From: [redacted]
To: A47 NorthTuddenham to Easton
Subject: A47NTtE - Barbastelle Bats
Date: 15 October 2021 10:50:33
Attachments: Item 8 supporting document_ Bat Report Complaint Letter & Letter to NCC re NWl Barbastelle research 26.02.21_Redacted (1).pdf
NWL Interim Bat Report 2020 (1).pdf

Dear Mr Hunter,
I am unimpressed with the negative replies given by the Applicant to my comments on EXQ1.
I will be submitting a rebuttal to the design issues but this email is limited to the issue with barbastelle bats.
The Applicant's response simply states that this is all covered in the earlier replies to the RRs, despite my comments pointing out that these did not reflect other documents which are publically available.
Naively, I had assumed the principle of a planning inquiry was to get all relevant information in front of an inspector to allow an informed decision.
I am therefore attaching relevant documentation which is available on Norfolk County Council's website relating to this protected species for the proposed Norwich Western Link (NWL) road scheme.
The first document is a collection of open letters, including one from Dr Packman, which accompanied the Agenda for the 7 June 2021 Council Cabinet meeting and the second is a further bat report by WSP carrying out surveys for the Council which was published in June 2021.
The A47NTtE proposals are within the zone of influence for this protected species of mammal and the Applicant should take this into consideration. The documents are attached so that these are also available for you to consider.
It is not known whether these were given to the Applicant by the County Council and whether they have been considered by the Applicant or not.
The responses from the Applicant to date on these questions raised in several of the representations is limited to repeating the denial manta of the Council that they are awaiting details so cannot comment.
It maybe that the additional information does not have environmental implications for this scheme but it must raise questions of whether the NWL will be granted planning permission after due consideration of Section 40 of the Natural Environment and Rural Affairs act 2006 .
If this is the case, my original representation that the A47NTtE scheme should not be based on traffic calculations and designs assuming the NWL as a certainty, is reinforced but has never been answered by the Applicant.
The two road schemes are contemporaneous in time scales and any design changes necessary to A47NTtE if the NWL does proceed can be approved under that scheme and accommodated in the construction phase of A47NTtE with any cost differential borne by the NWL budget.
Kind regards,
Bryan Robinson (ID 20028154)

Mr Tom McCabe, (By EMAIL)

[redacted]

May 21st, 2021

Dear Mr McCabe,

Evidence of Barbastelle Bat Super-Colony - Open Letter

We wish to register a formal complaint about the Council's decision to publicly dismiss without good cause or justification the independent ecological evidence recently submitted by, and in the name of, a number of leading ecologists and scientists.

This is an open letter. For their interest, we are specifically copying this letter to several environmental and transport organisations who are working to protect wildlife and nature and secure a safe future climate, via progressive and transformational transport policies (see list at end). We take the Climate and Ecological Emergency seriously, and note NCC claims to do so too, in the Environment Policy.

The Council must be honest, open and transparent about the recent discovery of a super-colony of a European Protected Species, and on its status and the most up-to-date and robust evidence on it.

The requirement for full disclosure of all ecological evidence has now become urgent as a date has now been set for Cabinet and full Council to decide and debate the business case to the Department of Transport, and the contractor procurement.

Trustworthy and legitimate decisions cannot be taken on June 7th, without all councillors being fully briefed and aware of all the ecological evidence (not just evidence it has commissioned). This must happen before councillors receive agenda papers for these meetings[1].

In support of this complaint we wish to refer to the Barbastelle Bat Research Findings report dated 26th, February 2021[2], and also the Report of Dr Mark Hassall dated 19th, February 2021.

Report of 26th, February 2021

The primary findings of this report can be summarised as follows:

[1] s.100D(5) of the Local Government Act 1972 and with reference to the judgment in R (Joicey) v. Northumberland CC [2014] EWHC 3657 (Admin) and Hale Bank Parish Council v Halton Borough Council. Case Number: CO/1023/2019

[2] As signed by Dr Charlotte Packman (Director, Wild Wings Ecology & Associate, University of East Anglia), Dr Iain Barr (Senior Lecturer in Ecology, University of East Anglia), Dr Stuart Newson (lead on Norfolk Bat Survey, British Trust for Ornithology & member of Natural England's Bat Expert Panel) Richard Moores (Norfolk Mammal Recorder) Jane Harris (Research Project Officer, Norfolk Barbastelle Study Group) Ash Murray (Chair, Norfolk Barbastelle Study Group) John Hiskett (People & Wildlife Manager, Norfolk Wildlife Trust) Holly Nichols (Assistant Ecologist, Wild Wings Ecology) Georgina Lester (MSc research student, University of East Anglia), Mick Finnemore (Bat Ecologist) and Nick Pinder (Bat Ecologist). Available at: http://bit.ly/2021Feb_BatResearch

1. The proposed route of the Norwich Western Link (NWL), and the construction channels, pass through the UK's only known Super-Colony of a very rare and highly protected bat species, the barbastelle (>60 roosts).

2. Part of this Super-Colony is located within the main block of woodland to be directly impacted by the road, (home to a maternity colony), if built.

3. The presence of these bats elevates the conservation value of the land through which the road is to pass to a pSAC and also satisfies the criteria for designation as a Site of Special Scientific Interest.

4. Proposed mitigation is very unlikely to prevent habitat fragmentation, habitat degradation, loss of foraging habitat, severance of bat commuting corridors, bat fatalities due to collision with motor vehicles and disturbance from noise and light[3]. This view is supported by a Position Statement issued by the Bat Conservation Trust on 4th, March, 2021[4]

Report of 19th, February 2021

This report is presented by a senior and well-respected animal ecologist with over 45 years of experience and is based on an analysis of your contractor's report on findings made during bat surveys. Dr Hassall's findings can be summarised as follows:

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[3] Dr Hassall is also of the opinion that there exists no evidence demonstrating the proposed mitigation will work. He states: ***'...that the "Achilles heel" in the NCC case is their claim that damaging impacts to the barbastelle bat colony caused by the proposed development could be avoided by using mitigating measures such as gantries, green bridges and underpasses. As far as I am aware there is no published evidence to support this claim. On the contrary the completely unique biology of barbastelles make it highly unlikely that such measures would be successful for this species, however successful they may be for other species such as pipistrelle, brown long eared or Daubentons bats'***

[4] https://www.bats.org.uk/our-work/biodiversity-policy-advocacy/position-statements-1/bcts-position-statement-on-the-proposed-norwich-distributor-road-western-link

1. The Council's own contractor's evidence supports a high level of barbastelle bat presence and activity on or close to the proposed route of the road.

2. These findings by the contractor do not support NCC's position that the construction and the operation of the road if built will have no deleterious impact on the UK's largest Super-Colony of barbastelle bats.

3. On the contrary, the road will result in a high risk of detrimental effects on the colony due to the inevitable disturbance and destruction of sheltering sites and foraging habitats.

4. Due to metapopulation dynamics implications the adverse impact of the road on the colony may also impact on the size and longevity of other populations of barbastelle bats located in other parts of Norfolk.

5. The reason mitigation is unlikely to prevent the new development from causing damaging impacts on barbastelle bats is because of the exceptionally high fidelity of barbastelle bats to both their sheltering and feeding sites, not only within seasons but also between years and therefore their corresponding high fidelity to connecting flight paths. Barbastelle bats are therefore extremely unlikely to deviate from these traditional "commuting" routes whatever mitigation measures are provided.

The findings and conclusions of these reports are based on solid scientific findings and input from leading independent ecologists and scientists. They

all point to the indisputable presence and high activity levels of a strictly protected and threatened mammal species in and around the proposed route and construction corridors of the road.

Complaint

The significance and importance of noting the presence and activity of the barbastelle bat when it came to assessing and selecting a route for the road was evident throughout NCC's Option Selection Report dated July 2019.

The relevant extracts are as follows:

5.8.8

Bat surveys primarily focussing on the rare barbastelle bat began in May 2019 and will continue until September 2019. The results of these surveys have been used to help inform this assessment. **The barbastelle bat receives European legal protection and is a significant ecological consideration for the scheme.** Additional habitat and species surveys are currently being undertaken.

5.8.17

Barbastelle could be dependent on the woodland habitat along the route, as a known barbastelle maternity colony is located within 300m of the route near to Morton. Within the Dinosaur Park/Morton area there are multiple known roosts of barbastelle and it is considered that this area is of particular importance to the colony and the area of highest conservation significance to

barbastelle in the study area. Areas where maternity colonies are located are of high conservation significance and can be vulnerable to disturbance. At this very close distance the bats could be particularly vulnerable to lighting and noise impacts from Route A. The severance of woodland and hedgerows may have significant impacts on barbastelle commuting between roosts and foraging habitat.

5.8.24

The route is close to the known maternity roosts around Morton. As indicated above in Route A analysis, due to the multiple known roosts the barbastelle colony uses in the area it is considered that the area is of higher conservation value and importance to barbastelle bats. The barbastelle bats using the Morton area would be vulnerable to disturbance from Route B due to the very close proximity of the route to the known roost sites. In addition possible maternity roosts, of barbastelle bat have been recorded in woodlands the route impacts in the south from the May 2019 bat surveys. One of the woodlands that the route bisects comprises a thin strip running along the south side of The Broadway where one of the possible maternity roosts was recorded. This woodland is connected to another woodland: Foxburrow Plantation, running parallel to The Broadway and linking into Hall Hills woodland. Within Hall Hills another possible maternity roost of barbastelle was located. It has not been confirmed whether these roosts are just gathering roosts or are part of a separate maternity colony within the study area. However the data collected to date does not indicate that The Broadway and Hall Hills woodland area are of the same conservation value as the Morton area. Given the surveys undertaken this May, recorded interchange between

bats using these roosts and bats within the Morton area, it is possible that they form part of the Morton area maternity colony.

5.8.25

The May surveys also highlighted the importance of the woodlands in the northern and southern part of the route to foraging and commuting barbastelle. The habitat removal and disturbance within the woodlands is likely to have significant negative impacts for the barbastelle bat colony.

5.8.31

The route is close to the known maternity roost around Morton. As indicated above in Route A analysis, due to the multiple known roosts the barbastelle colony uses in the area it is considered that the area is of higher conservation value and importance to barbastelle bats. The barbastelle bats using the Morton area would be vulnerable to disturbance from Route B due to the very close proximity of the route to the known roost sites. In addition, two possible maternity roosts of barbastelle bat have been recorded in woodlands the route impacts in the south from the May 2019 bat surveys. One of the woodlands which the route bisects comprises a thin strip running along the south side of The Broadway where one of the possible maternity roosts was recorded. This woodland is connected to another woodland: Foxburrow Plantation, running parallel to The Broadway and linking into Hall Hills woodland. Within Hall Hills another possible maternity roost of barbastelle was located. It has not been confirmed whether these roosts are just possible maternity roosts or are part

of a separate maternity colony within the study area. However, the data collected to date does not indicate that The Broadway and Hall Hills woodland area are of the same conservation value as the Morton area. Given the surveys undertaken this May, recorded interchange between bats using these roosts and bats within the Morton area, it is possible that they form part of the Morton area maternity colony.

5.8.32

The May surveys also highlighted the importance of the woodlands in the northern and southern part of the route to foraging and commuting barbastelle. The habitat removal and disturbance within the woodlands is likely to have significant negative impacts for the barbastelle bat colony

5.8.38

Two possible maternity roosts of barbastelle bat have been recorded in woodlands, which the route will impact in the south, from the May 2019 bat surveys. One of the woodlands which the route bisects comprises a thin strip running along the south side of The Broadway where one of the roosts was recorded. This woodland is connected to another woodland: Foxburrow Plantation, running parallel to The Broadway and linking into Hall Hills woodland. Within Hall Hills another possible maternity roost of barbastelle was located. It has not been confirmed whether these roosts are just gathering roosts or are part of a separate maternity colony within the study area. However, the data collected to date does not indicate that The Broadway and Hall Hills woodland area are of the same conservation value as the Morton area. Given the surveys undertaken this May recorded interchange between

bats using these roosts and bats within the Morton area it is possible that they form part of the Morton area maternity colony.

5.8.39

The May surveys also highlighted the importance of the woodlands in the southern part of the route to foraging and commuting barbastelle. Without mitigation the habitat removal and disturbance within the woodlands is likely to have significant negative impacts for the barbastelle bat colony.

5.8.55

Given the nature of the landscape in the north-western corner of the study area i.e. lots of fragmented woodland and the proximity of the Morton barbastelle colony roost area containing multiple barbastelle roosts, mitigating for the impact of route options A and both B options will be difficult and potentially very expensive. Multiple bat crossing areas would be required to ensure safe passage of foraging and commuting bats in this area.

5.8.56

Route Option C is located further away from the identified maternity roost area however Route Option C and B (East and West) bisects a woodland known to contain a possible maternity roost of barbastelle bats along The Broadway. The route crosses perpendicular to The Broadway woodland through a strip of woodland less than 40m wide. Mitigation for foraging and commuting bats using The Broadway woodland and Foxburrow Plantation could comprise two green bridges or underpasses. Given the linear nature of these woodlands

mitigation in this area is considered likely to be successful as bats are effectively ‘channelled’ to follow the linear woodlands.

5.8.57

Route Option D also has the potential to impact barbastelle bats however due to land access constraints the bat data along this route is more limited than the other routes. Where access was possible barbastelle bats have been recorded along the route during the May surveys. Route option D causes the highest level of fragmentation of the landscape as it severs multiple woodlands and also passes in between more blocks of woodland compared to all other routes. Therefore, mitigation along this route has the potential to be very expensive as potentially multiple green bridges and/or underpasses would be required to ensure ecological linkages existed once the route was constructed.

5.8.62

The very large adverse impact categorisation for routes A and B West and East are due to these routes impacting the ecological features in the study area (recorded so far) that receive the highest legal and policy protection; namely the River Wensum (SAC and SSSI) and barbastelle bat

5.8.65

Route Option D is likely to have the greatest ecological impact on the most ecological features, as it would affect seven of the 11 key ecological features identified. Route D would be likely to cause the greatest amount of severance and fragmentation of habitats of conservation importance and is therefore

likely to give rise to the most direct and indirect impacts on species of conservation importance using these habitats, in particular barbastelle bat

5.8.66

Route Option B (western variant) also has the potential to affect ecological features of particular importance namely the River Wensum SAC and the barbastelle bat. Route B (western variant) has the potential to give rise to significant effects on the Wensum because of the requirement for a new bridge crossing which is likely to give rise to loss of river habitat. Both variants for Route B are close to the Morton area barbastelle maternity colony and the possible maternity roost recorded along The Broadway. The routes also bisect core barbastelle bat foraging areas and commuting habitat. The habitats in the northern part of route B include multiple small blocks of woodland which would make mitigation options difficult and potentially very expensive as multiple new crossing points would be required.

5.8.68

Route Option A was considered to have least impact across the 11 key ecological features identified (including for the Wensum). The route is largely located within a more arable landscape than the other route options and so fragmentation impacts are considered to be minimal. However, this route has the potential to have a significant impact on the Morton barbastelle colony due to the very close proximity of the roosts to the route. As outlined above this would be difficult to mitigate for and so adverse impacts on bats as a result of this route are considered possible.

The above demonstrates:

1. The barbastelle bat is regarded as a significant ecological consideration.

2. The impact on this species if the NWL was to be constructed is viewed as a significant adverse risk.

3. Areas where maternity colonies are located are of high conservation significance and can be vulnerable to disturbance. At this very close distance the bats could be particularly vulnerable to lighting and noise impacts. The severance of woodland and hedgerows may have significant impacts on barbastelle commuting between roosts and foraging habitat.

4. The habitat removal and disturbance within woodlands is likely to have significant negative impacts for the barbastelle bat colony.

5. **The ecological considerations surrounding the presence and activity of the barbastelle bats relied upon when Route C was chosen are no longer valid, and are now similar, if not greater in weight, than the considerations that led to the discounting of the other routes.**

6. NCC chose their preferred route before the WSP Interim report was published, and indeed changed their brief for the surveys commissioned to WSP , in the summer of 2019, from a comparative study of several of the route options, to just concentrating on the preferred route (WSP Interim Report). Thus it appears that a substantial sum of public money was spent to provide ecological evidence to inform and validate a decision that had already been made

Ground 1 of the complaint

You have failed to attach sufficient, if any, weight to the Councils own independent contractors findings of a high level of barbastelle bat presence and activity on or close to the proposed route of the road.

You have also failed to attach sufficient, if any, weight to the overwhelming independent expert evidence pointing to the existence of a large and active Super-Colony of barbastelle bats in and around the proposed route, together with your failure to publicly recognise the cogency and significance of the evidence.

Since the evidence was produced, members of your project team have repeatedly stated in public that there is no evidence of high activity of barbastelle bats in and around the preferred route and construction channels[5].

You have also repeatedly accused, unjustly, one of the experts, Dr Charlotte Packman, of physically disrupting a survey undertaken by your contractor in the summer of 2020. There is no evidence to corroborate the claim and it is clear this contention has one objective, and one objective only and that is to discredit the findings of Dr Packman.

This has caused Dr Packman undue stress, as has the strong pressure NCC has continued to place her under not only to provide summaries of her analyses, which she has now already provided, but also by reason of ongoing unreasonable demands that she should share her original raw data with NCC.

[5] https://www.edp24.co.uk/news/local-council/ndr-western-link-threatens-uk-largest-barbastelle-bat-colony-6575386

This is completely contrary to established research ethics. If a research scientist were to make their data available on demand in this way it would seriously impair their chances of getting analyses of these data published in main line scientific journals (the editors of which insist that none of the data have been previously released). Publications in mainline journals constitute the key currency of a research scientist's career. For a young female scientist, relatively early in her career, working in isolation, (i.e., not as part of a larger team) to be repeatedly pressurised so strongly by Councillors and NCC Project Team, into doing something that could potentially compromise her career appears to be irregular and highly inappropriate conduct.

Your ongoing refusal to recognise the evidence produced by these experts can only be seen and interpreted as an expression of doubt as to the integrity of the evidence and the signatories of the report supplied. It also provides the public with a misleading picture of the current status of the ecological considerations relating to the road.

The council is required to be honest, open and transparent in all of its dealings with the public. By failing to share accurately with councillors and the public the true nature and significance of this expert evidence the Council has, in our submission, failed to uphold these values and act solely in terms of the public interest[6].

This is of particular relevance in the light of the forthcoming meetings on 7th June when the cabinet and full council will be expected to make major funding decisions in respect of the project. The failure to recognise the importance of this evidence and the lack of full, complete and accurate ecological evidence

[6]Seven Principles of Public Life

from the Council's own surveying can only serve to reinforce our views as stated above and below.

Ground 2 of the complaint

The failure to recognise the significance of the evidence and to attach sufficient if any weight to the findings as part of ongoing ecological investigations, and preferring instead to duplicate the surveying, also raises a question about the handling and application of public funds. To engage and fund further surveying, when robust evidence already exists, calls into question the Council's duty to ensure public resources are used prudently and in accordance with its rules and the Seven Principles of Public Life.

Ground 3 of the complaint

Notwithstanding the weight and cogency of the expert evidence produced, the Council has failed to undertake a review of the ecological considerations that led to the decision to adopt Route C over and above other considered routes.

It is clear from the extracts taken from the Options Report, as outlined above, that the expert evidence casts serious doubt on the soundness of the route selection process when it is clear the ecological factors that played a significant part in the decision of the Council to discount the other route options, now also apply to the chosen route, Route C.

It is incumbent on the Council in terms of its obligation to act at all times in the public interest to identify material changes in circumstances as and when they

happen and to review when necessary decisions taken, especially when in the present case the decision can no longer be regarded as rational and if not changed could lead to the misapplication of public funds.

We would ask for the above to be investigated. We seek the following remedies:

1. The publication of a statement within the NWL part of the Council's website of the two reports together with a commentary to acknowledge the findings they contain and in particular the presence and activity of barbastelle bats in and around the scheme boundaries, and for this to happen prior to publication of agenda papers for the June 7th, meetings.

2. A commitment given to use the highly reliable evidence already collected as part of your ecological investigations, and to rely on that evidence rather than expose the bat population in the area to the disturbance of further unnecessary surveys.

3. The immediate establishment of a public review of the preferred route in the light of the expert evidence produced and to take this step before entering into any contractual obligation with a contractor to undertake the construction of the proposed road.

4. Confirmation to be given that the two expert reports have been shared with Natural England and also all prospective building contractors.

5. Clarification of the claim that not all evidence has been shared with the Council. Please identify the 'missing' evidence and explain for what purpose this is needed.

6. Inclusion of reference to the evidence and the pSAC to be added to the Local Transport Plan 4 and the Greater Norwich Local Plan, and to the associated Habitats Regulations Assessments for those documents.

Please acknowledge receipt of this letter and we look forward to receiving a full reply to this formal complaint in due course.

Yours Faithfully

Dr Andrew Boswell for Climate Emergency Planning and Policy (CEPP)
Cllr Denise Carlo, Norwich City Council
David Pett Solicitor for Stop the Wensum Link Campaign
Dr Iain Robinson UEA Lecturer and Woodland Owner

Address for contact:
[redacted]

CC

Helen Edwards
Chris Dady, Chair, CPRE Norfolk

Professor Tim O'Riordan, President, CPRE Norfolk

Michael Rayner, CPRE Norfolk

David Hook, CPRE Norfolk

Nik Khandpur, Norfolk Wildlife Trust

Kevin Hart, Norfolk Wildlife Trust

David Diggens, Chief Executive Officer, Norfolk Rivers Trust

Kit Stoner, Chief Executive, Bat Conservation Trust

Sam Hunter-Jones, Lawyer, ClientEarth

Chris Todd, Director, Transport Action Network

Asher Minns, Tyndall Centre, University of East Anglia

Norfolk County Councillor Brian Watkins

Norfolk County Councillor Tim Adams

Norfolk County Councillor Steve Morphew

Norfolk County Councillor Emma Corlett

Norfolk County Councillor Ben Price

Norfolk County Councillor Jamie Osborn

Norfolk County Councillor Ed Maxfield

Norfolk County Councillor Jim Moriarty

Norfolk County Councillor Alex Kemp

[redacted]

Councillor Andrew Proctor
Leader of Norfolk County Council
Norfolk County Council
County Hall
Martineau Lane
Norwich
Norfolk
NR1 2DH

19.02.2021

Dear Councillor Proctor

During a recent Parish Council meeting, County Councillor Greg Peck reported on progress with the proposed Norwich Western Link road (NWL). I am writing to try to assist the Council with evaluating the ecological consequences of the proposed development. As a senior professional animal ecologist for over 45 years, I feel I may be able to offer a rather different ecological perspective on the results presented by WSP in their interim report (2020) from that given by Councillor Peck. My purpose is to interpret these data in the context of other published studies on barbastelle bats and in relation to wider ecological theory.

I believe that the results of the WSP interim survey provide clear and conclusive evidence that there is a high risk that the planned development of the preferred route for the NWL could have a highly detrimental impact on a very important population of a rare, declining and internationally protected species of bat. I feel that it is important to ensure that the development of the NWL does not violate national biodiversity objectives.

I am writing as a Norfolk resident and professional ecologist, not on behalf of my local Parish Council.

With kind regards

[redacted]

Dr M Hassall FRES

(Emeritus Reader in Animal Ecology, School of Environmental Sciences, University of East Anglia)

A Case for Interpreting Results in the Interim Report by WSP (2020) in the Contexts of the Wider Ecology of Barbastelle Bats and of Ecological Theory

Introduction

1. Construction of the Norwich Northern Distributor Road (NDR) stopped when it joined the A1067. Further scientific evidence of potentially harmful impacts on the ecology of the Lower River Wensum Valley were required before proposals for a link to the A47 could be fully evaluated.

2. Provisional plans for several possible routes were evaluated in relation to political and economic criteria, but not with respect to all aspects of the scientific case, as key surveys had not yet been completed when the preferred route was chosen.

3. Since the preferred route was chosen new scientific discoveries reported in the first Interim Report by the appointed ecological consultancy WSP (WSP 2020) show that the there is a high risk that building the NWL along the preferred route would significantly damage an important and nationally valuable colony of one of the UK's rarest mammals, the barbastelle bat. The largest colony of this declining species in the UK is present in the Lower Wensum Valley (Wild Wings Ecology data), straddling the route that NCC chose as its preferred option for the proposed NWL before the new scientific discoveries by WSP could be taken into consideration.

4. As it seems that identification of the preferred route could not take into account all the relevant scientific evidence (because it was not available when the choice of preferred route was made), there is a case for suspending further development of the Outline Building Case along this preferred route, at least until the results of 2020 survey work commissioned by NCC are available. From the proposals for the further work listed on p59 (WSP 2020) is every unlikely to alter conclusions drawn from the results of the 2019 surveys which already provide ample scientific evidence of how damaging this development is likely to national and international interests.

5. The Wensum Valley is of exceptionally high biodiversity value, containing several areas of nationally and internationally designated interest (WSP 2020), but its importance for one of the rarest mammals in the UK was not fully apparent until the WSP Interim Report was published. The extreme rarity of this species (British Mammal Society Red list 2020) places a strong onus on NCC to show that a species with such high biodiversity value will not be harmed by the proposed development (Geneletti 2003).

6. As fully acknowledged in the WSP (2020) report, the presence of barbastelle bats is a very important wildlife feature of the Lower Wensum Valley (Wild Wings Ecology 2019), as this is one of the rarest and declining species of mammal in the UK . Although there is a compelling socio-economic rationale at the local and regional levels, the very high value of one of the rarest bats in Western Europe (Rebello & Jones 2010) is of great concern at both national and international levels.

The Area Surveyed in the WSP Interim Report (WSP, 2020)

The ecological survey commissioned from WSP covered all species of bat but was restricted predominantly to an area immediately adjacent to the preferred route. Some potential day sheltering sites, summer maternity shelter sites and hibernating sites were identified. Due to access constraints, radio-telemetry surveys could not be undertaken in such close vicinity of the corridor of the "preferred route". Instead telemetry studies were focused the Golf Course/Dinosaur park site. This is only c. 2km from the preferred route so is well within the average home range of 6.5km diameter reported in Section 4.5 WSP 2020.

Summary of Key Survey Results

7. Radio telemetry studies revealed the presence of nine roosts used by the tagged bats (Table 4.8 (WSP 2020)). The closest of these roosts, that may possibly have been "maternal roosts"(Section 4.5.5.(WSP2020)) was only 440m from the planned preferred route. Up to 27 barbastelle bats were observed leaving roosts used by tagged pregnant individuals. The ground level tree surveys revealed that there were 77 trees, within 50 m of the preferred route, that had either high or moderate potential to support bat roosts. Very high numbers of barbastelle bat calls (from a wide range of locations within 500m along the preferred routes) and 23 records of barbastelle presence made from vantage points mostly within 50 - 100m of the preferred route during May to mid-June 2019 indicate a very high level of barbastelle bat activity in the immediate vicinity of the preferred route. **This provides clear new scientific evidence that were this route to be developed, there would be a very high risk that it would disturb and disrupt the activities of a significant number of this very rare species**.

The Risk of Direct Mortality Due to Increases in Road Kills.

8. The new scientific evidence in the WSP Interim Report (Tables 4.3, 4.5 & 4.6) clearly indicates that members of this Lower River Wensum Valley colony of barbastelle bats use the corridor of the preferred route both intensively and extensively. Barbastelle bats, while a highly mobile species (Kuhnert et al 2016), show very high fidelity (are highly faithful) to both sheltering sites and foraging sites and the commuting flight paths between them (Hillen et al 2011, Zeale et al 2012; Gotwald et al 2017). This behavioural inflexibility makes them particularly poorly adapted to withstand changes in their environment, such as the development of a new highway (Hillen et al 2009). **Therefore a significant number of barbastelle bats will be placed at increased risk of being killed, as the result of collisions with motor vehicles, if the NWL were to be constructed on the preferred route**. Furthermore this risk is higher for barbastelle bats, than for other species of bat, because in open habitats barbastelle bats forage closer to the ground than most other species of bat (often within 1-2 metres above ground level) and therefore they are more vulnerable to being killed in collision with motor vehicles than many other species of bats (Keith & Melber 2009). This conclusion is supported by analyses of bats killed on roads in mainland Europe, where barbastelle carcasses have been found, despite the species' rarity (Medinas et al 2013).

Potential Adverse Effects of Development on Foraging Behaviour of Barbastelle Bats.

9. Barbastelle bats typically feed in more than one foraging habitat during a single foraging trip (Zeale 2012). Exhibiting partial feeding preferences (Hassall & Lane 2005) by foraging in more than one habitat within a single foraging trip enables animals to feed on different species of prey with different and complimentary nutrient profiles. They are thus able to ingest their required dietary nutrients more efficiently than if foraging in a single habitat in accordance with the geometric framework model of mixed diet theory (Simpson and Raurbenstein 2012). Failure to obtain the right balance of nutrients would be likely to adversely affect reproductive success and hence reduce abundance. **Disturbance and disruption of any of the combination of feeding sites used would therefore risk damaging the future viability of this colony,** particularly in the context of the national decline of macro-moths (Fox 2013). In the lower Wensum Valley barbastelle bats forage along woodland edges, field boundaries, above rivers, and extensively over flood plain pastures. The availability of this combination of required feeding habitats in one locality has declined significantly in the UK due to changes in land use and agricultural practices.

10. Barbastelle bats feed predominantly, up to 99%, on moths (Sierra & Arletteaz & 1997) although they sometimes ingest 4 – 17% of Diptera with only traces members of other insect orders (Rydell et al 1996). Large species of moths are strongly preferred (Andreas et al 2012) even when their abundance is relatively low compared to high densities of smaller species. **Barbastelle bats thus have a very narrow trophic niche making them especially vulnerable to disturbance of their feeding grounds.** Individual barbastelle bats have an exceptionally high fidelity to specific foraging localities, with individuals returning to the same place to feed not just on successive nights but also during successive seasons (Hillen et al 2011, Zeale et al 2012). Any disturbance of these key feeding grounds could therefore have long term deleterious effects.

Potential Adverse Effects of Development of the NWL on Sheltering Behaviour of Barbastelle Bats.

11. Barbastelle bats not only need a mosaic of feeding sites they also require a range of shelter sites. Barbastelle bats shelter in a clearly defined sequence of sites during different times of year and under different weather conditions (Kuhnet et al 2016). Their sheltering requirements are different when sheltering in diurnal roosts compared with when they are rearing young, and different again when hibernating. Due to their highly specialised thermo-regulatory strategies and moisture requirements, barbastelle bats move between different types of shelter according to weather conditions. Hillen et al (2020) tracked **13 members of one colony to 46 different sheltering sites** and found strong inter-seasonal fidelity to roost sites. Some of the required shelter sites are found in ancient and very long-established woodlands, which are now an uncommon habitat in the UK.

12. There is a high frequency of roost switching, even by mothers rearing young. Kuhnet et al (2016), observed mothers to use 11 different sites during one reproductive period. **The number of shelters occupied at any one instant therefore significantly underestimates the number used throughout the whole annual cycle.** Thus it is not possible to assess the impacts of the proposed development on availability of required shelters without an almost continuous record of which sites are occupied by how many bats, for how long, and at which times of year.

13. The composition of groups of individual bats sheltering together does not remain constant (Patriquin 2016). Hillen et al (2020) found that there was a high level of "fission-fusion" behaviours in barbastelle bat sub-groups, resulting in a high turnover rate of sub-group composition. Even during the winter, during spells of warmer weather, individuals regularly move between hibernating sites, leaving from one group and returning to a different group in a different shelter. There is thus throughout the year a continuous turnover in the composition of individuals, as found for a wide range of other species of animal (e.g. Hassall & Tuck 2007, Timbuka 2012). Over a more extended period this process of changing group composition will result in a far higher proportion of the total population using a given shelter site than might be suggested by the proportion of the population that is recorded in that site on any given survey date. **It thus follows that the adverse impact of any disturbance or damage to a particular shelter site on the whole population will be much greater than it would be if group composition remained constant.**

14. The woodlands present in the Lower Wensum Valley provide an exceptionally favourable combination of all the different types of shelter sites required by barbastelle bats. The availability of **this combination of favourable sheltering sites is both very uncommon and declining in this country**. This helps to explain why the largest colony of this rare and declining species in the UK is found in the Lower Wensum Valley.

Why the Combination of Favourable Sheltering and Foraging Sites in the Lower Wensum Valley Makes it such a Nationally Important Site for Barbastelle Bats

15. Barbastelle bats are so rare partly because they have such a unique suite of very specific habitat requirements both for sheltering and feeding (Sierro & Arlettaz 1997, Zeale 2012, De Bruyn et al 2021), a combination which has declined nationally due to changes in land use and agricultural practice. As predicted by Southwood's (1977) habitat template model and Weins's (1985) habitat selection model, it is only when each of the separate habitat components are aligned together at appropriate spatial and temporal scales that an organism will select and be able to utilise a habitat. **The preferred route for the NWL crosses a mosaic of this very rare combination of sheltering and feeding habitats**. This explains why the barbastelle bat colony in this locality is the largest in the whole of the UK. Damage to any part of this mosaic of habitats will thus have a serious impact upon a high proportion of the total UK population of this very rare and declining species, as found for other analyses of the impact of roads on biodiversity in relation to ecosystem rarity (Geneletti 2003).

Metapopulation Dynamics Implications

16. The effects of damage to this colony may be even more widespread than at first appears if it forms a metapopulation (Hanski 1998) with other smaller satellite colonies elsewhere in the county. According to metapopulation dynamics theory (Gilpin & Hanski 2012) this central colony in the Lower Wensum Valley may be acting as a "source" colony, helping to maintain other smaller colonies elsewhere in Norfolk, by individuals emigrating to these smaller colonies which are likely to be of more marginal viability due to them occupying less favourable mosaics of habitats. If this is the case, **damage to the central source population could also potentially threaten the continued viability of satellite sink populations** (Krebs 1976, Hanski 1998, Gilpin & Hanski (2012). This is a very

serious risk because the combination of colonies of barbastelle bats in Norfolk represents a high proportion of the whole UK population of barbastelle bats.

Could Mitigation Measures Reduce the Impact of the NWL on Barbastelle Bats?

17. The overall negative effects of major roads on bats is well documented and results from a combination of road kills, traffic disturbance and ruptured connectivity. These deleterious effects having been particularly serious for low flying species including barbastelle bats (Kerth & Melber2009, Claireux 2016). In other localities adverse effects of developing new roads on other species of bats have been partially mitigated by adopting measures such as building overhead gantries, green bridges, underpasses and bat boxes. Barbastelle bats are as rare as they are because they have such extremely precise and specialised requirements for a combination of different sheltering and feeding sites and commuting routes between them. **It is therefore extremely unlikely that these highly specialised requirements could ever be met by usual mitigation measures deployed for other species**.

    For example, it takes centuries for trees to grow old enough to provide the very specific combination of barksheltering sites required by this species. Although barbastelle bats have been recorded flying through underpasses, they prefer to fly over highway developments more than some other species (Kerth & Melber 2009). Barbastelle bats are well known for their exceptionally high fidelity to both their sheltering sites (Hillen et al 2020) and foraging sites both within years and between years (Zeale 2012, De Bruyn et al 2021). **They are thus exceptionally unlikely to change their traditional commuting routes to use gantries, green bridges or underpasses**.

18. Due to the very high level of activity of barbastelle bats in close proximity to the selected route, as revealed by the surveys reported by WSP (2020), the only viable strategy to mitigate the very high risk posed by the NWL to this colony, would therefore be **to switch the proposed route to one of the earlier options located outside the home-range boundary of this super-colony of barbastelle bats**.

Equating the Value of a Species at the National and International Levels with Socio-economic Values at the Local and Regional Levels

19. The currency of local and regional interests is different from the currency of interests at a national and international level making evaluating their relative importance difficult. **However economic theory provides a conceptual framework of values which helps to overcome this problem** (Geneletti 2003, Justus et al 2009).

20. All living organisms have an **intrinsic value**. This takes account of extinction being a permanent loss to the whole planet not just for this, but also for all future, generations (Justus et al 2009).

21. For rare and declining species, another important component to their value is their **rarity value** Courchamp (2006). This is particularly relevant to planning the NWL because barbastelle bats are so rare that they may be at risk of suffering from the “Allee Effect” which could be triggered were there any detrimental effects caused to the Lower Wensum Valley colony by developing the NWL.

    The “Allee Effect” (Stephens, et al 1999, Stephens & Sunderland 1999) applies to very rare species, such as the barbastelle bat. When their populations become so low that social interactions break

down, fitness of individuals decreases causing a further decline in the population. This negative feedback cycle exacerbates the decline of a population until it becomes extinct. Barbastelle bats in the Lower Wensum Valley have a complex and delicate social structure so if they are subject to disturbance in any one part of the colony it will impact on the social structure of the whole colony, generating a risk of triggering an Allee Effect leading to local extinction.

22. Species also have a **"passive use value"** (Nunes & van Bergh (2001), because members of society "*passively*" appreciate a species as being part of their living environment. Everyone has a right to be able to enjoy reading about or watching television documentaries about a particular species. Barbastelle bats are members of the only order of flying (as opposed to gliding) mammals. Bats are also the only terrestrial animals that routinely use echo-location when both navigating and feeding. For this combination of reasons members of society as a whole therefore value bats very highly. For a species of bat with a unique ecology, as is the case for barbastelle bats, the combination of these three different sorts of values is exceptionally high at both national and international levels.

Executive Summary of Conclusions.

A. *The null hypothesis that constructing the NWL along the preferred route will not have a deleterious effect on the largest colony of barbastelle bats in the UK has been tested, using data published by WSP in their Interim Report (2020).* ***No evidence was found to support this hypothesis****.*

B. *The Interim Report from WSP is based on using a combination of different methods for detecting bats: ground survey, vantage point observations, automatic sound detection and radio telemetry. All the methods revealed a high level of barbastelle bat presence and activity on, or close to, the preferred route, Sound detections at a range of sites adjacent to the preferred route revealed up to 40 passes per night for a individual locations. Roost counts of up to 27 individuals emerging from nine roosts used by radio telemetry tagged individuals. The closest of these roosts was only 440m from the preferred route and all within the 6.5 km average diameter of the home ranges monitored therefore all within the 7km diameter undisturbed buffer zone around roosts of barbastelle bats recommended by Zeale et al (2012) for this "near-threatened and declining" species.* ***The WSP Interim Report (2020) thus provides important new scientific evidence of high levels of barbastelle bat activity along the "preferred route".***

C. *The alternative hypothesis that construction of the NWL along the preferred route,* ***will result in a high risk of detrimental effects*** *on this colony of barbastelle bats, is supported by the observations of high levels of activity of this nationally and internationally highly valued species, in close proximity to the preferred route (WSP 2020) .*

D. *Barbastelle bats have extremely specialised and specific requirements for a range of sheltering sites, combined with a specialised requirement to feed in a mosaic of different foraging habitats (Zeale 2012).* ***The Lower Wensum Valley has a very rare combination of both favourable sheltering and foraging habitats****.*

E. *It is therefore appropriate to apply the* ***Precautionary Principle,*** *at least until after all available data from 2020 surveys commissioned by NCC have been published and fully evaluated. Similar data will be required for other potential routes for the NWL outside the home range boundaries of the uniquely important barbastelle bat 'super-colony' in the Lower Wensum Valley.*

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26th February 2021

Dear Mr Fernandez,

Open letter to Norfolk County Council re barbastelle bat research findings and the proposed NDR 'Western Link' dual carriageway

As you are aware, research has been carried out for a number of years on a key population of a very rare and highly protected bat species, the Western Barbastelle (*Barbastella barbastellus*). This population is located to the north-west of Norwich. The research programme has been a collaboration between Wild Wings Ecology and the University of East Anglia, contributed to and supported by the Norfolk Barbastelle Study Group and a number of other professional ecologists, bat experts and researchers.

The selected route for the proposed 'Norwich Western Link' road (NWL) would pass through this nationally important area for barbastelles, which is home to the UK's only known 'super-colony' (the 'Wensum Valley Super-Colony'), which includes what is thought to be the UK's largest extant maternity roost.

Our data on the Wensum Valley barbastelle super-colony include roost locations, colony counts, home ranges, foraging areas, commuting routes and activity levels. Our Ecological Impact Assessment (EIA) of the road on barbastelles shows that the severity and diversity of impacts cannot be effectively mitigated or compensated for. Consequently, should the road scheme proceed, even with mitigation and compensation measures in place, it would be predicted to have a substantial negative impact on the super-colony and would be very likely to cause significant and sustained long-term damage to the Favourable Conservation Status of this nationally important bat population. Therefore, it is our judgment that the road scheme as proposed cannot be delivered in compliance with wildlife laws.

We feel that it is imperative that our research findings, which are considerably more comprehensive than the council's own barbastelle surveys for this area, are fully considered in relation to the road proposals. We are glad that the council is now willing to engage with our research findings, albeit at a rather late stage in the development of the road scheme proposals. Our research is ongoing and will be subject to peer-review prior to publication.

Therefore, to ensure you are aware of our data and findings thus far and can give these proper consideration in relation to the road proposals, we are providing an interim report here. In this letter I present a résumé of some of our (relevant) key research findings, more detailed information on barbastelle bats, our data collection, preliminary results and conclusions.

Key research findings

1. The proposed NWL would cut through a **nationally important area** for a rare, Annex II species: the barbastelle bat
2. This area is home to the **UK's only known 'super-colony' of barbastelles** (a cluster of significant, linked maternity colonies)
3. The 'Wensum Valley Super-Colony' includes what is thought to be the **UK's largest extant barbastelle roost**, with ≥105 individuals
4. The super-colony as a whole is estimated to have a ***minimum* of 270 barbastelles** (to put this in context, the criteria for 'Site of Special Scientific Interest' designation for barbastelles is breeding complexes of 20 or more adults)
5. To date we have located an exceptional **63 barbastelle roost trees within the impact zone of the proposed NWL**
6. The **main block of woodland to be directly cut through by the proposed road is home to a barbastelle maternity colony** (part of the super-colony)
7. The above key findings were missed by the council's own commissioned surveys for the road and as such impacts on barbastelles cannot have been appropriately assessed, with data inadequate for a valid assessment
8. There are also concerns given the failures of bat mitigation/compensation measures for the Norwich Northern Distributor Road (NDR) and the apparent disappearance of the two barbastelle colonies that were located within 2.5 km of the NDR, prior to construction
9. Our radio-tracking data show that **barbastelles avoid the bat mitigation road crossing structures on the NDR** (including the green bridge and bat gantries), instead crossing at potentially 'unsafe' locations, risking collision with vehicles
10. The projected scale and severity of the impacts of the road on this nationally important barbastelle population and the documented ineffectiveness of mitigation/compensation options are such that the **Favourable Conservation Status[1] of this barbastelle population could not be maintained should the road scheme proceed as proposed**

[1] *"conservation status will be taken as 'favourable' when: population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long term basis."* - Habitats Directive Article 1 (i).

1. About barbastelles

1.1 Conservation status & legislation

Barbastelles are one of the rarest of the UK's 17 resident/breeding bat species. They are one of only two of our UK bat species to be listed as '*Near Threatened*' globally on the IUCN Red List, having undergone substantial population declines and extinctions in other parts of their range. In the Mammal Society's recently updated Red List of UK Mammals, barbastelles are described as being *'at imminent risk of extinction'* and listed as '*Vulnerable*'[2].

Barbastelles are protected by a range of legislation, including The Wildlife and Countryside Act 1981 (as amended) and are listed on Annex II of The Conservation of Habitats and Species Regulations 2017 (along with only three other UK bat species). It is an offence to deliberately or recklessly disturb, capture, possess, injure or kill bats or obstruct access to, damage or destroy their roosts. Disturbance includes *'to impair their ability to breed or reproduce or rear or nurture their young or to affect significantly the local distribution or abundance of the species'.* Annex II species are those whose conservation requires the designation of 'Special Areas of Conservation'.

1.2 Barbastelles in Norfolk – and the Norwich Northern Distributor Road

Norfolk is considered a stronghold for barbastelles and, thanks to the work of the Norfolk Barbastelle Study Group (Harris 2020[3]), we now understand a lot more about the species and the importance of Norfolk in ensuring the future persistence of this species.

Post-construction monitoring of the Norwich Northern Distributor Road (NDR) raised concerns over the road's impact on two (of three) main barbastelle colonies in the area, located c. 2.5 km and c. 350 m from the road. These colonies could not be located after the road had been completed and opened to traffic (Packman 2019[4]). In light of this and the location of the remaining/third significant colony in the area (furthest from the NDR, c. 3.5 km to the west), concerns over the likely impact of the proposed extension of the NDR through this area (the NWL) were highlighted. These concerns were removed from the monitoring report, without the author's consent, prior to publication on the council's website.

NDR post-construction bat monitoring data on the implemented mitigation/compensation measures for bats (including road crossing structures) showed that these measures had very low usage by bats and as such had likely failed to protect local bat populations. However,

[2] https://www.mammal.org.uk/2020/07/one-quarter-of-native-mammals-now-at-risk-of-extinction-in-britain/
[3] Harris, J. (2020) A review of the barbastelle *Barbastella barbastellus* in Norfolk based on the work of the Norfolk Barbastelle Study Group. British Island Bats, Volume One, p33-49.
[4] Packman, C.E. (2019) Norwich Northern Distributor Road post-construction barbastelle bat radio-tracking monitoring report, Year 1: 2018 (January 2019 v1.0 – correct/author-approved version). Wild Wings Ecology, Norwich.

this was not adequately analysed and conveyed in the associated reports published by the council.

1.3 Barbastelle ecology

1.3.1 Life history & food

Barbastelles can live to at least 20 years old and they reproduce very slowly (once mature, they typically give birth to one pup each year). They are ancient woodland specialists, requiring extensive tracts of good quality, mature natural habitats to survive and thrive. They feed on insects (with moths being a key component of their diet), including a number of arable crop pests, providing an 'ecosystem service' of natural pest control.

1.3.2 The role of woodlands: raising young, shelter & foraging

In the summer months, females congregate in 'maternity colonies', where they give birth to and raise their young, known as 'pups', in communal nursery roosts. Maternity colonies are usually found in mature woodlands, where they roost in trees, often under loose bark or other features that are associated with old trees. Each colony will utilise a number of individual roost features within the woodland, regularly moving between different roosts and as such require a significant number and range of available roosts within the maternity colony woodland. Barbastelles are considered to be sedentary and are highly faithful to their maternity sites, with females returning to the same woodlands (and often using the same roosts) each year to give birth and raise their pups.

Barbastelles show considerable 'winter hardiness', being unusually active (compared to other UK species) over the winter months, continuing to emerge to forage at night when conditions are reasonably mild.

The woodlands provide not only a range of suitable roost features with diverse conditions and microclimates, but also foraging areas, where barbastelles hunt for their insect prey using echolocation, and shelter, providing protection during adverse weather and a safe environment where the young can learn to fly and hunt for food.

1.3.3 Landscape use & Core Sustenance Zones

Barbastelles have large home ranges, travelling up to 20 km away from their roosts in a night to forage (more typically in Norfolk, 5-6 km and up to 11 km). Consequently, they have large 'Core Sustenance Zones' (CSZ, see definition box below), of 6 km radius around communal bat roosts, reflecting their requirement for substantial areas of good quality habitat to support viable colonies. Foraging habitats include woodlands, riparian habitats and hedgerows/field edges.

"A Core Sustenance Zone (CSZ), as applied to bats, refers to the ***area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roost****. With reference to planning and development the CSZ could be used to indicate:*

1. The area surrounding the roost ***within which development work can be assumed to impact the commuting and foraging habitat of bats using the roost****…*

2. The area within which mitigation measures should ***ensure no net reduction in the quality and availability of foraging habitat for the colony****…*

…Note: ***There may be justification with Annex II and other rare species to increase the CSZ to reflect use of the landscape by all bats in a population****"*

(Bat Conservation Trust[5])

2. Data collection

2.1 Bat trapping surveys

Bat trapping surveys provide information on species presence, reproductive status and enable barbastelles to be fitted with radio-tags and/or rings. Bats are trapped in fine 'mist-nets', processed (biometric data recorded and, where applicable, a radio-tag and/or ring fitted) and then released.

We have undertaken eighteen bat trapping surveys in woodlands within the impact zone of the NWL, between 2018-2020, as part of our wider research. Bat trapping surveys were carried out in the periods May to early June and August, to gain key information on barbastelle maternity colonies whilst avoiding the mid-June to end of July period when trapping/tagging carries a significant risk of harm to heavily pregnant females and very young, dependent pups. All trapping sites are located between 0 - 3.9 km from the proposed road route, with the proposed NWL well within these colonies' 6 km CSZs (note the need to increase the size of this radius for rare Annex II species (barbastelles) to reflect landscape use by all bats in the population).

2.2 Barbastelle radio-tracking

By temporarily fitting individual barbastelles with tiny, lightweight radio-transmitters, their movements can be tracked using a receiver and antenna, revealing roost locations, home ranges, foraging areas and commuting routes. Tracking also enable an assessment of habitat use and interactions with other landscape variables, such as existing roads and bat mitigation road crossing structures e.g. 'green bridges' and 'bat gantries' on the NDR.

[5] Bat Conservation Trust (2016) Core Sustenance Zones: determining zone size. Bat Conservation Trust, London.

To date we have radio-tagged thirty-three adult female barbastelles from within the NWL impact zone (2018-2020, compared to the council's commissioned surveys for the NWL, which are based on seven radio-tagged barbastelles, 2019-2020).

2.3 Roost emergence counts & colony estimates

Once roosts are located through radio-tracking, the number of barbastelles emerging from each roost at dusk can be counted. A colony will make use of multiple roost trees within a woodland and at any one time the colony may be utilising any number of these (although typically bats within a maternity colony will be roosting together or split between a small number of these roosts at any one time). All roost trees in use by radio-tagged bats are counted simultaneously (on the same night) to give a minimum estimate of colony size. Counts are conducted by experienced bat surveyors, equipped with infrared night vision/recording equipment and bat detectors to enable species identification.

2.4 Acoustic data (bat activity levels)

Static bat detectors, which record bats' ultrasonic echolocation and social calls, have been positioned throughout key woodlands in the area. These data provide an index of barbastelle (and other bat species) activity levels, by analysing the number of bat 'passes' recorded for each species (identified from sonograms/spectrograms). Data have been collected each month over the last year (since March 2020) and data collection is ongoing.

Should the road scheme go ahead, these detectors will provide pre-construction baseline data on bat activity levels and species presence, which can be used to compare with post-construction data to enable an independent assessment of impacts on local bat populations. Detectors have been positioned at varying distances perpendicular to the proposed road route, allowing an assessment of how far away road impacts are evident on bat populations, should the road be built.

3. Preliminary results

3.1 Bat trapping surveys

To date we have trapped 462 bats from within the NWL impact zone (2018-2020), which includes 106 barbastelles (compared to the council's commissioned surveys for the NWL: 138 bats trapped, of which 10 were barbastelles (but only seven individuals)).

During trapping surveys we have recorded the following seven species from within the NWL impact zone:

- Barbastelle *Barbastella barbastellus*
- Common pipistrelle *Pipistrellus pipistrellus*
- Soprano pipistrelle *Pipistrellus pygmaeus*
- Natterer's bat *Myotis nattereri*

- Daubenton's bat *Myotis daubentonii*
- Brown long-eared bat *Plecotus auritus*
- Noctule *Nyctalus noctula*

Table 1 compares our bat trapping survey findings with those of the council's commissioned surveys for the major block of mature woodland habitat to be directly cut through by the road. In the period 2019-2020, we have trapped 114 bats in this woodland, of which 14 were barbastelles; the council's surveys during this same period trapped just nine bats and no barbastelles.

Table 1. Comparison of barbastelle bat trapping survey effort and findings: the council's surveys for the NWL (taken from their interim report[6]) and our surveys (Packman *et al. in prep*) for the major woodland block in the direct path of the proposed NWL, 2019-2020.

Survey findings ↓	**Council's NWL surveys**	**Our surveys**		
Survey date →	**19th May 2019**	**31st August 2019**	**10th June 2020**	**6th August 2020**
Number of bats trapped	9	22	61	31
Number of barbastelles trapped	0	3	6	5
Number of barbastelles radio-tagged	0	2 (adult females)	3 (adult females)	3 (adult females)
Number of barbastelle roost trees located at site (cumulative)	0	2	10	
Barbastelle maternity colony presence identified from subsequent radio-tracking & roost counts?	No	Yes	Yes	Yes

3.2 Barbastelle radio-tracking

All-night tracking of barbastelles from key maternity colony woodlands within the 'Wensum Valley Super-Colony' (and within the impact zone of the proposed NWL) have provided detailed information on home ranges, foraging areas and commuting routes. Roost and foraging woodlands, other foraging areas and commuting routes within close proximity to the proposed NWL (northern section) are summarised in Figure 1.

Woodlands on and in close proximity to the proposed NWL route are used extensively as both roost sites (including maternity use) and foraging areas. The River Wensum is a major commuting route for the super-colony and the surrounding riparian habitat and floodplain are used extensively for foraging. At the northern end of the proposed NWL route, the road would cut through a complex network of commuting routes (between roost woodland and the river), foraging areas and maternity colony woodland.

[6] WSP (2020) Appendix F – Bat Survey Report – 2019. Bat trapping and radio-tracking. Norfolk County Council.

Detailed, 'close-approach' radio-tracking enabled crossing points over major roads in the area to be located with a high degree of precision. Crossing points were at a few discreet locations and, predictably, where suitable habitat was located close to and on both sides of the roads, such as woodland/trees or vegetated waterways (unlit). Along the western section of the NDR, radio-tracked barbastelles crossed at two specific locations only (where habitat connectivity was best) and avoided the bat mitigation road crossing structures (a green bridge and a bat gantry) in the vicinity.

Furthermore, the Marriott's Way is well used as a commuting route (and foraging area) for barbastelles in the super-colony (see Figure 1), but it was clear from the radio-tracking data that the green bridge was ineffective, with barbastelles flying up to the end of the vegetated corridors either side of the bridge, but not passing over the (exposed and mostly unvegetated) bridge itself (with a c. 300 m gap in vegetation cover over and either side of the bridge). Instead, barbastelles crossed the NDR c. 130 m to the east, utilising a quiet, dark, mature tree-lined lane, with a corresponding tree and hedgeline on the opposite side (a gap in vegetation cover of only c. 100 m).

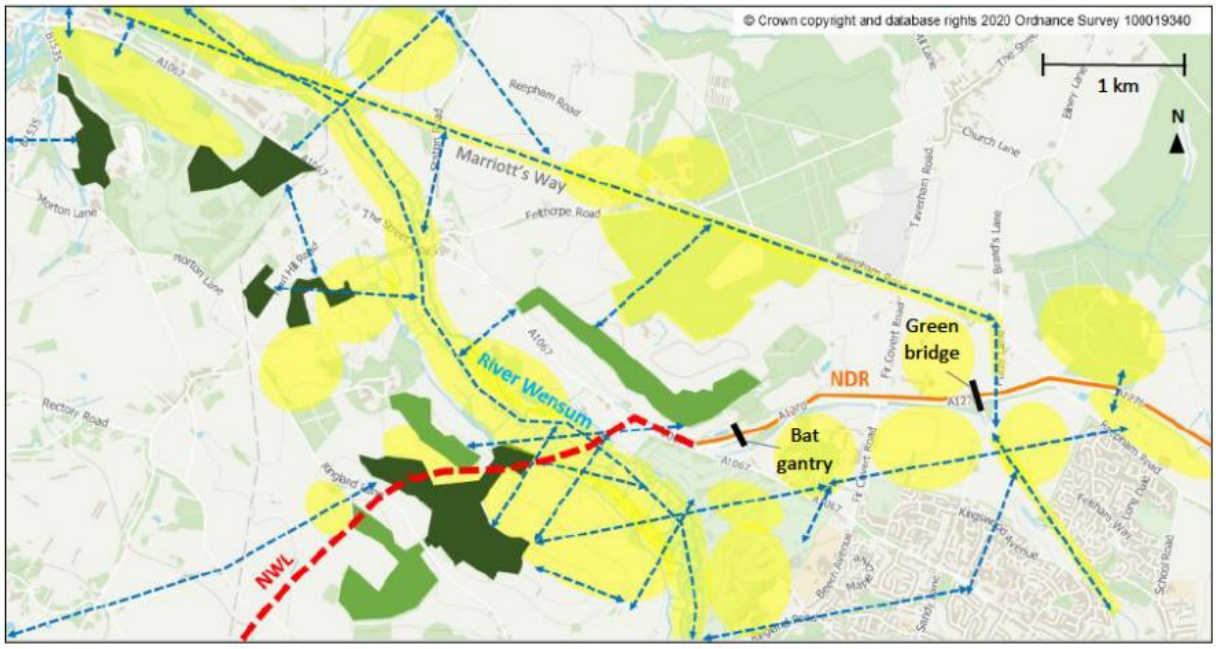

Figure 1. Summary schematic showing the key barbastelle areas which are in close proximity to the proposed NWL (northern section, red dashed line). Maternity colony (also used for foraging) woodlands shown in dark green, other barbastelle roost and key foraging woodlands in light green, foraging areas (outside of key roost/foraging woodlands) in yellow and main commuting routes with blue dashed arrows. The NDR (orange line) and bat mitigation road crossing structures within this area (green bridge and bat gantry) are also shown (labelled black rectangles). Overlaid on an Ordnance Survey map.

3.3 Roosts, emergence counts & colony size estimates

From radio-tracking adult female barbastelles in the area we have, to date, identified 63 roost trees within 3.5 km of the proposed road route.

Individual maternity colonies within the super-colony range in size from 27 - ≥105 barbastelles. Factoring in males, this gives a minimum estimate for the barbastelle population within the super-colony as a whole of 270 individuals.

Figure 2 shows the outer boundary of the merged (overlapping) 6 km Core Sustenance Zones around the known maternity colony woodlands in the area. The proposed NWL route cuts through the most critical area, the 'core of the cores', where all the CSZs overlap (i.e. the key area for all of the known maternity colonies within the super-colony).

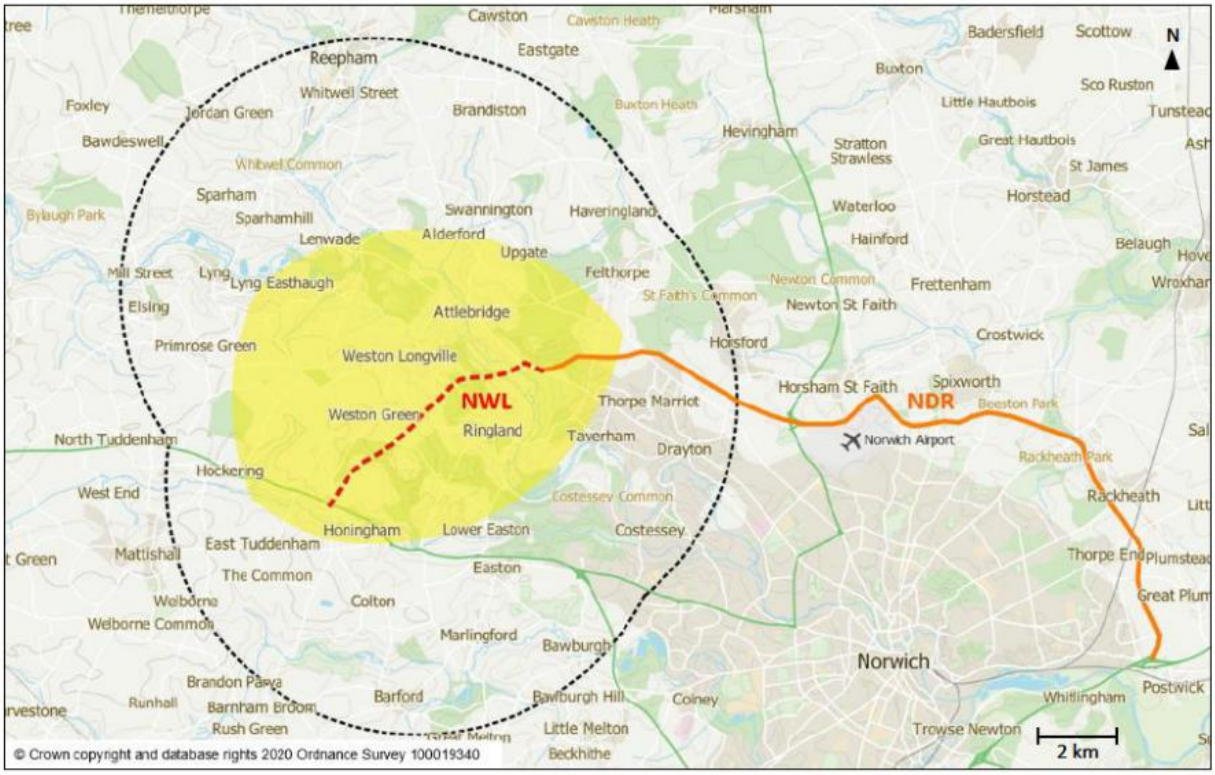

Figure 2. Outline of merged Core Sustenance Zones (black dashed line) around known barbastelle maternity colony woodlands in the vicinity of the proposed NWL, with the 'core of the cores' (the area where all six CSZs overlap) highlighted in yellow. Overlaid on an Ordnance Survey map and with the NDR (orange line) and proposed NWL (red dashed line) highlighted.

3.4 Acoustic data (bat activity levels)

The bat acoustic data are still being collected and analysed. However, based on preliminary analyses:

- 10 bat species have been recorded within woodlands in the NWL impact zone
- High levels of barbastelle activity have been recorded
- In winter/spring 2020, barbastelles were the second most commonly recorded species (after soprano pipistrelle)
- In summer 2020, barbastelles were the third most commonly recorded species, after soprano and common pipistrelles

4. Conclusions

The importance of this area for barbastelles is summarised by Emerson *et al.* 2020[7], on the basis of this research: *"there are several areas within Norfolk where high levels of activity have been recorded, including in the Wensum Valley where extensive radio-tracking work has been carried out to locate roosts of this species. The Wensum Valley appears to be a stronghold for this red-listed species in Norfolk and is likely to be important in a national context. This population is under threat by the proposed Western Link road in Norwich… loss of old mature woodland and veteran trees is the greatest threat".*

The proposed NWL is planned to pass through what is one of the most important areas in the country for barbastelles, which are '*at imminent risk of extinction*' (Mammal Society 2020). Our research has revealed the presence of the **first known barbastelle 'super-colony'** in the UK (the 'Wensum Valley Super-Colony') with an **estimated minimum population size of 270 barbastelles**. It also includes the **largest known extant roost in the country (≥ 105 barbastelles), one of 64 roosts identified to date as being used by the super-colony**. The proposed **NWL would pass through the 'core of the cores'; the critical area where the CSZs for each of the maternity colony woodlands overlap**. **In both summer and winter, barbastelle activity levels in this area are exceptionally high**. As a result there is a **very high risk that the proposed route of the NWL would have a very negative impact on this population, of significant national importance, which is vital to the future persistence of this threatened species.**

The council commissioned bat surveys to inform decision making concerning the NWL. The research reported on here shows that the council's assessment of impacts on barbastelles have been seriously underestimated. The much more comprehensive bat trapping and radio-tracking surveys summarised in this letter more accurately determine the significance of the threat to this rare species. The council's surveys will have substantially underestimated impacts on barbastelles, as the significance of the area for this rare species

[7] Emerson, J., Farrow, F., Leech, T., Parmenter, J. (eds) (2020) Norfolk's Wonderful 150. Norfolk & Norwich Naturalists' Society Occasional Publication 18. Norfolk & Norwich Naturalists' Society, Norwich.

was missed, a reflection of the paucity of bat trapping and barbastelle radio-tracking data (as documented here, in comparison to our independent, voluntary surveys carried out in the area by professional ecologists). The council's surveys failed to identify a barbastelle maternity colony in the major woodland in the direct path of the road, have only identified a handful of barbastelle roost trees in the area, have overlooked the presence of the super-colony within the road's impact zone and substantially underestimated the significance of the barbastelle population in the area. The concept of CSZs has also been overlooked, with insufficient scale and reach of impacts considered, given that barbastelles have very large home ranges, with a CSZ of 6 km radius. Consequently, **the council's presumption that impacts of the proposed NWL on the barbastelle population can be mitigated and compensated for is flawed and based on inadequate data.**

The destruction of barbastelle maternity colony woodland (used throughout both the critical summer and winter periods) is not permissible under UK wildlife laws and would be unprecedented. Our independent Ecological Impact Assessment for the NWL (and its associated substantial construction corridor) on barbastelles includes:

- Destruction of barbastelle maternity colony (and foraging) woodlands
- Habitat fragmentation
- Habitat degradation
- Loss of foraging habitat
- Severance of bat commuting routes
- Bat fatalities resulting from collisions with vehicles
- Disturbance from noise and light

The council's Environmental Impact Assessment Scoping Report[8] suggests that green bridges, underpasses and culverts would be used on the NWL scheme as mitigation against bat fatalities from vehicle collisions and severance of commuting routes. **Evidence shows that similar approaches on the NDR have failed and analysis of commuting routes in our study has revealed new evidence that barbastelles avoid using bat mitigation road crossing structures including green bridges and bat gantries.**

Compensation that has been proposed for loss of roost and foraging woodlands includes planting of tree saplings. A complex, mature woodland ecosystem capable of supporting a barbastelle maternity colony (providing a variety of roosts, shelter, abundant insect prey etc) takes hundreds of years to develop; tree whips are not replacement habitat for mature woodland ecosystems. Bat boxes have also been proposed to provide replacement roost features yet have notoriously poor uptake by bats and again, are unrealistically simplistic; they are not a replacement for mature woodland with many different roost niches and associated conditions that support colonies.

[8] WSP (May 2020) Norwich Western Link Environmental Impact Assessment Scoping Report. Norfolk County Council.

There has been no proposed mitigation/compensation for other predicted significant impacts on barbastelles and **there is a lack of evidence to demonstrate that the council's proposed mitigation and compensation measures would succeed in protecting these barbastelle colonies**. Failures in the NDR mitigation/compensation for bats and the apparent disappearance of the two barbastelle colonies that were located within 2.5 km of the road prior to construction are deeply concerning and do not bode well for the remaining key population, the Wensum Valley Super-Colony, should the NWL be built.

Under The Conservation of Habitats and Species Regulations 2017, ***'any disturbance which is likely to impair their ability to breed or reproduce or rear or nurture their young or to affect significantly the local distribution or abundance of the species'*** (for protected species which include barbastelles) **is an offence**. In order to legally proceed with the road scheme, a derogation licence must be sought from Natural England and can only be granted if three tests are met: 'imperative reasons of overriding public interest' (IROPI Test), 'no satisfactory alternative' (NSI Test) and 'maintenance of Favourable Conservation Status' (FSC Test). **It is clear that the FSC test for barbastelles cannot be met here**, satisfactory alternatives do not appear to have been meaningfully explored and IROPI seems improbable. Consequently, **the road cannot proceed, as proposed, in compliance with wildlife laws and without causing significant harm to the country's fragile barbastelle population.**

Given the **exceptional importance of the Wensum Valley barbastelle population**, we propose that key roost, foraging and commuting habitats should be robustly protected from future threats by **designation of a barbastelle Special Area of Conservation** (as required under The Conservation of Habitats and Species Regulations 2017).

Yours sincerely,

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[redacted]

Norfolk County Council

NORWICH WESTERN LINK ROAD

Interim Bat Survey Report- 2020

70061370-09-12
June 2021

Norfolk County Council

NORWICH WESTERN LINK ROAD

Interim Bat Survey Report- 2020

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1 INTRODUCTION

1.1 PROJECT BACKGROUND

1.1.1. The Norwich Western Link Road (NWL) is a highway scheme linking the A1270 Broadland Northway from its junction with the A1067 Fakenham Road to the A47 trunk road near Honingham.

1.1.2. The NWL, hereafter referred to as the Scheme, will comprise:

- Dualling the A1067 Fakenham Road westwards from its existing junction with the A1270 to a new roundabout located approximately 400m to the north west.
- Construction of a new roundabout.
- Constructing a dual carriageway link from the new roundabout to a new junction with the A47 near Honingham.

1.1.3. As part of a separate planned scheme, Highways England proposes to realign and dual the A47 from the existing roundabout at Easton to join the existing dual carriageway section at North Tuddenham. If that scheme proceeds, it is expected that Highways England will construct the Honingham junction and the Norwich Western Link will connect to the north-eastern side of that junction.

1.1.4. The Scheme will cross the River Wensum and its flood plain by means of a viaduct. The Scheme will also cross four minor roads by means of overpass or underpass bridges. The Scheme will include ancillary works such as provision for non-motorised users, necessary realignment of the local road network and the provision of environmental mitigation measures.

1.2 ECOLOGICAL BACKGROUND

1.2.1. Baseline bat surveys were undertaken in 2019 to inform the route optioneering process (WSP UK Ltd, 2020). This included ground level tree assessments (GLTA), bat activity surveys, bat radio-tracking and bat hibernation surveys (WSP UK Ltd, 2020).

1.2.2. Following selection of a preferred route (Route C) and further consultation, the methodology and survey area was refined to provide a complete data set to inform appropriate mitigation measures for the Scheme. This technical report presents the methods and result of bat survey work undertaken in 2020 and should be read in conjunction with earlier reporting.

1.2.3. Further baseline surveys will be completed in 2021, to be followed by the production of final reporting capturing the results gathered in 2019, 2020 and 2021.

1.3 BRIEF AND OBJECTIVES

SURVEY OBJECTIVES

1.3.1. WSP UK Ltd was commissioned by NCC to complete a comprehensive suite of bat surveys for the Scheme, with the following objectives:

- to gain an understanding of the use of the defined Survey Areas (see Section 1.4) by bats, including foraging, commuting and roosting activity as well an understanding of general distribution across the Scheme; and
- to gain further information on habitat use and roosting locations of barbastelle Barbastella barbastellus and other target species (species from the genus' Myotis) across the defined Survey Areas.

REPORT OBJECTIVES

1.3.2. The aim of this report is to provide an interim baseline covering survey work undertaken in 2020, including the survey approach and findings of the tree-roost assessments, structure roost assessments and bat activity surveys.

1.3.3. Data reported here refines the baseline information gathered in 2019, following confirmation of the Scheme boundary and further clarity with regards to the design. This report highlights the requirement for further surveys in 2021 to complete the baseline and inform impact assessment.

1.4 SURVEY AREAS

SUMMARY OF SURVEY AREAS

1.4.1. The areas covered by each type of survey are hereafter referred to as the 'Survey Areas'. The Survey Areas covered by 2020 surveys and reported here are detailed in Table 1-1 below. The survey approaches are described in Section 3.

Table 1-1 - Summary of Survey Areas for Surveys Completed in 2020.

Roosting Bat Surveys

Survey Type	Survey Area
Preliminary Bat Roost Assessment (PBRA) of Structures	All areas within and up to a 100m buffer from Scheme.
Ground-Level Tree Assessments (GLTA) and Presence/Absence Surveys	All areas encompassed within and up to a 100m buffer from the Scheme[1].

[1] The original Survey Area for the 2020 GLTA survey covered all areas up to and within a 25m buffer of the Scheme boundary. To account for the risk of permanent disturbance to roosts from the operation of the Scheme, the Survey Area was subsequently updated during the survey season to incorporate all land up to and within a 100m buffer of the Route alignment. Due to the differing extents of the Scheme Boundary and the Route alignment, occasionally trees surveyed fell within the 100m Route alignment buffer but outside the 25m Scheme boundary buffer, and *vice versa*. Both buffers are presented on Figure B-1 for information.

Survey Type	Survey Area
Vantage Point Surveys	Scheme boundary
Bat-tracking Surveys	Scheme boundary
Automated Detector Surveys	Scheme boundary and connected habitats at risk of severance from the Scheme.

DESCRIPTION OF HABITATS ALONG THE SCHEME

1.4.2. Throughout this report, the following areas will be referred to, in order from north to south, the locations of which are shown in Figure A-2.

- **River Wensum** – a chalk river flowing north-west to south-east which will be crossed by the Scheme.
- **Northern Woodlands** – a complex of woodland blocks in the northern extent of the Scheme encompassing Primrose Grove, The Nursery, Rose Carr and Spring Hills (which are individually labelled on Figure A-2). Parts of the Northern Woodlands lie within the Scheme boundary and will be directly impacted by the Scheme.
- **Long Plantation** – a block of mixed plantation woodland south of the Northern Woodlands and north of Ringland Lane, which is partially within the Scheme boundary and will be directly impacted by the Scheme.
- **Ringland Lane** – a single-track road connecting Ringland to Weston Longville which will be crossed by the Scheme.
- **Unnamed Woodland South of Ringland Lane** – a block of semi-natural broad-leaved woodland which is partially within the Scheme boundary and will be directly impacted by the Scheme.
- **Hedgerow North of Weston Road** – a hedgerow running in an east to west orientation, connecting a woodland (east) to a tree-lined public footpath (west). There is a central junction where a perpendicular section of hedge joins it, this section of hedge runs in north-south orientation from Weston Road to the junction with this hedgerow.
- **The Broadway** – a single-track woodland-lined avenue which will be crossed by the Scheme.
- **Foxburrow Plantation** – a strip of broad-leaved plantation woodland bordered to the south by a tributary stream. Foxburrow Plantation is partially within the Scheme boundary and will be directly impacted by the Scheme.
- **Foxburrow Stream** – a tributary stream which feeds into the River Tudd which will be crossed by the Scheme.

2 RELEVANT LEGISLATION

2.1 Legal Compliance

ALL SPECIES

2.1.1. Bats and their roosts are afforded a high level of protection under the Conservation of Habitats and Species Regulations 2017 as amended (the 'Habitat Regulations'). The legislation means that it is an offence to:

- Deliberately capture, injure or kill a wild bat;
- Deliberately disturb wild bats; 'disturbance of animals includes, in particular, any disturbance which is likely:
  - to impair their ability —
    - to survive, to breed or reproduce, or to rear or nurture their young; or
    - in the case of animals of a hibernating or migratory species, to hibernate or migrate; or
  - to affect significantly the local distribution or abundance of the species to which they belong.'
- Damage or destroy a breeding site or resting place used by this species.

2.1.2. Protection is also afforded under the Wildlife and Countryside Act 1981 (as amended) with respect to disturbance of animals when using places of shelter, and obstruction of access to places of shelter.

2.1.3. Due to the high level of protection afforded to bats and their habitat, mitigation for this species is governed by a strict licensing procedure administered by Natural England (normally, planning permission must be obtained before a licence can be sought). Licencing is subject to three tests, as defined under the Habitats Regulations 2017, these must also be applied by the planning authority before granting permission for activities affecting bats. For permission to be granted the following criteria must be satisfied:

- The proposal is necessary 'to preserve public health or public safety or 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'; and
- The proposals 'will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range'.

2.1.4. Certain species of bats including the barbastelle, noctule bat Nyctalus noctula, brown long-eared bat Plecotus auritus and soprano pipistrelle bat Pipistrellus pygmaeus are also listed as a Species of Principal Importance (SPI) for the Conservation of Biodiversity in England under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006. Under Section 40 of the NERC Act 2006 public bodies (including local planning authorities) have a duty to have regard for the conservation of SPI when carrying out their functions, including determining planning applications.

3 METHODS

3.1 GUIDANCE

3.1.1. The methodology applied for all survey techniques and bat call analysis was completed with reference to best practice guidance and industry standards (Collins, 2016) (Russ, 2012).

3.2 SUMMARY

3.2.1. Surveys were designed to assess species composition and key areas of bat foraging and commuting activity, and to determine the presence/inferred absence and nature of bat roosts across and within proximity to the Scheme. The scope of bat surveys detailed below was agreed with Natural England in 2019:

- Roost Surveys of Structures
  - Preliminary Bat Roost Assessment (PBRA) – to identify the bat roost suitability of built structures (buildings, culverts, railway bridges and underground structures) to inform the requirement for further surveys; and
  - Follow-up presence/absence surveys and roost characterisation surveys – to determine the presence/inferred absence of bats within structures identified as having bat roost potential. The surveys involved emergence/return-to-roost surveys and hibernation surveys, in which are currently being updated in 2021.
- Roost Surveys of Trees
  - Ground-Level Tree Assessments (GLTA) – to focus on identification of potential tree bat roosts;
  - Follow-up presence/absence surveys and roost characterisation surveys – to determine the presence/inferred absence of bats within trees identified as having bat roost potential. The surveys involved emergence/return-to-roost surveys and aerial inspection surveys;
- Bat activity surveys
  - Vantage point surveys – pairs of surveyors sat in static positions and using thermal imaging technology to identify the behaviour of bats at linear habitat features (hedgerows, glades, footpaths and country lanes) due to be severed by the Scheme. Observations were made regarding height and direction of flight, behaviour and time after sunset.
  - Bat-tracking surveys – larger teams of surveyors (up to 10 people) roaming within designated ‘compartments’ to understand the movement of bats through broader habitats such as woodlands and along roads (The Broadway).
  - Automated detector surveys – to assess the species assemblages and distribution of activity at numerous locations across the survey area.

DATES OF SURVEY AND PERSONNEL

3.2.2. The dates of survey and details of personnel completing the survey are provided in Table 3-1.

Table 3-1 – Survey dates and personnel.

Roosting Bat Surveys: Structures

Survey Type	Dates of survey	Personnel
Preliminary Bat Roost Assessments (PBRAs)	20 May, 1 and 3 July and 29 October 2020.	Two licensed bat ecologists were involved in these surveys. Their NE licence numbers were: 2018-33429-CLS-CLS / 2018-37280-CLS-CLS

Roosting Bat Surveys: Trees

Survey Type	Dates of survey	Personnel
Ground-Level Tree Assessments (GLTA)	5 and 6 August, 26 November 2019 17 and 18 March, 12 May, 18 November and 2 December 2020 In addition to the above dates, any features noted whilst completing other surveys were recorded. This was a dynamic survey and new features were often identified during aerial surveys (see below) or following weather events (storms, high winds etc), and the results were updated accordingly.	GLTAs were completed by ecologists competent in recognising potential bat roost features. Any inspection of features at ground-level (e.g. using an endoscope) were coordinated and undertaken by a licenced bat ecologist. Three licensed bat ecologists were involved in these surveys. Their NE licence numbers were: 2018-33429-CLS-CLS / 2018-37280-CLS-CLS / 2019-33801-CLS-CLS
Aerial Inspection	27, 28 and 29 August 2019; 14 and 19 May 2020; 8, 10, 12 and 18 June 2020; 9, 15, 16, 22, 28, 30 and 31 July 2020; 4, 6 and 11 August 2020.	Aerial inspections were coordinated and undertaken by teams of two ecologists (at least one holding a Level 2 NE bat licence) who were also qualified in tree-climbing and aerial rescue. The licence numbers of the surveyors involved with these surveys are the same as detailed above.
Dusk Emergence /Dawn Return	Various dates May – September 2020. For a full list of dates, see Table B-1 in Appendix B.	Tree ranging between emergence/re-entry surveys were undertaken by surveyors with experienced in conducting this type of surveys.

Bat Activity Surveys

Survey Type	Dates of survey	Personnel
Vantage Point Surveys	Thermal imaging vantage point surveys were completed in May and June 2019, and between May and September 2020. For full list of dates, see Table D-1 in Appendix D.	Vantage point surveys and bat tracking surveys were undertaken by surveyors with experienced in conducting bat activity surveys.

Survey Type	Dates of survey	Personnel
Dusk/Dawn Bat-Tracking Surveys	Dusk/dawn bat tracking surveys were completed between July – September 2020. For a full list of dates see Table E-1 in Appendix E.	The survey team were led by surveyors experienced in observing and recording bats in flight.
Automated Detector Surveys	Deployment of automated detectors was undertaken between May – September 2019 and 2020. For a full list of months deployed for each detector see Table F-2 in Appendix F.	Detector deployment was undertaken by ecologists experienced in automated detector deployment and collection.

3.3 ROOSTING BAT SURVEYS

PRELIMINARY BAT ROOST ASSESSMENTS OF STRUCTURES

3.3.1. All structures within a 100m buffer of the Scheme were subject to a Preliminary Bat Roost Assessment survey. A visual inspection of structures was undertaken from ground level using binoculars, an endoscope and a high-powered torch to search for features which provide potential roosting opportunities for bats, or potential access/egress for bats to enter internal voids within said structures.

3.3.2. Where potential roosting features or access/egress points were identified, their location and a brief description were recorded, in order to aid further survey work as required. Where possible, each feature was visually inspected for evidence of use by roosting bats, including:

- bat droppings in, around or below the potential roost feature;
- urine staining below the potential roost feature;
- scratch marks; and,
- characteristic staining (from fur oils).

3.3.3. The majority of structures were only subject to an external inspection, due to health and safety concerns associated with the COVID-19 pandemic. Internal inspections were only completed for vacant properties under NCC ownership, or small barn and stable units. The assessment of suitability was based on the available survey data. The precautionary principle was applied where an internal assessment was not possible, and the external inspection recorded potential for suitable conditions to be present.

3.3.4. Where internal inspections were undertaken, these comprised the systematic search of internal spaces for potential roosting features (e.g. crevices in walls, presence of roof beams) and a search for evidence of roosting bats including droppings and roosting bats themselves.

3.3.5. Structures were categorised in line with the descriptions in Table 3-2. Structures categorised as having negligible suitability to support roosting bats are not discussed further in this report.

Table 3-2 – Structures bat roost suitability classification (Collins, 2016)

Bat Roosting Suitability	Description of Roosting Behaviour
Confirmed	A structure with features confirmed to be used by roosting bats either by historic records or evidence recorded during survey.
High	A structure 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 habitat.
Moderate	A structure with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only- the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).
Low	A structure 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 or hibernation).
Negligible	Features with negligible value to structure-roosting bats.

GROUND-LEVEL TREE ASSESSMENT AND PRESENCE/ABSENCE SURVEYS

3.3.6. This report presents the results of both 2019 and 2020 GLTA surveys and tree presence/inferred absence surveys, as the 2020 surveys built upon findings of the 2019 surveys. For these survey types, this report supersedes the 2019 report (WSP UK Ltd, 2020).

Ground-Level Tree Assessment

3.3.7. All trees within a 100m buffer of the Route alignment (or originally 25m buffer of the Scheme as discussed in Table 1-1) were subject to a GLTA. All GLTA surveys were completed by ecologists competent in recognising potential features of suitability for tree-roosting bats. A visual inspection of the trees from ground level using binoculars and a high-powered torch was undertaken to search for features which provide potential roosting opportunities for bats such as:

- woodpecker holes;
- rot holes;
- hazard beams;
- cracks and splits (e.g. frost cracks);
- knot holes;
- cankers;
- dense ivy; and
- lifting/peeling bark.

3.3.8. Where potential roost features were identified, their location and a brief description were recorded, in order to aid further survey work as required. Where possible, each feature was visually inspected for evidence of use by roosting bats, including:

- bat droppings in, around or below the potential roost feature;
- urine staining below the potential roost feature;
- scratch marks; and,
- characteristic staining (from fur oils).

3.3.9. Where features were present at a height possible for a ground-level inspection to be safely completed (e.g. <2m high), this was completed by a Level 2 licensed bat surveyor using high powered torches and/or an endoscope.

3.3.10. Trees were categorised in line with the descriptions in Table 3-3. Trees categorised as having negligible suitability to support roosting bats are not discussed further in this report, beyond those which were downgraded to negligible following further inspection.

3.3.11. A ten-figure grid reference was taken for the trees identified as being of low, moderate or high suitability, and photographs were taken. Additional information with respect to the trees was collected, including species, approximate height (m) and age class.

Table 3-3 – Tree bat roost suitability classification (Collins, 2016).

Bat Roosting Suitability	Description of Roosting Behaviour
Confirmed	A tree with features confirmed to be used by roosting bats either by historic records or evidence recorded during survey.
High	A 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 habitat.
Moderate	A tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only- the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).
Low	A tree of sufficient size and age to contain potential roosting features (PRFs) but with none seen from the ground or features seen with only very limited roosting potential.
Negligible	Features with negligible value to tree-roosting bats.

ROOSTS CHARACTERISATION (BUILDINGS AND TREES)

3.3.12. Based on the features present and the location of the trees, the potential for different types of bat roost to be present was also considered.

3.3.13. For the purposes of this GLTA, potential roosts types were grouped as follows, with descriptions as defined by the Bat Conservation Trust (Collins, 2016):

- Maternity (breeding roost) – where female bats give birth and raise their young to independence.
- Summer roosts, to include:
  - Transitional roosts – used by a few individuals or occasionally small groups for generally short periods of time on waking from hibernation or in the period prior to hibernation.
  - Satellite roosts – an alternative roost found near the main nursery colony used by a few individual breeding females to small groups of breeding females throughout the breeding season.
  - Night roosts - a place where bats rest or shelter in the night but are rarely found in the day. May be used by a single individual on occasion or it could be used regularly by the whole colony.
  - Day roosts - a place where individual bats, non-breeding females or small groups of males, rest or shelter in the day but are rarely found by night in the summer.
- Mating roosts where mating takes place from late summer and can continue through winter.
- Hibernation where bats may be found individually or together during winter. They have a constant cool temperature and high humidity.

PRESENCE/ABSENCE SURVEYS

3.3.14. Any trees identified as being of moderate or high[2] suitability for tree-roosting bats (or a confirmed roost) have been (or will be during 2021 surveys) subject to a follow-up presence/inferred absence survey. The presence/inferred absence survey methods consisted of aerial inspection surveys and dusk emergence/dawn re-entry surveys, as described under the following headings.

3.3.15. For both survey types, the number of survey visits completed was proportional to the level of suitability, as shown in Table 3-4 below. This is in line with current best practice guidance (Collins, 2016). A single survey visit consists of one of the following:

- a dusk emergence survey;
- a dawn re-entry survey; or
- an aerial tree inspection.

3.3.16. The survey types were interchangeable, and trees were sometimes subject to both types of survey. At least two weeks elapsed between survey visits. In some cases, the number of survey visits exceeded the number recommended in Table 3-4. In total, 12 trees (T18, T19, T20, T22, T26, T58, T59, T60, T63, T105, T204 and T212) were subject to additional survey effort due to being located in frequently visited areas and having easily accessible features.

[2] Negligible and low trees did not receive a climbed inspection, in accordance with best practice survey guidance (Collins, 2016). The low potential trees were all recorded on a plan and will be considered when the bat mitigation strategy for the Scheme is formulated.

3.3.17. In cases where the GLTA classified a tree as high or moderate suitability, but the aerial inspection survey confirmed that the feature was unsuitable for roosting bats, the tree was downgraded accordingly (see Table B1 in Appendix B for changes in roosting suitability where applicable).

Table 3-4 – Recommended number of presence/absence survey visits.[3]

Roost Suitability	Recommended minimum number of survey visits
Low	No survey further survey required. Tree will be subject to checks immediately prior to felling.
Moderate	Two separate survey visits.
High	Three separate survey visits.
Confirmed Roost	At least three separate survey visits, or until roost has been characterised.

Aerial Inspection

3.3.18. Aerial inspection surveys were undertaken by qualified tree-climbers holding a Level 2 Natural England bat licence (or were supervised by an ecologist holding a Natural England Level 2 licence).

3.3.19. Where possible, ladders were used to access features that were less than 3m high. Any features greater than 3m in height (or where ladder access was deemed unsafe) were subject to aerial climbing inspections. Surveyors undertook inspections with high powered torches, endoscopes and mirrors. Information about the features were noted, for example, dimensions and exposure to cold, rain and light. After inspection, the suitability of the potential roost feature was re-evaluated depending on the suitability of the feature to support roosting bats, and re-categorised as appropriate (as Low, Moderate or High).

3.3.20. In instances where trees were unsafe to climb, or if the feature could not be fully inspected to confirm the inferred absence of a bat roost, the tree would be assessed as requiring dusk emergence/ dawn re-entry surveys as appropriate to determine its roost suitability categorisation.

Dusk Emergence/Dawn Return

3.3.21. These surveys were undertaken by surveyors experienced in completing tree emergence/re-entry surveys. Surveyors positioned themselves in order to achieve optimal visibility of the tree and any potential roosting features. In most cases one surveyor could survey the tree adequately, however, in some cases where there was restricted visibility or many features, a second surveyor was required.

3.3.22. The dusk emergence surveys began 15 minutes before sunset and continued for at least 1.5 hours. The dawn re-entry surveys began a minimum of 1.5 hours before sunrise and continued until 15 minutes after sunrise.

[3] 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

3.3.23. Surveyors used a variety of bat detectors, including Batlogger M, Echometer touch and Duet to listen to and record bat echolocation calls. On every survey occasion they were aided by either an infra-red or thermal imaging camera to enable visibility of the tree in darkness.

3.3.24. Surveyors noted features from which bats were observed emerging or returning. Surveyors recorded the species and time of activity, as well as noting any flight lines and comments on activity (i.e. commuting or foraging).

3.4 BAT ACTIVITY SURVEY

VANTAGE POINT SURVEYS (FOLLOWING DEFRA METHODOLOGY)

Surveys

3.4.1. A series of vantage point bat surveys were completed between May – September inclusive. These were intended to build upon information gained about bat activity, specifically with regards to barbastelle and Myotis sp., across the Scheme from 2019 surveys. Locations were linear features which could be surveyed by 2 – 3 people, such as hedgerows, streams, country lanes (The Broadway), woodland glades and footpaths within woodlands. The aim of the surveys was to observe the species composition of bats flying in these locations and to use thermal imagery to determine the direction of flight, activity levels and behaviour. Flight heights were estimated where bats were clearly observed in the field.

3.4.2. Eight vantage point survey locations were confirmed prior to the commencement of surveys. These were locations which had been identified as supporting higher levels of bat activity in 2019 recorded by static bat detectors, and where further understanding was required regarding the nature of activity in these areas. The vantage point locations are shown in Figure D-1 and described in Table 3-5 below.

3.4.3. Each vantage point survey began 15 minutes after sunset and continued until 3 hours after sunset (survey lasted for 2 hours 45 minutes in total).

3.4.4. The survey set-up as detailed in Table 3-5 was determined by the feature under survey, and in most cases this was determined for each vantage point on the first survey occasion. Occasionally the survey set-up changed between surveys, in order to optimise survey results or due to health and safety issues (e.g. cattle in field preventing access).

3.4.5. During each survey the surveyors noted the bat species heard and seen, including the time, location, and, where possible comments on behaviour and direction and approximate height of flight where bats were observed by the surveyor. Surveyors were equipped with bat detectors (EchoMeter Touch (EMT) and Duet) to listen to and record bat activity. Calls registered by the bat detectors were recorded for later analysis using specialist computer software Kaleidoscope Pro, details are provided below.

3.4.6. As well as bat detectors, surveyors were equipped with a thermal imaging camera (models used were FLIR E60, FLIR E75 and FLIR 90) to enable bats to be visualised after dark. As part of the analysis, the thermal imaging footage was matched with seen/heard bats documented by the surveyor in order to comment on the likely behaviour (i.e. commuting/foraging), direction and height of flight, if not detected in the field.

3.4.7. These surveys were conducted once every month at each location over the five-month period, May – September inclusive.

Data Analysis

3.4.8. Analysis of vantage point survey data focussed only on barbastelle (given that this is a rare species known to be present within the local area) and Myotis sp (woodland specialist species which may be impacted by woodland loss to a greater extent than other more generalist species).

3.4.9. Bat call data recorded on detectors during these surveys were analysed manually by ecologists with experience in bat call analysis. Where both surveyors on a vantage point survey detected and/or recorded a bat species at the same time, this was recorded as a single individual to prevent duplication.

3.4.10. During this analysis, all call files (including noise files) were manually checked for barbastelle and Myotis sp. The times of calls were recorded and compared with surveyor notes on bats seen/heard to produce a document of barbastelle and Myotis sp. call times and observed activity on each survey occasion.

3.4.11. In addition to this, the thermal imaging camera footage was analysed by ecologists. The footage was checked at the times when barbastelle or Myotis sp. were recorded by surveyors or by the detectors in order to pick up the behaviour of these bats (e.g. commuting/foraging and direction of flight). Flight height was not recorded during the survey and was therefore not considered as part of the analysis. Instead, a precautionary approach was taken, whereby all barbastelle and Myotis sp. bats detected were considered as part of the analysis, regardless of the flight height.

3.4.12. A quality assurance (QA) process was undertaken which involved completing a check of all calls of 10% of the surveys completed (i.e. 34 vantage point surveys were completed so four of these surveys were subject to QA checks).

Table 3-5 - Summary of Bat Vantage Point Survey Locations (relating to Figure D-1).

Reference	Location	Surveyor Setup	Survey Objective
Vantage point 1	Track running north to south through the eastern edge of The Nursery at the junction to Rose Carr.	Two surveyors sitting back-to-back in the centre of the track, approximately 2m apart, with one facing north, and the other facing south.	To determine the use of the track by commuting and foraging bats. Survey data will feed into the mitigation design at this location.
Vantage point 2*	Grassland between The Nursery and Spring Hills.	Surveyors sitting approximately 40m apart in the centre of the grassland (equidistant from the woodlands on either side), facing each other and in verbal contact with radio-transmitters.	To determine whether bats commute/forage over the open grassland between The Nursery and Spring Hills woodlands, and the height and direction of this flight.
Vantage point 3*	Grassland between Spring Hills and Long Plantation.	Surveyors sitting approximately 40m apart in the centre of the grassland (equidistant from the woodlands on either side), facing each other and in verbal contact with radio-transmitters.	To determine whether bats commute/forage over the open grassland between Long Plantation and Spring Hills woodlands, and the height and direction of this flight.
Vantage point 4	Ringland Lane.	Surveyors sitting approximately 40m apart alongside Ringland Lane (one surveyor on each edge of the Scheme alignment).	To determine the nature of the use of Ringland Lane by commuting bats, and the height and direction of this flight. This survey data will inform mitigation design in this location.
Vantage point 5	The hedgerow north of Weston Road.	Three surveyors (two on the first survey visit) were positioned evenly along the hedgerow. One surveyor sat on the eastern section of hedgerow, one sat in the central junction and one sat along the western section of hedgerow, covering the width of the Route.	To determine the nature of bat activity along this hedgerow. High levels of bat activity were recorded by a static bat detector on this hedgerow in 2019, so 2020 surveys aimed to determine the nature of activity in order to inform mitigation requirements in this location.

Reference	Location	Surveyor Setup	Survey Objective
Vantage point 6	The Broadway.	Two surveyors sitting approximately 40m away from each other and in contact with radio-transmitters, positioned on either side of the Route alignment.	To determine the nature of use of The Broadway by bats, and the height and direction of this flight. This survey data will inform mitigation design in this location.
Vantage point 7	The glade within Foxburrow Plantation.	Two surveyors sitting approximately 40m away from each other and in contact with radio-transmitters, positioned on either side of the Route alignment.	To determine the nature of use of The Broadway by bats, and the height and direction of this flight. This survey data will inform mitigation design in this location.
Vantage point 8	The stream south of Foxburrow Plantation.	Two surveyors sitting approximately 40m away from each other and in contact with radio-transmitters, positioned on either side of the route alignment between Foxburrow Plantation and the stream.	To determine the nature of use of Foxburrow Plantation by bats, and the height and direction of this flight. This survey data will be used to inform mitigation design in this location.

Surveys

3.4.13. Radio-tracking surveys were planned to occur during August 2020, however these were cancelled and therefore additional survey effort was conducted in order to maximise the information gained over the 2020 activity period. This consisted of dusk and dawn bat-tracking surveys. These surveys included the use of mobile survey teams (up to ten surveyors), with an aim to identify movement of bats through woodlands and across larger areas through detection within different 'surveyor compartments'. In addition, the methodology also encompassed tree-roost finding.

3.4.14. These surveys were conducted at four key locations across the Scheme, as shown in Figure F-1:

- Northern Woodlands;
- Woodland south of Ringland Lane;
- The Broadway; and
- Foxburrow Plantation.

3.4.15. Dusk surveys commenced 15 minutes before sunset and continued for 1.5 hours after sunset. Dawn surveys commenced 1.5 hours before sunrise and continued until 15 minutes after sunrise.

3.4.16. During the survey, teams of up to ten surveyors spread around the area under survey, each staying within an assigned 'compartment', attributed a letter from A – H (depending on the number of compartments). Each surveyor was equipped with an Echometer Touch (EMT) bat detector, a radio-transceiver and a weather-writer and survey sheet. During the survey, surveyors made notes of:

- The times of each bat call;
- The nature of activity recorded, if known (i.e. foraging or commuting);
- Comments on direction and height of flight, if observed.

3.4.17. The objectives of this survey were as follows:

- To identify bat commuting routes, with a particular focus on barbastelle;
- To identify key foraging areas, with a particular focus on barbastelle; and
- To identify bat tree-roosts in the area.

3.4.18. Surveyors patrolled their compartment and monitored for any activity associated with potential tree-roosts. Surveyors communicated activity (in particular barbastelle passes) on their radios, in order to track the direction of flight (i.e. the order in which surveyors heard the barbastelle would indicate which direction it was flying).

3.4.19. In instances where a previously unidentified tree was identified as a roost during this survey, a photograph and grid reference of the tree was taken, and this was recorded as a confirmed roost and incorporated into the database of trees for further survey.

Data Analysis

3.4.20. Analysis of bat-tracking survey data followed the same methods as described in 3.5.8 to 3.5.10 (which relates to analysis of vantage point survey data), focussing only on barbastelle and Myotis sp.

3.4.21. Bat call data recorded on detectors during these surveys were analysed manually by ecologists with experience in bat call analysis.

3.4.22. During this analysis, all call files (including Noise files) were manually checked for barbastelle and Myotis sp. The times of calls were recorded and compared with surveyor notes on bats seen/heard to produce a document of barbastelle and Myotis sp. call times and observed activity on each survey occasion.

3.4.23. Barbastelle and Myotis sp. calls were matched between surveyors (i.e. an isolated barbastelle call recorded by more than one surveyor in close time proximity would be assumed to be the same individual and flight paths can be mapped.

3.4.24. A QA process was undertaken which involved completing a check of all calls of 10% of the surveys completed (i.e. 27 bat-tracking surveys were completed so three of these surveys were subject to QA checks).

AUTOMATED DETECTOR SURVEY

Automated Detector Deployments

3.4.25. In addition to vantage point surveys, automated Song Meter 4 (SM4) detector surveys were carried out (referred to hereafter as “automated detector surveys”).

3.4.26. Between May – September inclusive, automated detector surveys were completed across the length of the Scheme. Detectors were placed within habitat features considered likely to be used by commuting or foraging bats within proximity of the route options (such as woodland edges and within areas of woodland, hedgerows and rivers). The microphones used were multi-directional, however, they were placed pointing along the feature under survey, at a height between 1.5 – 2m. The 2020 surveys aimed to build upon similar surveys which were conducted in 2019, to gather further information about the locations of bat commuting routes to be severed by the Scheme. Detector locations were selected with the following objectives:

- to fill data gaps left by the 2019 surveys, where data was missing due to detector failure, access restrictions or new detector locations being added part way through surveys commencing; and
- to add new locations, to increase the concentration of detector locations in areas where high levels of bat activity were recorded by static detectors in 2019, and where further information is required regarding the distribution of bat activity.

3.4.27. As in 2019, in 2020 automated detectors were deployed in a number of detector locations over the length of the Scheme, which resulted in a thorough coverage of habitats and a robust survey approach. The detector locations were each attributed a label, and these are shown in Figure E-1. A summary of the detector deployments between 2019 and 2020 is shown in Table 3-6.

Table 3-6 - Summary of Automated Detector Locations 2019 and 2020.

Year(s) of Survey	Total No.	Detector Locations
2019 only	19	B10i, B11ii, B8, C5, C6, C7, C8, C12, C13, C13i, C14i, C14ii, C15, C15i, C18, C20, C22, C26, D1
2019 and 2020	14	B11i, B9, C1, C11, C19, C21, C23, C24, C25, C27, C28, C29, C4, C60
2020 only	30	B8i, C31, C32, C33, C34, C35, C37, C38, C39, C40, C41, C42, C44, C45, C48, C49, C52, C53, C54, C55, C56, C57, C58, C61, M43, M46, M47, M50, M51, M52
TOTAL	**63**	

3.4.28. Automated detector locations were surveyed every month between May – September inclusive, for five nights in each month. In some instances, five nights of deployment, or deployment in certain months, was not possible, as explained in Section 3.6.1. Full details of deployments are provided in Appendix F.

3.4.29. The automated detectors were set to commence recording at least 30 minutes before sunset and cease recording 30 minutes after sunrise. The automated detectors were particularly concentrated in key areas along the Scheme for commuting and foraging bats, as identified from 2019 surveys. These locations are as follows, from north to south, and are labelled in Figure A-2:

- The Northern Woodlands – a complex of woodlands to the north of the Scheme, including Long Plantation, Rose Carr and The Nursery.
- Ringland Lane – a single track lane intersecting the Scheme in an east – west orientation.
- Woodland south of Ringland Lane – a block of lowland mixed deciduous woodland, which will be severed by the Scheme.
- Hedgerow north of Weston Road – a native hedgerow junction which will be severed by the Scheme.
- The Broadway – a country lane lined with trees and plantation woodland on either side.
- Foxburrow Plantation – a woodland block to the south of the Scheme.

3.4.30. Calls registered by the automated detectors were recorded for later analysis using the specialist computer software Kaleidoscope Pro, as detailed below.

Data Analysis

3.4.31. Once triggered by ultrasound, the SM4 and Echometer Touch detectors were programmed to record sound files with a duration of 15 seconds, which may contain a number of individual bat calls (or passes), or discrete groups of ultrasound 'pulses'. The assessment of relative bat activity is based on the relative abundance of recorded bat calls of each species within each survey period.

3.4.32. It should be recognised that a series of separate sound files may represent several different bats commuting within the range of an automated detector, or a smaller number of bats repeatedly triggering the detector (e.g. bats making repeated foraging passes within the range of a detector).

3.4.33. Where possible, bat calls were identified to species level. However, species of the genus Myotis were only identified to genus level as their calls are similar in structure and have overlapping call parameters, making species identification problematic (Russ, 2013).

3.4.34. Identification of the genus Nyctalus (noctule and Leisler's bat Nyctalus leisleri) was based on the following parameters:

- noctule <20 KHz;
- Nyctalus spp. (noctule or Leisler's bat) >20 KHz.

3.4.35. The following parameters were used to manually identify Pipistrellus species:

- common pipistrelle Pipistrellus pipistrellus ≥40 and ≤49KHz;
- soprano pipistrelle ≥50KHz;
- Nathusius' pipistrelle Pipistrellus nathusii ≤39KHz.

3.4.36. The process for bat call analysis is summarised below:

- Bat calls were run through Kaleidoscope-Pro using the 'Auto-ID' function, which enables identification of species or species groups based on call parameters.
- All bat calls (other than common and soprano pipistrelles for which Auto-ID has a high accuracy (Brabant, et al., 2018)) were manually checked by ecologists competent in analysing bat calls and experienced in the use of Kaleidoscope software. Where the Auto-ID label was incorrect, the correct species label was attributed to the call.
- Each file may contain calls of multiple bat species; however, the Auto-ID function is only capable of labelling one species. This was corrected during manual checks by duplicating the file and labelling each species separately.
- All files which were labelled as common or soprano pipistrelle in the Auto-ID process were manually checked for the presence of barbastelle calls within the same file, to ensure that no barbastelle were missed.
- To allow standardisation and comparison of automated detector survey results the number of bat passes recorded per night (ppn) was used, as explained below (Collins, 2016).

$$Batt\ ppn = \frac{Total\ bat\ passes\ recorded\ at\ a\ SM4\ location}{Number\ of\ nights\ SM4\ Surveyed}$$

3.4.37. No noise files were checked as part of the manual ID process. Noise files consist of any sound which has triggered the detector but which has not been recognised as a bat call, such as crickets or rustling vegetation etc. Occasional bat calls may be present with these, although these are usually short sections of calls from bats which are likely to have been further away from the detector and therefore less relevant to the habitat feature under survey. Although slightly higher numbers of calls of all species may be recorded if the noise files were analysed, this would not alter the results in terms of habitat features with highest/lowest levels of bat activity.

3.4.38. The analysed sound files were subject to a QA process. Ten percent of sound files which were identified as common or soprano pipistrelle and 20% (if more than 10 calls) or 100% (if less than 10 calls) of sound files identified as all other species were randomly selected for quality assurance checks. This process was completed by a suitably competent analyst experienced in using Kaleidoscope software.

3.5 NOTES AND LIMITATIONS

3.5.1. Every effort has been made to provide a comprehensive set of survey data; however, the following assumptions and limitations apply to the above referenced surveys.

GENERAL

- Bat survey data regarding roosting bats is typically valid for one year (CIEEM, 2019). Bat survey work will therefore continue to be undertaken throughout 2021 in advance of the planning application of the Scheme. If for any reason the submission is delayed, further bat survey work may be required to maintain accurate baseline data.

COVID-19

3.5.2. A number of limitations were experienced as a result of the 2020 COVID-19 pandemic.

- Survey work was always undertaken following current the most up to date government guidance at the time of survey. In some cases, detector deployments could not take place due to government guidelines preventing survey work, or landowners not permitting access due to COVID-19. Where this is the case, further survey work in 2021 will target-fill the missing months of data.
- Internal surveys of structures were not completed, unless it was deemed safe to do so (i.e. where the property or structure was vacant), and in these instances appropriate social distancing measures were taken. The precautionary principle was applied where appropriate in assigning a level of bat roosting suitability to buildings where internal access was not possible, as detailed in Section 3.4.4.

ROOSTING BATS

- GLTA can be undertaken at any time of year, however it is generally considered that the optimal time of survey is November – April, as outside of this period tree foliage may restrict visibility. Some of the GLTA surveys reported here were completed outside of these months, however, binoculars and high-powered torches were used as aids to visibility. Any limited visibility was accounted for by adopting a precautionary approach, and repeat surveys were conducted in 2020, and will be conducted in 2021 where deemed necessary. Additionally, bats (and signs of bats) can be encountered during GLTAs undertaken during the active season for bats i.e. between April – October.
- A few trees were considered unsafe to climb and therefore potential roost features within these trees were not subject to aerial inspection. These trees have been (or will be in 2021) subject to follow-up survey (such as emergence surveys with infra-red) as appropriate.
- Woodland roosting bats are known to exhibit regular roost switching behaviour, and therefore roost locations may be used intermittently, and not consistently, each year (Kuhnert, et al., 2016). The use of trees and potential roost features by bats changes as a result of a range of factors, including weather and microclimatic conditions. Due to the ephemeral nature of trees and the roost-switching behaviour of tree-roosting bats, a combination of survey methods has been employed to identify roost locations and further survey work such as radio-tracking will be undertaken to develop the baseline further in 2021.

3.5.3. While the 2020 surveys were in part aimed at filling survey gaps left by the 2019 data collection (due to access limitations or detector failures), some of the automated detector data collection was limited by COVID-19 restrictions, access restrictions or detector failure. Notes and limitations associated with the 2020 bat activity surveys are as follows:

- In order to reduce data gaps as much as possible these will be filled by targeted survey in 2021.
- With respect to the automated detector surveys; where less than 5 nights of data collected due to detector malfunctions or access issues, this was standardised as explained above (paragraph 3.5.38) to calculate bat passes per night, so this was not considered to limit the value of the data.
- Noise files were not analysed as part of the bat activity call analysis process for long-term detector surveys. The reasons for this are explained in paragraph 3.5.39. Although it is inevitable that some bat calls (incorrectly labelled as noise files) will have not been assessed and included as a result of this, these are likely to have been calls from bats a further distance from the detector and therefore less relevant to the habitat feature under survey. Additionally, the bat activity surveys were designed to provide representative data and not to record every pass possible. Therefore, this has been achieved utilising the existing methods and is not considered a limitation to this assessment.
- Calls identified as common pipistrelle or soprano pipistrelle during the Auto-ID process were not subject to a manual ID process. To ensure a robust and accurate dataset, a subset of common and soprano pipistrelle Auto-ID calls from the 2019, 2020 and 2021 static datasets will be subject to manual checks, the methods and results of which will be reported in the final 2021 report. As such, the total number of passes recorded may differ between this report and the final 2021 report.
- Due to the limited field of view of thermal imaging cameras and the speed of flight of bats under observation, vantage point surveys usually only picked up short ‘snapshots’ of bat activity, enough to provide indication of general direction of flight and in some cases the behaviour and observations such as flight height.
- The methodology followed for conducting bat tracking surveys was loosely based on principles set out in best practice guidance (Collins, 2016) for back-tracking surveys, however this was a bespoke survey methodology designed in the absence of August 2020 bat radio-tracking to provide information regarding the movement of barbastelle through the habitats of the Scheme.
- In some cases, due to issues such as poor weather conditions or access restrictions, the data was not collected in the correct month. Where this happened, the data was collected as early as possible in the following month, and a gap of at least two weeks left before data collection in that month. Where this was not possible, data will be collected in 2021.

4 RESULTS

4.1 ROOSTING BAT SURVEYS

PRELIMINARY BAT ROOST ASSESSMENT

4.1.1. A total of 29 structures were identified within the survey buffer, and all of these were subject to external surveys (as previously stated, in most cases internal surveys were not possible due to COVID-19 restrictions). Two of these structures were subject to internal surveys where the building was vacated and was deemed safe to enter (wearing relevant PPE and adhering to social distancing measures). As detailed the methods, a precautionary approach to assigning roosting suitability was taken for buildings where internal inspection could not be undertaken and where sufficient confidence in assessment could not be gained based solely on the external inspection results.

4.1.2. Of the 29 structures, five were found to be confirmed roosts, eight were assigned a high roosting suitability, four were considered to have moderate suitability, and a further five structures were assigned low suitability. The remaining seven structures were considered to have negligible roosting suitability. Further characterisation surveys of structures identified as bat roosts will be completed in 2021.

4.1.3. The overall results of the structure PBRA are summarised in Table 4-1 and below, with full results detailed in Appendix C. The locations of these structures are shown in Figure C-1.

Table 4-1 – Summary results for the Preliminary Bat Roost Assessment of structures

Roosting suitability	No. of structures	Structure references[4]
Negligible	7	3A2, 3A4, 5A3, 5A6, 6A5, 7A1, 7A2
Low	5	1A2, 1A3, 2A1, 5A1, 5A5
Moderate	4	5A4, 6A3, 9A1*, 9A2*
High	8	3A3*, 4A1*, 5A2*, 6A1, 6A2, 6A4, 9A3*, 9A4*
Confirmed roost	5	1A1, 3A1, 7B1, 7B2, 8A1

4.1.4. A brief summary of the confirmed roosts in structures identified in 2020 is provided below:

- Structure 1A1: A small wooden garden outbuilding, with a single bat dropping present beneath a gap in the eaves. No DNA analysis was undertaken as the dropping was crumbled to confirm it had originated from a bat.
- Structure 3A1: Warehouse/storage building, with two bat droppings present beneath a gap in the bargeboard. Droppings were consistent in size with a Pipistrellus sp., but DNA analysis proved inconclusive.

[4] Structures labelled with an asterisk (*) are those for which bat roosting suitability was assigned using the precautionary principle.

- Structure 7B1: A complex of connected barns, used for living space and storage. A single dropping was identified on the floor of a mezzanine ledge within the structure, which was crumbled to confirm it had originated from a bat.
- Structure 7B2: A two-storey residential dwelling which was internally and externally inspected. A number of droppings were identified within each of the three separate loft voids, which were subsequently submitted for DNA analysis.
- Structure 8A1: A single-storey residential dwelling with a flat roof garage, connected to the main structure through a boiler room. Droppings from a brown long-eared bat were found to be scattered along the interior wall of the garage, in the vicinity of boiler room entrance.

GROUND-LEVEL TREE ASSESSMENT AND PRESENCE/ABSENCE SURVEYS

4.1.5. The results presented here include 2019 and 2020 survey results to-date, and supersede the results presented in the 2019 bat report (WSP UK Ltd, 2020).

4.1.6. The results of the GLTA surveys undertaken to-date are shown in Appendix B, including a full table of results (Table B-1) and drawings showing the locations of the trees (Figure B-1). These results are summarised below in Table 4-2.

4.1.7. Table 4-3 summarises the number of trees for which surveys are complete, partially complete, or to be completed in 2021. Trees labelled in red text on Figure B1 are those for which surveys are not yet complete and will be completed in 2021.It should be noted that trees which fell within the boundary of the Scheme were prioritised for survey over trees which fell outside of the Scheme but within the survey buffer.

4.1.8. A total of 324 trees were identified during the 2019 and 2020 GLTA as being of low, moderate or high suitability for bats, or confirmed roosts.

Table 4-2 – Summary of results to-date of trees subject to GLTA in 2019 and 2020.

Current results to-date* – Suitability for tree-roosting bats (Collins, 2016)[5]	No. of trees
Negligible (downgraded following presence/absence)	1
Low	108
Moderate	144
High	45
Confirmed roost	26
TOTAL	**324**

*These numbers are the results of surveys completed in 2019 and up to 2nd December 2020. Additional tree assessment work will be completed in 2021 to develop the baseline further.

[5] Suitability for tree-roosting bats is categorised High, Moderate or Low according to the definitions provided in Table 3-3.

Table 4-3 – Status of follow-up surveys of trees with bat roost potential, based on current roosting suitability of trees assessed in 2019 and 2020.

Survey status	No. of trees
Presence/absence surveys not required - Low value[6]	108
Presence/absence surveys complete	97
Presence/absence surveys partially complete – to be completed 2021	33
No presence/absence surveys complete - to be completed 2021	86
TOTAL	**324**

4.1.9. Of the 86 trees where no survey has yet been completed:

- 4 fall within the Scheme boundary;
- 25 fall within the 25m buffer from the Scheme boundary; and
- 57 fall outside of the 25m buffer.

4.1.10. Of the 33 trees where surveys are partially complete:

- 10 fall within the Scheme boundary;
- 13 fall within the 25m buffer from the Scheme boundary; and
- 10 fall outside of the 25m buffer.

4.1.11. The details of bat tree-roosts confirmed during the 2019 and 2020 surveys are shown in Table 4-4 below. In the following cases, these trees will be subject to further roost characterisation surveys in 2021:

- Where the full set of surveys has not yet been completed due to access limitations or similar in 2020; or
- Where additional surveys are required in order to characterise the roost.

4.1.12. Any tree which has been known to support a bat roost on at least one survey occasion will be regarded as a 'confirmed roost', regardless of the presence/inferred absence of bats on subsequent visits.

4.1.13. Of the roosts identified in Table 4-4, one is considered to be a maternity roost for brown long-eared bats and the remaining 25 roosts are all considered to be non-breeding summer roosts. This includes ten soprano pipistrelle roosts, five brown long-eared roosts, two roosts for natterer's bat, two common pipistrelle roosts and one barbastelle roost. Two of the remaining roosts are used by unidentified Pipistrellus species, and one by an unidentified Myotis species. Two further roosts were confirmed through the presence of bat droppings, with species undetermined due to inconclusive eDNA analysis or due to a low number of droppings not submitted for analysis. An emergence was recorded at the final remaining roost, but the species could not be determined during the survey.

4.1.14.

[6] This category includes trees which were initially assessed as having moderate or high roosting suitability, but which were subsequently downgraded to low following a climbed inspection.

Table 4-4 - Details of confirmed bat tree-roosts to-date.

Tree No.	Bat roost findings	Characterisation of roost based on current data
11	Single barbastelle, present on first survey visit only.	Summer day roost.
20	At least three brown long-eared bats roosting in a vertical hollow. Identified during GLTA – not present on any subsequent visits.	Summer day roost.
21	Three male soprano pipistrelles – one in breeding condition. Droppings present on one subsequent survey visit.	Summer day roost.
27	Single pipistrelle sp. observed emerging on second survey visit.	Summer day roost.
38	Soprano pipistrelle observed emerging on first survey visit. Soprano pipistrelle observed returning to tree on third survey visit.	Summer day roost.
39	At least two soprano pipistrelles roosting in rear chamber of Kent bat box on at least two survey visits.	Summer day roost.
41	At least two soprano pipistrelles roosting in rear chamber of Kent bat box on at least two survey visits.	Summer day roost.
58	Single soprano pipistrelle returning to roost during second survey visit.	Summer day roost.
60	Single brown long-eared bat present on first survey visit only.	Summer day roost.
79	*Myotis* sp. seen emerging from canopy on one survey visit. Further survey required in 2021.	Summer day roost.
105	At least three common pipistrelles present on every survey visit.	Summer day roost.
107	Nine brown long-eared bat observed returning to roost on one survey occasion in August.	Maternity roost.
123	Single Natterers' bat *Myotis nattereri* present on first survey visit only.	Summer day roost.
124	Bat droppings identified within feature on one survey visit, which were crumbled to confirm they were of bat origin.	To be determined.
125	Bat droppings identified on tree on one survey visit, eDNA analysis of droppings were inconclusive due to age.	To be determined
127	Soprano pipistrelle seen returning to roost on second survey visit.	Summer day roost.
136	One emergence (of unknown species) on third survey visit.	Summer day roost.

Tree No.	Bat roost findings	Characterisation of roost based on current data
138	Single common pipistrelle emergence on second survey visit, two common pipistrelles emergences on third survey visit.	Summer day roost.
139	Single pipistrelle emergence on one survey visit.	Summer day roost.
193	At least three brown long-eared bat emergences on first survey visit. Surveys to be completed in 2021.	Summer day roost.
197	At least three brown long-eared bats seen emerging.	Summer day roost.
212	At least two soprano pipistrelles observed returning to roost on final survey visit.	Summer day roost.
220	Two soprano pipistrelles observed returning to roost on third survey visit (the first two visits were ladder inspections).	Summer day roost.
226	Single Natterers' bat present on the first survey visit only.	Summer day roost.
257	Two soprano pipistrelles returned to roost on third survey visit (the first two visits were ladder inspections).	Summer day roost.
259	Single soprano pipistrelle observed returning to roost on two survey visits.	Summer day roost.

4.2 BAT ACTIVITY SURVEYS

VANTAGE POINT SURVEYS

4.2.1. The dates and meteorological data of these surveys are provided in Appendix D, Table D-1.

4.2.2. The vantage point locations are shown in Figure D-1, and are described in Table 3-5 (previous section). The results of vantage point surveys completed between May – September 2020 are summarised below and indicative flight lines are shown in Figures D-2 to D-9.

Vantage Point 1 (Northern Woodlands)

4.2.3. The indicative flight-lines observed at Vantage Point 1 across all three surveys are illustrated in Figure D-2. The results of Vantage Point 1 are summarised below:

Barbastelle

- In two of the three months surveyed (July and August) barbastelle were observed commuting down the woodland track:
  - July – one barbastelle observed commuting south within an hour of sunset.
  - August – three barbastelle observed, all within 1.5 hours of sunset:
    - A single individual was observed flying south;
    - The second observation was an individual flying north after briefly flying south; and
    - The final observation was an individual flying south after briefly flying north.

- In July, one barbastelle was also observed flying east to west into adjacent woodland within an hour of sunset
- In all months, a number of barbastelle were recorded but not seen by surveyors or picked up by thermal imaging. These were likely flying over/along the edges of the woodland or present within surrounding woodland areas. All barbastelle activity occurred more than 30 minutes after sunset, with the majority of activity also having occurred within 1.5 hours of sunset.

Myotis sp.

- In July and September, Myotis sp. were observed by surveyors during the vantage point surveys.
- In July, four Myotis sp. were observed with the earliest observation at 59 minutes after sunset, including:
  - two individuals commuting north along the track,
  - one individual commuting south along the track; and
  - one individual flying across the track from east to west into adjacent woodland.
- In August, a number of Myotis sp. were recorded by detectors but not seen by the surveyor.
- In September, three Myotis sp. were observed between 1 hour 11 minutes and 2 hours 12 minutes after sunset, including:
  - two individuals commuting north up the track (one stopping briefly to forage); and
  - one individual flying across the track from the woodland to the west into the open fields to the east.

Vantage Point 2 (Grassland Between the Nursery and Spring Hills)

4.2.4. The indicative flight-lines observed at Vantage Point 2 across all four surveys are illustrated below in Figure D-3. The results of Vantage Point 2 are summarised below:

Barbastelle

- No barbastelle were observed by surveyors or recorded by an EMT device in June.
- In July, two barbastelle were recorded approximately 80 minutes after sunset. One flew south-west, foraged between the surveyors and then flew south-east, the other was not observed by surveyors.
- In the early September survey, six barbastelle were recorded within an hour of sunset, with three calls accounting for two bats observed flying from east to west, and the others not seen by surveyors.
- Three further barbastelle were recorded, one approximately 90 minutes after sunset and two very close together approximately 2.5 hours after sunset, which accounted for one bat. The first flew from east to west (approximately 15m high), and the other flew north, foraged briefly over the surveyors and then flew west.
- In late September, one barbastelle call was heard and recorded on an EMT device, but not seen by surveyors, just under 3 hours after sunset.

Myotis sp.

- In June, two Myotis sp. calls were heard and recorded on EMT devices, but not seen by surveyors, one within an hour of sunset, and one two hours after sunset. In late September one Myotis sp. call was recorded by an EMT device but not seen by surveyors, approximately 2.5 hours after sunset.
- In July, a few Myotis sp. calls were recorded within five minutes after sunset, but not seen by surveyors. One Myotis sp. was seen and recorded by detectors flying north along the western edge of The Nursery, approximately 105 minutes from sunset.
- In early September, two Myotis sp. were seen, one 1.5 hours (flying east) and one 2 hours after sunset (flying north-east to south-west, approximately 20m high). Three other Myotis sp. calls were recorded between 1.5 – 2 hours after sunset, but not seen by surveyors.

Vantage Point 3 (Grassland Between Spring Hills and Long Plantation)

4.2.5. The indicative flight lines observed at Vantage Point 3 across all three surveys are illustrated in Figure D-4. The results of Vantage Point 3 are summarised below:

Barbastelle

- No barbastelle were recorded during the June survey.
- In August, four barbastelle were recorded but not seen by surveyors, between 1 - 1.5 hours after sunset. These may have been within adjacent woodland or flying high over the grassland.
- In September, one call was identified which could not be distinguished between barbastelle or Myotis sp., this bat was seen flying north at 1 hour 49 minutes after sunset.

Myotis sp.

- Two Myotis sp. were heard but not seen during the June survey (between 1.5 and 2 hours after sunset). One Myotis sp. was seen by surveyors, flying north and foraging between the surveyors, just under 3 hours from sunset.
- One Myotis sp. was recorded in August, but not observed by surveyors, less than an hour after sunset.
- In September, three Myotis sp. were detected, two within an hour of sunset, one flying north and the other south at approximately 15m high and the other just over 2 hours from sunset flying northwest, also at approximately 15m high.

Vantage Point 4 (Ringland Lane)

4.2.6. The indicative flight-lines observed at Vantage Point 4 across all four surveys are illustrated in Figure D-5. The results of Vantage Point 4 are summarised below:

Barbastelle

- No barbastelle were recorded during the June or July surveys.
- During the August survey, both surveyors recorded one barbastelle each, one was seen flying north over Ringland Lane and the other was seen flying west down Ringland Lane, both at one hour and 30 minutes after sunset. It is not clear whether this was two separate bats or the same bat (two separate flightlines are shown on Plate 4-4).

- One barbastelle was recorded in the September survey, but not seen by surveyors, 3 hours after sunset.

Myotis

- No Myotis sp. were recorded during the June or July surveys.
- Two Myotis sp. were recorded during the August surveys, one flying east at 1 hour 51 minutes after sunset, and one flying south at 2 hours 46 minutes after sunset.
- One Myotis sp. was recorded in September, but not seen by the surveyor, 1.5 hours from sunset.

Vantage Point 5 (The Hedgerow North of Weston Road)

4.2.7. The indicative flight-lines observed at Vantage Point 5 across all five surveys are illustrated in Figure D-6. The results of Vantage Point 5 are summarised below:

Barbastelle

- Barbastelle were recorded associating with the hedge during all five survey months.
- All barbastelle activity occurred more than 1 hour after sunset, and most activity occurred less than 2 hours after sunset. Activity included barbastelle flying along the south-eastern section of hedge (in both directions) and flying to and from the central junction of hedge from the centre of the field to the south-east (likely foraging activity). Flight was usually at tree height when flying along the hedgerow.
- The main barbastelle activity observed is shown on Plate 4-5 as a primary flight-line, indicating a flight path which was observed over 5 times.

Myotis sp.

- No Myotis sp. were recorded during the May survey.
- Two Myotis sp. were recorded in June, both over 2 hours after sunset. One was foraging on the north-western section of the south hedge, before flying north west across the field, the other was foraging in the field south of the north-western section of hedge, sticking close to the hedge.
- In July, three Myotis sp. were recorded by the detector, but none of these were seen. All of these were over 1.5 hours after sunset.
- In August, nine Myotis sp. were recorded, all occurring over 1 hour after sunset. Seven of these were seen and were mostly recorded flying close to the ground, between 1m and 4m high. On most of these observations, the bat was flying along the hedge, occasionally foraging within the field to the south or flying north across the hedge.
- In September, one Myotis sp. was recorded approximately 1 hour after sunset, but not observed by surveyors.

Vantage Point 6 (The Broadway)

4.2.8. The indicative flight-lines observed at Vantage Point 6 across all five surveys are illustrated in Figure D-7. The results of Vantage Point 6 are summarised below:

Barbastelle

- In May, one barbastelle was heard and recorded on an EMT device approximately 2 hours after sunset, but not observed by surveyors.
- In June, July, August and September numerous barbastelle were recorded and observed. All barbastelle activity occurred over 30 minutes from sunset, with the majority of activity having occurred within 2 hours of sunset. Most of the observed barbastelle were commuting along the Broadway, with five seen commuting east and thirteen seen commuting west.
- Additionally, in July, one barbastelle was observed flying north and another south across the road, one further barbastelle flew from north of the road before commuting east and another flew from south of the road before commuting west.
- In June, July, August and September a number of barbastelle were recorded but not seen by surveyors or picked up by thermal imaging, particularly during the September survey where ninety-one barbastelle calls were recorded. These were likely flying over/along the edges of the woodland or present within surrounding woodland areas.

Myotis sp.

- No Myotis sp. were recorded during the May and June surveys.
- In July, six Myotis sp. were heard and recorded on an EMT device but not observed by the surveyors. All of these occurred over 1.5 hours after sunset.
- In August, two Myotis sp. were recorded approximately 75 minutes and 90 minutes from sunset, both were observed flying west along the road.
- Two Myotis sp. were recorded in September, both over 2 hours after sunset, one flew east along the road, approximately 3m high, and the other was not observed by surveyors.

Vantage Point 7 (The Glade within Foxburrow Plantation)

4.2.9. The indicative flight-lines observed at Vantage Point 7 across all five surveys are illustrated in Figure D-8. The results of Vantage Point 7 are summarised below:

Barbastelle

- No barbastelle were recorded during the May survey.
- In June, July, August and September numerous barbastelle were recorded and observed. The earliest barbastelle was recorded 18 minutes after sunset, with the majority of activity having occurred within approximately 1 hour of sunset. Most of the observed barbastelle were commuting along the glade, with ten observed flying east and sixteen flying west.
- In June, one barbastelle was also observed flying west along the glade, foraging briefly, then continuing east and another was seen flying west along the glade and then south into the woodland.
- Additionally, in August, the following were recorded:
  - two barbastelle seen flying from the woodland north of the glade, then continuing along the glade (one east, the other west);
  - and three barbastelle observed crossing the track (one flying south, two flying north).
- In September, four barbastelle were also observed crossing the glade, flying southwest at approximately canopy height.

- Also, in September, one bat was observed flying south across the glade approximately 1.5 hours after sunset which could not be distinguished between barbastelle or Myotis sp. as both species were heard and recorded within 30 seconds of each other.
- In June, July, August and September a number of barbastelle were recorded but not seen by surveyors or picked up by thermal imaging. These were likely flying over/along the edges of the woodland or present within surrounding woodland areas.

Myotis sp.

- In May and June, one Myotis sp. was heard and recorded by an EMT device but not observed by surveyors, approximately 1 hour and 1 hour 40 minutes after sunset.
- Two Myotis sp. were recorded in July approximately 2 and 3 hours from sunset, one flew north across the track and the other was not observed by surveyors.
- In August, three Myotis sp. were heard and recorded by an EMT device but not observed by surveyors, approximately 40 minutes, 1 hour 50 minutes and 2 hours 20 minutes after sunset.
- In September, fifteen Myotis sp. were recorded over 45 minutes from sunset. Only four Myotis sp. were observed between 50 minutes and 2.5 hours after sunset:
  - two individuals commuting along the track (one east above the canopy and the other west, approximately 4m high);
  - one individual flying south across the track through the canopy; and
  - one individual flying south from the canopy before continuing west along the track.
- The remaining Myotis sp. recorded in September which were not observed by surveyors or picked up by thermal imaging were most likely flying above the canopy or within the woodland.

Vantage Point 8 (The Stream South of Foxburrow Plantation)

4.2.10. The indicative flight-lines observed at Vantage Point 8 across all five surveys are illustrated in Figure D-9. The results of Vantage Point 8 are summarised below:

Barbastelle

- In May, only one barbastelle was recorded, approximately 1 hour after sunset, flying south across the stream.
- In June, July, August and September barbastelle were recorded and observed over 40 minutes from sunset. The majority of observed barbastelle were commuting west along the woodland edge.
- In July, one barbastelle was also recorded flying east along the woodland.
- In August, one barbastelle was also observed flying north into the woodland, another flying east along the woodland edge and another exiting the woodland before flying west along the woodland edge.
- In July, August and September a number of barbastelle were recorded but not seen by surveyors or picked up by thermal imaging. These were likely present within the woodland or foraging out of view.

Myotis sp.

- No Myotis sp. were recorded during the August survey.
- In July, one Myotis sp. was heard and recorded by an EMT device approximately 2 hours from sunset but was not observed by surveyors.
- In May, ten Myotis sp. calls were recorded from 105 minutes after sunset, with just one of these being observed by surveyors, flying from the west below the stream, then continuing south.
- In June, five Myotis sp. were recorded from 1.5 hours after sunset:
  - One individual flew west along the woodland edge, then continued north into the woodland;
  - One individual flew out of the wood, foraged briefly over the stream, then flew back into the woodland; and
  - remaining individuals were not observed by surveyors.
- In September, three Myotis sp. were recorded and observed:
  - one individual flew north towards the woodland from the meadow (approximately 4m high) 49 minutes from sunset;
  - one individual flew south out of the woodland (approximately 2m high) 115 minutes after sunset; and
  - one individual flew southeast (potentially from the woodland), foraged briefly over the meadow and then flew northwest back towards the woodland (approximately 5m high) 130 minutes after sunset.

BAT-TRACKING SURVEYS

4.2.11. Figures F2 – F9 show the indicative flight lines of barbastelle and Myotis sp. at each of the four bat-tracking locations.

4.2.12. The Plates below (Plates 4-1 to 4-4) show indicative surveyor compartments for surveyors to broadly survey within, for reference in the text. However, it should be noted that these varied between surveys depending on the number of surveyors. Where fewer surveyors were present the compartments were slightly larger or a smaller area was covered.

Northern Woodlands

4.2.13. The compartments roamed by surveyors during these surveys are shown in Plate 4-1 below. The results of dusk and dawn bat tracking surveys in the northern woodlands are shown in Figure E-2 and Figure E-3.

Plate 4-1 – Indicative surveyor compartments in the Northern Woodland.

4.2.14. Notable findings from the surveys of the Northern Woodland complex included:

Barbastelle

- Compartments K and L were only surveyed on one dawn survey occasion. The surveyor positioned in compartment L recorded 42 barbastelle passes between 86 and 26 minutes before sunrise. This is indicative of a barbastelle roost within proximity of this area.
- Across all surveys, barbastelle activity was consistently highest along the track (compartments G and F) and in compartment B and C, which connect to a strip of woodland to the north-west. This is indicative of barbastelle movement through the woodland, possibly between woodlands to the north-west and to the south of this area.
- During both the dusk and dawn surveys barbastelle were recorded flying in various directions through the woodland, and both north and south along the track. This may indicate foraging activity of barbastelle throughout the woodland. However, during the dawn surveys, it appeared that more barbastelle were observed commuting south through the woodland in the direction of Primrose Grove (south of compartment L).
- Compartment J was surveyed on one dawn survey occasion, during which surveyors did not observe or detect any barbastelle.

Myotis sp.

- Very few Myotis sp. were observed by surveyors during the surveys of the Northern Woodlands. During the dusk surveys, Myotis sp. were observed on three occasions by surveys, once observed in compartment B flying south through the woodland towards Rose Carr from the narrow woodland strip to the north-west, and once observed foraging around this area.
- On one occasion a Myotis sp. bat was observed flying south down the track (compartment G).
- During the dawn surveys, two Myotis flight lines were observed, one within compartment I, and the other between compartments G and C flying north-west in the direction of compartment B.

- The compartments roamed by surveyors during these surveys are shown in Plate 4-2 below. The results of dusk and dawn surveys in this location are shown by Figure E-4 and Figure E-5.

Plate 4-2 - Indicative surveyor compartments in the woodland south of Ringland Lane.

4.2.15. Notable findings from the surveys of the woodland south of Ringland Lane are as follows:

Barbastelle

- During one July dawn survey, no barbastelle were recorded throughout the whole survey. On another survey, one barbastelle call was recorded at 61 minutes before sunrise by the surveyor roaming in compartment A.
- Six barbastelle were recorded within the same minute in compartment A during an August survey visit (97 minutes before sunrise), which may indicate brief foraging activity. During the same survey, the surveyor in compartment C recorded a single barbastelle call at 68 minutes before sunrise. No surveyor saw any barbastelle during these surveys.
- The final dawn survey visit in August saw ten barbastelle passes recorded by the surveyor within Compartment A. Four of these were within the same two minutes (113 – 114 mins before sunrise) and the latest call was at 42 mins before sunrise. Surveyors in compartments B, C and D also picked up some of these barbastelle passes at times which would indicate that it may have been a single bat circling around the perimeter of the woodland.
- Barbastelle were occasionally recorded on dusk surveys at times ranging between 54 minutes to 145 minutes after sunset.
- Similarly to the dawn surveys, most barbastelle activity was recorded by the surveyor in compartment A and occasionally by surveyors compartment closest to the track, with groups of passes close in time suggesting foraging activity.

Myotis sp.

- In one July dawn survey and one August dawn survey no Myotis sp. were observed or recorded by surveyors during the survey.
- On other survey visits Myotis sp. were detected infrequently, but never observed by surveyors. The earliest of these Myotis sp. calls was mostly recorded at 45 minutes after sunset, however most of the calls recorded were over an hour after sunset

The Broadway

4.2.16. The compartments roamed by surveyors during these surveys are shown in Plate 4-3 below. *Myotis* sp. and barbastelle flight lines observed during the dusk and dawn bat tracking surveys are shown in **Figure E-6** and **Figure E-7**.

Plate 4-3 - Indicative surveyor compartments along the Broadway.

4.2.17. Notable findings from the surveys on the Broadway are as follows:

Barbastelle

- Most activity was recorded within compartments D – G, at the eastern end of the Broadway, and within the woodland either side of the road on Telegraph Hill (compartment G), and towards the centre of the Broadway.
- Within the woodland immediately south of the road at Telegraph Hill (compartment G), and along this section of road, the frequency and times of recorded calls would suggest the presence of a barbastelle roost within proximity of this area, consistent with the findings of radio-tracking surveys completed in 2019 (WSP UK Ltd, 2020).
- At dawn, barbastelle were observed commuting east – west along the Broadway on a number of occasions. Flight lines along the Broadway from west to east were also occasionally observed and recorded, as well as bats circling back and forth along the Broadway.

- At dusk, barbastelle were observed and recorded flying both east and west along The Broadway, as well as one observation of a barbastelle joining The Broadway from the woodland south of compartment C and flying east.
- Although not seen in most cases, when observed by surveyors barbastelle were seen flying approximately at 1.5 – 2 m in height.
- Barbastelle calls at dawn were recorded between 92 – 10 minutes before sunrise, with the latest calls (closest to sunrise) being recorded along the eastern section of road, consistent with the likely presence of a barbastelle roost in this area.
- Barbastelle calls at dusk were recorded between 25 – 120 minutes after sunset, with the earliest call being recorded along the eastern section of road, consistent with the suspected presence of a barbastelle roost in this area.

Myotis sp.

- A *Myotis* sp. was observed at 47 minutes after sunset on one dusk survey flying west along the Broadway in compartment E. This was the only *Myotis* sp. observed by a surveyor on any survey occasion.
- The highest number of *Myotis* sp. calls recorded by detectors was on a dusk survey in August, where thirteen calls were collectively detected between all surveyors. These calls were concentrated in compartment G (5 calls) and compartment A (4 calls). The earliest call recorded on this night was 31 minutes after sunset.
- Other than this, few *Myotis* sp. calls were detected on other survey nights, with a maximum of 4 calls being recorded on any other night.

Foxburrow Plantation

4.2.18. The compartments roamed by surveyors during these surveys are shown in Plate 4-4 below. *Myotis* sp. and barbastelle flightlines observed during the dusk and dawn bat tracking surveys are shown in **Figure E-8** and **Figure E-9**.

Plate 4-4 – Indicative surveyor compartments within Foxburrow Plantation.

4.2.19. Notable findings from the surveys of Foxburrow Plantation are as follows:

Barbastelle

- More barbastelle activity was recorded at dusk than at dawn in this location.
- Barbastelle were rarely observed by surveyors, and they did not appear to be flying down rides (where surveyors may have seen them) so were most likely flying through woodlands.
- Flight lines were therefore mostly inferred from the order at which they were recorded in different compartments.
- When barbastelle were observed, they appeared to have been flying at a height of approximately 12 metres.
- At dusk, barbastelle were recorded between 37 minutes after sunset and 69 minutes after sunset.
- At dawn, barbastelle were recorded between 85 minutes before sunrise and 23 minutes before sunrise.
- Flight-paths from east to west or west to east along the woodland ride (compartments A, E, D, F, H) were the most frequently recorded, with barbastelle less frequently picked up flying in a north to south direction down the woodland ride (compartments E, D, C).
- In addition to barbastelle flying along rides, individual barbastelle were detected by surveyors within the woodland blocks. Where these were not heard by other surveyors they were not noted as a flight-path, however this demonstrates that barbastelle are flying freely through woodland rather than consistently sticking to woodland rides.
- On some occasions, the activity recorded on detectors was indicative of barbastelle foraging, with multiple calls detected within a short time period, in isolation from any other periods of barbastelle calls.

***Myotis* sp.**

- Similarly to barbastelle, *Myotis* sp. were seen on very few occasions, and in most instances were recorded by detectors but not seen by surveyors. Therefore, the flightpaths shown in the figures are inferred from the order in which they were detected by surveyors.
- *Myotis* sp. were recorded flying in various directions at both dusk and dawn. The dawn surveys recorded *Myotis* sp. flying along the woodland edge to the south of Foxburrow Plantation in both directions.
- Both dusk and dawn surveys also recorded *Myotis* sp. flying in a north-east direction through Foxburrow Plantation, from the stream to the south (compartments C, D and E).
- On one occasion a *Myotis* sp. was also recorded flying north up the central glade from the south.
- Times of *Myotis* sp. calls recorded during the dawn surveys ranged between 90 minutes before sunrise to 21 minutes before sunrise.
- Times of *Myotis* sp. calls recorded during the dusk surveys ranged between 46 minutes and 113 minutes after sunset.

4.2.20. *Myotis* sp. are likely to be flying freely through the woodland canopy and possibly also over the canopy, which would account for why they were most often not seen by surveyors.

4.3 Automated detector surveys

4.3.1. A least eight bat species were recorded using habitats within proximity of the Route during the automated bat detector surveys. The confirmed species or species groups include:

- Myotis sp.;
- Noctule;
- *Nyctalus* sp. (this encompasses both noctule and Leisler's);
- serotine bat Eptesicus serotinus;
- barbastelle;
- brown long-eared bat;
- common pipistrelle;
- soprano pipistrelle; and
- Nathusius' pipistrelle.

4.3.2. The calls recorded during the automated detector surveys each month are summarised in **Table 4-5** below. A more detailed summary of the automated detector data is presented in**Table F-1**, Appendix F.

4.3.3. The automated detectors have been grouped into the following areas (listed below from north to south, and shown in Plates 4-5 to 4-13), with the detector locations included in these areas shown in brackets. These locations are grouped in **Table 4-5**:

- A: River Wensum (C1);
- B: Stream South of the River Wensum (C39);
- C: The Nursery and Rose Carr (C60, C4, C37, C38, C48, C49, C58, C61);
- D: Eastern edge of Spring Hills (C5, C44, C45, C52);
- E: Grassland within Northern Woodlands (M46, M47, M50, M51, M52);
- F: Northern edge of Primrose Grove (C57);
- G: Long Plantation (C7, C8, C53);
- H: Ringland Lane (C19);
- I: Woodland South of Ringland Lane (C54, C55, C18);
- J: C11 hedge (C11, C33, C35, C56);
- K: Weston Road (B8i, B8);
- L: Arable South of Weston Road (B9, C12, C28, C34);
- M: The Broadway (B10i, C13, C13i, C20, C21, C22);
- N: Hedgerow between Broadway and Foxburrow Plantation (C27);
- O: Foxburrow Plantation (B11i, B11ii, C14i, C14ii, C15, C15i, C23, C24, C41, C42);
- P: Foxburrow Stream (C32); and
- Q: Hedges south of Foxburrow Plantation (C25, C26, C29, C31, C40).

4.3.4. The mean number of 'passes per night' of each species in each area has been calculated (if more than one detector location is included), and this data is presented in Plates 4-5 to 4-13.

Table 4-5 - Summary of bat species records at each location.

Area A: River Wensum

Month	Total No. of detectors	Total No. of nights	Barb ppn	BLE ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pip ppn	55 Pip ppn	Nathusius' Pip ppn
May	1	5	1.0	0.2	22.8	13.8	0.4	0.2	64.2	955.4	0.0
June	1	5	0.0	1.6	2.8	28.2	0.0	0.0	34.2	47.8	1.0
July	1	5	0.2	1.0	3.8	19.4	1.0	0.4	48.4	96.4	0.6
August	1	5	1.8	0.6	21.8	4.2	2.2	0.2	52.0	1333.0	0.0
Sept	1	5	0.2	1.4	6.0	3.0	0.6	0.0	7.4	118.6	0.0

Area B: Stream South of the River Wensum

Month	Total No. of detectors	Total No. of nights	Barb ppn	BLE ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pip ppn	55 Pip ppn	Nathusius' Pip ppn
May	1	5	0.8	0.0	2.0	3.0	1.2	0.0	12.8	21.4	0.0
June	1	5	1.0	0.2	0.8	9.0	0.4	0.0	10.4	22.4	0.0
July	1	5	0.4	0.6	2.8	10.2	0.6	0.6	20.0	49.6	0.0
Aug	1	5	2.8	2.2	3.0	0.4	0.4	0.2	11.8	22.6	0.0
Sept	1	5	3.0	1.4	2.0	0.8	0.6	0.0	42.2	26.6	0.0

Area C: The Nursery and Rose Carr

Month	Total No. of detectors	Total No. of nights	Barb ppn	BLE ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pip ppn	55 Pip ppn	Nathusius' Pip ppn
May	3	15	6.5	0.7	2.0	5.0	0.4	0.7	405.4	37.6	10.8
June	3	15	4.0	1.0	1.9	2.4	0.3	0.6	30.7	73.9	3.7
July	8	40	25.2	1.9	7.7	6.5	1.2	1.0	612.6	277.5	0.2
August	9	40	25.9	3.4	5.9	3.6	0.5	1.7	142.4	350.9	0.1
Sept	9	45	27.5	3.0	5.7	2.2	0.8	0.3	135.8	447.5	0.5

Area D: Eastern Edge of Spring Hills

Month	Total No. of detectors	Total No. of nights	Barb ppn	BLE ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pip ppn	55 Pip ppn	Nathusius' Pip ppn
May	1	5	0.4	0.4	4.2	0.4	0.0	0.2	2.8	1.2	0.0
June	1	5	2.4	0.4	3.6	6.4	0.0	0.0	42.4	46.4	1.2
July	4	20	6.9	2.0	4.8	6.5	1.3	1.1	343.7	159.9	0.4
August	4	20	17.3	2.6	2.8	3.3	0.3	2.7	55.6	208.7	0.1
Sept	4	16	5.9	6.6	4.0	2.6	1.1	0.7	110.8	153.7	0.2

Area E: Grassland within Northern Woodlands

Month	Total No. of detectors	Total No. of nights	Barb ppn	BLE ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pip ppn	55 Pip ppn	Nathusius' Pip ppn
July	5	25	3.4	9.2	9.0	11.5	4.8	0.4	48.9	21.8	0.9
August	5	25	9.2	20.8	5.9	11.7	5.6	1.8	53.8	57.3	0.5
Sept	5	25	6.2	13.4	8.7	2.6	2.9	0.3	32.6	26.2	0.1

Area F: Northern Edge of Primrose Grove

Month	Total No. of detectors	Total No. of nights	Barb ppn	BLE ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pip ppn	55 Pip ppn	Nathusius' Pip ppn
June	1	5	0.4	2.6	13.2	1.4	0.0	0.4	20.8	6.8	0.0
July	1	5	34.8	12.6	11.6	12.4	5.2	1.8	144.2	69.2	0.0
August	1	5	12.0	18.4	8.6	15.8	5.0	2.6	53.0	55.2	0.0
Sept	1	5	17.6	22.6	9.4	3.4	1.4	0.2	124.6	64.6	2.0

Area G

Month	Total No. of detectors	Total No. of nights	Barb ppn	BLE ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pip ppn	55 Pip ppn	Nathusius' Pip ppn
May	2	10	1.4	0.8	6.7	0.0	0.0	0.0	9.7	3.0	0.1
June	2	10	2.5	0.1	0.4	1.4	0.0	0.0	30.9	40.1	0.6
July	3	15	4.5	0.4	0.7	2.9	4.7	2.7	267.5	15.5	0.6
August	3	15	51.5	1.3	4.1	1.5	0.5	0.7	667.9	69.1	0.1
Sept	3	15	6.5	0.6	1.7	2.7	0.2	0.1	467.7	105.9	0.7

Area H: Ringland Lane

Month	Total No. of detectors	Total No. of nights	Barb ppn	BLE ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pip ppn	55 Pip ppn	Nathusius' Pip ppn
May	1	5	9.8	4.0	2.6	0.8	0.2	0.0	12.8	15.2	0.8
June	1	5	0.4	1.0	0.2	0.0	0.0	0.2	7.0	8.2	0.0
July	1	5	0.0	1.2	0.0	3.6	0.4	0.8	19.8	4.4	2.8
August	1	3	31.7	1.0	1.3	0.7	0.0	0.0	16.3	7.0	0.0
Sept	1	4	1.0	0.5	1.3	0.5	0.0	0.0	4.8	12.0	0.3

Area I: Woodland South of Ringland Lane

Month	Total No. of detectors	Total No. of nights	Barb ppn	BLE ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pip ppn	55 Pip ppn	Nathusius' Pip ppn
May	1	5	7.0	1.4	0.4	0.0	0.2	0.2	61.4	102.0	1.0
June	1	5	1.2	0.4	1.0	1.6	0.2	2.0	20.8	45.4	2.2
July	3	15	0.7	1.5	0.3	1.9	0.6	0.6	57.9	60.6	0.7
August	3	15	38.6	2.3	2.1	1.4	1.7	2.1	326.6	131.9	0.1
Sept	3	14	15.2	1.9	2.2	0.8	0.4	0.2	370.4	322.2	0.0

Area J

Month	Total No. of detectors	Total No. of nights	Barb ppn	BLE ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pip ppn	55 Pip ppn	Nathusius' Pip ppn
May	2	10	1.5	1.5	0.7	1.6	0.1	0.1	56.4	5.3	6.1
June	4	20	1.8	2.6	3.6	0.8	0.4	1.1	100.0	7.0	2.5
July	4	20	2.8	2.8	2.8	3.9	0.3	0.2	174.5	6.4	2.1
August	4	20	13.3	6.0	4.1	2.8	1.5	5.8	342.6	129.9	4.8
Sept	3	15	2.3	1.2	3.0	0.0	0.2	0.1	21.0	3.9	0.1

Area K: Weston Road

Month	Total No. of detectors	Total No. of nights	Barb ppn	BLE ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pip ppn	55 Pip ppn	Nathusius' Pip ppn
May	2	10	9.7	6.7	0.7	1.1	0.1	0.0	175.8	24.9	15.2
June	1	5	4.2	4.6	0.0	1.0	0.2	0.0	52.0	4.4	0.2
July	1	5	4.4	4.2	0.0	0.6	0.0	0.0	112.2	14.8	0.4
August	1	5	4.8	6.4	0.0	0.8	0.4	1.8	25.0	11.6	0.4
Sept	1	5	0.2	1.0	0.0	0.0	0.0	0.0	4.6	3.2	0.0

Area L: Arable South of Weston Road

Month	Total No. of detectors	Total No. of nights	Barb ppn	BLE ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pip ppn	55 Pip ppn	Nathusius' Pip ppn
May	3	15	2.0	0.9	0.7	0.4	0.5	0.1	247.1	59.3	4.7
June	4	20	1.3	0.5	0.3	1.0	0.3	0.0	62.4	10.3	10.5
July	4	20	0.1	0.5	0.2	0.9	0.3	0.1	69.3	41.5	9.6
August	4	19	1.3	2.1	2.1	0.6	0.3	0.5	0.5	41.2	0.0
Sept	4	20	3.6	5.9	0.5	0.7	0.3	0.1	16.9	7.2	0.1

Area M

Month	Total No. of detectors	Total No. of nights	Barb ppn	BLE ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pip ppn	55 Pip ppn	Nathusius' Pip ppn
May	1	5	3.2	0.6	0.2	0.4	0.4	0.2	198.6	29.0	0.0
June	6	30	10.3	1.0	1.2	0.5	0.0	0.2	306.7	80.0	3.1
July	5	25	4.5	3.4	1.1	2.5	1.0	1.4	274.8	24.7	1.2
August	5	24	14.9	0.8	2.7	22.3	7.3	12.7	309.4	198.8	0.5
Sept	4	19	7.5	1.9	0.9	1.1	0.3	0.6	364.6	199.0	0.5

Area N: Hedgerow between Broadway and Foxburrow Plantation

Month	Total No. of detectors	Total No. of nights	Barb ppn	BLE ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pip ppn	55 Pip ppn	Nathusius' Pip ppn
May	1	5	0.6	0.6	2.0	0.6	0.4	0.0	35.0	8.2	2.8
June	1	5	0.8	0.0	6.8	0.8	0.0	0.0	23.2	28.6	0.4
July	1	5	0.2	0.6	1.0	2.4	0.2	0.4	50.0	12.2	0.0
August	1	5	3.2	2.2	2.6	2.2	0.0	0.8	19.0	12.6	0.6
Sept	1	5	0.4	1.6	0.4	0.4	0.0	0.0	8.0	9.2	0.0

Area O: Foxburrow Plantation

Month	Total No. of detectors	Total No. of nights	Barb ppn	BLE ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pip ppn	55 Pip ppn	Nathusius' Pip ppn
May	5	25	10.4	0.8	2.0	0.2	0.9	1.0	518.1	114.0	0.2
June	10	49	26.7	1.8	5.4	0.6	0.2	0.6	351.9	223.1	8.6
July	9	45	6.9	1.0	2.4	8.3	1.3	1.2	443.8	208.4	0.9
August	9	45	11.5	6.2	3.3	25.1	5.1	7.1	649.5	279.6	1.9
Sept	7	32	5.5	2.4	1.7	5.5	2.6	3.7	431.9	375.3	0.4

Area P

Month	Total No. of detectors	Total No. of nights	Barb ppn	BLE ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pip ppn	55 Pip ppn	Nathusius' Pip ppn
May	1	5	0.6	0.0	1.2	0.0	0.0	0.2	28.4	12.4	0.2
June	1	5	0.2	0.2	1.4	0.8	0.2	0.6	73.2	101.2	0.2
July	1	5	1.0	0.8	0.6	1.6	0.0	0.0	42.4	33.4	0.0
August	1	5	11.0	3.2	5.0	22.6	36.2	32.2	119.4	34.4	0.0
Sept	1	5	1.2	0.0	0.6	5.4	4.0	0.2	53.2	18.2	0.2

Area Q: Hedges south of Foxburrow Plantation

Month	Total No. of detectors	Total No. of nights	Barb ppn	BLE ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pip ppn	55 Pip ppn	Nathusius' Pip ppn
May	4	20	2.6	0.6	0.5	0.3	1.0	0.6	170.2	24.7	0.6
June	5	24	1.3	0.6	0.1	0.5	0.1	0.1	62.9	14.8	3.4
July	5	25	1.0	2.8	0.3	2.4	0.4	0.2	64.3	7.2	3.7
August	5	25	1.7	1.4	3.6	4.0	1.5	0.8	63.4	25.9	0.04
Sept	5	25	1.7	1.6	1.2	3.4	0.5	0.4	21.5	9.0	0.12

Plate 4-5 - Passes per night of Barbastelle *Barbastella barbastellus* across Areas A - Q.

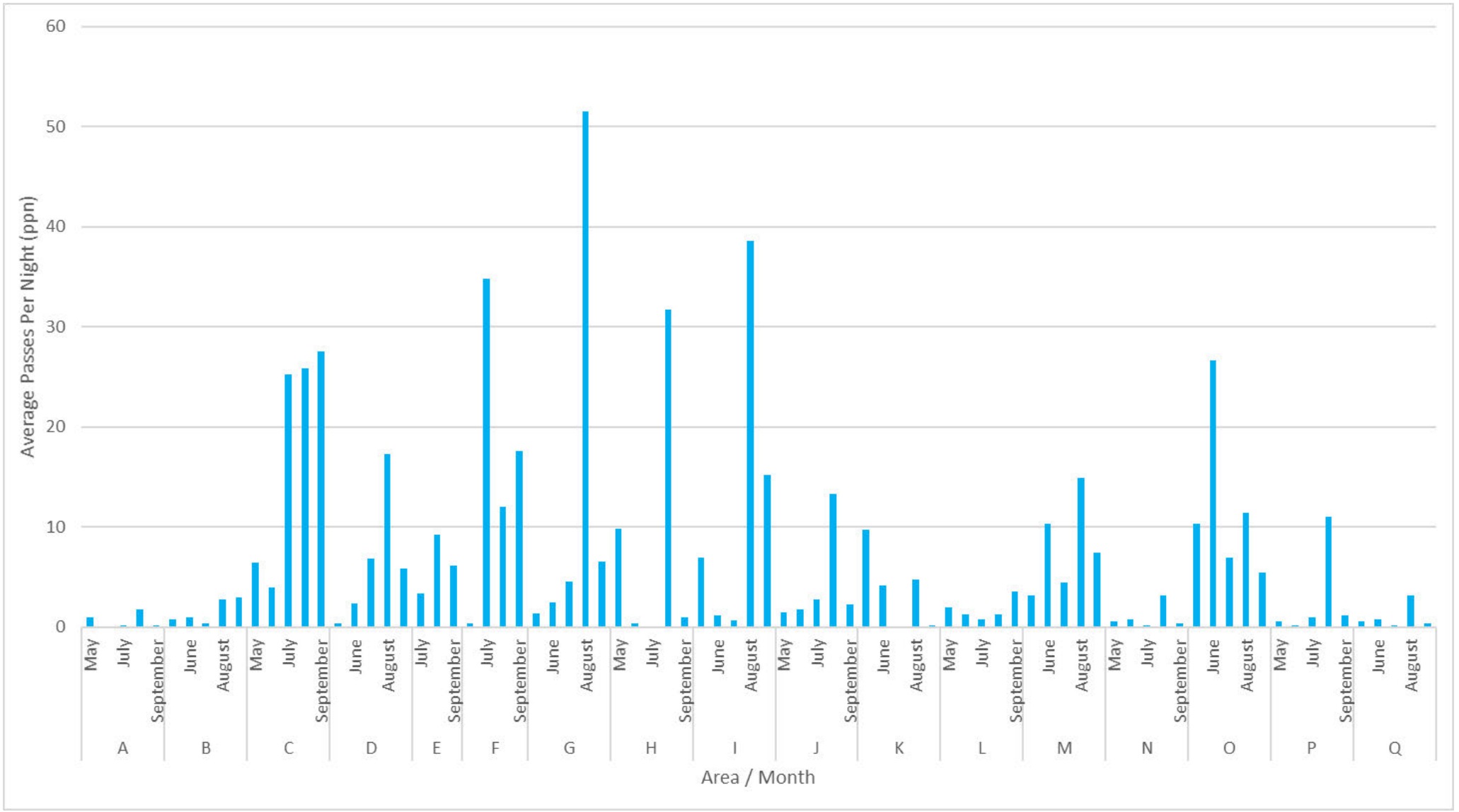


Plate 4-6 - Graph showing passes per night of brown long-eared bat *Plecotus auritus* in Areas A - Q.

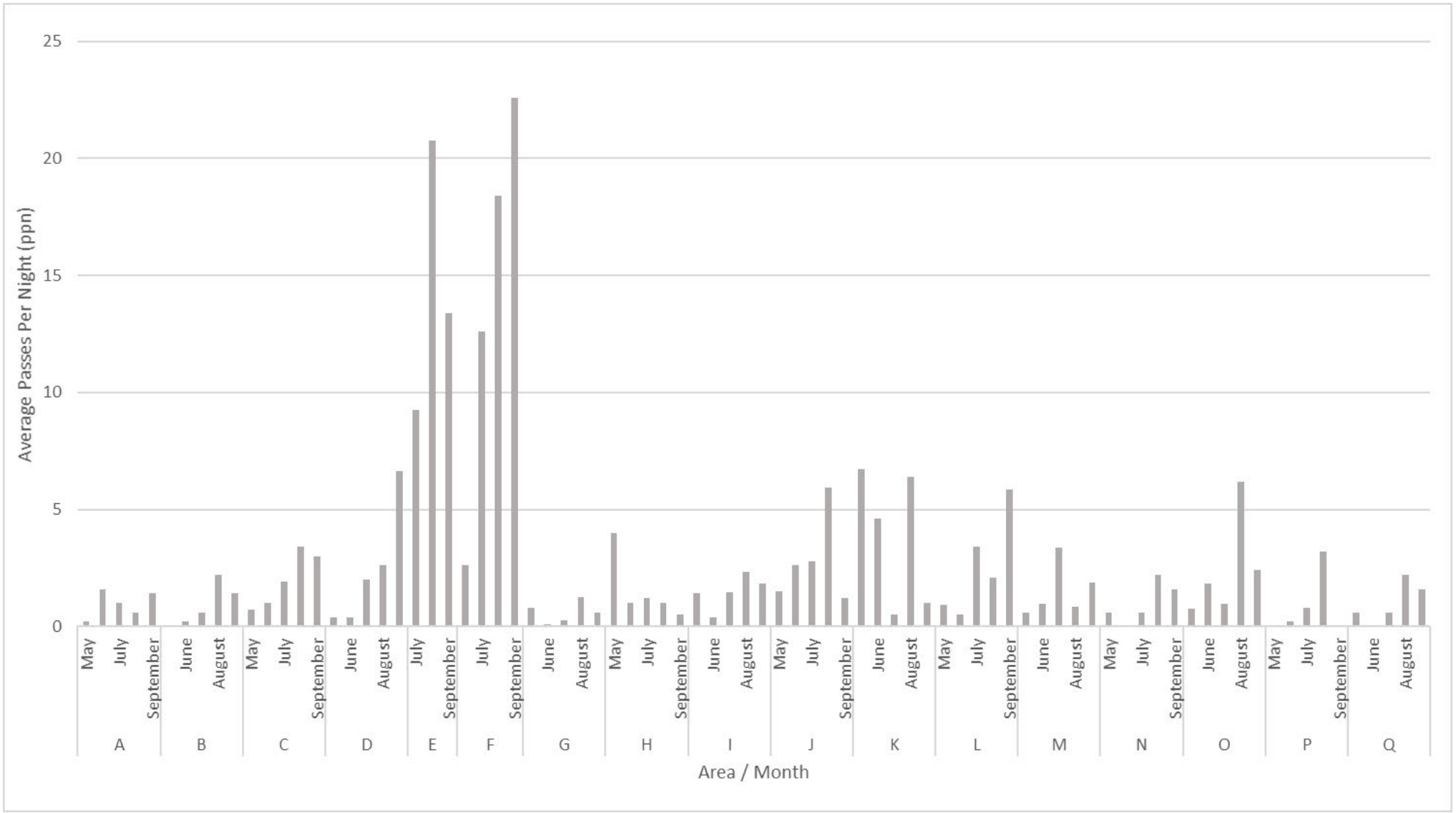


Plate 4-7 - Graph showing passes per night of *Myotis* sp. in Areas A – Q.

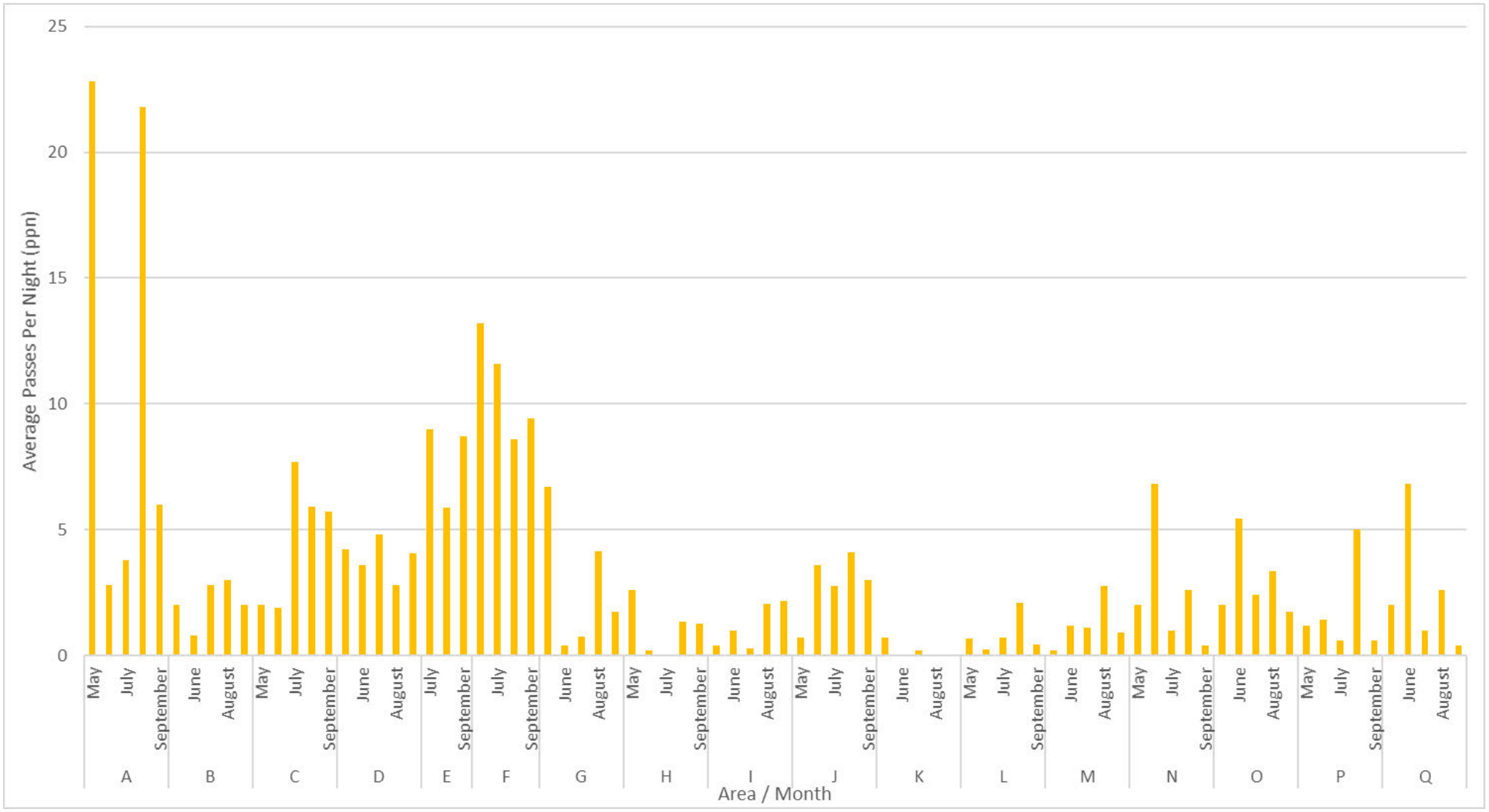


Plate 4-8 - Graph showing number of passes per night of noctule *Nyctalus noctula* at Areas A – Q.

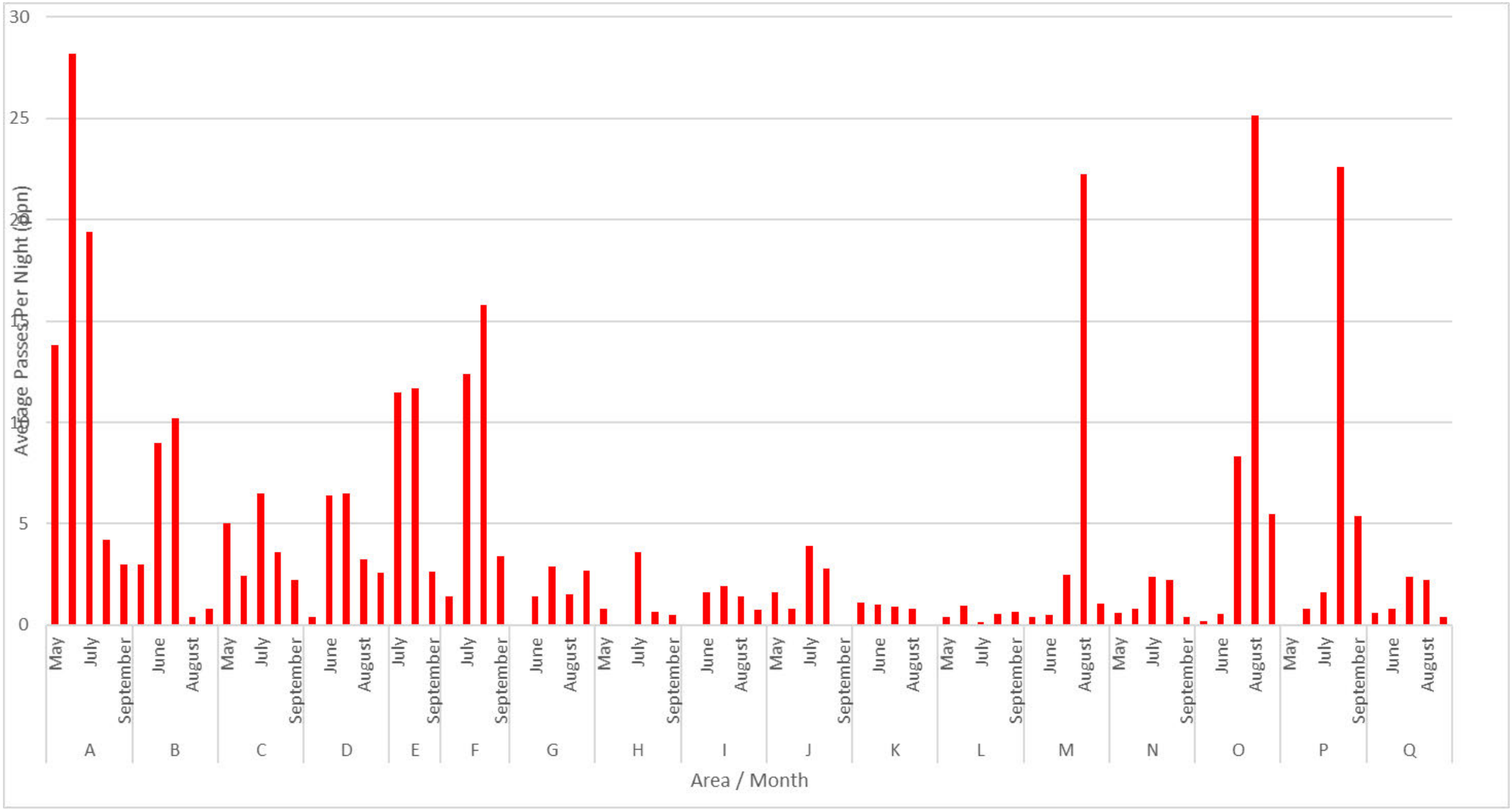


Plate 4-9 - Graph showing passes per night of Nathusius' pipistrelle *Pipistrellus nathusii* in Areas A - Q.

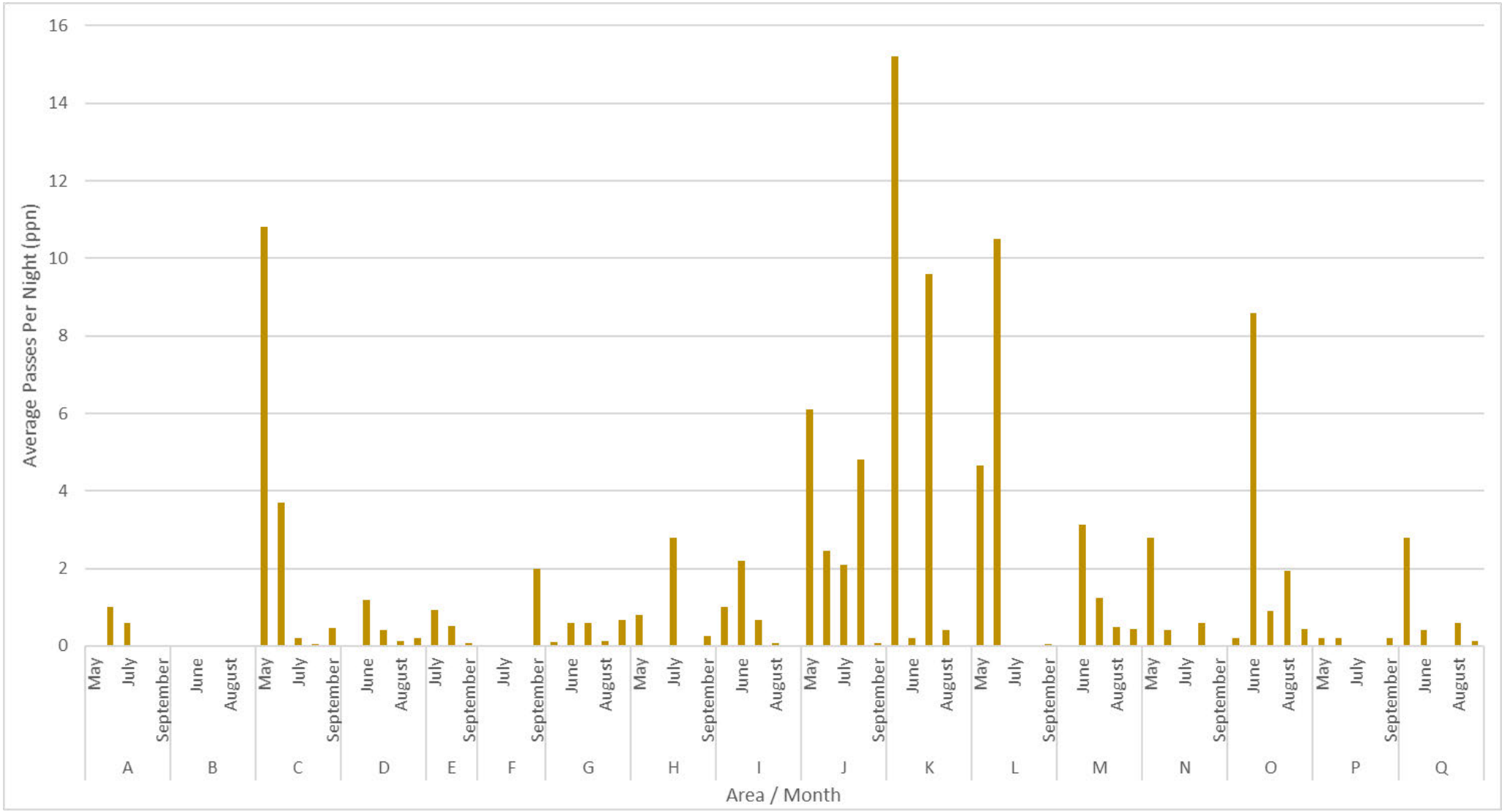


Plate 4-10 - Graph showing the passes per night of soprano pipistrelle *Pipistrellus pygmaeus* at Areas A – Q.

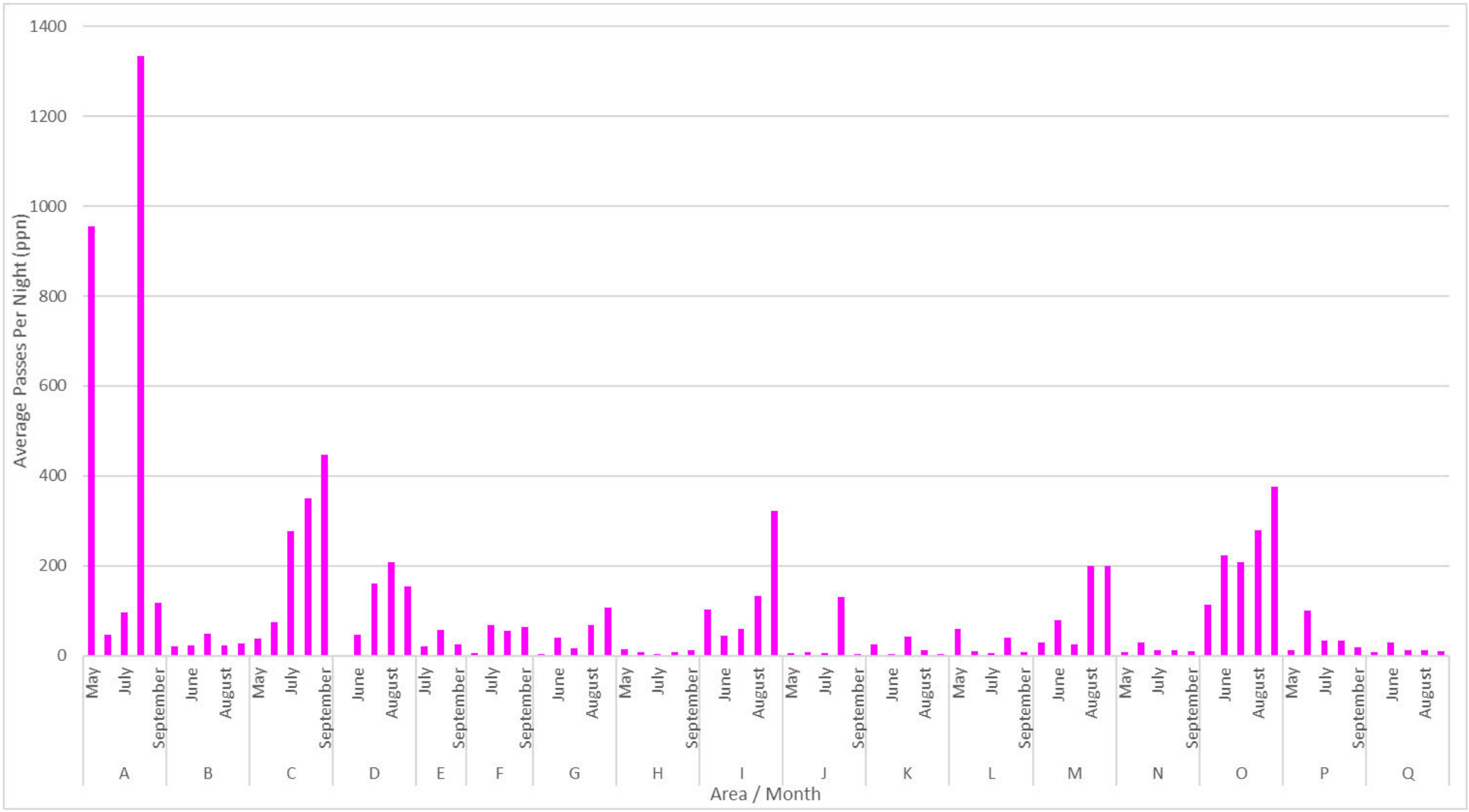
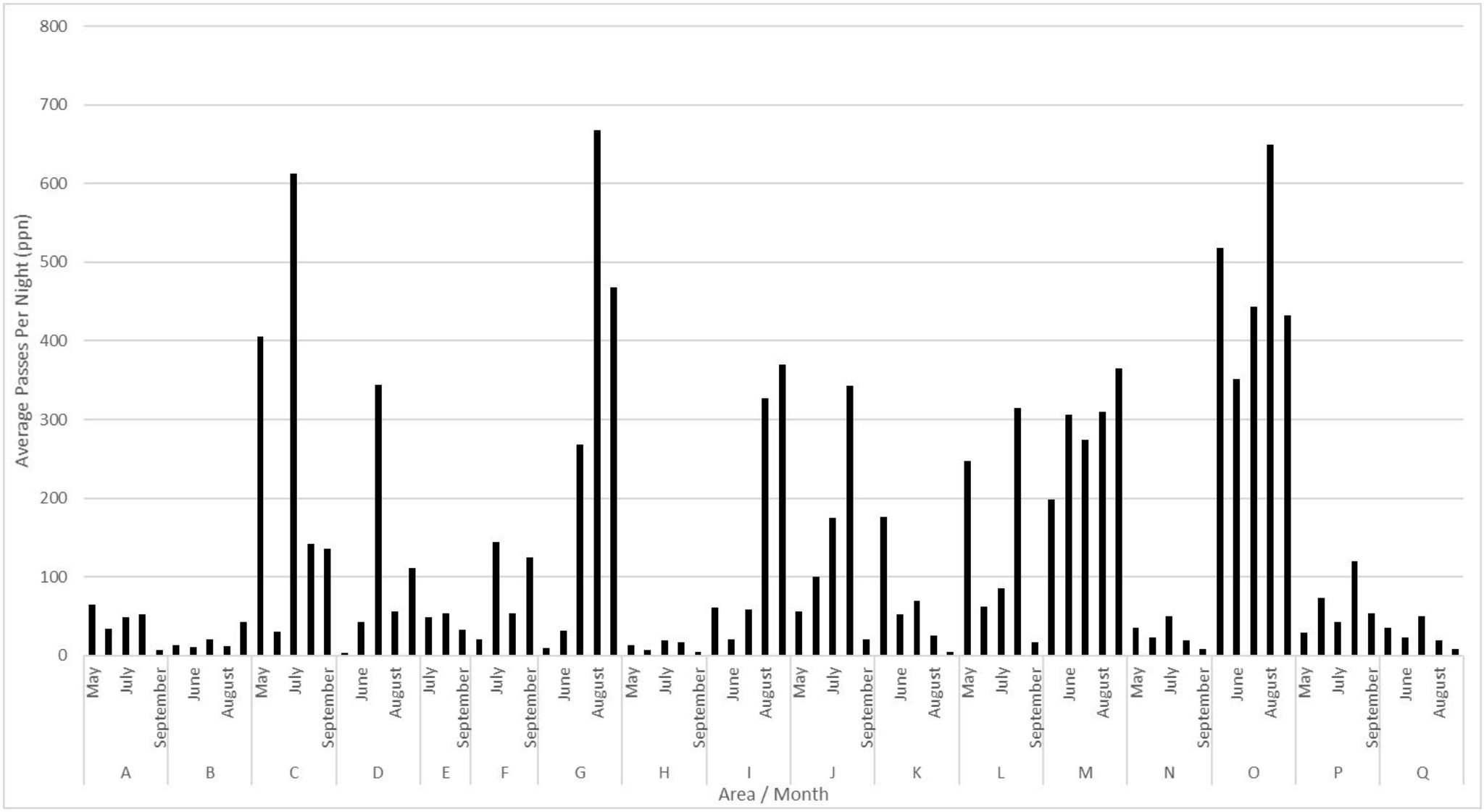


Plate 4-11 - Plate- Graph showing passes per night of common pipistrelle *Pipistrellus pipistrellus* at Areas A - Q.



4.3.5. The areas with cumulatively the highest numbers of bat passes per night (ppn) were The River Wensum (Area A), Rose Carr and The Nursery (Area C), Long Plantation (Area G), the woodland south of Ringland Lane (Area I), The Broadway (Area M) and Foxburrow Plantation (Area O).

4.3.6. In every 'Area' and detector location, bat calls were predominately comprised of common pipistrelle and soprano pipistrelle. In order to show a clear breakdown of other species present, the graphs provided above (Plates 4-5 to 4-11) show the frequency of each species in each area. Graphs for *Nyctalus* sp and serotine are present in Plates F-1 and F-2 in Appendix F. All locations recorded calls of at least six species in addition to common and soprano pipistrelle, including barbastelle, *Myotis* sp. (this could represent multiple species), noctule, *Nyctalus* sp. (this could represent noctule or Leisler's bat), brown long-eared bat, serotine and Nathusius' pipistrelle.

Barbastelle

4.3.7. The highest levels of barbastelle activity were associated with Long Plantation (Area G), where three detectors were present on the northern and southern edges of the woodland and in the centre. The peak in August activity related predominately to the detectors located on the southern and northern woodland edges (101.4 and 36.6 ppn respectively), although the central detector also recorded high numbers of barbastelle ppn relative to the rest of the Scheme (16.6 ppn). Given the known presence of barbastelle maternity roosts within the wider area, this August peak indicates likely foraging activity following birth of young, and dispersal of barbastelle maternity roosts.

4.3.8. Similarly, out of the 17 Areas, 11 Areas saw peaks in barbastelle activity in August:

- Area A – River Wensum;
- Area D – Western edge of Spring Hills;
- Area G – Long Plantation;
- Area H – Ringland Lane;
- Area I – Woodland south of Ringland Lane;
- Area J – Hedgerow north of Weston Road;
- Area M – The Broadway;
- Area N – Hedgerow between the Broadway and Foxburrow Plantation;
- Area O – Foxburrow Plantation;
- Area P – Foxburrow Stream; and
- Area Q – Hedgerow south of Foxburrow Plantation.

4.3.9. It should be noted that peak in August activity does not necessarily indicate higher numbers of individual bats in these locations in August but is more likely to represent constantly foraging barbastelle. This is supported by analysis of the timings of the calls, which show low numbers of calls in the hour after sunset and before sunrise, with the majority of calls occurring throughout the middle of the night, indicative of foraging activity. For example, at the River Wensum (Area A), all barbastelle calls in August were recorded between 22:25 (approximately two hours after sunset) and 04:15 (approximately one hour before sunrise).

4.3.10. The Nursery and Rose Carr (Area C) and the northern edge of Primrose Grove (Area F) saw consistently higher levels of barbastelle activity across July, August and September when compared to May and June, indicating that this is an area of importance to barbastelle throughout the maternity and post-maternity period. In particular, the peak in barbastelle activity in Area F occurred in July, when maternity colonies have formed and heavily pregnant females will be foraging close to roosts. This is reinforced by a number of barbastelle calls at Area F within approximately one hour of sunset (with calls between 21:51 and 22:11) and within one hour of sunrise (with calls between 04:02 and 04:25). Conclusions cannot be drawn about the comparatively lower activity recorded in the earlier months in these Areas as in some cases detectors were not deployed in May and June due to access limitations.

4.3.11. Consistently low levels of barbastelle activity (relative to the Scheme – i.e. never exceeding 5 ppn on any month) were recorded at the following locations:

- The River Wensum (Area A);
- The stream north of the River Wensum (Area B);
- Arable south of Weston Road (Area L);
- The hedgerow between Foxburrow Plantation and the Broadway (Area N); and
- The hedgerows south of Foxburrow Plantation (Area Q).

Brown Long-eared bat Plecotus auritus

4.3.12. Brown long-eared bats were recorded throughout the Scheme in relatively low numbers. Activity only exceeded five ppn in seven of the seventeen areas, and even in areas with the highest levels of activity, the highest average of passes per night recorded in one month was 22.6 (Area F – September).

4.3.13. Although this is comparatively low relative to other common and widespread species, a fair comparison cannot be made given that brown long-eared bats echolocate more quietly and therefore may have a lower 'detectability' than other species (Swift, 1998). This may also account for the fact that this species were recorded in much higher numbers in open areas (e.g. grassland and woodland edge habitats) than within cluttered vegetation and central woodland.

4.3.14. Brown long-eared bats were recorded in high numbers (relative to the rest of the Scheme in the western edge of Spring Hills (Area D), the grassland within the northern woodlands (Area E) and the northern edge of Primrose Grove (Area F). This finding is consistent with the known broad-leaved woodland habitat preference of brown long-eared bats (Murphy, Greenaway, & Hill, 2012), and it also favours closed, edge habitat, such as that provided by the grassland.

Myotis sp.

4.3.15. There were substantial peaks in *Myotis* sp. activity at the River Wensum (Area A) in May and August. It is speculated that these are most likely to be Daubenton's bats *Myotis daubentonii*, a species which typically forages over water. Peaks in May and August suggest foraging activity in the pre- and post-maternity period, before and after the formation of maternity

roosts. It is likely that during June and July these bats travel shorter distances to forage and therefore activity in these months is lower.

4.3.16. Other than Area A, consistently higher levels of *Myotis* sp. activity were observed in the areas encompassed by the complex of northern woodlands:

- The Nursery and Rose Carr (Area C);
- The western edge of Spring Hills (Area D);
- The grassland within the northern woodlands (Area E); and
- The northern edge of Primrose Grove (Area F).

4.3.17. *Myotis* sp. such as Natterer's *Myotis nattereri* are known to forage within woodland habitat, around woodland edges and in the open (Russ, 2012). The northern woodlands provide an extensive complex of sheltered open habitat and woodland edge habitat within which to forage, possibly explaining the higher levels of activity associated with these woodlands.

4.3.18. It is known that a maternity roost of Natterer's bats is present within the Primrose Grove woodland from the 2019 radio-tracking surveys (WSP UK Ltd, 2020), which may explain high levels of *Myotis* activity in this and surrounding areas.

4.3.19. To the south, although *Myotis* sp. activity was lower than in other areas of the Scheme, the following locations observed peaks in activity in June, suggesting the possible presence of a summer roost or maternity colony of *Myotis* sp. in the area:

- The hedgerow between the Broadway and Foxburrow Plantation (Area N);
- Foxburrow Plantation (Area O); and
- Foxburrow Stream (Area P).

Noctule and Leisler's *(Nyctalus sp.)*

4.3.20. The graph of *Nyctalus* sp. ppn is presented in Plate F-1 in Appendix F. *Nyctalus* spp. typically emerge earlier than other bat species (Collins, 2016) and commute at height (above tree level), so it is possible that where there were small numbers of ppn of these species that these consisted of individual commuting noctules commuting to and from their foraging areas (Joint Nature Conservation Committee, 2007). Peaks of activity however (as seen in Area A) likely indicate noctule foraging.

4.3.21. The highest levels of noctule activity were recorded at the River Wensum (Area A), with peaks in May, June and July at this location. In both June and July, the majority of noctule calls recorded at Area A were within approximately one hour of sunset or sunrise, indicating the potential presence of a roost within the locale of the River Wensum, although no noctule roosts were identified within the boundaries of the Scheme (based on results to-date described in this report).

4.3.22. Noctule activity was also high in the areas encompassed by the northern woodlands complex (relative to other areas). Due to the distances travelled by this species, it is possible that they are commuting over or foraging within the northern woodland complex. No noctule roosts were identified within the boundaries of the Scheme based on the results within this interim, however it is possible that a roost is present within proximity of the Scheme.

4.3.23. The central areas of the Scheme (for example south of Long Plantation and north of the Broadway – Areas G – L) observed low numbers of noctule calls and may indicate individual commuting bats not necessarily interacting with the habitats within the Scheme.

4.3.24. The Broadway, Foxburrow Plantation and Foxburrow Stream (Areas M, O and P) observed peaks in noctule activity in August (and September in Area P). This likely indicates foraging activity following dispersal of a maternity roost.

4.3.25. Calls labelled as *Nyctalus* sp. could represent either Leisler or noctule. Both species have similar roosting and foraging preferences.

4.3.26. Across all locations the number of calls labelled as *Nyctalus* sp. was low, only occasionally exceeding 5 ppn (grassland within northern woodlands – Area E, northern edge of Primrose Grove – Area F, and the Broadway – Area M), but never exceeding 8 ppn. The only exception to this was at Foxburrow Stream (Area P) where in August a peak in activity (an average of 36 ppn) was observed. This is indicative of foraging activity following dispersal of a maternity roost – juvenile Leisler's bats were shown in one study to spend two-thirds of their foraging time over pasture or drainage canals, a habitat type with similarities to the stream south of Foxburrow Plantation (Sheil, Shiel, & Fairley, 2006).

Serotine

4.3.27. The graph of serotine ppn is shown in Plate F-2 in Appendix F. Serotine activity was relatively low across all Areas, only exceeding 5 passes per night in three areas, and only in August:

- Hedgerow north of Weston Road (Area J) – August 5.8 ppn;
- The Broadway (Area M) – August 12.7 ppn;
- Foxburrow Plantation (Area O) – August 7.1 ppn; and
- Foxburrow Stream (Area P) – August 32.2 ppn.

4.3.28. This is similar to the findings of *Nyctalus* sp. and suggests that Area P may provide a foraging resource for serotine and Leisler/noctules in the post-maternity period.

Nathusius' pipistrelle

4.3.29. Nathusius' pipistrelle were present at low frequency within most areas of the Areas. The only area where this species was not recorded at all was the stream south of the River Wensum (Area B).

4.3.30. In most areas where Nathusius' pipistrelle activity was recorded, the frequency of calls was highest in earlier months (May – July) and frequency dropped (or no calls were recorded) in August and September.

4.3.31. Particular peaks in Nathusius' pipistrelle activity were noted in the following areas, which may indicate use of these areas as commuting routes or foraging areas:

- The Nursery and Rose Carr (Area C);
- Weston Road (Area K); and
- The arable south of Weston Road (Area L).

Common pipistrelle

4.3.32. Common pipistrelle was the most frequently recorded species and was recorded in high numbers (relative to other species) in all areas. Common pipistrelle are known to be a generalist species, spending it's foraging time in a wide range of habitats (Davidson-Watts, Walls, & Jones, 2006), which explains their abundance across the range of detector locations.

4.3.33. Particular peaks in common pipistrelle activity were observed in the following areas:

- Rose Carr and The Nursery (Area C);
- Long Plantation (Area G);
- Foxburrow Plantation (Area O).

4.3.34. In addition to the average passes per night for common pipistrelle across Areas, a number of individual detector locations within Areas also experienced large numbers (over 1000) of common pipistrelle passes per night throughout the season, including at:

- C14i (Area O) in July and August;
- C41 (Area O) in May and August;
- C42 (Area O) in August;
- C53 (Area G) in August and September;
- C55 (Area I) in September; and
- C60 (Area C) in July.

4.3.35. The woodland south of Ringland Lane (Area I) is an area known to support roosting common pipistrelles, and calls were frequently recorded in this area throughout the automated detector surveys in both 2019 and 2020.

Soprano Pipistrelle

4.3.36. Similarly to common pipistrelle, soprano pipistrelle is a common and widespread species in the UK, and was present in high numbers (relative to other species) in all areas.

4.3.37. Particular peaks were observed at the River Wensum (Area A), where 955.4 ppn were recorded in May, and 1333 ppn were recorded in August. Soprano pipistrelles are known to favour water and riparian habitats for foraging (Davidson-Watts, Walls, & Jones, 2006), and these numbers indicate foraging activity in the periods pre- and post- maternity, with reduced activity in June and July when bats do not travel long distances from their roosts to forage.

4.3.38. Rose Carr and The Nursery (Area C) saw peaks in soprano pipistrelle activity in July, August and September. There are known summer roosts of soprano pipistrelles within this woodland complex and likely more in the wider area, so this woodland complex is likely to be a valuable foraging resource for bats in these roosts.

4.3.39. Foxburrow plantation (Area O) is another area known to support roosting soprano pipistrelles, and high numbers of calls were recorded in this area (relative to the other areas).

5 SUMMARY OF FINDINGS

5.1.1. A summary is provided below for each key habitat feature across the Scheme to summarise knowledge acquired to-date of bat roosts and bat activity in the area, with particular focus on barbastelle. This summary is based on information provided within this report and should not be considered as a final assessment of the Scheme. The final assessment will be provided within a report provided later in 2021, based on information within this report, previous reports (WSP UK Ltd. 2020, Appendix F & WSP UK Ltd, 2020) and further surveys to be completed in 2021.

5.2 River Wensum

Bat activity

5.2.1. Automated detector surveys at the River Wensum (Area A) detected high numbers of *Myotis* sp. (likely to represent Daubenton's bat which is known to favour riparian habitats), noctule (likely commuting high overhead) and common pipistrelle relative to other Areas. Very few barbastelle calls (maximum of 1.8 passes per night in August) or calls of other species were recorded.

Bat Roosting

5.2.2. One tree of low suitability was identified to the north of the River Wensum. No trees of moderate or high suitability were identified and subsequently subject to follow-up surveys.

5.2.3. A number of buildings within proximity of the River Wensum have been identified as potentially suitable for building-roosting bats, or as confirmed roosts, and these will be subject to follow-up presence/inferred absence surveys where appropriate.

5.3 Northern Woodlands

Bat Activity

5.3.1. Barbastelle activity was consistently high within Rose Carr and The Nursery (Area C) between July to September (more than 25 passes per night in all three months), which suggests the presence of a nearby summer roost. This is supported by a July peak in barbastelle activity along the northern edge of Primrose Grove (Area F). Relative to this, barbastelle activity along the eastern edge of Spring Hills woodland (Area D) and within the grassland areas between these two woodland blocks was lower, other than peaks in August which likely represent foraging activity.

5.3.2. Collectively, the Northern Woodlands detector locations had the most consistently high levels of *Myotis* sp. activity of any other area within the Scheme, with the exception of the River Wensum. The grassland and woodland edge habitats in this area also supported high levels of brown long-eared bat activity.

5.3.3. Vantage point and bat-tracking surveys have identified barbastelle commuting in both directions along the track in The Nursery, flying through the woodland strip connected to the north-west of Rose Carr.

5.3.4. Surveys of the grassland between the woodland complex did not record barbastelle flying freely over the open grassland to/from Spring Hills woodland. Barbastelle were only recorded within this grassland on very few occasions during the vantage point surveys, flying at canopy height. Automated detectors placed along woodland edges adjacent to the grassland however, recorded barbastelle in higher numbers than detectors placed within the grassland, indicating that barbastelle may be flying along woodland edges rather than over the open grassland.

Bat Roosting

5.3.5. A total of tenbat roosts were identified within the northern woodlands in 2020, all of which were located within Rose Carr and The Nursery. A maternity roost of Natterer's bats is also known within Primrose Grove from the 2019 radio-tracking surveys (WSP UK Ltd, 2020). No roosts have yet been identified within Spring Hills, or Long Plantation.

5.3.6. Of the roosts identified in 2020, six were soprano pipistrelle roosts, one was a single Natterer's bat roost and two were unknown species (roost identified through presence of droppings). Roost characterisation surveys are still ongoing and to be completed in 2021 in some cases.

5.3.7. A property approximately 250m to the south-east of Rose Carr consisting of a residential dwelling and a number of outbuildings (building group 6A) supported buildings of high and moderate suitability for building-roosting bats.

5.4 Long Plantation

Bat Activity

5.4.1. Barbastelle activity in Long Plantation (Area G) saw a significant peak in August, with an average of more than 50 ppn across the three detector locations, higher activity than was recorded that at any other location across the Scheme. Activity at all three detector locations was high in August, however in other months activity never exceeded an average of 10 ppn across the three detector locations. This is suggestive of a peak in foraging activity following dispersal of maternity roosts within proximity of the area.

5.4.2. Activity of all other species was low or similar to other locations across the Scheme.

Bat Roosting

5.4.3. A number of trees have been identified within Long Plantation as being of moderate or high suitability for bats, however no bat roosts have been identified. Surveys are still ongoing in this area and will be completed in 2021.

5.5 Ringland Lane

Bat Activity

5.5.1. The detector located on Ringland Lane (Area H) recorded a similar pattern of barbastelle activity to the Long Plantation detectors, with a peak in activity in August (more than 30ppn), indicative of foraging activity.

5.5.2. There were no other notable findings from the long-term detector on Ringland Lane, low levels of activity of other bat species was recorded relative to the rest of the Scheme.

5.5.3. Vantage point surveys of Ringland Lane recorded relatively low levels of bat activity, with barbastelle and *Myotis* sp. only observed on the August and September surveys. Barbastelle were observed on one occasion each flying north over Ringland Lane towards Long Plantation, and west along Ringland Lane. *Myotis* sp. were observed on one occasion each flying south over Ringland Lane, and east along Ringland Lane.

Bat Roosting

5.5.4. There were no trees present along Ringland Lane. A few trees were identified within the small block of woodland immediately connected to Ringland Lane to the south, within which a number of trees have been identified as Moderate or High value to bats, and a confirmed roost (single Natterer's bat) is present on the southern edge of this woodland.

5.6 Unnamed Woodland South of Ringland Lane

Bat Activity

5.6.1. Barbastelle activity followed a similar pattern to Long Plantation and Ringland Lane (Area G and Area H), with a spike in activity in August indicative of foraging activity following maternity roost dispersal. Activity levels of other bat species were consistent with activity levels across the Scheme with no notable findings.

5.6.2. Results of bat-tracking surveys in this location varied, with July surveys recording no barbastelle or *Myotis* sp. at all, and the August surveys recording short bursts of barbastelle activity within a short period of time, with short bursts of calls within close proximity of each other, mostly detected along the eastern edge of the woodland. The times of these calls and their proximity in time suggests brief intervals of foraging.

Bat Roosting

5.6.3. Two tree roosts have been identified to-date within this area of woodland. One of these is a common pipistrelle roost, supporting at least three bats, and the other is a brown long-eared bat roost, supporting at least nine brown long-eared bats.

5.6.4. A number of other trees within this woodland block have been identified as high or moderate value to bats and surveys of this woodland are ongoing.

5.7 Hedgerow North of Weston Road

Bat Activity

5.7.1. Detectors placed along this hedge (Area J) recorded lower levels of barbastelle activity than in the Northern Woodlands, Long Plantation or the Unnamed Woodland south of Ringland Lane, however, it followed a similar pattern to these locations, with a peak in activity in August indicative of foraging activity.

5.7.2. A similar pattern of activity (peak in August) was seen in other species in this location – serotine, brown long-eared bat, *Myotis* sp., *Nyctalus* sp., soprano pipistrelle and common pipistrelle. This suggests that the hedge may be used for foraging activity by a number of species.

5.7.3. Vantage point surveys in this location recorded barbastelle flying along the south-eastern section of hedgerow, however very little activity was observed associated with the north-western section of hedgerow, or with the hedgerow perpendicular to it, connected to Weston Road. Further surveys in 2021 will aim to further assess the nature of barbastelle activity along this hedge.

Bat Roosting

5.7.4. No bat roosts have been identified on this hedge. Three trees were assessed as being of Low value and no further survey work is required in 2021.

5.8 The Broadway

Bat Activity

5.8.1. Detectors located along The Broadway (Area M) recorded peaks in activity in June and August, although these peaks were not as notable as in some of the habitats to the north of the Scheme. The peak in June is consistent with the known presence of a barbastelle maternity roost on Telegraph Hill, to the east of the Broadway, as identified through 2019 radio-tracking (WSP UK Ltd, 2020).

5.8.2. Other notable findings were peaks in serotine and noctule/*Nyctalus* sp. activity in August – this may indicate overhead commuting or that these species are foraging along The Broadway, as evidenced by detector location C21 for example, where all serotine calls in August were detected over an hour from sunrise and all but six calls within an hour of sunset.

5.8.3. Vantage point and bat tracking surveys along The Broadway identified the use of The Broadway as a commuting route for barbastelle, flying both along the road itself and also through the woodland strips either side of the road. Barbastelle were recorded flying in both directions along the road, as well as leaving/joining the road from the woodland to the south. Barbastelle activity was highest to the east of the road, towards Telegraph Hill where the known maternity roost is located.

Bat Roosting

5.8.4. A single barbastelle has been recorded roosting within a tree located to the south of the Broadway. Surveys are ongoing of other trees along The Broadway of moderate and high potential. Several World War II bunkers have been identified along The Broadway, which will be subject to surveys in 2021.

5.9 Foxburrow Plantation

Bat Activity

5.9.1. Detectors in Foxburrow Plantation (Area O) detected a peak in barbastelle activity in June, with >20 passes per night recorded at detectors C41, C42 and C15i, which suggests activity associated with a nearby maternity colony. Similarly, *Myotis* sp. also observed a peak in activity in June at detectors C14i and C15 indicating a possible roost within proximity of Foxburrow Plantation.

5.9.2. There was also a peak in brown long-eared activity in August. Brown long-eared bats are known to be roosting within trees in Foxburrow Plantation.

5.9.3. Vantage point and bat-tracking surveys identified that barbastelle were flying from east – west and west – east along the central glade, but additionally were also flying freely over and through the canopy of the woodland, not necessarily only sticking to the woodland rides.

Bat Roosting

5.9.4. Five bat roosts have been identified within Foxburrow Plantation. These consist of two brown long-eared bat roosts (one single bat roost and one bat roost with two individuals) and three soprano pipistrelle roosts (one, two and three bats present).

5.10 Stream South of Foxburrow Plantation

Bat Activity

5.10.1. Activity in this location (Area P) suggests that a number of species forage in the habitats associated within the stream in August, with serotine and *Nyctalus* sp./noctule all exhibiting notable peaks in activity in this month, and *Myotis* sp. to a lesser extent.

5.10.2. Detectors at this location recorded less barbastelle activity than within Foxburrow Plantation, but activity of this species also peaked in August (>10ppn).

5.10.3. Vantage point surveys observed barbastelle primarily flying west along the southern edge of Foxburrow Plantation, but also flying occasionally east and directly over the Foxburrow Stream.

5.10.4. *Myotis* sp. were also observed foraging over the stream.

Bat Roosting

5.10.5. No bat roosts have been identified in this location, however surveys of two trees are ongoing, to be completed in 2021.

6 FURTHER SURVEY WORK IN 2021

6.1.1. Recommended survey work to be conducted in 2021 which follows on from the 2020 surveys and other elements of survey work not reported here includes:

- an updated desk study;
- GLTA surveys to cover all remaining trees within the Survey Area;
- aerial inspection surveys or emergence surveys of trees of High/Moderate value;
- roost characterisation surveys of confirmed bat tree-roosts;
- emergence surveys of buildings with bat roost potential (where required);
- roost characterisation surveys of confirmed building roosts (where required);
- structure hibernation surveys (completed Jan – March 2021 and to be reported in 2021);
- automated bat detector surveys to gap-fill existing locations and to supplement existing data;
- vantage point surveys to gap-fill missing survey data or to gather additional survey data;
- radiotracking surveys, to cover the pre-maternity period in May (as an update to the 2019 radio-tracking) and the post-maternity period in August.

6.1.2. A summary of the status of bat surveys is presented below in Table 6-1 below summarises which surveys have been completed to-date, and which are to be completed in 2021.

Table 6-1 – Summary of baseline data collection and reporting

Desk-based Assessment

Survey Type	2019 Report	2020 Report	2021 Report (final report to be completed)
Desk Study	Completed. Data presented.	N/A Data still valid.	Final data request and associated desk study to be completed as an update to 2019 findings.

Roosting Bat Surveys

Survey Type	2019 Report	2020 Report	2021 Report (final report to be completed)
Preliminary Bat Roost Assessment (PBRA) of Structures	No survey work undertaken.	Completed. Data presented.	No further survey or reporting required.
Structure Evening Emergence/Dawn Re-entry Surveys	No survey work undertaken.	No survey work undertaken.	Surveys to be completed in 2021 with the final results presented in a technical report.
Ground-Level Tree Assessments (GLTA)	Partially complete. Data presented.	Partially complete. Data presented.	Survey to be completed in 2021 with the final results presented in a technical report.
Tree Evening Emergence/Dawn Re-entry Surveys	No survey work undertaken.	Partially complete. Data presented.	Survey to be completed in 2021 with the final results presented in a technical report.

Survey Type	2019 Report	2020 Report	2021 Report (final report to be completed)
Hibernation Surveys	Partially complete. Data presented.	No survey work undertaken.	Survey to be completed in 2021, with the final results presented in a technical report.

Bat Activity Surveys

Survey Type	2019 Report	2020 Report	2021 Report (final report to be completed)
Vantage Point Surveys	Partially complete. Data presented.	Partially complete. Data presented.	Survey to be completed in 2021 with the final results presented in a technical report.
Bat-tracking Surveys	Not completed – new survey type in 2020.	Completed. Data presented.	Complete. No further survey required.
Automated Detector Surveys	Partially complete. Data presented.	Partially complete. Data presented.	Survey to be completed in 2021 with the final results presented in a technical report.
Bat radio-tracking surveys	One trapping/radio-tracking session was completed in May 2019. Data presented.	No survey work undertaken.	Trapping/radio-tracking session to be completed in 2021 with final results presented in a technical report.

7 REFERENCES

7.1 Project References

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Appendix A

BACKGROUND INFORMATION

Figure A-1 – Route Alignment.

Figure A-2 – Reference Locations.

Appendix B

TREE-ROOSTING BATS – RESULTS OF 2019 AND 2020 SURVEYS

Table B-1 - Results of 2019 and 2020 GLTA and presence/absence surveys.

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
1	High	Three surveys completed - no evidence of bats on any survey Survey 1 – climbed inspection – 27/08/2019 Survey 2 – climbed inspection – 12/06/2020 Survey 3 – climbed inspection – 15/07/2020	High	N	N
2	Low	No survey required - Low habitat suitability	Low	N	N
3	Mod	Two surveys completed - no evidence of bats on either survey Survey 1 – ladder survey – 27/08/2019 Survey 2 – ladder survey – 21/05/2020	Mod	N	N
4	Mod	Surveys part complete, one survey undertaken to date - no evidence of bats on first survey Survey 1 – ladder survey - 27/08/2019 Survey 2 – cancelled due to H&S – active bees' nest	Mod	N	N
5	Mod	Two surveys completed - no evidence of bats on either survey Survey 1 – climbed inspection – 27/08/2019 Survey 2 – emergence survey – 13/07/2020	Mod	N	N
6	Mod	Two surveys completed - no evidence of bats on either survey Survey 1 – ladder survey – 27/08/2019 Survey 2 – ladder survey – 21/05/2020	Mod	N	N
7	Low	No survey required - Low suitability	Low	N	N
8	Low	No survey required - Low suitability	Low	Y	N
9	Low	No survey required - Low suitability	Low	Y	Y
10	Low	No survey required - Low suitability	Low	Y	N

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
11	High	Three surveys completed - confirmed roost - roost identified on first survey only Survey 1 – climbed inspection – 27/08/2019 Survey 2 – climbed inspection – 15/07/2020 Survey 3 – climbed inspection – 04/08/2020	Confirmed roost	Y	N
12	Low	No survey required - Low suitability	Low	N	N
13	Low	No survey required - Low suitability	Low	N	N
14	Low	No survey required - Low suitability	Low	N	N
15	High	Surveys part complete, two surveys undertaken to date - no evidence of bats on either survey Survey 1 – ladder survey – 27/08/2019 Survey 2 – ladder survey – 09/07/2020 Survey 3 – cancelled due to H&S – active hornets' nest	High	N	N
16	High	Three surveys completed - no evidence of bats on any survey Survey 1 – climbed inspection – 27/08/2019 Survey 2 – climbed inspection – 12/06/2020 Survey 3 – climbed inspection – 15/07/2020	High	N	N
17	Mod	Two surveys completed - no evidence of bats on either survey Survey 1 – climbed inspection – 27/08/2019 Survey 2 – climbed inspection – 12/06/2020	Mod	N	N
18	High	Four surveys completed - no evidence of bats on any survey Survey 1 – ladder survey – 27/08/2019 Survey 2 – ladder survey – 21/05/2020 Survey 3 – ladder survey – 12/06/2020 Survey 4 – ladder survey – 30/06/2020	Mod	Y	N

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
19	High	Four surveys completed - no evidence of bats Survey 1 – ladder survey – 27/08/2019 Survey 2 – ladder survey – 21/05/2020 Survey 3 – ladder survey – 12/06/2020 Survey 4 – ladder survey – 30/06/2020	Mod	Y	N
20	Confirmed roost	Five surveys completed - confirmed roost – roost identified on first survey only Survey 1 – ladder survey – 30/07/2019 Survey 2 – ladder survey - 27/08/2019 Survey 3 – ladder survey - 21/05/2020 Survey 4 – ladder survey – 12/06/2020 Survey 5 – ladder survey – 30/06/2020	Confirmed roost	Y	N
21	High	Three surveys completed - confirmed roost – roost identified on first survey, fresh droppings at entrance on second survey Survey 1 – climbed survey – 27/08/2019 Survey 2 – climbed survey – 12/06/2020 Survey 3 – emergence survey – 04/08/2020	Confirmed roost	N	N
22	Mod	Three surveys completed - no evidence of bats Survey 1 – ladder survey – 27/08/2019 Survey 2 – ladder survey – 21/05/2020 Survey 3 – ladder survey – 12/06/2020	Mod	Y	N
23	Mod	Two surveys completed - no evidence of bats Survey 1 – climbed inspection – 27/08/2019 Survey 2 – climbed inspection – 12/06/2020	Mod	Y	Y
24	Mod	Two surveys completed - no evidence of bats Survey 1 – ladder survey – 27/08/2019	Mod	Y	Y

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
		Survey 2 – ladder survey – 12/06/2020			
25	High	Three surveys completed - no evidence of bats Survey 1 – ladder survey – 27/08/2019 Survey 2 – ladder survey – 21/05/2020 Survey 3 – ladder survey – 12/06/2020	High	N	N
26	Mod	Three surveys completed - no evidence of bats Survey 1 – ladder survey – 27/08/2019 Survey 2 – ladder survey – 21/05/2020 Survey 3 – ladder survey – 09/07/2020	Mod	N	N
27	Mod	Surveys part complete, two surveys undertaken to date – confirmed roost - roost identified on second survey Survey 1 – ladder survey – 27/08/2019 Survey 2 – emergence survey – 18/05/2020	Confirmed roost	Y	N
28	Mod	Surveys part complete, two survey undertaken to date - no evidence of bats Survey 1 – ladder survey – 27/08/2019 Survey 2 – ladder survey – 21/05/2020	Mod	Y	Y
29	Mod	Two surveys completed - no evidence of bats Survey 1 – climbed inspection – 27/08/2019 Survey 2 – climbed inspection – 15/07/2020	Mod	N	N
30	High	Three surveys completed - no evidence of bats Survey 1 – climbed inspection – 28/08/2019 Survey 2 – climbed inspection – 08/06/2020 Survey 3 – climbed inspection – 11/08/2020	High	N	N
31	High	Three surveys completed - no evidence of bats	High	N	N

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
		Survey 1 – ladder survey – 28/08/2019 Survey 2 – ladder survey – 30/07/2020 Survey 3 – ladder survey – 11/08/2020			
32	Mod	Two surveys completed - no evidence of bats Survey 1 – ladder survey – 28/08/2019 Survey 2 – ladder survey – 11/08/2020	Mod	N	N
33	Mod	Surveys not complete due to active bees' nest	Mod	Y	N
34	Mod	Two surveys completed - no evidence of bats Survey 1 – climbed inspection – 28/08/2019 Survey 2 – climbed inspection – 11/08/2020	Mod	Y	N
35	Low	No survey required - Low value	Low	Y	N
36	Mod	Two surveys completed - no evidence of bats Survey 1 – PoleKam survey – 28/08/2019 Survey 2 – emergence survey – 24/09/2020	Mod	Y	N
37	Mod	Two surveys completed - no evidence of bats Survey 1 – climbed inspection – 28/08/2019 Survey 2 – climbed inspection – 30/07/2020	Mod	N	N
38	High	Three surveys completed - confirmed roost – roost identified on first and third survey Survey 1 – emergence survey – 22/07/2020 Survey 2 – emergence survey – 03/09/2020 Survey 3 – bat tracking survey – 07/08/2020	Confirmed roost	N	N
39	Confirmed roost	Three surveys completed - confirmed roost – roost identified on first survey Survey 1 – ladder survey – 30/07/2019	Confirmed roost	N	N

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
		Survey 2 – ladder survey – 27/08/2019 Survey 3 – ladder survey – 23/09/2020			
40	Low	No survey required - Low suitability	Low	N	N
41	Confirmed roost	Three surveys completed - confirmed roost – roost identified on first and third visit Survey 1 – ladder survey – 30/07/2019 Survey 2 – ladder survey – 27/08/2019 Survey 3 – ladder survey – 23/09/2020	Confirmed roost	N	N
42	Mod	Two surveys completed - no evidence of bats Survey 1 – ladder survey – 28/08/2019 Survey 2 – ladder survey – 09/07/2020	Mod	N	N
43	Low	No survey required - Low suitability	Low	N	N
44	Mod	One survey completed - no evidence of bats. Surveys to be completed in 2021. Survey 1 – climbed inspection – 14/07/2020	Mod	Y	N
45	High	Three surveys completed - no evidence of bats Survey 1 – ladder survey – 27/08/2019 Survey 2 – ladder survey – 09/07/2020 Survey 3 – ladder survey – 04/08/2020	High	Y	N
46	High	Surveys part complete, one survey undertaken to date - no evidence of bats Survey 1 – ladder survey – 04/08/2020	High	Y	Y
47	High	No surveys undertaken, to be completed in 2021.	High	Y	Y

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
48	High	Surveys part complete, one survey undertaken to date - no evidence of bats Survey 1 – emergence survey – 13/08/2020	High	Y	Y
49	High	No surveys undertaken, to be completed in 2021.	High	Y	Y
50	Mod	No surveys undertaken, to be completed in 2021.	Mod	Y	Y
51	Mod	No survey required - Low suitability.	Low	Y	Y
52	Mod	No surveys undertaken, to be completed in 2021.	Mod	Y	Y
53	Mod	Surveys part complete, one survey undertaken to date - no evidence of bats Survey 1 – emergence survey – 13/08/2020	Mod	Y	Y
54	Mod	No survey required - Low suitability.	Low	Y	Y
55	Mod	Two surveys completed - no evidence of bats Survey 1 – emergence survey – 07/07/2020 Survey 2 – emergence survey – 04/08/2020	Mod	Y	N
56	Mod	No survey required - Low suitability	Low	N	N
57	Mod	Two surveys completed - no evidence of bats Survey 1 – dawn return survey – 21/07/2020 Survey 2 – emergence survey – 04/08/2020	Mod	N	N
58	Mod	Four surveys completed - confirmed roost – roost identified on third survey and fourth survey Survey 1 – emergence survey – 07/07/2020 Survey 2 – climbed inspection – 15/07/2020 Survey 3 – dawn return survey – 04/08/2020 Survey 4 – bat tracking survey – 17/08/2020	Confirmed roost	N	N

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
59	Mod	Four surveys completed - no evidence of bats Survey 1 – ladder survey – 27/08/2019 Survey 2 – ladder survey - 21/05/2020 Survey 3 – ladder survey – 12/06/2020 Survey 4 – ladder survey – 09/07/2020	Mod	Y	N
60	High	Four surveys completed - confirmed roost – roost identified on first survey only Survey 1 – ladder survey – 28/08/2019 Survey 2 – ladder survey – 21/05/2020 Survey 3 – ladder survey – 12/06/2020 Survey 4 – ladder survey – 19/07/2020	Confirmed roost	Y	N
61	Mod	Two surveys completed - no evidence of bats Survey 1 – ladder survey – 12/06/2020 Survey 2 – ladder survey – 09/07/2020	Mod	N	N
62	High	Three surveys completes - no evidence of bats Survey 1 – ladder survey – 27/08/2019 Survey 2 – ladder survey – 21/05/2020 Survey 3 – ladder survey – 12/06/2020	High	Y	N
63	High	Four surveys completed - no evidence of bats Survey 1 – ladder survey – 27/08/2019 Survey 2 – ladder survey – 12/06/2020 Survey 3 – ladder survey – 09/07/2020 Survey 4 – ladder survey – 17/07/2020	High	Y	N
64	Low	No survey required - Low suitability	Low	Y	N
65	High	One survey completed - no evidence of bats Survey 1 – climbed inspection – 15/07/2020	Low	N	N

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
66	High	One survey completed - no evidence of bats Survey 1 – climbed inspection – 15/07/2020	Low	Y	N
67	High	Planned survey for 2021	High	Y	Y
68	High	Planned survey for 2021	High	Y	Y
69	Low	No survey required - Low suitability	Low	Y	Y
70	High	Planned survey for 2021	High	Y	Y
71	High	Planned survey for 2021	High	Y	Y
72	Mod	One survey completed - no evidence of bats Survey 1 – climbed inspection – 14/07/2020	Low	N	N
73	Mod	Two surveys completed - no evidence of bats Survey 1 – ladder survey – 28/08/2019 Survey 2 – ladder survey – 09/07/2020	Mod	N	N
74	Mod	One survey completed - no evidence of bats Survey 1 – climbed inspection – 14/07/2020	Low	N	N
75	High	Three surveys completed - no evidence of bats Survey 1 – climbed inspection – 14/07/2020 Survey 2 – emergence survey – 27/07/2020 Survey 3 – climbed inspection – 06/08/2020	High	Y	N
76	High	Three surveys completed - no evidence of bats Survey 1 – ladder survey – 28/08/2019 Survey 2 – ladder survey – 09/07/2020 Survey 3 – ladder survey – 06/08/2020	High	Y	N
77	High	Two surveys completed - no evidence of bats	Mod	Y	Y

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
		Survey 1 – ladder survey – 10/07/2020 Survey 2 – climbed inspection – 14/07/2020			
78	High	Surveys part complete, two surveys undertaken to date - no evidence of bats Survey 1 – climbed inspection – 30/07/2020 Survey 2 – climbed inspection – 23/09/2020	High	N	N
79	High	Surveys part complete - confirmed roost – roost identified on first survey Survey 1 – emergence survey – 22/07/2020 Survey 2 – emergence survey – 17/09/2020	Confirmed roost	Y	N
80	Low	No survey required - Low suitability	Low	N	N
81	Low	No survey required - Low suitability	Low	Y	N
82	Mod	One survey completed - no evidence of bats Survey 1 – climbed inspection – 14/07/2020	Low	Y	N
83	Mod	Two surveys completed - no evidence of bats Survey 1 – emergence survey – 13/07/2020 Survey 2 – emergence survey – 12/08/2020	Mod	Y	N
84	Low	No survey required - Low suitability	Low	Y	N
85	Low	No survey required - Low suitability	Low	Y	N
86	Low	No survey required - Low suitability	Low	Y	Y
87	High	Three surveys completed - no evidence of bats Survey 1 – emergence survey – 14/07/2020 Survey 2 – emergence survey – 12/08/2020 Survey 3 – emergence survey – 22/08/2020	High	Y	N

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
88	Mod	Two surveys completed - no evidence of bats Survey 1 – emergence survey – 06/08/2020 Survey 2 – emergence survey – 24/08/2020	Mod	Y	N
89	Low	No survey required - Low suitability	Low	Y	N
90	Mod	Two surveys completed - no evidence of bats Survey 1 – emergence survey – 14/07/2020 Survey 2 – emergence survey – 06/08/2020	Mod	N	N
91	Mod	Two surveys completed - no evidence of bats Survey 1 – emergence survey – 14/07/2020 Survey 2 – emergence survey – 05/08/2020	Mod	N	N
92	High	Two surveys completed - no evidence of bats Survey 1 – emergence survey – 14/07/2020 Survey 2 – emergence survey – 05/08/2020	Mod	N	N
93	Low	No survey required - Low suitability	Low	N	N
94	Low	No survey required - Low suitability	Low	N	N
95	Mod	Two surveys completed - no evidence of bats Survey 1 – emergence survey – 06/08/2020 Survey 2 – emergence survey – 24/08/2020	Mod	Y	N
96	Mod	One survey completed - no evidence of bats Survey 1 – emergence survey – 14/07/2020	Low	Y	N
97	High	Two surveys completed - no evidence of bats Survey 1 – emergence survey – 01/07/20202 Survey 2 – climbed inspection – 14/07/2020	Mod	Y	Y
98	Low	No survey required – Low suitability	Low	Y	Y

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
99	Mod	Two surveys completed - no evidence of bats Survey 1 – emergence survey – 15/07/2020 Survey 2 – emergence survey – 13/08/2020	Mod	Y	Y
100	Low	No survey required - Low suitability	Low	Y	Y
101	Mod	One survey undertaken to date - no evidence of bats Survey 1 – emergence survey – 15/07/2020	Mod	Y	N
102	High	One survey completed - no evidence of bats Survey 1 – emergence survey – 05/08/2020	Mod	N	N
103	High	Surveys completed - no evidence of bats Survey 1 – climbed inspection – 14/07/2020 Survey 2 – climbed inspection – 06/08/2020	Mod	N	N
104	Low	No survey required - Low suitability	Low	N	N
105	Confirmed roost	Four surveys completed - confirmed roost – roost identified on all four surveys Survey 1 – ladder survey – 27/08/2019 Survey 2 – ladder survey – 03/07/2020 Survey 3 – ladder survey – 09/07/2020 Survey 4 – dawn re-entry – 29/07/2020	Confirmed roost	N	N
106	Low	No survey required - Low suitability	Low	N	N
107	High	Three surveys completed - confirmed roost – roost identified on second survey Survey 1 – climbed inspection – 14/07/2020 Survey 2 – bat tracking survey – 11/08/2020 Survey 3 – emergence survey – 19/08/2020	Confirmed roost	N	N

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
108	Mod	Surveys part complete, one survey undertaken to take - no evidence of bats Survey 1 – emergence survey – 05/08/2020	Mod	N	N
109	Mod	One surveys completed -no evidence of bats Survey 1 – ladder survey – 06/08/2020	Low	N	N
110	Low	No survey required - Low suitability	Low	N	N
111	Low	No survey required - Low suitability	Low	N	N
112	High	Three surveys completed - no evidence of bats Survey 1 – emergence survey – 13/07/2020 Survey 2 – emergence survey – 13/08/2020 Survey 3 – emergence survey – 19/08/2020	High	N	N
113	Low	No survey required - Low suitability	Low	N	N
114	Low	No survey required - Low suitability	Low	N	N
115	Low	No survey required - Low suitability	Low	N	N
116	Low	No survey required - Low suitability	Low	N	N
117	Mod	Two surveys completed - no evidence of bats Survey 1 – ladder survey – 28/08/2019 Survey 2 – ladder survey – 08/06/2020	Mod	N	N
118	Mod	Two surveys completed - no evidence of bats Survey 1 – ladder survey – 08/06/2020 Survey 2 – ladder survey – 11/08/2020	Mod	N	N
119	Mod	Two surveys completed - no evidence of bats Survey 1 – emergence survey – 08/07/2020	Mod	N	N

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
		Survey 2 – emergence survey – 24/09/2020			
120	Mod	Two surveys completed - no evidence of bats Survey 1 – ladder survey – 28/08/2019 Survey 2 – ladder survey – 08/06/2020	Mod	Y	Y
121	Low	No survey required - Low suitability	Low	N	N
122	Low	No survey required - Low suitability	Low	N	N
123	Confirmed Roost.	Three surveys completed - confirmed roost – roost identified on first survey only Survey 1 – ladder survey – 17/03/2020 Survey 2 – ladder survey – 21/05/2020 Survey 3 – ladder survey – 08/06/2020	Confirmed Roost	N	N
124	Low	Three surveys completed - confirmed roost – roost identified during dawn bat tracking survey Survey 1 – ladder survey – 08/06/2020 Survey 2 – ladder survey – 11/08/2020 Survey 3 – ladder survey – 23/09/2020	Confirmed Roost	N	N
125	Confirmed Roost	Three surveys completed - confirmed roost – dropping identified around tree on 17/03/2020, emergence on second survey Survey 1 – ladder survey – 21/05/2020 Survey 2 – emergence survey – 08/06/2020 Survey 3 – emergence survey – 03/09/2020	Confirmed Roost	N	N
126	Mod	One survey completed - no evidence of bats Survey 1 – climbed inspection – 10/06/2020	Low	N	N
127	High	Three surveys completed - confirmed roost – roost identified on second survey	Confirmed roost	N	N

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
		Survey 1 – ladder survey – 10/06/2020 Survey 2 – emergence survey – 15/07/2020 Survey 3 – dawn re-entry survey – 07/08/2020			
128	Low	No survey required - Low suitability	Low	Y	N
129	Low	No survey required - Low suitability	Low	N	N
130	Mod	One survey completed - no evidence of bats Survey 1 – ladder survey – 10/06/2020	Low	Y	Y
131	Mod	Two surveys completed - no evidence of bats Survey 1 – ladder survey – 10/06/2020 Survey 2 – ladder survey – 11/08/2020	Mod	Y	Y
132	Mod	Surveys part complete, one survey undertaken to date - no evidence of bats Survey 1 – emergence survey – 11/08/2020	Mod	Y	Y
133	Mod	Two surveys completed - no evidence of bats Survey 1 – emergence survey – 18/05/2020 Survey 2 – emergence survey – 11/06/2020	Mod	N	N
134	Low	No survey required - Low suitability	Low	Y	N
135	Low	No survey required - Low suitability	Low	Y	N
136	High	Surveys part complete, three surveys undertaken to date - confirmed roost – roost identified on the third survey Survey 1 – emergence survey – 16/07/2020 Survey 2 – emergence survey – 11/08/2020 Survey 3 – emergence survey – 30/09/2020	Confirmed Roost	N	N
137	Mod	Two surveys completed - no evidence of bats	Mod	N	N

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
		Survey 1 – emergence survey – 10/08/2020 Survey 2 – emergence survey – 30/09/2020			
138	High	Three surveys completed - confirmed roost – roost identified on third survey Survey 1 – emergence survey – 10/08/2020 Survey 2 – emergence survey – 26/08/2020 Survey 3 – emergence survey – 28/09/2020	Confirmed roost	N	N
139	High	Three surveys completed - confirmed roost – roost identified on second survey Survey 1 – emergence survey – 10/08/2020 Survey 2 – emergence survey - 26/08/2020 Survey 3 – emergence survey – 28/09/2020	Confirmed roost	N	N
140	Mod	Surveys part complete, one survey undertaken to date - no evidence of bats Survey 1 – emergence survey – 10/08/2020	Mod	Y	N
141	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
142	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
143	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
144	Low	No survey required - Low suitability	Low	Y	Y
145	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
146	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
147	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
148	High	No follow-up surveys completed – scoped out following correspondence with Natural England.	High	Y	Y
149	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
150	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
151	Low	No survey required - Low suitability	Low	Y	Y
152	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
153	Low	No survey required – Low suitability	Low	Y	Y
154	High	No follow-up surveys completed – scoped out following correspondence with Natural England.	High	Y	Y
155	High	No follow-up surveys completed – scoped out following correspondence with Natural England.	High	Y	Y
156	Low	No survey required - Low suitability	Low	Y	N
157	Low	No survey required - Low suitability	Low	N	N
158	Low	No survey required - Low suitability	Low	N	N
159	Low	No survey required - Low suitability	Low	N	N

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
160	Mod	Two surveys completed - no evidence of bats Survey 1 – emergence survey – 13/05/2020 Survey 2 – emergence survey – 01/07/2020	Mod	N	N
161	Mod	Two surveys completed - no evidence of bats Survey 1 – emergence survey – 13/05/2020 Survey 2 – emergence survey – 01/07/2020	Mod	Y	N
162	Mod	Surveys part complete, one survey undertaken to date - no evidence of bats Survey 1 – emergence survey – 21/05/2020	Mod	Y	N
163	Mod	Surveys part complete, one survey undertaken to date - no evidence of bats Survey 1 – emergence survey – 21/05/2020	Mod	Y	N
164	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	N	N
165	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	N	N
166	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	N
167	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	N
168	Low	No survey required - Low suitability	Low	N	N
169	Low	No survey required - Low suitability	Low	Y	N
170	Low	No survey required - Low suitability	Low	N	N

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
171	Mod	Two surveys completed - no evidence of bats Survey 1 – emergence survey – 21/05/2020 Survey 2 – emergence survey – 15/07/2020	Mod	Y	N
172	Low	No survey required - Low suitability	Low	Y	N
173	Mod	Two surveys completed - no evidence of bats Survey 1 – emergence survey – 21/05/2020 Survey 2 – emergence survey – 15/07/2020	Mod	Y	N
174	Mod	Two surveys completed - no evidence of bats Survey 1 – emergence survey – 15/07/2020 Survey 2 – emergence survey – 04/08/2020	Mod	Y	N
175	Mod	One survey completed - no evidence of bats Survey 1 – climbed inspection – 15/07/2020	Low	N	N
176	Low	No survey required - Low suitability	Low	N	N
177	Low	No survey required - Low suitability	Low	Y	N
178	Low	No survey required - Low suitability	Low	Y	N
179	Mod	One survey undertaken to date - no evidence of bats Survey 1 – climbed inspection – 15/07/2020	Mod	Y	Y
180	Low	No survey required - Low suitability	Low	N	N
181	Low	No survey required - Low suitability	Low	Y	N
182	Low	No survey required - Low suitability	Low	Y	N
183	Low	No survey required - Low suitability	Low	Y	N
184	Low	No survey required - Low suitability	Low	Y	N

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
185	Low	No survey required - Low suitability	Low	Y	N
186	Low	No survey required - Low suitability	Low	Y	N
187	Low	No survey required - Low suitability	Low	N	N
188	High	Three surveys completed - no evidence of bats Survey 1 – ladder survey – 27/08/2019 Survey 2 – ladder survey – 12/06/2020 Survey 3 – ladder survey – 30/06/2020	High	N	N
189	Mod	Two surveys completed - no evidence of bats Survey 1 – emergence survey – 07/07/2020 Survey 2 – emergence survey – 03/08/2020	Mod	Y	N
190	High	Two surveys undertaken to date - no evidence of bats Survey 1 – endoscope survey – 12/06/2020 Survey 2 – endoscope survey – 09/07/2020	High	Y	N
191	Mod	Two surveys completed - no evidence of bats Survey 1 – climbed inspection – 15/07/2020 Survey 2 – ladder survey – 04/08/2020	Mod	N	N
192	High	Three surveys completed - no evidence of bats Survey 1 – emergence survey – 03/05/2020 Survey 2 – ladder survey – 12/06/2020 Survey 3 – emergence survey – 17/08/2020	High	N	N
193	Mod	Two surveys undertaken to date - confirmed roost – roost identified on first survey Survey 1 – emergence survey – 24/06/2020 Survey 2 – emergence survey – 03/08/2020	Confirmed Roost	Y	N

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
194	Mod	Two surveys completed - no evidence of bats Survey 1 – climbed inspection – 15/07/2020 Survey 2 – ladder survey – 04/08/2020	Mod	Y	Y
195	Low	No survey required - Low suitability	Low	Y	N
196	Mod	Two surveys completed - no evidence of bats Survey 1 – emergence survey – 25/06/2020 Survey 2 – emergence survey – 13/07/2020	Mod	Y	N
197	Mod	Three surveys completed – confirmed roost – roost identified on second visit. Survey 1 – emergence survey – 25/06/2020 Survey 2 – emergence survey – 13/07/2020 Survey 3 – emergence survey – 05/08/2020	Confirmed Roost	Y	N
198	Mod	Two surveys completed - no evidence of bats Survey 1 – emergence survey – 25/06/2020 Survey 2 – emergence survey – 13/07/2020	Mod	Y	N
199	High	Two surveys undertaken to date - no evidence of bats Survey 1 – endoscope survey – 09/07/2020 Survey 2 – ladder survey – 04/08/2020	High	Y	N
200	Mod	One survey undertaken to date - no evidence of bats Survey1 – endoscope survey – 09/07/2020	Mod	Y	Y
201	Mod	One surveys completed - no evidence of bats Survey 1 – ladder survey – 09/07/2020	Neg.	Y	N
202	Mod	Two surveys completed - no evidence of bats Survey 1 – emergence survey – 08/07/2020 Survey 2 – emergence survey – 05/08/2020	Mod	Y	Y

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
203	Mod	One survey undertaken to date - no evidence of bats Survey 1 – climbed inspection – 16/06/2020	Mod	Y	Y
204	Mod	Three surveys completed - no evidence of bats Survey 1 – emergence survey – 08/07/2020 Survey 2 – climbed inspection – 16/07/2020 Survey 3 – climbed inspection – 04/08/2020	Mod	Y	Y
205	High	Three surveys completed - no evidence of bats Survey 1 – emergence survey – 30/06/2020 Survey 2 – climbed inspection – 16/07/2020 Survey 3 – climbed inspection – 04/08/2020	High	Y	Y
206	Mod	One survey undertaken to date - no evidence of bats Survey 1 – ladder survey – 04/08/2020	Mod	Y	Y
207	Mod	Two surveys completed - no evidence of bats Survey 1 – climbed inspection – 16/07/2020 Survey 2 – climbed inspection – 04/08/2020	High	N	N
208	Mod	Two surveys completed - no evidence of bats Survey 1 – climbed inspection – 16/07/2020 Survey 2 – climbed inspection – 04/08/2020	Mod	N	N
209	Mod	One survey undertaken to date - no evidence of bats Survey 1 – ladder survey – 22/07/2020	Mod	Y	N
210	High	One survey undertaken to date - no evidence of bats Survey 1 – climbed inspection – 22/07/2020	High	Y	N
211	High	One survey undertaken to date - no evidence of bats Survey 1 – climbed inspection – 22/07/2020	High	Y	N

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
212	High	Four surveys completed - confirmed roost – roost identified on the third survey only Survey 1 – ladder survey – 21/05/2020 Survey 2 – ladder survey – 09/07/2020 Survey 3 – bat tracking survey – 04/08/2020 Survey 4 – ladder survey – 04/08/2020	Confirmed roost	N	N
213	Low	No survey required - Low suitability	Low	N	N
214	High	One survey undertaken to date - no evidence of bats Survey 1 – endoscope survey – 21/05/2020	High	Y	Y
215	Low	No survey required - Low suitability	Low	N	N
216	Moderate	Two surveys completed - no evidence of bats Survey 1 – endoscope survey – 08/06/2020 Survey 2 – ladder survey – 11/08/2020	Moderate	N	N
217	Moderate	Two surveys completed - no evidence of bats Survey 1 – ladder survey – 10/06/2020 Survey 2 – ladder survey – 30/07/2020	Moderate	Y	Y
218	High	Three surveys completed - no evidence of bats Survey 1 – endoscope survey – 10/06/2020 Survey 2 – emergence survey – 13/07/2020 Survey 3 – ladder survey – 11/08/2020	High	N	N
219	Mod	Two surveys completed - no evidence of bats Survey 1 – endoscope survey – 12/06/2020 Survey 2 – ladder survey – 09/07/2020	Mod	Y	N
220	Mod	Three surveys completed – confirmed roost – roost identified on third survey	Confirmed Roost	N	N

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
		Survey 1 – endoscope survey – 12/06/2020 Survey 2 – ladder survey – 09/07/2020 Survey 3 – bat tracking survey – 04/08/2020			
221	Mod	Two surveys completed - no evidence of bats Survey 1 – endoscope survey – 12/06/2020 Survey 2 – ladder survey – 09/07/2020	Mod	N	N
222	Low	No survey required - Low suitability	Low	N	N
223	Low	No survey required - Low suitability	Low	Y	N
224	Mod	Surveys part complete, one survey undertaken to date - no evidence of bats Survey 1 – emergence survey – 13/07/2020	Mod	Y	Y
225	Mod	Planned survey for 2021	Mod	Y	Y
226	Confirmed Roost	Three surveys completed - confirmed roost – roost identified on first survey Survey 1 – ladder survey – 03/07/2020 Survey 2 – ladder survey – 09/07/2020 Survey 3 – ladder survey – 07/08/2020	Confirmed Roost	Y	Y
227	Mod	Planned survey for 2021	Mod	Y	Y
228	Low	No survey required - Low suitability	Low	Y	Y
229	Low	No survey required - Low suitability	Low	Y	N
230	High	Surveys part complete, two surveys undertaken to date - no evidence of bats Survey 1 – climb and emergence – 14/07/2020 Survey 2 – climbed inspection – 06/08/2020	High	N	N

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
231	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	N
232	Low	No survey required - Low suitability	Low	Y	N
233	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
234	Low	No survey required - Low suitability	Low	Y	N
235	Low	No survey required – Low suitability	Low	Y	N
236	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
237	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	N
238	Low	No survey required - Low suitability	Low	Y	N
239	Low	No survey required - Low suitability	Low	Y	N
240	Low	No survey required - Low suitability	Low	Y	N
241	Low	No survey required - Low suitability	Low	Y	N
242	Low	No survey required - Low suitability	Low	Y	N
243	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	N
244	Low	No survey required - Low suitability	Low	Y	N
245	Low	No survey required - Low suitability	Low	Y	N
246	Mod	One survey undertaken to date - no evidence of bats	Mod	N	N

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
		Survey 1 – climbed inspection – 30/07/2020			
247	Moderate	One survey undertaken to date - no evidence of bats Survey 1 – climbed inspection – 30/07/2020	Low	N	N
248	Moderate	One survey undertaken to date - no evidence of bats Survey 1 – climbed inspection – 30/07/2020	Low	N	N
249	Moderate	One survey undertaken to date - no evidence of bats Survey 1 – climbed inspection – 30/07/2020	Low	N	N
250	Low	No survey required - Low suitability	Low	N	N
251	Mod	Planned survey for 2021	Mod	N	N
252	Low	No survey required - Low suitability	Low	N	N
253	Mod	One survey undertaken to date - no evidence of bats Survey 1 – ladder survey – 30/07/2020	Mod	N	N
254	Mod	One survey undertaken to date - no evidence of bats Survey 1 – ladder survey – 30/07/2020	Mod	N	N
255	Moderate	One survey undertaken to date - no evidence of bats Survey 1 – climbed inspection – 30/07/2020	Low	N	N
256	Mod	One survey completed - no evidence of bats Survey 1 – climbed inspection – 30/07/2020	Low	N	N
257	Mod	Three surveys undertaken to date - confirmed roost – roost confirmed on the third survey visit Survey 1 – ladder survey – 27/08/2019 Survey 2 – ladder survey – 21/05/2020 Survey 3 – bat tracking survey – 04/08/2020	Confirmed Roost	Y	N

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
258	Moderate	One survey completed - no evidence of bats Survey 1 – climbed inspection – 23/09/2020	Low	Y	N
259	Moderate	Three surveys completed - confirmed roost – roost identified on first and second survey Survey 1 – bat tracking survey – 05/08/2020 Survey 2 – bat tracking survey – 07/08/2020 Survey 3 – emergence survey – 24/09/2020	Confirmed Roost	N	N
260	Low	No survey required - Low suitability	Low	Y	Y
261	Mod	Planned survey for 2021	Mod	Y	Y
262	Mod	Planned survey for 2021	Mod	Y	Y
263	Low	No survey required - Low suitability	Low	Y	Y
264	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
265	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
266	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	N
267	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	N
268	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	N
269	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
270	High	No follow-up surveys completed – scoped out following correspondence with Natural England.	High	Y	Y
271	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
272	High	No follow-up surveys completed – scoped out following correspondence with Natural England.	High	Y	Y
273	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
274	Low	No survey required - Low suitability	Low	Y	Y
275	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
276	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
277	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
278	High	No follow-up surveys completed – scoped out following correspondence with Natural England.	High	Y	Y
279	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
280	High	No follow-up surveys completed – scoped out following correspondence with Natural England.	High	Y	N
281	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
282	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
283	High	No follow-up surveys completed – scoped out following correspondence with Natural England.	High	Y	N
284	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	N
285	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	N
286	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	N
287	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	N
289	Low	No survey required - Low suitability	Low	Y	Y
290	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
291	Low	No survey required - Low suitability	Low	Y	N
292	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	N
293	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
294	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
295	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
296	Low	No survey required - Low suitability	Low	Y	Y
297	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	N
298	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
299	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	N
300	Mod	Planned survey for 2021	Mod	N	N
301	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
302	Low	No survey required - Low suitability	Low	Y	Y
303	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	N
304	High	No follow-up surveys completed – scoped out following correspondence with Natural England.	High	Y	Y
305	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
306	High	No follow-up surveys completed – scoped out following correspondence with Natural England.	High	Y	Y
307	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	N

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
308	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	N
309	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	N
310	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	N
311	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
312	High	No follow-up surveys completed – scoped out following correspondence with Natural England.	High	Y	Y
313	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
314	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
315	Low	No survey required - Low suitability	Low	Y	Y
316	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
317	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	Y
318	Mod	No follow-up surveys completed – scoped out following correspondence with Natural England.	Mod	Y	N
319	Low	No survey required - Low suitability	Low	N	N
320	Low	No survey required - Low suitability	Low	Y	N

Ref. for reporting	GLTA result	2019/2020 follow-up presence/absence surveys	Current status	Outside Scheme boundary?	Outside 25m buffer?
321	Mod	Planned survey for 2021	Mod	Y	N
322	Mod	Planned survey for 2021	Mod	Y	N
323	Low	No survey required - Low suitability	Low	Y	N
324	Mod	Planned survey for 2021	Mod	Y	Y

Figure B-1 – 2019 and 2020 Tree Survey Results (Drawings B1 – B16).

Appendix C

STRUCTURE-ROOSTING BATS - RESULTS OF 2019 AND 2020 SURVEYS

Figure C-1 – Locations of Structures Identified Within the Survey Buffer.

Table C-1 - Results of Preliminary Bat Roost Assessments conducted in 2020

Building Ref.	Description of Building	Description of Features/Evidence of Bat Roosting	Current results to-date – Suitability for structure roosting bats (Collins, 2016)[7]	Photo
1A1	Wooden garden outbuilding with a pitched roof of slate tiles, slightly sunken and largely covered in moss. All faces clad in weatherboarding except for the southern face which was glass. Building appears to be in regular use as a small working/living space. Close proximity to hedgerows and vegetated features for commuting and foraging bats.	Potential gap under ridge tiles which may lead into a loft void, if present. Small gap in eaves on west corner of building, and a single dropping present underneath this gap. Similar feature also present on northern corner. DNA analysis was not undertaken as the single dropping was crumbled to confirm it had originated from a bat.	Confirmed roost.	

[7] Suitability for structure-roosting bats is categorised High, Moderate, Low or Negligible according to the definitions provided in Table 3-3.

Building Ref.	Description of Building	Description of Features/Evidence of Bat Roosting	Current results to-date – Suitability for structure roosting bats (Collins, 2016)[7]	Photo
1A2	Brick-built garage building with a pyramid roof pitch and a rolling door on the eastern face. No roof void. Lined roof of clay pantiles. Lining in good condition. Minor security lighting present at the entrance of structure. Building appears to be in regular use for storage purposes. Close proximity to hedgerows and vegetated features for commuting and foraging bats.	Occasional gaps under roof tiles.	Low.	
1A3	Wooden storage shed with weatherboarding and an unlined, mono-pitched corrugated bitumen felt roof. Building open and exposed. Close proximity to hedgerows and vegetated features for commuting and foraging bats.	Occasional small features under weatherboards and around wooden barge boards.	Low.	

Building Ref.	Description of Building	Description of Features/Evidence of Bat Roosting	Current results to-date – Suitability for structure roosting bats (Collins, 2016)[7]	Photo
2A1	A wooden stable block with weather boarded walls, and a wooden roof, with felt lining nailed onto it in places. Open, light and airy space. Close proximity to hedgerows and vegetated features for commuting and foraging bats.	Occasional lifted weatherboarding, and some minor roosting features present internally, such as under felt roof lining.	Low.	
3A1	External inspection only. Warehouse/storage building with foundations constructed of rendered bricks (and exposed brickwork in places) with a double-pitched corrugated metal roof. Security lighting and rolling doors at one end. Close proximity to hedgerows and vegetated features along a minor road for commuting and foraging bats.	Crevices under bargeboards at various locations around the periphery of the building. Two bat droppings present beneath one of these features (consistent in size with *Pipistrelle* sp. although eDNA was inconclusive).	Confirmed roost.	

Building Ref.	Description of Building	Description of Features/Evidence of Bat Roosting	Current results to-date – Suitability for structure roosting bats (Collins, 2016)[7]	Photo
3A2	External inspection only. Concrete shed with bitumastic felt roof. Close proximity to hedgerows and vegetated features along a minor road for commuting and foraging bats.	No potential roosting features identified on structure.	Negligible.	
3A3	External inspection only. Two-storey residential dwelling in current occupation, with a pitched clay pantile roof and a single storey gable extension and a conservatory. Close proximity to hedgerows and vegetated features along a minor road for commuting and foraging bats.	Few features externally, consisting of gaps associated with the soffits (although wire mesh may limit use of these by bats), and a possible gap at the apex of both gable ends.	High (precautionary as internal assessment not possible).	

Building Ref.	Description of Building	Description of Features/Evidence of Bat Roosting	Current results to-date – Suitability for structure roosting bats (Collins, 2016)[7]	Photo
3A4	External inspection only. Shed/storage with flat corrugated metal roof. Close proximity to hedgerows and vegetated features for commuting and foraging bats.	No potential roosting features observed.	Negligible.	
4A1	External inspection only. Two storey, brick-built residential dwelling with a pitched, tiled roof and a single-storey extension. Close proximity to hedgerows and vegetated features along a minor road for commuting and foraging bats.	Occasional lifted roof tiles, and likely to have a traditional roof void internally.	High (precautionary as internal assessment not possible).	

Building Ref.	Description of Building	Description of Features/Evidence of Bat Roosting	Current results to-date – Suitability for structure roosting bats (Collins, 2016)[7]	Photo
5A1	External inspection only. Metal framed, partially open-sided building with brickwork lower walls and a corrugated, unlined metal roof. Light and airy from skylight windows and open sides. Building in regular use as a material store. Within 100m of vegetated corridors for commuting and foraging bats.	Potential cavities where corrugated panels overlap brickwork.	Low.	
5A2	External inspection only. A connected group of pitched-roof brick-built farm buildings. The roof was unlined, some sections were comprised of clay pantile and others were comprised of corrugated asbestos. Within 100m of vegetated corridors for commuting and foraging bats.	Numerous features including gaps under broken/dislodged tiles and ridge tiles, holes in brickwork and missing mortar which have the potential to support transitional and hibernation roosts for crevice dwelling species.	High (precautionary as internal assessment not possible).	

Building Ref.	Description of Building	Description of Features/Evidence of Bat Roosting	Current results to-date – Suitability for structure roosting bats (Collins, 2016)[7]	Photo
5A3	External inspection only. Metal building of unknown use, well-sealed and in good condition. Within 100m of vegetated corridors for commuting and foraging bats.	No potential roosting features recorded.	Negligible.	
5A4	External inspection only. Residential barn conversion in use as a living space. Brick-built with pitched pantile roof. Within 100m of vegetated corridors for commuting and foraging bats.	Small gaps in eaves around the perimeter. Gaps between brickwork and eaves. Lifted roof tiles and lifted lead flashing.	Moderate.	

Building Ref.	Description of Building	Description of Features/Evidence of Bat Roosting	Current results to-date – Suitability for structure roosting bats (Collins, 2016)[7]	Photo
5A5	External inspection only. Two storey new-build residential dwelling with pitched roof, still undergoing construction at the time of survey. Within 100m of vegetated corridors for commuting and foraging bats.	Some gaps in brickwork but these were likely to have been temporary and will be filled by mortar during construction.	Low.	
5A6	External inspection only. Wooden field shelter with a bitumastic roof. Within 100m of vegetated corridors for commuting and foraging bats.	No potential roosting features recorded.	Negligible.	

Building Ref.	Description of Building	Description of Features/Evidence of Bat Roosting	Current results to-date – Suitability for structure roosting bats (Collins, 2016)[7]	Photo
6A1	External inspection only. Residential dwelling with a rendered exterior and a pitched, clay pantile roof. Good connectivity to floodplain and woodland habitat.	Potential access points below the ridge tiles, under the eaves and behind the gable end barge boards.	High.	
6A2	External inspection only. A single storey, brick-built 1700s barn with a pitched clay pan-tile roof, lined with breathable roof membrane. No internal loft void. The internal roofing structure comprised traditional hand carved timbers, and appears to be bright and drafty. Good connectivity to floodplain and woodland habitat.	Gaps in the brickwork on the western and eastern gable ends and around the southern facing barn door. Traditional timber roofing structure provided roosting potential.	High.	

Building Ref.	Description of Building	Description of Features/Evidence of Bat Roosting	Current results to-date – Suitability for structure roosting bats (Collins, 2016)[7]	Photo
6A3	External inspection only. Single storey rendered garage building with clay pan tiled roof. Good connectivity to floodplain and woodland habitat.	Potential entry points under ridge tiles. Possible small loft void may be present. Garage doors also provide an entry point.	Moderate.	
6A4	External inspection only. Converted barn with weather-boarded exterior and thatched roof. Good connectivity to floodplain and woodland habitat.	Weatherboarding and gaps along the ridge and eaves.	High.	

Building Ref.	Description of Building	Description of Features/Evidence of Bat Roosting	Current results to-date – Suitability for structure roosting bats (Collins, 2016)[7]	Photo
6A5	External inspection only. Wooden structure with flat corrugated metal roof. Good connectivity to floodplain and woodland habitat.	No potential roosting features recorded.	Negligible.	
7A1	External and internal inspection. Connected wooden stable blocks in active use, with an unlined corrugated bitumastic roof. Internal timbers in good condition. In close proximity to vegetated corridors for commuting and foraging bats.	No potential roosting features recorded.	Negligible.	

Building Ref.	Description of Building	Description of Features/Evidence of Bat Roosting	Current results to-date – Suitability for structure roosting bats (Collins, 2016)[7]	Photo
7A2	External and internal inspection. A wooden stable block in active use, with an unlined corrugated metal roof. Stables divided by chipboard. In close proximity to vegetated corridors for commuting and foraging bats.	No potential roosting features recorded.	Negligible.	
7B1	External and internal inspection. A complex of connected barns, separated internally. The main body of the building had been converted into a living space, and the attached sections were storage buildings and barns. No loft spaces within the building. In close proximity to vegetated corridors for commuting and foraging bats.	Lifted roof tiles and gaps underneath weatherboarding. Gaps around doorframes and in walls. A single bat dropping was recorded on the floor of the mezzanine level within the structure. DNA analysis was not undertaken as the dropping was crumbled to confirm it was of bat origin.	Confirmed roost.	

Building Ref.	Description of Building	Description of Features/Evidence of Bat Roosting	Current results to-date – Suitability for structure roosting bats (Collins, 2016)[7]	Photo
7B2	External and internal inspection. A two-storey brick-built residential dwelling with a pitched roof of clay pantiles. Three separate roof voids within the building, all lined. In close proximity to vegetated corridors for commuting and foraging bats.	Lifted roof tiles and occasional gaps associated with soffit boxes. Occasional gaps in roof lining providing access into roof void. Droppings present in all three roof voids. DNA analysis of results was inconclusive.	Confirmed roost.	
8A1	External inspection only. A single-storey residential dwelling with a pitched roof of clay pan tiles. Flat roof garage extension with a timber roof structure, connected to the main building through a boiler room. In close proximity to vegetated corridors for commuting and foraging bats.	Brown long-eared bat droppings were scattered on the wall of the garage leading towards the boiler.	Confirmed roost.	
9A1	External inspection only. A timber building with an asbestos shell. Good connectivity to woodland habitat.	Large barn with limited roosting opportunities against the timbers.	Moderate (precautionary as internal assessment not possible).	No photo available. Photographs to be taken in 2021.

Building Ref.	Description of Building	Description of Features/Evidence of Bat Roosting	Current results to-date – Suitability for structure roosting bats (Collins, 2016)[7]	Photo
9A2	External inspection only. Timber buildings with shiplap board cladding and an asbestos roof. Good connectivity to woodland habitat.	Large barn with limited roosting opportunities against the timbers, especially under the cladding.	Moderate (precautionary as internal assessment not possible).	No photo available. Photographs to be taken in 2021.
9A3	External inspection only. A brick-built timber barn structure with a clay tiled roof. An open faced, timber barn with an asbestos roof structure was connected to the building on the southern face. Good connectivity to woodland habitat.	Many gaps under tiles and through broken windows. Large open barns on the southern side also offered good foraging potential during bat weather conditions with multiple opportunities for feeding perches.	High (precautionary assessment as internal inspection not possible).	
9A4	External inspection only. A two-storey, brick-built residential dwelling with uPVC windows and shiplap weatherboarding. Pitched roof with clay pan-tiles and a traditional loft space (following discussion with land-owner). Good connectivity to woodland habitat.	Weatherboarding, gaps in the ridge tiles and under the eaves.	High (precautionary assessment as internal inspection not possible).	

Appendix D

VANTAGE POINT SURVEYS

Figure D-1 – Vantage Point Survey Locations (VP1 – VP8).

Figure D-2 - Flight lines observed at Vantage Point 1.

Figure D-3 - Flight lines observed at Vantage Point 2.

Figure D-4 - Flight lines observed at Vantage Point 3.

Figure D-5 - Flight lines observed at Vantage Point 4.

Figure D-6 - Flight lines observed at Vantage Point 5.

Figure D-7 - Flight lines observed at Vantage Point 6.

Figure D-8 - Flight lines observed at Vantage Point 7.

Figure D-9 - Flight lines observed at Vantage Point 8.

Table D-1 - Meterological data for vantage point surveys completed between May - September 2020.

VP1

Month	Date	Survey start and end times (sunset time in brackets)	Description (including windspeed and rain if recorded)	Temp. Start (°C)	Temp. End (°C)	Cloud cover (oktas)
May	*	*	*	*	*	*
June	*	*	*	*	*	*
July	29/07/20	21.06 to 23.51 (sunset: 20:51)	N/A	18	15	1
August	20/08/20	20:24 to 23:09 (sunset: 20:09)	Beaufort: 0	21	18	1
September	15/09/20	19:25 to 22:10 (sunset: 19:10)	N/A	23	17	0

*Not completed due to access restrictions – to be completed in 2021.

VP2

Month	Date	Survey start and end times (sunset time in brackets)	Description (including windspeed and rain if recorded)	Temp. Start (°C)	Temp. End (°C)	Cloud cover (oktas)
May	*	*	*	*	*	*
June	23/06/20	21:39 to 00:24 (sunset: 21:24)	Beaufort: 1	21	16	3
July	28/07/20	20:38 to 22:53 (sunset: 20:53)	Beaufort: 2-4	17	14	3
August	09/09/20	19:38 to 22:23 (sunset: 19.23)	Beaufort: 1	18	15	3
September	29/09/20	18:51 to 21:36 (sunset: 18:37)	Wind: 4mph Light rain/drizzle at start of survey, dry by end	13	11	8

*Not completed due to access restrictions – to be completed in 2021.

VP3

Month	Date	Survey start and end times (sunset time in brackets)	Description (including windspeed and rain if recorded)	Temp. Start (°C)	Temp. End (°C)	Cloud cover (oktas)
May	*	*	*	*	*	*
June	24/06/20	21:38 to 00:23 (sunset: 21:23)	Beaufort: 1	21	17	0
July[8]	27/07/20	20:40 to 22:25 (sunset: 20:55)	Beaufort: 4	19	16	4-5
August	12/08/20	21:01 to 23:27 (sunset: 20:27)	Beaufort: 1	22	21	1
September	10/09/20	19:37 to 22:22 (sunset: 19:22)	Beaufort: 0	14	13	7-8

VP4

Month	Date	Survey start and end times (sunset time in brackets)	Description (including windspeed and rain if recorded)	Temp. Start (°C)	Temp. End (°C)	Cloud cover (oktas)
May	*	*	*	*	*	*
June	29/06/20	21:38 to 00:23(sunset: 21.22)	Beaufort: 4	16	14	8
July	21/07/20	21:18 to 00:03 (sunset 21:03)	Beaufort: 0	14	13	6-8
August	10/08/20	20:46 to 23:31 (sunset: 20:30)	Beaufort: 0	19	21	1-0
September	17/09/20	19:19 to 22:04 (sunset: 19:04)	Beaufort: 1	15	15	5-1

[8] VP3 in July was terminated early (at 22:25, 1.5 hours after sunset). The July survey for VP3 will be repeated in 2021 to ensure a full dataset for VP3.

VP5

Month	Date	Survey start and end times (sunset time in brackets)	Description (including windspeed and rain if recorded)	Temp. Start (°C)	Temp. End (°C)	Cloud cover (oktas)
May	18/05/20	21:06 to 00:06 (sunset: 20:51)	Beaufort: 0-1	15.5	10	6
June	25/06/20	21:37 to 00:37 (sunset: 21:23)	Beaufort: 0-1	20	16	0
July	16/07/20	21:26 to 00:11 (sunset: 21:110	Beaufort: 1	19	17	8
August	11/08/20	20:43 to 23:28 (sunset: 20:28)	Beaufort: 1	26	23	1-0
September	16/09/20	19:22 to 22:07 (sunset: 19:07)	Beaufort: 4	16	14	8-7

VP6

Month	Date	Survey start and end times (sunset time in brackets)	Description (including windspeed and rain if recorded)	Temp. Start (°C)	Temp. End (°C)	Cloud cover (oktas)
May	14/05/20	21:00 to 00:00 (sunset: 20.45)	Beaufort: 0	4.5	1.3	0
June	08/06/20	21:32 to 00:17 (sunset: 21:17)	Beaufort: 1-2	10	7	3-0
July	14/07/20	21:28 to 00:13 (sunset: 21:13)	Beaufort: 0	17	14	8-5
August	06/08/20	20:53 to 23:38 (sunset: 20:38)	Beaufort: 0	24	21	2-0
September	08/09/20	19:40 to 22:25 (sunset: 19:25)	Beaufort: 1	23	20	5-2

VP7

Month	Date	Survey start and end times (sunset time in brackets)	Description (including windspeed and rain if recorded)	Temp. Start (°C)	Temp. End (°C)	Cloud cover (oktas)
May	12/05/20	20:40 to 23:30 (sunset: 20:42)	Beaufort: 0	9	8	4
June	04/06/20	21:28 to 00:13 (sunset: 21:13)	Beaufort: 1	10	10	4-6
July	07/07/20	21:33 to 00:18 (sunset: 21:18)	Beaufort: 1-0	13	12	8
August	13/08/20	20:39 to 23:24 (sunset: 20:24)	Beaufort: 1	17	15	8
September	07/09/20	19:44 to 22:29 (sunset: 19:29)	Beaufort: 3-2	16	16	8

VP8

Month	Date	Survey start and end times (sunset time in brackets)	Description (including windspeed and rain if recorded)	Temp. Start (°C)	Temp. End (°C)	Cloud cover (oktas)
May	20/05/20	21:09 to 00:09 (sunset: 20:54)	Beaufort: 1-0	20	15	0
June	21/06/20	21:38 to 00:23 (sunset: 21:23)	Beaufort: 0	17	13	3-2
July	20/07/20	21:21 to 00:06 (sunset: 21:06)	Beaufort: 0	14	11	2-1
August	03/08/20	20:59 to 23:44 (sunset: 20:44)	Beaufort: 0	16	11	5-2
September	03/09/20	19:53 to 22:38 (sunset: 19:32)	Beaufort: 1	18	17	5-6

Appendix E

BAT-TRACKING SURVEYS

Table E-1 – Summary of bat tracking survey dates

Location	Month	Date	Dusk/Dawn
Foxburrow	July	21/07/2020	Dawn
Foxburrow	July	22/07/2020	Dawn
Northern Woodlands	July	23/07/2020	Dawn
The Broadway	July	24/07/2020	Dawn
Foxburrow	July	28/07/2020	Dawn
Woodland south of Ringland Lane	July	29/07/2020	Dawn
Northern Woodlands	July	30/07/2020	Dawn
The Broadway	July	31/07/2020	Dawn
Foxburrow	August	04/08/2020	Dawn
Northern Woodlands	August	05/08/2020	Dawn
Woodland south of Ringland Lane	August	06/08/2020	Dawn
The Broadway	August	06/08/2020	Dawn
Northern Woodlands	August	07/08/2020	Dawn
Woodland south of Ringland Lane	August	11/08/2020	Dawn
The Broadway	August	12/08/2020	Dawn
Foxburrow	August	13/08/2020	Dawn
Foxburrow	August	17/08/2020	Dusk
The Broadway	August	18/08/2020	Dusk
Woodland south of Ringland Lane	August	19/08/2020	Dusk
Northern Woodlands	August	20/08/2020	Dusk
Woodland south of Ringland Lane	August	24/08/2020	Dusk
The Broadway	August	26/08/2020	Dusk
Northern Woodlands	August	27/08/2020	Dawn
Foxburrow	August	28/08/2020	Dawn
Foxburrow	September	01/09/2020	Dusk
The Broadway	September	02/09/2020	Dusk
Northern Woodlands	September	03/09/2020	Dusk

Figure E-1 - Bat tracking survey locations.

Figure E-2 - Flight lines observed during the dusk bat tracking surveys in the Northern Woodlands.

Figure E-3 - Flight lines observed during the dawn bat tracking surveys in the Northern Woodlands.

Figure E-4 - Flight lines observed during the dusk bat tracking surveys in the woodland south of Ringland Lane.

Figure E-5 - Flight lines observed during the dawn bat tracking surveys in the woodland south of Ringland Lane.

Figure E-6 - Flight lines observed during the dusk bat tracking surveys along the Broadway.

Figure E-7 - Flight lines observed during the dawn bat tracking surveys along the Broadway.

Figure E-8 - Flight lines observed during the dusk bat tracking surveys in Foxburrow Plantation.

Figure E-9 - Flight lines observed during the dawn bat tracking surveys in Foxburrow Plantation.

Appendix F

AUTOMATED BAT DETECTOR SURVEYS

Table F-1 - Summary of bat species recorded (including total and average number of sound files) during automated detector surveys between September 2019 and 2020

*__ppn__- Passes per night

May

Area A - River Wensum

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C1	5	1.0	0.2	22.8	13.8	0.4	0.2	64.2	955.4	0.0	**1058.0**

Area B – Stream south of the River Wensum

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C39	5	0.8	0.0	2.0	3.0	1.2	0.0	12.8	21.4	0.0	**41.2**

Area C – The Nursery and Rose Carr

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C60 (2019)	5	11.2	1.4	2.0	10.0	0.6	1.4	805.2	52.0	21.4	**905.2**
C4	5	1.8	0.0	2.0	0.0	0.2	0.0	5.6	23.2	0.2	**33.0**

Area D - Western edge of Spring Hills

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C5	5	0.4	0.4	4.2	0.4	0.0	0.2	2.8	1.2	0.0	**9.6**

Area G – Long Plantation

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C7	5	1.4	1.4	8.6	0.0	0.0	0.0	13.0	4.0	0.2	**28.6**
C8	5	1.4	0.2	4.8	0.0	0.0	0.0	6.4	2.0	0.0	**14.8**

Area H – Ringland Lane

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C19	5	9.8	4.0	2.6	0.8	0.2	0.0	12.8	15.2	0.8	**46.2**

Area I – Woodland south of Ringland Lane

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C18	5	7.0	1.4	0.4	0.0	0.2	0.2	61.4	102.0	1.0	**174.0**

Area J – Hedgerow north of Weston Road

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C11	5	6.2	1.0	0.6	0.0	0.2	0.2	100.6	5.8	12.2	**126.8**
C33	5	0.8	2.0	0.8	3.2	0.0	0.0	12.2	4.8	0.0	**23.8**

Area K – Weston Road

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
B8i	5	17.6	10.8	0.8	2.2	0.2	0.0	81.2	14.4	1.2	**128.4**
B8	5	1.8	2.6	0.6	0.0	0.0	0.0	270.4	35.4	29.2	**340.0**

Area L – Arable south of Weston Road

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
B9	5	1.2	1.2	2.0	1.2	0.4	0.2	616.8	154.8	12.8	**791.0**
C12	5	0.6	0.0	0.0	0.0	0.0	0.0	72.6	1.6	1.2	**76.0**
C28	5	4.2	1.6	0.0	0.0	0.8	0.2	52.0	21.6	0.0	**80.4**

Area M – The Broadway

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C21	5	3.2	0.6	0.2	0.4	0.4	0.2	198.6	29.0	0.0	**232.6**

Area N – Hedgerow between the Broadway and Foxburrow Plantation

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C27	5	0.6	0.6	2.0	0.6	0.4	0.0	35.0	8.2	2.8	**50.2**
B11i	5	3.6	1.0	0.2	0.0	0.2	0.8	198.2	29.6	0.0	**233.6**

Area O – Foxburrow Plantation

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C23	5	1.6	0.6	1.0	0.8	0.4	0.0	39.6	20.0	0.0	**64.0**
C24	5	1.2	0.0	2.8	0.2	0.0	0.2	442.6	98.4	0.8	**546.2**
C41	5	44.8	1.8	5.4	0.0	3.8	4.0	1210.2	158.6	0.2	**1428.8**
C42	5	0.6	0.4	0.6	0.0	0.0	0.0	699.8	263.2	0.0	**964.6**

Area P – Foxburrow Stream

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C32	5	0.6	0.0	1.2	0.0	0.0	0.2	28.4	12.4	0.2	**43.0**

Area Q -Hedgerow south of Foxburrow Plantation

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C25	5	0.6	0.2	0.2	0.2	0.2	0.0	15.6	3.2	0.0	**20.2**
C2	5	9.8	1.2	0.8	0.6	3.6	2.2	646.6	91.8	1.6	**758.2**
C31	5	0.0	0.8	0.8	0.2	0.0	0.0	5.8	1.2	0.2	**9.0**
C40	5	0.0	0.0	0.2	0.0	0.0	0.0	12.6	2.4	0.4	**15.6**

NA

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C6	5	1.4	0.6	6.0	3.0	0.4	1.2	121.4	65.0	2.6	**202.0**

June

Area A - River Wensum

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C1	5	0.0	1.6	2.8	28.2	0.0	0.0	34.2	47.8	1.0	**116.0**

Area B – Stream south of the River Wensum

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C39	5	1.0	0.2	0.8	9.0	0.4	0.0	10.4	22.4	0.0	**44.2**

Area C – The Nursery and Rose Carr

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C60 (2019)	5	15.2	1.0	1.8	4.2	0.6	1.0	135.8	103.4	6.0	**269.0**
C4	5	4.8	1.0	2.0	8.0	0.0	0.2	17.6	44.4	1.4	**79.4**

Area D - Western edge of Spring Hills

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C5	5	2.4	0.4	3.6	6.4	0.0	0.0	42.4	46.4	1.2	**102.8**

Area F – Northern edge of Primrose Grove

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C57	5	0.4	2.6	13.2	1.4	0.0	0.4	20.8	6.8	0.0	**45.6**

Area G – Long Plantation

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C7	5	5.0	0.2	0.6	2.0	0.0	0.0	50.2	61.0	0.0	**119.0**
C8	5	0.0	0.0	0.2	0.8	0.0	0.0	11.6	19.2	1.2	**33.0**

Area H – Ringland Lane

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C19	5	0.4	1.0	0.2	0.0	0.0	0.2	7.0	8.2	0.0	**17.0**

Area I – Woodland south of Ringland Lane

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C18	5	1.2	0.4	1.0	1.6	0.2	2.0	20.8	45.4	2.2	**75.0**

Area J – Hedgerow north of Weston Road

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C33	5	0.0	0.0	0.0	1.2	0.2	0.0	6.0	1.2	0.0	**8.6**
C35	5	5.6	3.6	1.8	0.0	0.2	0.0	38.4	5.4	0.0	**55.0**
C56	5	1.0	1.2	0.4	0.0	0.0	0.4	282.6	3.8	0.0	**289.4**
C11	5	0.6	5.6	12.2	2.0	1.4	4.0	72.8	17.6	9.8	**126.0**

Area K – Weston Road

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
B8i	5	4.2	4.6	0.0	1.0	0.2	0.0	52.0	4.4	0.2	**66.6**

Area L – Arable south of Weston Road

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C28	5	2.6	0.4	0.4	0.2	0.0	0.0	73.4	20.6	0.0	**97.6**
C34	5	0.2	1.2	0.0	2.8	0.2	0.0	0.6	0.0	0.8	**5.8**
B9	5	0.0	0.0	0.2	0.0	0.4	0.0	55.6	11.8	11.4	**79.0**
C12	5	2.2	0.4	0.4	0.8	0.4	0.0	119.8	8.6	29.8	**162.0**

Area M – The Broadway

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
B10i	5	17.6	0.0	0.0	0.0	0.0	0.6	535.4	50.6	2.0	**606.0**
C13	5	1.8	1.8	1.2	2.0	0.2	0.4	111.0	8.0	3.8	**130.0**
C13i	5	19.4	2.8	2.0	0.0	0.0	0.4	672.4	71.6	3.0	**772.0**
C20	5	3.6	0.0	0.2	0.2	0.0	0.2	365.4	73.4	2.8	**446.0**
C21	5	21.0	0.0	0.4	0.2	0.0	0.2	319.4	204.8	0.2	**546.2**
C22	5	5.8	0.2	2.2	0.0	0.0	0.0	65.2	42.4	5.8	**122.0**

Area N – Hedgerow between the Broadway and Foxburrow Plantation

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C27	5	0.8	0.0	6.8	0.8	0.0	0.0	23.2	28.6	0.4	**60.6**

Area O – Foxburrow Plantation

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C41	5	61.0	3.0	5.2	0.2	0.4	1.2	978.6	137.4	0.0	**1187.0**
C42	5	43.4	0.6	2.6	0.0	0.4	2.0	722.4	638.4	3.8	**1413.6**
B11i	5	11.2	4.2	7.0	1.2	0.2	0.6	135.4	107.6	8.2	**276.0**
B11ii	5	3.2	2.8	2.6	0.8	0.2	0.2	132.8	168.2	2.6	**313.0**
C14i	5	9.6	0.4	13.8	1.2	0.0	0.2	163.8	47.2	1.2	**237.0**
C14ii	5	1.6	0.6	0.8	0.8	0.2	0.2	152.4	109.4	8.4	**274.0**

C15	5	17.8	4.4	13.4	0.0	0.6	0.6	630.2	497.8	52.2	**1217.0**
C15i	4	112.5	0.0	1.3	0.0	0.3	0.5	464.0	440.8	6.0	**1025.0**
C23	5	5.2	1.0	6.4	1.2	0.2	0.0	75.6	42.2	0.2	**132.0**
C2	5	1.2	1.2	1.4	0.2	0.0	0.2	63.4	42.0	3.2	**113.0**

Area P – Foxburrow Stream

Detector Ref	**No. of Nights**	**Barbastelle ppn**	**Brown Long-eared ppn**	***Myotis* sp. ppn**	**Noctule ppn**	***Nyctalus* sp. ppn**	**Serotine ppn**	**45 Pipistrelle ppn**	**55 Pipistrelle ppn**	**Nathusius' Pipistrelle ppn**	**Total calls per night**
C32	5	0.2	0.2	1.4	0.8	0.2	0.6	73.2	101.2	0.2	**178.0**

Area Q -Hedgerow south of Foxburrow Plantation

Detector Ref	**No. of Nights**	**Barbastelle ppn**	**Brown Long-eared ppn**	***Myotis* sp. ppn**	**Noctule ppn**	***Nyctalus* sp. ppn**	**Serotine ppn**	**45 Pipistrelle ppn**	**55 Pipistrelle ppn**	**Nathusius' Pipistrelle ppn**	**Total calls per night**
C29	5	2.6	1.4	0.0	0.6	0.0	0.0	56.8	26.2	0.0	**87.6**
C31	5	1.6	0.2	0.0	0.4	0.0	0.0	43.6	13.4	1.4	**60.6**
C40	5	0.8	0.4	0.2	0.0	0.2	0.2	54.6	9.4	1.8	**67.6**
C26	4	0.0	0.3	0.3	1.0	0.0	0.0	96.8	10.3	10.3	**118.8**

NA

Detector Ref	**No. of Nights**	**Barbastelle ppn**	**Brown Long-eared ppn**	***Myotis* sp. ppn**	**Noctule ppn**	***Nyctalus* sp. ppn**	**Serotine ppn**	**45 Pipistrelle ppn**	**55 Pipistrelle ppn**	**Nathusius' Pipistrelle ppn**	**Total calls per night**
M43	5	1.0	4.4	2.2	4.2	0.0	0.4	23.0	4.4	0.0	**40.0**
D1	5	1.0	0.4	3.8	11.0	0.4	0.8	11.4	125.0	0.6	**154.0**

July

Area A - River Wensum

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C1	5	0.2	1.0	3.8	19.4	1.0	0.4	48.4	96.4	0.6	**171.0**

Area B – Stream south of the River Wensum

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C39	5	0.4	0.6	2.8	10.2	0.6	0.6	20.0	49.6	0.0	**84.8**

Area C – The Nursery and Rose Carr

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C37	5	8.0	6.0	20.0	1.4	0.6	0.0	171.8	103.8	0.0	**311.6**
C38	5	51.8	0.6	7.2	0.8	0.6	0.8	741.4	665.6	0.0	**1468.8**
C4	5	12.8	2.2	12.2	10.8	1.6	2.2	187.0	106.0	0.0	**334.8**
C5	5	14.8	1.0	5.6	2.6	0.4	1.0	526.8	168.0	0.0	**720.2**
C60 (2020)	5	7.4	0.2	1.2	1.6	1.0	0.6	1185.0	122.6	0.0	**1319.6**
C61	5	21.0	2.2	11.0	0.2	0.8	0.8	158.0	741.4	0.0	**935.4**
C60 (2019)	5	5.8	0.2	0.6	1.8	0.4	1.6	55.0	284.4	0.4	**350.2**
C4	5	4.6	2.8	3.8	13.2	4.4	1.2	37.8	28.4	1.2	**97.4**

Area D - Western edge of Spring Hills

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C5	5	4.6	3.6	9.4	15.4	1.6	1.0	17.8	25.6	1.0	**80.0**
C44	5	2.6	1.2	2.0	9.2	0.6	0.4	343.6	177.4	0.0	**537.0**
C45	5	18.8	3.0	4.0	1.4	2.6	1.0	546.8	77.4	0.6	**655.6**
C52	5	1.6	0.2	3.8	0.0	0.2	1.8	466.6	359.2	0.0	**833.4**

Area E – Grassland within Northern Woodlands

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
M46	5	1.2	6.6	2.4	9.4	3.2	0.6	54.2	19.4	1.4	**98.4**
M4	5	0.4	5.6	2.8	9.4	0.6	0.0	19.8	12.6	0.8	**52.0**
M50	5	3.2	7.8	10.8	13.2	6.8	0.4	16.4	11.4	1.6	**71.6**
M51	5	9.6	8.6	16.4	9.2	7.2	1.0	129.4	44.2	0.0	**225.6**
M52	5	2.4	17.6	12.6	16.2	6.0	0.0	24.8	21.2	0.8	**101.6**

Area F – Northern edge of Primrose Grove

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C57	5	34.8	12.6	11.6	12.4	5.2	1.8	144.2	69.2	0.0	**291.8**

Area G – Long Plantation

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C7	5	1.2	0.4	1.4	5.8	13.6	7.8	28.8	8.8	1.6	**69.4**
C8	5	0.2	0.2	0.6	2.0	0.6	0.2	59.4	20.0	0.2	**83.4**

Area H – Ringland Lane

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C53	5	12.2	0.2	0.2	0.8	0.0	0.2	714.4	17.8	0.0	**745.8**

Area I – Woodland south of Ringland Lane

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C18	5	0.0	3.8	0.4	0.6	0.0	0.4	15.0	10.0	1.8	**32.0**
C54	5	2.0	0.0	0.4	5.2	0.6	0.2	54.6	64.6	0.2	**127.8**
C55	5	0.2	0.6	0.0	0.0	1.2	1.2	104.2	107.2	0.0	**214.6**

Area J – Hedgerow north of Weston Road

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C33	5	0.2	0.4	0.4	0.6	0.0	0.0	11.2	1.4	0.0	**14.2**
C35	5	0.0	2.4	2.8	1.2	0.0	0.0	25.0	6.0	0.0	**37.4**
C56	5	1.0	4.0	0.4	9.8	0.0	0.0	533.2	5.6	0.0	**554.0**
C11	5	9.8	4.4	7.4	4.0	1.2	0.8	128.4	12.4	8.4	**176.8**

Area K – Weston Road

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
B8i	5	4.4	4.2	0.0	0.6	0.0	0.0	112.2	14.8	0.4	**136.6**

Area L – Arable south of Weston Road

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C34	5	0.0	0.8	0.2	0.0	0.0	0.0	1.8	0.0	0.0	**2.8**
B9	5	0.0	0.8	0.2	1.4	0.4	0.0	41.8	162.0	2.4	**209.0**
C12	5	0.0	0.4	0.2	1.4	0.4	0.0	89.0	3.4	17.2	**112.0**
C28	5	0.2	0.0	0.2	0.8	0.2	0.4	144.6	0.4	18.8	**166.0**

Area M – The Broadway

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
B10i	5	13.0	1.2	0.4	0.8	0.2	1.0	676.6	145.4	4.4	**843.0**
C13i	5	4.8	6.0	4.4	1.2	0.8	0.4	434.2	32.8	4.2	**489.0**
C21	5	4.8	0.2	0.2	0.0	0.2	1.2	351.2	31.6	0.0	**389.4**
C20	5	6.6	7.0	1.0	10.0	0.6	3.0	248.8	43.8	1.4	**322.0**
C22	5	1.8	0.2	0.0	1.2	2.2	2.2	64.8	15.2	0.6	**88.0**

Area N – Hedgerow between the Broadway and Foxburrow Plantation

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C27	5	0.2	0.6	1.0	2.4	0.2	0.4	50.0	12.2	0.0	**67.0**

Area O – Foxburrow Plantation

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C41	5	12.2	1.0	3.0	0.0	0.8	0.8	641.0	224.2	0.0	**883.0**
C42	5	19.4	0.2	0.6	0.0	0.0	0.4	627.6	171.0	0.2	**819.4**
B11i	5	2.8	2.4	2.2	15.4	2.2	2.6	242.4	161.4	3.4	**435.0**
B11ii	5	2.2	0.4	1.0	7.6	0.8	1.2	68.2	21.2	0.6	**103.0**
C14i	5	7.4	0.6	4.6	18.8	1.4	0.4	1245.0	211.8	0.2	**1490.0**
C14ii	5	1.8	0.2	0.6	3.0	0.8	0.0	248.2	19.4	0.6	**275.0**
C15i	5	7.8	1.6	1.4	13.2	1.2	2.2	1.6	774.2	1.6	**264.0**
C23	5	6.4	0.6	4.2	7.4	2.4	1.2	873.8	267.8	1.0	**1164.8**
C24	5	2.2	1.8	4.0	9.4	2.0	2.2	46.4	24.2	0.6	**93.0**
C25	5	0.4	0.6	0.4	4.0	1.4	0.2	49.4	10.4	0.6	**67.4**
C26	5	0.2	0.6	0.2	0.8	0.2	0.4	148.2	10.6	18.0	**179.2**
C29	5	0.4	0.0	0.0	5.4	0.2	0.4	0.6	0.4	0.0	**7.4**

Area P – Foxburrow Stream

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C32	5	1.0	0.8	0.6	1.6	0.0	0.0	42.4	33.4	0.0	**79.8**

Area Q -Hedgerow south of Foxburrow Plantation

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C31	5	1.4	11.6	0.8	1.6	0.0	0.2	24.0	7.8	0.0	**47.4**
C40	5	2.6	1.4	0.2	0.0	0.0	0.0	99.2	9.4	0.0	**112.8**

NA

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C59	5	2.8	0.2	0.0	0.4	0.0	0.0	461.6	75.0	0.0	**540.0**
M43	5	2.6	7.0	10.8	5.6	2.8	1.2	40.4	18.0	0.0	**88.4**

August

Area A - River Wensum

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C1	5	1.8	0.6	21.8	4.2	2.2	0.2	52.0	1333.0	0.0	**1415.8**

Area B – Stream south of the River Wensum

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C39	5	2.8	2.2	3.0	0.4	0.4	0.2	11.8	22.6	0.0	**43.4**

Area C – The Nursery and Rose Carr

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C60 (2019)	5	8.0	0.2	0.8	5.2	0.4	0.4	214.0	148.2	0.0	**377.2**
C37	5	3.4	5.0	6.6	0.8	0.4	2.6	31.4	248.2	0.0	**298.4**
C38	5	99.0	5.0	3.4	0.8	0.6	1.2	202.6	532.8	0.0	**845.4**
C58	5	27.2	0.8	2.6	1.8	0.2	0.6	262.0	582.6	0.0	**877.8**
C48	5	6.4	9.2	5.4	10.2	1.6	1.8	67.8	132.2	0.4	**235.0**
C49	5	20.0	2.4	8.0	1.4	0.0	0.4	28.0	114.6	0.0	**174.8**
C60 (2020)	5	16.0	2.8	2.6	8.4	0.6	5.8	83.4	262.6	0.0	**384.0**
C61	5	27.0	2.0	17.8	0.2	0.0	1.0	249.8	786.2	0.0	**1084.0**

Area D - Western edge of Spring Hills

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C44	5	2.4	2.6	0.8	0.8	0.0	0.0	14.8	47.4	0.0	**68.8**
C45	5	70.6	1.8	2.0	2.2	0.6	0.0	40.8	110.2	0.0	**228.2**
C52	5	5.0	2.0	7.6	1.2	1.0	9.4	199.6	656.6	0.0	**914.6**
C5	5	8.6	4.0	3.6	8.8	0.0	1.2	22.6	20.4	0.6	**69.8**

Area E – Grassland within Northern Woodlands

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
M46	5	8.2	17.8	5.2	7.0	6.2	0.8	49.6	74.0	0.0	**168.8**
M47	5	4.0	11.6	7.2	32.0	0.4	4.0	42.4	55.2	1.6	**158.4**
M50	5	0.4	25.6	0.4	0.0	0.2	0.0	42.2	53.2	0.0	**122.0**
M5	5	27.4	24.4	8.2	8.4	11.0	2.4	95.6	74.0	0.0	**251.4**
M52	5	6.2	24.4	8.4	11.0	10.0	1.8	39.4	30.2	1.0	**132.4**

Area F – Northern edge of Primrose Grove

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C57	5	12.0	18.4	8.6	15.8	5.0	2.6	53.0	55.2	0.0	**170.6**

Area G – Long Plantation

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C53	5	16.6	0.4	3.0	1.2	0.4	1.2	1007.4	74.8	0.0	**1105.0**
C7	5	36.6	2.8	7.8	2.6	0.4	1.0	846.8	115.2	0.2	**1013.4**
C8	5	101.4	0.6	1.6	0.8	0.6	0.0	149.4	17.4	0.2	**272.0**

Area H – Ringland Lane

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C19	3	31.7	1.0	1.3	0.7	0.0	0.0	16.3	7.0	0.0	58.0

Area I – Woodland south of Ringland Lane

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C18	5	0.0	3.8	0.4	0.6	0.0	0.4	15.0	10.0	1.8	**32.0**
C54	5	2.0	0.0	0.4	5.2	0.6	0.2	54.6	64.6	0.2	**127.8**
C55	5	0.2	0.6	0.0	0.0	1.2	1.2	104.2	107.2	0.0	**214.6**

Area J – Hedgerow north of Weston Road

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C11	5	22.8	3.0	4.4	0.8	0.4	3.4	680.6	267.8	19.2	**1002.4**
C33	5	9.8	1.0	2.0	1.6	0.2	0.6	258.6	174.4	0.0	**448.2**
C35	5	2.6	7.8	3.2	5.8	4.4	0.6	111.0	28.6	0.0	**164.0**
C56	5	18.0	12.0	6.8	3.0	1.0	18.6	320.2	48.8	0.0	**428.4**

Area K – Weston Road

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
B8i	5	4.8	6.4	0.0	0.8	0.4	1.8	25.0	11.6	0.4	**51.2**

Area L – Arable south of Weston Road

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C34	5	0.4	6.8	0.6	0.4	0.8	0.6	3.8	2.6	0.0	**16.0**
B9	5	0.8	0.2	1.0	0.8	0.0	0.2	390.0	136.8	0.0	**530.0**
C12	4	1.0	0.8	0.8	1.0	0.0	0.8	25.5	3.5	0.0	**33.0**
C28	5	2.8	0.6	0.2	0.0	0.2	0.4	837.8	22.0	0.0	**864.0**

Area M – The Broadway

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
B10i	5	19.8	1.2	1.4	1.4	0.0	1.4	488.2	133.8	3.6	**651.0**
C13i	5	6.4	1.6	1.8	16.4	1.6	4.6	370.6	93.2	0.8	**497.0**
C20	4	33.5	2.0	6.5	72.5	13.0	32.5	822.8	512.0	1.0	**1496.0**
C21	5	27.2	0.4	2.8	17.6	17.8	19.6	184.6	273.6	0.6	**544.2**
C22	5	7.6	0.2	2.6	4.8	4.2	7.0	169.2	115.2	0.0	**311.0**

Area N – Hedgerow between the Broadway and Foxburrow Plantation

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C27	5	3.2	2.2	2.6	2.2	0.0	0.8	19.0	12.6	0.6	**43.2**

Area O – Foxburrow Plantation

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C40	5	1.2	2.4	1.2	8.4	1.6	0.2	109.0	52.0	0.0	**176.0**
C41	5	32.2	6.2	5.4	1.0	15.8	10.0	1179.0	332.0	0.0	**1588.6**
C42	5	14.0	6.0	8.8	2.4	6.0	11.0	1013.4	633.4	0.0	**1715.2**
B11i	5	11.2	31.8	2.0	19.0	7.2	5.4	400.2	261.6	7.6	**746.0**
B11ii	5	6.4	1.8	2.2	6.2	2.6	9.8	348.0	38.4	0.6	**416.0**
C14i	5	5.0	0.2	1.2	9.0	0.6	3.6	1404.4	0.0	0.0	**1915.4**
C14ii	5	12.0	3.2	2.6	89.6	0.8	2.4	369.0	159.0	0.6	**639.0**
C15i	5	13.8	1.0	0.6	1.8	0.2	3.8	696.6	675.4	2.2	**1395.0**
C23	5	3.8	5.2	5.2	6.4	11.6	7.2	221.8	299.0	3.8	**564.0**
C24	5	4.8	0.2	2.0	90.8	1.2	10.8	213.0	117.8	2.6	**443.0**
C26	5	0.6	0.8	2.4	0.2	0.0	0.6	0.4	0.2	0.0	**5.2**
C29	5	2.8	0.6	13.0	4.0	0.0	0.6	1.0	0.6	0.2	**22.8**

Area P – Foxburrow Stream

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C32	5	11.0	3.2	5.0	22.6	36.2	32.2	119.4	34.4	0.0	**264.0**

Area Q -Hedgerow south of Foxburrow Plantation

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C25	5	2.4	1.2	1.0	1.6	0.8	1.6	171.2	51.8	0.0	**231.6**
C31	5	1.6	2.0	0.6	5.8	5.2	1.0	35.6	25.0	0.0	**76.8**

NA

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C59	5	37.8	2.4	3.0	6.0	5.0	4.2	261.0	119.6	0.0	**439.0**
M43	5	8.8	12.6	6.6	11.8	7.0	1.4	72.4	58.6	0.0	**179.2**

September

Area A - River Wensum

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C1	5	0.2	1.4	6.0	3.0	0.6	0.0	7.4	118.6	0.0	**137.2**

Area B – Stream south of the River Wensum

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C39	5	3.0	1.4	2.0	0.8	0.6	0.0	42.2	26.6	0.0	**76.6**

Area C – The Nursery and Rose Carr

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C37	5	3.6	7.6	4.4	0.6	0.2	0.2	39.0	168.0	0.0	**226.0**
C38	5	60.0	1.2	0.8	0.2	0.2	0.2	306.2	1472.0	0.0	**1840.8**
C4	5	7.4	3.6	3.8	3.2	3.0	0.0	168.8	38.2	0.0	**256.2**
C48	5	10.4	6.0	3.6	7.0	0.6	0.6	118.4	55.2	2.8	**204.6**
C49	5	25.4	2.2	10.6	2.8	2.0	0.2	166.4	134.2	0.2	**347.0**
C58	5	71.2	2.0	3.8	1.4	0.8	0.0	183.4	1289.2	0.0	**1551.8**
C60 (2020)	5	39.8	2.2	2.8	1.2	0.2	0.4	73.4	97.6	1.2	**218.8**
C61	5	9.0	1.2	21.2	0.0	0.2	0.6	14.4	574.4	0.0	**654.6**
C60 (2019)	5	20.8	1.0	0.6	3.8	0.0	0.2	152.4	198.8	0.0	**377.6**

Area D - Western edge of Spring Hills

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C44	5	18.0	14.0	10.4	1.8	4.8	0.0	128.4	79.4	0.6	**267.2**
C45	5	3.6	5.6	0.0	0.6	0.6	0.2	110.4	92.4	0.2	**213.6**
C52	5	1.8	9.0	4.8	0.0	0.0	1.8	235.4	534.6	0.0	**798.8**
C5	4	6.0	4.5	5.0	10.5	0.3	1.3	79.8	62.3	0.3	**169.8**

Area E – Grassland within Northern Woodlands

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
M46	5	0.4	16.2	0.0	0.2	0.0	0.0	53.0	19.4	0.0	**90.0**
M47	5	0.6	10.0	8.4	3.4	3.8	0.0	6.2	4.0	0.0	**36.6**
M50	5	5.8	11.6	14.4	2.4	5.2	0.4	21.4	17.8	0.0	**81.2**
M51	5	20.8	21.8	16.0	5.0	2.2	0.8	73.8	80.6	0.0	**221.0**
M52	5	3.4	7.4	4.8	2.2	3.4	0.2	8.8	9.4	0.4	**40.0**

Area F – Northern edge of Primrose Grove

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C57	5	17.6	22.6	9.4	3.4	1.4	0.2	124.6	64.6	2.0	**245.8**

Area G – Long Plantation

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C53	5	7.4	0.6	3.2	0.0	0.0	0.4	1028.6	232.6	0.0	**1272.8**
C7	5	4.8	0.6	1.4	7.2	0.0	0.0	232.8	59.8	1.8	**308.4**
C8	5	7.4	0.6	0.6	0.8	0.6	0.0	141.8	25.4	0.2	**177.4**

Area H – Ringland Lane

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C19	4	1.0	0.5	1.3	0.5	0.0	0.0	4.8	12.0	0.3	**20.3**

Area I – Woodland south of Ringland Lane

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C54	5	12.0	1.0	2.0	1.6	0.6	0.4	71.8	104.6	0.0	**194.0**
C55	5	19.2	0.8	3.8	0.2	0.2	0.2	1026.8	851.0	0.0	**1902.2**
C18	4	14.5	3.8	0.8	0.5	0.3	0.0	12.5	14.0	0.0	**37.0**

Area J – Hedgerow north of Weston Road

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C11	5	4.0	0.6	0.2	0.0	0.2	0.0	25.2	3.4	0.2	**33.8**
C33	5	0.6	1.4	8.2	0.0	0.2	0.0	6.0	1.6	0.0	**18.0**
C35	5	2.2	1.6	0.6	0.0	0.2	0.4	31.8	6.8	0.0	**43.6**

Area K – Weston Road

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
B8i	5	0.2	1.0	0.0	0.0	0.0	0.0	4.6	3.2	0.0	**9.0**

Area L – Arable south of Weston Road

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
B9	5	7.2	13.6	0.4	0.4	0.0	0.0	17.0	1.6	0.0	**40.2**
C28	5	4.8	4.0	0.6	0.6	0.6	0.0	22.6	22.2	0.2	**55.6**
C34	5	0.4	5.0	0.4	0.8	0.2	0.0	0.0	0.8	0.0	**7.6**
C12	5	2.0	0.8	0.4	0.8	0.2	0.2	28.0	4.0	0.0	**36.0**

Area M – The Broadway

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C13i	5	9.8	3.6	0.6	0.4	0.0	0.4	416.0	40.4	0.4	**472.0**
C20	4	10.3	1.5	1.5	2.3	0.0	1.3	741.8	443.5	1.3	**1203.0**
C21	5	16.4	0.4	1.8	1.4	0.2	0.4	619.6	258.6	0.6	**899.4**
C22	5	1.0	2.0	0.6	0.2	1.2	0.2	45.4	53.6	0.0	**104.0**

Area N – Hedgerow between the Broadway and Foxburrow Plantation

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C27	5	0.4	1.6	0.4	0.4	0.0	0.0	8.0	9.2	0.0	**20.0**

Area O – Foxburrow Plantation

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
B11i	5	13.0	1.8	2.8	6.0	9.2	7.8	365.8	103.6	0.4	**510.4**
C24	5	2.4	3.2	1.6	8.6	3.6	0.8	85.0	25.2	0.2	**130.6**
C31	5	1.4	2.2	1.0	6.6	0.8	0.4	47.4	8.0	0.4	**68.2**
C40	5	2.8	1.6	0.8	0.4	0.0	0.0	22.8	5.0	0.0	**33.4**
C42	5	9.0	2.4	4.0	1.0	2.0	9.2	579.0	522.0	0.0	**1128.6**
B11ii	5	3.2	2.4	1.8	4.4	2.4	2.6	761.6	362.0	1.0	**1141.0**
C14ii	3	4.3	2.3	0.3	15.7	1.0	3.0	165.0	264.7	0.3	**456.7**
C15i	4	4.3	2.5	0.3	0.8	0.0	2.0	662.3	721.5	0.5	**1394.0**
C23	5	2.2	2.2	1.4	2.0	0.0	0.2	404.8	628.4	0.6	**1041.8**
C25	5	0.2	1.0	1.0	3.0	0.4	0.2	8.0	5.4	0.2	**19.4**
C26	5	1.0	1.6	1.6	3.2	1.2	0.8	7.8	4.4	0.0	**21.6**
C29	5	3.2	1.8	1.4	3.6	0.0	0.6	21.4	22.4	0.0	**54.4**

Area P – Foxburrow Stream

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C32	5	1.2	0.0	0.6	5.4	4.0	0.2	53.2	18.2	0.2	**83.0**

NA

Detector Ref	No. of Nights	Barbastelle ppn	Brown Long-eared ppn	*Myotis* sp. ppn	Noctule ppn	*Nyctalus* sp. ppn	Serotine ppn	45 Pipistrelle ppn	55 Pipistrelle ppn	Nathusius' Pipistrelle ppn	Total calls per night
C59	5	19.2	0.6	1.4	0.6	0.4	0.2	301.8	195.6	0.0	**519.8**
M43	5	14.4	38.4	12.6	4.4	4.2	0.8	128.2	47.6	0.4	**268.6**

Plate F-2 - Graph showing serotine *Eptesicus serotinus* passes in Areas A – Q

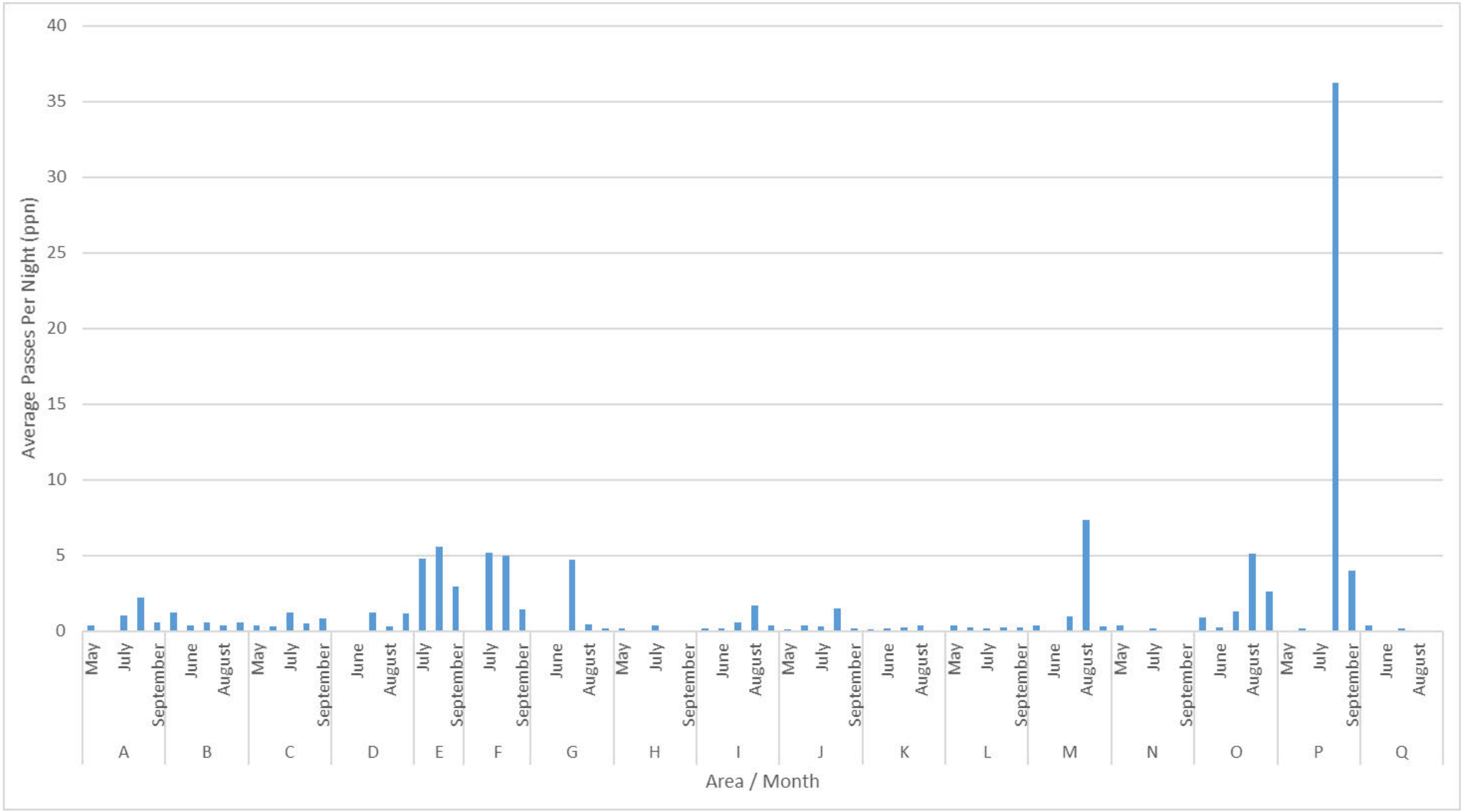

Plate F-2 - Graph showing serotine *Eptesicus serotinus* passes in Areas A – Q

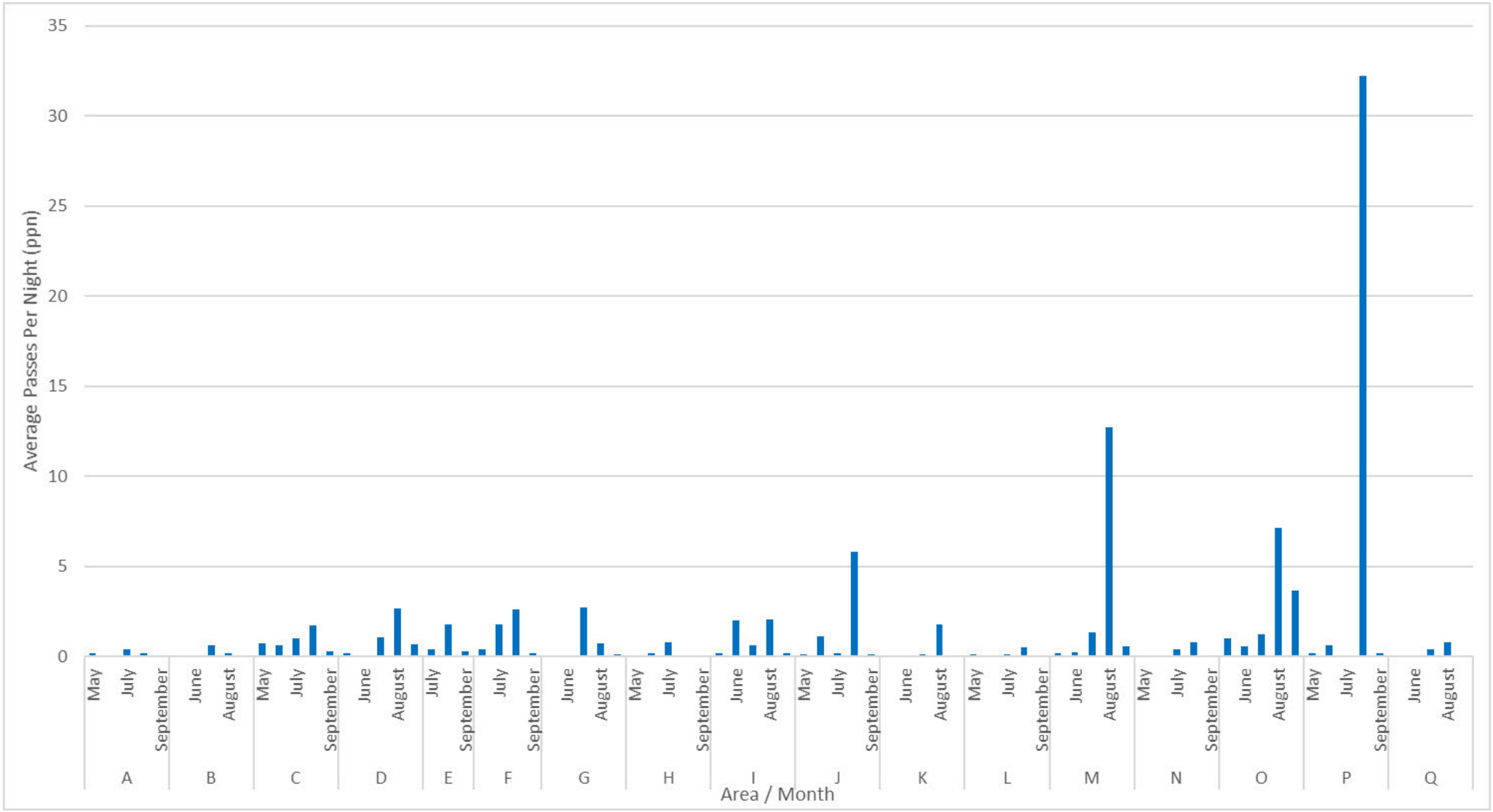

Table F-2 – Detector Deployments over May – September 2019 and 2020

B8

Reasons for < 5 nights or missing months of data - Location discontinued to enable more locations on the Scheme

Months Deployed	Year	No. of nights recorded
May	2019	5

B8i

Months Deployed	Year	No. of nights recorded
May	2020	5
June	2020	5
July	2020	5
August	2020	5
September	2020	5

B9

Months Deployed	Year	No. of nights recorded
May	2019	5
June	2019	5
July	2019	5
August	2019	5
September	2020	5

B10i

Reasons for < 5 nights or missing months of data - Not gap-filled in 2020 due to detector efforts being concentrated on the Route alignment.

Months Deployed	Year	No. of nights recorded
June	2019	5
July	2019	5
August	2019	5
September	2019	2

B11i

Months Deployed	Year	No. of nights recorded
May	2020	5
June	2019	5
July	2019	5
August	2019	5
September	2020	5

B11ii

Reasons for < 5 nights or missing months of data - Not gap-filled in 2020 due to detector efforts being considered more valuable elsewhere – large amounts of data already collected in Foxburrow Plantation.

Months Deployed	Year	No. of nights recorded
May	2020	5
June	2019	5
July	2019	5
August	2019	5
September	2020	5

C1

Months Deployed	Year	No. of nights recorded
May	2020	5
June	2019	5
July	2019	5
August	2020	5
September	2020	5

C60 (2019)

Months Deployed	Year	No. of nights recorded
May	2020	5
June	2019	5
July	2019	5
August	2020	5
September	2020	5

C4

Reasons for < 5 nights or missing months of data - No August data due to system failure.

Months Deployed	Year	No. of nights recorded
May	2020	5
June	2019	5
July	2019	5
September	2020	5

C5

Months Deployed	Year	No. of nights recorded
May	2020	5
June	2019	5
July	2019	5
August	2020	5
September	2020	5

C6

Reasons for < 5 nights or missing months of data - Location discontinued as not due to be impacted.

Months Deployed	Year	No. of nights recorded
May	2019	5

C7

Months Deployed	Year	No. of nights recorded
May	2019	5
June	2019	5
July	2019	5
August	2019	5
September	2019	5

C8

Months Deployed	Year	No. of nights recorded
May	2019	5
June	2019	5
July	2019	5
August	2019	5
September	2019	5

C11

Months Deployed	Year	No. of nights recorded
May	2019	5
June	2019	5
July	2019	5
August	2020	5
September	2020	5

C12

Months Deployed	Year	No. of nights recorded
May	2019	5
June	2019	5
July	2019	5
August	2019	5
September	2019	5

C13

Reasons for < 5 nights or missing months of data - Location adjusted to C13i and therefore only surveyed in June.

Months Deployed	Year	No. of nights recorded
June	2019	5

C13i

Reasons for < 5 nights or missing months of data - No May data due to location being added later to supplement existing locations. Not gap-filled in 2020 due to detector efforts being considered more valuable elsewhere

Months Deployed	Year	No. of nights recorded
June	2019	5
July	2019	5
August	2019	5
September	2019	5

C14

Reasons for < 5 nights or missing months of data - Location adjusted to C14i and therefore only surveyed in June.

Months Deployed	Year	No. of nights recorded
June		5

C14i

Reasons for < 5 nights or missing months of data - May and September not redeployed in 2020 due to being outside of the Scheme alignment. Not gap-filled in 2020 due to detector efforts being considered more valuable elsewhere.

Months Deployed	Year	No. of nights recorded
June	2019	5
July	2019	5
August	2019	5
September	2019	1

C14ii

Reasons for < 5 nights or missing months of data - Not redeployed in May – location replaced with C41.

Months Deployed	Year	No. of nights recorded
June	2019	5
July	2019	5
August	2019	5
September	2019	4

C15

Reasons for < 5 nights or missing months of data - Location adjusted to C15i and therefore only surveyed in June 2019 and not redeployed in 2020.

Months Deployed	Year	No. of nights recorded
June	2019	4

C15

Reasons for < 5 nights or missing months of data – No May data, C42 deployed in 2020 close to C15i.

Months Deployed	Year	No. of nights recorded
June	2019	5
July	2019	5
August	2019	5
September	2019	4

C18

Months Deployed	Year	No. of nights recorded
May	2019	5
June	2019	5
July	2019	5
August	2019	5
September	2019	5

C19

Months Deployed	Year	No. of nights recorded
May	2019	5
June	2020	5
July	2019	5
August	2019	5
September	2019	5

C20

Reasons for < 5 nights or missing months of data - No May data due to location being added later. Not gap-filled in 2020 due to detector efforts being considered more valuable elsewhere..

Months Deployed	Year	No. of nights recorded
June	2019	5
July	2019	5
August	2019	5
September	2019	5

C21

Reasons for < 5 nights or missing months of data - No May or July data in 2019 due to system failure; gap-filled in 2020.

Months Deployed	Year	No. of nights recorded
May	2020	5
June	2019	5
July	2020	5
August	2019	5
September	2019	5

C22

Reasons for < 5 nights or missing months of data - Three detectors in close proximity – only C21 redeployed in May.

Months Deployed	Year	No. of nights recorded
June	2019	5
July	2019	5
August	2019	5
September	2019	5

C23

Months Deployed	Year	No. of nights recorded
May	2020	5
June	2019	5
July	2019	5
August	2019	5
September	2019	5

C24

Months Deployed	Year	No. of nights recorded
May	2020	5
June	2019	5
July	2019	5
August	2019	5
September	2020	5

C25

Months Deployed	Year	No. of nights recorded
May	2020	5
June	2019	5
July	2019	5
August	2020	5
September	2019	5

C26

Reasons for < 5 nights or missing months of data – No May data due to location being added later. Not gap-filled in 2020 due to detector efforts being considered more valuable elsewhere.

Months Deployed	Year	No. of nights recorded
June	2019	5
July	2019	5
August	2019	5
September	2019	5

C27

Months Deployed	Year	No. of nights recorded
May	2020	5
June	2019	5
July	2019	5
August	2019	5
September	2019	5

C28

Months Deployed	Year	No. of nights recorded
May	2020	5
June	2020	5
July	2019	5
August	2019	5
September	2020	5

C29

Months Deployed	Year	No. of nights recorded
May	2020	5
June	2020	5
July	2019	5
August	2019	5
September	2019	5

C31

Months Deployed	Year	No. of nights recorded
May	2020	5
June	2020	5
July	2020	5
August	2020	5
September	2020	5

C32

Months Deployed	Year	No. of nights recorded
May	2020	5
June	2020	5
July	2020	5
August	2020	5
September	2020	5

C33

Months Deployed	Year	No. of nights recorded
May	2020	5
June	2020	5
July	2020	5
August	2020	5
September	2020	5

C34

Reasons for < 5 nights or missing months of data – Location added as a control location in June. May data not considered important for informing mitigation or understanding bat behaviour at control location

Months Deployed	Year	No. of nights recorded
June	2020	5
July	2020	5
August	2020	5

C35

Reasons for < 5 nights or missing months of data – Location added in June. May detector to be deployed in 2021.

Months Deployed	Year	No. of nights recorded
June	2020	5
July	2020	5
August	2020	5
September	2020	5

C37

Reasons for < 5 nights or missing months of data – Access restrictions prevented May and June 2020 deployments. To be deployed in 2021.

Months Deployed	Year	No. of nights recorded
July	2020	5
August	2020	5
September	2020	5

C38

Reasons for < 5 nights or missing months of data – Access restrictions prevented May and June 2020 deployments. To be deployed in 2021.

Months Deployed	Year	No. of nights recorded
July	2020	5
August	2020	5
September	2020	5

C39

Months Deployed	Year	No. of nights recorded
May	2020	5
June	2020	5
July	2020	5
August	2020	5
September	2020	5

C40

Months Deployed	Year	No. of nights recorded
May	2020	5
June	2020	5
July	2020	5
August	2020	5
September	2020	5

C38

Reasons for < 5 nights or missing months of data – To be deployed in September 2021.

Months Deployed	Year	No. of nights recorded
May	2020	5
June	2020	5
July	2020	5
August	2020	5
September	N/A	Deploy September 2021

C42

Months Deployed	Year	No. of nights recorded
May	2020	5
June	2020	5
July	2020	5
August	2020	5
September	2020	5

C44

Reasons for < 5 nights or missing months of data – Access restrictions prevented May and June 2020 deployments. To be deployed in 2021.

Months Deployed	Year	No. of nights recorded
July	2020	5
August	2020	5
September	2020	5

C45

Reasons for < 5 nights or missing months of data – Access restrictions prevented May and June 2020 deployments. To be deployed in 2021.

Months Deployed	Year	No. of nights recorded
July	2020	5
August	2020	5
September	2020	5

C48

Reasons for < 5 nights or missing months of data – Access restrictions prevented May and June 2020 deployments. July deployment failed. To be deployed in 2021..

Months Deployed	Year	No. of nights recorded
August	2020	5
September	2020	5

C49

Reasons for < 5 nights or missing months of data – Access restrictions prevented May and June 2020 deployments. To be deployed in 2021.

Months Deployed	Year	No. of nights recorded
July	2020	5
August	2020	5
September	2020	5

C52

Reasons for < 5 nights or missing months of data – Access restrictions prevented May and June 2020 deployments. To be deployed in 2021.

Months Deployed	Year	No. of nights recorded
July	2020	5
August	2020	5
September	2020	5

C53

Reasons for < 5 nights or missing months of data – Access restrictions prevented May and June 2020 deployments. To be deployed in 2021.

Months Deployed	Year	No. of nights recorded
July	2020	5
August	2020	5
September	2020	5

C54

Reasons for < 5 nights or missing months of data – Access restrictions prevented May and June 2020 deployments. To be deployed in 2021.

Months Deployed	Year	No. of nights recorded
July	2020	5
August	2020	5
September	2020	5

C55

Reasons for < 5 nights or missing months of data – Access restrictions prevented May and June 2020 deployments. To be deployed in 2021.

Months Deployed	Year	No. of nights recorded
July	2020	5
August	2020	5
September	2020	5

C56

Reasons for < 5 nights or missing months of data – Location added June 2020. May deployment will be conducted in 2021. September data not collected due to detector failure.

Months Deployed	Year	No. of nights recorded
June	2020	5
July	2020	5
August	2020	5

C57

Reasons for < 5 nights or missing months of data – Location added June 2020. May deployment will be conducted in 2021.

Months Deployed	Year	No. of nights recorded
June	2020	5
July	2020	5
August	2020	5
September	2020	5

C58

Reasons for < 5 nights or missing months of data – Access restrictions prevented May and June 2020 deployments. To be deployed in 2021.

Months Deployed	Year	No. of nights recorded
July	2020	5
August	2020	5
September	2020	5

C51

Reasons for < 5 nights or missing months of data – Access restrictions prevented May and June 2020 deployments. To be deployed in 2021.

Months Deployed	Year	No. of nights recorded
July	2020	5
August	2020	5
September	2020	5

D1

Reasons for < 5 nights or missing months of data – Location not within Scheme alignment and access was problematic so location discontinued.

Months Deployed	Year	No. of nights recorded
June	2019	5

M43

Reasons for < 5 nights or missing months of data – Location added June 2020. May deployment will be conducted in 2021.

Months Deployed	Year	No. of nights recorded
June	2020	5
July	2020	5
August	2020	5
September	2020	5

M46

Reasons for < 5 nights or missing months of data – Location added in July 2020. May and June data to be collected in 2021.

Months Deployed	Year	No. of nights recorded
July	2020	5
August	2020	5
September	2020	5

M47

Reasons for < 5 nights or missing months of data – Location added in July 2020. May and June data to be collected in 2021.

Months Deployed	Year	No. of nights recorded
July	2020	5
August	2020	5
September	2020	5

M50

Reasons for < 5 nights or missing months of data – Location added in July 2020. May and June data to be collected in 2021.

Months Deployed	Year	No. of nights recorded
July	2020	5
August	2020	5
September	2020	5

M51

Reasons for < 5 nights or missing months of data – Location added in July 2020. May and June data to be collected in 2021.

Months Deployed	Year	No. of nights recorded
July	2020	5
August	2020	5
September	2020	5

M52

Reasons for < 5 nights or missing months of data – Location added in July 2020. May and June data to be collected in 2021.

Months Deployed	Year	No. of nights recorded
July	2020	5
August	2020	5
September	2020	5

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