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Bat Survey Update - September 2009

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Report:	Island Farm Bat Surveys 2009 – Survey findings
Site location:	Island Farm, Bridgend
Client:	Just Ecology Ltd.
Date of Survey:	April - September 2009
Report No.:	070907b

1 INTRODUCTION

- 1.1 This is a report on the findings from a series of bat surveys undertaken at the Island Farm site, Bridgend, on behalf of Just Ecology Ltd.
- 1.2 The site is intended for development into a sports complex with supporting car parking and amenity areas. This report details surveys for bats undertaken between April and September 2009 in order to help assess the impact of the proposed development and suggest mitigation and compensatory measures.
- 1.3 An old Prisoner of war hut - "Hut 9" – remains on site, and is a known roost for lesser horseshoe bats and occasionally other species. This is the only known roost that is potentially affected by the proposed development.
- 1.4 Island Farm is located within 1.5km of Merthyr Mawr village, which has a mansion with gardens and parkland as well as mature woodland and grazed improved pasture. This area of rich habitat also follows the Ogmere River down into a tidal estuary and sand dune system. A large maternity colony of lesser horseshoe bats is known at a confidential location near the village and just over 1km from Hut 9.

2 METHODOLOGY

- 2.1 A series of walked bat detector survey transects were carried out by two surveyors on nights between April and September 2009. One additional off-site activity survey was undertaken on 31st May 2009 using a group of eleven surveyors both on and around the site. This was repeated with a team of twelve surveyors on the south and western periphery of the site on 16th August 2009, in addition to further dusk and dawn visits. Three daytime survey visits were made to the inside of Hut 9 by Dr Jeff Kirby of Just Ecology Ltd. accompanied by Steve Moon and/or Wendy Gardner of Bridgend County Borough Council (and Richard Crompton & Bob Firmin on the final visit) in July, August and September 2009.
- 2.2 Transect walks were undertaken according to the methodology in *Bat Surveys – Good Practice Guidelines* (Bat Conservation Trust, 2007). The surveyors were onsite from 30 minutes prior to sunset and carried out a two hour walked transect, with recording stops en-route. Both surveyors each used two bat detectors; a frequency division and heterodyne Batbox Duet and an Anabat SD1 detector. The Anabats were recording constantly throughout the surveys. The Duet detectors were not recorded, but used to identify activity and flight direction as well as quieter species sometimes under recorded by the Anabats. Survey notes were annotated on maps for each visit with each pass being noted with direction and foraging/commuting behaviour noted where possible. Weather conditions were also recorded.
- 2.3 Point surveys were carried once off-site (May) on key junctions and points selected from aerial photographs and maps, and once as a perimeter survey (August) based on preliminary findings to try to establish commuting routes on and off site. This second survey was focussed on the south and western side of the site due to observation and habitat in this area. The trainees who took part in this were all ecologists, and used a range of bat detectors – mostly heterodyne – which were not recorded

3 PERSONNEL

- 3.1 The transect surveys have been undertaken by Richard Crompton CEnv, MIEEM, BSc (who has been involved with surveys on the site since 2005) and Bob Firmin BSc – both are CCW

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licensed bat workers specialising in bat surveys. Trainee Gareth Starr assisted for the external roost counts and August transect survey. Seven additional bat licence trainees and two licensed bat trainers (Richard Crompton & Dr Sandie Sowler) also assisted with the combined off- and on-site survey on 31st May 2009, and eight plus the two trainers with the survey on 16th August 2009.

- 3.2 Internal visits to the Hut 9 roost were undertaken under the supervision of Dr Jeff Kirby of Just Ecology, also a CCW licensed bat worker.

4 SURVEY RESULTS

- 4.1 The following surveys have been undertaken in 2009:

22nd April	Dusk transect
13th May	Dusk transect
31st May	Roost emergence, off site recording and on-site observation
28th June	Dusk transect
2nd July	Internal roost visit; other surveys abandoned due to poor weather*
12th August	Roost emergence survey (dusk)
13th August	Roost entry survey (dawn)
14th August	Internal roost count
16th August	Dusk transect, plus site perimeter fixed point surveys
14th September	Dusk transect
16th September	Internal roost count

* July was an extremely wet month; surveys were planned on 3 occasions, but all had to be cancelled due to heavy rain.

- 4.2 Summarised results for the transect surveys and static monitoring (including 'Hut 9' counts, off-site and perimeter surveys) are provided in Appendix 1, including weather conditions and a description of results. Survey maps are presented in Appendix 2, and Anabat analysis in Appendix 3.

Species recorded

- 4.3 The transect surveys have revealed the following species: lesser horseshoe, common and soprano pipistrelle, noctule and Myotis species – thought to be Daubenton's and Natterer's.
- 4.4 The offsite surveys produced the same species list with the addition of a single pass of a bat thought to be a barbastelle, at the far south-west corner of the site at the road junction near New Bridge.

Activity patterns

- 4.5 The species exhibit trends in their behaviour which are summarised below, based on the findings of the 2009 surveys.

SPECIES	SUMMARISED FLIGHT BEHAVIOUR
Lesser horseshoe bat	Apart from the surroundings of the Hut 9 roost, all movement was recorded following the various hedgerows and woodland edges which run south west from Hut 9. No feeding was observed, and all passes were brief as the bats travelled quickly.
Noctule	These bats were regularly recorded flying and feeding over the site at height. Most observations suggest a mostly east-west direction parallel with the A 48.
Common pipistrelle	These bats were widely recorded across the site, and seemed to appear from the east and west extremities - assumed to be from the buildings on either side of the site.
Soprano pipistrelle	These bats were regularly observed entering the site from the north, crossing the A48 at the north western end of the site. From here they spread out along the linear features to feed widely across scrub and arable areas.
Myotis bats – probable Daubenton's and Natterer's	These two species were infrequently recorded, and always close to trees or hedgerows or the two 'spinneys' (ponds with riparian trees). Most contacts were in the south western half of the site, although determining flight direction was difficult for these late emerging species.
Brown long-eared bat	These quiet bats have a very short range echolocation and none were confidently identified during transect surveys. It is assumed the small number in Hut 9 and around the site use the woodland and hedgerows.
Barbastelle	This species was recorded just once with reasonable confidence of its identity. This low density species roosts in woodland and navigates along water courses. Its presence at the very southwest tip of the site (closest to the Merthyr Mawr woodlands and NNR) places the bat closest to richer habitat and connectivity. Island Farm may offer some seasonal foraging for individuals nearby.

- 4.6 It is likely that other Myotis species are present on site in small numbers. These are difficult to differentiate from other Myotis bats, and it may not be possible to confirm presence or likely absence without more invasive catching surveys. The overall impact of the scheme on these species over and above that of other species should be considered before attempting such surveys as they are disturbing to the bats.

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Off-site survey

- 4.7 On 31st May 2009 a team of eleven surveyors were divided into pairs to work around the periphery of the site with two also positioned to do an emergence count at Hut 9. Surveyors were positioned at the following locations [with grid references]:

Hut 9 (emergence count) [SS 900784]

At the A48 bridge over the River Ogmore [SS 892786]

At New Inn Bridge “ “ “ “ [SS 891783]

At New Bridge “ “ “ “ [SS 891779]

At the corner of new Inn Road and Merthyr Mawr Road [SS 893781] and 3rd hedgerow junction (one surveyor at each) [SS 897778]

Perimeter survey

- 4.8 On 16th August 2009 a team of eight surveyors were sent to fixed point locations along the south and western perimeter of the site with the intention of identifying crossing points where bats entered and/or left the site. The fixed point locations and results are shown in Appendix 2, Fig 9.

Roost counts at Hut 9

- 4.9 Previous studies at the site by the same surveyors revealed that the lesser horseshoe bats only appeared to use the roost entrance at the south west end of the building. This was verified by observers during the survey on 31st May 2009 and the August dusk and dawn survey. During 2009 the internal count results were:

2nd July 18 lesser horseshoes, 1 brown long eared

14th August 30 lesser horseshoes and 1 brown long eared

16th September 30 lesser horseshoes and 3 brown long eared

- 4.10 This, combined with emergence counts, shows the maximum number of ~30 lesser horseshoes to be a realistic indication of the number of bats using the site and shows an increase on past years. No dependent juveniles were seen, indicating it is not a maternity roost. The small number (~3) of brown long eared bats is consistent with past results.

- 4.11 A count, or more accurately, index, was taken by an Anabat detector positioned for the duration of the transect surveys (see 4.10 regarding calibration). The following index of lesser horseshoe emergence activity was taken at the hut (measure of passes NOT emergences), apart from where indicated * by emergence or internal counts:

22nd April = 3

13th May = 36

31st May = 12 (but corrected to 14* by observers)

28 th June	= no data; reason unknown (either no bats or malfunction)
2 nd July	= 18* lesser horseshoes from internal roost count (plus one long eared bat)
12 th August	= 44 (30* bats exiting counted by observer, 12 re-entered and 2 more re-emerged)
13 th August	= 15 (dawn survey 25* lesser horseshoes re-entering)
14 th August	= 30* lesser horseshoe and 1 brown long eared bat counted in internal roost count
16 th August	= 48 (corrected to 28* by observers)
14 th September	= 5
16 th September	= 30* lesser horseshoes and 3 brown long eared bats counted in internal roost count.

Roost count calibration

- 4.12 Whilst two surveyors were present for the transect surveys, an automated emergence count from the end of Hut 9 was also conducted at the same time using an Anabat. This was calibrated by an observer during the 31st May and 12th August surveys, which showed that in May the Anabat recorded 12 lesser horseshoe bat passes and the observer counted 14 and in August the anabat recorded 44 passes and the observer recorded 30 emerging, 12 re-entering and 2 re-emerging (42 passes). The Anabat records only bat passes within range and will miss some calls due the very short range and directional nature of lesser horseshoe echolocation. It is not possible during routine surveys to get inside the fence line around the building to improve detection. Initially it was proposed that a multiplier be used to determine an approximate count from anabat data. However, this limited calibration exercise suggests that emergence counts can both be under- and over-recorded on emergence by this method, but the mean count of anabat 'triggers' (bat passes) over time should give a reasonable indication of mean colony size.

Other possible roosts on and close to the site

- 4.13 There is a large number of modern houses close to the site in Island Farm Close, across the A48 and several large older houses along Merthyr Mawr Road. These are all potential roost locations but have not been checked during the current surveys.
- 4.14 Apart from this there are few other potential roost locations on-site apart from trees (which are suitable for some bat species only). Potential tree roosting locations are mainly restricted to the mature tree-lined hedgerows on the western side of the site. Possible roosting behaviour by common pipistrelles has been seen on repeated visits around an over-mature pine tree close to the western entrance drive approximately 100m from Merthyr Mawr Road and the former country club (SS 896783). This would benefit from further investigation if this tree is to be affected by any proposals.

5 INTERPRETATION

Flightlines and use of the landscape

- 5.1 Bat use of the site is strongly associated with linear features. In many respects it was surprising how little any of the bat species deviated from the hedgerows, tree lines and paths throughout the site during the surveys. The exception to this is noctules and the two pipistrelle species which foraged over the site with little reliance on the linear features.
- 5.2 This behavior indicates that bats are primarily commuting through the site, to and from roosts and other sites, with opportunistic feeding along the way, apart from when there are occasional peaks of insect activity (e.g. when the fields were spread with manure), rather than using the site as a preferred foraging habitat.

Assessment of different habitat areas

- 5.3 Bat activity across the site can be summarised as follows:

Improved arable fields and hedgerows

- 5.4 The fields clearly offer some foraging opportunities. Occasional insect peaks, such as when manure is spread or emergence of certain flying insects from the ground, are likely to provide seasonal food sources. Although the least bat activity was associated directly with the arable areas, the hedgerows which surround them are key flight lines, and a feeding resource in their own right. As many of these linear habitat features should be maintained as possible, or new hedgerows created in compensation for the loss of others.

Brown field area and scrub

- 5.5 These areas were used by bats especially on less windy nights when insects were not displaced. The piles of clinker in the middle of the site and the concrete foundation pads gather solar heat and this attracts insects which the bats feed on. In addition the scrub vegetation itself shelters many of the insect prey. This habitat is certainly a source of food for the majority of bats species on the site. A proportion of the features listed should be retained or mitigated for.

Woodland

- 5.6 The woodland areas are probably the most valuable of habitats to bats, although the combination with more open habitats is also necessary. The mature trees are likely to provide roosting opportunities for the *Myotis* and long eared bats, plus pipistrelles, and all trees provide shelter and foraging. The on-site woodland is even-aged and is sub-optimal in comparison to the rich pasture woodland habitat at Merthyr Mawr. However, it is still of value and should be retained as much as possible, and enhanced by improving habitat linkage to the river corridor, e.g. by planting up the hedgerows/shelterbelt woodlands to the south west corner of the site and the river at New Bridge and New Inn bridge.

Status of Hut 9 roost

- 5.7 The hut is known to be a roost site for at least two species of bats:
- Brown long-eared bat: one torpid bat was found in October 2004 (previously unknown

record) and a maximum of 3 were recorded in 2009.

- Lesser horseshoe bats: between 3 and 9 bats have been counted emerging from inside the hut during the period October 2004 – October 2005. Up to 30 were recorded during the 2009 surveys.

5.8 A number of lesser horseshoe bats were caught during a previous survey in 2006 and sub-adult females and males were found suggesting it is not a nursery roost. It is likely to be a satellite to the known larger maternity roost at Merthyr Mawr which had a peak count of 79 Lesser horseshoe bats in 2002, the most recent data found (Halliwell & Matthews 2002, CCW Natural Science Report No. 03/9/1). There is also a large area of high quality feeding habitat around Merthyr Mawr village with rich grazed pasture, wetland and woodlands.

5.9 Even though the Hut 9 roost is thought to be a satellite roost rather than a nursery roost, all bat roosts are legally protected under the Conservation (Natural Habitats &c.) Regulations 1994 (as amended).

5.10 During an internal roost count on 16th September 2009 an attempt was made to catch some of the lesser horseshoe bats present by static hand net [under licence to R. Crompton]. The bats were warm and very active and so this was abandoned to avoid excessive disturbance. One adult female brown long-eared bat was caught. She was parous (had given birth in a previous year).

6 POTENTIAL IMPACTS TO BATS FROM DEVELOPMENT

6.1 In broad terms, it is feasible to zone the site into areas of importance – particularly for the lesser horseshoe bats. The farmland to the south of the site was considerably less used by bats during the survey nights, with the exception of the mature hedgerows. However the northern and western sections of the site had most of the bat activity. This suggests a strong correlation between bat activity and less managed habitat types. Any mitigation design and/or development plans must consider this within the design.

Impact on roosts

6.2 Development of the site may have various impacts on this existing roost, depending on the extent of proposed works:

6.3 Disturbance of the roost through the close proximity of development works, i.e. noise, dust, use of artificial lights and general increase in use of the site. At worst, this could result in abandonment of the roost.

6.4 Isolation of the roost through destruction of surrounding habitat, i.e. hedgerows and tree lines currently used as commuting routes by bats to and from the roost. This could also potentially result in abandonment of the roost by bats.

6.5 It is likely that there are other bat roosts on the site and there are a number of mature trees that have potential to accommodate bats. Disturbance, isolation and destruction of tree roosts due to development of the site could have similar impacts and could result in the loss or abandonment of tree roosts.

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Impact on flightlines and feeding areas

- 6.6 Development of the site could also have impacts on the existing flightlines to and from roosts and preferred feeding areas:
- 6.7 Removal of hedgerows, tree lines and prominent trees to make way for development could sever important flight lines used by bats to commute to and from roosts and feeding areas. This could severely restrict the movement of bats across the site and could result in abandonment of roosts.
- 6.8 Loss of feeding areas could increase the energy demands on bats by furthering the distance to the next suitable feeding area. This is directly related to the selection of roost sites since bats tend to roost close to optimum feeding habitat. Roosts could be abandoned if feeding areas are too far away.
- 6.9 Destruction or reduction of dense undergrowth and sheltered hedgerows that bats commute along to reduce the chances of being predated when traveling between roosts and feeding areas.
- 6.10 Development of the site as a sports complex, business premises and car parks which would significantly increase the use of the site could result in disturbance to bat flight lines due to the increased noise and artificial lights (e.g. street lighting, security lights, car traffic, etc.). Roosts could be abandoned if there are no sheltered/dense flight lines left on the site.

7 POTENTIAL OPTIONS FOR MITIGATION MEASURES

- 7.1 The following options for minimising impact on bat species are available:

Roosts

- 7.2 Hut 9, in its present condition, is a sub-optimal roosting environment for bats. If a more suitable alternative roost could be provided well in advance of development work, the bats currently using the hut may be persuaded to use the purpose built roost also. The new roost will need to be designed with access points that favour lesser horseshoe and long-eared bats, and accommodate a variety of roosting conditions (different temperature regimes, etc.) to suit seasonal and diurnal changes in temperature. A specially built bat roost offering a range of temperatures (from a warm attic to a constant and cool temperature cellar) could be located towards the west or south-west side of the site, or even just off site near the road junction near New Bridge.

Flightlines

- 7.3 If a purpose built roost were to be successfully occupied, and Hut 9 little used by any bats, some of the less important flightlines to bats (e.g. those around the agricultural land in the south and east of the site) could potentially be developed depending on other constraints. This might be subject to European Protected Species licensing.
- 7.4 The denser hedgerows, tree lines and areas of scrub are more valuable to bats for commuting and foraging and these areas contain many mature trees with potential to accommodate roosting bats. These areas should either not be developed, or could undergo minimal development, e.g. maintain the site as a nature reserve for public enjoyment and education purposes.

Feeding areas

- 7.5 The lesser horseshoe bats appear to be feeding by opportunistic foraging on the site whilst commuting to the optimal foraging habitat close to Merthyr Mawr to the south of the site. The full extent of this opportunistic foraging is not known and would be very costly to fully research. Other species appear to be utilising the site according to seasonal insect abundance, and also following farming activities such as crop harvesting and muck-spreading when large numbers of insects are disturbed/attracted.

8 CONCLUSIONS

- 8.1 It is clear that the Island Farm site is used by a number of bat species for both roosting and foraging behaviour which changes throughout the year. Key elements of the site are the built structure (Hut 9) and the mature vegetation (trees and hedgerows). However, the brownfield/scrub and to some degree arable areas also provide feeding opportunities.
- 8.2 Any mitigation scheme designed as part of the proposed development will need to factor in these requirements. In addition the remote nature of Hut 9 from the river corridor and woodland, and its close proximity to the A48, means it is more vulnerable from disturbance and isolation. Serious consideration should be given to building a purpose made 'bat building' with warm (attic) and cool (cellar) areas.
- 8.3 There is also scope for some habitat enhancement around the site; extending habitat linkage near the New Bridge road junction to the river corridor would reduce pressure of lost hedgerows on site. A tall connecting tree canopy across the minor roads would also promote the safe passage of bats.

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9. APPENDICES

Appendix 1: Summarised transect, roost count and fixed point results.

All transect notes correlate with timings on field recording sheets. Note LHS = Lesser horseshoe bat.

April – September 2009.

22/04/2009 – Transect

Weather: Dry, calm, 13°C at start. 90% cloud. Sunset 20:19

First bat at 22:40, common pipistrelle. Total of 10 common and 4 soprano pipistrelle passes until 21:09 when Anabat unit failed. Lesser horseshoe pass at 21:04, flying along the path away from Hut 9, within 50m of the hut. Fields had been freshly muck spread, so much feeding activity on resulting insects.

13/05/2009 – Transect

Weather: Light drizzle, calm, 11°C throughout. 100% cloud. Sunset 19:57

First bat at 21:07, common pipistrelle. Predominantly common pipistrelle activity, with 33 passes until 22:56. Three soprano pipistrelle passes later in survey at 22:34, 22:43, and 22:59. Possible *Myotis* at 21:13. Last bat, soprano pipistrelle at 22:59.

31/05/2009 Off-site surveys

Weather: dry, calm, 18°C at start, 10% cloud. Sunset 21:15

A48 bridge

Soprano pipistrelles active beneath bridge from 21:26, with Daubenton's active from 21:32. Greater numbers of soprano pipistrelles at first, with the number of Daubenton's increasing from 21:43 until they were the predominant bat from 21:50 and for the remainder of the survey. Large number of social calls from both species. Common pipistrelle at 22:37. Last bat soprano pipistrelle at 22:45. Some calls resemble brown long-eared, but likely to be Daubenton's feeding buzzes.

Crossroads near New bridge

Soprano pipistrelles from 21:50, *Myotis* possible Natterer's at 22:04. Two LHS passes plus pipistrelles, noctule and *Myotis* (likely Daubenton's) between 22:10 and 22:26 when a barbastelle was recorded (reasonable but short call). Further *Myotis* (Daubenton's) and both pipistrelle's and one further lesser horseshoe was recorded to end of the survey at 22:50.

New Bridge and New Inn Bridges

Surveyors at both sites identified regular pipistrelle bats, and occasional Daubenton's passes along the river. Both teams were surprised by the overall lack of activity. Neither recorded lesser horseshoe bats.

28/06/2009 – Transect

Weather: Dry following showers, calm, 18°C at start, 90% cloud. Sunset 21:33

First bat at 21:56, Noctule. Common pipistrelle activity from 22:01 and soprano pipistrelles from 22:04. Nearly equal number of common (21) and soprano (23) pipistrelle passes, with 5 pipistrelles recorded echolocating at 50kHz. Further Noctule passes at 22:10, 22:15, and 23:06. Two *Myotis* passes at 22:10 and 23:06. Last bat, common pipistrelle, at 23:40.

12/08/2009 – Roost emergence survey (Hut 9) - dusk

Weather: Mild, light drizzle – dry, breezy. 15°C start. 100% cloud. Sunset 2045

Three surveyors positioned at north east and south corners - to watch other possible emergence points - and one surveyor counting main exit on south west end with infra-red camera. Lesser horseshoe's 'light sampling' from 2045. First bat left at 2055, followed by ~20 over a few minutes. A further 10 emerged leading up to 2140. Some bats were returning from 2150, possibly including 1 or 2 long eared bats. No LHS seen/heard at NE corner, and 10 at southern corner. All surveyors recorded some pipistrelle activity.

13/08/2009 – Roost re-entry survey (Hut 9) - dawn

Weather: Calm, dry, mild. Temp 14°C at start. Sunrise 0555.

Two surveyors; one SE corner of hut, one on SW side with IR camera. LHS activity from 0430. Bats entering and leaving roost (swarming) from 0445. Mixed activity with bats entering (~40) and leaving (~15) until 0537. Only 6 LHS heard/seen at SE corner between 0503 and 0605.

16/08/2009 – Transect, plus fixed point perimeter surveys

Weather: Calm but occasional gusts of wind. Dry, 100% cloud. 16°C at start. Sunset 2045

Survey delayed at Hut 9, due to coordination of surveyors – resulting in more than normal LHS contacts until 2105. However, more LHS were encountered on this survey than normal across the wider site. Pipistrelle bats active from 2049. LHS active at roost from 2041, but most from 2052. Regular bat activity through to 2209. Noctule passes recorded at 2221 (recorded centrally in site) and 2225 (static Anabat at Hut 9) – likely to be the same bat passing southwest-northeast. A maize crop (over 6' tall) had been planted in agricultural fields, making walking around them noisy and obscuring visibility.

14/09/2009 – Transect

Weather: Calm, dry, 10% cloud. 15.5°C at start (13.5°C end). Sunset 1934.

Pipistrelle bats recorded from 1956 with both common and soprano species feeding over the taller habitat usually late- surveyor had walked right across the site from Hut 9 prior to sunset, but no bats until 20 minutes after sunset. Anabat at Hut 9 also recorded first LHS around this time. LHS otherwise little recorded across the wider site, whilst pipistrelle's were frequently encountered throughout the survey. Three unidentified bat passes and one myotis pass (alongside tall hedgerow in field close to rough grassland area) also noted. Maize crop still growing in fields causing interference with bat detection and observation.

Appendix 2: Survey results maps

Fig 1. Lesser horseshoe – all surveys



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Fig 2. Myotis bats – all surveys

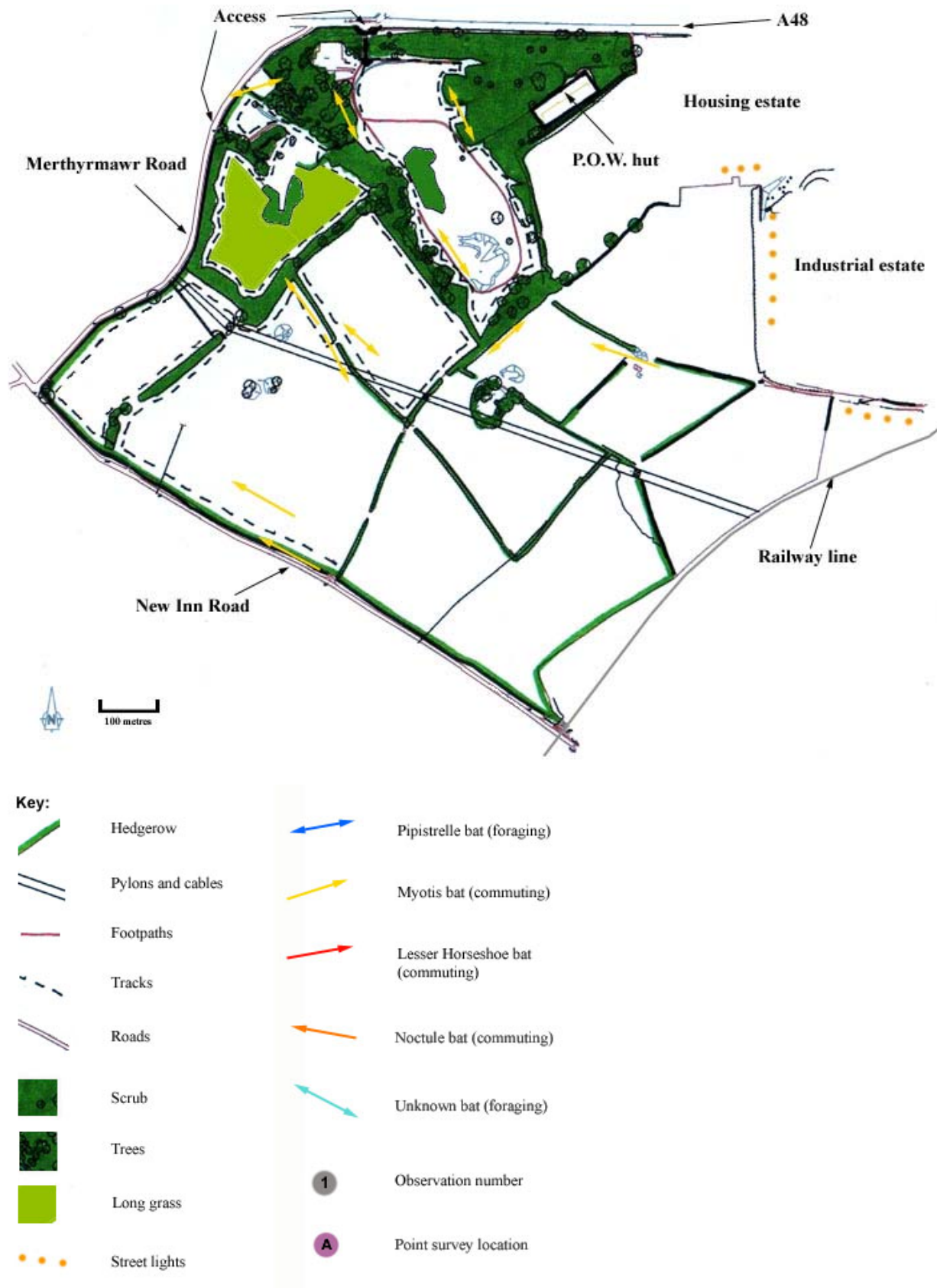


Fig 3. Noctules – all surveys



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Fig 4. Pipistrelle bats (soprano & common combined) – all surveys

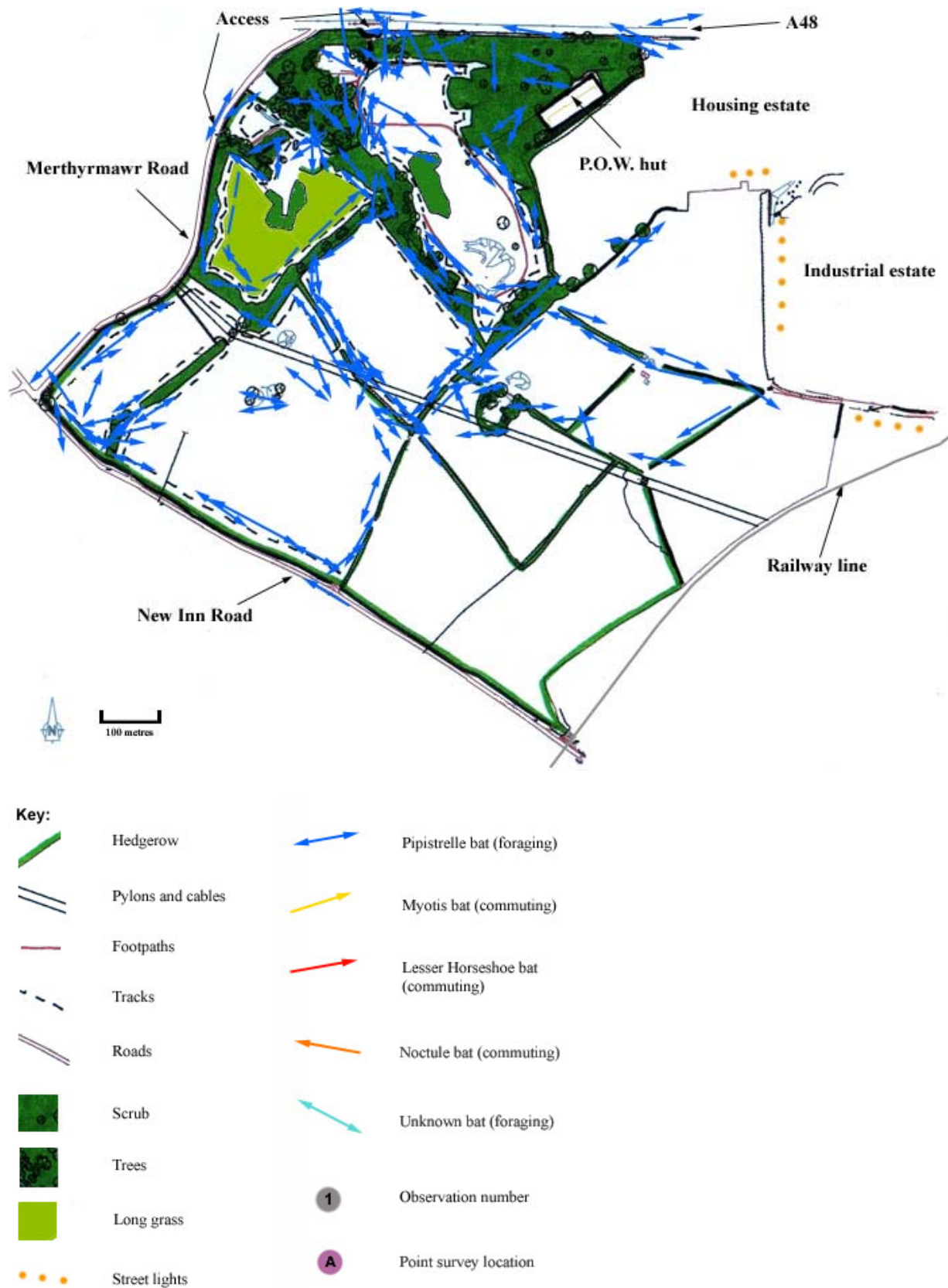
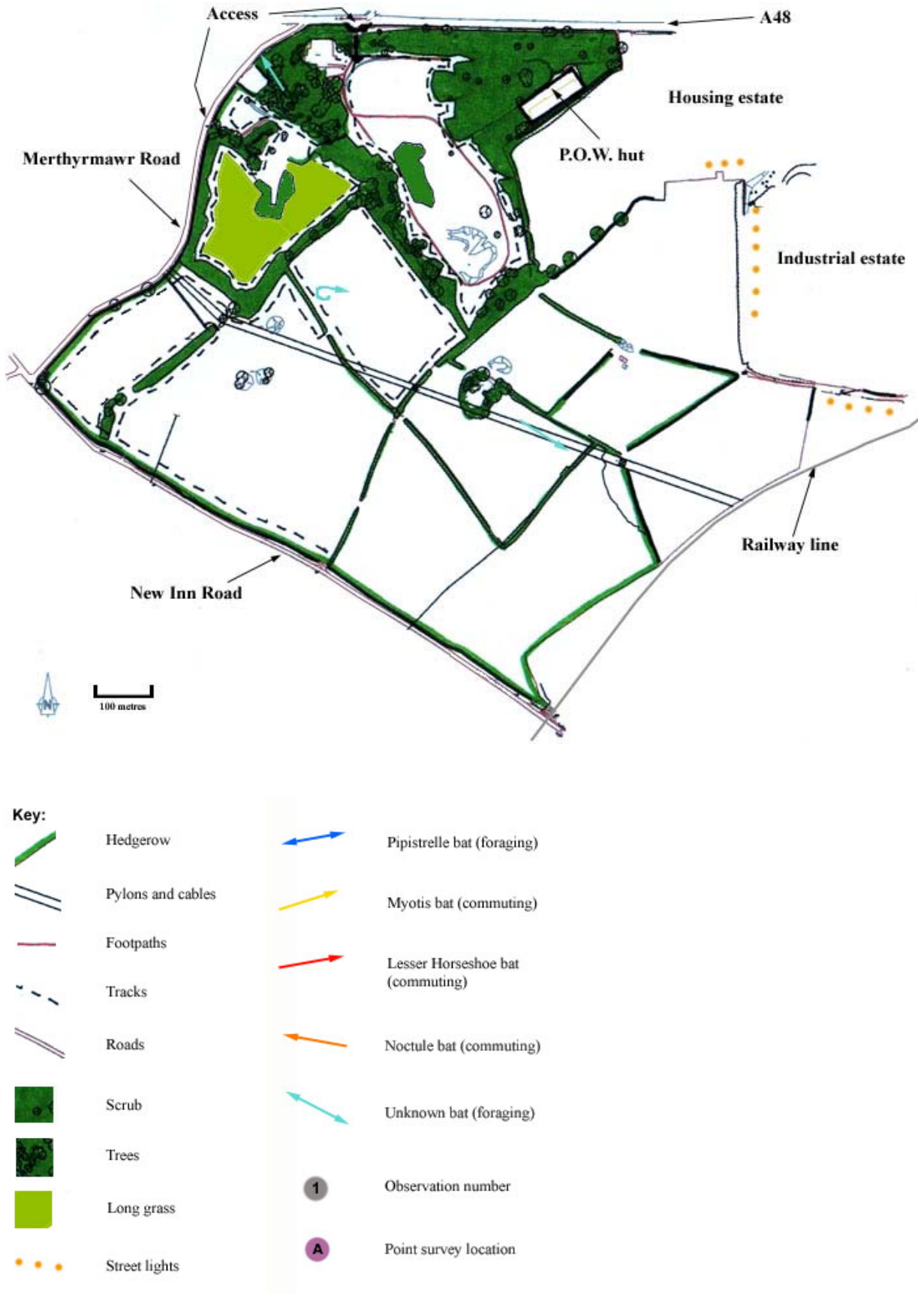


Fig 5. Unknown/unsure identification – all surveys



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Fig 6. April Survey – all species

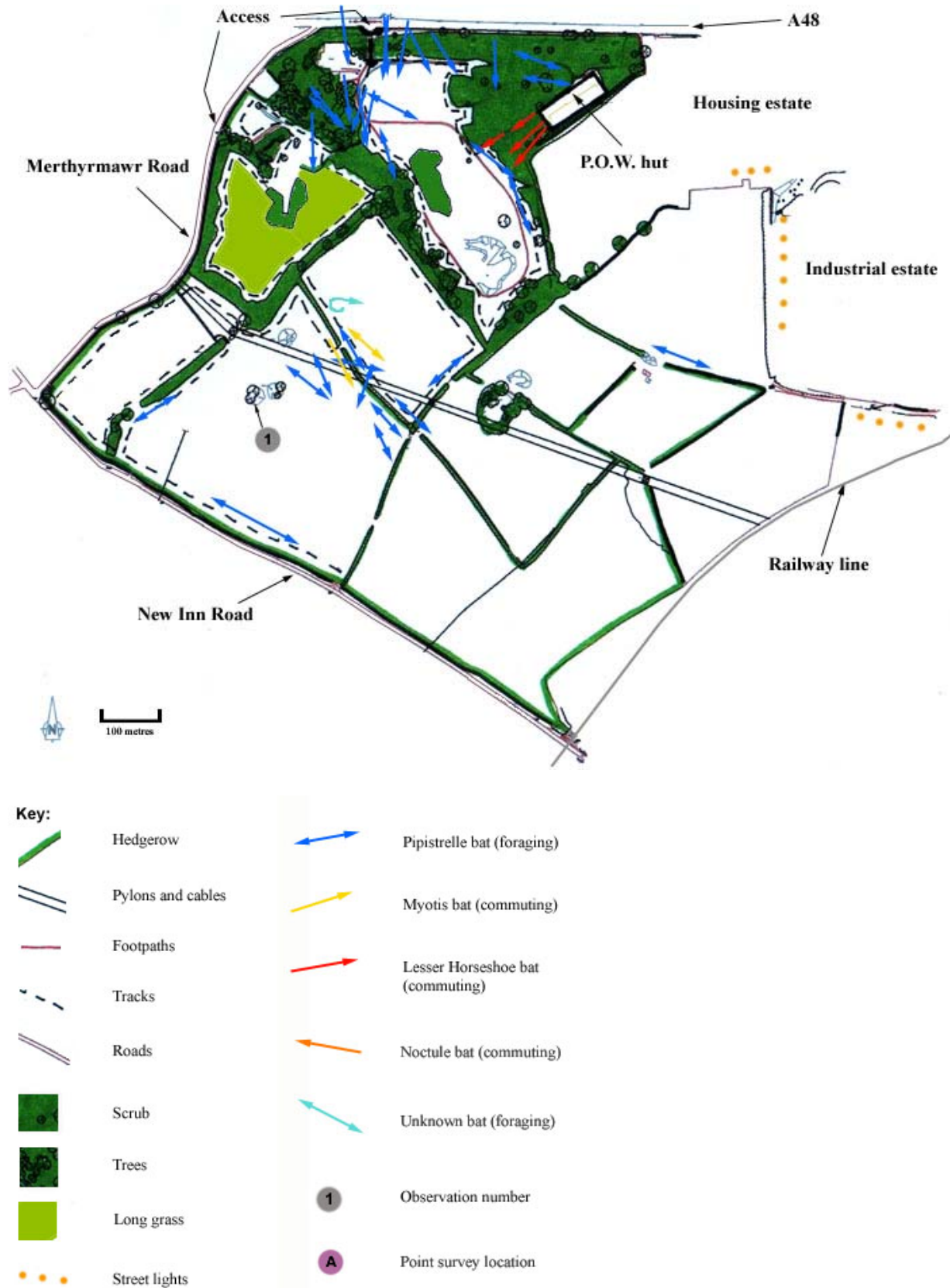


Fig 7. May Survey – all species

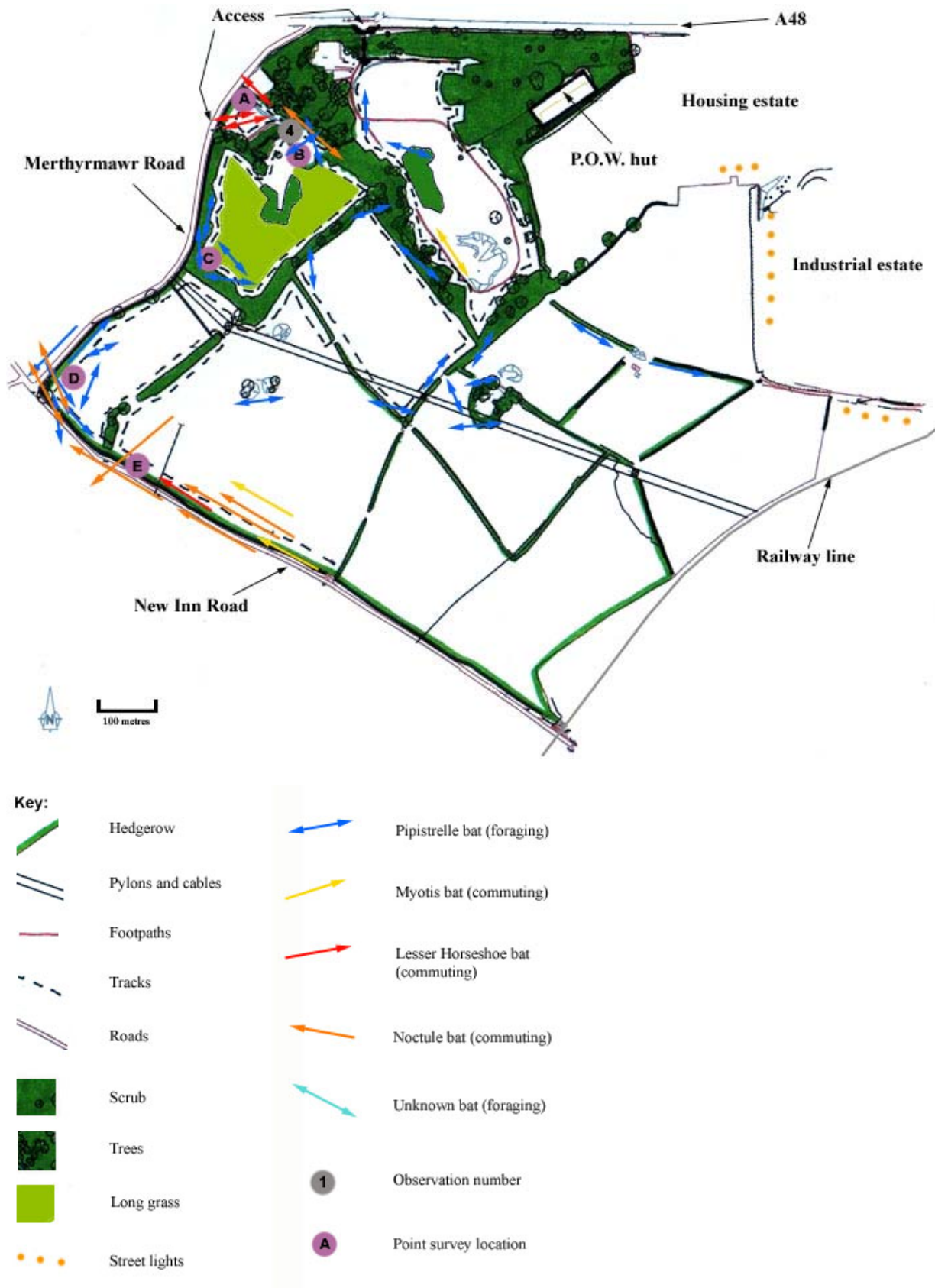


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Fig 8. June Survey – all species



Fig 9. August Survey (transect and perimeter point survey) – all species



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Fig 10. September Survey – all species



Appendix 3: Analysed Anabat data

22 April 2009

Hut 9 fixed monitoring.

BF+RC transects. No data recorded on BF Anabat after 21:09

Surveyor/ site	Time	P. pipistrellus	P. sp	P. pygmaeus	P. auritus	R. hipposideros	R. hipposideros (fund)	Myotis. sp	M. nattereri	N. noctula	unknown
BF	20:40	1									
	20:41	1									
	20:45			1							
	20:46			1							
	20:51	1		1							
	20:52	1									
	20:53	1		1							
	20:55	1									
	20:56	1									
	20:57	1									
	21:00	1									
	21:08						1				
	21:09	1									
BF Total		10		4		1					
Hut 9	20:34	3									
	20:35	4		4							
	20:36	3		4							
	20:37			4							
	20:38			4							
	20:39			3							
	20:40			4							
	20:41			4							
	20:42			3							
	20:43			5							
	20:49			1							
	20:51					1					
	21:00	1									
	21:01					1					
	21:11					1					
	21:48	1									
	22:12	1									
22:27	1										
22:48	1										
Hut 9 Total		15		36		3					
RC	20:34	1									
	20:37	1									
	20:38	2									
	20:39	1									
	20:40	3									
	20:41	2									

Appendix 9.3 Bat Survey Update 2009

Surveyor/ site	Time	P. pipistrellus	P. sp	P. pygmaeus	P. auritus	R. hipposideros	R. hipposideros (fund)	Myotis. sp	M. nattereri	N. noctula	unknown
	20:42	2									
	20:46	1		1							
	20:50	1									
	20:51	1									
	20:53	2									
	20:55			1							
	21:01					1					
	21:02	1									
	21:07	1									
	21:10			1							
	21:19	1									
	21:20	2									
	21:22	2	1	2							
	21:23	3		1							
	21:24	4									
	21:25	3									
	21:26	3									1
	21:27	3	1	3					1		
	21:28	2		1				1	2		
	21:31	1									
	21:32	2									
	21:33	2									
	21:34	4		4							
	21:35	5		4							
	21:36	3		3							
	21:37	2		5							
	21:38			1							
	21:39	2		1							
	21:40	1									
	21:41	2									
	21:42	4		1							
	21:43	2		1							
	21:47	1									
	21:48	4									
	21:49	2									
	21:50			1							
	21:52	1									
	21:53	4									
	21:54	3									
RC Total		87	2	31		1		1	3		1

13th May 2009

Walked transects and Hut 9 fixed monitoring
Failure of RC Anabat to record/download data

Surveyor/ site	Time	P. pipistrellus	P. sp	P. pygmaeus	P. auritus	R. hipposideros	R. hipposideros (fund)	Myotis. sp	M. nattereri	N. noctula	unknown
BF	21:07	1									
	21:10	1									
	21:11	3									
	21:13							1			
	21:16	1									
	21:18	1									
	21:26	1									
	21:27	1									
	21:31	1									
	21:56	1									
	21:57	2									
	21:58	1									
	21:59	2									
	22:00	2									
	22:01	1									
	22:02	1									
	22:09	1									
	22:10	1									
	22:15	1									
	22:16	3									
	22:17	3									
	22:19	1									
	22:23	2									
	22:34			1							
	22:43			1							
	22:49										1
	22:56	1									
	22:59			1							
BF Total		33		3				1			1
Hut 9	21:10					5					
	21:12	1									
	21:13					7					
	21:14					2					
	21:16			1							
	21:19	1		1							
	21:20	1				1					
	21:22	1				1					
	21:23	1				1					
	21:24	3									
	21:25	2									
	21:26	1									
	21:27					1					
	21:29	1				1					
	21:30	1									1

Appendix 9.3 Bat Survey Update 2009

Surveyor/ site	Time	P. pipistrellus	P. sp	P. pygmaeus	P. auritus	R. hipposideros	R. hipposideros (fund)	Myotis. sp	M. nattereri	N. noctula	unknown
	21:31					2					
	21:34	3									
	21:35	1				1					
	21:36	4									
	21:38	3									
	21:44					2					
	21:46					1					
	21:49					1					
	21:53					1					
	22:03					1					
	22:06					1					
	22:10	1									
	22:16					1					
	22:17					1					
	22:19					2					
	22:21	1									
	22:28					1					
	22:29	1									
	22:48	1				1					
	22:51					1					
Hut 9 Total		28		2		36					1

31st May 2009

Hut 9 fixed monitoring.

RC (random transect) +SS locations [SS 893781]

Surveyor/ site	Time	P. pipistrellus	P. sp	P. pygmaeus	P. auritus	R. hipposideros	R. hipposideros (fund)	Myotis. sp	M. nattereri	N. noctula	unknown
Hut 9	21:49					1					
	21:50					1					
	21:51					3					
	21:52					1					
	21:53					1					
	21:56	1				1					
	21:58					2					
	22:00	1									
	22:02	1									
	22:15			1							
	22:25			1							
	22:40					2					
	22:49	2									
	Hut 9 Total		5		2		12				
RC	21:36			1							
	21:48	1									
	21:49	1		1							
	21:50	1									
	21:51	1		1							
	21:52	2									
	21:53	1									
	21:55	1		1							
	21:56	2		1							
	21:57	2									
	21:58			2							
	22:00	1									
	22:01	1		1							
	22:02	1		2							
	22:03	2		1							
	22:06						1				
	22:08			1							
	22:11			2							
	22:14	1									
	22:15			1							
	22:16			1							
	22:19			1							
	22:20	1									
	22:22			1							
	22:23	1									
	22:26	2									
	22:27			1							
22:28	1										
22:32			1								
22:34									1		

Appendix 9.3 Bat Survey Update 2009

Surveyor/ site	Time	P. pipistrellus	P. sp	P. pygmaeus	P. auritus	R. hipposideros	R. hipposideros (fund)	Myotis. sp	M. nattereri	N. noctula	unknown
	22:35			1							
RC Total		23		21		1			1		
SS	21:35									2	
	21:54			1							
	21:55	1									1
	21:56	1									
	21:59	1		1							
	22:00			1							
	22:01					1					
	22:02	2		2							
	22:04			1							
	22:14	1		1						1	
	22:15			2							
	22:16										1
	22:18	1									
	22:20			1							
	22:23	1									
	22:25			1							
	22:26										1
	22:27	1									
	22:28	1		1							
	22:32			1				1			
	22:33	2		4	1						
	22:34			1							
	22:36	1									
	22:38	1									
	22:41	1									
	22:42			2							
	22:43			1							
SS Total		15		21	1	1		1		3	3

28th June 2009

Walked transects.

Failure of RC and Hut 9 Anabats

Surveyor/ site	Time	P. pipistrellus	P. sp	P. pygmaeus	P. auritus	R. hipposideros	R. hipposideros (fund)	Myotis. sp	M. nattereri	N. noctula	unknown
BF	21:56									2	
	22:01	1									
	22:02		1								
	22:04	2		1							
	22:06			1							
	22:08		1	2							
	22:09			2							
	22:10			2				1		2	
	22:11			3							
	22:12			1							
	22:15	2								1	
	22:16			1							
	22:23			1							
	22:26	1	2								
	22:28	1									
	22:29	1									
	22:35	1									
	22:38	1									
	22:40	1	1								
	22:42			1							
	22:43	1		2							
	22:50			1							
	22:54	1									
	22:59	1									
	23:03			1							
	23:04			1							
	23:05			2							
	23:06									1	
	23:07	1									
	23:12			1							
	23:25	2									
	23:26	1									
	23:28							1			
	23:29	1									
	23:32	1									
	23:40	1									
BF Total		21	5	23				2		6	

Appendix 9.3 Bat Survey Update 2009

12th August 2009

Hut 9 dusk

Surveyor/ site	Time	P. pipistrellus	P. sp	P. pygmaeus	P. auritus	R. hipposideros	R. hipposideros (fund)	Myotis. sp	M. nattereri	N. noctula	unknown
Hut 9	20:56					1					
	20:57					1					
	20:59					1					
	21:00					2					
	21:01	3				1					
	21:02					2					
	21:03					1					
	21:04					6					
	21:05					1					
	21:06	2				2					
	21:07	5				3					
	21:08	4									
	21:09	5									
	21:10	4				3					
	21:11			1		1					
	21:12	1				4					
	21:13	1									
	21:14	1									
	21:15	1									
	21:30							1			
	21:36					1					
	21:41					1					
	21:43				1						
	21:46							1			
	21:50					1					
	21:53	1									
	21:55					3					
	21:58					2					
	21:59					6					
	22:07					1					
	22:16				1						
	22:18			1							
Hut 9 Total		28		2	2	44		2			
Hut 9 North	21:01	1									
	21:20			1							
	21:35			1							
	21:47	1									
	22:08			1							
Hut 9 North Total		2		3							

13th August 2009

Hut 9 dawn

Surveyor/ site	Time	<i>P. pipistrellus</i>	<i>P. sp</i>	<i>P. pygmaeus</i>	<i>P. auritus</i>	<i>R. hipposideros</i>	<i>R. hipposideros</i> (fund)	<i>Myotis. sp</i>	<i>M. nattereri</i>	<i>N. noctula</i>	unknown
Hut 9	04:45				1						
	04:54					1					
	05:06			1							
	05:10							1			
	05:12	1									
	05:15	1									
	05:17			1							
	05:18	1				2					
	05:19					5					
	05:22					2					1
	05:23					1					
	05:24	1				3					
	05:25	1									
	05:27			1		1					
	05:28	1									
	05:32			1							
Hut 9 Total		6		4	1	15		1			1

Appendix 9.3 Bat Survey Update 2009

16th August 2009

Hut 9 fixed monitoring

RC transect (skewed at start – time spent near Hut 9 coordinating other surveyors)

Surveyor/ site	Time	P. pipistrellus	P. sp	P. pygmaeus	P. auritus	R. hipposideros	R. hipposideros (fund)	Myotis. sp	M. nattereri	N. noctula	unknown
Hut 9	20:41					2					
	20:49	3									
	20:50	6									
	20:51	4			1						1
	20:52	3				2					
	20:53	6				1					
	20:54	5	1			1					
	20:55	3				1					
	20:56	1	2			2					
	20:57	2				6					
	20:58	5									
	20:59	6				1					
	21:00	3			1	1					
	21:01	4				1					
	21:02	4				1					
	21:03					1					
	21:04					1					
	21:09					1					1
	21:12					1					
	21:29						1				
	21:37	1									
	21:43					5					
	21:45					1					
	21:49	1									
	21:50	1									
	22:06					8					
	22:07					7					
	22:09					3					
	22:25									1	
Hut 9 Total		58	3		2	47	1			1	2
RC	20:39										
	20:41										
	20:45					2					
	20:49	3									
	20:50	5									
	20:51	4									
	20:52	3				2					
	20:53	5				1					
	20:54	5	1			1					
	20:55	3		1		1					
	20:56	2	2			1					
	20:57	2				5					
	20:58	4									
	20:59	6				1					

Surveyor/ site	Time	P. pipistrellus	P. sp	P. pygmaeus	P. auritus	R. hipposideros	R. hipposideros (fund)	Myotis. sp	M. nattereri	N. noctula	unknown
	21:00	3				1					
	21:01	3									
	21:02	3				1					
	21:03					1					
	21:04					1					
	21:09			1		1					
	21:12					1					
	21:29						1				
	21:37	1									
	21:43					6					
	21:45					1					
	21:49	1									
	22:06					10					
	22:07					8					
	22:09					3					
	22:17										
	22:18										
	22:19										
	22:21									1	
	22:22										
	22:24										
	22:25									1	
RC Total		53	3	2		48	1			2	

Appendix 9.3 Bat Survey Update 2009

14th September 2009

Hut 9 fixed monitoring.
BF+RC transects.

Surveyor/ site	Time	P. pipistrellus	P. sp	P. pygmaeus	P. auritus	R. hipposideros	R. hipposideros (fund)	Myotis. sp	M. nattereri	N. noctula	unknown
BF	19:40										1
	19:56	1		1							
	19:57			1							
	19:58	1		1							
	20:07			1							
	20:08	4		1							
	20:09	3		2							
	20:10	4									
	20:11	2		1							
	20:13	2									
	20:19			1							
	20:24	1									
	20:46	1									
	20:55			1							
	21:11						1				
	21:17										1
	21:28			1							
	21:35		1								
	21:38			1							
	21:46	3		2							
BF Total		22	1	14			1				2
Hut 9	19:53					1					
	19:54			1							
	19:55	1				2					
	19:56					1					
	19:59	1		1							
	20:00			1							
	20:02			1							
	20:05	1									
	20:06			1							
	21:07					1					
Hut 9 Total		3		5		5					
RC	19:57			1							
	19:58	1		1							
	19:59			1							
	20:00	1									
	20:11	2		1							
	20:12	4	1								
	20:13	2									
	20:17	1									
	20:20			1							
	20:27	1									
	20:29	3									

Surveyor/ site	Time	P. pipistrellus	P. sp	P. pygmaeus	P. auritus	R. hipposideros	R. hipposideros (fund)	Myotis. sp	M. nattereri	N. noctula	unknown
	20:35			1							
	20:47	1									
	20:56			1							
	21:13			1							
	21:14	3									
	21:15	3		1							
	21:20							1			
	21:30			1							
	21:36	1	1								
	21:39										1
	21:47	1		1							
	21:48	2		1							
RC Total		26	2	12				1			1