

TECHNICAL APPENDIX 8.1 ECOLOGY SURVEY REPORT

RETFORD CIRCULAR ECONOMY PROJECT

LOUND HIVE LIMITED

FEBRUARY 2023





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1 SUMMARY

Arcus Consultancy Services Ltd was commissioned by Hive Energy to undertake ecology surveys on land south of Lound, Nottinghamshire (the 'Site') as it was identified that the Site had the potential to support a range of important ecological features that may be sensitive to development. The surveys have been designed to inform an Ecology Impact Assessment (EcIA) which is be presented in Chapter 8 of Volume 1 of the Environmental Statement (ES).

The initial Extended Phase 1 Habitat survey identified the need for further surveys for bats, great crested newts (GCN), reptiles, water voles, otters and badger. This report presents the methods and results of the ecological surveys undertaken.

Ornithology surveys were also undertaken, findings of which are presented in a Technical Appendix 8.3.



2 INTRODUCTION AND BACKGROUND

Arcus Consultancy Services Ltd (Arcus) has been commissioned by Lound Hive Limited (The Applicant) to undertake ecological surveys on land south of Lound, Nottinghamshire (the 'Site'). The surveys have been designed to inform an Ecological Impact Assessment (ECIA) is presented in Chapter 8 of Volume 1 of the Environmental Statement (ES) submitted in support of a planning application for the extraction of Pulverised Fuel Ash (PFA) from former disposal lagoons (the 'Proposed Development').

This report presents the findings of the ecological surveys undertaken; including methods and results (boundaries for the survey methods are shown on Figure 1 in Appendix B). The results of the surveys should be considered valid for 12 to 24 months, depending on the species, site and potential impacts. Ornithology surveys have also been undertaken, the results of which are presented in Technical Appendix 8.3, and therefore not considered further herein.

2.1 Structure of Report

The report is supported by the following appendices:

- Appendix A Planning Policy and Legislation
- Appendix B Figures
 - Figure 1: Survey Areas
 - Figure 2a: Non-Statutory Designated Sites
 - Figure 2b: Statutory Designated Sites
 - Figure 3: Phase 1 Habitat Survey
 - Figure 4: Potential Bat Roost Tree Locations
 - Figure 5: Bat Transect Route and Automated Static Bat Detector Locations
 - Figure 6: Bat Transect Survey Results Overview
 - Figure 7: Water Vole and Otter Survey Waterbody Locations
 - Figure 8: Reptile Survey Results
- Appendix C Plant Species List
- Appendix D Photographs
- Appendix E Habitat Suitability Index (HSI) Assessment Scores

2.2 Planning Policy and Legislation

Relevant legislation and policy are summarised in Appendix A.

3 METHODS

3.1 Desk Study

Natural England's Multi Agency Geographic Information for the Countryside¹ (MAGIC) website was consulted to obtain information about local or national statutory designated sites such as Local Nature Reserves (LNR) and Sites of Special Scientific Interest (SSSI) within 2 km of the Site (shown on Figure 2b in Appendix B). A search for sites in the National Site Network (Special Area of Conservation (SAC), Special Protection Area (SPA) or Ramsar sites) within 5 km of the Site was also undertaken (shown on Figure 2b in Appendix B). MAGIC was also consulted for information about important habitats, such as Ancient Woodland, and European Protected Species (EPS) mitigation licences.

Nottinghamshire Biological and Geological Records Centre (NBGR) was consulted for local records of features of ecological interest within 2 km of the Site, which included non-

¹ Multi Agency Geographic Information for Countryside (MAGIC) [Online] Available at: <u>https://magic.defra.gov.uk/home.htm</u> [Accessed August 2022]



statutory designated Local Wildlife Sites (LWS) and notable and protected species (shown on Figure 2a in Appendix B).

Derbyshire and Nottinghamshire Entomology Society (DaMES) was also consulted for local records of invertebrates within 2.5 km of the Site boundary.

A review of historic aerial satellite imagery 2 was undertaken for the Site to gain an understanding of past land-use.

3.2 Extended Phase 1 Habitat Survey

An Extended Phase 1 Habitat Survey was conducted on 3rd February 2021, and updated on 17th August 2021. The survey included all land within the Site (shown in Figure 1, Appendix B). The aim of the survey was to classify and map habitats according to standard methods³ and to assess their potential to support notable and protected species. The survey was carried out following the Guidelines for Preliminary Ecological Appraisal⁴. Target Notes (TN) were recorded of features of particular ecological interest.

3.2.1 Survey Limitations

Initially the Extended Phase 1 Habitat Survey was undertaken outside the optimal months (June to August) for surveying grassland habitat, as many grasses are difficult to identify at species level before flowering or when grazed close to the ground. This potential limitation is not considered significant as a relatively comprehensive species list was attained and the grassland categorised with confidence. Nevertheless, an additional visit in August provided an opportunity to update the species list and to re-evaluate the habitats during the optimal season, and ensure there were no notable changes.

3.3 Bats

3.3.1 Bat Assessment

During the Extended Phase 1 Habitat Survey, a preliminary assessment of the potential of features within the Site to support bat roosts and/or provide suitable commuting or foraging habitat was conducted. The bat assessment work and recommendations followed guidelines produced by the Bat Conservation Trust (BCT)⁵. This initial bat assessment informs whether or not further surveys are required to assess the potential effects of the Proposed Development on bats.

3.3.1.1 Roosts

A ground-level inspection of trees/structures/buildings was undertaken during the Extended Phase 1 Habitat Survey to identify Potential Roost Features (PRFs) suitable for roosting bats such as woodpecker holes, spilt limbs, peeling bark, lifted tiles and missing mortar. Based on these observations, trees are assigned a level of suitability (negligible, low, moderate or high). Should evidence of bats be recorded or the features assessed to provide suitability for bats, then further surveys may be required. Woodland at the perimeter of the Site were excluded from individual assessment of trees during the Extended Phase 1 Habitat Survey, as the Proposed Development layout at the time excluded the woodland from the works footprint. Following a change of proposal, follow-up assessments of the on-site woodland were undertaken in November 2022.

² Google LLC (2020) *Google Earth*. Available from: <u>https://earth.google.com/web/</u> [Accessed June 2022]

³ JNCC (2010) Handbook for Phase 1 habitat survey: a technique for environmental audit. Nature Conservancy Council.

⁴ CIEEM (2017) *Guidelines for Preliminary Ecological Appraisal, 2nd Edition.* Chartered Institute of Ecology and Environmental Management, Winchester.

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



3.3.1.2 Habitats

Visual assessment of habitats to determine their potential to support commuting, foraging or swarming bats, such as good connectivity and linear features. Based on these observations, the Site is assigned a level of suitability. Should suitable habitat for bats be recorded, then further surveys may be required.

3.3.2 Bat Surveys

The Extended Phase 1 Habitat Survey concluded that the Site has 'high' suitability for foraging and commuting bats, due the variety of habitats and good commuting corridors and connection within the landscape. Bat surveys were undertaken in accordance with Bat Conservation Trust (BCT)⁵ guidance.

One high suitability roost was recorded on site, two moderate suitability roosts recorded and six low suitability roosts. The rest of trees recorded on site were considered negligible to support roosting bats. Therefore, no specific swarming surveys were undertaken.

The survey effort for a high suitability Site is two transects per month and the deployment of three automated detectors for a minimum of five consecutive nights in separate locations per month during April and October.

3.3.2.1 Transect Survey

Two transect surveys were undertaken per month, during April and October 2021 (inclusive) to record the activity of bats within the Site. See Table 3.1 overleaf for further details.

Due to the size of the Site, two transects were walked/driven during the same time in order to survey the full extent of the Site; northern transect and southern transect. The transect routes (Figure 5, Appendix B) were consistent for all surveys; however, they were travelled in a clockwise and anti-clockwise direction which was alternated during each month. By alternating the direction of the transects it ensured that spatio-temporal patterns of activity were not an artefact of the survey the method. The transect route was chosen to cover the majority of habitat types present.

Since the bat transect surveys were undertaken in 2021, the Site boundary has been amended. Sections of both the transect routes have surveyed habitats that are no longer within the Site (Figure 5 and Figure 6, Appendix B).

The transects started at around sunset and lasted for up to 2.5 hours, however a single pre-dawn transect was undertaken which also lasted up to 2.5 hours and finished at sunrise. Point counts were undertaken at a series of locations along the transects, pausing for at each. Surveyors recorded bat activity using a combination of Anabat Express, BatBox Duet and/or Echo Meter Touch 2 Pro during the surveys.

In addition to the digital recordings, information about bat registrations was recorded on maps and standardised recording sheets, including, if possible:

- Time of bat registration;
- Direction of flight;
- Bat behaviour e.g. foraging; and
- Environmental variables, including cloud cover, wind strength, precipitation, and air temperature were recorded at the start and end of the survey.



Month and Date	Weather					
	Temperature (°C)		Wind	Cloud Cover	Rain*	
	Start	End	Start	Start	Start	End
April – 26.04.21	9	9	Still	Slight overcast	Dry	
April – 30.04.21	5	5	Still	Overcast	Light rai 20:40, c after	in until Iry
May – 22.05.21	10	8	Still	Clear	Dry	
May – 28.05.21	14	14	Slight breeze	Slight overcast	Dry	
June – 14.06.21	14	14	Still	Slight overcast	Dry	
June – 22.06.21	12	12	Still	Clear	Dry	
July – 12.07.21	16	15	Still	Overcast	Dry	
July – 23.07.21	17	16	Still	Overcast	Dry	
August – 18.08.21	18	17	Slight breeze	Overcast	Dry	
August – 23.08.21	17	17	Slight breeze	Slight overcast	Dry	
September – 19.09.21	17	17	Slight breeze	Slight overcast	Dry	
September – 23.09.21	17	17	Still	Slight overcast	Dry	
October – 11.10.21	7	7	Still	Clear	Dry	
October – 11.10.21	12	10	Still	Slight overcast	Dry	

Table 3.1: Transect Dates and Weather Conditions

3.3.2.2 Remote Monitoring

Remote monitoring was undertaken to record the bat activity at fixed locations and over longer periods than the transect surveys. The remote monitoring was undertaken using six automated bat detectors (Anabat Express). Detectors deployed for a minimum of five nights on seven occasions (Table 3.2) at six locations (Figure 5, Appendix B). Each night of remote monitoring included two separate dates as surveys are carried out throughout the night from dusk on one day to dawn on the next. To assist with interpreting the data, each survey night is identified by the date on which the remote monitoring survey began.

Survey	Static Locations	Survey Date Range	No. of Survey Nights
April	1, 2, 3	19.04.21 to 24.04.21	5
	4, 5, 6	24.04.21 to 29.04.21	5
Мау	1, 2, 3	26.05.21 to 31.05.21	5
	4, 5, 6	08.05.21 to 13.05.21	5
June	1, 2, 3	01.06.21 to 06.06.21	5
	4, 5, 6	22.06.21 to 27.06.21	5
July	1, 2, 3	18.06.21 to 23.07.21	5
	4, 5, 6	03.07.21 to 08.07.21	5
August	1, 2, 3	01.08.21 to 06.08.21	5
	4, 5, 6	23.08.21 to 28.08.21	5
September	1, 2, 3	19.09.21 to 24.09.21	5
	4, 5, 6	01.09.21 to 06.09.21	5
October	1, 2, 3	01.10.21 to 06.10.21	5
	4, 6	14.10.21 to 19.10.21	5 (No data for 4).
	5	14.10.21 to 19.10.21	5

Table 3.2: Remote Monitoring Dates

Call Analysis

Remote monitoring data was analysed using Analook W4.1 and assessed to species/genus level through sonogram identification. This was supposed by species guidance produced by Russ (2012)⁶.

There are limitations associated with species identification using sonogram analysis. Echolocation calls from congeneric species often exhibit a large degree of overlap in their call structures making definitive identification difficult. Also, bats vary the structure of its echolocation calls to reflect its proximate needs. This behaviour results in a large degree of variation in the call structure of any given bat species and can also result in the structure of echolocation calls overlapping with those of other bat species. Species identification is therefore applied with a level of confidence, especially where deterministic call characteristics are not present within a recording.

Six species belonging to the *Myotis* genus are known to be resident in the UK. There is a large amount of overlap between the characteristics of the echolocation calls of these congeneric species and so a definitive identification of *Myotis* bats to species level is rarely possible from frequency division recordings. As such, all calls from *Myotis* species bats were identified to genus as unidentified *Myotis* species.

Furthermore, high quantities of records are not necessarily an indication of large population size and can represent constant foraging passes by a small number of bats in the immediate vicinity of a detector.

⁶ Russ, J. (2012) *British Bat Calls: A Guide to Species Identification,* Pelagic Publishing, Exeter.



Equipment Calibration

In line with BCT guidance⁵, all detectors are subject to routine maintenance and testing. Detectors used for remote monitoring are routinely calibrated using appropriate equipment and software by the equipment supplier.

3.3.2.3 Swarming Assessment

The Site was deemed unsuitable for swarming bats due to the overall lack of suitable roosting opportunities identified during the Extended Phase 1 Habitat Survey and during surveys described in Section 3.3.1.1. However, remote monitoring was undertaken using six automated bat detectors on seven occasions between April and October 2021. In order to provide a robust assessment of the Site's suitability for swarming the recordings between August and October 2021 were analysed to determine if there were any peaks in activity 3–4 hours after sunset.

3.3.2.4 Survey Limitations

In line with BCT guidelines⁵ it was intended that five-consecutive days of bat activity data would be recorded, by means of automated static bat detectors, for the month of October 2021. However, due to a technical malfunction of the static detector, no records were captured for Location 4 for this month. With the large amount of data captured for the remainder of the Site and across the full season, professional judgement will be applied to inform the expected level of bat activity for the missed location in October and therefore it is not considered a limitation to the robustness of the assessment.

3.4 Great Crested Newt

Great crested newt (*Triturus cristatus;* GCN) assessment/surveys were carried out at accessible waterbodies within the Site and within a 500 m buffer (shown on Figure 1 in Appendix B).

3.4.1 Habitat Suitability Index (HSI) Assessment

A total of 43 waterbodies were identified onsite and within a 500 m buffer. However, only three of them were accessible for a Habitat Suitability Index (HSI) assessment⁷ during the Extended Phase 1 Habitat Survey.

The HSI assessment considers a range of features that affect the suitability of ponds to support GCN; e.g., size of pond, extent of shading, abundance of aquatic plants, presence of fish and quality of surrounding habitat. The assessment results in a score that helps to determine the suitability of ponds and the need for further, more detailed surveys. HSI scores are classified according to the thresholds shown in Table 3.3.

HSI score	Pond suitability
< 0.5	Poor
0.5 – 0.59	Below average
0.6 – 0.69	Average
0.7 – 0.79	Good

Table 3.3: Categorisation of HSI scores

⁷ Oldham R.S, et al. (2000) *Evaluating the suitability of habitat for the Great Crested Newt (Triturus cristatus).* Herpetological Journal 10 (4), 143-155.



HSI score	Pond suitability
> 0.8	Excellent

HSI Assessment was carried out in three waterbodies (P14 to P16), locations of which are shown on Figure 1, Appendix B.

3.4.2 Environmental DNA Testing

Out of the 43 waterbodies, 17 were subject to eDNA testing (P1 to P17) as the remaining were scoped out (P18 to P37, River Idle and D1 to D4). Waterbodies were scoped out due to a number of reasons including; too large, running water (e.g. River Idle), stocked with fish, substantial barrier preventing GCN to migrate across (e.g. busy roads), and dry at the time of survey/no longer existed. Locations are shown on Figure 1, Appendix B.

Waterbody references are detailed in Table 3.4 below.

Waterbody Reference	OS Grid Reference
Pond 1	SK 68987 82904
Pond 2	SK 68992 82998
Pond 3	SK 68886 83022
Pond 3a	SK 68926 83049
Pond 4	SK 69057 83331
Pond 5	SK 68798 83371
Pond 6	SK 68804 83450
Pond 7	SK 68927 83596
Pond 8	SK 69085 83999
Pond 9	SK 69183 84038
Pond 10	SK 69438 84438
Pond 11	SK 69547 84544
Pond 12	SK 69655 84543
Pond 13	SK 69525 84675
Pond 14	SK 69841 85270
Pond 15	SK 69885 85391
Pond 16	SK 70046 85410
Pond 17	SK 70049 85610

Table 3.4 Waterbody References and OS Grid References

Environmental DNA testing was carried out on 23rd and 24th April 2021, where water samples were collected from P1 to P17. This testing method is approved by Natural England as a reliable technique for determining presence or absence of GCN within a waterbody, based upon the detection of trace eDNA within the water samples. This would produce 'positive' or 'negative' eDNA results for each waterbody.

The samples were processed by SureScreen Scientific Ltd following the methods set out in Appendix 5 of the DEFRA Technical Report WC1067⁸.

⁸ Biggs J, Ewald N, Valentini A, Gaboriaud C, Griffiths RA, Foster J, Wilkinson J, Arnett A, Williams P and Dunn F (2014) Analytical and methodological development for improved surveillance of the Great Crested Newt. Appendix 5. Technical advice



3.4.3 Survey Limitations

HSI assessments were only carried out on three waterbodies (P14 to P16). No access was granted for the remaining waterbodies at the time of the Extended Phase 1 Habitat Survey.

Nevertheless, access was granted to all identified waterbodies at the time of eDNA analysis, overcoming the limitation.

3.5 Badger

Badger are considered at risk from persecution and so the methods and results of the badger surveys are provided in a separation Confidential Annex⁹.

3.6 Reptiles

3.7 Reptile Surveys

Reptile surveys were carried out between 14th May 2021 and 12th July 2021 to determine the likely presence/absence of reptiles on the Site. The survey followed Froglife survey method¹⁰. A total of 212 refugia measuring approximately 50 cm x 50 cm, which reptiles preferentially use for basking and resting, were placed in suitable habitat throughout the Site. Locations are shown in Figure 8, Appendix B. The refugia were left undisturbed for a minimum period of 14 days before returning to the Site for the first inspection. Inspections were carried out on seven separate days during suitable weather conditions avoiding precipitation, strong winds or high temperatures (Table 3.5).

Survey Date	Weather Conditions				
14.05.2021	Start: 9 °C End: 10 °C Slight overcast, dry, still.				
20.05.2021	Start: 11 °C End: 12 °C Slight overcast, dry, still.				
28.05.2021	Start: 17 °C End: 17 °C Still, clear, dry.				
14.06.2021	Start: 17 °C End: 16 °C Overcast, dry, slight breeze.				
24.06.2021	Start: 15 °C End: 15 °C Still, clear, dry				
30.06.2021	Start: 12 °C End: 14 °C Still, clear, dry.				
12.07.2021	Start: 16 °C End: 16 °C Overcast, dry, still.				

Table 3.5: Reptile Survey Weather Data

3.7.1 Survey Limitations

July is considered to be sub-optimal for reptile surveys as temperature is generally high enough the reptiles are active without the need for basking on or under the refugia. Only one of the surveys was completed in July, with the rest during suitable months, three of which are in the peak month of May. All temperatures and weather conditions met with guidelines and therefore one survey in a sub-optimal month is not considered to alter the results of the surveys.

[[]cont.] *note for field and laboratory sampling of great crested newt (Triturus cristatus) environmental DNA*. Freshwater Habitats Trust, Oxford.

⁹ Arcus Consultancy Services Ltd (2022) *Confidential Annex, Loud Ash Extraction,* Hive Energy.

¹⁰ Froglife (1999), *Reptile survey: an introduction to planning, conducting and interpreting surveys for snake and lizard conservation*. Froglife Advice Sheet 10. Froglife.



3.8 Water Vole

3.8.1 Water Vole Surveys

A water vole survey was completed in June 2021 and August 2021, where the visit in June was spread over two days (see Table 3.6), by two suitably experienced ecologists. A total of four waterbodies (D2 to D4 and P14) were surveyed, locations shown on Figure 7, Appendix B.

Survey Date	Weather Conditions	
08.06.21	19 ^o C light breeze, SSW, dry and sunny.	
09.06.21	22 ^o C, gentle breeze, SW dry and sunny.	
17.08.21	16 ^o C, gentle breeze W, overcast.	

 Table 3.6: Water Vole Survey Weather Data

The survey methodology for water vole was based on the industry-standard survey methodology for this species¹¹. Habitat quality was assessed and noted during the survey, and was combined with field sign observations and published data on average territory sizes for water vole¹².

The surveyor walked along the banks of all accessible watercourses considered suitable for water vole and initially conducted a metre-by-metre search (as far as possible accounting for dense scrub cover) of riparian and emergent vegetation for diagnostic water vole signs – such as latrines, faeces, feeding stations, feeding platforms, feeding excavations, burrows, runs and ball nests. As soon as a burrow was discovered, the surveyor switched to an intermittent search approach, searching a 2-3 m wide section approximately every 20 m to minimise disturbance of bankside habitats. The location of any confirmed field sign was logged.

3.8.1.1 Survey Limitations

The surveys were undertaken in optimal weather conditions by suitably experienced ecologists who are members of the Chartered Institute of Ecology and Environmental Management (CIEEM).

No access was granted to off-site ditches; however, the Proposed Development would not impact these ditches.

3.9 Otter

3.9.1 Otter Surveys

An otter survey was carried out at the same time as the water vole survey (dates detailed in Table 3.5), to determine presence/absence of otters from the ditches within or adjacent to the Site (D2 to D4 and P14 on Figure 7 in Appendix B).

In line with standard guidance¹³¹⁴ two detailed inspections of banks of the ditches were undertaken in order to record any signs of otters, as well as assessing any areas that could

¹¹ Dean, M (2021) Water Vole Field Signs and Habitat Assessments: A Practical Guide to Water Vole Surveys Pelagic Publishing, Exeter, UK

¹² Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016) The Water Vole Mitigation Handbook (The Mammal Society Mitigation Guidance Series). Eds Fiona Matthews and Paul Chanin. The Mammal Society, London.

¹³ Highways Agency (2001), Design Manual for Roads and Bridges: Volume 10, Section 4, Part 4, *Nature Conservation Advice in Relation to Otters.*

¹⁴ Chanin P (2003). *Monitoring the Otter Lutra lutra*. Conserving Natura 2000 Rivers Monitoring Series No. 10, English Nature, Peterborough.



provide lying up/resting places for otters, was carried out. Both surveys were undertaken during optimal weather conditions. Field signs for otters include:

- Footprints and slides (where otters regularly enter water);
- Spraint; and
- Feeding remains.

Suitable riparian habitats within the Site and up to 200 m up and down were not surveyed as the survey effort would be disproportionate to the level of impact predicted by the Proposed Development. Camera traps placed throughout the Site targeting badgers included potential otter commuting routes and data from these was reviewed to inform the baseline condition.

3.9.2 Survey Limitations

The surveys were undertaken in optimal weather conditions by suitably experienced ecologists who are members of the Chartered Institute of Ecology and Environmental Management (CIEEM).

No access was granted to the remaining waterbodies identified within a 500 m buffer of the Site, including the River Idle, at the time of the survey; however, the Proposed Development would not directly impact these waterbodies.

3.10 Invertebrate Habitat Potential Assessment

An Invertebrate Habitat Potential (IHP) assessment was undertaken on the 14th and 15th of November 2022 at the Site in order to assess the potential the habitats have to support more specialised, unique or rare invertebrate assemblages and highlight the need for further survey.

The survey followed the IHP Assessment methodology¹⁵, which is split into two parts. Before attending the Site, a desk study was undertaken to identify habitat parcels within the Site which would be the focus of assessment and scope out areas of uniform poor quality habitat. This was undertaken using a variety of resources including aerial imagery, desk study results, NBN atlas¹⁶ and Magic¹⁷.

Following the selection of suitable sites during the desk study, a Site walkover was then conducted. Each parcel was assessed using 11 habitat elements (Table 3.7 overleaf) which are subject to a grading system (Table 3.8 overleaf). Each habitat parcel was characterised by a string of 11 letters, one corresponding to each habitat element. These were then utilised to determine whether further action in the form of further survey or mitigation was required.

¹⁵ Dobson and Fairclough (2021). Rapid Assessments of the Potential Value of Invertebrate Habitats: Applications for Planning and Nature Conservation ('Phase 1 for Bugs'). *InPractice 112. June 2021.*

¹⁶ National Biodiversity Atlas (NBN) Atlas (https://ror.org/00mcxye41). [Online]. Available from: <u>http://www.nbnatlas.org</u> [Accessed: November 2022]

¹⁷ Defra Magic Maps (online). Available from: <u>Magic Map Application (defra.gov.uk)</u> [Accessed: November 2022]



Habitat Element	Reference	Comments
Decaying Wood	HE1	In all its forms; from decaying wood on/in large trees to woodland floor debris.
Rotational Management	HE2	Planned or serendipitous; and whether for nature conservation of other purposes.
Nectar Resources	HE3	As a proxy for nectar- and pollen resources, as assessment of pollen resources is impracticable on a walk-through survey.
Wet Substrates	HE4	Including marginal, marshy, muddy and seasonally inundated habitats, as well as flushes.
Open Water Habitats	HE5	The Open Water element of rivers, lakes, ponds, streams, ditches etc.
Structural Patchwork	HE6	Habitat Mosaics, including, but by no means restricted to open mosaic habitats on previously developed land.
Still Air (S)	HE7	Suntraps and still-air microclimates in open situations. The term 'still air' is used in preference to 'wind breaks' as many rigid wind breaks are likely to produce turbulent air in their lee.
Still Air (H)	HE8	Humid still-air microclimates in sheltered and shaded situations.
Connectivity	HE9	Landscape-scale connectivity between the site and external habitats.
Ecoclines	HE10	A graded transition between two or more broad habitats
Bare Earth	HE11	Un-shaded bare or sparsely vegetated well- drained substrate, regardless of soil type.

Table 3.7: Habitat Elements Assessed within the IHP

Table 3.8: Habitat Element Grading System

Grade	Description
Negligible /Absent (E)	Habitat element is absent or of insignificant (barely perceptible) quantity.
Minor (D)	Habitat element is present but is of insufficient quality to qualify as Moderate or above. For example, it may be of extremely limited extent, or very sparsely dispersed. Likely to support common and widespread, generalist species.
Moderate (C)	A clear example of the habitat element is present, but which does not qualify as Major. Likely to be of sufficient quality to support a characteristic invertebrate fauna.
Major (B)	Good quality examples of each habitat element which do not meet the criteria for Exceptional. Likely to be a predominant factor in supporting characteristic and specialised invertebrate assemblages. Considerations might include the extent, maturity and historic- and current connectivity of the element.
Exceptional (A)	Very high-quality examples of the habitat element, including but not restricted to those of potential regional significance. This may be for reasons of intrinsic quality,



	rarity, vulnerability, or the perceived importance of its position in the wider landscape.
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Further action is required if a parcel has 1 A grade, 2 B grades or 1 B and 2 C grades. The course of further action is then determined by professional judgement and scope of the works, but the two pathways consist of:

- Consultation with an entomologist to review the IHP and develop a scope for further specialised invertebrate surveys; and
- Avoidance and sustainable mitigation of the parcel.

3.10.1 Limitations

The survey was undertaken at a time of year where pollen and nectar resources were not evident and thus an estimation of presence was undertaken. This may have led to an underscoring of each parcel for HE3. However, as several visits to the Site have been undertaken previously at more optimal times of the year, we were able to make an informed decision which reduces the likelihood that this affected the robustness of the survey.

Guidance on size of parcel and sampling effort was not available at the time of survey and therefore results may differ depending on size of parcel and sample effort. Sample size was kept uniform across the Site, with large enough areas to be able to fully assess each of the criteria. The desk study allowed for the most favourable locations across the Site to be identified and the sample effort was based upon this, increasing the likelihood that any high-quality habitat for invertebrates would be captured by the survey.

4 **RESULTS**

4.1 Desk Study

4.1.1 Designated Sites

4.1.1.1 Statutory

There are no National Network Sites located within 5 km of the Site, however there is one two statutory designated sites within 2 km; Sutton and Lound Gravel Pits SSSI and Retford Cemetery LNR. Further details are provided in Table 4.1 overleaf and shown on Figure 2b in Appendix B.

4.1.1.2 Non-Statutory

There are eight LWS within 2 km of the Site; the closest being Sutton and Lound LWS which overlaps the Site. Further details are provided in Table 4.1 and shown on Figure 2a in Appendix B.



Site	Status	Approximate Minimum Distance and Direction (km) from Site boundary	Description/Reason for Designation
Statutory desig	nated sites	5	
Sutton and Lound Gravel Pits	SSSI	Split into two areas: Within the Site and adjacent to the south/south- east 0.2 km north-east	 Extensive areas of open water lagoons that support a variety of breeding, wintering andpassage birds. Also supports a nationally important population of wintering gadwall. Adjacent to the lagoons lies areas of open grassland, acidic scrub and willow dominated woodland. The site is one of themost important localities for passage and over-wintering wildfowl in the East Midlands. Designated features are: Gadwall (aggregation of non-breeding birds); Breeding bird assemblage (lowland open waters and their margins); and Variety of passage bird species. Part of the SSSI is managed as a publically accessible nature reserve by Nottinghamshire Wildlife Trust,
Retford Cemetery	LNR	1.4 km south-east	Victorian era cemetery where it's age, large size, range of mature trees, and Chesterfield Canal running along eastern boundary helps create an environment with different habitats for a variety of wildlife. Supports an assemblage of bats important to county, invertebrates, lichens and other botanical species.
Non-statutory	designated	sites	
Sutton and Lound	LWS	Split into two areas: Within the Site and immediately adjacent to the south/south-east Adjacent to the north	The site comprises sand and gravel pits covering approximately 450 ha. This also includes part of the Sutton and Lound SSSI. The River Idle borders the site along the eastern boundary. The site contains a variety of habitats, including large areas of open water, tall ruderal vegetation, grassland, secondary and relict woodland, scrub and marshes. The site supports a range of breeding and wintering wetland birds.
Idle Valley Nature Centre Pond	LWS	0.2 km south-east	Designated for its botanical and invertebrate interest. Species include dingy skipper (<i>Erynnis</i> <i>tages</i>), brown argus (<i>Aricia agestis</i>), common blue (<i>Polyommatus icarus</i>), purple hairstreak (<i>Neozephyrus quercus</i>), small copper (<i>Lycaena</i> <i>phlaeas</i>) and small heath (<i>Coenonympha</i> <i>pamphilus</i>).
Tiln Wood Track	LWS	0.6 km south/south-east	This track forms part of a public bridleway, situated on sandy soils running through a mature pine plantation. High botanical value.

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Site	Status	Approximate Minimum Distance and Direction (km) from Site boundary	Description/Reason for Designation
Tiln North and the Conservation Lake	LWS	0.7 km east	Several gravel pits, designated for ornithological interest.
River Idle Chainbridge Lane Bridge	LWS	0.8 km east	No citation given.
Bolham Wood	LWS	0.9 km east	A small deciduous, ancient woodland situated on a steep south-facing slope above the River Idle.
Folly Dyke, Chain Bridge Lane, NW of Hayton	LWS	1.4 km east	No citation given.
Chesterfield Canal (Shireoaks to Welham)	LWS	1.6 km south- west	Chesterfield canal supports a variety of notable fauna and aquatic flora.
Idle Valley	NWT Reserve	Adjacent to the south/south- east/east/north- east	Complex of flooded sand and gravel pits supporting a mosaic of habitats comprising grassland, tall ruderal vegetation, flooded gravel pits, planted, secondary and relict woodland, scrub, and marsh.
			Large areas of open water support good numbers of wildfowl in winter and many breeding wetland birds and passage migrants further supporting a good selection of aquatic plants.
			Overall the site supports a wide diversity of wildlife, providing a range of ecological niches for both flora and fauna.

4.1.2 Protected Species Records

4.1.2.1 Nottinghamshire Biological and Geological Records Centre (NBGR)

Species records dated from 2010 onwards and that are relevant to the habitats present and the Proposed Development are summarised in Table 4.2. The species are protected under UK legislation^{21,22} and/or are listed under the NERC Act 2006²³²³ as species of principal importance.

There is one European Protected Species (EPS) mitigation licence application for bats within 2 km of the Site. The licence was for to allow a destruction of a resting place of brown long-eared and common pipistrelle bats, with the licence to end in September 2019, approximately 130 m west of the Site boundary.



Taxonomic group	Species	Number of records	Date of most recent record	Distance and direction of most recent record from the Site (km)
Bats	Noctule (<i>Nyctalus 17aubent</i>)	42	18/08/2017	Within the Site boundary
	Soprano pipistrelle (<i>Pipistrellus pygmaeus</i>)	79	15/09/2018	Within the Site boundary
	Common pipistrelle (<i>Pipistrellus pipistrellus</i>)	111	15/09/2018	0.1 km south
	Brown long-eared (<i>Plecotus auratus</i>)	8	15/09/2018	0.1 km west
	<i>Pipistrellus</i> sp.	11	19/09/2013	0.1 km west
	<i>Myotis</i> sp.	33	18/08/2017	0.1 km south
	<i>Nyctalus</i> sp.	6	20/10/2016	0.4 km west
	Brandt's (<i>Myotis brandti</i>)	1	04/09/2015	0.9 km south
	Daubentons' (<i>Myotis 17aubentoniid</i>)	15	18/08/2017	0.9 km south
	Nathusius's pipistrelle (<i>Pipistrellus nathusii</i>)	8	15/09/2018	0.9 km north-west
	Natterer's (<i>Myotis nattereri</i>)	1	04/09/2015	0.9 km south
	Whiskered bat (<i>Myotis mystacinus</i>)	3	04/09/2015	0.9 km south
	Whiskered/Brandt's (<i>Myotis mystacinus/</i> brandti)	1	21/05/2013	1.9 km south-west
	Unidentified bat	2	15/07/2013	1.9 km south-west
Mammals	Western European Hedgehog (<i>Erinaceus europaeus</i>)	12	17/07/2016	Within the Site boundary
	Brown hare (<i>Lepus europaeus</i>)	1	26/04/2018	0.6 km south
	Water vole (<i>Arvicola amphibius</i>)	24	01/10/2012	0.6 km east
	Badger (<i>Meles meles</i>)	11	22/10/2020	0.9 km north-west
	Otter (<i>Lutra lutra</i>)	2	28/09/2017	0.9 km north-west
Amphibians	Common toad (<i>Bufo bufo</i>)	7	14/03/2017	Within the Site boundary
	Great crested newt (<i>Triturus cristatus</i>)	1	2014	0.6 km east

Table 4.2: Protected and Priority Species within 2 km of the Site



Taxonomic group	Species	Number of records	Date of most recent record	Distance and direction of most recent record from the Site (km)
	Common frog (<i>Rana temporaria</i>)	7	26/08/2016	1.0 km north-west
	Smooth newt (<i>Lissotriton vulgaris</i>)	3	21/04/2011	1.0 km south-west
Reptiles	Grass snake (<i>Natrix natrix</i>)	25	09/05/2014	Within the Site boundary
Invertebrates	Dingy Skipper (<i>Erynnis tages</i>)	6	04/06/2019	0.1 km south
	Small Heath (<i>Coenonympha pamphilus</i>)	4	26/06/2017	0.1 km south

Due to the large volume of bird records, these are excluded from the table above but have been considered in forming recommendations. The desk study returned 34,677 records of 226 species of birds, many of which are species of conservation concern and have been recorded recently (post-2010). 253 records of 29 species have been recorded within the Site boundary during 2016 and 2017.

4.1.2.2 Derbyshire and Nottinghamshire Entomology Society (DaMES)

Invertebrate species records dated from 2010 onwards and that are relevant to the habitats present and the Proposed Development are summarised in Table 4.3.

A total of 242 records of invertebrate species were returned within 2.5 km of the Site boundary. Records of nationally scarce¹⁸ and notable¹⁹ invertebrate species, dated from 2010 onwards, are summarised in Table 4.3.

Table 4.3 Nationally scarce and notable invertebrate species within 2.5	; km of
the Site	

Species	Number of records	Date of most recent record	Distance and direction of most recent record from the Site (km)		
Orange-blotch Cosmet (<i>Chrysoclista lathamella</i>)	1	2013	0.1 km south		
Kent Black Arches (<i>Meganola albula</i>)	1	2019	0.2 km south-east		
Rhubarb and Custard moth (<i>Onocera</i> <i>semirubella</i>)	1	2019	0.2 km south-east		
A micro-moth (<i>Stathmopoda pedella</i>)	1	2019	Within the Site		

 ¹⁸ Nationally Scare B species are uncommon in GB and thought to occur between 31 and 100 10 km squares of the National Grid or, for less-well recorded groups between either and 20 vice-counties.
 ¹⁹ Species with conservation designations, but no legal protection.



4.1.3 Priority Habitats

The woodland habitats within the Site boundary to the west, north-west, east and south are classified as a deciduous woodland on the priority habitat inventory¹. Further areas of deciduous woodland are present within 2 km of the Site, mostly within Idle Nature Reserve. An area of good quality semi-improved grassland lies directly south of the Site boundary. Other habitats classified on the priority habitat inventory within 2 km of the Site boundary include a traditional orchard which is situated approximately 0.5 km south and areas of coastal and floodplain grazing marsh which are situated approximately 0.4 km south and 1.6 km east from the Site.

4.1.4 Site History

Satellite imagery shows the Site to have been grazed grassland fields with adjacent woodland habitats and scattered scrub/trees separating the field margins, all of these habitats appear to have been the same since at least 2004 and have not changed over recent years. Prior to this the Site was part of a former pulverised fuel ash disposal lagoons, part of Bellmoor Quarry which was in operation between the 1970s and 1990s.

4.1.5 Site Description

A large proportion of the Site comprises improved grassland fields separated by fencing and scattered scrub/trees. The Site is approximately 113.58 hectares (ha) includes Sutton and Lound LWS which forms a narrow strip between the westernmost field and the rest of the Site. The River Idle is approximately 110 m to the south of the Site. There are many waterbodies present within 500 m of the Site, most of which are part of Idle Valley Nature Reserve to the north-east and south of the Site.

4.2 Extended Phase 1 Habitats

For the purposes of this report, scientific names are excluded from plant species names in the following sections and only the common names are used. A full list of species recorded, including scientific names, is provided in Appendix C. Habitats are shown in Figure 3, Appendix B and photographs in Appendix

4.2.1 Semi-Natural Woodland

A small area of semi-natural woodland is present in the south of the Site. Species included ash and oak. Trees in this area were more mature than to the north of the Site, notably three large oaks. The understorey was limited, dominated by bramble with large brash piles also present.

4.2.2 Plantation Woodland

Areas of deciduous plantation woodland were present along the western, southern, eastern and north-western boundary of the Site, including within Sutton and Lound LWS in the west of the Site. Species included ash, oak, whitebeam, hazel, red alder and aspen. The majority of trees were relatively young (~20 years of age based on historic aerial mapping) and many were still within tree guards. At the time of the assessment, only buds were visible for tree identification. The understorey included creeping jenny, ground, ivy, dove's foot-cranesbill, mouse-ear chickweed and yarrow. Willow trees surrounded the pond (P1) to the north of Lound Low Road.

Broadleaved plantation strips, of relatively young age, were also present separating the field margins in the centre of the Site, species included alder, oak, ash and hawthorn (Photograph 2 in Appendix D).



Mixed plantation woodland is present within the south of the Site, in addition to species listed above, confer and pine species were also present. Understory in these areas is limited with a deep litter leaf layer (predominantly needles in coniferous areas) and occasional scattered bramble. Dead wood is also present.

A small plantation, 'Ruth's Plantation', is situation to the north of Lound Low Road and contains several young sycamore and ash trees of less than 10 years of age.

4.2.3 Recently felled woodland: broadleaved and mixed

Woodland underlaying electricity lines in the south-east of the Site was recently cleared in a 12 m wide swathe. Cuttings ranged from brash to mature trees. Arisings, including multiple log piles, and intact mature tree trunks cut at the base remained on Site at the time of survey.

4.2.4 Scrub Dense/Continuous

Scattered scrub was present surrounding the field margins throughout the Site. Gorse scrub was mostly dominant along the northern and southern boundaries, whereas Scotch broom was recorded frequently along the southern and northern boundaries of the improved grassland fields, some of which was growing through the barbed-wire fencing.

4.2.5 Scattered Scrub

Scattered gorse scrub was recorded along the north-western and southern boundaries of the Site. Further areas of scrub were scattered to the east and west of the access track (Photograph 4 in Appendix D); and along the field margins included blackthorn, bramble and dog's rose.

4.2.6 Scattered Trees – Broadleaved

Several mature oak trees were present on the sides of Lound Low Road, some covered in ivy. Scattered sliver birch and oak trees were present along the access track towards the south of the Site, one of which had a barn owl box on its eastern aspect (TN 7 on Figure 3; Photograph 5 in Appendix D). Scattered Trees – Coniferous

Scattered conifer trees were present along the south of Lound Low Road and were approximately 25 m in height.

4.2.7 Improved Grassland

The majority of the fields comprised improved grassland (Photographs 1 and 3), some of which were grazed by cattle and sheep. The sward in all fields was very short with limited species diversity. Species which were frequently recorded included perennial rye-grass, white clover, common nettle, common dandelion and ribwort plantain. Vetch sp., cock's foot, tufted hair-grass and mosses were recorded occasionally along the field margins, adjacent to the fence lines. Rabbit droppings were evident in these fields, particularly along the field margins.

4.2.8 Poor Semi-Improved Grassland

An area of poor semi-improved grassland was present adjacent to Lound Low Road. The sward was very short with patches of bare ground present. Species in the sward included Yorkshire fog, creeping thistle, common nettle, cleavers, cow's parsley and yarrow.



4.2.9 Other Tall Herb and Fern – Tall Ruderal

An area of tall ruderal was recorded scattered in the west of the Site and is part of Sutton and Lound LWS. Species included thistle, teasel, common nettle, rushes and occasional bramble.

4.2.10 Standing Water

A drainage ditch ran along the south of Lound Low Road, adjacent to the north of the improved grassland fields. The ditch was wider to the west and water was standing in this area (Photograph 10 in Appendix D). Bulrush and reed grasses of varying heights were present in the ditch. Vegetation was dense within the watercourse, but water, where visible, appeared to be turbid; water was absent from some stretches.

4.2.11Intact Hedge – Species Poor

An intact species-poor hedge ran along the northern boundary, adjacent to Lound Low Road. This hedgerow comprised only hawthorn and the shape of the hedgerow was well-managed. Ground flora were limited to common nettle, creeping thistle and tansy ragwort.

4.2.12 Buildings

There are several buildings to the north of the Site, three of which appeared to be residential and the remaining commercial buildings in current use. Heavy plant and machinery was in frequent operation around these buildings. A portable cabin was present to the south of a small fenced area of improved grassland (TN 5 on Figure 3). A further storage unit was situated in the south-eastern corner of one of the improved grassland fields (TN 9 on Figure 3).

4.2.13 Bare Ground

Several access tracks were present throughout the Site. Several large soil mounds were present to the south of Lound Low Road, situated east and west of the existing bare ground access track (TN 10 and 11 on Figure 3).

4.2.14 Fence

The improved grassland fields were separated by stock-proof fencing.

4.3 Bats

4.3.1 Bat Assessment

4.3.1.1 Roosts

Thirteen trees were assessed as having moderate, and low potential to support roosting bats, as shown on Figure 4, Appendix B. All other trees were assessed as having negligible potential to support roosting. Some trees are located outside of the Site boundary due to surveys undertaken referring to a slighting different boundary in

Table 4.4 below provides further details of the mature trees subject to assessment, its location, roost potential, and Potential Roost Features (PRFs) such as rot holes, split limbs, and lifted bark.

Table 4.4: Descr	iptions of Trees	s with Potential	Roosting Features
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Tree No	Species and Location	Bat Roost Potential	Potential Roost Features
5	Unidentified tree species (SK 69731 85109)	Moderate	Barn owl box present on the E elevation.



7	Ash (SK 68539 83474)	Low	Dense ivy at all elevations.
10	Willow species (SK 68808 83928)	Low	Dead central stem, three woodpecker holes on E/S aspect. Open to elements at top/ hollow, provide little shelter.
11	Birch species (SK 68781 84203)	Low	Bark cavity on SE aspect. Small, only big enough for possibly single bat.
12	Willow species (SK 68541 83912)	Moderate	Two knot holes 1 and 2 m up, higher may lead to a larger cavity, W aspect. Tear out is superficial.
13	Oak species (SK 68545 83439)	Moderate	Mature tree with ivy cover, horizontal crack in tear out on SW elevation appear superficial, horizontal crack on torn off branch at NE elevation has most potential.
14	Oak species (SK68529 83438)	Low	Thick ivy stems (dead?) and several areas of peeling bark in the upper branches. Narrow horizontal branch split SW aspect 4 m high.
15	Oak species (SK 68539 83443)	Low	Ivy cover, no other visible features.
16	Oak species (SK 68582 83380)	Moderate	Knothole on SW aspect 4 m high and W aspect 4 m high, possible cavities.
17	Pine species (SK 68673 83236)	Low	Ivy cover.
19	Ash (SK 69276 84704)	Low	Young, with branch tear out on S aspect 2m high
20	Unidentified tree species (SK 69481 84823)	Low	Dead standing tree, pealing bark throughout. Splits present but appear superficial.
21	Willow species (SK 69235 85072)	Low	Thick ivy cover.

4.3.1.2 Habitats

The Site mostly comprised open fields of improved grassland, but the mosaic of surrounding hedgerows, woodland and trees helps to provide a landscape with the potential to support foraging and commuting bats. These higher value features were connected to extensive areas of suitable habitats in the wider landscape by hedgerows and areas of mature woodlands and waterbodies. The Site itself does not experience any light disturbance and is therefore suitably dark for foraging and commuting bats. On this basis and following the BCT guidelines⁵, the Site was classed as having a 'high' suitability for foraging, commuting and roosting bats.

The desk study returned 321 records of nine species of bat. Two bat species, noctule and soprano pipistrelle, haven been recorded within the Site boundary in 2017/2018.

4.3.2 Bat Transect Surveys

Transect surveys recorded eight taxa where six identified to species level: common pipistrelle, soprano pipistrelle, noctule, Daubenton's, brown long-eared and Nathusius' pipistrelle, and the remaining two to genus: *Myotis* species and *Nyctalus* species. The number of passes recorded by the surveyor for each species and survey are summarised in Table 4.5. The results do not show the total number of individual bats recorded per survey; they show the number of times an individual bat passes per survey, where an individual bat could pass multiple times. An overview of the species registrations during the surveys are shown on Figure 6, Appendix B.



Daubenton's, Nathusius' pipistrelle, brown long-eared and an unidentifiable *Nyctalus* species were recorded very infrequently, along with a few unidentifiable *Myotis* species and some noctule recordings. Common pipistrelle and soprano pipistrelle were recorded in similar proportions, although the pattern of activity among surveys differed between species. The highest common pipistrelle activity was recorded in August whereas the highest of soprano pipistrelle was recorded in June. Most overall bat activity was recorded in August.

The majority of the activity was recorded at the edges of the grassland fields and woodland edges, and near offsite waterbodies. Relatively limited activity was recorded in the open grassland habitats within the centre of the Site.

Survey Season and Transect	Common pipistrelle	Soprano pipistrelle	Noctule	Daubleton's	Myotis sp.	Brown-long eared	Nyctalus sp.	Nathusius' pipistrelle	Number of Bat Passes
26.04.2021 N	8	9	2	3	2	0	0	0	24
26.04.2021 S	8	5	3	1	1	0	0	0	18
30.04.2021 N	2	0	0	0	0	0	0	0	2
30.04.2021 S	0	0	0	0	0	0	0	0	0
22.05.2021 N	0	1	1	0	0	0	0	0	2
22.05.2021 S	13	12	0	0	1	0	0	0	25
28.05.2021 N	5	8	0	0	5	1	0	0	19
28.05.2021 S	6	3	1	0	0	0	0	0	10
14.06.2021 N	3	2	4	0	0	0	0	0	9
14.06.2021 S	3	10	2	0	2	0	0	0	17
22.06.2021 N	1	1	8	0	0	0	0	0	10
22.06.2021 S	14	8	4	0	0	0	0	0	26
12.07.2021 N	11	8	2	0	0	0	0	0	21
12.07.2021 S	7	3	3	0	0	0	0	0	13
23.07.2021 N	4	5	3	0	0	0	0	0	12
23.07.2021 S	11	6	0	0	1	0	0	0	18
18.08.2021 N	22	3	4	1	1	0	0	0	31
18.08.2021 S	7	7	3	0	0	0	0	0	17
23.08.2021 N	12	7	2	0	0	0	0	0	21
23.08.2021 S	1	7	8	0	0	0	0	0	16
19.09.2021 N	3	7	2	0	0	0	1	0	13
19.09.2021 S	10	3	0	0	1	0	1	0	15
23.09.2021 N	2	7	1	0	0	0	0	1	11
23.09.2021 S	2	2	3	0	0	0	0	0	7

Table 4.5: Transect Survey Results – Number of Bat Passes per Survey

Survey Season and Transect	Common pipistrelle	Soprano pipistrelle	Noctule	Daubleton's	Myotis sp.	Brown-long eared	Nyctalus sp.	Nathusius' pipistrelle	Number of Bat Passes
11.10.2021 N Dawn	0	0	0	0	0	0	0	0	0
11.10.2021 S Dawn	0	1	0	0	0	0	0	0	1
11.10.2021 N Dusk	0	3	0	0	1	0	0	0	4
11.10.2021 S Dusk	3	1	0	0	0	0	0	0	4
19.10.2021 N	4	0	2	0	0	0	0	1	7
19.10.2021 S	3	4	0	0	0	0	0	0	7
Total	165	133	58	5	15	1	2	2	380

4.3.3 Remote Monitoring

Ten taxa were identified during the remote monitoring surveys (Table 4.6). Seven taxa were identified to species level: noctule, Leisler's bat, serotine, Nathusius' pipistrelle, brown long-eared bat, common pipistrelle and soprano pipistrelle. The remaining three taxa were only identifiable to genus: unidentified *Myotis*, *Pipistrellus* and *Nyctalus* species.



Survey Month	Monitoring Location	Myotis sp.	Nyctalus sp.	Leisler	Noctule	Nathusius pipistrelle	Common pipistrelle	Soprano pipistrelle	Pipistrellus sp.	Brown long-eared bat	Serotine	Total
April	1	12	100	41	8	1	156	39	4	0	0	361
	2	18	4	6	8	3	2895	141	191	0	0	3266
	3	22	18	1	18	5	2097	1884	112	0	0	4157
	4	6	2	0	6	2	10	33	0	1	0	60
	5	30	7	0	1	1	821	95	0	0	0	955
	6	23	2	1	10	0	108	51	0	0	0	195
Мау	1	30	60	2	37	5	1232	392	23	4	1	1785
	2	57	27	11	22	6	1257	299	56	1	0	1736
	3	212	47	1	45	33	7321	3602	505	0	0	11766
	4	10	0	4	11	0	91	137	0	0	0	253
	5	100	12	0	18	0	6100	2188	0	2	0	8420
	6	31	4	2	21	21	2113	504	0	0	0	2697

 Table 4.6: Number of AnaBat Files per Taxon and Monitoring Dates



Survey Month	Monitoring Location	Myotis sp.	Nyctalus sp.	Leisler	Noctule	Nathusius pipistrelle	Common pipistrelle	Soprano pipistrelle	Pipistrellus sp.	Brown long-eared bat	Serotine	Total
June	1	10	17	1	8	3	476	87	12	0	0	614
	2	23	30	5	63	1	2013	129	49	0	0	2313
	3	151	98	1	75	2	1714	756	225	0	0	3022
	4	14	5	0	31	0	53	41	0	0	0	144
	5	43	672	659	1509	8	719	553	0	2	0	4165
	6	22	0	0	0	3	1008	347	0	0	0	1380
July	1	97	140	4	73	12	1467	373	39	1	0	2206
	2	608	155	87	335	37	5229	2767	25	0	0	9243
	3	67	142	92	328	0	810	421	0	3	0	1863
	4	18	1	0	5	0	70	80	0	2	0	176
	5	11	122	136	450	7	1270	532	0	1	0	2529
	6	88	0	0	0	2	5372	4954	0	0	0	10416
August	1	47	92	2	31	0	607	143	6	0	0	928



Survey Month	Monitoring Location	Myotis sp.	Nyctalus sp.	Leisler	Noctule	Nathusius pipistrelle	Common pipistrelle	Soprano pipistrelle	Pipistrellus sp.	Brown long-eared bat	Serotine	Total
	2	423	64	204	71	32	5227	5687	3	0	0	11711
	3	617	35	42	8	14	4656	4929	0	5	0	10306
	4	29	5	11	92	0	309	200	0	0	0	646
	5	892	249	91	843	0	2086	1738	0	1	0	5900
	6	89	0	7	51	0	1985	587	31	0	0	1850
September	1	239	8	0	5	6	155	118	4	1	0	536
	2	8	3	1	3	0	83	121	0	0	0	219
	3	164	0	0	3	7	1816	1869	251	0	0	4110
	4	11	4	9	7	0	278	104	0	0	0	413
	5	450	145	55	324	4	2190	1486	0	0	0	4654
	6	40	0	6	8	0	214	86	8	0	0	362
October	1	14	2	0	7	5	67	30	1	0	0	126
	2	4	3	0	4	0	3	13	0	0	0	27



Survey Month	Monitoring Location	Myotis sp.	Nyctalus sp.	Leisler	Noctule	Nathusius pipistrelle	Common pipistrelle	Soprano pipistrelle	Pipistrellus sp.	Brown long-eared bat	Serotine	Total
	3	60	0	0	0	4	619	210	72	0	0	965
	4*	-	-	-	-	-	-	-	-	-	-	-
	5	9	1	0	5	0	625	149	0	0	0	789
	6	58	0	9	0	0	385	334	10	0	0	796

Common pipistrelle was the most frequently recorded taxon, contributing c. 54.86 % of the total number of AnaBat files, followed by soprano pipistrelle, which contributed c. 32.33% of the AnaBat files. The remaining taxa, combined, contributed c. 12.81 % of the total number of AnaBat files, predominantly made up of *Myotis* sp. and noctule.



Survey Month	Monitoring Location	<i>Myotis</i> sp.	<i>Nyctalus</i> sp.	Leisler	Noctule	Nathusius pipistrelle	Common pipistrelle	Soprano pipistrelle	<i>Pipistrellus</i> sp.	Brown long- eared bat	Serotine	Total
	1	0.01	0.08	0.03	0.01	0.00	0.13	0.03	0.00	0.00	0.00	0.31
	2	0.02	0.00	0.01	0.01	0.00	2.45	0.12	0.16	0.00	0.00	2.77
April	3	0.02	0.02	0.00	0.02	0.00	1.78	1.60	0.09	0.00	0.00	3.52
Артп	4	0.01	0.00	0.00	0.01	0.00	0.01	0.03	0.00	0.00	0.00	0.05
	5	0.03	0.01	0.00	0.00	0.00	0.70	0.08	0.00	0.00	0.00	0.81
	6	0.02	0.00	0.00	0.01	0.00	0.09	0.04	0.00	0.00	0.00	0.17
	1	0.03	0.05	0.00	0.03	0.00	1.04	0.33	0.02	0.00	0.00	1.51
	2	0.05	0.02	0.01	0.02	0.01	1.06	0.25	0.05	0.00	0.00	1.47
Max	3	0.18	0.04	0.00	0.04	0.03	6.20	3.05	0.43	0.00	0.00	9.97
May	4	0.01	0.00	0.00	0.01	0.00	0.08	0.12	0.00	0.00	0.00	0.21
	5	0.08	0.01	0.00	0.02	0.00	5.17	1.85	0.00	0.00	0.00	7.13
	6	0.03	0.00	0.00	0.02	0.02	1.79	0.43	0.00	0.00	0.00	2.28
	1	0.01	0.01	0.00	0.01	0.00	0.40	0.07	0.01	0.00	0.00	0.52
	2	0.02	0.03	0.00	0.05	0.00	1.71	0.11	0.04	0.00	0.00	1.96
1	3	0.13	0.08	0.00	0.06	0.00	1.45	0.64	0.19	0.00	0.00	2.56
June	4	0.01	0.00	0.00	0.03	0.00	0.04	0.03	0.00	0.00	0.00	0.12
	5	0.04	0.57	0.56	1.28	0.01	0.61	0.47	0.00	0.00	0.00	3.53
	6	0.02	0.00	0.00	0.00	0.00	0.85	0.29	0.00	0.00	0.00	1.17

Table 4.7: Bat Activity as a Percentage of Total Recorded Activity per Taxon and Monitoring Location²⁰

²⁰ To two decimal places.



	4	0.00	0.12	0.00	0.00	0.01	1.24	0.22	0.02	0.00	0.00	1.07
	1	0.08	0.12	0.00	0.06	0.01	1.24	0.32	0.03	0.00	0.00	1.87
	2	0.51	0.13	0.07	0.28	0.03	4.43	2.34	0.02	0.00	0.00	7.83
July/	3	0.06	0.12	0.08	0.28	0.00	0.69	0.36	0.00	0.00	0.00	1.58
July	4	0.02	0.00	0.00	0.00	0.00	0.06	0.07	0.00	0.00	0.00	0.15
	5	0.01	0.10	0.12	0.38	0.01	1.08	0.45	0.00	0.00	0.00	2.14
	6	0.07	0.00	0.00	0.00	0.00	4.55	4.20	0.00	0.00	0.00	8.82
	1	0.04	0.08	0.00	0.03	0.00	0.51	0.12	0.01	0.00	0.00	0.79
	2	0.36	0.05	0.17	0.06	0.03	4.43	4.82	0.00	0.00	0.00	9.92
August	3	0.52	0.03	0.04	0.01	0.01	3.94	4.17	0.00	0.00	0.00	8.73
August	4	0.02	0.00	0.01	0.08	0.00	0.26	0.17	0.00	0.00	0.00	0.55
	5	0.76	0.21	0.08	0.71	0.00	1.77	1.47	0.00	0.00	0.00	5.00
	6	0.08	0.00	0.01	0.04	0.00	0.92	0.50	0.03	0.00	0.00	1.57
	1	0.20	0.01	0.00	0.00	0.01	0.13	0.10	0.00	0.00	0.00	0.45
	2	0.01	0.00	0.00	0.00	0.00	0.07	0.10	0.00	0.00	0.00	0.19
Sontombor	3	0.14	0.00	0.00	0.00	0.01	1.54	1.58	0.21	0.00	0.00	3.48
September	4	0.01	0.00	0.01	0.01	0.00	0.24	0.09	0.00	0.00	0.00	0.35
	5	0.38	0.12	0.05	0.27	0.00	1.85	1.26	0.00	0.00	0.00	3.94
	6	0.03	0.00	0.01	0.01	0.00	0.18	0.07	0.01	0.00	0.00	0.31
	1	0.01	0.00	0.00	0.01	0.00	0.06	0.03	0.00	0.00	0.00	0.11
	2	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.02
Octobor	3	0.05	0.00	0.00	0.00	0.00	0.52	0.18	0.06	0.00	0.00	0.82
UCLUDEI	4*	-	-	-	-	-	-	-	-	-	-	-
	5	0.01	0.00	0.00	0.00	0.00	0.53	0.13	0.00	0.00	0.00	0.67
	6*	0.05	0.00	0.01	0.00	0.00	0.33	0.28	0.01	0.00	0.00	0.67
Total		4.11	1.93	1.26	3.85	0.19	54.89	32.36	1.38	0.02	0.00	



Bat activity varied between sample locations, with activity peaking at different locations through the season. This distribution of activity was applicable to the majority of the taxon.

In order to account for the variation in the number of monitoring nights completed per month, and the varying length of time between sunset and sunrise between surveys, a bat activity index (BAI) was calculated (Table 4.8). The BAI represents the mean number of bat passes per hour for each taxon during each month.

Table 4.8: BAI per Taxon and Monitoring Dates

Survey Month	Monitoring Location	<i>Myotis</i> sp.	<i>Nyctalus</i> sp.	Leisler	Noctule	Nathusius pipistrelle	Common pipistrelle	Soprano pipistrelle	<i>Pipistrellus</i> sp.	Brown long-eared bat	Serotine	Total
April	1	0.24	2.05	0.69	0.16	0.10	3.14	0.66	0.13	0.00	0.00	7.17
	2	0.36	0.13	0.20	0.20	0.10	48.65	2.84	3.84	0.00	0.00	56.32
	3	0.44	0.46	0.10	0.61	0.25	35.29	38.12	2.23	0.00	0.00	77.5
	4	0.21	0.21	0.00	0.16	0.21	0.26	0.86	0.00	0.10	0.00	2.01
	5	0.62	0.24	0.00	0.10	0.10	17.14	3.31	0.00	0.00	0.00	21.51
	6	0.34	0.21	0.10	0.34	0.00	2.25	1.06	0.00	0.00	0.00	4.3
Мау	1	0.24	0.62	0.12	0.44	0.12	9.31	2.81	0.32	0.17	0.00	14.15
	2	0.46	0.27	0.19	0.26	0.15	4.61	1.10	0.41	0.13	0.00	7.58
	3	1.50	0.41	0.12	0.67	0.67	49.44	24.00	3.55	0.00	0.00	80.36



Survey Month	Monitoring Location	<i>Myotis</i> sp.	<i>Nyctalus</i> sp.	Leisler	Noctule	Nathusius pipistrelle	Common pipistrelle	Soprano pipistrelle	<i>Pipistrellus</i> sp.	Brown long-eared bat	Serotine	Total
	4	0.23	0.00	0.15	0.25	0.00	1.73	2.60	0.00	0.00	0.00	4.96
	5	1.89	0.23	0.00	0.51	0.00	115.34	41.38	0.00	0.23	0.00	159.58
	6	0.25	0.15	0.11	0.48	2.39	39.90	9.53	0.00	0.00	0.11	52.92
June	1	0.32	0.73	0.13	0.26	0.19	15.22	2.79	0.48	0.00	0.00	20.12
	2	0.30	0.35	0.22	0.74	0.13	10.86	0.69	0.96	0.00	0.00	14.25
	3	1.97	1.15	0.13	0.88	0.13	18.46	8.15	2.63	0.00	0.00	33.5
	4	0.37	0.17	0.00	0.46	0.00	1.17	1.09	0.00	0.00	0.00	3.26
	5	0.82	5.24	5.13	11.11	0.35	15.91	12.23	0.00	0.27	0.00	51.06
	6	0.27	0.00	0.00	0.00	0.26	116.22	107.28	0.00	0.00	0.00	224.03
July	1	0.65	0.88	0.16	0.58	0.14	8.87	2.25	0.34	0.12	0.00	13.99
	2	3.83	1.33	0.94	2.55	0.44	20.33	12.31	0.56	0.00	0.00	42.29
	3	1.36	1.32	0.91	2.49	0.00	16.39	8.52	0.00	0.18	0.00	31.17
	4	0.29	0.13	0.00	0.16	0.00	1.51	1.73	0.00	0.26	0.00	4.08



Survey Month	Monitoring Location	<i>Myotis</i> sp.	<i>Nyctalus</i> sp.	Leisler	Noctule	Nathusius pipistrelle	Common pipistrelle	Soprano pipistrelle	Pipistrellus sp.	Brown long-eared bat	Serotine	Total
	5	0.36	2.28	2.55	8.43	0.46	27.49	11.51	0.00	0.13	0.00	53.21
	6	0.72	0.00	0.00	0.00	0.26	116.22	107.28	0.00	0.00	0.00	224.48
August	1	0.66	1.14	0.23	0.50	0.00	7.5	1.77	0.23	0.00	0.00	12.03
	2	4.76	0.90	2.55	1.15	0.72	36.53	37.31	0.17	0.00	0.00	84.09
	3	11.52	2.01	2.41	0.46	0.39	86.66	91.89	0.00	0.55	0.00	195.89
	4	0.48	0.16	0.21	1.29	0.00	6.10	3.29	0.00	0.00	0.00	11.53
	5	3.49	2.69	1.11	9.14	0.00	34.36	28.58	0.00	0.10	0.00	79.47
	6	1.81	0.00	0.14	1.04	0.00	22.03	11.92	0.63	0.00	0.00	37.56
September	1	1.81	0.11	0.00	0.14	0.10	1.08	0.90	0.08	0.08	0.00	4.3
	2	0.17	0.12	0.08	0.12	0.00	1.40	1.70	0.00	0.00	0.00	3.59
	3	1.23	0.00	0.00	0.25	0.12	15.02	12.90	2.08	0.00	0.00	31.6
	4	0.26	0.12	0.14	0.22	0.00	4.31	1.61	0.00	0.00	0.00	6.66
	5	1.69	1.22	0.86	2.15	0.19	34.15	23.17	0.00	0.00	0.00	63.43



Survey Month	Monitoring Location	<i>Myotis</i> sp.	<i>Nyctalus</i> sp.	Leisler	Noctule	Nathusius pipistrelle	Common pipistrelle	Soprano pipistrelle	<i>Pipistrellus</i> sp.	Brown long-eared bat	Serotine	Total
	6	0.76	0.00	0.11	0.15	0.00	4.09	1.64	0.15	0.00	0.00	6.92
October	1	0.16	0.79	0.00	0.18	0.13	1.04	0.33	0.08	0.00	0.00	2.71
	2	0.11	0.12	0.00	0.16	0.00	0.12	0.34	0.00	0.00	0.00	0.85
	3	0.78	0.00	0.00	0.00	0.16	12.00	2.73	1.12	0.00	0.00	16.79
	4*	-	-	-	-	-	-	-	-	-	-	0
	5	0.10	0.07	0.00	0.19	0.00	7.73	1.84	0.00	0.00	0.00	9.93
	6	0.86	0.00	0.13	0.00	0.00	5.73	4.97	0.15	0.00	0.00	11.84

4.3.4 Swarming Assessment

The review of data showed that for static monitoring between August and October there was only one incidence of peak activity between 3-4 hours from sunset (shown in Table 4.9) at Static Location 2 (shown on Figure 5 in Appendix B). A further review of the data showed higher than average activity throughout the night at static location 2 in August, therefore this peak in activity is considered related to feeding activity due to suitable weather conditions. Furthermore, there are no suitable caves, barns or underground areas known to be present within the surrounding area.

Location	Month	Sunset Time*	Peak Period of Calls	Time After Sunset
1	September	19:09	19:00-21:00	Within the hour.
1	October	18:17	19:00-21:00	Within the hour.
2	August	20:23	00:00-01:00	4 hours
2	September	19:09	19:00	Within the hour.
2	October	18:17	19:00	Within the hour.
3	August	20:23	21:00-22:00	Within the hour.
3	September	19:09	03:00-04:00	8 hours (pre- dawn)
3	October	18:17	19:00-20:00	Within the hour.
4	August	20:23	20:00-21:00	Within the hour.
4	September	19:09	20:00-21:00	Within the hour.
5	August	20:23	20:00-21:00	Within the hour.
5	September	19:09	20:00-21:00	Within the hour.
5	October	18:17	19:00-20:00	Within the hour.
6	August	20:23	21:00 and 00:00	Within the hour.
6	September	19:09	20:00-23:00	Within the hour.
6	October	18:17	18:00-20:00	Within the hour.

Table 4.9: Times of Peak Activity during Static Monitoring

4.3.5 Summary

High activity levels have been recorded during these surveys, with a peak of 116 common pipistrelle bats per hour at location 6 in July. In addition, a wide range of bat species have been recorded, indicating the site has favourable habitat for these taxa.

4.4 Great Crested Newt

4.4.1 Habitat Suitability Index (HSI) Assessment

A total of 43 waterbodies were identified within the Site and a 500 m buffer.

Only three waterbodies were accessible at the time of survey (P14 to P16). The remaining waterbodies were located on private land, where no access was permitted at the time of survey.

Table 4.10 summaries the results of the HSI surveys; full HSI scores are provided in Appendix E.

Table 4.10: Level of Suitability for each Waterbody



Waterbody	HSI Score	Suitability
P14	0.88	Excellent
P15	0.86	Excellent
P16	0.58	Below Average

A variety of grassland, scrub and woodland habitats across the Site offer suitable foraging, sheltering and commuting opportunities for GCN, and other amphibians. Woodland boundaries were damp in places, with numerous log and brash piles providing hibernacula.

Furthermore, woodland at the boundary provide further opportunities and connectivity to the wider landscape.

Three GCN recorded were returned by the desk study for locations within 2 km of the Site, the nearest being approximately 0.4 km east in 2014. A further 17 records of other amphibians, including common toad, common frog and smooth newt, were also returned by the desk study.

4.4.2 eDNA Survey

When off-site access became available, further HIS was completed and a total of 18 waterbodies were subject to eDNA testing. The results of the eDNA analysis indicate that eDNA for GCN was absent in all waterbodies. Waterbodies are shown in Figure 1, and summarised results of the analysis can be seen in Table 4.11.

Waterbody	Lab Sample Number	Detection of GCN
P1	2312	Negative
P2	2298	Negative
P3	2300	Negative
РЗа	2296	Negative
P4	2297	Negative
P5	2302	Negative
P6	2306	Negative
P7	2299	Negative
P8	2310	Negative
P9	2303	Negative
P10	2311	Negative
P11	2301	Negative
P12	2315	Negative
P13	2307	Negative
P14	2309	Negative
P15	2308	Negative
P16	2305	Negative
P17	2304	Negative

Table 4.11: Results of eDNA Analysis

The results confirm the absence of GCN all waterbodies.



4.5 Reptiles

The mixture of grassland, hedgerows, woodland, scrub and waterbodies provide suitable habitat for foraging, basking and sheltering reptiles. A number of log and brash piles (TN 2, 4, 6 and 8) were also recorded, providing further sheltering opportunities as well as hibernacula. Furthermore, several south-facing embankments (TN 3) were recorded to have potential to support basking reptiles.

The desk study returned 25 records for grass snake within 2 km of the Site boundary, four of which were from within the Site boundary in 2011, 2013 and 2014.

4.5.1 Reptile Surveys

A low population of grass snake (peak of two individuals) was recorded. The grass snakes were recorded within areas of grassland and scrub, and at the woodland boundaries. The majority of the grass snakes were recorded at the northern boundary, within grassland and scrub, adjacent to standing water. Locations of the records are shown on Figure 8, Appendix B.

The weather conditions were considered suitable to record reptile presence for the majority of the surveys, with inspections completed at different times of day during the active season for reptiles and a range of suitable weather conditions (Table 4.12).

Visit	Time and Date	Weather	Species	Grid Reference
1	14.05.2021 Start: 09:00	Start: 9°C End: 10 °C	1 x juvenile grass snake	SK7009085394
	Finish: 11:30	Slight overcast, dry, still.	3 x juvenile grass snake	SK7012185402
			1 x juvenile grass snake	SK6981785253
			1 x adult grass snake (male)	SK6978385235
			1 x juvenile grass snake	SK6971185197
2	20.05.2021 Start: 08:30	Start: 11 °C End: 12 °C	3 x juvenile grass snake	SK6984185266
	Finish: 11:00	Slight overcast, dry, still.	1 x adult grass snake (male)	SK6971185197
3	28.05.2021 Start: 18:30	Start: 17 °C End: 17 °C	1 x juvenile grass snake	SK6936284662
	Finish: 20:30	Still, clear, dry.	1 x adult grass snake (female)	SK6975785217
			1 x juvenile grass snake	SK6978385235
			1 x juvenile grass snake	SK6997385330
			1 x juvenile grass snake	SK7015885394
4	14.06.2021 Start: 18:30	Start: 17 ℃ End: 16 ℃	1 x juvenile grass snake	SK7003185362
	Finish: 20:30	Overcast, dry, slight breeze.	2 x juvenile grass snake	SK7015885394
			1 x juvenile grass snake	SK6937384486
			1 x juvenile grass snake	SK6902384640
			1 x juvenile grass snake	SK6889384063
5	24.06.2021 Start: 07:45	Start: 15 ℃ End: 15 ℃	2 x adult grass snake (female)	SK69817 85253
	Finish 10:40	Still, clear, dry.	2 x grass snake (1 adult, male, 1 juvenile)	SK 69841 85266
			1 x juvenile grass snake	SK70121 85402
			1 x adult grass snake (female)	SK 70090 85394
			1 x juvenile grass snake	SK69783 85235

Table 4.12: Reptile Survey Dates, Results and Weather Conditions



6	30.06.2021 Start: 08:00	Start: 12 ℃ End: 14 ℃	1 x adult grass snake (female)	SK 70031 85362
	Finish 11:00	Still, clear, dry.	2 x grass snake (1 adult, male, 1 juvenile)	SK 70064 85382
			1 x adult grass snake (male)	SK 70090 85394
			1 x adult grass snake (male)	SK 70158 85394
			Shed grass snake skin	SK 68972 84333
			1 x juvenile grass snake	SK 69250 84224
7	12.07.2021 Start: 08:00	Start: 16 ℃ End: 16 ℃	1 x adult grass snake (female)	SK 70064 85382
	Finish: 12:00	Overcast, dry, still.	1 x juvenile grass snake	SK 70121 85402
			2 x juvenile grass snake	SK 70158 85394
			1 x adult grass snake (male)	SK 68892 84004
			Shed grass snake skin	SK 68972 84333

4.6 Water Vole

Four waterbodies (D2 to D4 and P14) were identified during the Extended Phase 1 Habitat Survey with potential to provide suitable habitat for water voles. Locations are shown on Figure 7, Appendix B. The banksides were level and therefore provided few opportunities for burrow creation; however, channel vegetation was present for shelter and foraging. Furthermore, there are several suitable waterbodies within close proximity to the Site, where the site is well connected within the landscape.

The desk study returned 24 records of water vole within 2 km of the Site, the most recent is approximately 0.6 km east in 2012

4.6.1 Water Vole Surveys

Waterbodies D2 to D4 and P14 had negligible to low suitability for water vole. The results of the water vole survey are summarised in Table 4.13 overleaf. No evidence of water vole was recorded.

Transect ID	Transect length	Evidence of water vole	Evidence of rat	Evidence of mink or other predators	Water vole habitat Suitability	Description of habitat
Ditch 2	742m	None recorded	None recorded	None recorded	Low	Very little standing water with no aquatic vegetation present and heavy shading. Where water is present there is discolouration (potentially from agricultural runoff). During the August visit very dense duckweed was present in addition to a greater volume of standing water.
Ditch 3	270m	None recorded	None recorded	None recorded	Low	Shallow (maximum depth circa 30 cm) with very dense reed grass. Occasional yellow flag iris and water mint were present, and stony substrate found in some areas. Shaded by reed grasses and scattered willow trees. Does not connect to nearby waterbodies. No bankside suitable for burrow creation. Dense scrub (bramble, nettles and bindweed) on bankside.
Ditch 4	498m	None recorded	None recorded	None recorded	Negligible – very dry	No standing water appears to have been dry for an extended period of time. Himalayan balsam present throughout the dry ditch. Additional ground flora included: bramble, dog rose, common nettles, cleavers and scattered semi-mature willow and ash trees.
P14	270 m	None recorded	None recorded	None recorded	Low	Shallow (maximum depth c. 30 cm) with very dense reed grass. Occasional yellow flag iris and water mint. Stony substrate in areas. Shaded by reed grasses and scattered willow trees. Does not connect to nearby waterbodies. No banksides suitable for burrow creation. Dense scrub (bramble, nettles and bindweed) on banksides.

Table 4.13: Water Vole Survey Results

4.7 Otter

Boundary habitats, such as woodland and scrub, were considered to provide foraging and sheltering habitat for otter. The majority of the Site was considered to provide limited foraging and sheltering habitat for otter, being dominated by open improved grassland, which are exposed to the elements. However, boundary habitats, such as woodland and



scrub and numerous waterbodies offsite, such as the River Idle to the south of the Site, were considered suitable for otters.

The desk study returned two records of otter, the closest being 0.7 km south in 2014.

4.7.1 Otter Surveys

Waterbodies D2 to D4 and P14 were surveyed for otter, during the water vole survey. No evidence of otter was recorded.

There was no evidence of otter recorded on the camera traps placed across the Site for badger. There were no incidental records of otter or evidence of presence found during other surveys at the Site.

4.8 Other Protected/Notable Species

New growth of Himalayan Balsam (*Impatiens glandulifera*) was recorded within the Western section of the woodland block to the south of site on the 7th March 2022.

Several clusters of pyramidal orchids (*Anacamptis pyramidalis*) and bee orchids (*Ophrys apifera*) were recorded onsite. Locations are shown on Figure 3, Appendix B, TN 23 to TN 28.

Beaver (*Castor fiber*) have been released in the Idle Valley Nature Reserve, approximately 900 m north east of the most easterly boundary of the Site. They are enclosed currently and have no connectivity to the Site.

4.8.1 Invertebrate Habitat Potential Assessment

4.8.1.1 Desk Study

A total of four records of Nationally Scarce B¹⁸ and notable¹⁹ invertebrate species, within 2.5 km of the Site boundary, were returned by DaMES data search. One record was within the Site boundary in 2019, confirming the presence of suitable invertebrate habitats.

4.8.1.2 Survey

A total of 10 parcels were selected during the desk study, these were approximately 20 m² and a variety of plantation woodland, scrub and ruderal habitats. The results of each parcels assessment, including a habitat description are shown in Table 4.12 overleaf. Photos of each parcel are shown in Appendix F. Three parcels require further surveys at the appropriate time of year, with the remainder of the Site providing below moderate potential for invertebrates.

4.8.2 Polecat

Despite the presence of rabbits (the preferred prey of polecats) throughout the Site, no signs of predation were recorded, however multiple rabbit burrows (the resting site for polecat) were recorded. Site boundaries are composed of woodland and scrub which are conducive to polecat movement. Suitable linear corridors, such as woodland edge and field boundaries, in the vicinity of the Site are prevalent. A single polecat record 2.95 km southwest was returned from the data centre. Furthermore, a hybrid polecat was recorded during bird surveys within the Site. Therefore, polecat presence on Site is considered likely.



Table 4.12: IHP Results

Deveel	Parcel Central Crid			Letter Grades									Further	
number	Reference	Parcel description	HE1	HE2	HE3	HE4	HE5	HE6	HE7	HE8	HE9	HE10	HE11	Action
1	SK 70119 85412	Woodland strip adjacent lake, some deadwood and stone piles (and a lot of litter). Seasonally inundated ditch, banks provide low levels of still air.	D	E	D	D	с	E	D	E	с	D	E	No
2	SK 70320 84955	Immature plantation woodland with scrub boundary. No dead wood (standing or on ground). Limited understory, leaf litter covers floor. Small pockets of standing air created by tree stands.	Е	Е	D	E	E	E	D	E	D	D	E	No
3	SK 69739 85020	Mound (orchids previously identified) gorse also have pollen opportunities, high levels of dead wood including large brash pile and scattered cut trunks, in clearing between plantation woodland. Low levels of connectivity through adjacent woodland.	В	E	С	E	E	D	с	E	D	D	E	Yes
4	SK 68931 84159	Large pile of wood surrounded by scrub and tall ruderals, this graduates to plantation woodland. Several small wood piles and one larger. Some small clearings likely to get sun. Likely to be ample nectar resource in summer months.	В	E	С	E	E	E	D	E	С	D	E	Yes
5	SK 68990 84547	Dense gorse adjacent improved field. Grassy clearings in scrub, grasses into woodland toward lake offsite. Likely high pollen resource in summer from ruderals and gorse.	D	E	с	E	E	D	D	E	с	с	E	No
6	SK 69911 84632	Deciduous woodland (willow dominated), leaf litter. Some pollen availability (orchids previously noted). Connected to similar habits and fenced so eco tone absent.	С	E	с	E	E	E	D	E	D	D	E	No



Davial			Letter Grades									Funther		
number	Reference	Parcel description		HE2	HE3	HE4	HE5	HE6	HE7	HE8	HE9	HE10	HE11	Action
		understory with brash and grass cuttings and small stacks of decaying wood.												
7	SK 68916 84023	Area of dense scrub at base of embankment. Good connectivity to woodland and scrub adjacent. Large woodpile surrounded by scrub and ruderal vegetation within dip, sheltering the area and making section of still air. Woodpiles likely created due to woodland management.	В	E	с	E	E	D	с	E	с	D	E	Yes
8	SK 68567 83533	Area of plantation coniferous woodland. Limited pollen resource, lot of dead wood on floor (otherwise understory limited). Still air created by shelter from bank and trees. Good connectivity to woodland and scrub (but not on Breedon site side).	с	E	D	E	E	E	с	E	D	D	E	No
9	SK 69659 85079	Plantation (young) woodland upon top of embankment. Areas of scrub, grassland and ruderals for pollen. Piles of brash and old hay bales, open grassland sections and unshaded areas of bare ground. Trees may provide wind break.	С	E	С	E	E	С	D	E	D	D	с	No
10	SK 69549 84801	Clearing in woodland with scattered scrub over SI grassland. Embankment creates still air. Bare ground around rabbit warrens.	E	E	D	E	E	D	D	E	D	с	D	No



5 SCOPED OUT SPECIES

5.1.1 Hazel Dormouse

The Site lies within the geographical range of hazel dormouse and the habitat is apparently suitable; however, no records were returned by the desk study provided and the species is known to be absent from the area. Hazel dormouse went extinct from 17 English counties since the end of the 19th century, including Nottinghamshire, a recent records reveal existing populations have probably fallen by a third since 2000. This is due to a loss of woodland and hedgerow habitat, as well as changes to traditional countryside management. However, four reintroductions have taken place in Nottinghamshire in 2013, 2014, 2015 and 2019, releasing over 100 dormice into three different woodlands within a 5-mile radius of each other; Treswell Wood, Eaton Wood and Gamston Wood. The nearest woodland is approximately 6.3 km south east of the Site and close monitoring confirm that they have not yet dispersed sufficiently far from the release sites.

On this basis, hazel dormice are not at risk at being impacted by the Proposed Development and therefore are not considered further.

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APPENDIX A – PLANNING POLICY AND LEGISLATION

The Wildlife & Countryside Act 1981

The Wildlife and Countryside Act 1981²¹, as amended by the Countryside and Rights of Way Act (CRoW) 2000²² and the Natural Environment and Rural Communities Act (NERC) 2006²³, consolidates and amends existing national legislation to implement the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) and Council Directive 79/409/EEC on the Conservation of Wild Birds (Birds Directive)²⁴, making it an offence to:

- Intentionally kill, injure or take any wild bird or their eggs or nests (with certain exceptions) and disturb any bird species listed under Schedule 1 to the Act, or its dependent young while it is nesting;
- Intentionally kill, injure or take any wild animal listed under Schedule 5 to the Act; intentionally or recklessly damage, destroy or obstruct any place used for shelter or protection by any wild animal listed under Schedule 5 to the Act; intentionally or recklessly disturb certain Schedule 5 animal species while they occupy a place used for shelter or protection; and
- Pick or uproot any wild plant listed under Schedule 8 of the Act. Schedule 9, Part II of the Act also lists many species for which it is an offence to plant, or otherwise cause to grow, in the wild. Any material containing Japanese knotweed is also identified as controlled waste under the Environment Protection Act 1990 and must be disposed of properly at licenced landfill according to the Environmental Protection Act (Duty of Care) Regulations 1991.

Habitat Regulations 2017

The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019²⁵ (the 'Habitat Regulations') are the principal means by which Council Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Flora and Fauna (the 'Habitats Directive') is transposed into law in England and Wales. The objective of the Habitats Directive is to protect biodiversity through the conservation of natural habitats and species of wild fauna and flora. The Directive lays down rules for the protection, management and exploitation of such habitats and species and makes it an offence to deliberately capture, kill or disturb wild animals protected under the Habitat Regulations. It is also an offence to damage or destroy a breeding site or resting place of such an animal (even if the animal is not present at the time).

Natural Environment & Rural Communities (NERC) Act 2006

The NERC Act 2006²³ places a duty on local planning authorities to have due regard for biodiversity and nature conservation during the course of their operations, and thus ensures that biodiversity is a key consideration in the planning process.

http://www.legislation.gov.uk/ukpga/2000/37/contents [Accessed June 2022]

²¹ Legislation.gov.uk *Wildlife and Countryside Act 1981 (as amended)* [online] Available at: http://www.legislation.gov.uk/ukpga/1981/69 [Accessed June 2022]

²² Legislation.gov.uk *The Countryside and Rights of Way Act 2000* [online] Available at:

²³ Legislation.gov.uk *Natural Environment and Rural Communities Act 2006* [online] Available at:

https://www.legislation.gov.uk/ukpga/2006/16/contents [Accessed June 2022]

²⁴ EUR Lex: Access to European Law *Birds Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds* [online] Available at: <u>https://eur-lex.europa.eu/legal-</u> <u>content/EN/TXT/?uri=CELEX:32009L0147</u> [Accessed June 2022

²⁵ Legislation.gov.uk *The Conservation of Habitats and Species Regulations 2017*

[[]online] Available at: https://www.legislation.gov.uk/uksi/2017/1012/contents/made [Accessed June 2022]



National Planning Policy Framework 2021

The National Planning Policy Framework (NPPF) 2021²⁶ sets out the Government's requirement for the planning system in England and in doing so establishes framework within which local planning authorities can develop their own planning policies. The NPPF explicitly addresses the conservation and enhancement of the natural environment, including biodiversity, through paragraphs 174–177.

²⁶ Gov.UK National Policy Planning Framework 2021 [Online] Available from: <u>https://www.gov.uk/government/publications/national-planning-policy-framework—2</u> [Accessed June 2022]



APPENDIX B – FIGURES

Table B1: Target Notes for Figure 3

Target Note	Description
1	Brown hare seen
2	Several log piles
3	South facing embankment area may provide suitable reptile basking habitat
4	Large brash pile
5	Built compounds and grass airstrip for light aircraft (Model Flying Club)
6	Brash piles
7	Barn owl box facing east
8	Large wood pile
9	Storage unit and pipes
10	Soil and manure piles
11	Soil and manure piles
12	Small mammal burrow
13	Brash and log piles
14	Rabbit burrow
15	Several rabbit burrows
16	Rabbit burrows
17	Rabbit burrows
18	Rabbit burrows
19	Rabbit burrows
20	Reptile refugia
21	Rabbit burrows
22	Rabbit burrows
23	Pyramidal orchids 8x
24	Bee orchids 3x
25	Bee orchids 2x
26	Bee orchids 2x
27	Bee orchids 3x
28	Bee orchids 5x



Y:\GIS\Ecology\Projects\4092 Lound Ash Extraction\4092 Lound Ash Extraction.aprx\4092-REP-027 Fig 1 Survey Areas





Y:\GIS\Ecology\Projects\4092 Lound Ash Extraction\4092 Lound Ash Extraction.aprx\4092-REP-025 Fig 2b Statutory Designated Sites



Y:\GIS\Ecology\Projects\4092 Lound Ash Extraction\4092 Lound Ash Extraction.aprx\4092-REP-023 Fig 3 Phase 1 Habitat Survey











Y:\GIS\Ecology\Projects\4092 Lound Ash Extraction\4092 Lound Ash Extraction.aprx\4092-REP-022 Fig 8 Reptile Survey Results



APPENDIX C – PLANT SPECIES LIST

Table C1: Plant Species Recorded During Extended Phase 1 Habitat Survey

Common name	Scientific name
Alder	Alnus glutinosa
Ash	Fraxinus excelsior
Aspen	Populus tremuloides
Bramble	Rubus saxatilis
Blackthorn	Prunus spinosa
Bulrush	Typha latifolia
Cock's-foot	Dactylis glomerata
Common hogweed	Heracleum sphondylium
Common nettle	Urtica dioica
Conifer	Pinophyta sp.
Cleavers	Galium aparine
Cows parsley	Anthriscus sylvestris
Creeping Jenny	Lysimachia nummularia
Creeping thistle	Cirsium arvense
Dandelion	<i>Taraxacum</i> agg.l
Dog's rose	Rosa canina
Dove's-foot cranesbill	Geranium molle
Gorse	<i>Ulex</i> sp.
Ground ivy	Glechoma hederacea
Hard rush	Juncus inflexus
Hawthorn	Crataegus monogyna
Hazel	Corylus avellana
Ivy	Hedera helix
Mouse-ear chickweed	Cerastium fontanum
Moss sp.	Bryophyta
Oak	Quercus robur
Perennial rye-grass	Lolium perenne
Primrose	Primula vulgaris
Rose	<i>Rosa</i> sp.
Ribwort plantain	Plantago lanceolata
Scotch broom	Cytisus scoparius
Soft rush	Juncus effusus
Spear thistle	Cirsium vulgare
Speedwell sp.	Veronica
Sliver birch	Betula pendula
Tansy ragwort	Jacobaea vulgaris



Teasel	Dipsacus fullonum
Tufted hair-grass	Deschampsia cespitosa
Vetch sp.	Vicia sp.
White clover	Trifolium repens
Willow	<i>Salix</i> sp.
Whitebeam	Sorbus subg. Aria
Yarrow	Achillea millefolium
Yorkshire fog	Holcus lanatus



APPENDIX D – PHOTOGRAPHS



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APPENDIX E – HABITAT SUITABILITY INDEX (HSI) ASSESSMENT SCORES

Table E1: HSI Scores for GCN Suitability

	HSI scores		
HSI Description	P15	P16	P14
1. Geographic location	1	1	1
2. Pond area	0.80	0.0	0.80
3. Pond permanence	0.90	0.90	1.00
4. Water quality	0.67	0.67	0.67
5. Shade	1.00	1.00	0.80
6. Water fowl effect	0.67	0.01	1.00
7. Fish presence	0.67	0.67	1.00
8. Pond Density	1.00	1.00	1.00
9. Terrestrial habitat	1.00	1.00	0.67
10. Macrophyte	0.00	0.00	0.00
HSI Score	0.86	0.58	0.88
Pond suitability	Excellent	Below Average	Excellent



APPENDIX F – INVERTEBRATE HABITAT POTENTIAL ASSESSMENT PHOTOGRAPHS



Photograph 1: Parcel 1



Photograph 3: Parcel 3





Photograph 4: Parcel 4

Technical Appendix 8.1: Ecology Survey Report Retford Circular Economy Project





Photograph 7: Parcel 7

Photograph 6: Parcel 6

Photograph 8: Parcel 8



Technical Appendix 8.1: Ecology Survey Report Retford Circular Economy Project



Photograph 9: Parcel 9



Photograph 10: Parcel 10