

Bat Roosting Scoping Assessment, Subsequent Presence/Absence Surveys, and Potential Badger Sett

Survey At The Back Walk

Stirling Castle

Stirling

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Prepared for Stirling Council

by

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Executive Summary

In October 2014, Acorna Associates Ltd. was requested to provide a scoping opinion on the bat roost potential of a number of mature deciduous trees along The Back Walk at Stirling Castle. Following on-site discussions on the roost potential, Acorna was commissioned by Stirling Council to complete a suite of two dusk bat emergence surveys to determine if any active bat roost was present in any of the trees that were scheduled to have crown reduction, ivy removal, or in some cases cutting back to tall stumps to open up the traditional views at viewpoint locations where the tree growth had badly restricted the views along the Back Walk.

The surveys found no roosting bats in any of the study trees but did find foraging Soprano and Common Pipistrelle bats present in very low numbers scattered along the western flank of the hill. We therefore conclude that bats are not an ecological constraint for the proposed tree management works, and in this report we recommend a number of best practice actions to maintain a high due regard for bats during the tree management works.

A second part of the commission was to inspect a suspected Badger burrow to confirm presence or absence of this species, and advise appropriate mitigation if it was in fact a Badger sett. The burrow was duly examined and was found to be in use by rabbits. No evidence of Badger presence was found, and this species is not considered an ecological constraint for the proposed tree management. Again we recommend some best practice measures to take a due regard for Badgers being present in the wider area.

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1. Introduction

In October 2014, Acorna Associates Ltd. was requested to provide a scoping opinion on the bat roost potential of a number of mature deciduous trees along The Back Walk at Stirling Castle. Following on-site discussions on the roost potential, Acorna was commissioned by Stirling Council to complete a suite of two dusk bat emergence surveys to determine if any active bat roost was present in any of the trees that were scheduled to have crown reduction, ivy removal, or in some cases cutting back to tall stumps to open up the traditional views at several viewpoint locations along the Back Walk where the tree growth had badly restricted the views and now required management.

A second part of the commission was to inspect a suspected Badger burrow to confirm presence or absence of this species, and advise appropriate mitigation if it was in fact a Badger sett.

2. Relevant Policy and Guidance

This ecological assessment has been undertaken with regard to the legislative requirements given in the following:

- The Conservation (Natural Habitats &c) Regulations 1994 (The Habitats Regulations);
- The Conservation (Natural Habitats &c) Amendment (Scotland) Regulations 2007 & 2008 and subsequent amendments;
- Nature Conservation (Scotland) Act, 2004;
- Wildlife and Countryside Act 1981 (and subsequent amendment through The Conservation (Natural Habitats &c) Amendment (Scotland) Regulations 2007, 2008 & 2009);
- Protection of Badgers Act, 1992 (and subsequent amendment through The Nature Conservation (Scotland) Act 2004);
- Wild Mammals (Protection) Act, 1996;
- The Convention on the Conservation of European Wildlife and Natural Habitats (The Berne Convention), 1979;
- The Land Reform (Scotland) Act, 2003;
- Scottish Planning Policy (Feb 2010) replaces NPPG14;
- Scottish Executive (now Scottish Government) document: European Protected Species, Development Sites and the Planning System, 2001. Interim guidance for Local Authorities on Licensing Arrangements (October 2001);
- The UK Biodiversity Action Plan (BAP), revised priority list 2007;
- The Stirling Local Biodiversity Action Plan 2014 (LBAP currently under review); and
- Scottish Biodiversity List 2007.

2.1. Biodiversity Status

The UK Biodiversity Action Plan (BAP) is the UK Government's commitment to the Convention on Biological Diversity signed in 1992. It is comprised of two types of Action Plans developed to set priorities for nationally and locally important habitats and wildlife:

Species Action Plans

Produced for UK BAP Priority Species: information on the threats facing 382 species and action plan targets to achieve a positive conservation status;

- Grouped Species Action Plans - common policies, actions and targets for similar species, for example for Eyebrights, or Commercial Marine Fish. There are nine grouped action plans; and
- Species Statements - overview of the status of species and broad policies developed to conserve them for two groups of species.

Several bat species are UK BAP priority species with action plans. Soprano Pipistrelles are a UK Biodiversity Action Plan priority species but Common Pipistrelle bats have now been removed from the list (2007). Badgers are only considered of UK conservation concern in the UKBAP.

Local Biodiversity Action Plans

Each Local Biodiversity Action Plan (LBAP) partnership, usually but not always at the local authority level identifies and establishes actions to conserve local priorities and also link this action to the delivery of national Species and Habitat Action Plan targets wherever possible. Grouped action plans at this level include bats, and Waders, for example.

Pipistrelle sp., Daubenton's, Brown Long-eared, Natterer's, Whiskered, Leisler's, and Noctule bats are all on the draft species list for the Stirling LBAP but not considered priority species at present, while data is lacking for Leisler's Bat, and Nathusius' Pipistrelle. Badgers are a species of Scottish conservation concern that have been recorded in the Stirling area but data is deficient on their local status.

2.2. The Conservation (Natural Habitats &c) Regulations 1994 (The Habitats Regulations)

Full consideration of European Protected Species (EPS) must be given as part of the planning application process, not as an issue to be dealt with at a later stage. The European Protected Species of potential relevance to this assessment were bats.

European Protected Species are protected in Annex IVa in the EC Habitats and Species Directive, which is transposed into UK legislation by the Conservation (Natural Habitats &c) Regulations 1994 (Schedule II of The Habitats Regulations). The full details of this legislation can be viewed at:

http://www.opsi.gov.uk/SI/si1994/Uksi_19942716_en_4.htm

This legislation was amended on the 14th February 2007 (The Conservation (Natural Habitats &c) Amendment (Scotland) Regulations 2007.), and explanatory guidance on this was published by the Scottish Government in April 2007. The amendment removed all EPS from Schedule 5 of the Wildlife & Countryside Act 1981. There are therefore now no defences in the WCA 1981 whatsoever for any actions impacting on EPS, and protection is afforded by the following legislation only:

Under Regulation 39 of the Conservation (Natural Habitats &c) Regulations 1994 (The Habitats Regulations) it is now a criminal offence (subject to specific exceptions) to:

(a) deliberately or recklessly to capture, injure or kill a wild animal of a European protected species; (only defences are mercy killing, capture for tending a disabled animal or circumstances where the animal is captive bred and lawfully held);

(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;

(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.

It should be noted that only the offence of damaging or destroying a breeding site or resting place of an EPS is a strict liability offence. The remaining offences are offences only where they are carried out “deliberately” or “recklessly”.

In Scotland licences may be granted by Scottish Natural Heritage (SNH) to permit certain activities that would otherwise be illegal due to their potential impact on EPS or their places of shelter/breeding, whether or not they are present in these refuges. This includes for developmental work. Under Regulation 44 of The Habitats Regulations, the provisions in Regulation 39 (protection of animals) do not apply to anything done for any of the purposes defined in Regulation 44 provided that any action is carried out “under and in accordance with the terms of a licence granted by the appropriate authority”.

Three tests must be satisfied before a development licence for disturbance of an EPS or damage to a site/destruction of a site used by EPS will be granted. Note: A license application will fail unless all three tests are satisfied.

- Test 1 - the licence application must demonstrably relate to one of the purposes specified in Regulation 44(2). This regulation states that licences may be granted by Scottish Natural Heritage where the activities to be carried out under any proposed licence are for the purpose of “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”;
- Test 2 - Regulation 44(3)(a) states that a licence may not be granted unless Scottish Natural Heritage is satisfied “that there is no satisfactory alternative”; and
- Test 3 - Regulation 44(3) (b) states that a licence cannot be granted unless Scottish Natural Heritage is satisfied “that the action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range”.

Note: Breach of Licensing Conditions

A new regulation 46A came into force on 15th May 2007. This now makes it an offence to breach any conditions attached to a licence. Licence conditions should therefore be adhered to at all times.

2.3. Additional Legal Protection

- Additional protection is afforded through the Bern Convention (1979), enacted in Scotland through the Nature Conservation Act (Scotland) 2004;
- Appendix III, the Convention on the Conservation of Migratory Species of Wild Animals (Bonn, 1980), Appendix 2; and
- The Bonn Convention’s Agreement on the Conservation of Bats in Europe (London, 1991).

It is also a legal obligation in Scotland to consult with SNH before you do anything that might affect bats or their roosts such as:

- Removal of hollow, old, or decaying trees;
- Blocking, filling, or installing grilles over old mines or caves; and
- Building, alteration, maintenance, or re-roofing.

In all cases where bats are found to occupy trees or buildings and there is a developmental issue, SNH must be informed before any development takes place. A licence to permit development may then be obtained from SNH if appropriate.

2.4. Badger

In the UK, Badgers are protected under the Protection of Badgers Act 1992 (c.51), which repeals the previous Badgers Acts of 1973 and 1991, and certain sections of other relevant acts such as The Wildlife and Countryside Act 1981, The Environmental Protection Act 1990, The Animals (Scientific Procedures) Act 1986, The Natural Heritage (Scotland) Act 1991, and The Criminal Justice Act 1991. The Protection of Badgers Act 1992 was further amended and strengthened through the Nature Conservation Act (Scotland) 2004.

The 1992 Act makes it an offence to:

- Wilfully kill, injure, catch, or take a Badger from the wild (or attempt to);
- Cruelly ill-treat a Badger, digging for Badgers, using Badger tongs, using a firearm other than permitted (under the exceptions regarding humane dispatch of an injured animal) within the Act;
- Damage, destroy or obstruct access to any part of a Badger sett (whether occupied or unoccupied);
- Disturb a Badger while it is occupying a sett, either by intent or by negligence;
- Dig a Badger sett;
- Cause a dog to enter a Badger sett;
- Sell or offer for sale a live Badger, have possession or control of a live Badger. Be in possession of a live or dead Badger or any part of one; and#
- Mark a Badger or attach any ring, tag, or other marking device to a Badger.

Note: A Badger sett is defined within the Act as “any structure or place which displays signs indicating current use by a Badger” where current use means “any sett within an occupied Badger territory regardless of when it may have last been used”.

It is also a legal obligation to obtain a licence from Scottish Natural Heritage before you do anything that might affect Badgers or their setts, for example for:

- Development purposes [as defined under the Town & Country Planning (Scotland) Act 1997]; and
- Alteration or maintenance of existing buildings where Badgers are found.

It is also a legal obligation in Scotland to consult with SNH before you do anything that might impact Badger setts, whether currently occupied or not.

3. Bats in Scotland

3.1. Species found in Central Scotland

Seven species of bat are known to occur in Stirlingshire:

- Common Pipistrelle Bat (*Pipistrellus pipistrellus*) 45 kHz;
- Soprano Pipistrelle Bat (*Pipistrellus pygmaeus*) 55 kHz;
- Nathusius's Pipistrelle Bat (*Pipistrellus nathusii*) 38 kHz;
- Daubenton's Bat (*Myotis daubentonii*);
- Brown Long-eared Bat (*Plecotus auritus*);
- Whiskered Bat (*Myotis mystacinus*);
- Natterer's Bat (*Myotis nattereri*); and

Another two are also known in Central Scotland but not from Stirling, although they may also be present:

- Noctule Bat (*Nyctalus noctula*); and
- Leislars Bat (*Nyctalus leisleri*)

3.2. Bat Roost Types

Eight main types of roost have been identified (Hundt 2012). These are:

- Transitional roosts (spring or autumn generally but may be used April-October): Some roosts may be transitional, when small numbers are present for a limited period, usually during the spring and autumn. Night roosts are often indicated by large accumulations of insect remains and some droppings;
- Maternity roosts (May - August): the most obvious roost type. These consist almost exclusively of females (sometimes also small numbers of males), most of which give birth and raise a single young. These colonies usually disperse by the autumn. Some species remain in one roost all year;
- Satellite roosts (May - August): alternative roosts near to maternity roosts used by a few breeding females;
- Mating roosts (September - October);
- Night roosts (March - November): may be different sites to those used during the day. Can be used by solitary bats or entire colonies, and are often indicated by large accumulations of insect remains and some droppings;
- Day roosts (March - November): used for resting during the day, and may be occupied daily by solitary or small numbers of males, or may be used infrequently as part of a chain of roost sites alternated daily. Whole colonies of some species such the Leisler's bat will change roost during the day including taking young with them;
- Feeding roosts (May - November): used during the night between bouts of foraging, in times when weather changes, or just for a temporary rest. May be used by solitary bats to whole colonies; and

- Hibernation roosts (October – March); must have a high humidity and constant temperature above freezing.

Note: swarming sites (August – November) tend to be around caves and mines and may be used for hibernation as well as gathering for mating.

Most species conceal themselves in crevices and are not easy to find. The presence of droppings is a key sign to their presence but numbers of droppings vary widely and even some large roosts have little evidence of droppings to indicate their presence. Hibernating bats however leave little or no trace of their presence. Other possible signs are a characteristic odour like ammonia. In addition, a clean or polished area at a place through which light can enter may suggest an entrance/exit hole.

3.3. Bats and Trees

Trees may provide safe dry places for bats to roost, although some bats prefer to roost in buildings when suitable buildings are present. Some bats remain roost faithful for prolonged periods, while others may have several alternate roost sites, and others may range much further using roosts several kilometres apart as weather conditions, food availability, and seasons change. Potential roost sites in trees may include:

- Crevices in bark;
- Gaps under loose bark on dead branches or trunks;
- Rotted knot holes;
- Hollow trunks;
- Storm-damaged branches twisted off leaving split timber;
- Rotted-out branches;
- Growth deformities;
- Dense ivy coverage; and
- Crow, Magpie, Buzzard, and other nests.

4. Survey Methods

4.1. Bats

Methodology for dusk bat emergence surveys followed Bat Conservation Trust Bat Surveys: Good Practice Guidelines (Hundt 2012). It must be noted that these are guidelines, and that Scottish Natural Heritage has advised that survey effort should be not only based on the guidelines but also be based on the professional judgement of the surveyors, should be fit for purpose, and proportionate, and therefore the level of effort should be judged on a case by case basis.

4.1.1. Scoping Walkover Assessment of Tree Potential for Use by Bats

Dr P. Baker (MCIEEM) was asked to attend site with staff from the Local Authority during daylight to provide a basic verbal scoping assessment of the potential for a number of mature trees at viewpoint locations to be used by roosting bats. While the scoping exercise was not a written one, it followed the Categories listed in the BCT Guidelines (Hundt 2012), which can be used to score individual trees on their level of potential for use by roosting bats:

- Known or confirmed roost;
- Category 1*: Trees with multiple highly suitable features for large roosts of bats;
- Category 1: Definite bat potential but fewer suitable features than cat 1*. Potential for use by single bats;
- Category 2: No obvious potential to support bat roosts, although the tree is of a size and age that further survey may result in cracks or crevices being found or the tree supports some features which may have limited potential to support bats; and
- Category 3: Nil potential to support bat roosts.

Recommendations for follow-up bat emergence surveys were made and implemented based on the outcome of the scoping exercise, which found features of potential value for use by roosting bats.

4.1.2. Dusk Bat Emergence Surveys

Two dusk bat emergence surveys were completed on 22nd and 24th October 2014, with six surveyors present (Figure 1.). The surveys targeted the locations identified for tree surgery works identified by the Local Authority staff (Figure 1.). Surveys followed Bat Conservation Trust Guidelines (Hundt 2012), with each survey commencing a half hour before sunset and continuing for a minimum of 1hr 15 minutes (after which time transects started). Surveys were completed in suitable weather conditions for bat activity (temperatures 8°C or greater, light wind or no wind, and dry). Note: SSF Bat -2 and Batbox Duet detectors were used during the surveys, with SSF Bat-2 detectors scanning all frequencies for echolocating bats, and allowing immediate switching to that frequency for identification purposes.

4.1.3. Post-emergence Activity Surveys

Immediately after the end of the bat emergence surveys all six bat workers walked informal line transects along the entire footpath network along the Back Walk (and path to Ballangeich Road) and paths down to the lower Kings Knot/Haining path between Ballangeich Road and Greenwood Avenue to determine if there were any areas where bat activity was concentrated on both evenings.

4.2. Badgers

Field survey methodology followed Harris et al. (1989). Badgers leave many different signs of their occurrence, so are relatively easy to detect, these include:

- Badger setts may be large networks of connected tunnels and chambers with several entrances that are usually shaped like a flattened arch and 20-30cm high and 25-35cm across, or have a single entrance to either a small burrow or large network of tunnels. Bones in and around the entrance, usually indicate Fox activity (rank fox smell may be noticeable). Fox earths have smaller entrances, but foxes may occupy Badger setts even when Badgers are in residence;
- Scraps of fresh bedding that have been dragged in (often grassy material) may be found around the sett entrance. There may also be scraps of old bedding that has been dragged out;
- Day nests are piles of bedding above ground that are used by Badgers occasionally;
- Badgers are clean animals and create spoil heaps outside the main sett, which may contain old bedding, bits of fur, and perhaps small bones. They also use latrines, and will have one or more that are used until the hole is full, and then they start another;
- Badger droppings are very varied depending on the diet (black and slimy means a diet rich in worms, but cereal grains, seeds, and hard parts of insects may be seen. The smell and texture are very distinctive; as is the usual deposition in small oblong latrines either by the sett or at strategic locations on the territory boundary (different individuals have different home ranges within the clan territory). Occasionally droppings are not deposited in latrines but left lying on the ground;

- Clear footprints will show a prominent central pad, either four or five toes and claw marks, and may be found leading to and from the sett, as well as on Badger trails. The front foot usually has longer claws than the back foot, and the prints may overlap, with the back print partially obscuring the front;
- Badger Hairs may be found caught on fences, on brambles or other thorny plants as well as in old bedding outside setts. The guard hairs are 7.5-10cm long, distinctly wiry to the touch, and are mainly white/off-white with a distinctive black band near the white tip. Shorter belly hairs may also be found but are finer and less wiry so are harder to confirm as Badger unless guard hairs or another field sign is found;
- Scratch marks on trees and rocks, fence-posts, wooden greenhouses, barns, or even garden furniture. Scratch marks often show a series of four or five parallel deep gouges, but sometimes lighter parallel lines of scratches are left where Badger claws have clipped something they have scrambled over (such as logs obstructing a Badger trail);
- Badgers have their own traditional networks of regularly used trails both through woodland and across fields that may have been used for many years, and may be worn to a clearly visible rut in the soil, with any new plant growth flattened. Prints may be evident on these trails and where boundary features or obstacles cross the route, Badger hairs may be found caught (for example, on barbed wire, low thorny branches, wooden fences, etc. Closer to the sett, these trails may be muddy through constant use;
- Ground disturbance from foraging Badgers may include round/oval snuffle holes a few cm deep when they forage for worms (50% of lowland Badger diet (especially on lawns and golf-courses). Signs of digging for roots, bulbs such as pignut, and tubers. Beetles and grubs may also be eaten, and the remains of wasp nests torn out of the ground are a sign of Badgers in an area. Badgers usually dig down through the top to avoid getting stung. Bark ripped from rotting logs or tree trunks may also be signs of foraging and grub extraction; and
- On cold, still, winter days, steam may rise from active Badger sett entrances.

The Badger survey focused entirely on a large burrow on a steep section of hill halfway down between the upper Back Walk and lower path. This burrow was inspected as per methodology above to look for evidence of Badger presence. Note: During our bat surveys we also maintained vigilance to look for signs of Badgers along paths, evidence of burrows in woodland, or any other indication that Badgers may be present as supporting anecdotal information.

4.3. Limitations of Surveys

4.3.1. Bats

The surveys were completed during October, which is still within the active bat season – bats tend to remain active until late November subject to local climatic conditions. The weather during October was un-seasonally hot for the first two weeks, and then became cool and wet in week three. So the surveys commenced a week later than had been anticipated into the last week of the month as the weather warmed up again. At the time of survey the temperatures were warm at dusk and conditions generally mild (see Results). As bats were found to be active, we consider that the surveys were completed in appropriate conditions for survey.

The main constraint was time of year - being late in the active bat season, so the surveys were completed outwith the bat maternity season so no assessment for maternity roosts could be made. However, as the main habitat present for roosting was Ivy we consider the potential for maternity roosts to be present was negligible. As the surveys were completed to maintain a high due regard for the potential presence of roosting bats to inform pressing tree management works we consider that the surveys met and fulfilled the requirement that they had been commissioned for – namely to identify if any bat roost was present before the trees were worked on. The Local Authority has therefore met its due obligation to consider the potential presence of European protected species before commencing works.

4.3.2. Badgers

The only constraints were topography – the steep slopes were a significant health and safety risk; and that the survey was requested for one single burrow location. With topography being a significant issue the whole hillside would have been time consuming to survey and have required significant safety measures to be in place so was not practical to survey.

5. Results

5.1. Daylight Scoping of Tree Roost Potential

The daylight scoping assessment was only a brief verbal field assessment to guide to whether any further bat survey effort was appropriate no notes were made of numbers of trees with ivy or other features of potential value for use by roosting bats. It was evident from the scoping visit that many trees in the three study areas had dense ivy cover and so could be used by non-hibernating bats, so the assessment concluded that each location where tree management was required did need bat emergence surveys completing to be conclusive about current presence/absence of roosting.

5.2. Activity Survey Conditions and Timings

Table 5.2. Weather Conditions and Times of Emergence Surveys

Date	Temp start °C	Temp finish °C	Cloud cover (Oktas)	Dry/ rain	Wind speed	Wind direction	Start time	End time
22/10/2014	12	10	8/8	Dry-V-light rain-Dry	2-3	SW-W	1730	1930
24/10/2014	11	9	7/8	Dry	0	-	1730	1930

5.3. Dusk Bat Emergence and Activity Surveys

No bats were detected emerging from any tree during either dusk emergence survey.

The six surveyors were distributed to cover six viewpoints (Table 5.3. below, Figure 1.). Surveyor 4 covered viewpoints 4 and 5 as they were near each other, and there were only a few trees with potential for use by bats in that area. Surveyor 6 viewed the V1/V2 points from below. Note: grid references in Table 5.3. are approximate only.

Table 5.3. Surveyor locations

Viewpoint reference #	Grid reference	Surveyor #	Surveyor position
V1	NS 79040 93851	S1	NS 79029 93866
V2	NS 79009 93904	S2	NS 79009 93904
V3	NS78991 93947	S3	NS 78994 93950
V4	NS 78931 94027	S4	NS 78917 94071
V5	NS 78914 94060	S5	NS 78875 94218
V6	NS 78874 94204	S6	NS 78959 93878

5.3.1. Emergence Survey 22/10/14

One species of bat was detected: Soprano Pipistrelle, with a total of 12 detections/observations made on the first evening. Only solitary Soprano Pipistrelles were encountered but the locations of activity suggest that several individuals were involved, probably with no more than three – four Soprano Pipistrelles involved in the detections.

Given the time of evening the first Soprano Pipistrelle was detected and the direction of flight it came from we consider that a bat roost is present either in the trees between the cemetery and the

Esplanade by Upper Castlehill, or within the southeastern part of the Castle itself. The roost location is certainly not more than a few minutes flight away.

5.3.2. Post Emergence Activity Survey Transects 22/10/14

A total of fifteen detections of pipistrelle bats were made including 10 detections of lone Soprano Pipistrelles and five detections of one Common Pipistrelle. The Common Pipistrelle foraged extensively at the Cemetery area with one of the Soprano Pipistrelles, and all five detections are thought to relate to the same bat.

5.3.3. Emergence Survey 24/10/14

Only one species of bat was detected, the Soprano Pipistrelle, with only two detections, probably of the same bat, again near the Cemetery as previously noted.

5.3.4. Post Emergence Activity Survey Transects 24/10/14

Only one Soprano Pipistrelle was detected, and is considered to be the same individual observed during the emergence survey. Activity was noticeably much reduced compared to the evening of the 22nd. Although temperatures were still suitable for bat activity it felt much colder than during the previous survey, and may account for the reduced activity. Appendix 1. contains the detailed survey results and Figures 1. & 2. illustrate the findings.

5.4. Badgers

The burrow was inspected by Dr P. Baker prior to the first dusk bat survey on 22nd October. A mound of loose sandy soils that had cascaded below the burrow onto the footpath below had only dog prints present on it.

A close inspection of the burrow entrance showed an enlarged hole at the entrance that narrowed down within. At the entrance of the burrow were fresh rabbit droppings and some fine rabbit hair. There were no strong paths to indicate use by Badger, and no Badger field signs such as prints, droppings, or hair.

6. Conclusions

6.1. Bats

The study trees contained no active bat roosts at the time of survey. Tree roosting by bats is highly variable, and can be irregular, regular, annual, and bats are even known to regularly move roost during the day. Roosting habitats are not a limiting factor at this site, and the tree resource with ivy coverage on the hill is extensive, so the loss of a small number of trees with ivy coverage is not considered to be a significant loss of the resource. Also it is worthy of noting that the Local Authority will be conserving as much of each tree that will undergo crown reduction as possible, so will be conserving as much of the habitat as possible, while enhancing the public amenity value of the viewpoints. Some trees will have as much as 6-9m of ivy-covered trunk left, others may be shorter but the ivy will continue to flourish on these trees and still be of value for use by roosting bats as well as birds for roosting and nesting. We recommend that the arbor squad be briefed on the potential for roosting bats to be present in ivy or in cavities concealed behind ivy, and that works should be suspended immediately if any bat was found. The following is a series of best practice measures for working with trees where roosting bats could be present – i.e. any tree with ivy or cavities/splits:

1. Prior to the start of works all contractors involved in tree management works should be briefed by the Local Authority Ranger on the potential for bats to be present in ivy, or within hidden crevices, knot holes or any other features such as split branches etc., and that bats may move roost even during daylight hours, and what to do if any bats were found;
2. All trees with ivy coverage or broken branches, knot holes or other cavities that could potentially be used by bats (i.e. Category 1* and 1 – Hundt 2012) should be worked on during Nov or perhaps into early December (if weather conditions stay mild), or March-April to avoid the main hibernation months of deep winter. This means any bat disturbed would still be able to move roost, forage, and survive;

3. If bats are found or any evidence of bats is found, a licence from SNH must be applied for before works can proceed. (Please note that in such circumstances SNH can prioritise such licences and usually issue it on the day of request);
4. Works should proceed using sectional felling - dismantling and lowering from the top of the tree down as follows:
 - Where a cut needs to be made through ivy it would be best to shake the ivy first to make sure no bats are hidden within it – if any bat comes out then work on that tree must stop and SNH be consulted on licencing requirements;
 - Where trees are being crown reduced the ivy should be cut through at the final height proposed for the reduced tree to stand at and the ivy should not be cut through at the ground – the idea is to maintain active ivy growth on the tree remnants to maintain potential roosting habitat for bats;
 - Where a potential roost feature cannot be fully inspected, cuts should be made at least 50cm from the potential roost feature;
 - Where cracks have not been fully checked consideration should be given to felling techniques to ensure that the removal of limbs does not result in the closing-up of such cracks (i.e. the crack should be wedged open);
 - Once the surplus material from trees have been lopped off and crown reduction is achieved, any branches or trunk sections with potential roost features should be laid on the ground and checked to ensure no bats are present;
 - If bats are found at any time works must stop immediately where the bats have been found and within a 30m radius, and advice must be sought from a licensed bat ecologist and SNH.

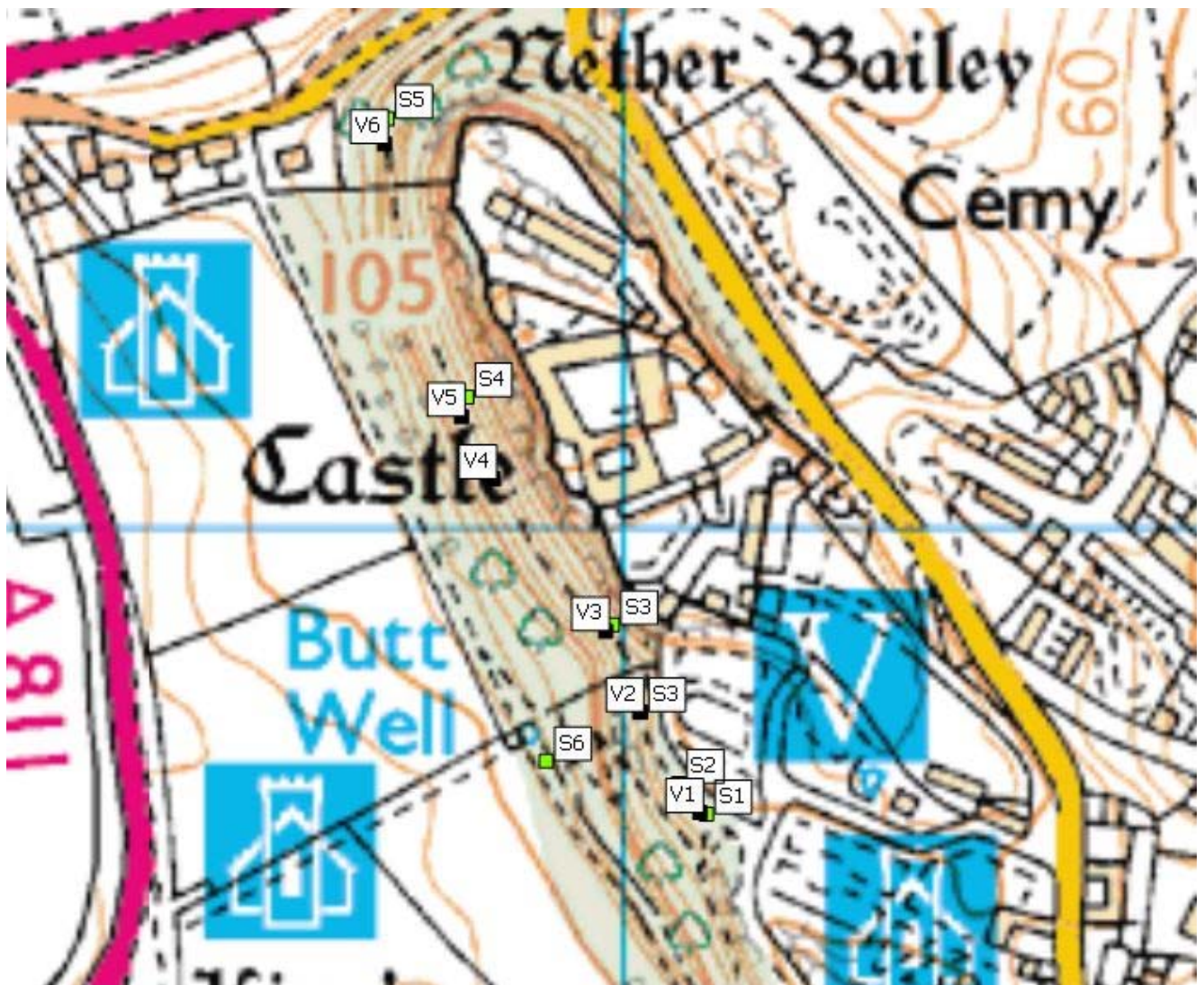
6.2. Badgers

No evidence of Badgers was found anywhere during our surveys for bats or the targeted burrow inspection. This does not mean that Badgers could not be present. Badgers may travel over 1.5km to forage so Badgers may pass through this area to feed or commute even if no Badger setts are present. It is recommended that the arbor squad that will carry out the tree surgery should be briefed on the presence of Badgers in the wider Stirling area and that if they come across any Badger or sett then works should be suspended within 30m while they consult the Local Authority Ranger Service for advice as best practice to maintain a high due regard for Badgers.

7. References/relevant reading

- Bang, P. & Dahlstrøm, P. 2000. Animal Tracks and Signs. Oxford University Press, Oxford
- Harris, S., Cresswell, P. and Jefferies, D. 1989. Surveying Badgers. The Mammal Society, Occasional Publication No.9. Published by the Mammal Society.
- Hundt, L. 2012. Bat Surveys – Good Practice Guidelines, 2nd Ed. Bat Conservation Trust, London. ISBN-13: 9781872745985
- Mitchell-Jones, A.J., and A.P. McLeish. (Eds.) 2004. Bat Workers Manual 3rd Ed. JNCC
- Scottish Natural Heritage. 2004. Badgers and Development. Environment & Heritage Service Publishing Unit

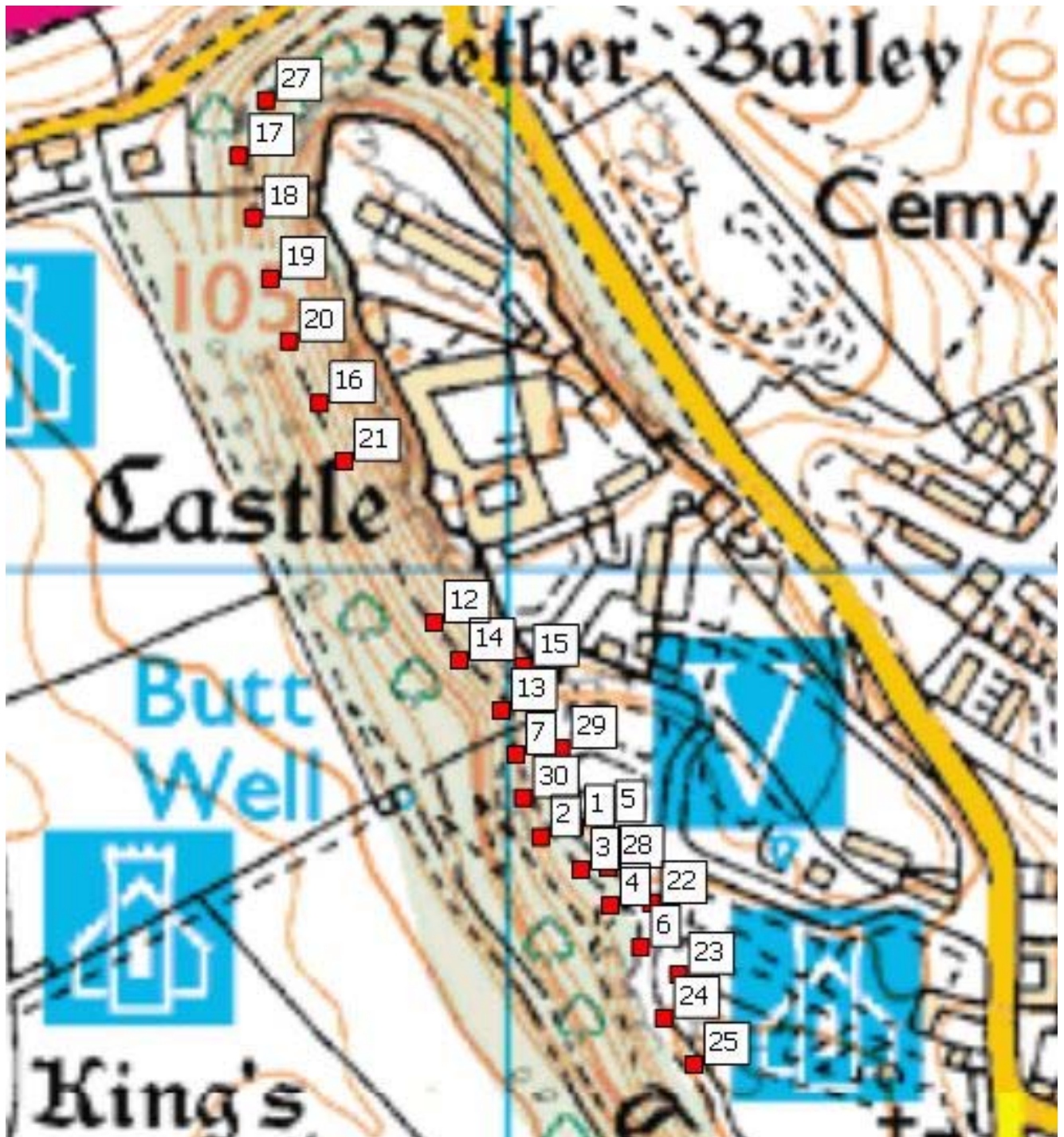
Figure 1. Locations of Viewpoints and Surveyors



Key

- V1 – V6 Viewpoint reference number (arbitrary number for survey purposes)
- S1 – S6 Surveyor reference number

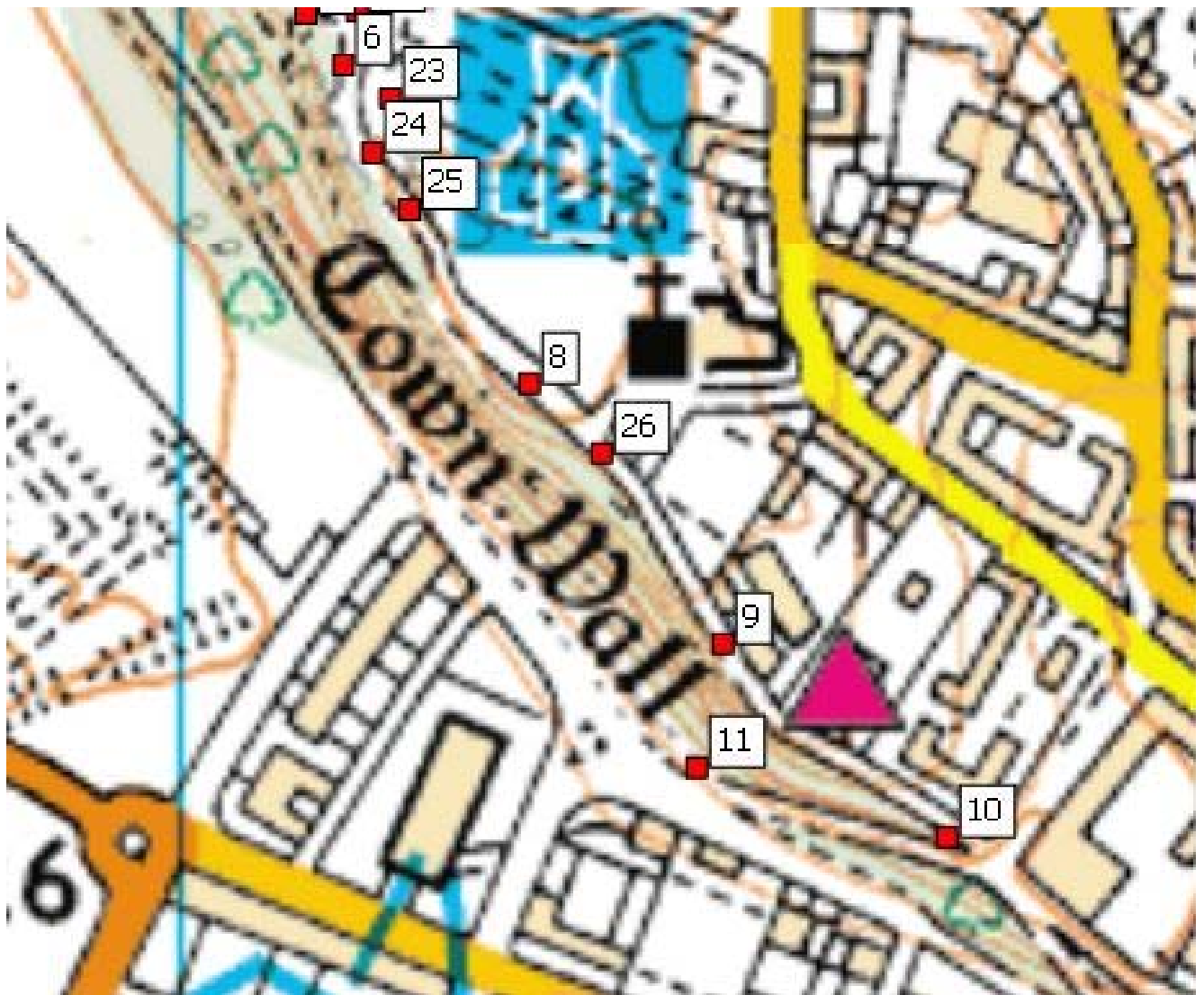
Figure 2a. Locations of detected bats (north end of survey area – map overlaps with south end)



Key

Numbered red squares = locations where bats were detected and cross refers to Map reference numbering in Appendix 1.

Figure 2b. Locations of detected bats (south end of survey area – map overlaps with north end)



Key

Numbered red squares = locations where bats were detected and cross refers to Map reference numbering in Appendix 1.

Appendix 1. Bat survey data

Date	Survey position	Map ref #	Obs. #	Time	Species	Survey type	# bats	# passes	Location	Comments
22/10/2014	S1	1	1	1811	Soprano Pipistrelle	Dusk	1	2	NS 79029 93866	Soprano Pipistrelle came from a southerly direction then flew back in the same direction
22/10/2014	S1	2	2	1813	Soprano Pipistrelle	Dusk	1	1	NS 79029 93866	Heard but did not observe
22/10/2014	S1	3	3	1814	Soprano Pipistrelle	Dusk	1	2	NS 79029 93866	Soprano Pipistrelle came from a southerly direction then flew back in the same direction
22/10/2014	S1	4	4	1830	Soprano Pipistrelle	Dusk	1	2	NS 79029 93866	Heard but did not observe
22/10/2014	S1	5	5	1834	Soprano Pipistrelle	Dusk	1	2	NS 79029 93866	Heard but did not observe
22/10/2014	S1	6	6	1901	Soprano Pipistrelle	Transect	1	1	NS 79072 93825	Flying south along Back Walk
22/10/2014	S2	7	1	1818	Soprano Pipistrelle	Dusk	1	Multi	NS 79009 93904	One Soprano Pipistrelle was observed making multiple passes before heading in a southerly direction towards graveyard
22/10/2014	S2	8	2	1958	Soprano Pipistrelle	Transect	1	2	NS 79136 93696	Flew south along Back Walk then returned northwards foraging along path
22/10/2014	S2	9	3	1924	Common Pipistrelle	Transect	1	1	NS 79211 93595	Heading north along path
22/10/2014	S2	10	4	1927	Soprano Pipistrelle	Transect	1	1	NS 79298 93520	Heading north along path
22/10/2014	S2	11	5	1928	Soprano Pipistrelle	Transect	1	1	NS 79201 93547	Heading north along path
22/10/2014	S3	12	1	1815	Soprano Pipistrelle	Dusk	1	1	NS 78994 93950	Heard but did not observe
22/10/2014	S3	13	2	1831	Soprano Pipistrelle	Dusk	1	1	NS 78994 93950	Heard but did not observe
22/10/2014	S3	14	3	1835	Soprano Pipistrelle	Dusk	1	1	NS 78994 93950	Heard but did not observe
22/10/2014	S3	15	4	1840	Soprano Pipistrelle	Dusk	1	1	NS 78994 93950	Heard but did not observe
22/10/2014	S4	16	1	1840	Soprano Pipistrelle	Dusk	1	1	NS 78917 94071	Heard briefly but did not observe
22/10/2014	S5	17	1	1840	Soprano Pipistrelle	Dusk	1	1	NS 78875 94218	Heard but did not observe
22/10/2014	S5	18	2	1846	Soprano Pipistrelle	Transect	1	3	NS 78882 94155	Heard foraging around position but did not observe

Date	Survey position	Map ref #	Obs. #	Time	Species	Survey type	# bats	# passes	Location	Comments
22/10/2014	S5	19	3	1847	Soprano Pipistrelle	Transect	1	1	NS 78887 94145	Heard foraging around position but did not observe
22/10/2014	S5	20	4	1849	Soprano Pipistrelle	Transect	1	1	NS 78896 94109	Heard foraging around position but did not observe
22/10/2014	S5	21	5	1853	Soprano Pipistrelle	Transect	1	1	NS 78917 94065	Heard foraging around position but did not observe
22/10/2014	S5	22	6	1857	Common Pipistrelle	Transect	1	Multi	NS 79071 93829	Soprano Pipistrelle was heard making multiple passes around position but did not observe
22/10/2014	S5	23	7	1900	Common Pipistrelle	Transect	1	1	NS 79068 93794	Heard but did not observe
22/10/2014	S5	24	8	1902	Common Pipistrelle	Transect	1	3	NS 79068 93794	Heard but did not observe
22/10/2014	S5	25	9	1903	Common Pipistrelle	Transect	1	1	NS 79068 93794	Heard but did not observe
22/10/2014	S5	26	10	1928	Soprano Pipistrelle	Transect	1	1	NS 79164 93669	Heard but did not observe
22/10/2014	S6	27	1	1940	Soprano Pipistrelle	Transect	1	1	NS 78885 94224	Heard but did not observe
24/10/2014	S1	28	1	1843	Soprano Pipistrelle	Dusk	1	1	NS 79029 93866	Heard but did not observe
24/10/2014	S2	29	1	1844	Soprano Pipistrelle	Dusk	1	1	NS 79009 93904	Heard but did not observe
24/10/2014	S2	30	2	1856	Soprano Pipistrelle	Transect	1	1	NS 79009 93904	Heard faintly but did not observe
24/10/2014	S3		N/A	N/A	N/A	Dusk	N/A	N/A	NS 78994 93950	No bats detected
24/10/2014	S4		N/A	N/A	N/A	Dusk	N/A	N/A	NS 78917 94071	No bats detected
24/10/2014	S5		N/A	N/A	N/A	Dusk	N/A	N/A	NS 78875 94218	No bats detected
24/10/2014	S6		N/A	N/A	N/A	Dusk	N/A	N/A	NS 78959 93878	No bats detected

