NORTH LOWTHER ENERGY INITIATIVE

Bat Survey Report

Technical Appendix 8.3

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EXECUTIVE SUMMARY

MacArthur Green was commissioned by NLEI Ltd to complete bat surveys for the proposed North Lowther Energy Initiative (hereafter referred to as the 'Development').

These surveys were undertaken to inform the ecological assessment for the North Lowther Energy Initiative Environmental Impact Assessment.

This report presents the results of the bat survey work undertaken between 18th May and 15th September 2015 (inclusive) at the Site.

Five bat species were recorded during the temporal and spatial surveys: common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus), Nyctalus* sp., Pipistrelle sp.[1] , *Myotis* sp. and possible Nathusius' pipistrelle (*Pipistrellus nathusii*). The daytime inspection recorded two properties at Duntercleuch House and Clackleith with bat roost potential.

The Bat Activity Index (BAI) for all species is considered to be low for the Development Area.

1. INTRODUCTION

MacArthur Green was commissioned by NLEI Ltd to undertake bat surveys at the proposed North Lowther Energy Initiative (hereafter referred to as the 'Development'). The Development is located within the Buccleuch Estate, between Sanquhar and Wanlockhead in Dumfries & Galloway.

A survey plan for bats was conducted during the period of 18th May to the 15th September 2015. The survey plan included;

- Daytime inspection of the Development Area;
- Roost assessment;
- Spatial (point counts and transect) surveys; and
- Temporal (static) surveys.

The aim of the surveys was to identify roosting potential, quantify Development Area usage and variation of activity levels within the Development Area as required. Surveys were carried out during the main bat activity period and in optimum weather conditions in order to maximise the likelihood of recording bats (see Annex 7). These surveys were undertaken to inform the ecological assessment for the North Lowther Energy Initiative Environmental Statement (hereafter referred to as the 'ES').

2. THE DEVELOPMENT AREA

The Study Area in which bat surveys were carried out within the Development boundary were focused around the north of the site (refer to Figure 8.6).

The majority of the Study Area supports open moorland with relatively steep-sided cleuchs and associated plateaus, interspersed by commercial conifer plantation in the west. The Study Area is at an elevation of approximately 210m to 588m with several hills at an altitude of 400m and 588m located around the Study Area.

There are a number of watercourses present throughout the Study Area. Wanlock Water runs from the east to north-west across the north section on the Study Area and is fed by a number of smaller tributaries. It flows into the Crawick Water which runs along the western Study Area boundary. There are also a number of watercourses flowing in the south western section of the Site which feed into Loch Burn and the Mennock Water to the south and eventually the River Nith outwith the south-west boundary of the Study Area. The watercourses within the Study Area are part of the River Nith catchment.

Habitat types within the Site were defined as edge, open and closed habitats according to their exposed or sheltered nature. Edge habitats such as woodland edge and burns are the preferred habitat of pipistrelle bats, while open habitats are more favoured by *Nyctalus* bats and closed habitats such as woodland are typical foraging habitats used by brown long-eared bat (*Plecotus auritus*) and some *Myotis* species. Daubenton's (*Myotis daubentonii*) are associated with waterways and are adapted to feeding over water.

There are a number of properties within the Study Area. The roost assessments focused on properties within 300m of proposed turbine locations known at the time and is also valid for the final layout. Roost assessments were carried out on the following properties; Cogshead, Duntercleuch and Clackleith.

Outwith the Study Area to the south there are suitable habitats for commuting, foraging and roosting bats with small blocks of forestry and broadleaved woodland located along the lower section of the Mennock Water.

[1] It should be noted that 'Pipistrelle sp.' is a bat call that overlaps between a soprano pipistrelle and common pipistrelle call which can only be classified to genus level. For the purposes of this report it is not included in the overall number of species recorded for the Study Area.

3. BATS AND WINDFARMS

3.1 Policy and Guidance

All bats species are protected under the legislation shown below. Under the terms of Regulation 39(1), with certain exceptions, a person commits an offence if he/she: deliberately or recklessly captures, injures or kills a bat. It is also an offence to disturb, damage or destroy a place of shelter i.e. a roost. Details pertaining to the legal status of bats are included within Annex 1.

- The Habitats Directive 92/43/EEC and respective domestic legislation.
- The Wildlife and Countryside Act 1981 (as amended).
- The Nature Conservation (Scotland) Act 2004 (as amended).

In the UK, guidelines have been produced with regards to assessing the ecological impact upon bats from wind farm developments. These guidelines aid in preparing mitigation and compensation strategies to minimise any negative impact upon local bat populations. The following guidance documents have been used in the preparation of this report:

- Natural England (2014) Bats and onshore wind turbines: interim guidance. TIN051. Third Edition.
- Hundt L (2012) Bat Surveys: Good Practice Guidelines, 2nd Edition, Bat Conservation Trust.
- Rodrigues L., *et al.* (2014) Guidelines for consideration of bats in wind farm projects, revision 2014. EUROBATS Publication Series No. 6.

3.2 Potential Impacts

It is now understood that, in some circumstances, bats may be at a greater risk of death from wind turbines than birds because they are affected by barotrauma[2] as well as direct collision from blades (Baerwald *et al*. 2008) with wind turbines in Europe and North America killing on average 2.3 birds and 2.9 bats per year (Rydell *et al*. 2012).

In the UK three taxa groups have been identified as high risk collision species with 98% of bat mortality predominantly among taxa adapted to open-air foraging such as: *Nyctalus, Pipistrellus* and *Eptesicus* (Rydell *et al*. 2010).

Natural England interim guidance (2014) includes a collision risk assessment for British bat species. This is divided into two parts: (i) bat species likely to be threatened due to impacts from wind turbines and (ii) bat populations likely to be threatened due to impacts from wind turbines (shown in Tables 1 and 2). Different bat species are considered to be at different levels of risk depending on their habitat preferences, flight behaviour and population status. Surveys have therefore been carried out for all bat species.

Natural England (2014) has identified the species of bats considered to be at low, medium and high risk (refer to Tables 1 and 2).

Table 1 *Bats likely to be at risk from wind turbines (taken from Natural England, 2014)*

Low Risk	Medium Risk	High Risk
Myotis species	Common pipistrelle	Noctule
Long-eared bats	Serotine	Leisler's
Horseshoe bats	Soprano pipistrelle	Nathusius' pipistrelle
	Barbastelle	

Table 2 *Populations likely to be threatened due to impacts from wind turbines (taken from Natural England, 2014)*

Low Risk	Medium Risk	High Risk
Myotis species	Serotine	Noctule
Long-eared bats	Barbastelle	Leisler's
Horseshoe bats		Nathusius' pipistrelle
Soprano pipistrelle		
Common pipistrelle		

Bats travel between hibernacula sites to summer roosts in spring and autumn and therefore could be impacted negatively if wind farms were positioned between these areas.

A recent synthesis of European and American data by the Swedish Vindval research programme concluded the following habitats to be high risk locations for wind farms; coasts, wetlands, hills and ridges. Turbines sited along linear landscapes such as lake shores, rivers, treelines, hedgerows, etc., are also considered to increase the likelihood of collision (Rydell *et al.,* 2012).

3.3 Study Area Assessment

The appropriate level of effort for a bat survey at a proposed wind farm development depends on the scale of its likely impact, which in turn depends on the size of the site and the quality of the habitat. Bat Conservation Trust (BCT) guidance (Hundt, 2012) provides recommendations of minimum standards of survey effort in instances where sampling is required. To determine the survey effort the site must be assigned a high, medium or low risk. Annex 2 contains the BCT assessment table *"Factors to consider when determining the survey effort and site risk",* which was used to determine the potential risk level of the development.

The Study Area was assigned low risk due to its low foraging/commuting suitability and high exposed plateaus within the Study Area. For a low risk site BCT guidelines (Hundt, 2012) recommend a minimum survey effort of at least one visit per transect per season between April and October for spatial surveys. For temporal surveys the guidelines recommend five consecutive nights for each pair of locations per season within the Study Area between April and October. Annex 3 details bat survey minimum requirements (Hundt, 2012).

At height surveys were not completed due to the low foraging/commuting suitability of habitats within the Study Area. Further discussion on 'at height' surveys and *Nyctalus* activity is provided in Section 5.

4. SURVEY METHODS

4.1 Desk-based Study

A desk-based study was undertaken in order to inform subsequent field surveys and assessment with regards the presence of designated sites/species of interest within the Study Area and its environs.

[2] Barotrauma involves tissue damage to air-containing structures caused by rapid or excessive pressure change; pulmonary barotrauma is lung damage due to expansion of air in the lungs that is not accommodated by exhalation and has been found to be a cause of death of bats near wind turbines.

This study consisted of a search for *Ncytalus r*ecords from the 'Scottish Leisler's Bat Project' which are records supplied to MacArthur Green in May 2015. These records are from the whole of southern Scotland including long-term monitoring at proposed wind farms, other developments and on-going research work being carried out by the 'Scottish Leisler's Bat Project' from 2010 to 2014. A search for records within 20km from the Study Area was completed.

4.2 Daytime Inspection and Roost Assessment

Daytime inspection of the Study Area was carried out on the 16th July 2015. This inspection involved a walkover of the Study Area recording different habitat types and their suitability to support bats. Potential roost features such as trees and buildings within the Study Area were also mapped and recorded as target notes.

Tree surveys followed the assessment methodology as set out in Hundt (2012) whereby a tree is assigned a category value between 1* to 3 which determines the likelihood of bats being present (refer to Annex 4 of this report).

The suitability of buildings as a roost was determined during an external daytime survey which looked for potential roost features and access points. Buildings were assessed as being of either low, medium or high roost potential according to Hundt (2012).

4.3 Spatial Surveys - Point Counts

Spatial point count surveys were carried out over the main period of bat activity with surveys starting in May and finishing in September 2015; totalling three surveys (three surveys over three separate visits). The Study Area was divided into three transects and 51[3] point counts (Figure 8.6). For the dusk surveys each surveyor started their survey 30 minutes before sunset with each transect taking between 2 hours 26 minutes and 3 hours 35 minutes hours to complete. The start and finish points were rotated in every survey. Each surveyor carried calibrated bat detectors of the same type and model (Anabat SD 2 and Bat Box). Spatial survey effort is summarised in Table 3.

Table 3. *Summary of Spatial Survey Effort.*

Survey Date	Transect	Survey Type	Total Survey Time (hrs:mins)
18/05/2015	1	Dusk	03:35
	2	Dusk	02:54
	3	Dusk	02:56
16/07/2015	1	Dusk	02:57
	2	Dusk	02:26
	3	Dusk	03:03
09/09/2015	1	Dusk	02:53
	2	Dusk	02:34
	3	Dusk	03:02
Total Survey (nights)	**9**	**Total Survey (hrs:mins)**	**26:20**

[3] Two point counts were removed from Transect 2 during the second visit due to the presence of breeding birds restricting access to parts of the transect.

4.4 Temporal Surveys – Static Detectors

Temporal surveys involved leaving static Anabat SD2 detectors within the Study Area in order to record activity overnight and over prolonged periods of time. Seven Anabat detectors were placed at seven different locations.

The locations of the static detectors (refer to Figure 8.6) were selected based on the following criteria:

- to allow comparison of temporal variation between open, edge and stream habitats within the Study Area;
- to identify the fidelity of bats to particular foraging areas and commuting routes; and
- to identify migratory patterns across the Study Area.

Calibrated detectors were left out at these locations seasonally for a minimum of five nights. The surveys were undertaken in May, July, August and September 2015 and therefore covered spring, summer and autumn seasons. This exceeds the survey effort as outlined in BCT guidance (Hundt, 2012) for a low risk site with an extra survey completed in the summer. Each detector recorded bats from dusk to dawn with detectors starting 30 minutes before dusk and finishing 30 minutes after dawn. Table 4 shows a summary breakdown of the temporal survey effort.

Total automated survey effort is considered sufficient to provide a representative sample of bat activity within the Study Area.

Table 4. *Summary of Temporal surveys.*

Survey Date	Time Parameter	Locations	Total Survey (hrs:mins)	Total Number of Complete Nights
18-25/05/2015	20:53-08:38	1	60:32:46	7
		2	60:32:53	7
		3	60:32:49	7
		4	00:00:00	0
		5	57:50:37	7
		6	60:32:50	7
		7	60:32:46	7
		Total	**360:34:41**	**42**
16-22/07/2015	21:18-05:23	1	48:30:00	6
		2	48:30:00	6
		3	00:00:00	0
		4	48:30:00	6
		5	00:00:00	0
		6	45:01:00	5
		7	44:47:00	5
		Total	**235:18:00**	**28**
12-17/08/2015	20:28-06:14	1	27:36:00	2
		2	48:50:00	5
		3	48:50:00	5

Survey Date	Time Parameter	Locations	Total Survey (hrs:mins)	Total Number of Complete Nights
		4	09:46:00	4
		5	48:50:00	5
		6	48:50:00	5
		7	43:40:00	4
		Total	**276:22:00**	**30**
09-15/09/2015	19:18-07:08	1	61:07:00	5
		2	63:44:00	5
		3	57:42:00	4
		4	66:42:00	5
		5	71:00:00	6
		6	45:31:00	3
		7	58:24:00	4
		Total	**424:10:00**	**32**
Total Survey (hrs:mins)	**1296:24:41**		**Total survey (nights)**	**132**

4.5 Method of Analysis

A bat pass is classified as a sequence of bat pulses which is captured on a 15 second Anabat sound file. One sound file is counted as one bat pass. Different species within the same 15 second sound file are counted as different bat passes.

An individual bat can pass a particular feature on several occasions while foraging. It is therefore not possible to estimate the number of individual bats. In accordance with BCT guidance (Hundt, 2012) an activity index is used to calculate bat passes per hour which allows analysis of bat activity to estimate abundance and/or activity.

BAI (per hour) = Total number of bat 'passes' / number of hours of recording

In the absence of any recognised criteria to define levels of bat activity (e.g. what quantifies low, medium or high activity) professional judgement has been used, taking into consideration geographical location and experience gained through conducting similar surveys at other sites in the region and throughout Scotland.

5. BAT SURVEY LIMITATIONS

The survey design and effort was created in accordance to Hundt (2012) guidelines as shown in Annexes 2 and 3. The surveys carried out are considered to be sufficient to meet the guideline standards and exceed the recommended number of temporal visits for a low risk site.

The survey design was continually assessed with point count data analysed post survey visits to determine if the design was appropriate to the number and species of bats encountered within the Study Area.

The surveys were undertaken during the main activity period of bats (April to October), therefore there is no seasonal limitation to the survey results.

The spatial point count surveys were largely carried out in optimal survey conditions (refer to Annex 7). In May the temperature dropped below 10 degrees Celsius and averaged 5.7 degrees Celsius. In July the wind was on occasion a strong or moderate breeze. However, as bats are often active below temperatures of 10 degrees Celsius in Scotland, and as the strong and moderate wind conditions were not constant, these sub-optimal conditions are not seen as significant and are unlikely to alter the outcome of the survey results (refer to Annex 7 for spatial survey weather data).

Transect 2 had 16 point counts along its length (refer to Figure 8.6). The number of point counts along this transect was reduced to 14 during the second visit due to the presence of breeding birds. Access to the area was restricted to ensure minimal disturbance to breeding birds. The reduction in points is not considered to have affected the overall results of the transect survey, given the large area covered by the three transects.

The automated static detectors are powered by 12 volt batteries and on some occasions the battery charge was not sufficient to complete a full survey period, or the equipment malfunctioned. As the number of visits made to the Study Area was four, which is greater than the recommended number of visits for a site of low risk according to Hundt (2012). The small loss of data is therefore not considered to be significant in the context of the amount of data collected.

There is some overlap between the frequency calls of the common and soprano pipistrelle's which echolocate at a peak frequency of approximately 45 kHz and 55 kHz respectively. In instances where pipistrelle calls overlapped between 50kHz and 50.9kHz, they were recorded as pipistrelle species.

Myotis species calls often overlap depending on their surrounding environs i.e. cluttered or open space. This often makes it difficult to identify *Myotis* bats to species level. If *Myotis* calls could not be identified to species level they were recorded as '*Myotis* species'.

Nyctalus species calls (noctule and Leisler's bats) can be difficult to identify to species level as their calls overlap. Given that both these species have been assigned a high risk level for both collision and population risk, and given that they can be difficult to identify to species level, they were classified only to genus level.

One pipistrelle species call was identified as a 'possible Nathusius' call' as it displayed some of the characteristics of this species, however some overlap with a common pipistrelle call was present. Given the characteristics of the call and the 'high risk' status of Nathusius pipistrelle (Natural England, 2014) a worst case scenario is assumed.

Unknown calls were recorded during the spatial and temporal surveys. For spatial surveys this was due to very faint calls which were heard on the BatBox but not recorded on the Anabat SD2 (directional microphone). Therefore, desk analysis of the call could not be carried out using Analook software to determine the species. Some temporal calls were assigned an unknown value, due to a very faint call that could not be identified to species level on the spectogram.

Anabat detectors are the preferred bat detector for acoustic monitoring at wind farm sites (Kunz *et al*., 2007); however, Anabat detectors have limitations and will only monitor bat activity within a limited area, usually around 30 metres[4]. Furthermore the detection rate of bat calls varies with a bias towards loud bat calls with quieter calls, namely brown long-eared bats, potentially being under recorded. As a result of equipment limitations only relative rather than direct statistical comparisons of bat activity can be made between species and only a set area within the Study Area can be sampled.

[4] Detection distances vary with frequency and loudness (amplitude) of the bat calls and atmospheric attenuation. Many bats are detected over 30m under typical conditions, while some species such as *Nyctalus* sp. which call at low frequencies may be detectable from as far as 100m. However some species such as brown long-eared bats are hard to detect from shorter distances. This is why only relative rather than direct statistical comparisons of bat activity are made between species.

The analysis of bat data is subject to experience, therefore the Anabat data was analysed by ecologists experienced with bat call analysis using AnalookW 4.3.19 software.

Nyctalus species are relatively more active at a height of 30m than those species with high frequency echolocation calls such as *Myotis* (Collins and Jones, 2009). A recent study on the difference of bat activity in relation to bat detector height found the difference between *Nyctalus* passes at the upper and lower detectors not to be statistically significant, despite proportionally more passes of these species being recorded at height (Collins and Jones, 2009). Not all sites in the study by Collins and Jones (2009) recorded more *Nyctalus* passes at height, two sites recorded more passes at the lower detectors than the higher detectors suggesting that habitat type can determine the activity height of *Nyctalus* species.

The study suggests that surveying from ground level provides an accurate account of the species composition of bat populations including high flying species such as *Nyctalus* sp. with the possible exception of closed canopy woodland situations. As the majority of the habitats within the Study Area are open the temporal surveys are therefore understood to provide a representative sample of *Nyctalu*s activity within the Study Area.

The information currently available on bat behaviour in the UK is not sufficient to assess the threat that wind turbines may pose to populations. Anecdotal records of individual collisions exist but no quantified data at the colony or population level are available (Natural England, 2014).

In the absence of any recognised criteria to define levels of bat activity (e.g. what quantifies low, medium or high activity) professional judgement has been used, taking into consideration geographical location and experience gained through conducting similar surveys at other sites in the region and throughout Scotland.

6. SURVEY RESULTS

6.1 Desk-based Study

A search was carried out on records from the 'Scottish Leisler's Bat Project' supplied to MacArthur Green in May 2015.

Table 5 shows the number of *Ncytalus* records within 20km from the Study Area. Three *Nyctalus* records are within 13km and five records are within 20km of the Study Area.

Table 5. 'Scottish Leisler's Bat Project' Records Within 20km of the Study Area.

Species	Location	Grid Ref.	Distance from the Study Area	Year	Record type
Leisler's	Sanquhar	NS8008	1.8km	2010	Anabat
Noctule	Near Kirkconnel	NS7111	8.4km	2011	Anabat
Leisler's	Abington	NS9322	9.2km	2013	Anabat
Leisler's	Near Douglas, South Lanarkshire	NS8334	15.2km	2008	Anabat
Leisler's	Coalburn	NS8136	17.3km	2014	Anabat
Leisler's	South Ayrshire	NS6304	18km	2010	Anabat
Noctule	Moniavie	NX7890	19km	2012	Anabat
Noctule	West of Moniaive	NX7790	19.3km	2011	Anabat

6.2 Daytime Inspection and Roost Assessment

The daytime inspection recorded the majority of the Study Area to be open moorland with several high plateaus (400 – 588m), interspersed by commercial conifer plantation in the west. The habitats in the Study Area are mainly semi-improved acid grassland, wet and dry heath, bog and conifer plantation.

Habitats of note for bats include stonewalls, conifer plantation edges and watercourses. A static detector was deployed at the Wanlock Water (location 7) as this burn was identified as a possible foraging and commuting resource for bats in the east to north-west section of the Study Area. Transects were designed so that they followed potential feeding habitats such as conifer plantation edges, tracks and sheltered gullies as well as less suitable, more exposed habitats at higher altitude.

Features of interest for roosting bats (target note (TN)), are showed on Figure 8.7 and further details are provided in Annex 5. Two properties were identified as potential roosting structures for bats. The first property Duntercleuch House (TN1) was being renovated with new roof repairs taking place at the time of the survey. The external survey noted a few broken tiles and a gap present where the chimney meets the roof. The property is considered to have low roost potential. This assessment took into account the new roof repairs.

The second property Clackleith (TN2) is a dormer bungalow with a separate outbuilding. The condition of the main house was generally good, with a few tiles dislodged and missing with some gaps present under the flashing. The outbuilding could not be approached as a nesting bird was present; however, surveyors at a suitable distance could see that the northern side of the outbuilding was missing stones with potential access points into the outbuilding. Both buildings are considered to have moderate roost potential.

An old stone ruin was located at Coghead (TN3). This stone ruin had no roof and no obvious cavities. There was an old fireplace present but nettles were growing at the bottom of the fire place. No sign of droppings was seen around the fireplace or the structure. This ruin is unlikely to have any roosting potential.

6.3 Spatial Surveys – Point Counts

In total four bat species were recorded during the spatial surveys: soprano pipistrelle (s.pip or '55 pip'); common pipistrelle (c.pip or '45 pip'); *Myotis* sp. (my) and possible Nathusius' pipistrelle (Nat./pip sp) (unknown bat and Pipistrelle sp. (pip. sp.) are not included in the overall number of species recorded for the Study Area). *Myotis* species recorded were mainly Daubenton's (*Myotis daubentonii*) with some records only identifiable to genus level i.e. *Myotis* sp. Full results are provided in Annex 9.

Figure 8.8 shows the number and location of bat passes recorded along the transect routes during the survey period. The greatest bat activity was recorded along the edge of Wanlock Water at point count 35 in the north, and at the edge of conifer plantation at point count 43 south west of Wedder Dodd.

The total bat passes per hour (bpph) recorded for each species is shown in Table 6. A total of 91 passes equating to 3.45 bpph were recorded for the Study Area over the three survey visits. The most commonly recorded species by bpph were soprano pipistrelle (1.14) and common pipistrelle (1.02) followed by Pipistrelle sp. (0.46), *Myotis* sp. (0.46), unknown bat (0.34) and a possible Nathusius' pipistrelle (0.04), as illustrated in Graph 1.

Table 6. *Summary of spatial surveys results (bpph for habitat does not correspond to species bpph as the species bpph is calculated to total survey effort).*

Total Activity						
Rec. time	**s. pip.**	**c. pip.**	**pip sp.**	**My**	**Unknown**	**nat./pip sp**
26:22:00	30	27	12	12	9	1
	1.14	1.02	0.46	0.46	0.34	0.04
Total Passes		**91.00**		**Total bpph**	**3.45**	

(Abbreviations: s.pip – soprano pipistrelle; c.pip - common pipistrelle; pip. sp. pipistrelle species; My – *Myotis* sp.; *Nat*. /pip sp. - possible Nathusius' pipistrelle)

Tables 7 to 9 show the total spatial survey results per survey visit. These results are also illustrated in Graph 2. Bat passes peaked in September (8.57 bpph). This peak in bpph was mainly caused by an increase in soprano pipistrelle, common pipistrelle and Pipistrelle sp. numbers.

The weather for September was ideal for detecting bats and could be the reason bats peaked at this time. This increase in bat numbers could also be attributed to the natural increase in bat number at this time of year with juvenile's bats leaving maternity roost. This increase and the dispersal of maternity roosts results in bats utilising more habitats for foraging (dispersal to avoid competition). Therefore habitats that record little of no bat activity in the early summer months may become foraging resources when weather conditions are suitable.

Bats were mainly recorded to be commuting and feeding within the Study Area as shown in Annex 8. No social calls were recorded during the survey. Where possible, flight heights for bats were recorded. The survey recorded the following height bands of 0 to 5 meters and 6 to 10 meters for pipistrelle species, unknown bat and a Daubenton's bat.

Table 7. *Spatial surveys results May 18-19/05/2015.*

Activity total 1 - May 18-19/05/2015					
Rec. time	**s. pip.**	**c. pip.**	**pip. sp.**	**My**	**Unknown**
9:25:00	1.00	0	0	10	0
	0.11	0.00	0.00	1.06	0.00
Total Passes	**11.0**		**Total bpph**	**1.17**	

(Abbreviations: s.pip – soprano pipistrelle; c.pip - common pipistrelle; pip. sp. - pipistrelle species; My – *Myotis* sp.)

Table 8. *Spatial surveys results May 16-17/07/2015.*

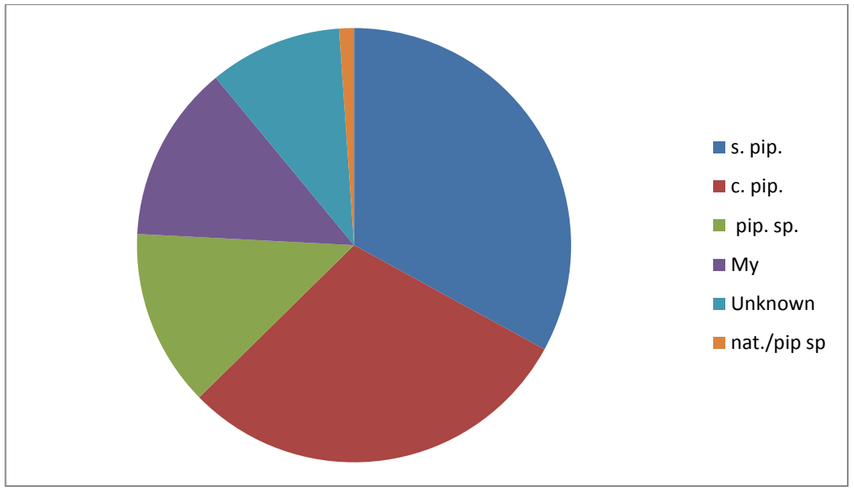
Activity total 2 - July 16-17/07/2015						
Rec. time	**s. pip.**	**c. pip.**	**pip sp.**	**My**	**Unknown**	**Nat./pip sp**
8:26:00	2	2	2	0	0	1
	0.24	0.24	0.24	0.00	0.00	0.12
Total Passes	**7**		**Total bpph**		**0.83**	

(Abbreviations: s.pip – soprano pipistrelle; c.pip - common pipistrelle; pip. sp. - pipistrelle species; My – *Myotis* sp.; *Nat*. /pip sp. - possible Nathusius' pipistrelle)

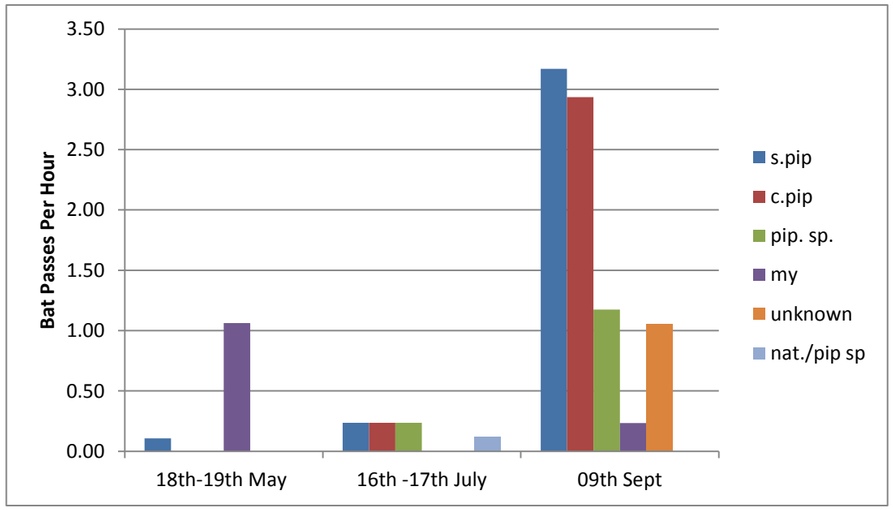
Table 9. *Spatial surveys results September 09/09/2015.*

Activity total 3 - September 09/09/2015					
Rec. time	**s. pip.**	**c. pip.**	**pip sp.**	**My**	**Unknown**
8:31:00	27	25	10	2	9
	3.17	2.94	1.17	0.23	1.06
Total Passes	**73**		**Total bpph**	**8.57**	

(Abbreviations: s.pip – soprano pipistrelle; c.pip - common pipistrelle; pip. sp. - pipistrelle species; My – *Myotis* sp.)



Graph 1. *Spatial Survey Results: Total Species Composition in Study Area (bat passes per hour).*



Graph 2. *Total Spatial Activity in Study Area (bat passes per hour).*

6.4 Temporal Surveys – Static Detectors

Static detectors were deployed at seven locations (refer to Figure 8.9) within the Study Area for at least five days per visit during the survey period. The total bat passes recorded for each species is shown in Table 10 and illustrated on Graph 3. In total four bat species were recorded during the temporal (static) surveys: common pipistrelle, soprano pipistrelle, pipistrelle species, *Myotis* sp. and *Nyctalus* sp. (unknown bat and Pipistrelle sp. (pip. sp.) are not included in the overall number of species recorded for the Study Area) with a total of 3.33 bpph recorded for the Study Area. The most commonly recorded by bpph was soprano pipistrelle (1.92 bpph), followed by common pipistrelle (1.36 bpph), pipistrelle species (0.03 bpph) and *Myotis* sp. (0.02 bpph). *Nyctalus* sp. were recorded during the surveys at two locations (location 4 open/moorland and location 7 edge/burn) but

their pass rate was low with only 5 passes in total (0.004 bpph). The habitat type that recorded the most bat passes per hour was edge/burn at location 7 (20.14 bpph) followed by edge/plantation at location 5 (0.73 bpph), open/moorland at location 4 (0.64 bpph), clearfell at location 6 (0.19 bpph), edge/fence at location 2 (0.14 bpph), open/moorland at location 3 (0.05 bpph) and open/moorland at location 1 (0.02 bpph) (refer to Figure 8.9). Raw data is provided in Annex 10.

***Table 10**. Summary of temporal surveys results (bbph for location does not correspond to species bpph as the species bpph is calculated to total survey effort).*

Loc.	Habitat type	Rec. time	c. pip.	s. pip.	pip. sp.	My	Nyc	Total Passes	Total bpph
1	Open/moorland	197:45:46	1	2	0	0	0	3	**0.02**
2	Edge/fence	221:36:53	14	14	2	0	0	30	**0.14**
3	Open/moorland	167:04:49	5	3	0	0	0	8	**0.05**
4	Open/moorland	124:58:00	58	17	2	1	2	80	**0.64**
5	Edge/plantation	177:40:37	66	58	1	5	0	130	**0.73**
6	Clearfell	199:54:50	13	20	0	1	0	34	**0.19**
7	Edge/burn	207:23:46	1603	2375	31	14	3	4026	**20.14**
Total		**1296:24:41**	**1760**	**2489**	**36**	**21**	**5**	**4311**	
Total bpph			**1.36**	**1.92**	**0.03**	**0.02**	**0.004**	**3.33**	

(Abbreviations: s.pip – soprano pipistrelle; c.pip - common pipistrelle; pip. sp. pipistrelle species; My – *Myotis* sp.; Nyc - *Nyctalus* sp.)

Analysis of the temporal data for each visit is shown in Tables 11 to 14. The number of bat passes per hour in May was 0.16, which increased to 1.16 bpph in July and continued to increase until it peaked at 8.08 bpph in August. Numbers decreased in September to 4.12 bpph.

Nyctalus sp. were only recorded during the August and September surveys. Pass rates were low, with two passes recorded in August (0.01bpph) and three pass recorded in September (0.007bpph).

***Table 11.** Summary of activity totals May – 18-25/05/2015.*

Activity total 1 May 18-25/05/2015									
Loc.	**Habitat type**	**Rec. time**	**c. pip.**	**s. pip.**	**pip. sp.**	**My**	**Nyc**	**Total Passes**	**Total bpph**
1	Open/moorland	60:32:46	0	0	0	0	0	0	**0.00**
2	Edge/fence	60:32:53	0	0	0	0	0	0	**0.00**
3	Open/moorland	60:32:49	0	0	0	0	0	0	**0.00**
4	Open/moorland	0:00:00	0	0	0	0	0	0	**0.00**
5	Edge/plantation	57:50:37	4	1	0	5	0	10	**0.17**
6	Clearfell	60:32:50	1	0	0	1	0	2	**0.03**
7	Edge/burn	60:32:46	20	24	0	0	0	44	**0.73**
	Total passes		**25**	**25**	**0**	**6**	0	56	
	Total bpph		**0.07**	**0.07**	**0.004**	**0.02**	**0.00**	**0.16**	
Total Bat Passes			**56**		**Total bpph**			**0.16**	

(Abbreviations: s.pip – soprano pipistrelle; c.pip - common pipistrelle; pip. sp. pipistrelle species; My – *Myotis* sp.; Nyc - *Nyctalus* sp.)

***Table 12**. Summary of activity totals July – 16-22/07/2015.*

Activity total 2 July 16-22/07/2015									
Loc.	**Habitat type**	**Rec. time**	**c. pip.**	**s. pip.**	**pip. sp.**	**My**	**Nyc**	**Total Passes**	**Total bpph**
1	Open/moorland	48:30:00	0	0	0	0	0	0	**0.00**

Activity total 2 July 16-22/07/2015									
Loc.	**Habitat type**	**Rec. time**	**c. pip.**	**s. pip.**	**pip. sp.**	**My**	**Nyc**	**Total Passes**	**Total bpph**
2	Edge/fence	48:30:00	2	0	0	0	0	2	**0.04**
3	Open/moorland	0:00:00	0	0	0	0	0	0	**0.00**
4	Open/moorland	48:30:00	39	2	1	0	0	42	**0.87**
5	Edge/plantation	0:00:00	0	0	0	0	0	0	**0.00**
6	Clearfell	45:01:00	4	0	0	0	0	4	**0.09**
7	Edge/burn	44:47:00	150	76	0	0	0	226	**5.05**
	Total passes		**195**	**78**	**1**	**0**	**0**	**274**	
	Total bpph		**0.83**	**0.33**	**0.00**	**0.00**	**0.00**	**1.16**	
Total Bat Passes			**274**		**Total bpph**			**1.16**	

(Abbreviations: s.pip – soprano pipistrelle; c.pip - common pipistrelle; pip. sp. pipistrelle species; My – *Myotis* sp.; Nyc - *Nyctalus* sp.)

***Table 13**. Summary of activity totals August – 12-17/08/2015 (bpph for location does not correspond to species bbph as the species bpph is calculated to total survey effort).*

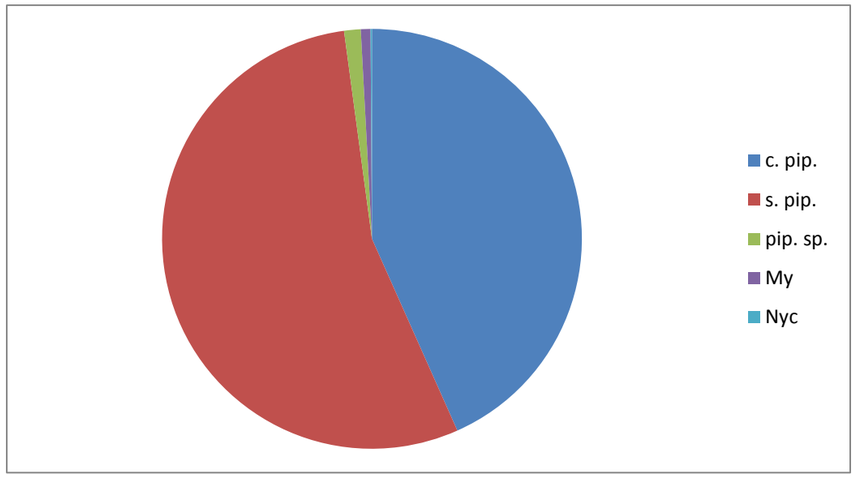
Activity total 3 August 12-17/08/2015									
Loc.	**Habitat type**	**Rec. time**	**c. pip.**	**s. pip.**	**pip. sp.**	**My**	**Nyc**	**Total Passes**	**Total bpph**
1	Open/moorland	27:36:00	1	2	0	0	0	3	**0.11**
2	Edge/fence	48:50:00	7	13	2	0	0	22	**0.45**
3	Open/moorland	48:50:00	1	2	0	0	0	3	**0.06**
4	Open/moorland	9:46:00	11	3	0	1	0	15	**1.54**
5	Edge/plantation	48:50:00	47	21	0	0	0	68	**1.39**
6	Clearfell	48:50:00	3	12	0	0	0	15	**0.31**
7	Edge/burn	43:40:00	915	1171	14	6	2	2108	**48.27**
	Total passes		**985**	**1224**	**16**	**7**	**2**	**2234**	
	Total bpph		**3.56**	**4.43**	**0.06**	**0.03**	**0.01**	**8.08**	
Total Bat Passes			**2234**		**Total bpph**			**8.08**	

(Abbreviations: s.pip – soprano pipistrelle; c.pip - common pipistrelle; pip. sp. pipistrelle species; My – *Myotis* sp.; Nyc - *Nyctalus* sp.)

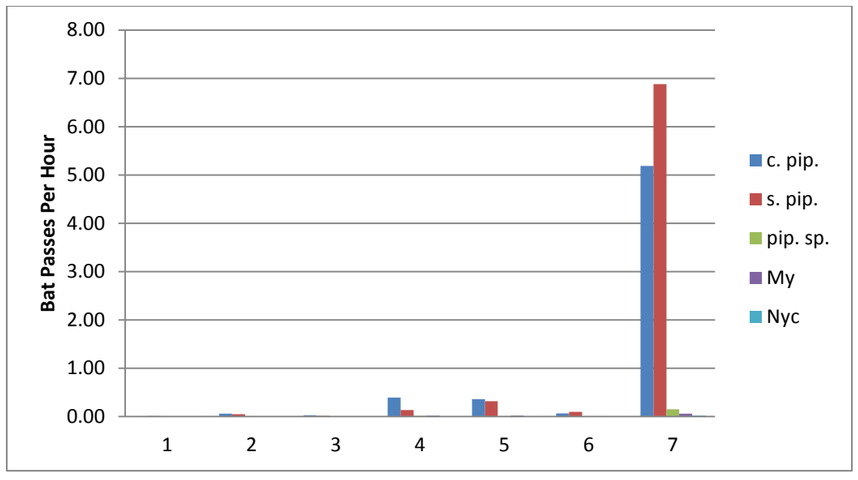
***Table 14.** Summary of activity totals September – 09-15/09/2015 (bpph for location does not correspond to species bbph as the species bpph is calculated to total survey effort).*

Activity total 4 September 09-15/09/2015									
Loc.	**Habitat type**	**Rec. time**	**c. pip.**	**s. pip.**	**pip. sp.**	**My**	**Nyc**	**Total Passes**	**Total bpph**
1	Open/moorland	61:07:00	0	0	0	0	0	0	**0.00**
2	Edge/fence	63:44:00	5	1	0	0	0	6	**0.09**
3	Open/moorland	57:42:00	4	1	0	0	0	5	**0.09**
4	Open/moorland	66:42:00	8	12	1	0	2	23	**0.34**
5	Edge/plantation	71:00:00	15	36	1	0	0	52	**0.73**
6	Clearfell	45:31:00	5	8	0	0	0	13	**0.29**
7	Edge/burn	58:24:00	518	1104	17	8	1	1648	**28.22**
	Total passes		**555**	**1162**	**19**	**8**	**3**	**1747**	
	Total bpph		**1.31**	**2.74**	**0.04**	**0.02**	**0.007**	**4.12**	
Total Bat Passes			**1747**		**Total bpph**			**4.12**	

(Abbreviations: s.pip – soprano pipistrelle; c.pip - common pipistrelle; pip. sp. pipistrelle species; My – *Myotis* sp.; Nyc - *Nyctalus* sp.)



Graph 3. *Temporal Survey Results: Species Composition of Study Area (bat passes per hour).*



Graph 4 *Temporal Activity of Study Area (bat passes per hour).*

6.5 Collision Risk

Table 15 represents the total number of bat passes per hour for high, medium and low risk species. The bat activity index figure for individual bat species has been achieved by combining the temporal and static survey results; the bpph for which is then calculated to total survey time (spatial and temporal). The combined bat activity index figure for unknown bat species is 0.01 which is not represented in the table below as it cannot be assigned a risk level.

Table 15 *Bat Activity Index for Species at Risk of Collision*

Species	High	Medium	Low
c. pipistrelle		1.35	
s. pipistrelle		1.90	
pipistrelle sp.		0.04	
Myotis sp.			0.02
Nyctalus sp.	0.004		
Possible Nathusius' pipistrelle	0.001		
Total bat passes per hour	0.005	3.29	0.02

7. DISCUSSION

7.1 Survey Overview

Much of the variation in activity can be accounted for by changes in weather but also by the fidelity of bats to particular foraging areas and commuting routes.

Five bat species were recorded within the Study Area during the temporal and spatial surveys (not including pipistrelle and unknown bat records). When combining the data as shown in Table 15, the most commonly recorded bat species by bat passes per hour was soprano pipistrelle (1.90) followed by common pipistrelle (1.35), Pipistrelle sp. (0.05), *Myotis* sp. (0.02) *Nyctalus* sp. (0.004) and then possible Nathusius' pipistrelle (0.001).

The temporal surveys recorded high bat activity levels along Wanlock Water (20.14 bpph) at location 7. All other temporal location recorded low bat activity levels (less than 0.73 bpph).

Two properties with bat roost potential were located within the Study Area: Duntercleuch House (TN1 – low bat roost potential) and Clackleith (TN2 – medium bat roost potential). A third house was recorded (TN3) but this ruin at Coghead was not seen to offer any roosting potential for bats. Target notes locations are shown in Figure 8.7.

It is likely that bats will only utilise the exposed areas of the Study Area in suitable weather conditions as prey species will only be present in these areas in low wind, humid and warm weather conditions. Commuting bats would more than likely utilise gullies and sheltered areas around the Study Area to reduce energy expenditures and are likely to only utilise open habitats when weather conditions are favourable. Therefore due to the exposed nature of the Study Area which on average experiences sub-optimal conditions for bats (high wind and low temperatures), and as indicated by the variability of the spatial and temporal data, it is likely that the Study Area is only used occasionally by bat species. More favourable habitat at location 7, which is at a lower altitude, recorded the highest bpph for the Study Area (20.14 bpph).

Bat activity peaks in August for all static locations, as shown during the temporal surveys.

Overall, the BAI for high, medium and low collision risk species is considered to be low for the Study Area.

7.2 High Risk Species

Nyctalus sp. are classed as being at high risk of collision and at high risk at their population level (Natural England, 2014).

Nyctalus sp. were recorded in very low numbers during the temporal surveys in August and September at open ground east of Tongue Hill (location 4) and at Wanlock Water (location 7).

Noctule bats are known to travel 10km from their roosts and Leisler's up to a distance of 13km (Mackie and Racey, 2007 and Shiel *et al.,* 1999). The desktop search located three *Nyctalus* records within 13km of the Study Area. These were recorded on Anabat detectors (i.e. not specific roost records), so it is possible that roosts are located more than 13km from the Study Area.

Leisler and noctule bats predominantly feed in open woodland, parkland, pasture, woodland edge and above water (Waters, 1999, and Mackie and Racey, 2007). It is unlikely that they would be feeding over upland moorland habitat in the northern section of the Study Area; however, it is possible that this habitat may be used to commute between roost and suitable foraging habitats. Habitats outwith the south of the Study Area near Sanquhar are considered to be more suitable forging habitat for these species.

The results of the surveys would suggest that *Nyctalus* species are only present within the Study Area infrequently with a low total BAI for this species (0.004 bpph). The low BAI suggests that there is not a roost within the vicinity of the Study Area and bats use the Study Area for infrequent commuting.

Dumfries and Galloway Biodiversity Action Plan defined Leisler's bat as a Local Priority Species and have established an Action Plan to maintain the distribution of this species, monitor its presence, and protect and improve key sites and habitat for the species in Dumfries and Galloway.

A possible Nathusius' pipistrelle was recorded once (one pass) during the spatial survey.

Nathusius' pipistrelle is a widespread and relatively common species on continental Europe, but its status in Britain is still 'unknown' due to a lack of a data (JNCC, 2007). It was originally thought that its status in Britain was as a vagrant from the continent, but then as more records accumulated it was described as a rare autumn migrant and winter visitor to Britain. Subsequently, evidence began to accumulate in the 1990's that some bred in Britain (Russ *et al.* 1998). The first maternity colony located in Britain was found in 1998 in Northern Ireland. Nathusius' pipistrelle is now considered to be predominantly a winter visiting migrant (with peak numbers of records in autumn but also a smaller peak in spring), but with some remaining in Britain to breed (Russ *et al*. 2001).

Numbers of Nathusius' pipistrelles in Dumfries and Galloway are unknown, but are expected to be extremely small. It was not recorded in south west Scotland between 1980 and 1999 (Richardson, 2000).

Nathusius' pipistrelles will be at risk of mortality from wind turbines where their foraging flights bring them into wind farms, as they do sometimes forage above tree height, but this species tends to feed predominantly relatively low down, especially over and around water and associated riparian woodland and shrubs.

The total BAI for this species across the Study Area is considered to be very low at 0.001 bpph.

7.3 Medium Risk Species

The greatest activity seen throughout the spatial and temporal survey was a result of medium risk species such as common pipistrelle and soprano pipistrelle numbers. These bat species are classed as being at medium risk of collision but are at low risk at the population level due to their distribution and abundance within the UK. Population estimates for common pipistrelle and soprano pipistrelle bats in the UK in 2005 were 2,430,000 and 1,300,000 respectively (JNCC, 2007).

BAI for these species is considered to be low: soprano pipistrelle (1.19), common pipistrelle (0.95) and pipistrelle species (0.05). Activity was mainly recorded around the burn at location 7 with activity much reduced on the temporal detectors in more exposed areas.

7.4 Low Risk Species

Myotis species are low risk for collision and also low risk at the population level (Natural England, 2014).

Only low numbers of *Myotis* sp. which were mainly Daubenton's were recorded for the Study Area. Habitat usage was similar to pipistrelle species with *Myotis* species favouring the burns at location 7.

BAI for these species is considered to be low at 0.03 bpph.

8. MITIGATION PROPOSALS

8.1 Potential Bat Roosts

None of the potential bat roost properties (TN1 & TN2) are within 200m of a turbine and it is not proposed to directly disturb the buildings. Therefore no further surveys are needed to establish the presence or absence of a roost.

8.2 Buffers from Turbines

No area of moderate to high bat activity was witnessed during the spatial survey, while the temporal surveys recorded high bat activity along the Wanlock Water. Bats are known to remain close to linear habitat features when commuting and feeding (Natural England, 2014). Therefore Natural England (2014) recommends that a 50m buffer from turbine blade tip to the top of a linear habitat is adhered to alongside edge habitat. It is recommended that the development adhere to this guidance and turbines are not placed within 50m of Wanlock Water, burns and conifer edge. The buffer distance is illustrated in Annex 6.

The edge of the rotor-swept area needs to be at least 50m from the nearest part, usually the highest point, of the habitat feature. Guidelines suggest a calculation, as shown below:

$$b = \sqrt{(50m + bl)^2 - (hh - fh)^2}$$

(blade length (bl), the hub height (hh) and feature height (fh))

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ANNEX 1 – Protected Species Legal Status

All **bat** species receive protection under the Conservation Regulations (1994) (as amended) only[5].

Conservation (Natural Habitats, &c.) Regulations 1994 (as amended)

Under Regulation 39 (1) it is an offence to:

(a) deliberately or recklessly to capture, injure or kill a wild animal of a European protected species;

(b) deliberately or recklessly:

(i) to harass a wild animal or group of wild animals of a European protected species;

(ii) to disturb such an animal while it is occupying a structure or place which it uses for shelter or protection;

(iii) to disturb such an animal while it is rearing or otherwise caring for its young;

(iv) to obstruct access to a breeding site or resting place of such an animal, or otherwise to deny the animal use of the breeding site or resting place (i.e. roost sites);

(v) to disturb such an animal in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species to which it belongs; or

(vi) to disturb such an animal in a manner that is, or in circumstances which are, likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young;

(c) deliberately or recklessly to take or destroy the eggs of such an animal; or

(d) to damage or destroy a breeding site or resting place of such an animal.

Regulation 44 (2e) allows a licence to be granted for the activities noted in Regulation 39 such that:

Preserving 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.

Legal and Conservation Status of UK Bat Species taken from Bat Conservation Trust (http://www.bats.org.uk)

Species	Legislation / Convention													
	Bern Convention Appendix II	Bonn Convention Appendix II	WCA	Habitats Directive Annex IV	Habitats Directive Annex II	Habs Regs 1994 (as amended) *Scotland*	Conservation of Habs & Species Regs 2010	Conservation Regs (N Ireland) 1995	CROW Act 2000	NERC Act 2006	Wild Mammals Protection Act	UK BAP Priority species	IUCN Red List*	EUROBATS Agreement
Greater horseshoe bat	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	LC	✓
Lesser horseshoe bat	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	LC	✓
Daubenton's bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Natterer's bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Whiskered bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Brandt's bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Bechstein's bat	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	NT	✓
Alcathoe bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		DD	✓
Noctule	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	LC	✓
Leisler's bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Serotine	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Common pipistrelle	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Soprano pipistrelle	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	LC	✓
Nathusius' pipistrelle	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Brown long-eared bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	LC	✓
Grey long-eared bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Barbastelle	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	NT	✓
Greater mouse-eared bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓

*IUCN categories: LC is Least Concern, NT is Near Threatened, DD is Data deficient; see www.iucnredlist.org for more details.

[5] The Conservation Amendment (Scotland) Regulations (2007) removed EPS from Schedule 5 and 8 of the Wildlife and Countryside Act 1981.

ANNEX 2 – Determining Site Risk

Factors to consider when determining the survey effort and site risk (taken from Hundt, 2012)			
Quality of habitat and number of habitat features likely to affect bat mortality rates if altered by development*	**Species likely to use the site***	**Importance of roosts, of species likely to use site, which may be affected by development***	**Potential risk level of development**
No potential habitat for roosting, foraging or commuting bats	None	Local	Lowest
Small number of potential roost features, of low quality. Low quality foraging habitat that could be used by small numbers of foraging bats Isolated site not connected to the wider landscape by prominent linear features.	Low number, single low risk species High number, several low risk species	Parish	Low
Buildings, trees or other structures with moderate high potential as roost sites on or near the site. Habitat could be used extensively by foraging bats. Site is connected to the wider landscape by linear features such as scrub, tree lines and streams.	Low number, medium risk species High number, medium risk species	District County	Medium
Numerous suitable buildings, trees (particularlymature ancient woodland) or other structures with moderate-high potential as roost sites on or near the site, and/or confirmed roosts present close to or on the site. Extensive and diverse habitat mosaic of high quality for foraging bats. Site is connected to the wider landscape by a network of strong linear features such as rivers, blocks of woodland and mature hedgerows.	High number, single high risk species High number, several high risk species High number, all high risk species	National International	High

*As outlined in current scientific research, SNCO guidance and illustrated in (Wray, S., Wells, D., Long, E. and Mitchell-Jones, T. (2010).

ANNEX 3 – Minimum Standards for Bat Surveys

(Taken from Hundt, 2012)

	Site Risk Level		
	Low risk	**Medium risk**	**High risk**
	Roost survey		
Selection of roosts requiring further survey	If evidence of roosting by medium or high-risk species and/or roosts of district importance is found, further survey should follow SNCO guidance and Hundt (2012) guidelines wherever possible.		
Survey period	Surveys should provide data for one season as a minimum.		
Survey area	Up to 200m + rotor radius from turbine locations or potential turbine locations	Up to 200m + rotor radius from turbine locations or potential turbine locations	Up to 200m + rotor radius from turbine locations or potential turbine locations
Ground level transect surveys	One visit per transect each season (spring, summer and autumn)	One visit per transect each month (April-Oct)	Up to two visits per transect each month may be required (April-Oct)
Automated surveys at ground level	5 consecutive nights for each single or pair of locations within the survey area, per season	5 consecutive nights for each single or pair of locations within the survey area, per month	Up to 2 sets of 5 consecutive nights for each single or pair of locations within the survey area, per month
Automated surveys at height	See Section 10.5.6 [of Hundt, 2012] for situations where at-height survey may be appropriate For surveys undertaken from masts (met mast or other) survey effort is as outlined above for surveys at ground level.		

ANNEX 4 – Tree Roost Assessment Method

(Taken from Hundt, 2012)

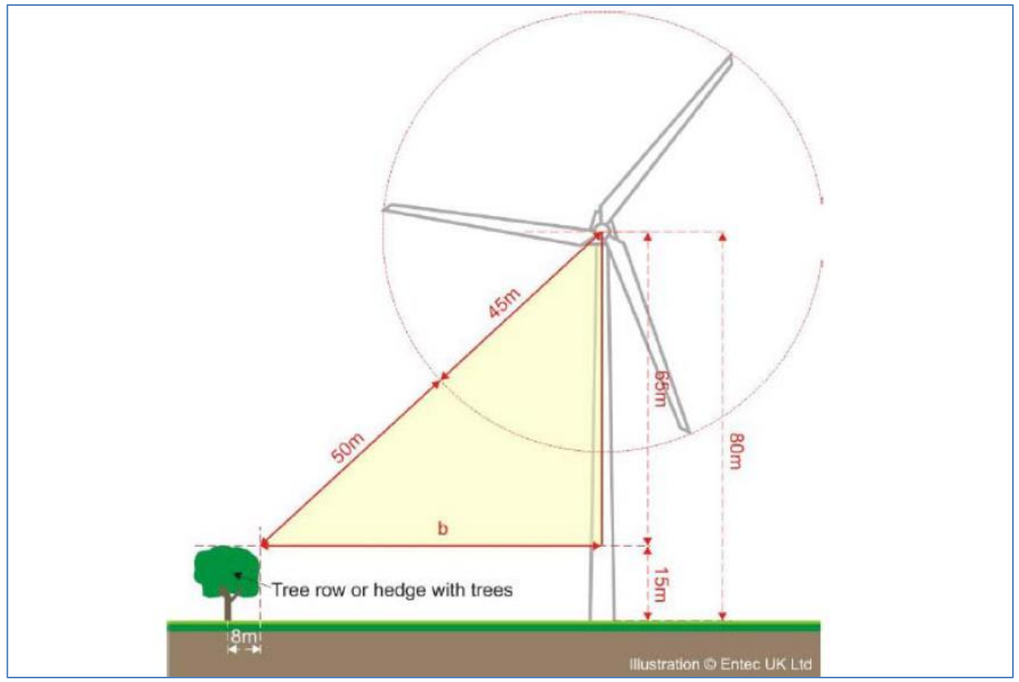
Tree category and description	Stage 1 Initial survey requirements	Stage 2 Further measures to inform proposed mitigation	Stage 3 Likely mitigation
Known or confirmed roost	Follow SNCO guidance and these guidelines wherever possible, to establish the extent to which bats use the site. This is particularly important for roosts of high risk species and/or roosts of district or higher importance and above		The tree can be felled only under EPS licence following the installation of equivalent habitats as a replacement.
Category 1* Trees with multiple, highly suitable features capable of supporting larger roosts	Tree identified on a map and on the ground. Further assessment to provide a best expert judgement on the likely use of the roost, numbers and species of bat, by analysis of droppings or other field evidence. ***A consultant ecologist is required***	Avoid disturbance to trees, where possible. Further dusk and pre-dawn survey to establish more accurately the presence, species, numbers of bats present and the type of roost, and to inform the requirements for mitigation if felling is required.	Felling would be undertaken taking reasonable avoidance measures3 such as 'soft felling' to minimise the risk of harm to individual bats.
Category 1 Trees with definite bat potential, supporting fewer suitable features that category 1* trees or with potential for use by single bats	Tree identified on a map and on the ground. Further assessed to provide a best expert judgement on the potential use of suitable cavities, based on the habitat preferences of bats. ***A consultant ecologist required***	Avoid disturbance to trees, where possible. More detailed, off the ground visual assessment. Further dusk and pre-dawn survey to establish the presence of bats, and if present, the species and numbers of bats and type of roost, to inform the requirements for mitigation if felling is required.	Trees with confirmed roosts following further survey are upgraded to Category 1* and felled under licence as above. Trees with no confirmed roosts may be downgraded to Category 2 dependent on survey findings
Category 2 Trees with no obvious potential, although the tree is of a size and age that elevated surveys may result in cracks or crevices being found; or the tree supports some features which may have limited potential to support bats.	None. ***A consultant ecologist is unlikely to be required***	Avoid disturbance to trees, where possible. No further surveys.	Trees may be felled taking reasonable avoidance measures. Stop works and seek advice in the event bats are found, in order to comply with relevant legislation.
Category 3 Trees with no potential to support bats	None. ***A consultant ecologist is not required unless new evidence is found***	None.	No mitigation for bats required.

ANNEX 5 – Target Notes

TN	Feature	X	Y	Dusk and dawn	Notes	Recommendations
1	Building	284864	615393	Not conducted	Bungalow with renovation works taking place to the roof. Some access points in roof under flashing and under loose tiles. This property was assessed to have low roost potential.	Due to distance to turbines and infrastructure: none
2	Buildings	282953	617001	Not conducted	A dormer bungalow with an outbuilding. The condition of the main house was generally good. Gaps under tiles and some tiles missing. The outbuilding could not be approached because of a nesting bird, however, potential access points from afar could be seen into the outbuilding. Both buildings are assessed to have a moderate roost potential.	Due to distance to turbines and infrastructure: none
3	Ruin	282905	613153	Not required	Stone ruin with no roof and no obvious cavities. Old fireplace present but nettles growing at the bottom of the fire place. No sign of droppings around the fireplace. Unlikely to have any roosting potential.	None

ANNEX 6 – Illustration to Show 50m Buffer Zone

(Taken from Natural England, 2014)



ANNEX 7 – Weather Data (Spatial Surveys)

Date	Transect	Surveyor	Start Time	Finish Time	Hour	Temperature °	Relative Humidity	Wind Speed	Wind Direction	Moon phase	Rain	Cloud Cover	Cloud Height	Notes
18/05/2015	1	JM	21:24	00:59	1			0 calm	n/a	new moon	0 none	8/8'	2 >500m	
18/05/2015	1	JM	21:24	00:59	2			3 gentle breeze	WNW	new moon	0 none	6/8'	2 >500m	
18/05/2015	1	JM	21:24	00:59	3			2 light breeze	WNW	new moon	0 none	7/8'	2 >500m	
18/05/2015	1	JM	21:24	00:59	4			2 light breeze	NW	new moon	2 light showers	8/8'	2 >500m	00:45 rain ceased
18/05/2015	2	LC	20:53	23:47	1	5.1	85.4	3 gentle breeze	NW	new moon	0 none	7/8'	2 >500m	
18/05/2015	2	LC	20:53	23:47	2	5.5	81	4 moderate breeze	NW	new moon	0 none	7/8'	2 >500m	
18/05/2015	2	LC	20:53	23:47	3	5.1	80.1	4 moderate breeze	NW	new moon	0 none	7/8'	2 >500m	
18/05/2015	3	EM	20:53	23:49	1	7.2	70.6	0 calm	n/a	new moon	0 none	7/8'	2 >500m	
18/05/2015	3	EM	20:53	23:49	2	6.6	78.8	0 calm	n/a	new moon	0 none	7/8'	2 >500m	Rain at 2 at 22:25.
18/05/2015	3	EM	20:53	23:49	3	5.1	88.9	0 calm	n/a	new moon	1 drizzle/mist	4/8'	2 >500m	Sheltered. Only few drops of rain. Relatively dry.
16/07/2015	1	EM	21:18	00:15	1	14.4	76	4 moderate breeze	NE	new moon	0 none	8/8'	2 >500m	Wind gust of 5
16/07/2015	1	EM	21:18	00:15	2	14.1	74.1	5 fresh breeze	E	new moon	0 none	8/8'	2 >500m	Rain of 1 at 22:37 then stopped at 22:50. Cloud cover of 1 at 22:50
16/07/2015	1	EM	21:18	00:15	3	11.6	91.1	6 strong breeze	E	new moon	1 drizzle/mist	8/8'	1 150-500m	Wind gust of 7 when at height. Lessened at 23:43. Rain stopped at 22:50.
16/07/2015	2	LC	21:18	23:44	1	13.7	78.1	4 moderate breeze	n/a	new moon	0 none	8/8'	2 >500m	Gusting to 5 in open areas
16/07/2015	2	LC	21:18	23:44	2	13.8	76.5	5 fresh breeze	n/a	new moon	0 none	8/8'	2 >500m	Gusting to 6 in open areas
16/07/2015	2	LC	21:18	23:44	3	11.2	92.9	6 strong breeze	n/a	new moon	0 none	8/8'	2 >500m	Shower at 23:05. Lasted 5 minutes. Heaving gusting to 7
16/07/2015	3	AW	21:18	00:21	1	-	-	4 moderate breeze	SE	new moon	0 none	7/8'	2 >500m	
16/07/2015	3	AW	21:18	00:21	2	-	-	3 gentle breeze	SSE	new moon	0 none	8/8'	2 >500m	Rain spell at very end of hour
16/07/2015	3	AW	21:18	00:21	3	-	-	4 moderate breeze	SSE	new moon	2 light showers	8/8'	2 >500m	Intermittent rain
16/07/2015	3	AW	21:18	00:21	4	-	-	5 fresh breeze	S	new moon	0 none	8/8'	2 >500m	Gusting to 7
09/09/2015	1	LC	19:18	22:11	1	12.6	82	2 light breeze	S	waning crescent	0 none	8/8'	2 >500m	
09/09/2015	1	LC	19:18	22:11	2	11.4	82.5	5 fresh breeze	S	waning crescent	0 none	8/8'	2 >500m	
09/09/2015	1	LC	19:18	22:11	3	10.9	82.9	5 fresh breeze	S	waning crescent	0 none	8/8'	2 >500m	
09/09/2015	2	SS	19:18	21:52	1	12.3	79.3	3 gentle breeze	ENE	waning crescent	0 none	7/8'	2 >500m	
09/09/2015	2	SS	19:18	21:52	2	11.4	80.4	4 moderate breeze	ENE	waning crescent	0 none	8/8'	2 >500m	
09/09/2015	2	SS	19:18	21:52	3	12	81.2	3 gentle breeze	ENE	waning crescent	0 none	8/8'	2 >500m	Gusts of 4
09/09/2015	3	MH	19:18	22:20	1	-	-	4 moderate breeze	SE	waning crescent	0 none	6/8'	2 >500m	
09/09/2015	3	MH	19:18	22:20	2	-	-	5 fresh breeze	SE	waning crescent	0 none	7/8'	2 >500m	
09/09/2015	3	MH	19:18	22:20	3	-	-	2 light breeze	SE	waning crescent	0 none	7/8'	2 >500m	

ANNEX 8 – Behavioural Data (Spatial Surveys)

Date	Transect	Point count	Surveyor	Species	pass no.	Behaviour	Direction	Height	Notes
18/05/2015	3	43	EM	Pip sp.	1	likely commuting	unknown	unknown	Not seen
18/05/2015	3	35	EM	Daubenton	10	feeding buzz	Circling	0-5m	Feeding along stream under bridge. Flying E to W and W to E >1 m from the water.
16/07/2015	1	4 to 3	EM	Pip sp.	1	unknown	unknown	unknown	Not seen
16/07/2015	1	2 to 1	EM	Pip 55	1	unknown	unknown	unknown	Not seen
16/07/2015	1	1	EM	Pip sp.	1	unknown	unknown	unknown	Not seen. Faint
09/09/2015	1	7 to 8	LC	Pip sp.	1	unknown	unknown	unknown	Not seen
09/09/2015	1	10	LC	Pip sp.	2	feeding buzz	unknown	unknown	
09/09/2015	1	9 to 10	LC	Pip 45	3	unknown	unknown	unknown	
09/09/2015	1	9 to 10	LC	Pip sp.	1	unknown	unknown	unknown	
09/09/2015	1	14	LC	Pip sp.	7	feeding buzz	unknown	unknown	
09/09/2015	1	13 to 14	LC	Pip sp.	1	unknown	unknown	unknown	
09/09/2015	1	14 to 15	LC	Pip 55	3	unknown	unknown	unknown	
09/09/2015	1	15 to 16	LC	Pip sp.	3	unknown	unknown	unknown	
09/09/2015	1	16	LC	Pip sp.	1	unknown	unknown	unknown	
09/09/2015	1	16 to 17	LC	Pip sp.	1	unknown	unknown	unknown	
09/09/2015	1	17 to 18	LC	Pip sp.	1	unknown	unknown	unknown	
09/09/2015	2	29	SS	Pip 45	1	feeding buzz	unknown	unknown	Not seen
09/09/2015	2	30	SS	Pip 55	1	feeding buzz	unknown	unknown	Not seen
09/09/2015	2	33	SS	Pip 45	1	likely commuting	unknown	unknown	Not seen
09/09/2015	2	33 to 34	SS	Pip 45	1	feeding buzz	unknown	unknown	Not seen
09/09/2015	2	34	SS	Pip 45	3	feeding buzz	unknown	unknown	Not seen
09/09/2015	3	43 to 44	MH	Unknown bat	3	unknown	unknown	unknown	Not seen
09/09/2015	3	43	MH	Pip sp.	2	unknown	unknown	unknown	Not seen
09/09/2015	3	42 to 43	MH	Pip 45	1	unknown	unknown	unknown	Not seen
09/09/2015	3	42	MH	Unknown bat	1	unknown	unknown	unknown	Not seen
09/09/2015	3	41 to 42	MH	Unknown bat	1	unknown	unknown	unknown	Not seen
09/09/2015	3	40	MH	Pip 55	1	likely commuting	E	6-10m	8m flight height. Flying west to east
09/09/2015	3	40	MH	Pip sp.	1	unknown	unknown	unknown	
09/09/2015	3	39 to 40	MH	Pip sp.	1	likely commuting	S	6-10m	6m flight height. Flying north to south
09/09/2015	3	38	MH	Unknown bat	1	likely commuting	SW	0-5m	5m flight height. Flying north-east to south-west
09/09/2015	3	38	MH	Pip sp.	1	unknown	unknown	unknown	
09/09/2015	3	37	MH	Pip 55	1	likely commuting	E	0-5m	5m flight height. Flying west to east. Evaded when torch went on it
09/09/2015	3	35 to 36	MH	Unknown bat	3	unknown	unknown	unknown	Faint registration. Not seen
09/09/2015	3	35	MH	Pip sp.	3	unknown	unknown	unknown	Not seen

ANNEX 9 – Spatial Raw Data

Site name:	NLEI			Date:	18-19/05/2015						Transect 1	Transect 2	Transect 3			Entered by	Euan Murray 01/06/2015																				
Recorder(s):	JM + LC + EM			Sunset:	21:23		Sunrise				Start time	21:24	20:53	20:53			QA	Ashleigh Wylie 20/11/2015																				
Survey Type:	Dusk			SS parameter	20:53		SR parameter		00:30		Finish time	00:59	23:47	23:49		Final Anabat QA		Leanne Cooke 02/12/15																				
Point count	Recorder	Date	start time	finish time	Total time	Total decimal time	pipistrelle sp	bp ph	pipistrellus	bp ph	pygmgeus	bpph	nathusius	bpph	leisleri	bp ph	noctula	bp ph	nyctalus	bp ph	myotis sp	bp ph	daubentonii	bp ph	natteri	bp ph	mystacinus	bp ph	brandtii	bp ph	mys/brandt	bp ph	Plecotus	bp ph	Unknowbat sp	bp ph	Total	Total bp ph
							pass		pass		pass		pass		pass		pass		pass		pass		pass		pass		pass		pass		pass		pass		pass	
1	JM	18/05/2015	21:24	21:29	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 1 and 2	JM	18/05/2015	21:29	21:37	00:08	0.13		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
2	JM	18/05/2015	21:37	21:42	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 2 and 3	JM	18/05/2015	21:42	21:49	00:07	0.12		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
3	JM	18/05/2015	21:49	21:54	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 3 and 4	JM	18/05/2015	21:54	22:02	00:08	0.13		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
4	JM	18/05/2015	22:02	22:07	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 4 and 5	JM	18/05/2015	22:07	22:15	00:08	0.13		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
5	JM	18/05/2015	22:15	22:20	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 5 and 6	JM	18/05/2015	22:20	22:30	00:10	0.17		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
6	JM	18/05/2015	22:30	22:35	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 6 and 7	JM	18/05/2015	22:35	22:43	00:08	0.13		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
7	JM	18/05/2015	22:43	22:48	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 7 and 8	JM	18/05/2015	22:48	22:56	00:08	0.13		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
8	JM	18/05/2015	22:56	23:01	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 8 and 9	JM	18/05/2015	23:01	23:07	00:06	0.10		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
9	JM	18/05/2015	23:07	23:12	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 9 and 10	JM	18/05/2015	23:12	23:21	00:09	0.15		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
10	JM	18/05/2015	23:21	23:26	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 10 and 11	JM	18/05/2015	23:26	23:33	00:07	0.12		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
11	JM	18/05/2015	23:33	23:38	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 11 and 12	JM	18/05/2015	23:38	23:44	00:06	0.10		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
12	JM	18/05/2015	23:44	23:49	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 12 and 13	JM	18/05/2015	23:49	23:56	00:07	0.12		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
13	JM	18/05/2015	23:56	00:01	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 13 and 14	JM	19/05/2015	00:01	00:09	00:08	0.13		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
14	JM	19/05/2015	00:09	00:14	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 14 and	JM	19/05/2015	00:14	00:20	00:06	0.10		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0

15																																				
15	JM	19/05/2015	00:20	00:25	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 15 and 16	JM	19/05/2015	00:25	00:31	00:06	0.10		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
16	JM	19/05/2015	00:31	00:36	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 16 and 17	JM	19/05/2015	00:36	00:42	00:06	0.10		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
17	JM	19/05/2015	00:42	00:47	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 17 and 18	JM	19/05/2015	00:47	00:54	00:07	0.12		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
18	JM	19/05/2015	00:54	00:59	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
19	LC	18/05/2015	20:53	20:58	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 19 and 20	LC	18/05/2015	20:58	21:05	00:07	0.12		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
20	LC	18/05/2015	21:05	21:10	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 20 and 21	LC	18/05/2015	21:10	21:16	00:06	0.10		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
21	LC	18/05/2015	21:16	21:21	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 21 and 22	LC	18/05/2015	21:21	21:28	00:07	0.12		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
22	LC	18/05/2015	21:28	21:33	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 22 and 23	LC	18/05/2015	21:33	21:40	00:07	0.12		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
23	LC	18/05/2015	21:40	21:45	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 23 and 24	LC	18/05/2015	21:45	21:50	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
24	LC	18/05/2015	21:50	21:55	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 24 and 25	LC	18/05/2015	21:55	22:00	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
25	LC	18/05/2015	22:00	22:05	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 25 and 26	LC	18/05/2015	22:05	22:11	00:06	0.10		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
26	LC	18/05/2015	22:11	22:16	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 26 and 27	LC	18/05/2015	22:16	22:20	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
27	LC	18/05/2015	22:20	22:25	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 27 and 28	LC	18/05/2015	22:25	22:31	00:06	0.10		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
28	LC	18/05/2015	22:31	22:36	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 28 and 29	LC	18/05/2015	22:36	22:43	00:07	0.12		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
29	LC	18/05/2015	22:43	22:48	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 29 and 30	LC	18/05/2015	22:48	22:55	00:07	0.12		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
30	LC	18/05/2015	22:55	23:00	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 30 and	LC	18/05/2015	23:00	23:09	00:09	0.15		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0

31																																					
31	LC	18/05/2015	23:09	23:14	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 31 and 32	LC	18/05/2015	23:14	23:20	00:06	0.10		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
32	LC	18/05/2015	23:20	23:25	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 32 and 33	LC	18/05/2015	23:25	23:32	00:07	0.12		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
33	LC	18/05/2015	23:32	23:37	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 33 and 34	LC	18/05/2015	23:37	23:42	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
34	LC	18/05/2015	23:42	23:47	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
35	EM	18/05/2015	23:44	23:49	00:05	0.08		0		0		0		0		0		0		0		0	10	120		0		0		0		0		0		0	**10**	120
Between 35 and 36	EM	18/05/2015	23:40	23:44	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
36	EM	18/05/2015	23:35	23:40	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 36 and 37	EM	18/05/2015	23:31	23:35	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
37	EM	18/05/2015	23:26	23:31	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 37 and 38	EM	18/05/2015	23:22	23:26	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
38	EM	18/05/2015	23:17	23:22	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 38 and 39	EM	18/05/2015	23:13	23:17	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
39	EM	18/05/2015	23:08	23:13	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 39 and 40	EM	18/05/2015	23:04	23:08	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
40	EM	18/05/2015	22:59	23:04	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 40 and 41	EM	18/05/2015	22:55	22:59	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
41	EM	18/05/2015	22:50	22:55	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 41 and 42	EM	18/05/2015	22:44	22:50	00:06	0.10		0		0		0		0		0		0		0		0	4	40		0		0		0		0		0		0	**4**	40
42	EM	18/05/2015	22:39	22:44	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 42 and 43	EM	18/05/2015	22:34	22:39	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
43	EM	18/05/2015	22:29	22:34	00:05	0.08	1	12		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**1**	12
Between 43 and 44	EM	18/05/2015	22:24	22:29	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
44	EM	18/05/2015	22:19	22:24	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 44 and 45	EM	18/05/2015	22:13	22:19	00:06	0.10		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
45	EM	18/05/2015	22:08	22:13	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 45 to 46	EM	18/05/2015	22:01	22:08	00:07	0.12		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
46	EM	18/05/2015	21:56	22:01	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 46 and 47	EM	18/05/2015	21:51	21:56	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0

47	EM	18/05/2015	21:46	21:51	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 47 and 48	EM	18/05/2015	21:36	21:46	00:10	0.17		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
48	EM	18/05/2015	21:31	21:36	00:05	0.08		0		0	1	12		0		0		0		0		0		0		0		0		0		0		0		0	**1**	12
Between 48 and 49	EM	18/05/2015	21:26	21:31	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
49	EM	18/05/2015	21:21	21:26	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 49 and 50	EM	18/05/2015	21:16	21:21	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
50	EM	18/05/2015	21:11	21:16	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Betwenn 50 and 51	EM	18/05/2015	20:58	21:11	00:13	0.22		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
51	EM	18/05/2015	20:53	20:58	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0

decimal time	**total hrs/ min**	**pipistrelle sp**	**Total bp ph**	**pipistrellus**	**Total bp ph**	**pygmgeus**	**Total bpph**	**nathusius**	**Total bpph**	**leisleri**	**Total bp ph**	**noctula**	**Total bp ph**	**nyctalus**	**Total bp ph**	**myotis sp**	**Total bp ph**	**daubentonii**	**Total bp ph**	**natteri**	**Total bp ph**	**mystacinus**	**Total bp ph**	**brandtii**	**Total bp ph**	**mys/brandt**	**Total bp ph**	**Plecotus**	**Total bp ph**	**Unknow bat sp**	**Total bp ph**	**Total bats**	**Total bp ph**
9.42	**09:25**	**1**	**0.11**	**0**	**0**	**1**	**0.11**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0.42**	**10**	**1.06**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**16**	**1.70**

Site name:	NLEI	**Date:**	16-17/07/2015						**Transect 1**	**Transect 2**	**Transect 3**			**Entered by**	Euan Murray 11/11/2015																										
Recorder(s):	EM + LC + AW	**Sunset:**	21:48		**Sunrise**	04:53		**Start time**	**21:18**	**21:18**	**21:18**			**QA**	Ashleigh Wylie 20/11/2015																										
Survey Type:	Dusk	**SS parameter**	**21:18**		**SR parameter**	**05:23**		**Finish time**	**00:15**	**23:44**	**00:21**			**Final Anabat QA**	Leanne Cooke 02/12/2015																										
Point count	**Recorder**	**Date**	**start time**	**finish time**	**Total time**	**Total decimal time**	**pipistrelle sp**	**bp ph**	**pipistrellus**	**bp ph**	**pygmgeus**	**bpph**	**nathusius**	**bpph**	**leisleri**	**bp ph**	**noctula**	**bp ph**	**nyctalus**	**bp ph**	**myotis sp**	**bp ph**	**daubentonii**	**bp ph**	**natteri**	**bp ph**	**mystacinus**	**bp ph**	**brandtii**	**bp ph**	**mys/brandt**	**bp ph**	**Plecotus**	**bp ph**	**Unknow bat sp**	**bp ph**	**Total**	**Total bp ph**
							pass		**pass**		**pass**		**pass**		**pass**		**pass**		**pass**		**pass**		**pass**		**pass**		**pass**		**pass**		**pass**		**pass**		**pass**		**pass**	
1	EM	16-17/07/2013	00:10	00:15	00:05	0.08	1	12		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**1**	12
Between 1 and 2	EM	16-17/07/2014	00:07	00:10	00:03	0.05		0		0	1	20		0		0		0		0		0		0		0		0		0		0		0		0	**1**	20
2	EM	16-17/07/2015	00:02	00:07	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 2 and 3	EM	16/07/2015	23:58	00:02	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
3	EM	16/07/2015	23:53	23:58	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 3 and 4	EM	16/07/2015	23:48	23:53	00:05	0.08		0	1	12		0		0		0		0		0		0		0		0		0		0		0		0		0	**1**	12
4	EM	16/07/2015	23:43	23:48	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 4 and 5	EM	16/07/2015	23:37	23:43	00:06	0.10		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
5	EM	16/07/2015	23:32	23:37	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 5 and 6	EM	16/07/2015	23:26	23:32	00:06	0.10		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
6	EM	16/07/2015	23:21	23:26	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 6 and 7	EM	16/07/2015	23:16	23:21	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
7	EM	16/07/2015	23:11	23:16	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0

Between 7 and 8	EM	16/07/2015	23:07	23:11	00:04	0.07		0	1	15		0		0		0		0		0		0		0		0		0		0		0		0		0	**1**	15
8	EM	16/07/2015	23:02	23:07	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 8 and 9	EM	16/07/2015	22:54	23:02	00:08	0.13		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
9	EM	16/07/2015	22:49	22:54	00:05	0.08		0	1	12		0		0		0		0		0		0		0		0		0		0		0		0		0	**1**	12
Between 9 and 10	EM	16/07/2015	22:39	22:49	00:10	0.17		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
10	EM	16/07/2015	22:34	22:39	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 10 and 11	EM	16/07/2015	22:30	22:34	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
11	EM	16/07/2015	22:25	22:30	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 11 and 12	EM	16/07/2015	22:20	22:25	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
12	EM	16/07/2015	22:15	22:20	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 12 and 13	EM	16/07/2015	22:09	22:15	00:06	0.10		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
13	EM	16/07/2015	22:04	22:09	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 13 and 14	EM	16/07/2015	21:59	22:04	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
14	EM	16/07/2015	21:54	21:59	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 14 and 15	EM	16/07/2015	21:50	21:54	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
15	EM	16/07/2015	21:45	21:50	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 15 and 16	EM	16/07/2015	21:41	21:45	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
16	EM	16/07/2015	21:36	21:41	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 16 and 17	EM	16/07/2015	21:32	21:36	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
17	EM	16/07/2015	21:27	21:32	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 17 and 18	EM	16/07/2015	21:23	21:27	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
18	EM	16/07/2015	21:18	21:23	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
21	LC	16/07/2015	23:39	23:44	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 21 and 22	LC	16/07/2015	23:35	23:39	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
22	LC	16/07/2015	23:30	23:35	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 22 and 23	LC	16/07/2015	23:25	23:30	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
23	LC	16/07/2015	23:20	23:25	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 23 and 24	LC	16/07/2015	23:14	23:20	00:06	0.10		0		0	1	10		0		0		0		0		0		0		0		0		0		0		0		0	**1**	10
24	LC	16/07/2015	23:09	23:14	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 24 and 25	LC	16/07/2015	23:02	23:09	00:07	0.12		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
25	LC	16/07/2015	22:57	23:02	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 25 and 26	LC	16/07/2015	22:49	22:57	00:08	0.13		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0

26	LC	16/07/2015	22:44	22:49	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 26 and 27	LC	16/07/2015	22:37	22:44	00:07	0.12		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
27	LC	16/07/2015	22:32	22:37	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 27 and 28	LC	16/07/2015	22:27	22:32	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
28	LC	16/07/2015	22:22	22:27	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 28 and 29	LC	16/07/2015	22:16	22:22	00:06	0.10		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
29	LC	16/07/2015	22:11	22:16	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 29 and 30	LC	16/07/2015	22:05	22:11	00:06	0.10		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
30	LC	16/07/2015	22:00	22:05	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 30 and 31	LC	16/07/2015	21:54	22:00	00:06	0.10		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
31	LC	16/07/2015	21:49	21:54	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 31 and 32	LC	16/07/2015	21:43	21:49	00:06	0.10		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
32	LC	16/07/2015	21:38	21:43	00:05	0.08		0		0		0	1	12		0		0		0		0		0		0		0		0		0		0		0	**1**	12
Between 32 and 33	LC	16/07/2015	21:33	21:38	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
33	LC	16/07/2015	21:28	21:33	00:05	0.08		0		0	1	12		0		0		0		0		0		0		0		0		0		0		0		0	**1**	12
Between 33 and 34	LC	16/07/2015	21:23	21:28	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
34	LC	16/07/2015	21:18	21:23	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
35	AW	16/07/2015	21:18	21:23	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 35 and 36	AW	16/07/2015	21:23	21:29	00:06	0.10		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
36	AW	16/07/2015	21:29	21:34	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 36 and 37	AW	16/07/2015	21:34	21:39	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
37	AW	16/07/2015	21:39	21:44	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 37 and 38	AW	16/07/2015	21:44	21:49	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
38	AW	16/07/2015	21:49	21:54	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 38 and 39	AW	16/07/2015	21:54	21:58	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
39	AW	16/07/2015	21:58	22:03	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 39 and 40	AW	16/07/2015	22:03	22:07	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
40	AW	16/07/2015	22:07	22:12	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 40 and 41	AW	16/07/2015	22:12	22:17	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
41	AW	16/07/2015	22:17	22:22	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 41 and 42	AW	16/07/2015	22:22	22:30	00:08	0.13		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0

42	AW	16/07/2015	22:30	22:35	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 42 and 43	AW	16/07/2015	22:35	22:47	00:12	0.20		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
43	AW	16/07/2015	22:47	22:52	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 43 and 44	AW	16/07/2015	22:52	23:01	00:09	0.15		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
44	AW	16/07/2015	23:01	23:06	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 44 and 45	AW	16/07/2015	23:06	23:13	00:07	0.12		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
45	AW	16/07/2015	23:13	23:18	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 45 to 46	AW	16/07/2015	23:18	23:25	00:07	0.12		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
46	AW	16/07/2015	23:25	23:30	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 46 and 47	AW	16/07/2015	23:30	23:38	00:08	0.13		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
47	AW	16/07/2015	23:38	23:43	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 47 and 48	AW	16/07/2015	23:43	23:48	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
48	AW	16/07/2015	23:48	23:53	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 48 and 49	AW	16/07/2015	23:53	23:58	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
49	AW	16/07/2015	23:58	00:03	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 49 and 50	AW	16-17/07/2015	00:03	00:07	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
50	AW	16-17/07/2015	00:07	00:12	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Betwenn 50 and 51	AW	16-17/07/2015	00:12	00:16	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
51	AW	16-17/07/2015	00:16	00:21	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0

decimal time	total hrs/ min	pipistrelle sp	Total bp ph	pipistrellus	Total bp ph	pygmgeus	Total bpph	nathusius	Total bpph	leisleri	Total bp ph	noctula	Total bp ph	nyctalus	Total bp ph	myotis sp	Total bp ph	daubentonii	Total bp ph	natterei	Total bp ph	mystacinus	Total bp ph	brandtii	Total bp ph	mys/brandt	Total bp ph	Plecotus	Total bp ph	Unknow bat sp	Total bp ph	Total bats	Total bp ph
8.43	**08:26**	**1**	**0.12**	**3**	**0.36**	**3**	**0.36**	**1**	**0.12**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**8**	**0.95**

Site name:	NLEI		Date:	09/09/2015						Transect 1	Transect 2	Transect 3			Entered by	Euan Murray 11/11/2015																		
Recorder(s):	LC + SS + MH		Sunset:	19:48		Sunrise		04:55		Start time	19:18	19:18	19:18			QA	Ashleigh Wylie 20/11/2015																
Survey Type:	Dusk		SS parameter	19:18		SR parameter		05:25		Finish time	22:11	21:52	22:20			Final Anabat QA	Leanne Cooke 03/12/2015																

Point count	Recorder	Date	start time	finish time	Total time	Total decimal time	pipistrelle sp	bpph	pipistrellus	bp ph	pygmgeus	bpph	nathusius	bpph	leisleri	bp ph	noctula	bp ph	nyctalus	bp ph	myotis sp	bp ph	daubentonii	bp ph	natterei	bp ph	mystacinus	bp ph	brandtii	bp ph	mys/brandt	bp ph	Plecotus	bp ph	Unknow bat sp	bpph	Total	Total bpph
							pass		pass		pass		pass		pass		pass		pass		pass		pass		pass		pass		pass		pass		pass		pass		
1	LC	09/09/2015	19:18	19:23	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Betwee	LC	09/09/	19:	19:24	00:01	0.02		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0

n 1 and 2		2015	23																																
2	LC	09/09/2015	19:24	19:29	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 2 and 3	LC	09/09/2015	19:29	19:31	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
3	LC	09/09/2015	19:31	19:36	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 3 and 4	LC	09/09/2015	19:36	19:41	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
4	LC	09/09/2015	19:41	19:46	00:05	0.08		0	1	12	1	12		0		0		0		0		0		0		0		0		0		0		0	**2**	24
Between 4 and 5	LC	09/09/2015	19:46	19:51	00:05	0.08		0	1	12	1	12		0		0		0		0		0		0		0		0		0		0		0	**2**	24
5	LC	09/09/2015	19:51	19:56	00:05	0.08		0		0	1	12		0		0		0		0		0		0		0		0		0		0		0	**1**	12
Between 5 and 6	LC	09/09/2015	19:56	20:02	00:06	0.10		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
6	LC	09/09/2015	20:02	20:07	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 6 and 7	LC	09/09/2015	20:07	20:12	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
7	LC	09/09/2015	20:12	20:17	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 7 and 8	LC	09/09/2015	20:17	20:23	00:06	0.10	1	10		0		0		0		0		0		0		0		0		0		0		0		0		0	**1**	10
8	LC	09/09/2015	20:23	20:28	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 8 and 9	LC	09/09/2015	20:28	20:34	00:06	0.10		0	7	70	1	10		0		0		0		0		0		0		0		0		0		0		0	**8**	80
9	LC	09/09/2015	20:34	20:39	00:05	0.08		0		0	2	24		0		0		0		0		0		0		0		0		0		0		0	**2**	24
Between 9 and 10	LC	09/09/2015	20:39	20:45	00:06	0.10		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
10	LC	09/09/2015	20:45	20:50	00:05	0.08		0	1	12	2	24		0		0		0		0		0		0		0		0		0		0		0	**3**	36
Between 10 and 11	LC	09/09/2015	20:50	20:59	00:09	0.15	1	6.666667	3	20		0		0		0		0		0		0		0		0		0		0		0		0	**4**	26.666667
11	LC	09/09/2015	20:59	21:04	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 11 and 12	LC	09/09/2015	21:04	21:09	00:05	0.08		0	1	12		0		0		0		0		0		0		0		0		0		0		0		0	**1**	12
12	LC	09/09/2015	21:09	21:14	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 12 and 13	LC	09/09/2015	21:14	21:21	00:07	0.12		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
13	LC	09/09/2015	21:21	21:26	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 13 and 14	LC	09/09/2015	21:26	21:29	00:03	0.05	1	20		0		0		0		0		0		0		0		0		0		0		0		0		0	**1**	20
14	LC	09/09/2015	21:29	21:34	00:05	0.08	7	84		0		0		0		0		0		0		0		0		0		0		0		0		0	**7**	84
Between 14 and 15	LC	09/09/2015	21:34	21:39	00:05	0.08		0		0	3	36		0		0		0		0		0		0		0		0		0		0		0	**3**	36
15	LC	09/09/2015	21:39	21:44	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 15 and 16	LC	09/09/2015	21:44	21:48	00:04	0.07	3	45		0		0		0		0		0		0		0		0		0		0		0		0		0	**3**	45
16	LC	09/09/2015	21:48	21:53	00:05	0.08	1	12		0		0		0		0		0		0		0		0		0		0		0		0		0	**1**	12
Between 16 and 17	LC	09/09/2015	21:53	21:57	00:04	0.07	1	15		0		0		0		0		0		0		0		0		0		0		0		0		0	**1**	15

17	LC	09/09/2015	21:57	22:02	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 17 and 18	LC	09/09/2015	22:02	22:06	00:04	0.07	1	15		0		0		0		0		0		0		0		0		0		0		0		0		0	**1**	15
18	LC	09/09/2015	22:06	22:11	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
19	SS	09/09/2015	19:18	19:23	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 19 and 20	SS	09/09/2015	19:23	19:28	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
20	SS	09/09/2015	19:28	19:33	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 20 and 21	SS	09/09/2015	19:33	19:39	00:06	0.10		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
21	SS	09/09/2015	19:39	19:44	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 21 and 22	SS	09/09/2015	19:44	19:49	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
22	SS	09/09/2015	19:49	19:54	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 22 and 23	SS	09/09/2015	19:54	20:00	00:06	0.10		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
23	SS	09/09/2015	20:00	20:05	00:05	0.08		0	1	12	1	12		0		0		0		0		0		0		0		0		0		0		0	**2**	24
Between 23 and 24	SS	09/09/2015	20:05	20:09	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
24	SS	09/09/2015	20:09	20:14	00:05	0.08		0		0	1	12		0		0		0		0		0		0		0		0		0		0		0	**1**	12
Between 24 and 25	SS	09/09/2015	20:14	20:19	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
25	SS	09/09/2015	20:19	20:24	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 25 and 26	SS	09/09/2015	20:24	20:29	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
26	SS	09/09/2015	20:29	20:34	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 26 and 27	SS	09/09/2015	20:34	20:39	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
27	SS	09/09/2015	20:39	20:44	00:05	0.08		0		0	1	12		0		0		0		0	1	12		0		0		0		0		0		0	**2**	24
Between 27 and 28	SS	09/09/2015	20:44	20:49	00:05	0.08		0		0	1	12		0		0		0		0	1	12		0		0		0		0		0		0	**2**	24
28	SS	09/09/2015	20:49	20:54	00:05	0.08		0	1	12	1	12		0		0		0		0		0		0		0		0		0		0		0	**2**	24
Between 28 and 29	SS	09/09/2015	20:54	20:59	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
29	SS	09/09/2015	20:59	21:04	00:05	0.08		0	1	12		0		0		0		0		0		0		0		0		0		0		0		0	**1**	12
Between 29 and 30	SS	09/09/2015	21:04	21:08	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
30	SS	09/09/2015	21:08	21:13	00:05	0.08		0		0	1	12		0		0		0		0		0		0		0		0		0		0		0	**1**	12
Between 30 and 31	SS	09/09/2015	21:13	21:18	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
31	SS	09/09/2015	21:18	21:23	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 31 and 32	SS	09/09/2015	21:23	21:29	00:06	0.10		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
32	SS	09/09/2015	21:29	21:34	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 32 and 33	SS	09/09/2015	21:34	21:38	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0

33	SS	09/09/2015	21:38	21:43	00:05	0.08		0	1	12		0		0		0		0		0		0		0		0		0		0		0	**1**	12
Between 33 and 34	SS	09/09/2015	21:43	21:47	00:04	0.07		0	1	15		0		0		0		0		0		0		0		0		0		0		0	**1**	15
34	SS	09/09/2015	21:47	21:52	00:05	0.08		0	3	36		0		0		0		0		0		0		0		0		0		0		0	**3**	36
35	MH	09/09/2015	22:15	22:20	00:05	0.08	3	36		0		0		0		0		0		0		0		0		0		0		0		0	**3**	36
Between 35 and 36	MH	09/09/2015	22:11	22:15	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0	3	45	**3**	45
36	MH	09/09/2015	22:06	22:11	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 36 and 37	MH	09/09/2015	21:59	22:06	00:07	0.12		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
37	MH	09/09/2015	21:54	21:59	00:05	0.08		0		0	1	12		0		0		0		0		0		0		0		0		0		0	**1**	12
Between 37 and 38	MH	09/09/2015	21:50	21:54	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
38	MH	09/09/2015	21:45	21:50	00:05	0.08	1	12		0		0		0		0		0		0		0		0		0		0		0	1	12	**2**	24
Between 38 and 39	MH	09/09/2015	21:40	21:45	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
39	MH	09/09/2015	21:35	21:40	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 39 and 40	MH	09/09/2015	21:30	21:35	00:05	0.08	1	12		0		0		0		0		0		0		0		0		0		0		0		0	**1**	12
40	MH	09/09/2015	21:25	21:30	00:05	0.08	1	12		0	1	12		0		0		0		0		0		0		0		0		0		0	**2**	24
Between 40 and 41	MH	09/09/2015	21:19	21:25	00:06	0.10		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
41	MH	09/09/2015	21:14	21:19	00:05	0.08		0	5	60	1	12		0		0		0		0		0		0		0		0		0		0	**6**	72
Between 41 and 42	MH	09/09/2015	21:07	21:14	00:07	0.12		0		0	2	17.14285714		0		0		0		0		0		0		0		0	1	8.5714286	**3**	25.714286
42	MH	09/09/2015	21:02	21:07	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0	1	12	**1**	12
Between 42 and 43	MH	09/09/2015	20:54	21:02	00:08	0.13		0	1	7.5	2	15		0		0		0		0		0		0		0		0		0		0	**3**	22.5
43	MH	09/09/2015	20:49	20:54	00:05	0.08	2	24		0	1	12		0		0		0		0		0		0		0		0		0		0	**3**	36
Between 43 and 44	MH	09/09/2015	20:40	20:49	00:09	0.15		0		0	1	6.666666667		0		0		0		0		0		0		0		0		0	3	20	**4**	26.666667
44	MH	09/09/2015	20:35	20:40	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 44 and 45	MH	09/09/2015	20:25	20:35	00:10	0.17		0	1	6	3	18		0		0		0		0		0		0		0		0		0		0	**4**	24
45	MH	09/09/2015	20:20	20:25	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 45 to 46	MH	09/09/2015	20:12	20:20	00:08	0.13		0	2	15		0		0		0		0		0		0		0		0		0		0		0	**2**	15
46	MH	09/09/2015	20:07	20:12	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 46 and 47	MH	09/09/2015	19:59	20:07	00:08	0.13		0		0	1	7.5		0		0		0		0		0		0		0		0		0		0	**1**	7.5
47	MH	09/09/2015	19:54	19:59	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 47 and 48	MH	09/09/2015	19:50	19:54	00:04	0.07		0	1	15	1	15		0		0		0		0		0		0		0		0		0		0	**2**	30
48	MH	09/09/2015	19:45	19:50	00:05	0.08	1	12	1	12	1	12		0		0		0		0		0		0		0		0		0		0	**3**	36
Between 48 and 49	MH	09/09/2015	19:41	19:45	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0

49	MH	09/09/2015	19:36	19:41	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 49 and 50	MH	09/09/2015	19:32	19:36	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
50	MH	09/09/2015	19:27	19:32	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
Between 50 and 51	MH	09/09/2015	19:23	19:27	00:04	0.07		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0
51	MH	09/09/2015	19:18	19:23	00:05	0.08		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	**0**	0

decimal time	total hrs/ min	pipistrelle sp	Total bpph	pipistrellus	Total bpph	pygmgeus	Total bpph	nathusius	Total bpph	leisleri	Total bpph	noctula	Total bpph	nyctalus	Total bpph	myotis sp	Total bpph	daubentonii	Total bpph	natterreri	Total bpph	mystacinus	Total bpph	brandtii	Total bpph	mys/brandt	Total bpph	Plecotus	Total bpph	Unknowbat sp	Total bpph	Total bats	Total bpph
8.52	**08:31**	**25**	**2.94**	**33**	**3.87**	**32**	**3.76**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0.23**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**9**	**1.06**	**101**	**11.86**

ANNEX 10 – Temporal Raw Data

Date		Time	Species	Number	Visit no.	Transect	Analook
18/05/2015		-	-	0	1	1	No bats recorded
18/05/2015		-	-	0	1	2	No bat recorded
18/05/2015		21:31	55pip	1	1	3	added to point 48
18/05/2015		22:47	myotis	1	1	3	added to point 41 - 42
18/05/2015		22:48	myotis	2	1	3	added to point 41 - 42
18/05/2015		22:49	myotis	1	1	3	added to point 41 - 42
16/07/2015		22:49	45pip	1	2	1	added to point 9
16/07/2015		23:09	45pip	1	2	1	changed from pip sp to 45 pip point 7 - 8
16/07/2015		21:39	nathupip	1	2	2	added to point 32
16/07/2015		21:32	55pip	1	2	3	added to point 33
16/07/2015		23:17	55pip	1	2	3	added to point 23 - 24
09/09/2015		19:17	45pip	1	3	1	not added, before survey began
09/09/2015		19:41	45pip	1	3	1	added to point 4
09/09/2015		19:41	55pip	2	3	1	added to point 4
09/09/2015		19:48	55pip	1	3	1	added to point 4 to 5
09/09/2015		19:51	45pip	1	3	1	added to point 4 to 5
09/09/2015		19:53	55pip	1	3	1	added to point 8 to 9
09/09/2015		20:29	45pip	1	3	1	added to point 8 to 9
09/09/2015		20:31	45pip	1	3	1	added to point 8 to 9
09/09/2015		20:31	55pip	1	3	1	added to point 8 to 9
09/09/2015		20:32	45pip	2	3	1	added to point 8 to 9
09/09/2015		20:33	45pip	2	3	1	added to point 8 to 9
09/09/2015		20:34	45pip	1	3	1	added to point 8 to 9
09/09/2015		20:37	55pip	1	3	1	added to point 9
09/09/2015		20:39	55pip	1	3	1	added to point 9
09/09/2015		20:45	55pip	1	3	1	point 10 changed 1 x pip sp to 2 x 55 pip and added 45 pip
09/09/2015		20:47	55pip	1	3	1	point 10 changed 1 x pip sp to 2 x 55 pip and added 45 pip
09/09/2015		20:48	45pip	1	3	1	point 10 changed 1 x pip sp to 2 x 55 pip and added 45 pip
09/09/2015		20:52	45pip	1	3	1	no change
09/09/2015		21:05	45pip	1	3	1	added to point 11 to 12
09/09/2015		20:01	55pip	1	3	2	added to point 23
09/09/2015		20:02	45pip	1	3	2	added to point 23
09/09/2015		20:12	55pip	1	3	2	added to point 24
09/09/2015		20:42	myotis	1	3	2	added to point 27
09/09/2015		20:43	55pip	1	3	2	added to point 27
09/09/2015		20:47	myotis	1	3	2	added to point 27 to 28
09/09/2015		20:49	55pip	1	3	2	added to point 27 to 28
09/09/2015		20:50	55pip	1	3	2	added to point 28
09/09/2015		20:51	45pip	1	3	2	added to point 28
09/09/2015		19:09	55pip	1	3	3	not added, before survey began
09/09/2015		19:46	pip.sp	1	3	3	added to 48
09/09/2015		19:48	45pip	1	3	3	added to 48
09/09/2015		19:48	55pip	1	3	3	added to 48
09/09/2015		19:51	55pip	1	3	3	added to 47 to 48
09/09/2015		19:53	45pip	1	3	3	added to 47 to 48
09/09/2015		20:01	55pip	1	3	3	added to 46 to 47
09/09/2015		20:12	45pip	1	3	3	added to 45 to 46
09/09/2015		20:15	45pip	1	3	3	added to 45 to 46
09/09/2015		20:27	55pip	1	3	3	added to 44 to 45
09/09/2015		20:28	45pip	1	3	3	added to 44 to 45
09/09/2015		20:31	55pip2	1	3	3	added to 44 to 45
09/09/2015		20:45	55pipsoc	1	3	3	added to 43 to 44
09/09/2015		20:53	55pip	1	3	3	added to 43
09/09/2015		20:55	55pip	1	3	3	added to 43
09/09/2015		20:59	45pip	2	3	3	added to 42 to 43
09/09/2015		20:59	55pip	1	3	3	added to 42 to 43
09/09/2015		21:02	55pip	1	3	3	added to 42 to 43

Date		Time	Species	Number	Visit no.	Transect	Analook
09/09/2015		21:08	55pip	1	3	3	added to 41 to 42
09/09/2015		21:10	55pip	1	3	3	added to 41 to 42
09/09/2015		21:15	45pip	2	3	3	added to 41
09/09/2015		21:15	55pip	1	3	3	added to 41
09/09/2015		21:17	45pip	1	3	3	added to 41
09/09/2015		21:18	45pip	2	3	3	added to 41