Bat Pro Ltd: Specialists in Bat Species & their Habitats 14B Dursley Road, DURSLEY GLOS. GL11 6PP

Bath Urban Surveys: Dusk Bat Surveys for horseshoe bats around Weston, Bath. Surveys and Assessments Summer & Autumn 2013

Final Report

prepared

by

Dr R D Ransome
Bat Pro Ltd

for

Bath and North East Somerset Council
Planning Services
PO Box 5006
BATH
BA1 1JG

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[1] Bat Pro Ltd. Reg. No. 3322070 Tel: 01453-545177

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REMIT

In June 2013 Bat Pro Ltd. was commissioned by Bath and North East Somerset Council to:

- Carry out two dusk surveys in July for foraging or commuting bats within the Weston area to the north-west of Bath by sampling 25 locations using static systems. The surveys were to be primarily to obtain quantified data for foraging horseshoe bats, including location, timing and numbers of passes.

- Although primarily for horseshoe bats, Bat Pro agreed to store all data obtained to allow the subsequent identification of other species using the locations if required at a later date.

In August 2013 Bat Pro Ltd. was commissioned by Bath and North East Somerset Council to:

- Carry out a dusk survey for foraging or commuting bats within a targeted area Weston to the north of Bath by sampling 15 locations. The surveys were to be primarily to obtain quantified data for foraging horseshoe bats, including location, timing and numbers of passes.

- Although primarily for horseshoe bats, Bat Pro agreed to store all data obtained to allow the subsequent identification of other species using the locations.

- Write a report of the survey findings and assess the importance of location to horseshoe bat populations and impacts upon potential development

Produce a single concise report of the findings of the two surveys.

EXECUTIVE SUMMARY

1. Dusk surveys to discover horseshoe bat activity at Weston, Bath for two hours post sunset were carried out in July and September 2013. Static, automated systems were used as for the 2008/9 Bath Urban study. This involved regions of Bath between Horsecombe Vale and Odd Down.

2. In July, 25 locations were sampled. They were spread widely within fields from north-west to south-east Weston. Two nights were needed to cover the locations using 3 staff.

3. In September, 16 locations were sampled in a more restricted region, mainly to the north-west. Only one night was needed for this.

4. The July surveys revealed only two locations where Lesser horseshoe bats commuted quickly past the detector. They were near the north-western edge of Weston.

5. The September survey revealed three locations where Lesser horseshoe bats commuted quickly past the detector. Two of these locations were close to the July ones.

6. The September survey also showed a Greater horseshoe bat foraging at a single, different location from the Lesser horseshoe bats, in a recently cattle-grazed field for about 12 minutes.

7. These data, although showing that the two endangered horseshoe bat species use a small number of fields in Weston, indicate a very low level of use compared with the Odd Down study.

8. The results suggest that development should be able to proceed within the identified Possible Housing Allocation area, if appropriate mitigation measures are implemented.

1. HORSESHOE BAT POPULATIONS WITHIN THE BATH & BRADFORD ON AVON SAC

1.1 The Bath and Bradford on Avon SAC contains a number of disused oolitic limestone mines that are used as hibernacula. At least two also contain maternity roosts through the summer. The mines are located in, or near Bradford on Avon, Box, Winsley, Lympley Stoke, Mells, Bathampton and Combe Down. There are six maternity colonies of Greater horseshoe bats at Bradford on Avon, Box, Iford, Mells, Byfield and Camerton. Summer roosts are either in large old buildings or underground sites, and colonies vary in size from about 20 to over 300 adults. Altogether a total adult population of about 1,200 Greater horseshoe bats is currently present in the SAC, or about 19% of the UK total.

1.2 The quality and proximity of their foraging habitats are probably the main factors influencing specific maternity colony size in a region. The Iford and Mells colonies have grown strongly during the improved climatic conditions since 1987.

1.3 The Combe Down, Bath colony failed to recover until after the CDSM Project works started in 2000, and by 2007 had grown to about 130 adults and 38 young. Following exclusion to allow works from 2007 to 2010, the colony moved to an unknown roost site in mid summer. In the summer of 2013, a small number of young were born inside the Fraylings incubator in Mount Pleasant Mine. Up to 100 adults were present there in July 2013, and up to 75 adults in mid winter. The status of the small Camerton colony is unknown.

1.4 Little was known in the past about Lesser horseshoe maternity sites, but a significant maternity colony (70?) was discovered roosting in the disused office block at Mount Pleasant Quarry in 2005. Subsequently some 40 or so of these bats started to breed underground in the Grey Gables incubator chamber built in 2006. By 2012 some young were seen on monitoring visits.

1.5 In 2012 and 2013 a small breeding colony of some 50 adult LH bats occupied the Byfield incubator chamber in summer. This event is probably due to the absence of use by Greater horseshoe bats after the cessation of stabilisation works. At Grey Gables Greater horseshoe bats have shown aggression against Lesser horseshoes, and have had to be excluded from its incubator by the addition of a small letter-box sized slot across its entrance.T

2. HORSESHOE BAT POPULATIONS AT WESTON

2.1 There have been very few records of either horseshoe bat from this part of Bath. Possibly this is due to the absence of any significant underground tunnels, grottoes or mines. There have been a very small number of captures of ringed GH bats in mist nets erected at Kelston, which is close to Weston. In the absence of ringed LH bats, no such reporting has taken place.

2.2 The Billington radio-tracking study of Combe Down GH 2000 failed to show that these bats reached any part of the Weston area. The nearest location used was at Newton St Loe, where a small summer colony existed in the 1960s. The closest Greater horseshoe underground roost is near Upton Cheyney. It is a transitional spring and autumn mating roost used by a single male and several adult females.

3. THE DUSK BAT SURVEYS COMPLETED

These surveys were undertaken by Bat Pro Ltd. Staff, supervised and assisted by Roger Ransome and assisted by Andrew Hulbert and Andrew Pinch. A daytime visit was carried out prior to each monthly survey to determine the precise locations. The fields selected were those that the landowner or tenant gave permission for access to survey. In addition, only fields with livestock that were able to be removed from the field on the night of the survey could be surveyed. Finally, the proximity of the locations to vehicle access was a factor, since the maximum number of stools and static systems a surveyor can safely carry is five.

The methodology adopted does not comply with NE or BCT current guidelines, and neither were the surveys in the two months consistent. Most of the 25 locations sampled in July were not re-sampled by the 15 locations sampled in September. This was due to other considerations connected with planning issues. This situation impacted upon the structure of this report. It is necessary to describe the site locations and descriptions twice.

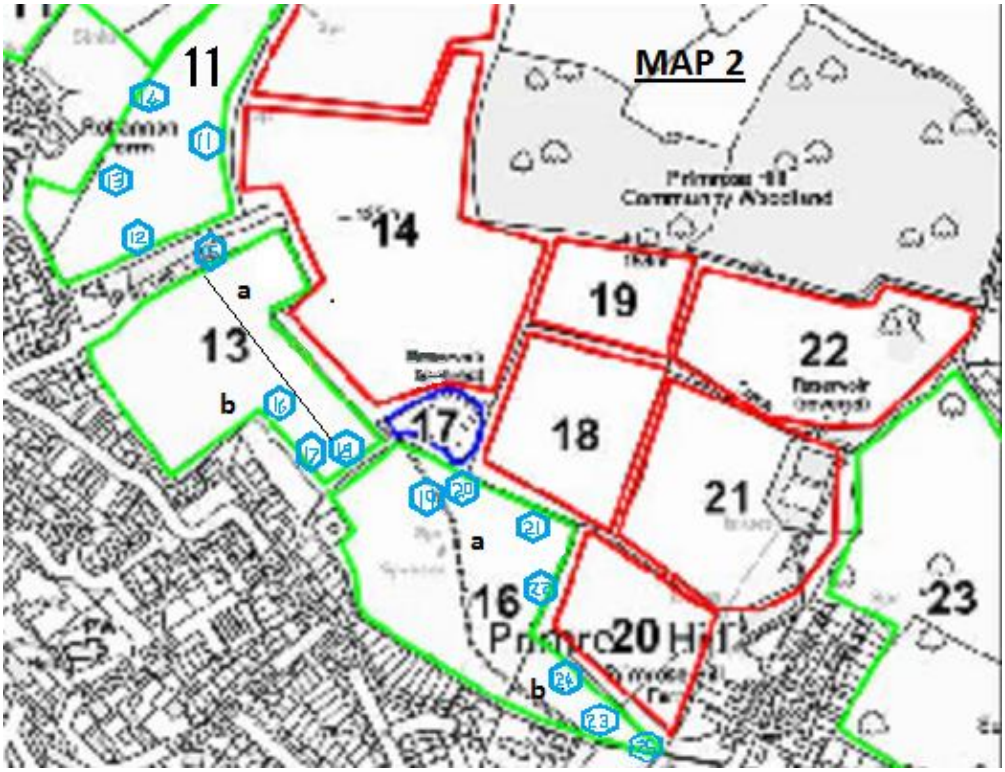
A brief report of the July and September 2013 surveys was required for a meeting with Natural England in October 2013.

Karen Renshaw, Council Ecologist, provided maps of potential fields for development in July, and again in September. The number of fields sampled was reduced for the September surveys. RDR arranged site access permission.

3.1 Description of the July 2013 Locations sampled.

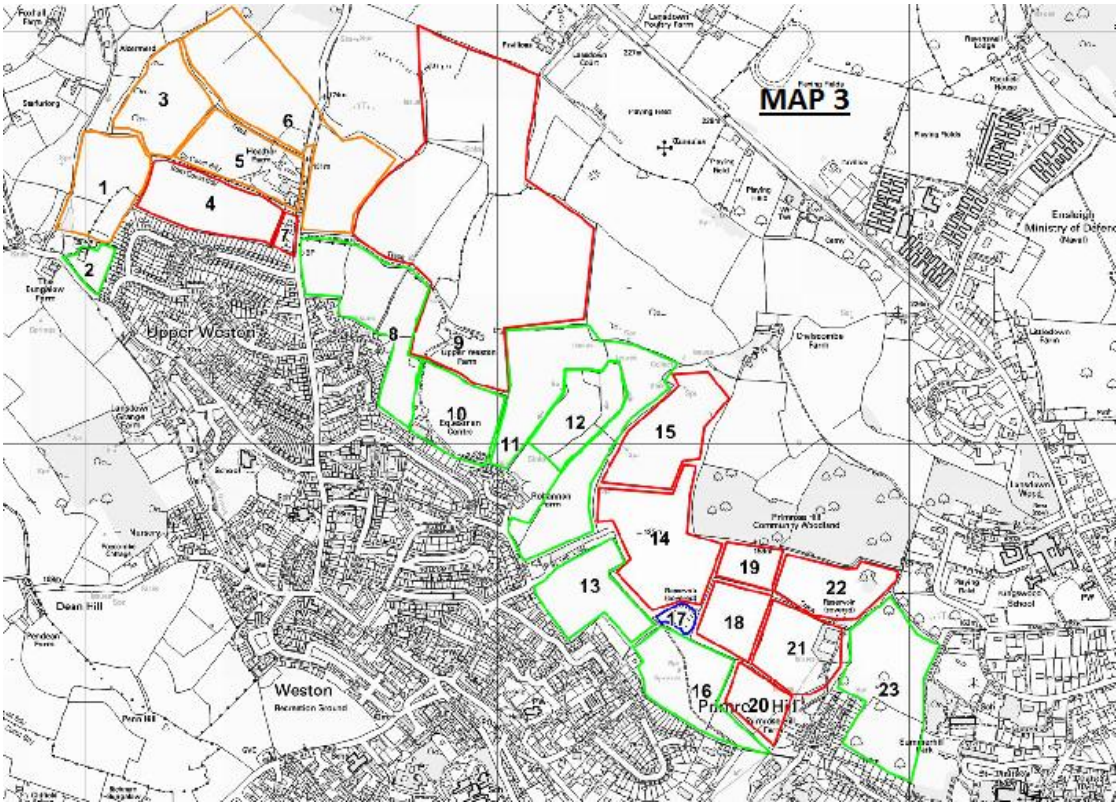
Maps 1 and 2 below show the distribution of the 25 sampled locations (blue hexagons with numbers). Detectors were angled slightly upwards and outwards from their position at 1 m height above ground level.

Large black numbers are those allocated to fields by BNES Council planning team. Red perimeter lines show fields where access was initially refused. Permission for field 7 granted later.



Large black numbers are those allocated to fields by BNES Council planning team. Red perimeter lines show fields where access to survey was refused.

Map 3 below shows the spatial relationships between the two maps above



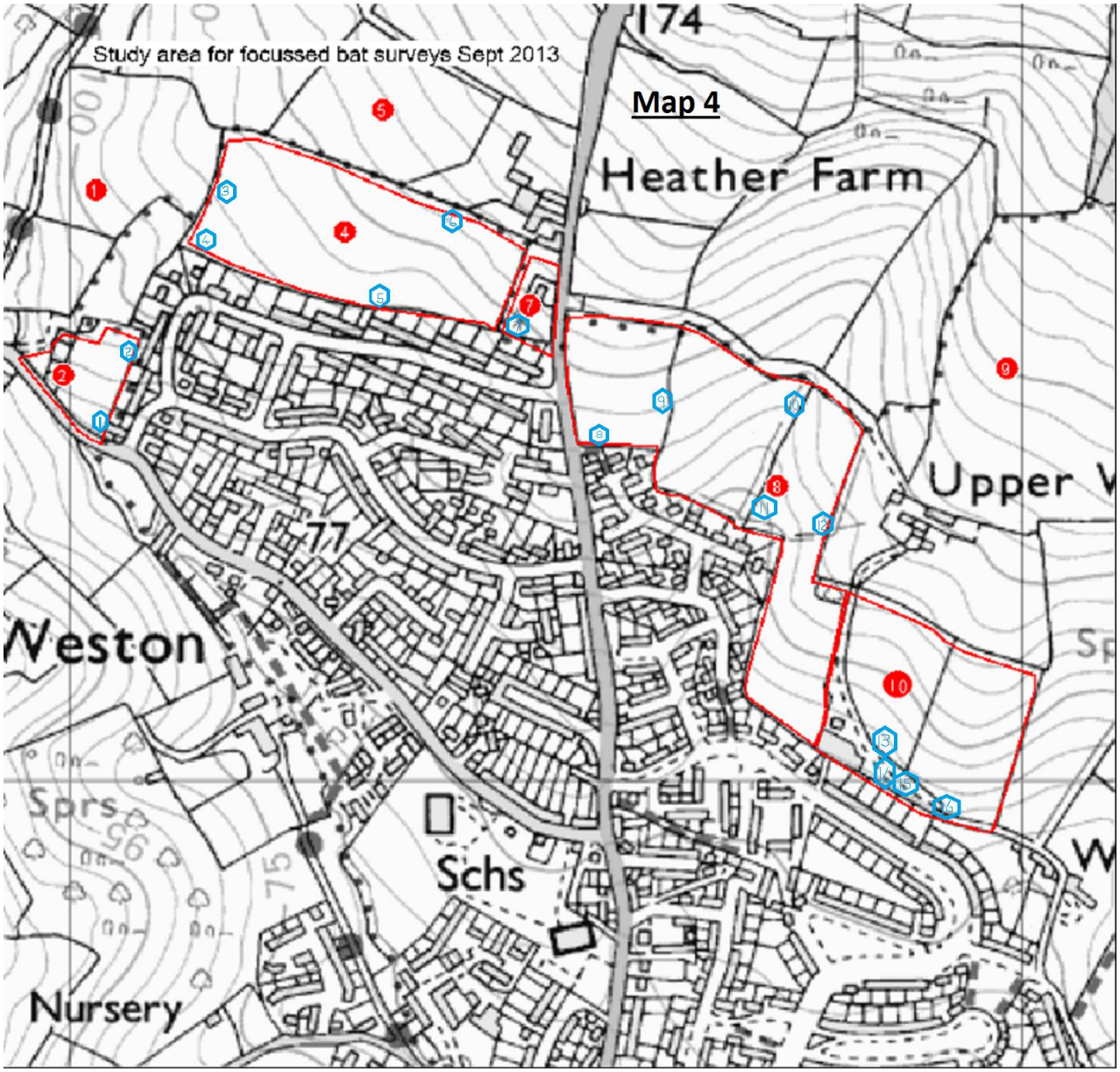
The two powerpoint presentations supplied separately shows the exact photolocations and the habitat nearby for each monthly survey.

Table 1 below summarises major habitat aspects for locations relevant to the 9th and 11th July 2013 dusk bat surveys. Fields 11, 13 & 16 were surveyed on the 9th July. Fields 1, 7 & 8 were surveyed on the 11th July.

Location number	Field number	Description of location
1	1	Corner at bottom of field heavily grazed by many sheep beneath tall overhanging trees. Very sheltered position.
2	1	Side of same field near gate; beneath tall overhanging trees. Very sheltered position.
3	1	Top of same field near another gate; near low hedgerow lacking overhanging trees. Exposed location.
4	1	Corner at bottom of same field near horse-box used as shelter for livestock; very sheltered by tall overhanging trees. Adjacent to hedgerow and stream running alongside the road.
5	1	In tall hedgerow at end of the housing estate. Field grazed by several horses.
6	7	Beneath deciduous trees in a sheltered position adjacent to tall line of conifer. Field with grass quite long & not recently grazed.
7	8a	Close to thick hedgerow separating field from Lansdown Lane. Field recently cut for hay. No livestock.
8	8a	Beneath tall trees separating field from housing below. Affected by lighting from street lights on Lansdown Road. Same field as above.
9	8b	Top corner of field grazed by some 15 cattle. Sheltered beneath trees within tall hedgerow. Currently field with long grass. Near gate & track to farm.
10	8b	Corner as for location above, but deep inside wooded area adjacent to drying up stream bed. Very sheltered position. Field as above.
11	11	Near very tall hedgerow with many trees abutted by sloe outgrowths into field with long grass ready to cut for hay. Very sheltered position.
12	11	As for location 11, but situated close to woodland edge alongside Blind lane. Sheltered position.
13	11	As for location 11, but lower down the slope not far above housing. 5 m out from substantial tree-line and sloe/bramble outgrowths.
14	11	As for location 13.
15	11 wood	Within open woodland on the ridge above Blind Lane, to the north-west.
16	13b	Placed on a fallen ash tree to raise equipment above vegetation level. Edge of field with long grass ready for hay making. Within tall nettles and other weed growth. Sheltered area fairly close to housing beyond the hedgerow.
17	13b	Placed within an area of trampled nettles. Otherwise as for location 16.
18	13b hedge	As for location 17, but placed within wooded, thick hedgerow near field corner.
19	16a	Placed within a vegetational island off a footpath within a large large field recently cut for hay. Beneath ash trees. Fairly sheltered position.
20	16a	As for location 19, but in long grass close to sloe & hawthorn outgrowths from substantial tree-line.
21	16a	As for location 20. Just beyond gateway, going eastwards.
22	16a	Placed within substantial sloe outgrowths from a lower hedgerow running south from the field corner. Field edge bordered by long grass not cut by haymaking.
23	16b	Field 16b is isolated from field 16a by substantial tree-lines. It is uncut and has very long grass and developing scrub around the edges. Placed on the edge of sloe bushes. Well sheltered, and probably wet most of the year.
24	16b	As for location 23, but placed adjacent to very tall tree-line.
25	16b	As for location 24. Bottom corner of field.

3.2 Description of the September 2013 Locations sampled.

Map 4 below show the distribution of the 16 sampled locations on 24th September (blue hexagons with numbers). Field numbers are in red circles. Detector systems were angled slightly upwards and outwards from their position at 1 m height above ground level. Only locations 7, 8 and 10 were repeated from the July surveys.



The red perimeter line shows the fields selected for focussed bat surveys by BNES Council planning team. All owners or tenants gave consent for surveys, and moved livestock on the day of the surveys, or the day before. Field numbers are in red circles. Static system numbers in blue hexagons indicate locations sampled.

Table 2 below summarises major habitat aspects for locations used on the 24th September 2013 dusk bat surveys.

Location number	Field number	Description of location
1	2	Near corner at bottom of field close grazed by two horses. Close to hedgerow beneath sparse overhanging elder. Sheltered position with house beyond hedge.
2	2	Higher up the same field near corner. Near sheep pen beneath overhanging trees. Very sheltered position.
3	4	Near gap in low hedgerow lacking overhanging trees. Exposed location in field not grazed this summer. Other side of hedge to location 3 of the July survey.
4	4	Corner at bottom of same large field. Very sheltered by tall overhanging trees on two sides. Diagonally opposite location 5 of the July survey. Adjacent to end of house line.
5	4	In tall hedgerow behind house gardens. Field not grazed this summer, but grass short. Possibly used for hay. Semi sheltered on one side.
6	4	Beneath a row of poplar trees in a sheltered position adjacent to trees surrounding various buildings above it. Sheltered position.
7	**7**	Beneath deciduous trees in a sheltered position adjacent to tall line of conifers off Lansdown Lane. Field with grass long & not grazed this summer. Same location as no. 6 in July survey.
8	8a	Beneath tall trees separating field from housing below. Affected by lighting from street lights on Lansdown Lane. Same location and number as in July survey. Field recently grazed by many cattle.
9	8a	Same field as above. In a sheltered beneath thick hedgerow with emergent trees. Adjacent to field very recently grazed.
10	8b	Corner of large field that connects with field 8a. Close to, but not within wooded area adjacent to drying up stream bed. Very sheltered position. About 20 m from location used in the July survey.
11	8c	Near rear of houses in a large field that connects with fields 8a and Bb. Sheltered position near dried up steam bed and thin hedgerow.
12	8c	Near corner of the same large field. Very sheltered position behind paddock beneath farm buildings – grazed by sheep. Overhung with tall trees in a thick hedge.
13	10	At the bottom of a horse-grazed field near large open barn & machinery. Fairly sheltered position.
14	10	At the bottom of a horse-grazed field in a more open location close to a low but thick hedge. Fairly sheltered position.
15	10	In a very sheltered position cut into a steep bank overgrown with scrub and trees. Adjacent to a stored boat.
16	10	In a very sheltered position near a double line of disused old wooden stable blocks. Surrounded by scrub and trees.

4. DATA FROM THE DUSK SURVEYS

Tables 3 and 5 in this section summarise the very few horseshoe bat passes recorded during the 41 two-hour sampling periods at all locations.

Tables 3 and 6 summarise the sparse data for all bat species seen or detected by three surveyors during three two-hour dusk surveys.

4.1 Summary data

Table 3 below summarises the results of the 9th and 11th July 2013 dusk bat surveys at static locations. NB Sunset was at 21.15 hours

Location number	Field number	N GH passes	N LH passes	Brief comments on other bat activity
1	1a	0	0	Passes by Pips & Nyctalus post 21.47 hrs. Myotis 4 times post 22.00 hrs
2	1a	0	0	Few passes Pips & Nyctalus. Post 21.55 hrs
3	1a	0	3 @ 22.59, 23.13 & 23.17 hrs	Regular passes by Pips & Nyctalus. Post 21.45 hrs 3 passes (9 calls) late in survey. Commuting or brief foraging.
4	1a	0	0	Lots of passes by Pips & Nyctalus. Post 21.46 hrs. Lots Myotis 22.04 – 22.34 then again at 22.57 briefly.
5	1b	0	1 @ 22.59 hrs	Few passes Pips & Nyctalus. Post 22.08 hrs. Myotis briefly @ 22.08 & 22.17 hrs. One LH pass, possibly one which commuted from location 3.
6	7	0	0	Few passes Pips & Nyctalus. Post 21.53 hrs
7	8a	0	0	Few passes Pips & Nyctalus. Post 22.03 hrs
8	8a	0	0	Few passes Pips & Nyctalus. Post 21.43 hrs
9	8b	0	0	Few passes Pips & Nyctalus. Post 21.59 hrs
10	8b	0	0	Very few passes Pips & Nyctalus. Post 22.05 hrs
11	11	0	0	Steady passes Pips & Nyctalus. Post 21.55 hrs
12	11	0	0	Few passes Pips & Nyctalus. Post 22.00 hrs. One Myotis pass.
13	11	0	0	Few passes Pips & Nyctalus. Post 22.10 hrs. One Myotis pass?
14	11	0	0	Few passes Pips & Nyctalus. Post 22.10 hrs.
15	11 wood	0	0	Only 1 Myotis pass @ 23.14 hrs.
16	13b	0	0	Passes by Pips only. Post 21.42 hrs
17	13b	0	0	As for location 16.
18	13b hedge	0	0	Few passes Pips & Nyctalus. Post 21.57 hrs
19	16a	0	0	Fair number of passes Pips & Nyctalus. Post 21.54 hrs
20	16a	0	0	Good passes Pips & Nyctalus. Post 21.54 hrs. Plus Myotis after 22.35 hrs
21	16a	0	0	Few passes Pips & Nyctalus. Post 21.53 hrs. Plus Myotis after 22.23 hrs
22	16a	0	0	Few passes Pips & Nyctalus. Post 21.46 hrs. Plus Serotine @ 22.34 hrs
23	16b	0	0	No data. Recording failure.
24	16b	0	0	Few passes Pips & Nyctalus. Post 21.50 hrs
25	16b	0	0	Passes Pips & Nyctalus. Post 21.49 hrs. Myotis @ 22.08 & 22.30 hrs.

Olive green cells contain LH passes at those locations

Table 4 below summarises the results of the July 2013 dusk bat surveys by Bat Pro staff using automatic heterodyne detectors (Tranquility Megas)

Date 2013	Field numbers	P45?	P55?	Nyctalus?	Myotis sp?	Serotine?
11th July	1 & 1a	Lots of activity esp. Near small oak		2 Noctules foraged & chased from 30 mins post dusk.	Not heard	Call heard but bat not seen
9th July	8a, 8b, lane	Mostly these. 6+ around large oak tree.	1 bat late on	Noctules around oak tree in lane dip	Not heard	Not heard
9th July	11	Only two definite calls	Seen foraging	Noctules & Leislers seen near woodland	Not heard	Not heard
11th July	13b & 16a	Regular passes near reservoir.	Some calls in both fields	Leislers first seen near reservoir. No definite Noctules	Not heard	One call late on near hedgerow. Too dark to see.
11th July	16a & 16b	Some late on	One late on	Mostly Leislers, plus one Noctule	Not heard	Not heard

Table 5 below summarises the results of the 24th September 2013 dusk bat surveys at static locations. NB Sunset was at 18.55 hours

Location number	Field number	N GH passes	N LH passes	Brief comments on bat activity
1	2	0	3 @ 19.54; 21.05 & 21.23 hrs	Commuting single LH bat or bats without evidence of foraging. Passes by Pips & Nyctalus from 19.35 hrs.
2	2	0	2 @ 20.09 & 21.05 hrs	Good number of passes Pips & Nyctalus. From 19.27 hrs. Commuting single bat or bats without foraging.
3	4	0	0	Few passes by Pips & Nyctalus. Post 21.45 hrs
4	4	0	0	Passes by Pips & Nyctalus. From 19.31 hrs.
5	4	0	0	Good passes Pips & Nyctalus. From 19.31 hrs. Myotis briefly later.
6	4	0	0	Passes by Nyctalus from 21.15 hrs. Pips post 19.33 hrs. Lots of Myotis calls as well later on.
7	7	0	0	Pip passes post 19.30 hrs.
8	8a	0	0	Serotine passé @ 19.35 hrs. Pips & Leislers post 20.34 hrs
9	8a	13 total @ 9 times: 19.40; 19.41; 19.43; 19.44; 19.45; 19.46; 19.49; 19.51; 19.52	0	Foraging GH hawking along hedgerow for about 12 minutes in field recently vacated by cattle. Passes interspersed with Pips, Noctule & Myotis passes, Noctule post 19.15 hrs; Pips post 19.32 hrs & Myotis post 20.39 hrs
10	8b	0	1 @ 20.00 hrs	LH pass briefly commuting. Passes of Noctule post 19.34 hrs; Pips from 19.30 hrs; Myotis from 20.05 hrs
11	8c	0	0	Few passes Noctule.post 19.31 hrs; Pips from 19.38 hrs
12	8c	0	0	Few passes Pips post 19.38 hrs. Myotis pass @ 20.53 hrs..
13	10	0	0	Few passes. Pips post 19.40 hrs. Myotis 20.30 hrs.
14	10	0	0	Few passes. Noctule @ 18.55 hrs. Pips post 19.45 hrs.
15	10	0	0	Only 1 Pip pass @ 19.34 hrs.
16	10	0	0	Some passes by Pips post 19.42 hrs. Few Myotis from 20.11 hrs.

Olive green cells contain LH passes, and pink cells contain GH passes, at those locations

Table 6 below summarises the results of the 24th September 2013 dusk bat surveys by Bat Pro staff using automatic heterodyne detectors (Tranquility Megas) set on auto heterodyne mode

Date 2013	Field numbers	P45?	P55?	Nyctalus?	Myotis sp?	Serotine?	Horseshoe bats?
24-9-13	2	NA	NA	NA	NA	NA	NA
24-9-13	4	Near locns. 4 & 5 @ 19.35; 19.40; foraging. Briefly @ 20.23 passing.	Near locn. 4	Noctule seen commuting E to W between locns. 4 & 5 @ 19.38. Also another E to W @ 19.43 nr 5.	Brief pass at 20.28 between locns. 4 & 5	None	None
24-9-13	8a, 8b, 8c	8c crossing field @ 19.35. 8b near lane @ 20.10	8b crossing field @ 20.03	8c Noctule commuting E to W @ 19.22 8b Nyctalus @ 19.30 commute. Leislers near Oak 8b @ 20.05, 20.20 & 20.42. Foraging?	None	8b commuting @ 19.28 8c commuting @ 20.25	None
24-9-13	10 building areas below field	Passes @ 19.50, 20.22 & 21.50 nr various buildings	none	none	Brief pass @ 20.28	none	none

NB due to the impossibility of the surveyor reaching field 2 from field 4, and being able to guarantee the security of the systems placed in field 4, no data were obtained.

Table 7 combines all horseshoe bat data from static detector surveys obtained from sampling 41 locations, each for 2 hours

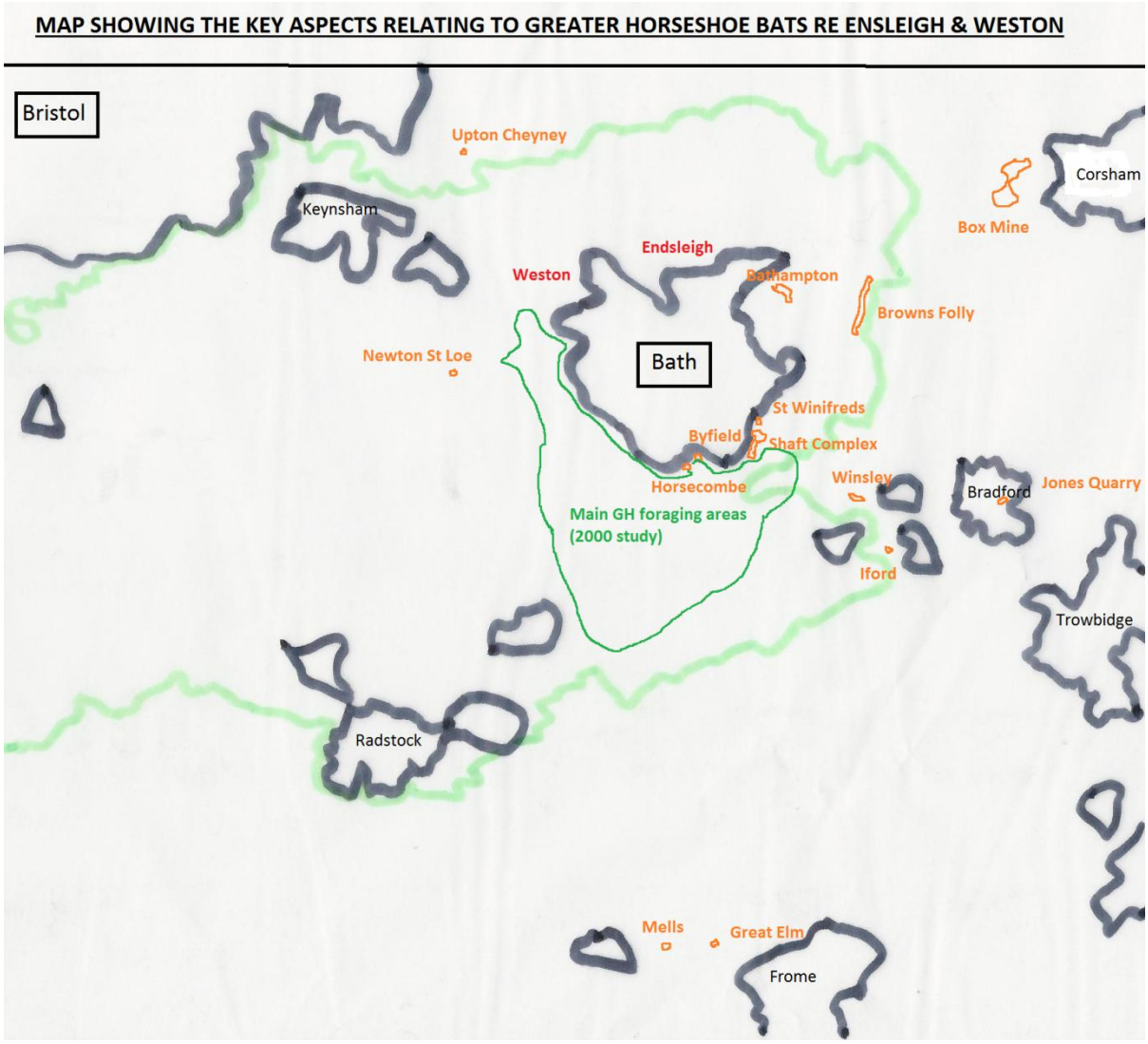
Month of survey	Total number of LH passes (n locations)	Total number of GH passes (n locations)	Total number of horseshoe bat passes/hour sampled (n locations)
July 2013	4 (2 locations)	0	0.08 (2)
September 2013	6 (3 locations – 1, 2 10)	13 (1 location in field 8a for 12 minute period)	0.59 (4)
Both combined	10 (5 different locations; 4 in the same area – fields 1 &2; 1 in 8b)	13 (1 location)	0.28 (6 different locations; 4 close together; others field 8a & 8b).

NB in both months the first horseshoe bat passes were recorded at least 45 minutes after sunset.

NNB No horseshoe bat calls were recorded by any surveyor during the 18 hours spent carrying out roving surveys.

5. ASSESSMENT OF HORSESHOE BAT USE OF WESTON FIELDS

The map below, taken from the report of habitat assessments for horseshoe bats, produced after a field visit made in January 2013, indicates some of the key information that needs to be considered. The report of the habitat assessment predicted that few, if any Greater horseshoe bats would make significant use of the Weston fields.



The current study indicates that neither horseshoe bat species makes significant use of any of the Weston fields. The allocation option for Weston shows that part of field 4, all of field 7, and part of field 8 are areas for Possible Housing Allocation. The part of field 8 indicated on the option map includes all of my 8a designation as above, and about 25% of field 8b.

Hence the only PHA affected by the bat survey results, is the one for field 8. Location 9 in September was where a single Greater horseshoe bat foraged for about 12 minutes. This bat was first detected about 45 minutes after sunset (see Table 5). It would take a bat flying at 20 km/hr from a roost located 5 km away only 15 minutes to reach this location. These bats emerge to forage about half an hour after sunset. Hence the foraging GH could easily have come from a roost near either Upton Cheney, or Newton St Loe. Alternatively it may have come from the school roost near Lansdown Crescent. Upton Cheyney may be most likely, since it has virtually unbroken favourable habitat to cross. The other sites involve crossing many significant roadways.

6. RECOMMENDATIONS

- As part of the development plant blocks of deciduous woodland to provide woodland edge foraging habitat, and retain and enhance boundary hedgerows, to provide habitat buffer zones around the exposed housing areas.
- Ensure lighting provision for the new housing is designed to avoid light spill on retained and created habitat, and the wider countryside. Light spill onto retained and newly created habitat and into wider countryside should not exceed 1 lux (equivalent to a moonlit night).

- Ensure that cattle, sheep or horse grazing can be continued long-term adjacent to these fields at a sustainable level for some all-year round occupation.

- Create a permanent pond at a suitable location for bats to drink from.

- As opportunities allow in the wider countryside support deciduous woodland planting, and the creation of more tree-lines and thick hedgerows across large open grazed fields to provide breaks against prevailing winds, and additional commuting routes. Create a patchwork of small fields, using the system of 'ley farming' that rotated field use as described by Panes (2005), over a 10 to 13 year cycle.

7. ACKNOWLEDGEMENTS

Bat Pro Ltd gratefully acknowledges the willing co-operation of the following landowners and tenants for access to their properties to carry out the dusk surveys.

Mrs J Comely, Mr John Fielding, Mr Adrian Palmer, Mr Roger Perry, Mr M. Prettejohn, Mr Paul Robinson, and Mrs Liz Vowles,

We also acknowledge the assistance of Dr Karen Renshaw in providing contact details of owners and tenants, plus maps for planning the surveys and this report.

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APPENDIX 1: DIET HABITAT AND ROOST FACTORS RE METHOD STRATEGY

- Greater horseshoe bats prefer to feed on dung beetles, either *Aphodius* or *Geotrupes*, from August through the winter to April; Cockchafers in early May, and Moths from late May to early August. If these prey items are unavailable, they will eat Tipulids, Ophion wasps, and finally dung flies as a last resort. Lesser horseshoe bats mainly eat a variety of small Dipterans, including Nematocerans (especially Tipulids and midges) and dung flies, but also significant amounts of small moths in spring and summer. In some localities they eat caddis flies, neuropterans and small wasps. They are outstanding winter foragers, coping with temperatures down to 2 ^{o}C.

- The habitats that produce these insects include permanently grazed pastures by sheep, cattle or horses, surrounded by thick, tall hedgerows, and deciduous woodland blocks adjacent to the grazed pastures. Areas of long grass are also needed to generate significant moth poulations.

- Greater horseshoe bats at maternity roosts surrounded by favourable habitat generally commute daily from their roosts to foraging areas within 3 to 5 km of their roosts in mid summer. In habitat-stressed roosts, they may travel up to 22 km. In Spring and Autumn after they disperse to transitory roosts, they travel much shorter distances, generally less than 1 km. Winter distances travelled are unknown.

- Lesser horseshoes forage very close to their roosts, and even spend much of their time foraging around mine entrances. The distances they travel in summer seem to be in the range of 2 - 3 km (Schofield 1996). One study in November showed a mean of 1.2 km, with a maximum of 2.1 km (Williams 2001).

These considerations mean that some fields at Weston have the potential to provide suitable commuting and/or foraging areas for horseshoe bats. Whether they actually significantly use them, also depends on the proximity of their roosts.

In July horseshoe bats congregate in a single maternity roost which females normally return to annually until they die at up to 30 years of age. Males often only return to their natal roost for their first few years. In September, most adult horseshoe bats disperse to transitory roosts where they start to store fat for hibernation. Some occupy mating roosts, where they are joined by mature females for mating. Hence surveys need to be conducted at least in these months to discover which foraging areas are being used.

METHODOLOGY STRATEGY

The methods used on each survey date were essentially those used in the extensive 2008 and 2009 Urban Surveys. These were carried out in south-western Bath to re-assess the use made by horseshoe bats of certain foraging areas identified by the Billington 2000 summer radio-tracking study. The 2008/9 surveys were also designed to identify the presence of other bat species (vesper bats) that were foraging at the various sampling stations. Surveys were monthly from June to October in 2008. Following the recommendations made in the 2008 Report, two further monthly surveys were conducted in April and May 2009 to complete a whole ‘summer’ foraging cycle of 7 months. This methodology was approved by English Nature prior to commencement.

Unlike the 2008/9 Urban surveys, which involved 7 months (April to October), only two months were attempted at Weston in 2013. The surveys followed a wide-ranging habitat assessment of Weston and Ensleigh during daytime in January 2013. Hence these surveys should not be regarded as part of a rigorous investigation of the complete Weston rural areas.

The 2013 surveys were required by the planning inspector to inform the planning authority of the current importance of various locations in Weston to horseshoe bats. They may possibly roost, forage or commute through them. If they do so at a significant level, an Appropriate Assessment for the Bath and Bradford on Avon SAC is likely to be necessary.

The SAC designation was initially made because of the presence of significant populations of greater and lesser horseshoe bats. Both of these bat species are listed as endangered. Horseshoe bat foraging areas close to a SAC enjoy a high level of protection from activities that may harm their use.

Greater horseshoe bats are known to forage along tall hedgerows and woodland edge over long grass from May to July/August, and cattle or sheep-grazed pastures for a significant part of the remaining summer months, and again in April and May. Lesser horseshoe foraging behaviour is less well known, but is thought to be quite similar

APPENDIX 2: METHODOLOGY SUPPLEMENT

Foraging habitat surveys used in this study

The methodology used static recording systems deployed in a standardized manner, with data supplemented by less structured surveyor observations. This approach has been widely used by Bat Pro staff over many years to assess habitat use by bats around dusk.

The detailed methodology and rationale are provided in the 2009 Bath Urban Bat Survey Report. Only a brief account is given below.

3.1 Static surveys

Three surveyors each set up about 5 static broad-band detector systems (each with a Tranquility transect broad-band detector; a Sony ICD P520 dictation recorder & 6v battery pack) at specified locations (see maps above).

The equipment was placed on a low stool, about 0.6m above ground level as horseshoe bats commute at about 1-2 m height above ground level. This height is also suitable for vesper bats that fly much higher, as long as they are within detection range, since their calls radiate out in all directions.

Each system automatically recorded 320 ms slots of time-expanded bat calls onto the Sony digital recorder, which was set in voice-activated mode. Each time slot can be treated as a bat pass, since it takes about 10 seconds for the calls to be replayed to the Sony at divide by 32 times speed. During that time the recorder is deaf to further calls. Hence it consistently samples bat activity, but does not record all calls. The Sony records the precise time of bat call slots detected at the site, but does not record periods without activity.

Weather data (temperature, windspeed, light level, rainfall) operating during the session, was recorded by one surveyor throughout each dusk survey.

Bat call recordings were later downloaded to computer and analysed using Batsound version 4 professional software (Pettersen Electronik). The precise times of all recorded horseshoe bat calls were noted by species and site location from the numbered Sony recorder. Also the presence of all identifiable vesper bat types at each location, as per the contract specification.

The 320 ms, time-expanded sample provides high-quality calls with all their characteristics. The slot allows inter-pulse intervals to be calculated for vesper bats. This is an important characteristic to be able to distinguish between some bat species, such as the *Nyctalus* bats (Noctule and Leislers).

Since bats were not aware of the static systems, their behavior was normal. Static systems are superior at recording the presence of horseshoe bats compared with surveyors carrying out transects using the same detectors. This is because horseshoe bats are predator-sensitive, and shun movements and/or light sources. They also fly low and/or close to vegetation where they are hard to see even when flying soon after sunset, and virtually impossible to see later on in cloudy conditions.

3.3 Roving surveys

Surveyors were primarily responsible for setting up, and ensuring the safety of up to 5 static broad-band detector systems within their allocated area. In addition they were required to record the time, position and nature of any bat activity they observed onto a proforma as they moved around checking the static systems from a distance. They did not do this in any formal way.

Each surveyor used a Tranquility Mega detector (David Bale, Cheltenham) set to automatic heterodyne mode. In this mode the detector checks for the peak frequency of any passing bat's calls as they either commute or forage. If no bat is detected, it reverts to 21 kHz sampling. If a GH bat passes, 83 or 84 shows up on the digital window. If LH it shows about 110, and the two pipistrelles either near to 45 or 55 according to species.

This is significantly superior to using heterodyne detectors were tuned to either 83 kHz (for Greater horseshoe bats), or 110 kHz (for Lesser horseshoe bats) as in the 2008/9 surveys. Surveyors had to frequently switch tuning frequency to search for the two species, with the consequent deafness to all other frequencies.

Appendix 4 of the 2008/9 survey report gives a fuller comparison of types of detectors and their uses in surveys at that time.