bramble and leaf litter which could provide suitable refuge and hibernation habitat for dormice during the winter months. Honeysuckle <i>Lonicera periclymenum</i> , a species favoured by dormice for use as nesting material, was noted in the woodland section along the eastern edge of the site boundary.	Given the nearby records of dormouse within the wider area in addition to the supporting vegetation present on site and its connectivity with abundant suitable vegetation within the wider landscape, it is possible that the site may support dormouse and as such this species may be impacted by the proposed works. Dormice are typically active from April/May to October/November and prefer to commute and forage amongst deciduous trees with dense and overlapping canopies and scrub understories. The loss of a small area of trees is unlikely to severely affect habitat connectivity within the context of the wider landscape as arboreal connectivity will be retained by trees, shrubs and	Dormouse are sensitive to various operations relating to tree works and ground disturbance depending on the time of year. It is recommended a dormouse survey is undertaken to establish the presence of dormouse in the woodland and scrub present within the site. Dormouse nest tubes (65 no.) should be set up within the suitable habitat within the north-east field site and checked over the peak season (April – November) to confirm presence or likely absence. Within the Lakeside Country Park site 50 dormouse tubes should be installed within the hedgerow within the eastern boundary of the site.

		bramble scrub to the east of the site. Dormice could also hibernate in accumulations of leaf litter (typically between November and April/May) within the site. Therefore, impacts to dormouse are possible throughout the entire year as a result of the proposed works (in the absence of mitigation).	
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3.2 FIELD SURVEY

No dormice or evidence of dormice was found. It is considered that a robust survey has been undertaken, which has determined likely absence of dormice within the site. The details and results of the dormouse survey are summarised in **Table 3.2**. Numerous wood mouse (*Apodemus sylvaticus*) were identified during the survey.

Table 3.2 Dormouse survey results

Visit	Date	Survey Score (running total)	Dormice	Comments
Set-up	02/08/2021	-	-	-
1	01/09/2021	5	-	5 wood mouse (box no. 55, 61 (3 individuals) and 64).
2	07/10/2021	12	-	4 wood mouse (box no. 1, 2 5 and 6). 3 wood mouse nests (box no.1, 59 and 60). 2 wood mouse food cache (box no. 54 and 55).
3	09/11/2021	14	-	4 wood mouse (box no. 2 (two individuals), 3 and 50). 4 wood mouse nests (box no.1, 61, 62 and 63). 2 wood mouse food cache (box no. 5 and 55).
4	09/12/2021	16	-	1 wood mouse (box no. 5) 3 wood mouse nests (box no. 1, 2 and 46).
5	19/05/2022	17	-	1 wood mouse (box no. 4).
6	17/06/2022	21	-	1 wood mouse (box no. 4).

4. SUMMARY OF FINDINGS AND RECOMMENDATIONS

4.1 STATUS OF DORMICE ON SITE

No dormice or evidence of dormice was recorded during the survey. It can therefore be concluded that dormice are likely absent within the survey area and as such no further surveys or specific mitigation measures are recommended regarding the species. Numerous wood mouse were identified during the survey therefore demonstrating the suitability of the site for rodents.

4.2 POTENTIAL MITIGATION REQUIREMENTS

No dormice or evidence of dormice was recorded during the visits therefore no specific mitigation is required.

If any dormice nests or individuals are suspected or encountered during works, the work should cease as soon as it is safe to do so, and an ecologist be promptly contacted for the most appropriate course of action. Due to the suitability of the site for rodents an ecologist it is recommended post construction wooden dormouse nest boxes are installed within the woodland on site to offer additional nesting resources.

APPENDICES

Appendix 1 – Legislation and Planning Policy

The Wildlife & Countryside Act 1981 (as amended)

Provides for **designation** and protection of Sites of Special Scientific Interest (SSSI), which are areas that represent the most valuable habitats in the UK for nature conservation.

The Act creates the following **offences**:

- To intentionally kill, injure, or take any wild bird or their eggs or nests (with exception to species listed in Schedule 2). Special penalties are available for offences related to birds listed on Schedule 1, for which there are additional offences of disturbing these birds at their nests, or their dependent young.
- To intentionally kill, injure, or take, possess, or trade in any wild animal listed in Schedule 5 (including the hazel dormouse), and interference with places used for shelter or protection, or intentionally disturbing animals occupying such places.
- Certain methods of killing, injuring, or taking wild animals listed in Schedule 6.
- To pick, uproot, trade in, or possess (for the purposes of trade) any wild plant listed in Schedule 8, and prohibits the unauthorised intentional uprooting of such plants.
- The release of certain non-native animals and planting of plants listed in Schedule 9.

It also provides a mechanism making any of the above offences legal through the granting of licences by the appropriate authorities.

Conservation of Habitats and Species Regulations 2017

The principal means by which the European Habitats Directive is transposed in England and Wales.

Provide for the **designation** and protection of a network of 'European Sites' (also termed Natura 2000), including Special Areas of Conservation (SAC) and Special Protection Areas (SPA).

Regulation 41 creates the following offences relating to European Protected Species (EPS) (including the hazel dormouse):

- deliberately capture, injure or kill any wild animal of a European Protected Species;
- deliberately disturb animals of any such species in such a way as to be likely to:
- impair their ability to survive, breed, rear or nurture their young, hibernate or migrate, or
- significantly affect the local distribution or abundance of the species to which they belong;
- deliberately take or destroy the eggs of such an animal; or
- damage or destroy a breeding site or resting place of such an animal.

The Regulations also make it an offence (subject to exceptions) to deliberately pick, collect, cut, uproot, destroy, or trade in the plants listed in Schedule 5.

However, the actions listed above can be made lawful through the granting of licences (European Protected Species Licence) by the appropriate authorities (Natural England in England). Licences may be granted for a number of purposes, but only after the appropriate authority has determined that the following regulations are satisfied:

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- there is 'no satisfactory alternative'
- the action 'will not be detrimental to the maintenance of the population of the species concerned at favourable conservation status in their natural range'.

To apply for a licence, the following information is required:

- The species concerned.
- The relative size of the population at the site (note this may require a survey to be carried out at a particular time of the year).
- The impact(s) (if any) that the development is likely to have upon the populations.
- What measures will be conducted to mitigate for the impact(s).

The Animal Welfare Act 2006

This imposes a duty of care on anyone responsible for an animal to take reasonable steps to ensure that the animal's needs are met. This means that a person has to look after the animal's welfare and ensure that it does not suffer. The Act says that an animal's welfare needs include:

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- a suitable diet;
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- any need it has to be housed with, or apart from, other animals; and
- protection from pain, suffering, injury and disease.



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SOUTHAMPTON NAVIGATOR QUARTER – INVERTEBRATE SCOPING SURVEY

Report for: Southampton Airport

Ref. 84006449

Ricardo ref. ED15367102

Issue: 1.0

23/12/2021

Customer:

Southampton Airport International Airport

Customer reference:

84006449

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APPENDIX 1: SPECIES LIST

APPENDIX 2: STATUS CATEGORIES FOR RARE AND NOTABLE SPECIES

SUMMARY

A single scoping visit was made to two land parcels neighbouring Southampton Airport, namely the North East Field (SU458177) and the Network Rail Field (SU463177), by Invertebrate Ecologist Scotty Dodd MSc MCIEEM MRES on behalf of Ricardo Energy & Environment (Ricardo). The remit for the visit was to assess the potential for important invertebrate assemblages and notable and S41 invertebrates across the site.

Survey date: 16th July 2021

Species total: 195 invertebrate species identified.

European Protected Species or Wildlife & Countryside Act species: None

UKBAP / SPI (NERC S41) species: 2 species :-

- Small Heath *Coenonympha pamphilus* (Priority Species)
- Cinnabar Moth *Tyria jacobaeae* (Research Only)

Other Designated Species: 4 species

Order	Family	Taxon	Common Name	Status	Field A	Field B
Lepidoptera	Nymphalidae	<i>Coenonympha pamphilus</i>	Small Heath	NT	1	0
Araneae	Salticidae	<i>Ballus chalybeius</i>	a jumping spider	NS	1	0
Diptera	Acroceridae	<i>Ogcodes pallipes</i>	a hunchback fly	NS	1	0
Heteroptera	Berytidae	<i>Berytinus hirticornis</i>	a stilt bug	[Nb]	1	0

Pantheon analysis:

No Specific Assemblage Types found to be in Favourable condition by SSSI standards.

Recommendations:

There is the potential for net loss to biodiversity if the proposed works will adversely impact upon the areas of interest detailed in Figure 2. Ideally these areas would be avoided and preserved. It is difficult to provide any more specific advice without full masterplans being available. However, without some form of mitigation and/or compensation invertebrate assemblages associated with the peripheral grassland / scrub mosaic habitats at the site are at particular risk and further general survey work is recommended to inform a robust mitigation / compensation strategy.

1. INTRODUCTION

1.1 BACKGROUND

A single scoping visit was made to two land parcels neighbouring Southampton Airport, namely the North East Field (SU458177) and the Network Rail Field (SU463177), by Invertebrate Ecologist Scotty Dodd MSc MCIEEM MRES on behalf of Ricardo. The remit for the visit was to assess the potential for important invertebrate assemblages and notable and S41 invertebrates.

The survey was undertaken on the 16 July 2021.

This report provides the scoping survey's findings along with any required recommendations for further survey, mitigation, and further ecological enhancements. A list of invertebrate species observed during the visit is appended.

2. METHODS

2.1 SITE VISIT

The site was visited on the 16 July 2021 by Invertebrate Ecologist Scotty Dodd MSc MCIEEM MRES.

Weather conditions were extremely hot and sunny. Approximately five hours were spent surveying the site.

A general walkover survey of the site (see **Figure 2.1**) was undertaken to visually identify features and habitats with the potential to support scarce or protected invertebrates. Features of interest were sampled for invertebrates using heavy duty calico sweep net, beating tray, suction sampler, butterfly net for spot-netting at resources of interest and hand searching targeted food-plants / features. Visual observations of mobile insects were also noted.

2.2 DATA ANALYSIS

2.2.1 The Pantheon programme

There is currently no standard framework for evaluating the invertebrate value of a site as part of an Ecological Impact Assessment. However most active invertebrate ecologists have adopted the Pantheon programme to assess sites. Pantheon was developed by Natural England and the Centre for Ecology & Hydrology to analyse invertebrate sample data and assess assemblage data for favourable versus unfavourable condition by SSSI standards. Hence, if one or more assemblages are found to be in favourable condition this would indicate that the site is likely to be of significant importance for invertebrates. Further information on Pantheon is available here: <http://www.brc.ac.uk/pantheon/about/pantheon>.

Users import lists of invertebrates (called “samples”) into Pantheon, which then matches the species to the preferred name in the UK species inventory (A list of species maintained by the Natural History Museum). Not all macro-invertebrate taxa are included in the database. To date over c.13,000 species have been assessed, this being about a quarter of the total macro-invertebrate fauna (estimated at 37,000). It remains limited to those taxa and families where there is enough ecological information to give a fair level of coding accuracy. These include species such as beetles, flies, bugs & hoppers, butterflies & macro-moths, ants, bees, wasps, spiders and molluscs.

2.2.2 Species definition

The method for defining species resources was broadly similar to that followed in Natural England Research Report 024 (Webb et al., 2010):

- ‘For each species, a literature search was undertaken. All relevant ecological information was extracted and added to a spreadsheet. This included ‘structural elements of the habitats that the species is generally associated with (e.g. emergent vegetation, seed heads) and/or other environmental factors that it requires, host plant and/or animal species alongside ecological guild of larvae as well as adults where these differed, (e.g. herbivore, carnivore). Only those resources which were considered important to the species in completing its life cycle were included’.

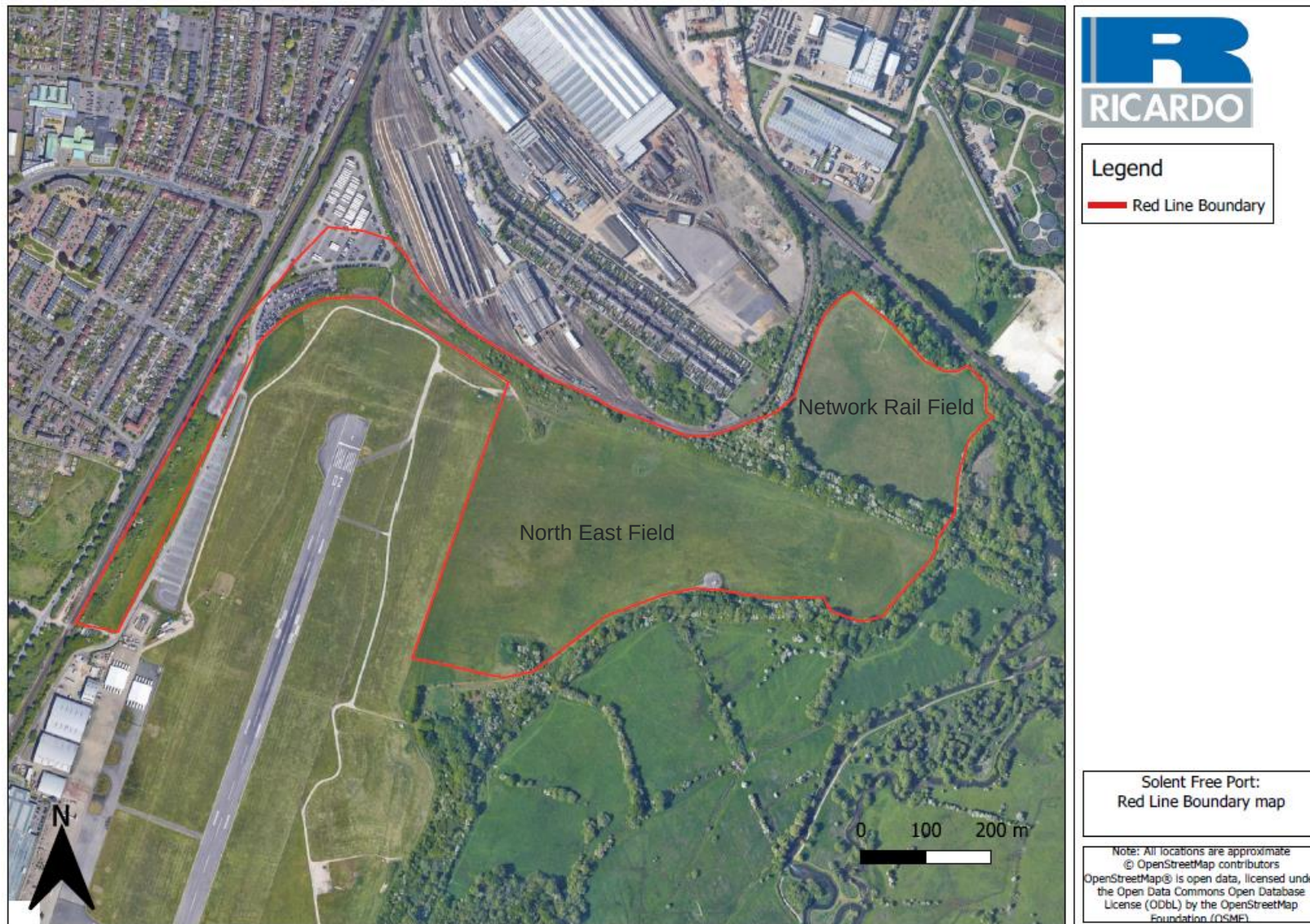
The assemblage types are labelled in terms that relate to their favoured habitats in order to make them accessible to non-specialists. However, they are actually defined by lists of characteristic species that are generally found together in nature. Two levels are recognised in the classification. Broad assemblage types (BATs) are a comprehensive series of assemblage types that are characterised by more widespread species. They can be expressed in lists from a wide range of sites. Specific assemblage types (SATs) are characterised by ecologically restricted species and are generally only expressed in lists from sites with conservation value. Since 2008 there has also been a third category of assemblage types that cut across this classification. They are mainly defined by lists of species dependent on a particular environmental resource, such as flowers as a source of pollen and nectar.

2.3 LIMITATIONS

- Daytime surveys will miss the vast majority of night flying species (moths, many Ichneumonids etc.).

- The summer of 2021 has been one of the worst on record for flying invertebrates. A cold and damp, cloudy May was followed by indifferent weather punctuated by all too brief warm and dry spells. The survey was undertaken on an exceptionally hot day which suppresses the activity of all but the hardiest invertebrates.
- A single survey visit in mid-July is unlikely to provide a comprehensive picture of the site's potential for invertebrates. However, a scoping visit should identify areas of higher potential that may require further survey.
- No masterplans were made available at the time of survey or of writing this report.

Figure 2.1. Invertebrate survey area.



3. RESULTS

3.1 SPECIES RECORDED

A total of 195 invertebrate species were recorded during the survey. This is a high number of species for a single visit in late summer. A full list of invertebrates recorded is appended.

No invertebrate species protected under Schedule 5 (Section 9) of the Wildlife & Countryside Act (as amended) 1981 were recorded during the scoping survey visit and there is very limited potential for any such species to be present at the site.

There are currently 943 Species of Principle Importance (SPI) (covering all taxonomic groups) included on the S41 list. The S41 list is intended to provide guidance to decision-makers, e.g. those representing public bodies and local/regional authorities, in implementing their duty under Section 40 of the NERC Act to '...have regard to the conservation of biodiversity in England when carrying out their normal functions'. A single UK Biodiversity Action Plan (UK BAP) priority species and SPI covered under The Natural Environment and Rural Communities Act 2006 Section 41 (NERC S41). Two Section 41 species were recorded:–

- Small Heath *Coenonympha pamphilus* (Priority Species)
- Cinnabar Moth *Tyria jacobaeae* (Research Only)

The scoping visit recorded four species with a conservation designation (excepting UKBAP / S41 species) (**Table 3.1**). The Small Heath butterfly is also regarded as Near threatened (NT) under IUCN criteria. A further three species are considered to be Nationally Scarce (NS). NS species without parenthesis have been recently reviewed using IUCN criteria. Those species within parenthesis (i.e. Na & Nb species) are yet to be reviewed using the new criteria and the NS status may be downgraded; this is qualified in the discussion section for each species.

Table 3.1. Species Identified with Conservation Designations

Order	Family	Taxon	Common Name	Status	NE Field	NR Field
Lepidoptera	Nymphalidae	<i>Coenonympha pamphilus</i>	Small Heath	NT; Section 41 Priority Species	1	0
Araneae	Salticidae	<i>Ballus chalybeius</i>	A jumping spider	NS	1	0
Diptera	Acroceridae	<i>Ogcodes pallipes</i>	A hunchback fly	NS	1	0
Heteroptera	Berytidae	<i>Berytinus hirticornis</i>	A stilt bug	[Nb]	1	0

3.2 PANTHEON ANALYSIS

Largely common and widespread species of invertebrates were found to be directly associated with the Specific Assemblage Types (SATs) generated. The results returned for all detected SATs is Unfavourable condition, by SSSI standards (**Table 3.2**).

Table 3.2: *Pantheon analysis showing Specific Assemblage Types (SATs) detected, number of species (No.Sp.) recorded that are assigned to the SAT and percentage representation of all species assigned to the SAT (% Rep.).*

Broad biotope	Habitat	SAT	No. Sp.	% Rep.	SQI	SP. With Status	Code	Condition
Open habitats		Rich flower resource	6	2	100	0	F002	Unfavourable (6 of 15 species)
Open habitats	Short sward & bare ground	Open short sward	6	3	1	0	F112	Unfavourable (6 of 13 species)
Open habitats		Scrub edge	5	2	1	0	F001	Unfavourable (5 of 11 species)
Tree-associated	Decaying wood	Bark & sapwood decay	3	<1	1	0	A212	Unfavourable (3 of 19 species)
Tree-associated	Decaying wood	Fungal fruiting bodies	1	1	1	0	A213	Unfavourable (1 of 7 species)
Open habitats		Scrub-heath & moorland	1	1	1	0	F003	Unfavourable (1 of 9 species)

4. DISCUSSION AND RECOMMENDATIONS

4.1 SPECIES RECORDED

A total of 195 invertebrate species were recorded during the survey. This is a high number of species for a single visit in late summer and there is the potential for many more species with spring / early summer phenology to be present.

Five of the species recorded have a conservation designation, representing 3% of the overall list. This is a low percentage and is representative of survey effort, time of year and limited high quality habitats at the site.

The following species with a conservation designation were recorded:

- The Small Heath butterfly *Coenonympha pamphilus* is a widespread species of grasslands and other open habitats. This butterfly has shown a severe decline over the long term and is therefore considered to be a Priority Species for conservation efforts by Butterfly Conservation. This species is also regarded as Near Threatened (NT) in the IUCN Review.
- The Cinnabar Moth *Tyria jacobaeae* is a widespread species associated with ragworts *Jacobaea* ssp. It is on the S41 list as a Research Only species, and as such no conservation action is currently required.
- The hunchback fly *Ogcodes pallipes* is believed to have declined sharply since 1990 and a rarity status of Nationally Scarce (NS) was retained in the IUCN review. This species is a parasitoid of spiders and adults are thought to be short-lived. Adults are associated with scrub-edge habitats and scrub mosaics in grasslands.
- *Ballus chalybeius* is largely south-east restricted with widely scattered and fairly localised records elsewhere. In its south-east stronghold the species has likely become more frequent in recent years. However, this species was recently elevated to NS status in the recent IUCN review. In Hampshire this species is widely scattered but local, being most common in north-east Hampshire around the Surrey borders. It is a predatory arboreal specialist associated with woodlands, scrub and scrub edge habitats.
- *Berytinus hirticornis* was previously confined to a handful of sites in south-west England. In recent years it has become more widespread and is common in some parts of the south-east. This species is likely to be downgraded when the group is reviewed. A highly polyphagous grassland species feeding on a range of plants.
-

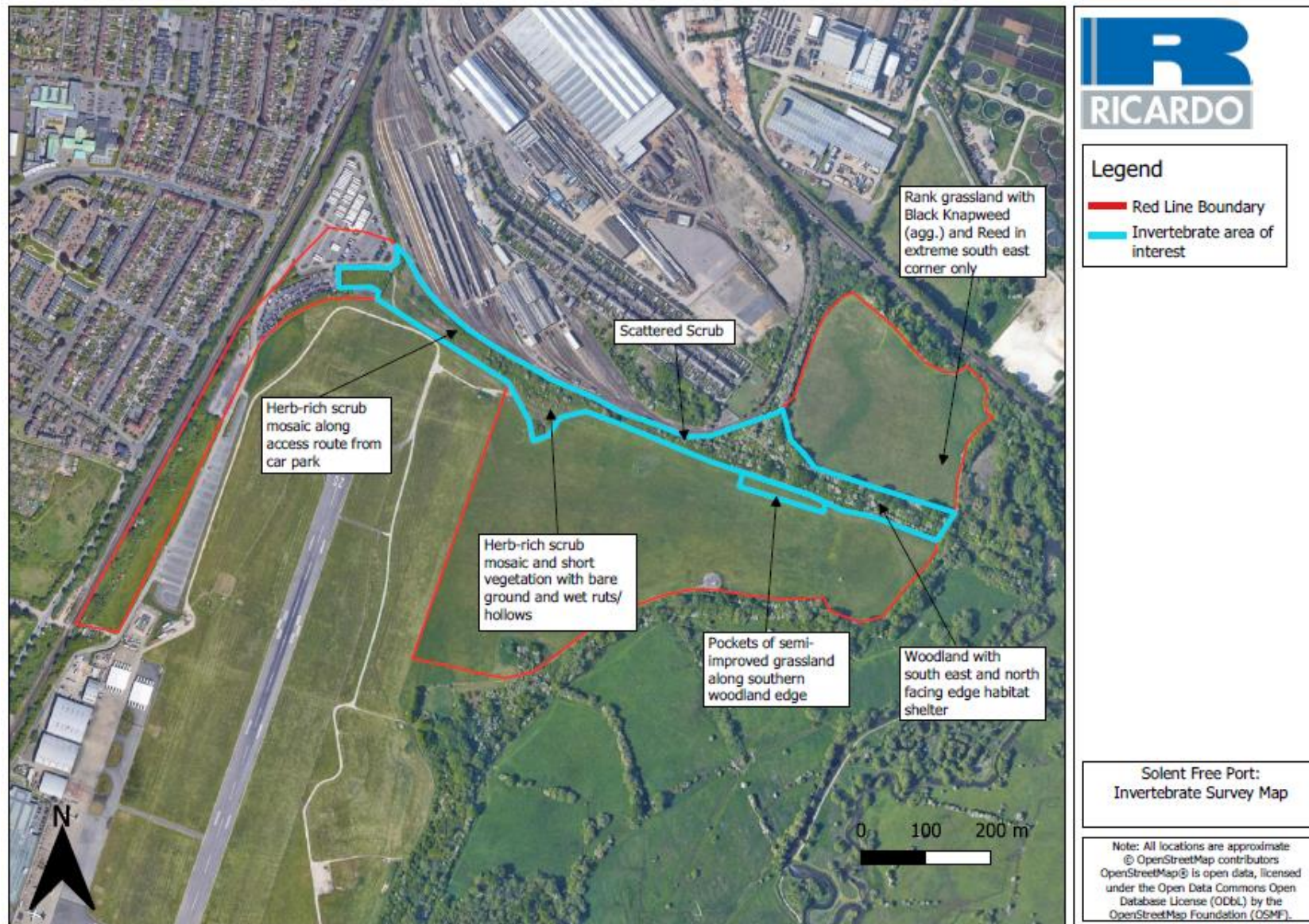
In summary, a low number of species with a conservation designation were recorded. However, the record of *Ogcodes pallipes* is significant, but suitable scrub edge / scrub mosaic habitat is very localised at the site (see **Figure 4.1**).

4.2 PANTHEON OUTPUT

On the basis of a single late summer visit none of the assemblages recorded were found to be in Favourable condition by SSSI standards. However, the SATs rich flower resource (F002), open short sward (F112) and scrub edge (F001) all had a reasonable number of associated species recorded and further survey effort throughout the spring / summer could potentially elevate these SATs to Favourable condition. However, it is noted that the habitat resources required by these assemblages are scarce and extremely localised at the site (see **Figure 4.1**), with much of the site being long, homogenous and botanically species-poor grassland.

The preliminary results suggest that semi-improved and reasonably herb-rich grassland habitat and the structural resources provided by scrub edge and scrub mosaic habitat along the northern boundary of the north East Field have some importance for invertebrates and offer potential for further key species to be present. The Network Rail Field is far less diverse, with species-poor rank grassland dominating. The Network Rail Field did however support Black Knapweed *Centaurea nigra* s.l. in the extreme south-east corner, an important plant resource that is not present, or was not detected, in North East Field.

Figure 4.1: Blue outline showing areas of interest for invertebrates within the red line boundary



4.3 FURTHER SURVEYS

Given the relatively high number of species recorded in a single day, albeit with only five species of conservation value, and the potential for several SATs to meet Favourable condition thresholds further surveys are recommended if any planned works will affect the areas of interest detailed in **Figure 4.1**.

5. CONCLUSIONS

There is the potential for net loss to biodiversity if the proposed works will adversely impact upon the areas of interest detailed in **Figure 4.1**. Ideally these areas would be avoided and preserved. It is difficult to provide any more specific advice until detailed masterplans are available. However, without some form of mitigation and/or compensation invertebrate assemblages associated with the peripheral grassland / scrub mosaic habitats at the site are at particular risk and further general survey work is recommended to inform a robust mitigation / compensation strategy.

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APPENDIX 1: SPECIES LIST

Order	Family	Taxon	Common Name	Status	SAT	Broad biotope	Habitat	Notes	A	B
Araneae	Agelenidae	<i>Agelena labyrinthica</i>	Labyrinth Spider	Widespread	F001	open habitats	tall sward & scrub	Predatory	1	1
Araneae	Anyphaenidae	<i>Anyphaena accentuata</i>	Buzzing Spider	Widespread		tree-associated	arboreal	Predatory	1	1
Araneae	Araneidae	<i>Araneus diadematus</i>	Garden Spider	Widespread				Predatory	1	1
Araneae	Araneidae	<i>Araneus marmoreus</i> var. <i>pyramidatus</i>	Marbled Orb Weaver	Local				Predatory	1	0
Araneae	Araneidae	<i>Araneus triguttatus</i>	an orb weaver spider	Widespread		tree-associated	arboreal	Predatory	1	0
Araneae	Araneidae	<i>Araniella cucurbitina</i>	Cucumber Spider	Widespread				Predatory	1	1
Araneae	Araneidae	<i>Mangora acalypha</i>	an orb weaver spider	Widespread		open habitats	tall sward & scrub	Predatory	1	1
Araneae	Araneidae	<i>Zygiella atrica</i>	an orb weaver spider	Widespread		tree-associated	arboreal	Predatory	1	0
Araneae	Cheiracanthiidae	<i>Cheiracanthium erraticum</i>	a spider	Widespread		open habitats	tall sward & scrub	Predatory	1	0
Araneae	Dictynidae	<i>Dictyna arundinacea</i>	a spider	Widespread		open habitats	tall sward & scrub	Predatory	1	1
Araneae	Dictynidae	<i>Dictyna uncinata</i>	a spider	Widespread		tree-associated	arboreal	Predatory	1	1

Order	Family	Taxon	Common Name	Status	SAT	Broad biotope	Habitat	Notes	A	B
Araneae	Gnaphosidae	<i>Drassyllus pusillus</i>	a spider	Widespread		open habitats	tall sward & scrub	Predatory	1	0
Araneae	Linyphiidae	<i>Agyneta rurestris</i>	a money spider	Widespread				Predatory	1	0
Araneae	Linyphiidae	<i>Erigone atra</i>	a money spider	Widespread				Predatory	1	1
Araneae	Linyphiidae	<i>Erigone dentipalpis</i>	a money spider	Widespread		open habitats	short sward & bare ground	Predatory	1	1
Araneae	Linyphiidae	<i>Oedothorax fuscus</i>	a money spider	Widespread				Predatory	1	0
Araneae	Linyphiidae	<i>Tenuiphantes tenuis</i>	a money spider	Widespread		open habitats	tall sward & scrub	Predatory	1	1
Araneae	Philodromidae	<i>Philodromus aureolus</i>	a running crab spider	Widespread		tree-associated	arboreal	Predatory	1	1
Araneae	Philodromidae	<i>Tibellus oblongus</i>	a running crab spider	Widespread		open habitats	tall sward & scrub	Predatory	1	0
Araneae	Pisauridae	<i>Pisaura mirabilis</i>	Nursery Web Spider	Widespread		open habitats	tall sward & scrub	Predatory	1	1
Araneae	Salticidae	<i>Ballus chalybeius</i>	a jumping spider	NS		tree-associated	arboreal	Predatory	1	0
Araneae	Salticidae	<i>Heliophanus cupreus</i>	a jumping spider	Widespread	F001	open habitats	tall sward & scrub	Predatory	1	1
Araneae	Salticidae	<i>Heliophanus flavipes</i>	a jumping spider	Widespread	F001	open habitats	tall sward & scrub	Predatory	1	1

Order	Family	Taxon	Common Name	Status	SAT	Broad biotope	Habitat	Notes	A	B
Araneae	Tetragnathidae	<i>Tetragnatha montana</i>	a spider	Widespread		wetland	acid & sedge peats	Predatory	0	1
Araneae	Theridiidae	<i>Anelosimus vittatus</i>	a spider	Widespread		tree-associated	arboreal	Predatory	1	1
Araneae	Theridiidae	<i>Enoplognatha latimana</i>	a spider	Widespread		open habitats	tall sward & scrub	Predatory	1	0
Araneae	Theridiidae	<i>Enoplognatha ovata</i>	a spider	Widespread				Predatory	1	1
Araneae	Theridiidae	<i>Platnickina tincta</i>	a spider	Widespread		tree-associated	arboreal	Predatory	1	0
Araneae	Theridiidae	<i>Theridion varians</i>	a spider	Widespread		tree-associated	arboreal	Predatory	1	1
Araneae	Thomisidae	<i>Xysticus cristatus</i>	a crab spider	Widespread				Predatory	1	1
Arachnida	Ixodidae	<i>Ixodes ricinus</i>	Deer Tick	Widespread				Mammalia	1	0
Pulmonata	Helicidae	<i>Cepaea hortensis</i>	White-lipped Snail	Widespread		open habitats	tall sward & scrub	Herbivore	1	0
Pulmonata	Hygromiidae	<i>Monacha cantiana</i>	Kentish Snail	Widespread		open habitats	tall sward & scrub	Herbivore	1	0
Pulmonata	Oxychilidae	<i>Oxychilus alliarius</i>	Garlic Snail	Widespread		conifer or broadleaved	woodland habitat	Herbivore	0	1
Heteroptera	Acanthosomatidae	<i>Acanthosoma haemorrhoidale</i>	Hawthorn Shieldbug	Widespread		tree-associated	arboreal	Crataegus	1	0

Order	Family	Taxon	Common Name	Status	SAT	Broad biotope	Habitat	Notes	A	B
Heteroptera	Anthoridae	<i>Anthocoris confusus</i>	a predatory bug	Widespread		tree-associated	arboreal	Acari, Aphididae	0	1
Heteroptera	Anthoridae	<i>Anthocoris nemoralis</i>	a predatory bug	Widespread		tree-associated	arboreal	Acari, Aphididae	0	1
Heteroptera	Anthoridae	<i>Anthocoris nemorum</i>	a predatory bug	Widespread		ubiquitous		Acari, Aphididae	0	1
Heteroptera	Anthoridae	<i>Temnostethus pusillus</i>	a predatory bug	Widespread				Acari, Aphididae	1	0
Heteroptera	Berytidae	<i>Berytinus hirticornis</i>	a stilt bug	[Nb]		open habitats	short sward & bare ground		1	0
Heteroptera	Berytidae	<i>Berytinus minor</i>	a stilt bug	Widespread	F112	open habitats	short sward & bare ground	Ononis repens	1	0
Heteroptera	Coreidae	<i>Gonocerus acuteangulatus</i>	Box Bug	Widespread		tree-associated	arboreal	Buxus, Crataegus	1	0
Heteroptera	Lygaeidae	<i>Nysius huttoni</i>	a ground bug	Naturalised		open habitats	short sward & bare ground		1	0
Heteroptera	Lygaeidae	<i>Scolopostethus affinis</i>	a ground bug	Widespread		open habitats	short sward & bare ground	Urtica	0	1

Order	Family	Taxon	Common Name	Status	SAT	Broad biotope	Habitat	Notes	A	B
Heteroptera	Lygaeidae	<i>Scolopostethus thomsoni</i>	a ground bug	Widespread		open habitats	tall sward & scrub	Urtica dioica	0	1
Heteroptera	Lygaeidae	<i>Stygnocoris sabulosus</i>	a ground bug	Widespread		open habitats	tall sward & scrub		1	0
Heteroptera	Miridae	<i>Amblytulus nasutus</i>	a plant bug	Widespread		open habitats	tall sward & scrub		1	0
Heteroptera	Miridae	<i>Atractotomus mali</i>	a plant bug	Widespread		tree-associated	arboreal	Aphididae, Crataegus, Malus	1	0
Heteroptera	Miridae	<i>Campyloneura virgula</i>	a plant bug	Widespread		tree-associated	arboreal	Corylus, Crataegus, Quercus	1	0
Heteroptera	Miridae	<i>Capsus ater</i>	a plant bug	Widespread		open habitats	tall sward & scrub	Poaceae	0	1
Heteroptera	Miridae	<i>Closterotomus norwegicus</i>	a plant bug	Widespread		open habitats	tall sward & scrub	Asteraceae, Trifolium, Urtica	1	0
Heteroptera	Miridae	<i>Deraeocoris flavilinea</i>	a plant bug	Naturalised		tree-associated	arboreal		0	1
Heteroptera	Miridae	<i>Deraeocoris lutescens</i>	a plant bug	Widespread		open habitats	tall sward & scrub		1	0
Heteroptera	Miridae	<i>Deraeocoris ruber</i>	a plant bug	Widespread		tree-associated	arboreal		1	0
Heteroptera	Miridae	<i>Dicyphus stachydis</i>	a plant bug	Widespread		open habitats	tall sward & scrub	Stachys sylvatica	0	1
Heteroptera	Miridae	<i>Heterotoma planicornis</i>	a plant bug	Widespread		open habitats	tall sward & scrub	Arthropoda, Urtica	1	0

Order	Family	Taxon	Common Name	Status	SAT	Broad biotope	Habitat	Notes	A	B
Heteroptera	Miridae	<i>Leptopterna dolabrata</i>	a plant bug	Widespread		open habitats	tall sward & scrub	Poaceae	1	0
Heteroptera	Miridae	<i>Lopus decolor</i>	a plant bug	Widespread		open habitats	tall sward & scrub	Poaceae	1	0
Heteroptera	Miridae	<i>Lygus rugulipennis</i>	a plant bug	Widespread		open habitats	tall sward & scrub		1	0
Heteroptera	Miridae	<i>Oncotylus viridiflavus</i>	a plant bug	Widespread		open habitats	tall sward & scrub	Centaurea	0	1
Heteroptera	Miridae	<i>Orthonotus rufifrons</i>	a plant bug	Widespread		tree-associated	shaded woodland floor		1	0
Heteroptera	Miridae	<i>Phylus coryli</i>	a plant bug	Widespread		tree-associated	arboreal	Arthropoda, Betula, Corylus, Quercus	0	1
Heteroptera	Miridae	<i>Phytocoris varipes</i>	a plant bug	Widespread		open habitats	tall sward & scrub		1	0
Heteroptera	Miridae	<i>Plagiognathus arbustorum</i>	a plant bug	Widespread		open habitats	tall sward & scrub		1	0
Heteroptera	Miridae	<i>Plagiognathus chrysanthemi</i>	a plant bug	Widespread		open habitats	short sward & bare ground		1	0
Heteroptera	Miridae	<i>Stenotus binotatus</i>	a plant bug	Widespread		open habitats	tall sward & scrub	Poaceae	1	0
Heteroptera	Nabidae	<i>Himacerus apterus</i>	a predatory bug	Widespread		open habitats	tall sward & scrub	Arthropoda	0	1

Order	Family	Taxon	Common Name	Status	SAT	Broad biotope	Habitat	Notes	A	B
Heteroptera	Nabidae	<i>Himacerus mirmicoides</i>	a predatory bug	Widespread		tree-associated	arboreal	Acari, Aphididae, Fagales	1	0
Heteroptera	Nabidae	<i>Nabis rugosus</i>	a predatory bug	Widespread		open habitats	tall sward & scrub	Arthropoda	1	0
Heteroptera	Pentatomidae	<i>Dolycoris baccarum</i>	Hairy Shieldbug	Widespread		open habitats	tall sward & scrub		1	0
Heteroptera	Pentatomidae	<i>Palomena prasina</i>	Green Shieldbug	Widespread		open habitats	tall sward & scrub	Corylus, Fagales	1	0
Heteroptera	Pentatomidae	<i>Pentatoma rufipes</i>	Red-legged Shieldbug	Widespread		tree-associated	arboreal	Alnus, Arthropoda, Corylus, Fagales, Quercus	0	1
Heteroptera	Pentatomidae	<i>Rhaphigaster nebulosa</i>	Mottled Shieldbug	Naturalised					1	0
Heteroptera	Tingidae	<i>Kalama tricornis</i>	a lace bug	Widespread	F112	open habitats	short sward & bare ground		1	0
Auchenorrhyncha	Aphrophoridae	<i>Philaenus spumarius</i>	a leafhopper	Widespread					1	0
Auchenorrhyncha	Cicadellidae	<i>Alebra albostriella</i>	a leafhopper	Widespread		tree-associated	arboreal	Quercus robur	0	1

Order	Family	Taxon	Common Name	Status	SAT	Broad biotope	Habitat	Notes	A	B
Auchenorrhyncha	Cicadellidae	<i>Allygus mixtus</i>	a leafhopper	Widespread	F001	open habitats	tall sward & scrub	esp. Quercus	1	0
Auchenorrhyncha	Cicadellidae	<i>Anaceratagallia ribauti</i>	a leafhopper	Widespread		open habitats	tall sward & scrub		1	1
Auchenorrhyncha	Cicadellidae	<i>Anoscopus serratulae</i>	a leafhopper	Widespread		open habitats	short sward & bare ground	Poaceae	1	0
Auchenorrhyncha	Cicadellidae	<i>Aphrodes makarovi</i>	a leafhopper	Widespread		open habitats	tall sward & scrub	Cirsium, Taraxacum, Urtica dioica	1	1
Auchenorrhyncha	Cicadellidae	<i>Eupteryx aurata</i>	a leafhopper	Widespread				Urtica dioica	1	1
Auchenorrhyncha	Cicadellidae	<i>Iassus lanius</i>	a leafhopper	Widespread		tree-associated	arboreal	Quercus	1	1
Auchenorrhyncha	Cicadellidae	<i>Megophthalmus scabripennis</i>	a leafhopper	Widespread		open habitats	tall sward & scrub	Poaceae	1	1
Auchenorrhyncha	Delphacidae	<i>Dicranotropis hamata</i>	a leafhopper	Widespread		open habitats	tall sward & scrub	Poaceae	0	1
Coleoptera	Apionidae	<i>Ceratapion carduorum</i>	a weevil	Widespread		open habitats	tall sward & scrub	Thistles	1	0

Order	Family	Taxon	Common Name	Status	SAT	Broad biotope	Habitat	Notes	A	B
Coleoptera	Apionidae	<i>Ischnopterapion loti</i>	a weevil	Widespread		open habitats	tall sward & scrub	Lotus	1	0
Coleoptera	Apionidae	<i>Oxystoma craccaae</i>	a weevil	Local		open habitats	tall sward & scrub	Vicia	1	0
Coleoptera	Apionidae	<i>Oxystoma pomonae</i>	a weevil	Widespread		open habitats	tall sward & scrub	Vicia	1	0
Coleoptera	Apionidae	<i>Protapion fulvipes</i>	a weevil	Widespread		open habitats	tall sward & scrub	Trifolium	1	0
Coleoptera	Apionidae	<i>Protapion trifolii</i>	a weevil	Widespread		open habitats	tall sward & scrub	Trifolium	1	0
Coleoptera	Biphyllidae	<i>Biphyllus lunatus</i>	a beetle	Local	A213	tree-associated	decaying wood	Fagus, Fraxinus, Daldinea	1	0
Coleoptera	Buprestidae	<i>Agrilus laticornis</i>	a jewel beetle	Local	A212	tree-associated	decaying wood	saproxyllic	1	0
Coleoptera	Cantharidae	<i>Rhagonycha fulva</i>	a soldier beetle	Widespread		open habitats	tall sward & scrub	Predatory	1	0
Coleoptera	Cantharidae	<i>Rhagonycha nigri-ventris</i>	a soldier beetle	Widespread		open habitats	tall sward & scrub	Predatory	0	1
Coleoptera	Carabidae	<i>Bembidion lunulatum</i>	a ground beetle	Widespread		wetland	marshland	Predatory	1	0
Coleoptera	Carabidae	<i>Calodromius spilotus</i>	a ground beetle	Widespread		tree-associated	arboreal; decaying wood	Predatory	0	1
Coleoptera	Carabidae	<i>Paradromius linearis</i>	a ground beetle	Widespread		open habitats	tall sward & scrub	Predatory	1	1

Order	Family	Taxon	Common Name	Status	SAT	Broad biotope	Habitat	Notes	A	B
Coleoptera	Carabidae	<i>Syntomus foveatus</i>	a ground beetle	Widespread		open habitats	short sward & bare ground	Predatory	1	0
Coleoptera	Cerambycidae	<i>Rutpela maculata</i>	a longhorn beetle	Widespread	A212	tree-associated	decaying wood	saproxyllic	1	0
Coleoptera	Chrysomelidae	<i>Cryptocephalus moraei</i>	a pot beetle	Local	F112	open habitats	short sward & bare ground	Hypericum	1	0
Coleoptera	Chrysomelidae	<i>Epitrix pubescens</i>	a flea beetle	Widespread		wetland	marshland	Solanum	1	0
Coleoptera	Chrysomelidae	<i>Longitarsus membranaceus</i>	a flea beetle	Widespread	F003	open habitats		Lamiaceae	1	0
Coleoptera	Chrysomelidae	<i>Psylliodes affinis</i>	a flea beetle	Widespread		open habitats	tall sward & scrub	Solanum	1	0
Coleoptera	Coccinellidae	<i>Adalia decempunctata</i>	10-spot Ladybird	Widespread		tree-associated	arboreal	Aphididae	1	1
Coleoptera	Coccinellidae	<i>Coccinella septempunctata</i>	7-spot Ladybird	Widespread				Aphididae	1	1
Coleoptera	Coccinellidae	<i>Propylea quattuordecimpunctata</i>	14-spot Ladybird	Widespread				Aphididae	1	1
Coleoptera	Coccinellidae	<i>Psyllobora vigintiduopunctata</i>	22-spot Ladybird	Widespread		open habitats	tall sward & scrub	Aphididae	1	1
Coleoptera	Coccinellidae	<i>Rhyzobius chrysomeloides</i>	a ladybird	Widespread		tree-associated	arboreal	Aphididae	1	1

Order	Family	Taxon	Common Name	Status	SAT	Broad biotope	Habitat	Notes	A	B
Coleoptera	Coccinellidae	<i>Rhyzobius litura</i>	a ladybird	Widespread		open habitats	tall sward & scrub	Aphididae	1	1
Coleoptera	Coccinellidae	<i>Subcoccinella vigintiquatuorpunctata</i>	24-spot Ladybird	Widespread		open habitats	tall sward & scrub		1	1
Coleoptera	Coccinellidae	<i>Tytthaspis sedecimpunctata</i>	16-spot Ladybird	Widespread		open habitats	tall sward & scrub	Aphididae	1	1
Coleoptera	Curculionidae	<i>Anthonomus pedicularius</i>	a weevil	Widespread		tree-associated	arboreal	Crataegus etc	1	0
Coleoptera	Curculionidae	<i>Anthonomus rubi</i>	Strawberry Blossom Weevil	Widespread	F001	open habitats	tall sward & scrub	Rosaceae	1	0
Coleoptera	Curculionidae	<i>Nedus quadrimaculatus</i>	Small Nettle Weevil	Widespread		open habitats	tall sward & scrub	Urtica dioica	1	1
Coleoptera	Curculionidae	<i>Parethelcus pollinarius</i>	a weevil	Widespread		open habitats	tall sward & scrub	Urtica dioica	0	1
Coleoptera	Curculionidae	<i>Phyllobius roboretanus</i>	a weevil	Widespread		open habitats	tall sward & scrub		1	1
Coleoptera	Curculionidae	<i>Tychius picirostris</i>	a weevil	Widespread		open habitats	tall sward & scrub	Trifolium	1	0
Coleoptera	Elateridae	<i>Athous haemorrhoidalis</i>	a click beetle	Widespread		open habitats	tall sward & scrub		0	1
Coleoptera	Melyridae	<i>Cordylepherus viridis</i>	a beetle	Widespread	F112	open habitats	short sward & bare ground		1	0