AES Wind Operations Europe

Sveti Nickola Wind Farm

Bat Monitoring Report 2011

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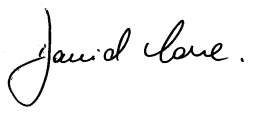
Signature		Signature	
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1. EXECUTIVE SUMMARY

1. This report provides details of bat surveys undertaken in 2011 at the Sveti Nikola Wind Farm in Kavarna, Bulgaria, on behalf of AES Wind Operations Europe. The report provides a comparison of survey results from 2009 (pre-operation but post-construction) with results from 2010 and 2011 (during operation).

2. Sveti Nikola Wind Farm consists of 52 Vestas V90 wind turbines, which were constructed during 2009 and commenced operation in spring 2010. The area is dominated by agriculture, with arable fields separated by bushy shelterbelts. .

3. Studies from the USA and Europe have found that dead bats can appear in large numbers beneath wind turbines either as a result of collision with the turbine blades or barotrauma, a fatal condition resulting from rapid pressure changes around the turbine. Casualties most often include migrating species, although high-flying resident species are also known to be involved.

4. Commitments were made as part of the original Environmental Impact Assessment (EIA) process and in the subsequent Environmental Management and Monitoring Plan (EMMP) (RSK Group, 2008) to carry out bat activity surveys and bat mortality monitoring to establish if the predicted level of impact was correct. It was predicted that diversity and abundance of bats within the territory would be low and therefore any negative impacts would be '*within the limits of the admissible*'.

5. The surveys carried out in 2009 included ground level car transect surveys both on-site and off-site (as a control) carried out monthly between July and October; bat detector surveys at height carried out during parts of August, September and October; late afternoon observations for foraging migrants during part of September; and night-time thermal infrared camera and acoustic migration surveys carried out during part of September.

6. The surveys carried out in 2010 included ground level car transect surveys both on-site and off-site monthly between April and October; bat detector surveys at height from April to October; and bat carcass searches (with searcher efficiency and carcass removal trials) carried out from July to October.

7. The surveys carried out in 2011 included repetitions of the car transect surveys both on and off-site monthly between April and October although the October surveys extended into the beginning of November, and bat carcass searches carried out from April to October.

8. No bat detector at height surveys were carried out during 2011 due to issues of noise from the nascelles of the turbines identified during the 2010 surveys making data gathered from the detectors unusable. These technical difficulties were insurmountable and a decision was made not to attempt further recording at height during 2011.

9. In 2009, 2010 and 2011 a diverse range of bat species was recorded at ground level during the car surveys at the Saint Nikola Wind Farm site. These included, most commonly, *Eptesicus serotinus; Hypsugo savii; Miniopterus schreibersii* and *Pipistrellus nathusii.* Species recorded less often were *Myotis* species; *Nyctalus noctula; Pipistrellus pipistrellus; P. pygmaeus; Rhinolophus ferrumequinum;* possibly *Nyctalus leisleri;* possibly *Vespertilio murinus* and possibly *Tadarida teniotis*.

10. In all three years, no bat species were recorded during the off-site transects that were not also recorded on site (similar diversity) and vice-versa. Similarly, bats were no less abundant at parts of the Saint Nikola site than in more diverse habitats towards the coast (similar abundance).

11. Average numbers of bat passes were higher on the site in the summer (during the breeding season) and lower in the autumn (during the migration season) in all years. Average numbers peaked to the north of the site in the autumn and peaks can be seen at the coast in both the summer and the autumn.

12. The patterns in bat activity are similar year to year, although the summer peak in the on-site transects appeared later in 2010 (August) compared to 2009 (July) and the autumn peak in the off-site transects appears earlier in 2011 (September) compared to 2009 (October). It is not known why this pattern occurs although it could relate to weather, particularly ambient temperature, which was higher in August and September 2011 than in July and October 2009.

13. In general, higher numbers of *Eptesicus serotinus* and lower numbers of *Hypsugo savii* and *Miniopterus schreibersii* were recorded in 2010 and 2011 than in 2009. There was no obvious pattern in the changes observed between all of the years for *Pipistrellus nathusii*.

14. A single dead *Nyctalus noctula* was found underneath one of the turbines during 2010. No other carcasses were observed during the bat carcass searches in 2010 or 2011 at the five selected wind turbines. Additionally no bat carcasses were discovered during the bird carcass searches 2011 also carried out at the site at every turbine. This suggests extremely low levels of mortality.

15. The car transect surveys and bat carcass searches commenced in 2010 and continued throughout 2011. After the 2010 surveys it was suggested that these surveys

continued for 2011 and that if no obvious patterns in bat activity emerged and no further bat carcasses were located that the surveys ceased, regardless of the three year commitment to monitor mortality in the EMMP.

16. The data collected during 2010 and 2011 during commissioning and operation of the wind farm showed fluctuations in overall numbers but no reduction in the number of species encountered. The variance in numbers could be because of environmental factors including weather, changes to the landscape due to agricultural practices or just natural variation in the general movement of bats and their roosts within the landscape.

17. The data suggests that the impacts of the Sveti Nikola wind farm on bats in this region are, as expected, low (or insignificant) despite the higher diversity and abundance of bats on site than expected in the original EIA.

2. INTRODUCTION

2.1. General

This report presents the results of bat surveys undertaken in 2011 in connection with the Sveti Nikola Wind Farm (Kavarna, Bulgaria) on behalf of AES Wind Operations Europe. The report provides a comparison of the results of the 2009 (pre-operation but post-construction) surveys and 2010 (1st year of operation) surveys with the 2011 (2nd year of operation).

Sveti Nikola Wind Farm consists of 52 Vestas V90 wind turbines, constructed during 2009. They have a capacity of 3 MW each, with an overall height to blade tip not exceeding 150 metres (m). Testing of the turbines commenced in mid-December 2009 and operation commenced in spring 2010. All turbines were fully operational throughout 2011.

AES Wind Operations Europe made commitments to carry out surveys to monitor the impacts of the wind farm on bats in relation to gaining funding for the project. These commitments are outlined in the original Environmental Impact Assessment (EIA) report and the Environmental Management and Monitoring Plan (EMMP) (RSK Group, 2008). Surveys carried out in 2009 included ground level bat detector car surveys; at height bat detector surveys; and thermal infrared camera / acoustic monitoring surveys. Surveys carried out in 2010 included ground level bat detector car surveys; at height bat detector surveys; and ground level bat carcass searches. Surveys carried out in 2011 included ground level bat detector car surveys; and ground level bat carcass searched. The 2011 surveys are the subject of this report.

The site location is shown in *Figure 1* and *Figure 2* shows an aerial photograph. All figures are provided in *Section 7*.

2.2. Ecological Context

The Sveti Nikola Wind Farm is located within a continuous area of agricultural land supporting arable crops. Between the large fields are shelter belts and dirt roads, which provide habitat connections for animal species. The countryside immediately surrounding the site is similarly agricultural, but also includes various villages. Several kilometres to the south are species-rich steppe grassland and rocky coastal cliffs with caves, cracks and crevices.

2.3. Background Information - Bats and Wind Turbines

Recent evidence from Europe and the USA, suggests that wind turbines can present a risk to bats and bat populations. Impacts can include pre-, during and post-construction disturbance; loss of roosts; loss of foraging and commuting habitat; fragmentation effects; and risk of direct collision with turbine blades.

Much of the evidence suggests that high-flying, migrating bats are most at risk from direct collision with turbine blades (or barotrauma caused by rapid changes in air pressure around the turbines); many casualties have been found beneath turbines during the late summer and early autumn migration period in Europe and the USA (Betts, 2006; Alcade and Saenz, 2004; Brinkmann, 2004; Johnson *et al.,* 2003 & 2004). There is other evidence from Sweden to suggest that resident species that hunt in open air space may be affected (Ahlen, 2003).

Various different hypotheses have been put forward to explain why bats die at wind turbines, including the effects of air turbulence; failure of individual bats to recognise the rotating blades using echolocation; and attraction of bats to increased numbers of invertebrates around wind turbines (Rodrigues et al., 2008).

2.4. Background Information about EIA and Commitments Made

EIA reports were submitted in 2006 for the Sveti Nikola Wind Farm. These reports provide details of bat survey work carried out during autumn (October) of 2004 using Pettersson D240x bat detectors, sound recording equipment and analysing bat echolocation calls following fieldwork using specialist software: BatSound 3.10.

Seven species of bats were recorded in the territory of the municipality of Kavarna and the region above the coastal cliff rich in rock niches, cracks and caves (between Yaylata and Taukliman). These species are *Rhinolophus hipposideros, Rhinolophus ferrumequinum, Eptesicus serotinus, Pipistrellus pipistrellus, P. pygmaeus*, *P. nathusii* and unidentified individuals of the *Myotis* species group.

Three caves within the region of Rusalka, on the coast, were visited and a maternity colony of *Rhinolophus hipposideros* observed.

Of interest, a large group of *Pipistrellus nathusii* bats were observed feeding around isolated trees in the species-rich steppe habitats, assumed to be migrants due to their absence on previous nights.

In the EIA report, comments relating to the bats actually at the site of the proposed wind farm are as follows:

- Rhinolophus hipposideros: 'probably when the weather is quiet these bats fly over the site'; and,
- Myotis species: 'single bats were observed from the smaller type of this species; they flew actively by single isolated trees on the territory of the site';

The observation was made that the number and diversity of bats observed at the coast was likely to be much higher than at the territory of the proposed wind farm and that any negative impacts would thus be '*within the limits of the admissible*'. It was also observed that, due to the well-developed echolocation systems of bats, they were likely to locate and avoid the wind turbine blades.

Table 1 provides information taken from the EMMP (RSK Group, 2008); it is the commitments register from the original EIA report.

Table 1. Parts of the commitments register from the EIA report relating to bats

Measures	Implementation period / stage	Reason for measure	Responsibility
Avoid removal of trees and treebelts when constructing the wind farm. Where removal is required trees will be replanted to compensate for the loss of vegetation	Construction	Prevent net loss of vegetation and impacts upon bat species	Contractor
Works will be restricted to daylight hours to avoid use of artificial lighting that may be a nuisance to the animals, many of which are active during night time including bat species.	Construction	Minimize the disturbance to animal species.	Contractor
Pre-construction surveys will be undertaken for mammals and reptiles in order to ensure the construction works do not disturb species. Particular attention will be paid to bat species	Construction	Prevent any collisions during bird migration.	AGE/ Contractor
Post construction surveys of bats will be undertaken in order to assess the potential impacts of the Project on these species. Mortality monitoring for bats will be annual for the first three years of operation. Where no significant effect is seen, monitoring will cease. Where	Operation	To monitor the impacts upon bat activity	AGE

effects are seen then measures will be developed and agreed with the funders and relevant authorities prior to implementation. Such measures to be considered include: planting suitable habitat (where acceptable to landowners) to divert bat activities away from the turbines, possible bat relocation and erection of bat boxes away from the turbine cluster, and use of possible deterrents (scarers to dissuade bats from passing close to turbines).	

The EMMP (RSK Group, 2008) makes the following general commitments in the text:

'Similar data in terms of mortality of bats will also be recorded as part of (bird) *carcass monitoring.'*

'*AES Geo Energy will commission a bat monitoring programme to assess whether the predicted impact level on bats is correct. This will include monitoring surveys of bat activity in adjacent woodland/shelterbelts within the site (close to turbines) and comparison with similar habitat outside the site. The results of such a study will help inform both the monitoring responsibilities of the project site and also provide a valuable data set for future impact assessments for wind turbines in similar habitats.*'

'Complete an independent bat survey and implement as necessary. Based on the survey, develop bat mitigation measures where necessary.'

In the case of the Sveti Nikola Wind Farm the concern relates mainly to post-construction disturbance, risk of collision with turbine blades (or barotrauma from rapid changes in air pressure around the turbine blades) and any associated higher altitude fragmentation effects. Bat monitoring did not commence at this site until construction was nearly complete and therefore pre- and during construction disturbance cannot easily be assessed. No roosts, foraging or commuting habitat were lost because the shelterbelts were retained. This means that habitat fragmentation is unlikely at a lower altitude.

2.5. Summary of 2009 Survey Data

Surveys carried out in 2009 included ground level bat detector car surveys both on-site (Transects 1,2, and 4) and off-site (as a control - Transect 3) carried out

monthly between July and October; bat detector surveys at height carried out during parts of August, September and October; late afternoon observations for foraging migrants during part of September; and night-time thermal infrared camera and acoustic migration surveys carried out during part of September.

A diverse range of bat species was recorded at ground level during the car surveys at the Sveti Nikola Wind Farm site in 2009. These included, most commonly Eptesicus serotinus; Hypsugo savii; Miniopterus schreibersii and Pipistrellus nathusii. Species recorded less often were Myotis species; Nyctalus noctula; Pipistrellus pipistrellus; P. pygmaeus; Rhinolophus ferrumequinum; possibly Nyctalus leisleri; and possibly Vespertilio murinus. No bat species were recorded during the off-site transects that were not also recorded on site (similar diversity). Similarly, bats were no less abundant at parts of the Sveti Nikola site than during the transect carried out in more diverse habitats towards the coast (similar abundance).

Several bat species were also recorded by the detectors placed at height, including most commonly Nyctalus noctula and Pipistrellus nathusii. Species recorded less often were Eptesicus serotinus; Hypsugo savii; Miniopterus schreibersii; Myotis species; Pipistrellus pipistrellus; Tadarida teniotis; possibly Nyctalus leisleri; possibly Pipistrellus pygmaeus; and possibly Vespertilio murinus. Numbers of the most commonly recorded species peaked simultaneously on several of the detectors on certain nights. Larger numbers were recorded when average wind speed was less than 7 m per second.

No large numbers of bats (which may be foraging migrants) were seen in the late afternoon during the September surveys.

150 animals were seen flying southwards along the coastline on 25.09.2009 between 00.20 and 01.00 using the thermal infrared camera. No acoustic data was collected by the surveyors at ground level on the coast, but there was a peak in numbers of Pipistrellus nathusii recorded by the detectors at height on the wind farm at around this time. It is possible that the animals observed on the coast formed part of a widespread group of these bats migrating through. Other evidence was collected during the surveys to suggest that this species may migrate through this region. It may be that Nyctalus noctula also migrates through, although less evidence is available to suggest this is the case.

Many of the species found at the Sveti Nikola Wind Farm have been found to be casualties within other European wind farm sites. Migrating and high-flying species, both of which occur at this site, are known to be particularly at risk. Pipistrellus nathusii and Nyctalus noctula are known to be particularly vulnerable to wind farm development, although impacts at a population level are difficult to establish. All species identified are protected to a varying level by international and national legislation.

2.6. Summary of 2010 Survey Data

Surveys carried out in 2010 included ground level bat detector car surveys both on-site (Transect's 1,2 and 4) and off-site (Transect 3) carried out monthly between July and October; bat detector surveys at height carried out throughout the bat active season (April – October), and carcass searches were carried out at five turbine sites (Turbines 8, 26, 37, 43 and 46) the same turbines with bat detectors positioned within the nascelles. .

A diverse range of bat species was recorded at ground level during the car surveys at the Sveti Nikola Wind Farm site in 2009 as detailed in *Section 2.5* above. The same species were recorded during the 2010 surveys with no loss of diversity in bat species.

Bat carcass searches were continued during 2010 with no carcasses recovered either during the dedicated bat carcass searches or during the bird carcass searches.

2.7. Objectives of the Surveys and Report

The aims of the 2011 surveys were:

- to identify if levels of bat activity across the site had changed during operation of the wind turbines (which commenced in spring 2010) in comparison to before operation (but during construction, as surveys had not commenced before this time); and

- to identify if any bats were subject to either collision or barotrauma (resulting in carcasses found beneath the turbines).

The overall aim was to satisfy the commitments outlined in *Section 2.3*.

The report outlines the methodology used to carry out the surveys and the results obtained.

3. METHODS

3.1. Car Transect Bat Surveys

The aim of carrying out car transect surveys is to compare bat diversity and levels of bat activity across the site during operation with the same parameters pre-operation (the 2009 surveys were carried out during the construction period). The rationale behind choosing this method is provided in the 2009 report (RSK Carter Ecological, 2010).

Car transect surveys were carried out at Sveti Nikola Wind Farm monthly between April and October 2011 by Ivaylo Raykov, who was trained during 2009 by Jan Collins of RSK Carter Ecological Limited. Four different car transect routes (two on-site and two off-site) were driven on four nights during each month; dates, transect numbers and times are given in Table 2, below. The wind turbines were operational during the surveys.

The methodology, including the sound analysis of bat passes[1] recorded during the car transect surveys, was exactly the same as that used in 2009 and 2010 and carried out by the same personnel, as described in the 2009 report (RSK Carter Ecological, 2010).

Surveys were only carried out in good conditions for bats to fly, i.e. when temperatures were above 8°C and there was no strong wind or rain. The temperature, wind speed (Beaufort) and cloud cover (Octas) were recorded at the start and end of each survey onto specially designed survey forms. Conditions recorded during the surveys are given in Table 2, below. Descriptions of the Beaufort and Octas scales are provided in Appendix 1.

[1] A bat pass is recorded during a survey when a bat flying past the observer is recorded on a bat detector. A bat pass can be defined as a continuous series of echolocation pulses emitted by one bat. No distinction is made of echolocation that indicates that a bat may be commuting or foraging.

Table 2. Dates, transect numbers, times and weather conditions for car transect surveys carried out in and around the Sveti Nikola wind farm during 2011

Date	21.04.11	23.04.11	18.04.11	20.04.11	16.05.11	18.05.11	14.05.11	15.05.11	16.06.11	14.06.11	15.06.11	13.06.11	.07.11	15.07.11
Transect number	1	2	3	4	1	2	3	4	1	2	3	4	1	2
Length of transect (km)	36.4	27.1	32.6	7.6	36.5	27	32.6	7.8	36.4	7.9	32.7	25.7	36.5	25.6
Sunset time	19:54	19:55	19:50	19:52	20:16	20:24	20:20	20:24	20:48	20:47	20:58	20:46	20:46	20:46
Survey start time	20:40	20:25	20:30	20:35	20:55	21:00	20:55	20:55	21:25	21:20	21:25	21:20	21:30	21:25
Survey end time	22:30	21:44	22:09	22:10	22:45	22:25	22:33	22:30	23:19	22:44	23:13	22:57	23:18	22:45
Length of transect (minutes)	110	79	99	95	110	85	98	95	114	88	108	97	108	80
Temperature at start (°C)	8.7	8	8.4	7.7	16	13.5	13.7	14.3	19	17.6	16.8	19.5	23.2	20
Temperature at end (°C)	6.7	5	8.6	7.1	15	13	11.2	14.2	15	15	14	18	21.8	18
Wind conditions at start (Beaufort)	1	1	1	1	2	2	1	2	1	0	0	1	2	0
Wind conditions at end (Beaufort)	1	1	1	1	2	1	1	2	1	1	0	1	2	2
Cloud cover at start (Octas)	0	1	3	1	1	1	1	1	1	1	0	3	1	0
Cloud cover at end (Octas)	0	1	3	0	1	1	1	1	1	1	0	2	0	0
Rain at start (dry / drizzle / rain)	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Rain at end (dry / drizzle / rain)	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dru	Dry	Dry

Table 2 (contd.). Dates, transect numbers, times and weather conditions for car transect surveys carried out in and around the Sveti Nikola wind farm during 2011

Date	16.07.11	18.07.11	16.08.11	17.08.11	18.08.11	19.08.11	13.09.11	15.09.11	16.09.11	17.09.11	15.10.2011	19.10.11	04.11.2011	24.10.2011
Transect number	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Length of transect (km)	32.7	7.9	36.5	25.6	32.7	7.9	36.5	25.5	32.7	7.9	32.7	7.9	36.5	25.6
Sunset time	20:45	20:51	20:10	20:09	20:08	20:10	19:24	19:19	19:18	19:16	18:26	18:19	16:56	18:12
Survey start time	21:25	21:36	20:40	20:40	20:40	20:40	20.05	20:00	20:00	20.05	19:07	19:00	17:40	18:45
Survey end time	23:01	23:16	22:28	22:01	22:21	22:17	21:53	21:21	21:36	21:57	20:56	20:27	19:20	20:34
Length of transect (minutes)	96	100	108	81	101	97	103	81	96	112	109	87	100	109
Temperature at start (°C)	20	22	23	22	18	25.5	20	21	20	20	8	7	6.9	11
Temperature at end (°C)	19	21	21	20	16	23.5	20	20	18	20	6	6	6	11
Wind conditions at start (Beaufort)	0	0	1	1	1	0	2	1	2	2	1	2	1	3
Wind conditions at end (Beaufort)	1	2	2	0	1	0	2	1	2	2	1	2	1	2
Cloud cover at start (Octas)	0	0	0	1	0	1	0	1	1	1	2	0	1	8
Cloud cover at end (Octas)	0	0	0	0	0	0	0	0	0	1	2	0	1	8
Rain at start (dry / drizzle / rain)	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Rain at end (dry / drizzle / rain)	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry

Temperature cells marked in red indicate periods when the temperataure dropped below the minimum normally required for bats to be fully active.

3.2. Bat Surveys at Height

The aim of carrying out bat activity surveys at height is to identify the bat species present at greater heights above ground level (diversity) and gain an impression of the number of individuals at greater heights (relative abundance). The ultimate aim was to compare bat activity data during operation of the turbines with that collected prior to operation commencing (the 2009 surveys were carried out post-construction but pre-operation, the 2010 surveys were carried out during operation). The rationale behind choosing this method is provided in the 2009 report (RSK Carter Ecological, 2010).

Anabat SD1 bat detectors were deployed into the nacelles of five wind turbines in order to record bat activity at height at Sveti Nikola Wind Farm constantly between April and October 2011. AES Wind Operations Europe was responsible for setting up and deploying these detectors.

The recordings retrieved from the Anabat detectors during 2010 were either that of noise from the turbines themselves, or the detectors themselves failed. The data that was retrived although a very small sample did indicate that bats were flying within range of the microphones within the nascelles. Due to technical difficulties in attempting to overcome the noise from the turbines by retro-fitting the microphones it was decided that no recording at height would take place during 2011.

3.2. Searcher Efficiency Trials

No additional searcher efficiency trials were carried out during 2011, as the searchers remained the same as those used during 2010 for the 2011 carcass searches.

The methodology used for the searcher efficiency trials is fully explained in the 2010 report (RSK Carter 2010) and was repeated in 2011.

3.3. Bat Carcass Search Repetition Rate

The searcher efficiency and carcass removal trial results from June 2010 were used to inform the search interval for bat carcass searches for the remainder of 2010 and throughout 2011 and details can be found in the 2010 report (RSK Carter Ecological, 2011).

3.4. Bat Carcass Searches

The aim of searching for carcasses beneath the turbines is to find bats that have been killed by the operational turbines.

Every five days (as determined by the searcher efficiency and carcass removal trials) a surveyor searched a plot 100 m x 100 m around the base of the five turbines where the bat detectors were erected (WTG 8, 26, 37, 43 and 46). Plots were surveyed by commencing in one corner and walking transects 2 m apart north up the plot then south down the plot searching systematically for bat carcasses until the whole area had been covered. In order to cover the area systematically the surveyors walked between markers placed at the ends of the plots and also used GPS units.

The searches were carried out during the morning, with a single turbine searched every day.

Ivaylo Raykov was trained to carry out these surveys during June 2010 by Jan Collins of RSK Carter Ecological Limited and completed the checks from 06.08.10 to 30.08.10. Stefan Mitev was subsequently trained by Ivaylo Raykov and continued the checks until the end of October.

The surveys for 2011 commenced on 20.04.2011 and ended on 30.09.2011 with 143 searches completed for 2011. Stefan Mitev completed all of the bat carcass searches during 2011.

4. RESULTS

4.1. Car Transect Bat Surveys

Appendices 2-8 provide the results of the sound analysis from the car transect surveys. The tables and graphs below provide summary information and a direct comparison between the results for 2010 and 2011

Table 3. Species/groups and number of passes recorded on car transect 1 between April and October 2010 at Sveti Nikola Wind Farm.

Species	April	May	June	July	August	September	October	TOTAL
Eptesicus serotinus			55	62	90	23	7	237
Hypsugo savii		1	122	6	6		3	138
Miniopterus schreibersii	2	17	5	1	4		1	30
Nyctalus noctula					3		6	9
Pipistrellus nathusii		18	36	20	26	60	19	179
Pipistrellus pipistrellus		1		2		4		7
Pipistrellus pygmaeus		1						1
Hypsugo savii or *Pipistrellus nathusii*		3	9	6	13		8	39
Miniopterus schreibersii or *Pipistrellus pipistrellus*			1					1
Nyctalus leisleri or *Nyctalus noctula*							2	2
Nyctalus leisleri, Nyctalus noctula or *Vespertilio murinus*							3	3
Pipistrellus pipistrellus or Pipistrellus nathusii				1		1		2
Myotis species		1			2			3
Myotis myotis or Myotis blythii				3				3
Undetermined			18	7	3		2	30
TOTAL BAT PASSES	2	42	246	108	147	88	51	684
AVERAGE NUMBER OF BAT PASSES PER KILOMETRE	0.05	1.15	6.76	2.96	4.03	2.41	1.40	
AVERAGE NUMBER OF BAT PASSES PER MINUTE	0.02	0.38	2.26	1.00	1.34	0.83	0.48	

Graph 1. Number of passes per species recorded on car transect 1 between April and October 2010 at Sveti Nikola Wind Farm.

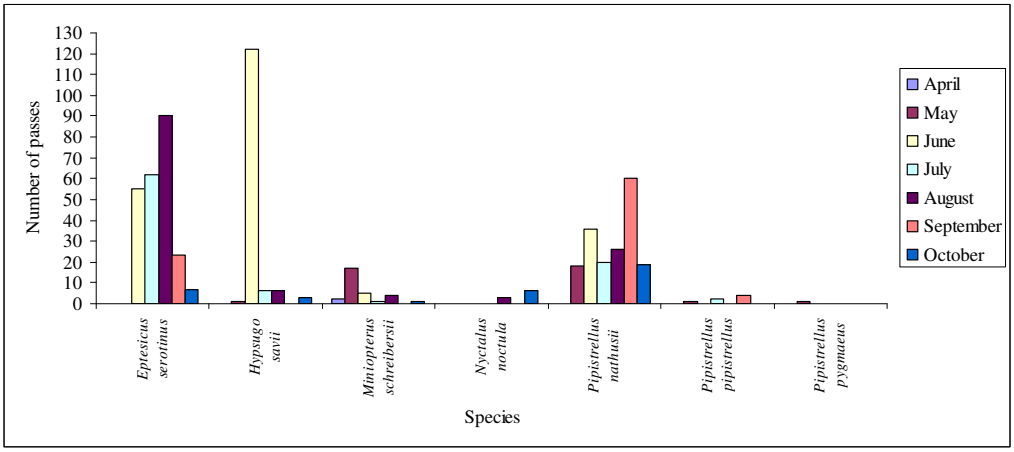


Table 4. Species/groups and number of passes recorded on car transect 1 between April and October 2011 at Sveti Nikola Wind Farm.

	April	May	June	July	August	September	October	Totals
Eptesicus serotinus			9	48	28	37	0	122
Hypsugo savii			1	8	8	23	0	40
Miniopterus schreibersii	1	18	1	3	11	12	3	49
Nyctalus noctula								0
Pipistrellus nathusii	3	16		15	29	77		140
Pipistrellus pipistrellus				1		7		8
Pipistrellus pygmaeus								0
Rhinolophus ferrumequinum								0
Eptesicus serotinus or Nyctalus noctula								0
Hypsugo savii or *Pipistrellus nathusii*		2	9	4	10	34	0	59
Miniopterus schreibersii or *Pipistrellus pipistrellus*								0
Pipistrellus pipistrellus or Pipistrellus nathusii						3		3
Myotis species			3					3
Nyctalus leisleri or Nyctalus noctula								0
Nyctalus leisleri or Nyctalus noctula or Vespertilio murinus								424
Undetermined								0
TOTAL BAT PASSES	4	36	23	79	86	193	3	
AVERAGE NUMBER OF BAT PASSES PER KILOMETRE	0.11	0.99	0.63	2.16	2.36	5.29	0.08	
AVERAGE NUMBER OF BAT PASSES PER MINUTE	0.04	0.33	0.21	0.73	0.78	1.82	0.03	

Graph 2. Number of passes per species recorded on car transect 1 between April and October 2011 at Sveti Nikola Wind Farm.

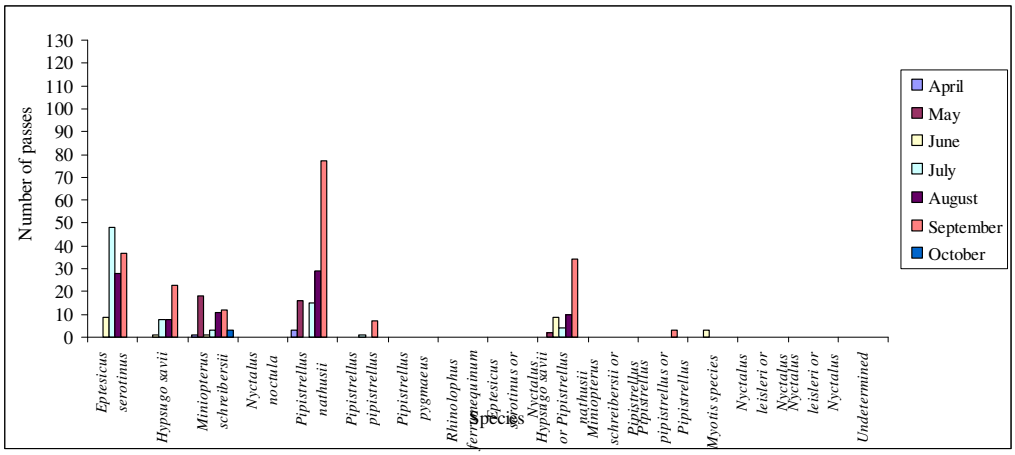


Table 3 and Graph 1 illustrate that at least eight bat species were recorded during April to October 2010 on Transect 1, which covers the western half of the site (wind farm). These species include Eptesicus serotinus, Hypsugo savii, Miniopterus schreibersii, Nyctalus noctula, Pipistrellus nathusii, Pipistrellus pipistrellus, Pipistrellus pygmaeus and at least one of the Myotis species. Table 4 and Graph 2 shows that the same number of species was recorded from Transect 1 during 2011.

Eptesicus serotinus, Hypsugo savii, Miniopterus schreibersii and Pipistrellus nathusii were recorded the most frequently, the rest were recorded only infrequently.

The largest numbers of passes for Eptesicus serotinus were recorded in July in 2011 and were totally absent in May when they had been most frequent during 2010. Miniopterus schreibersii were recorded in their largest numbers during May in both 2010 and 2011. The largest numbers of passes for Hypsugo savii were recorded in June in 2010 but during 2011 they were at their peak during September. In the case of Pipistrellus nathusii, however, more passes were recorded in September in both 2010 and 2011 than in any other month.

Table 5. Species/groups and number of passes recorded on car transect 2 between April and October 2010 at Sveti Nikola Wind Farm.

Species	April	May	June	July	August	September	October	TOTAL
Eptesicus serotinus			1	3	16	9		29
Hypsugo savii			24	1	6			31
Miniopterus schreibersii		1	5	5	4		2	17
Nyctalus noctula						1		1
Pipistrellus nathusii	1	15	2	5	15	9	15	62
Pipistrellus pipistrellus						1		1
Pipistrellus pygmaeus			1					1
Rhinolophus ferrumequinum			1				2	3
Hypsugo savii or *Pipistrellus nathusii*		2		1	9		1	13
Pipistrellus pipistrellus or Pipistrellus nathusii						2		2
Myotis species								0
Myotis myotis or Myotis blythii				3	9	1		13
Undetermined			5					5
TOTAL BAT PASSES	1	18	39	18	59	23	20	178
AVERAGE NUMBER OF BAT PASSES PER KILOMETRE	0.04	0.67	1.52	0.70	2.30	0.90	0.78	
AVERAGE NUMBER OF BAT PASSES PER MINUTE	0.01	0.23	0.52	0.24	0.79	0.31	0.27	

Graph 3. Number of passes per species recorded on car transect 2 between April and October 2011 at Sveti Nikola Wind Farm.

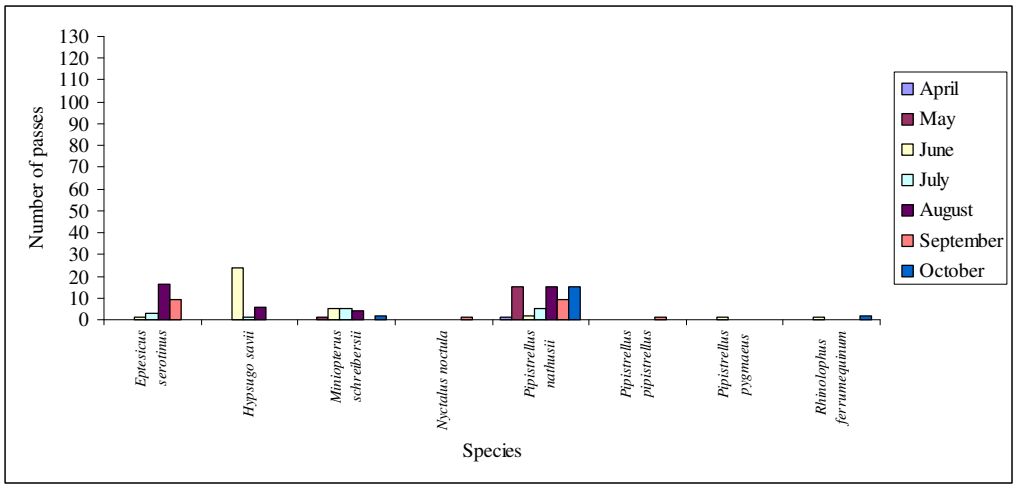
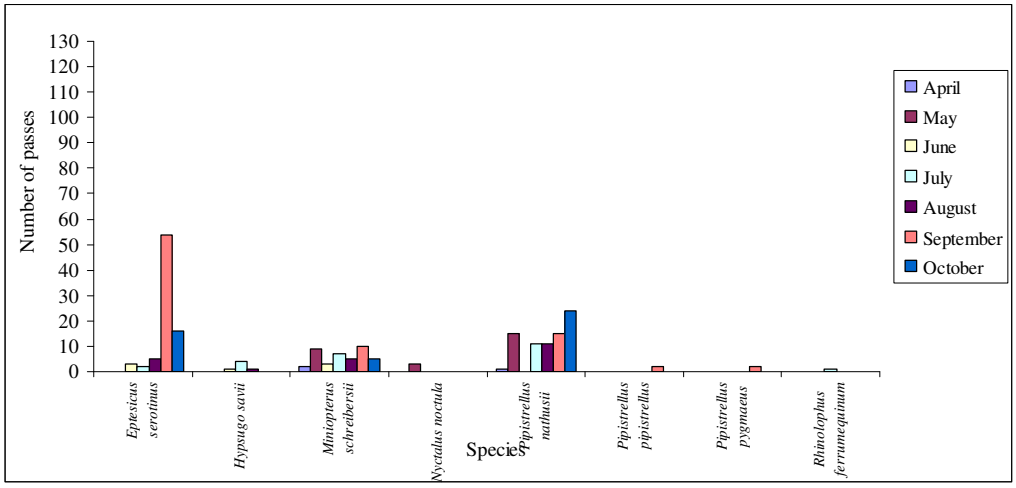


Table 6. Species/groups and number of passes recorded on car transect 2 between April and October 2011 at Sveti Nikola Wind Farm.

Species	April	May	June	July	August	September	October	TOTAL
Eptesicus serotinus			3	2	5	54	16	80
Hypsugo savii			1	4	1			6
Miniopterus schreibersii	2	9	3	7	5	10	5	41
Nyctalus noctula		3						3

Pipistrellus nathusii	1	15		11	11	15	24	77
Pipistrellus pipistrellus						2		2
Pipistrellus pygmaeus						2		2
Rhinolophus ferrumequinum				1				1
Hypsugo savii or *Pipistrellus nathusii*								
Pipistrellus pipistrellus or Pipistrellus nathusii				16	6	14		36
Myotis species			1					1
Myotis myotis or Myotis blythii								0
Undetermined								0
TOTAL BAT PASSES								251
AVERAGE NUMBER OF BAT PASSES PER KILOMETRE	**0.11**	**1.00**	**0.39**	**1.60**	**1.09**	**3.80**	**1.76**	
AVERAGE NUMBER OF BAT PASSES PER MINUTE	**0.04**	**0.34**	**0.13**	**0.54**	**0.37**	**1.31**	**0.60**	

Graph 4. Number of passes per species recorded on car transect 2 between April and October 2011 at Sveti Nikola Wind Farm



Tables 5 and 6 and Graphs 3 and 4 illustrate that at least nine bat species were recorded during April to October 2010 on Transect 2, which covers the eastern half of the site. These species include Eptesicus serotinus, Hypsugo savii, Miniopterus schreibersii, Nyctalus noctula, Pipistrellus nathusii, Pipistrellus pipistrellus, Pipistrellus pygmaeus, Rhinolophus ferrumequinum and at least one of the Myotis species.

Eptesicus serotinus, Hypsugo savii, Miniopterus schreibersii and Pipistrellus nathusii were recorded the most frequently, the rest were recorded only infrequently during both 2010 and 2011.

The largest numbers of passes for Hypsugo savii and Miniopterus schreibersii were recorded in June 2010. However, during 2011 Hypsugo savii peak numbers were a month later in July with the peak being 2/3 less in 2011 than the numbers recorded during 2010. Miniopterus schreibersii were evident throughout the year with distinctive peaks in May, July and September. The overall number of Miniopterus schreibersii recorded throughout the year more than doubled from 17 in 2010 to 41 in 2011.

The largest numbers of passes for Eptesicus serotinus were recorded in August in 2010 and in September during 2011. Similar numbers of Pipistrellus nathusii passes were recorded in the months of May, August and September in 2010, with less in the other months of the year. In 2011 similar numbers were recorded during May, July, August and September with a peak in numbers in October. The overall numbers of Pipistrellus nathusii recorded throughout the year in 2011 was 77 whereas only 62 were recorded during 2010.

Table 6. Species/groups and number of passes recorded on car transect 3 between April and October 2010 at Sveti Nikola Wind Farm.

Species	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**TOTAL**
Eptesicus serotinus			3	6	16	16	7	48
Hypsugo savii			17			3	3	23
Miniopterus schreibersii	7	9	9	6	1	1	1	34
Nyctalus noctula						8	6	14
Pipistrellus nathusii	12	8	11	3	7	75	19	135
Pipistrellus pipistrellus				3		5		8
Pipistrellus pygmaeus	1					1		2
Rhinolophus ferrumequinum								0
Eptesicus serotinus or *Nyctalus noctula*	1	1						2
Hypsugo savii or *Pipistrellus nathusii*				1		2	8	11
Miniopterus schreibersii or *Pipistrellus pygmaeus*	1							1
Pipistrellus pipistrellus or *Pipistrellus nathusii*				4	2	5		11
Myotis species					3	1		4
Myotis myotis or *Myotis blythii*					1	2		3
Nyctalus leisleri or *Nyctalus noctula*						1	2	3
Nyctalus leisleri, Nyctalus noctula or *Vespertilio murinus*						2	3	5
Nyctalus noctula or *Tadarida teniotis*					1			1
Undetermined			2			2	2	6
TOTAL BAT PASSES	22	18	42	23	31	124	51	311
AVERAGE NUMBER	0.67	0.55	1.28	0.70	0.95	3.79	1.56	

OF BAT PASSES PER KILOMETRE							
AVERAGE NUMBER OF BAT PASSES PER MINUTE	0.22	0.19	0.43	0.24	0.33	1.29	0.53

Graph 5. Number of passes per species recorded on car transect 3 between April and October 2011 at Sveti Nikola Wind Farm.

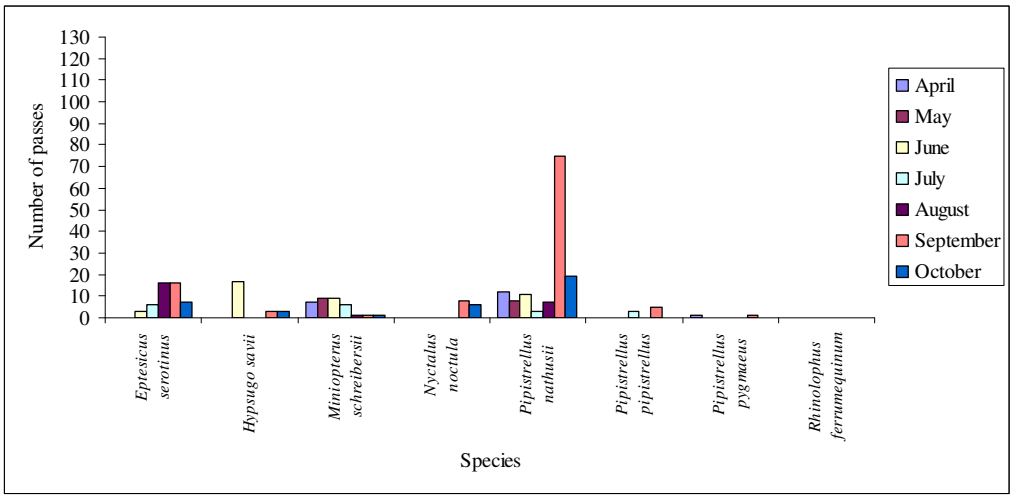


Table 6. Species/groups and number of passes recorded on car transect 3 between April and October 2011 at Sveti Nikola Wind Farm.

Species	April	May	June	July	August	September	October	TOTAL
Eptesicus serotinus	1	12	26	1	17	16	3	76
Hypsugo savii				2		1		3
Miniopterus schreibersii	3	1	7	6	1	2	2	22
Nyctalus noctula								0
Pipistrellus nathusii	1	4	4	7	7	26	1	50
Pipistrellus pipistrellus		1						1
Pipistrellus pygmaeus	1				1			2
Rhinolophus ferrumequinum								0
Eptesicus serotinus or *Nyctalus noctula*								0
Hypsugo savii or *Pipistrellus nathusii*			1	9	6	1	0	17
Miniopterus schreibersii or *Pipistrellus pygmaeus*	1							0
Pipistrellus pipistrellus or *Pipistrellus nathusii*				4	2	5		0
Myotis species		2		1		3		6
Nyctalus leisleri or *Nyctalus noctula*						1	2	3
Nyctalus leisleri, Nyctalus noctula or *Vespertilio murinus*							2	2
Nyctalus noctula or *Tadarida teniotis*								0
Undetermined			2	1		2		4
TOTAL BAT PASSES	6	20	40	27	32	50	8	183
AVERAGE NUMBER OF BAT PASSES PER KILOMETRE	**0.18**	**0.61**	**1.22**	**0.83**	**0.98**	**1.53**	**0.24**	
AVERAGE NUMBER OF BAT PASSES PER MINUTE	**0.06**	**0.21**	**0.41**	**0.28**	**0.34**	**0.52**	**0.08**	

Graph 7. Number of passes per species recorded on car transect 3 between April and October 2011 at Sveti Nikola Wind Farm.

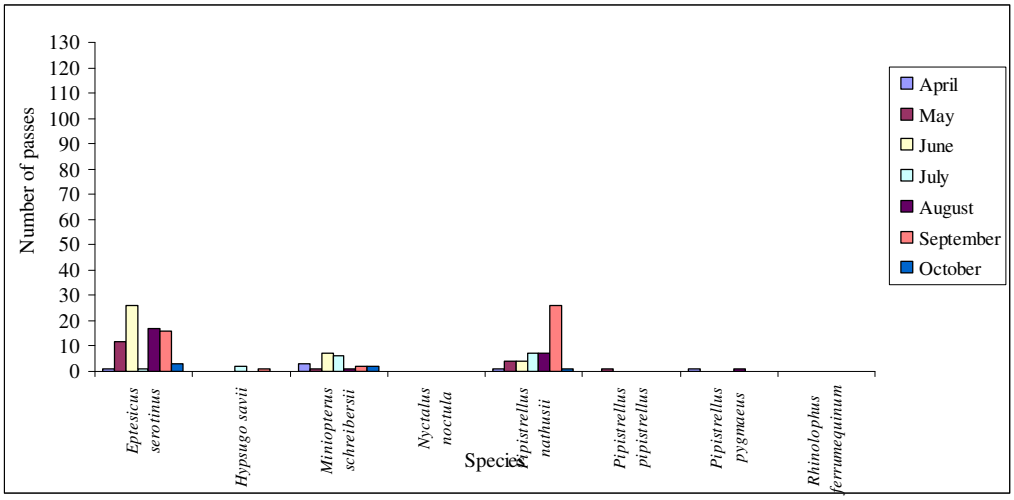


Table 5 and *Graph 3* illustrate that at least nine bat species were recorded during April to October 2010 on *Transect 3*, which is on undeveloped land to the north of the site. These species include *Eptesicus serotinus, Hypsugo savii, Miniopterus schreibersii, Nyctalus noctula, Pipistrellus nathusii, Pipistrellus pipistrellus, Pipistrellus pygmaeus, Rhinolophus ferrumequinum* and at least one of the *Myotis* species. During the surveys in 2011 this had reduced to at least eight species with *Nyctalus noctula* being absent.

Pipistrellus nathusii was recorded the most frequently and the greatest number of passes was recorded in September, the remaining species were recorded relatively infrequently during 2010. *Pipistrellus nathusii* were the second most recorded bat during 2011, but there was a similar peak in September of 2011. During 2011 Eptesicus serotinus were the most frequently encountered with bats being recorded throughout the year in all months. During June, was the highest peak with August and September also high.

Table 7. Species/groups and number of passes recorded on car transect 4 between April and October 2010 at Sveti Nikola Wind Farm.

Species	April	May	June	July	August	September	October	TOTAL
Eptesicus serotinus			11	74	1	20		106
Hypsugo savii			24	7	7	6	3	47
Miniopterus schreibersii	9	5	14	16	1	5	2	52
Nyctalus noctula						5		5
Pipistrellus nathusii	17	8	14	12	6	43	46	146
Pipistrellus pipistrellus						3	1	4
Pipistrellus pygmaeus	1	2						3
Rhinolophus								0

ferrumequinum								
Eptesicus serotinus or *Nyctalus noctula*					5			5
Hypsugo savii or *Pipistrellus nathusii*			16	14		9		39
Miniopterus schreibersii or *Pipistrellus pygmaeus*					1			1
Pipistrellus pipistrellus or Pipistrellus nathusii		1				2		3
Myotis species	1	12	5	5	7			30
Nyctalus leisleri or *Nyctalus noctula*								0
Nyctalus leisleri, Nyctalus noctula or *Vespertilio murinus*						10		10
Undetermined			4	4	1			9
TOTAL BAT PASSES	28	28	88	132	29	103	52	460
AVERAGE NUMBER OF BAT PASSES PER MINUTE	0.29	0.29	0.91	1.39	0.30	1.07	0.55	

Graph 8. Number of passes per species recorded on car transect 4 between April and October 2011 at Sveti Nikola Wind Farm.

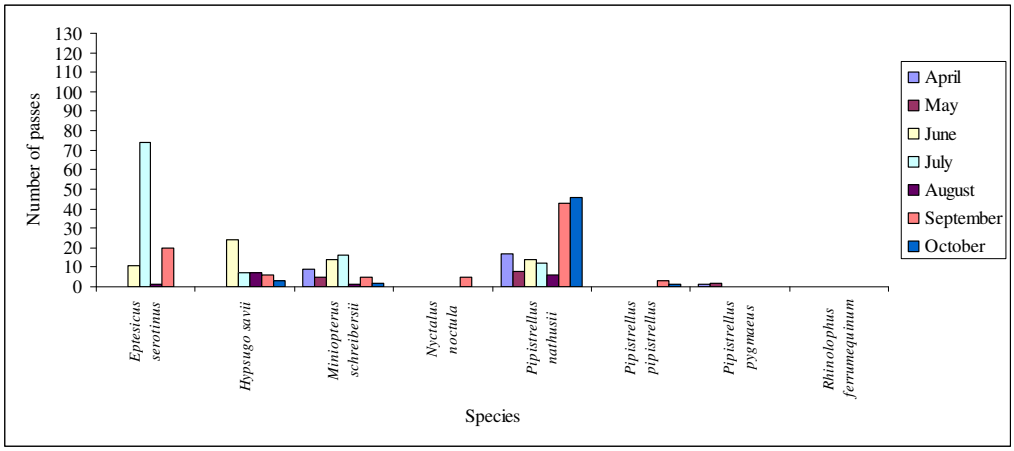
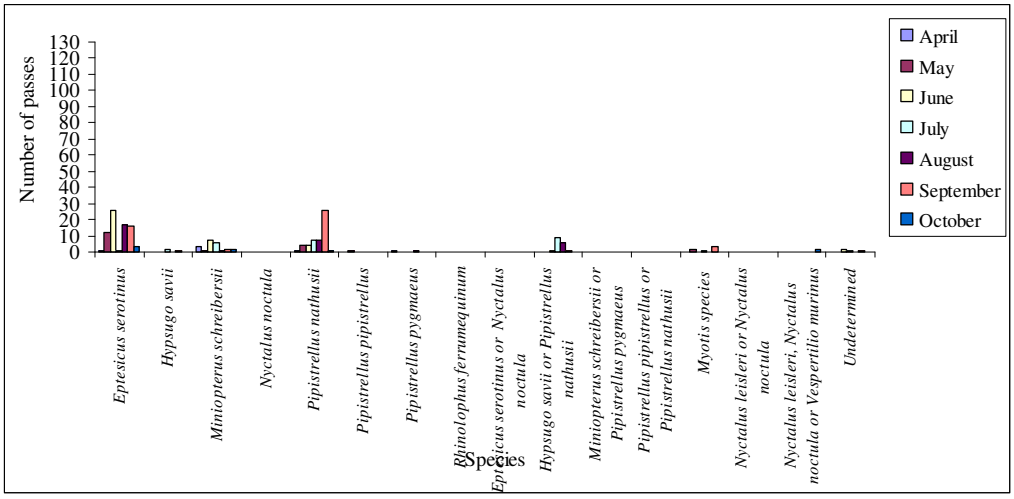


Table 8. Species/groups and number of passes recorded on car transect 4 between April and October 2011 at Sveti Nikola Wind Farm

Species	April	May	June	July	August	September	October	TOTAL
Eptesicus serotinus	1	12	26	1	17	16	3	76
Hypsugo savii				2		1		3
Miniopterus schreibersii	3	1	7	6	1	2	2	22
Nyctalus noctula								0
Pipistrellus nathusii	1	4	4	7	7	26	1	50
Pipistrellus pipistrellus		1						1
Pipistrellus pygmaeus	1				1			2
Rhinolophus ferrumequinum								0
Eptesicus serotinus or *Nyctalus noctula*								0
Hypsugo savii or *Pipistrellus nathusii*			1	9	6	1		17
Miniopterus schreibersii								0

or *Pipistrellus pygmaeus*								
Pipistrellus pipistrellus or Pipistrellus nathusii								0
Myotis species		2		1		3		6
Nyctalus leisleri or *Nyctalus noctula*								0
Nyctalus leisleri, Nyctalus noctula or *Vespertilio murinus*							2	2
Undetermined			2	1		1		4
TOTAL BAT PASSES	6	20	40	27	32	50	8	183
AVERAGE NUMBER OF BAT PASSES PER MINUTE	**0.06**	**0.21**	**0.41**	**0.28**	**0.34**	**0.52**	**0.08**	

Graph 9. Number of passes per species recorded on car transect 4 between April and October 2011 at Sveti Nikola Wind Farm.



Tables 7 and 8 and *Graphs 8 and 9* illustrate that at least nine bat species were recorded during April to October on *Transect 4 during both 2010 and 2011*, which is on undeveloped land to the south of the site. These species include *Eptesicus serotinus, Hypsugo savii, Miniopterus schreibersii, Nyctalus noctula, Pipistrellus nathusii, Pipistrellus pipistrellus, Pipistrellus pygmaeus, Rhinolophus ferrumequinum* and at least one of the *Myotis* species.

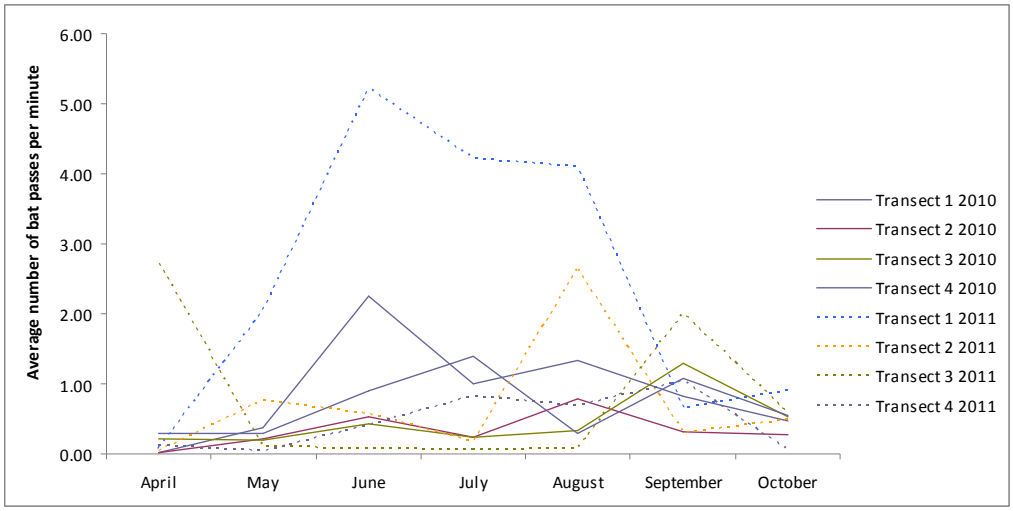
Eptesicus serotinus, Hypsugo savii, Miniopterus schreibersii and *Pipistrellus nathusii* were recorded the most frequently, the rest were recorded only infrequently during 2010. During 2011 *Eptesicus serotinus, Miniopterus schreibersii* and *Pipistrellus nathusii* were recorded most frequently. .

The largest numbers of passes for *Eptesicus serotinus* were recorded in June 2010. Only 3 passes of *Hypsugo savii* were recorded throughout the year during 2011 whereas 47 were recorded in 2010. Numbers of *Pipistrellus nathusii* passes peaked

in September and October in 2010 whilst the peak of activity in 2011 was restricted to September, with less in the other months of the year.

In the tables above, the number of bats per kilometre (for *Transects 1*, *2* and *3* only, because *Transect 4* included static point stops) and per minute of survey time were included in the tables as a relative measure of bat abundance. It is not appropriate to compare total numbers of bat passes because each transect was a different length. The graph below provides a comparison of relative abundance of bats on each transect by plotting the number of bat passes per minute.

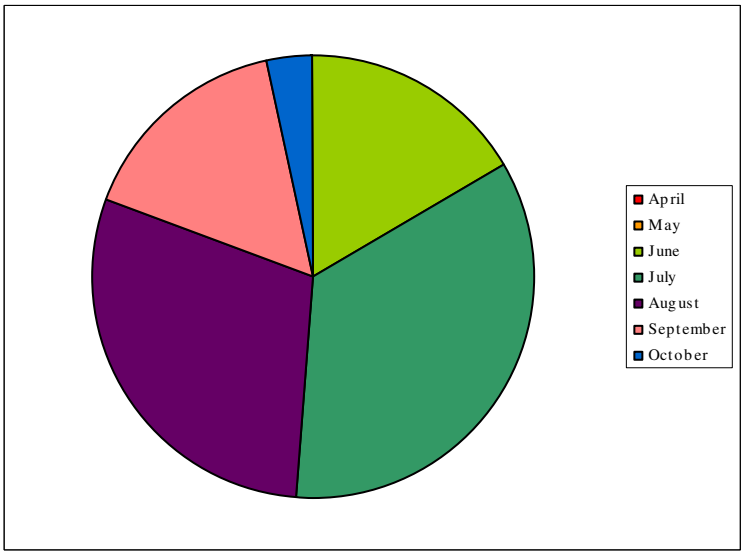
Graph 10. Number of bat passes per minute recorded on car transects driven between April and October 2010 and 2011 at and to the north and south of Sveti Nikola Wind Farm.



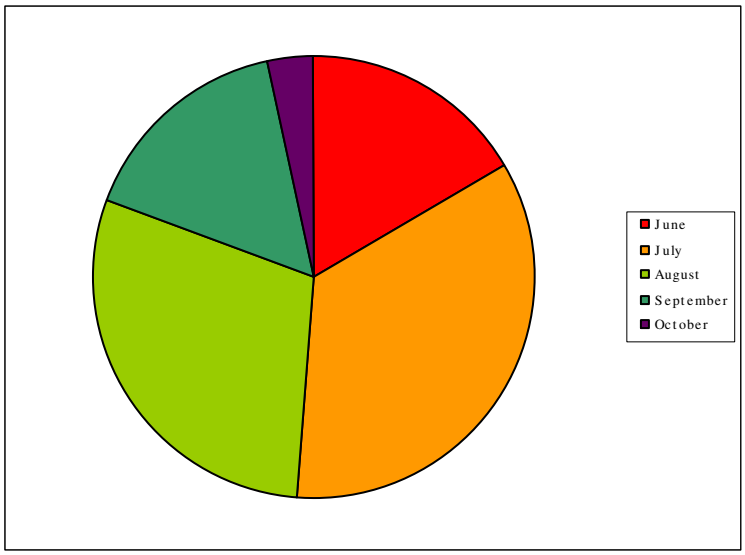
On the whole, the abundance of bats was not greater in the more diverse habitats at the coast than on the wind farm territory.

The four most commonly recorded species (*Eptesicus serotinus, Hypsugo savii, Miniopterus schreibersii and Pipistrellus nathusii*) are represented below according to the proportion of total recorded calls per month.

Graph 11. Distribution of passes of Eptesicus serotinus *recorded from April to October 2010 at and to the north and south of Sveti Nikola Wind Farm (sum of 420 passes).*

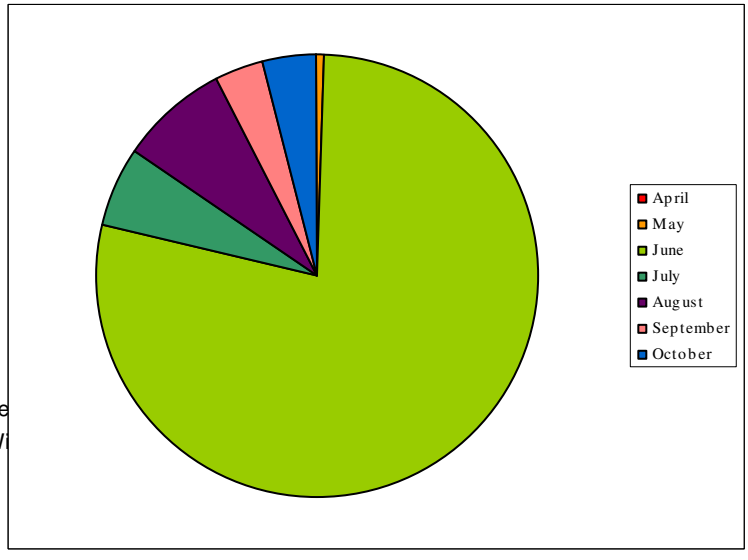


Graph 12. Distribution of passes of Eptesicus serotinus *recorded from April to October 2010 at and to the north and south of Sveti Nikola Wind Farm (sum of 453 passes).*



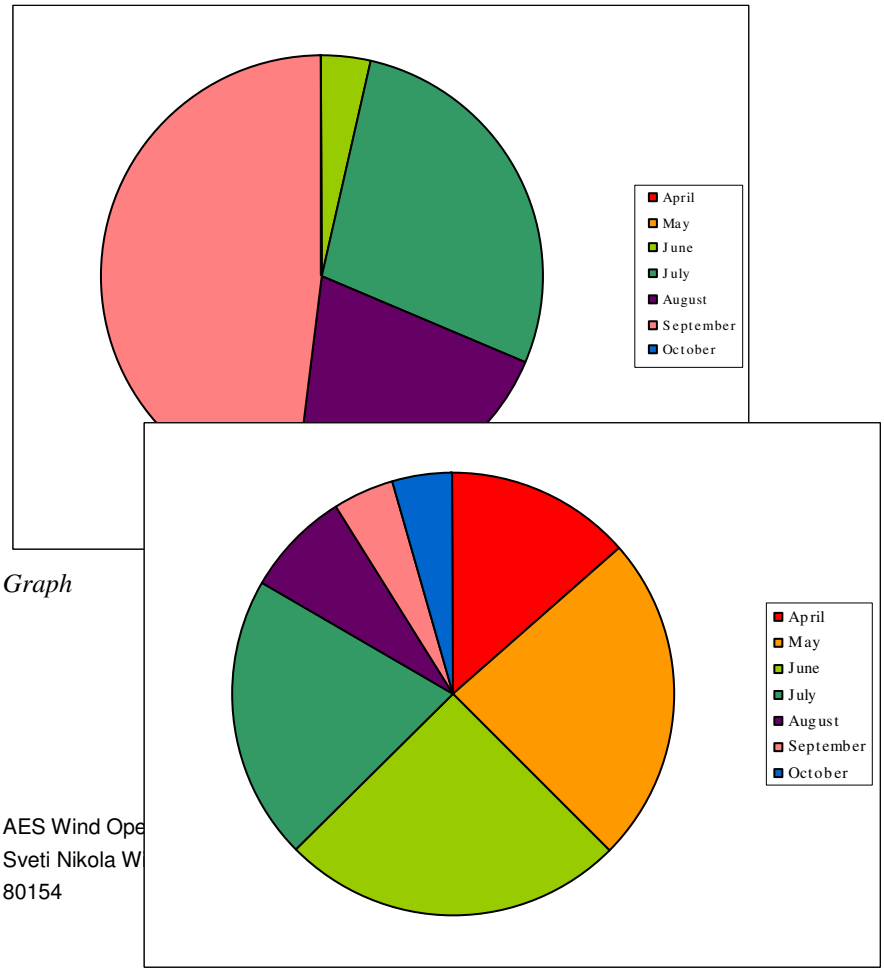
As can be seen from the two graphs above *Eptesicus serotinus* passes recorded between April and October in both 2010 and 2011 are broadly similar. The peaks in 2010 were in July and August. In 2011 the peaks were in July the same as 2010 with the next peak in 2011 being a month later in September.

Graph *13.*



Distribution of passes of Hypsugo savii *recorded from April to October 2010 at and to the north and south of Sveti Nikola Wind Farm (sum of 239 passes).*

Graph 14. Distribution of passes of Hypsugo savii *recorded from April to October 2010 at and to the north and south of Sveti Nikola Wind Farm (sum of 54 passes).*



Graph *15.*

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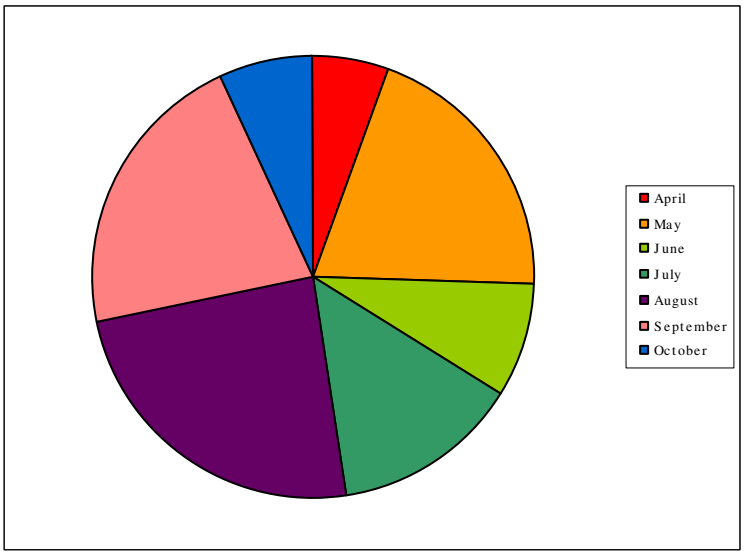
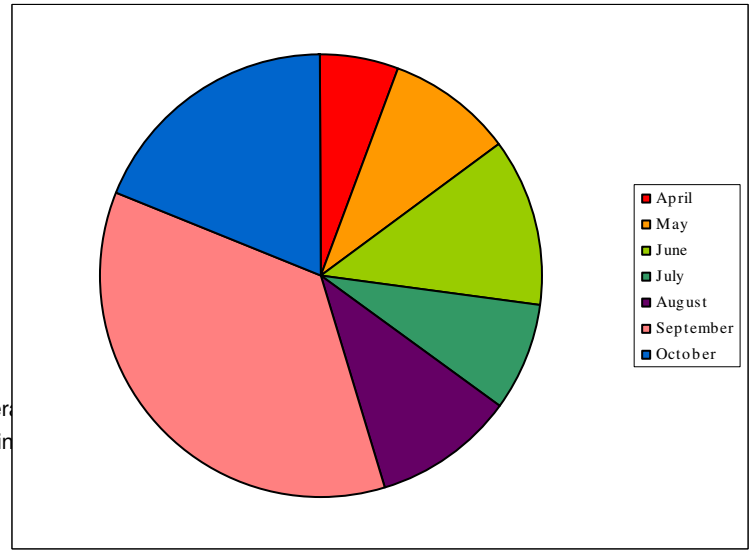
Distribution of passes of Miniopterus schreibersii *recorded from April to October 2010 at and to the north and south of Sveti Nikola Wind Farm (sum of 133 passes).*

Graph 16. Distribution of passes of Miniopterus schreibersii *recorded from April to October 2011 at and to the north and south of Sveti Nikola Wind Farm (sum of 145 passes)*

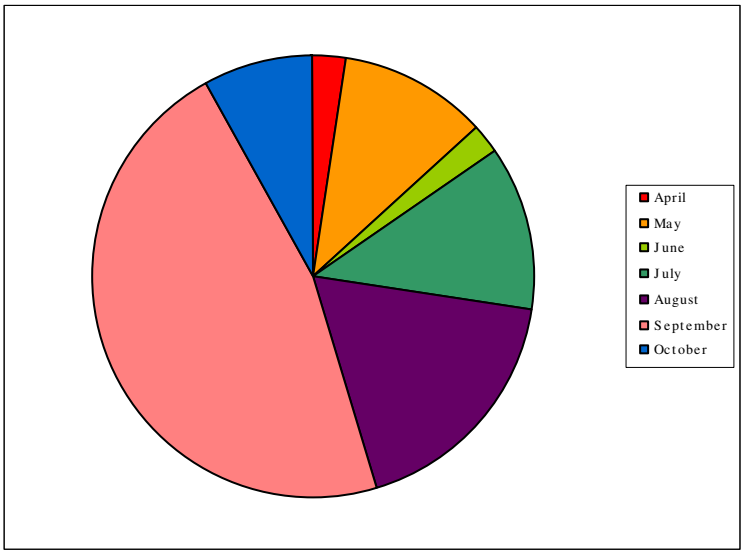


For the three species above, the largest proportion of calls was recorded in June and July in both 2010 and 2011. This may indicate that these bats are breeding in the region.

Graph 17. Distribution of passes of Pipistrellus nathusii *recorded from April to October 2010 at and to the north and south of Sveti Nikola Wind Farm (sum of 522 passes).*



Graph 17. Distribution of passes of Pipistrellus nathusii *recorded from April to October 2010 at and to the north and south of Sveti Nikola Wind Farm (sum of 323 passes).*



The largest proportion of passes of *Pipistrellus nathusii* was recorded in September in both 2010 and 2011. This may indicate that these bats are migrating through the region.

4.2. Bat Surveys at Height

No bat surveys at height were carried out during 2011. This was due to technical issues which are fully explained in the 2010 report. A decision was taken that although bats had been previously recorded flying at hub height during 2009 and 2010.

It was decided that back engineering the microphone positions so that turbine noise could be eliminated or sufficiently reduced was not practical. It was further decided that the car transect surveys and the carcass searching would detect any declines in bat populations at the site and also if bats were impacting with the turbines.

The data retrived in 2009 and 2010 confirms that bats can be recorded at height from within operational wind turbines although the method requires significant refinement.

4.3. Searcher Efficiency Trials

No additional searcher efficiency trials were carried out during 2011 as the searchers employed on the carcass searches were those used during the carcass searches in 2010. The methods used in establishing searcher efficiency are fully detailed in the 2010 report.

4.3. Bat Carcass Search Repetition Rate

A bat carcass search repition rate was calculated during 2010. As the same searchers were employed for 2012 that calculation was carried forward for 2011.

A search interval of 5 days was used as a compromise between the results gained and the effort exerted to gain those results. With this search interval, theoretically 48% of carcasses would be found.

4.4. Bat Carcass Searches

Carcass searches around the turbines was continued throughout 2011 at the search areas at turbines 8, 26, 37, 43 and 46, with a total of 143 searches being made.

A single bat was found during the carcass searches. This was a *Nyctalus noctula* (Noctule) found on 17.08.10 beneath wind turbine T46.

No bat carcasses were found during the carcass searches in 2011. This includes the dedicated bat carcass searches at the five identified turbines and the bird carcass searches made at all turbines throughout 2011.

5. DISCUSSION

5.1. Comparison Between 2009, 2010 and 2011 Car Transect Bat Survey Data

The same diverse range of species was recorded on the transects in 2010 and 2011 as compared to 2009, including the following:

- *Eptesicus serotinus;*
- *Hypsugo savii;*
- *Miniopterus schreibersii;*
- *Myotis* species;
- *Nyctalus noctula;*
- *Pipistrellus nathusii;*
- *P. pipistrellus;*
- *P. pygmaeus;*
- *Rhinolophus ferrumequinum;*
- possibly *Nyctalus leisleri;*
- possibly *Vespertilio murinus; and*
- possibly *Tadarida teniotis*.

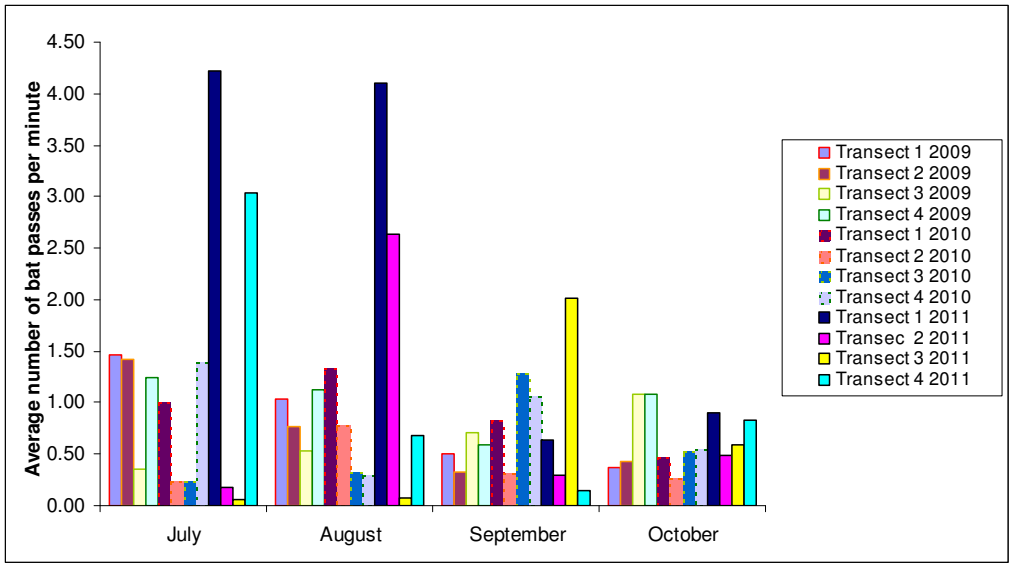
Similar to 2009 and 2010, the species recorded most frequently in 2011 were:

- *Eptesicus serotinus;*
- *Hypsugo savii;*
- *Miniopterus schreibersii;* and
- *Pipistrellus nathusii.*

Again, no more or less species (a measure of diversity) were recorded during the off-site car transects on agricultural land to the north (*Transect 3*) and on agricultural land, steppe grassland, wetland, scrub, trees, caves, cliffs and coastline to the south (*Transect 4*) when compared to the on-site car transects. This confirms that species recorded at the site are still typical of those in the surrounding area.

Graph 18 provides a comparison between the numbers of bat passes recorded per minute (a measure of abundance) in each month, on each transect and in the two years of survey.

Graph 18. Results of car transect surveys in 2009, 2010 and 2011 regarding the rate of bat passes at the four transects.



On *Transect 1* in 2009, the rates of bat passes were at their highest in July, reducing through August, September and October. Pass rate peaked later in 2010, with a higher rate in August than in July and a similar decline (the lines are almost parallel) in September and October. The trend was reversed in 2011 with the pass rate peaking in July with an almost identical peak in August. This was followed by a rapid decrease in the pass rate for September and October.

On *Transect 2* in 2009 a similar pattern was observed to that on *Transect 1* in 2009, with a peak in July followed by a decline through the remaining months (although a slight increase can be observed in October compared to September). Again, as with *Transect 1*, passes peaked later in 2010, with a higher rate in August than in July followed by a decline throughout the remaining months. In 2011 the peak was observed in August with a rapid rise in the number of bat passes. For the months of September and October the pass rate reverted to similar numbers as in 2009 and 2010

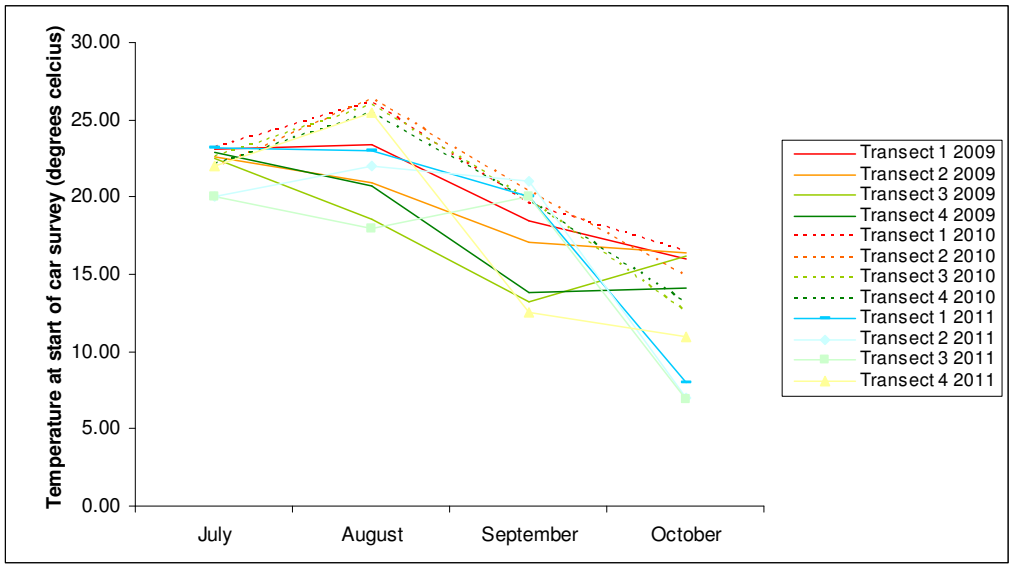
Transect 3 in 2009 showed an increase to a peak in September, followed by a decline in October. On the same transect in 2010, passes gradually rose to a peak in October. During 2011 a progressive increase and peaked in September as it did in 2009, this was also followed by a decline in October.

On *Transect 4* in 2009, the rate of passes dropped from a peak in July to a dip in September and a subsequent rise in October. The pattern is similar in 2011, starting with a peak in July followed by a dip, except that the dip is in August and is followed by a peak in September and another dip in October. In 2011 there was a

dramatic peak in the number of passes with numbers falling substantially during August and September followed by an increase during October.

In general, the rates of bat passes are higher on site (*Transects 1* and *2*) in the summer (during the breeding season) and lower in the autumn (during the migration season) in all years. Average pass rates peak to the north (*Transect 3*) in the autumn and peaks can be seen at the coast (*Transect 4*) in both the summer and the autumn. The patterns in activity are fairly similar year to year, although the summer peak in the on-site transects appears later in 2011 (August) compared to 2009 (July) and a very high peak is then seen in July and August in 2012. The autumn peak in the off-site transects appears earlier in 2010 and 2011 (September) compared to 2009 (October). It is possible that this is related to ambient temperature. *Graph 19*, below, shows temperatures recorded at the start of each car survey.

Graph 19. Temperatures recorded at the start of the car transect surveys in 2009, 2010 and 2011

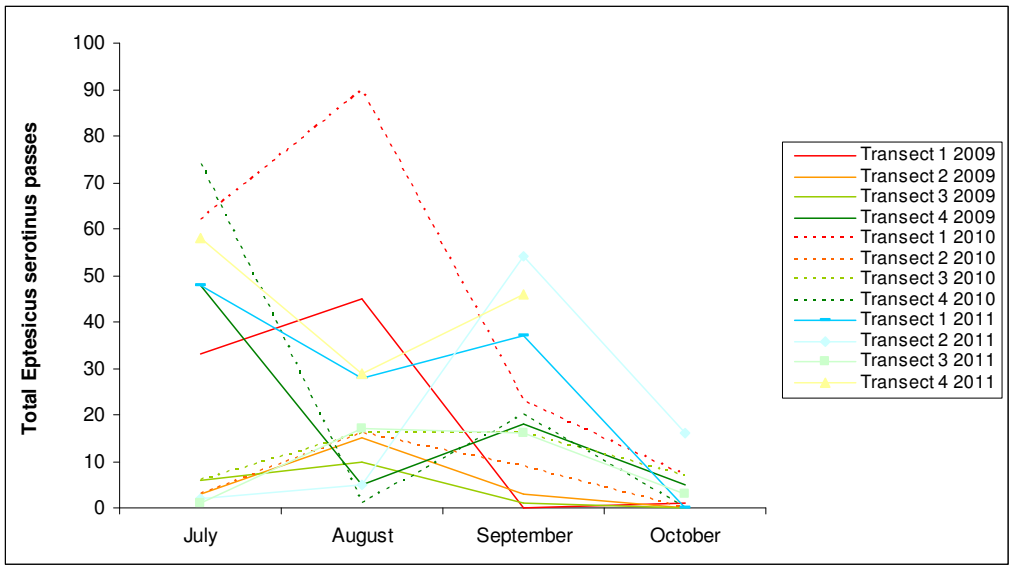


Temperatures in July were fairly similar in all three years but higher in August and September 2010 than in the same months in 2009 and 2011. This may have partly contributed to the differences in peak bat activity between the three years.

In 2011 the temperature in October dropped rapidly to levels well below those recorded in 2009 and 2010. It is likely that the reduction in bat passes recorded for the car transects in October 2011 is as a result of these very low temperatures.

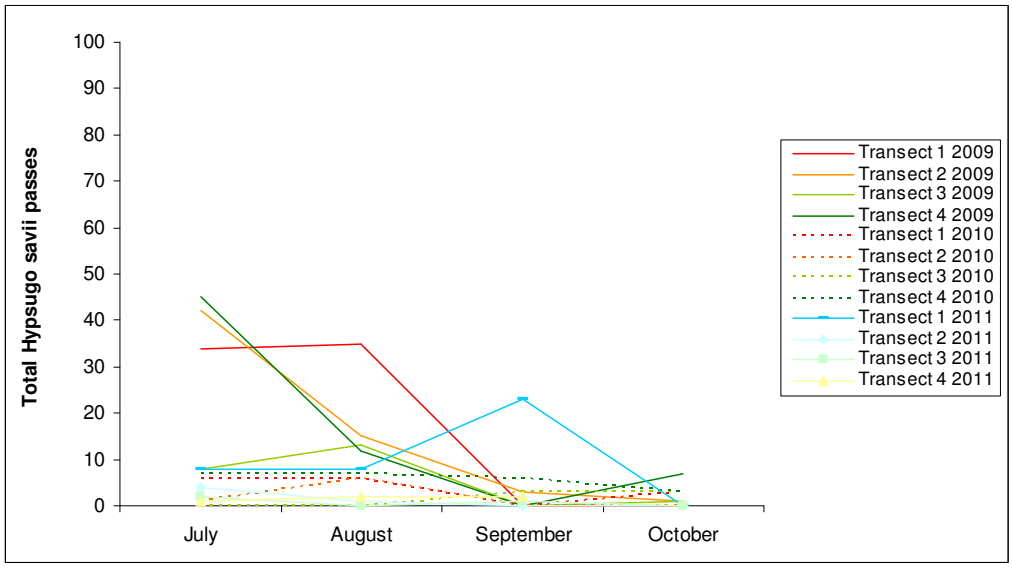
Graphs 20-23, below, enable a comparison of patterns of activity between 2009, 2010 and 2011, for the four most commonly recorded species.

Graph 20. Total Eptesicus serotinus passes recorded on car transect surveys in 2009 and 2011



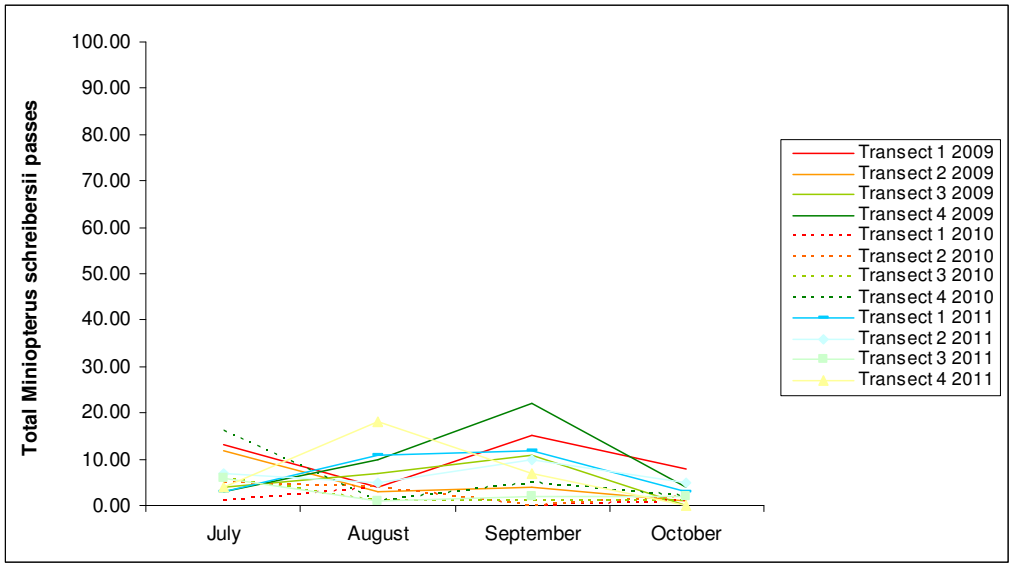
Similar activity patterns can be observed month to month in terms of numbers of *Eptesicus serotinus* passes on each of the transects between all three years (the solid lines and equivalent dashed lines are almost parallel: Graph 20). The most striking difference between the three years is in the number of passes of this species recorded on *Transect 1*; far more were recorded in 2010 than had been recorded in both 2009 and 2011. It is possible that this species has been attracted onto the wind farm in greater numbers due to the wind turbines, although this change could equally be attributed to other factors such as weather conditions or local roost relocations.

Graph 21. Total Hypsugo savii passes recorded on car transect surveys in 2009, 2010 and 2011



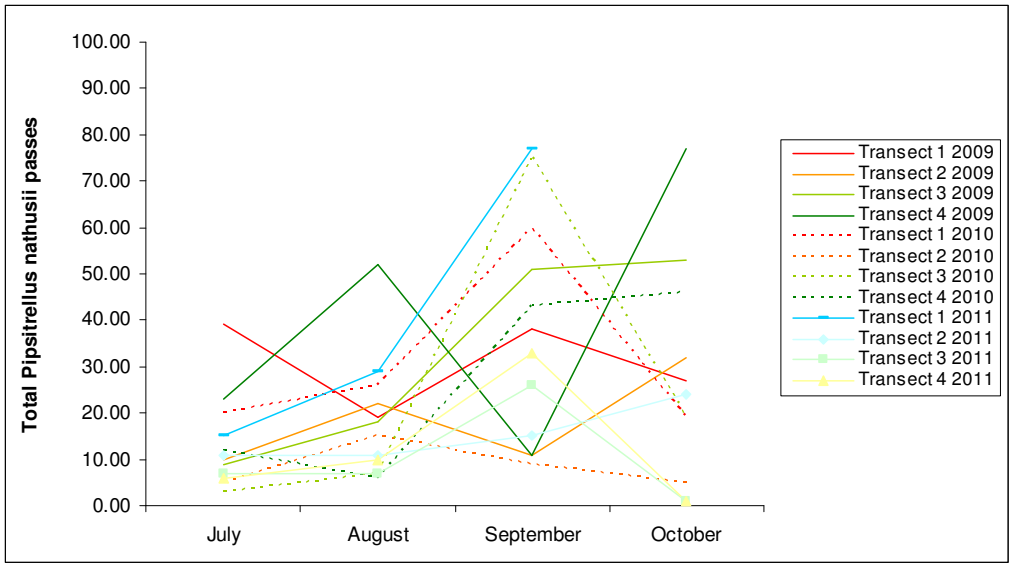
More passes of *Hypsugo savii* were recorded in July and August in 2009 than in both 2010 and 2011; then numbers were fairly similar in September and October (Graph 21). The number of passes during 2010 and 2011 appear very camparable with passes recorded fairly evenly throughout the year except for September 2011 when there is a surge in the numbers of these bats recorded on transect 1. This may be attributable to a number of factors; to the wind farm deterring bats or it could be due to different weather conditions or local roost relocations.

Graph 22. Total Miniopterus schreibersii passes recorded on car transect surveys in 2009, 2010 and 2011



More passes of *Miniopterus schreibersii* were recorded in September and October in 2009 and 2011 than in 2010, but passes were fairly similar between years in July and August (Graph 22). Again, this may be attributed to the wind farm deterring bats or it could be due to different weather conditions or local roost relocations.

Graph 23. Total Pipistrellus nathusii passes recorded on car transect surveys in 2009, 2010 and 2011



The pattern across transects and years is far more complicated for *Pipistrellus nathusii* (Graph 23). Higher passes were recorded on all transects in July 2009 compared to July 2010 and 2011. In August 2009, numbers on *Transects 1, 3,* and *4* were lower in 2009 compared to 2010 (numbers on *Transect 2* were actually higher in 2009 compared to 2010). What is clear, however, is that the autumn peak is earlier in 2010 and 2011 (September) than it was in 2009 (October). As this is likely to relate to migrating bats, it may be due to conditions experienced in the bats' country of origin rather than in Bulgaria.

5.1. Bat Surveys at Height

No data as retrieved during 2011 and without a full set of data during 2010 from the at height surveys it is not possible to draw any conclusions regarding changes in bat behaviour around the moving wind turbines.

5.2. Bat Carcass Searches

With only a single carcass found it is not appropriate to use equations to calculate the actual mortality for the wind farm. The sample size is too low.

Searches have been carried out throughout 2010 and 2011 at five wind turbines, with trials carried out on a further five. Surveyors have also been carrying out bird carcass searches on other plots; no bat carcasses have been found during these surveys.

Hence, these results suggest an extremely low level of mortality of bats at the site.

5.3. Recommendations for Further Bat Monitoring Surveys at Sveti Nikola Wind Farm

The car transect surveys apparently show some clear changes from year to year, with increases in bat activity seen in some species and decreases seen in others. There is, however, no clear overall pattern and therefore it is not possible to rationalise these changes given the data available.

No pre-construction data are available; no data are available from April to June 2009 (during construction) and there are little or no 'at height' data for 2009 and 2010 and none at all from 2011 against which to compare the 'ground level' car transect data.

There are no clear patterns emerging during any of the years during which recordings have been made at Sveti Nicola. Peaks of activity have varied throughout all of the years, and during 2011 numbers of bats recorded are lower overall than for 2009 and 2010.

Regardless, the car transect data should be assessed alongside the other data collected at the site, which suggest that bat mortality is extremely low. Therefore, whether bats are more attracted to the site with wind turbines or not, this does not appear to have caused a marked number of fatalities due to collision or barotraumas.

In the 2010 report it was recommended that if no further bat carcasses (or only small numbers in total) were found in 2011 then these surveys should also cease. This has been the case with only the single carcass found during 2010, and none in 2011. This was a combination of dedicated bat carcass searching at dedicated turbines and also any incidental discoveries of bat carcasses during the search for bird carcases.

The surveys carried out suggest that bat mortality at the Sveti Nikola Wind Farm is insignificant and that the impact of the wind farm on bats is as predicted: insignificant.

6. CONCLUSION

This report provides details of bat surveys undertaken during 2009, 2010 and 2011 at the Sveti Nikola Wind Farm in Kavarna, Bulgaria, on behalf of AES Geo Energy. The surveys were carried out to monitor bat populations at ground level and at height pre- and post operation. The ultimate aim of these surveys (and future surveys) is to meet the commitments made in the EIA report and EMMP (RSK Group, 2008) to carry out bat activity surveys and bat mortality monitoring to establish if the predicted low level of impact was correct.

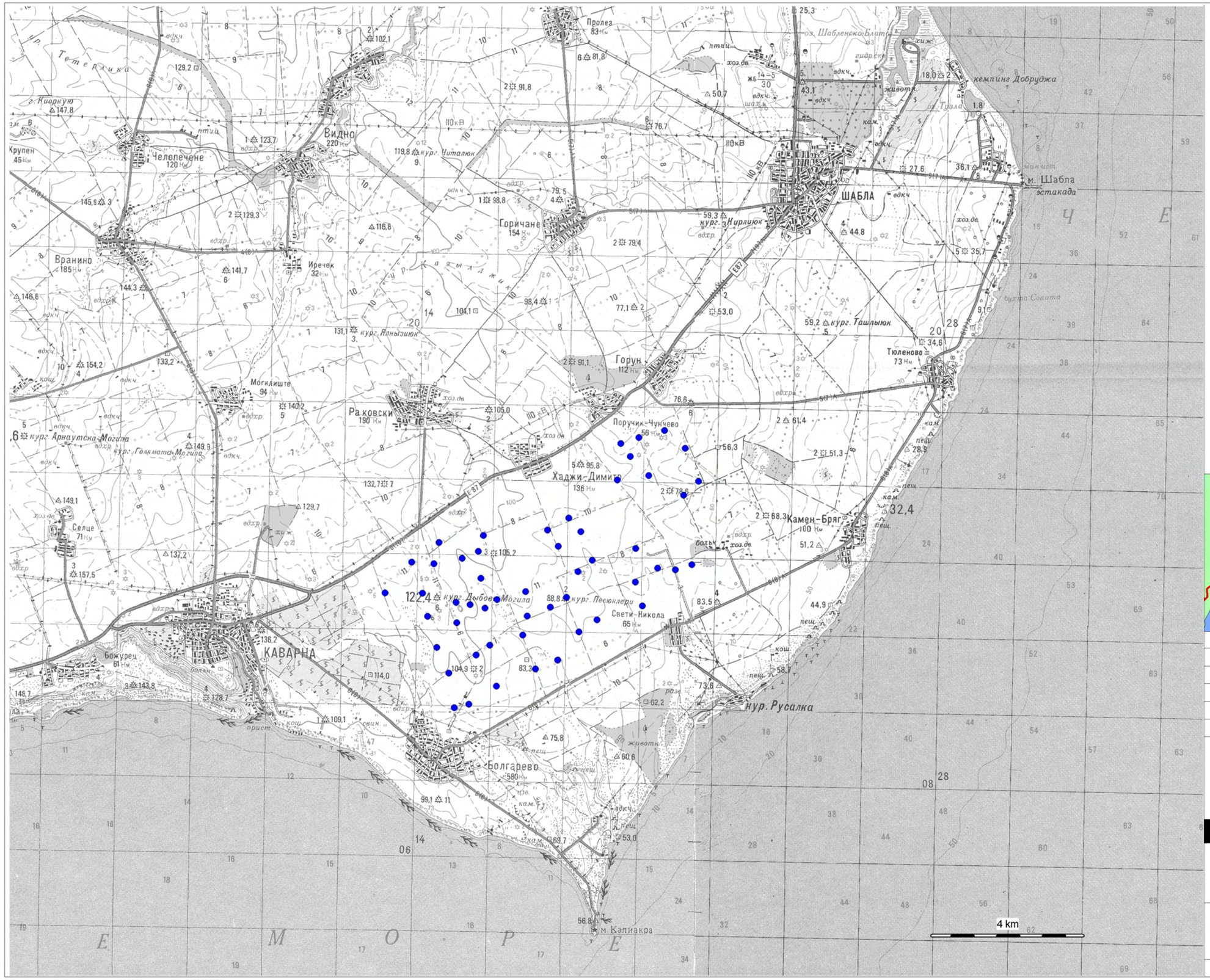
In 2009, ground level car transect surveys were carried out both on-site and off-site (as a control) monthly between July and October. These surveys were repeated in 2010 and 2011 between April and October. Bat detector surveys were carried out at height pre-operation during parts of August, September and October 2009 but practical difficulties associated with noise produced by the nacelles inhibited effective data collection in 2010, and no data collection using this method was carried out in 2011. Late afternoon observations for foraging migrants and night-time thermal infrared camera / acoustic migration surveys were carried out during part of September 2009. Carcass searches (including searcher efficiency and carcass removal trials) were carried out between August and September 2010 and throughout the year in 2011.

The results of the ground level car transect surveys have not shown any clear patterns of change from pre-operation (2009) to during operation (2010 and 2011) other than an overall reduction in detected bat passes during 2011. It is difficult to assess the reasons for this but the weather data where early spring temperatures and late autumn temperatures during 2011 suggests that it may have had an influence.

The results of the 2009 ‘at height’ surveys showed the presence of bat species that could be at risk of collision (or barotraumas) with wind turbine blades *(Pipistrellus pipistrellus* and *Nyctalus noctula);* peaks in activity of these species were observed during the migration season; and some possible observations of migrating bats were seen using the thermal infrared camera.. Although only limited data was collected ‘at height’ during 2009 and 2010 using this method it still demonstrated that species at risk were being recorded close to the nascelles and it is reasonable to assume that bats are probably still flying close to the nascelles.

Only a single *Nyctalus noctula* bat was found dead beneath one of the five turbines searched at the site. No other casualties were found despite continued presence on other turbine plots for trials and bird carcass searches. This suggests an extremely low level of mortality at the site. No bat carcasses were recovered in 2011 either during dedicated bat carcass searches or incidentally during bird carcass searches. Therefore, the surveys should cease as a conclusion can be drawn that the actual impacts of the wind farm on bats from the data that has been gathered are, indeed, as predicted insignificant.

7. FIGURES AND PLATES



Rev	Date	Description	Drn	Chk	App
00	09.02.10	Overview Map	RG	OM	JC

N
W E
S

Kavarna

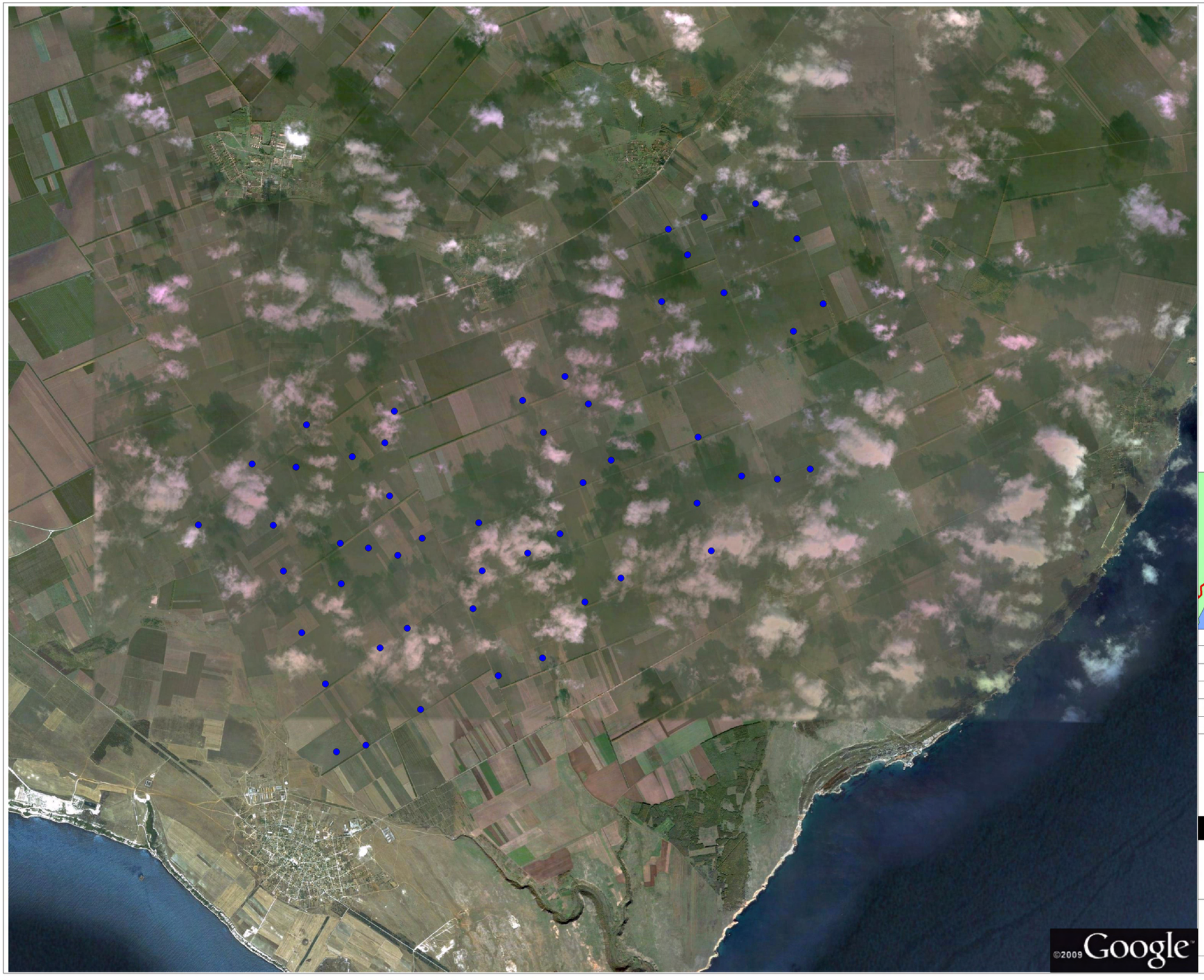
AES Geo Energy

Figure 1

Site location plan

SCALE: 1:100,000 @ A3

FILE NAME: T:\All GIS RSK\801154 - Kavarna\Figure\Final Wksps\Bat\



Wind turbine

00	09.02.10	Overview Map	RG	OM	JC
Rev	Date	Description	Drn	Chk	App

N
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Kavarna

AES Geo Energy

Figure 2

Aerial Photograph of Site

SCALE: 1:50,000 @ A3

FILE NAME: T:\All GIS RSK\80154 - Kavarna\FigureFinal Wksps\Bat\

Transect 1
Transect 2
Transect 3
Transect 4
Wind Turbine

Rev	Date	Description	Drn	Chk	App
00	09.02.10	BS	RG	OM	JC

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Kavarna

AES Geo Energy

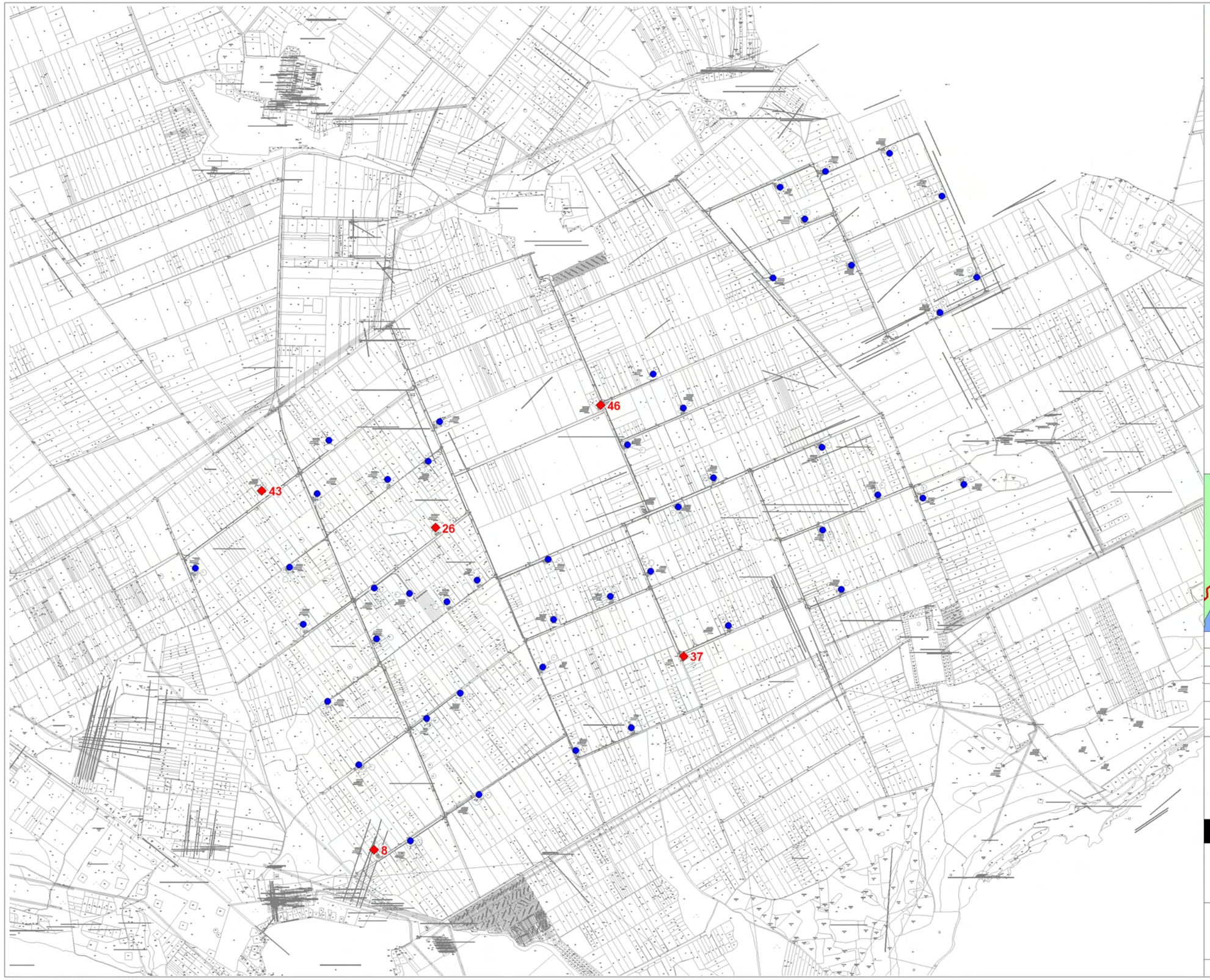
Figure 3

The four car transect routes

SCALE: 1:60,000 @ A3

Basemap provided by Client

FILE NAME: T:\All GIS RSK\801154 - Kavarna\Figure\Final \Wksps\Bat\



Wind turbine

Turbines with Anabat bat detectors

Rev	Date	Description	Drn	Chk	App
00	09.02.10	BS	RG	OM	JC

N
W E
S

Kavarna

AES Geo Energy

Figure 4

Turbines where Anabat bat detectors were erected

SCALE: 1:40,000 @ A3

FILE NAME: T:\All GIS RSK\60154 - Kavarna\Figure\Final Wksps\Batt

8. REFERENCES

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APPENDIX 1. DESCRIPTIONS OF BEAUFORT AND OCTAS SCALES USED FOR WEATHER RECORDING

Beaufort scale:

No.	Description	Effects on land
0	Calm	Smoke rises vertically.
1	Light air	Smoke drifts in the wind.
2	Light breeze	Leaves rustle. Wind felt on face.
3	Gentle breeze	Small twigs in constant motion. Light flags extended.
4	Moderate wind	Dust, leaves and loose paper raised. Small branches move.
5	Fresh wind	Small trees sway.
6	Strong wind	Large branches move. Whistling in phone wires.
7	Very strong wind	Whole trees in motion.
8	Gale	Twigs break off trees. Difficult to walk.
9	Severe gale	Chimney pots and slates removed.
10	Storm	Trees uprooted. Structural damage.
11	Severe storm	Widespread damage. Very rarely experienced on land.

12	Hurricane force	Widespread damage. Very rarely experienced on land.

Octas scale:

No.	Description
0	No cloud cover
1	12.5% cloud cover
2	25% cloud cover
3	37.5% cloud cover
8	100% cloud cover

APPENDIX 2. CAR TRANSECT SURVEY RESULTS APRIL 2011

Below are the detailed sound analysis results from the 2011 car transect surveys. The first column indicates the chunk of time for each recording. Where no bats were recorded those chunks have been removed.

Transect 1: 21.04.11

Chunk	Time (from the start of the snapshot) ms	No. of bats	No. of echolocation calls	No. of social call sequences	Peak frequency (KHz)	Duration (ms)	Suggested species
5	1947	1	1	0	39.7	4.6	Pipistrellus nathusii
	2299	1	1	0	37.9	8.2	Pipistrellus nathusii
	2648	1	1	0	37.3	10.1	Pipistrellus nathusii
17		0	0	0	0	0	No bats
18		0	0	0	0	0	No bats
19	366	1	1	0	52.0	8.5	Miniopterus schreibersii
20		0	0	0	0	0	No bats
21		0	0	0	0	0	No bats

Transect 2: 23.04.10

Chunk	Time (from the start of the	No. of bats	No. of echolocation calls	No. of social call sequences	Peak frequency (KHz)	Duration (ms)	Suggested species

	snapshot) ms						
4	23085	1	1	0	51.5	7.8	Miniopterus schreibersi
5	828	1	2	0	51.5	6.1	Miniopterus schreibersi
10	746	1	2	0	39.7	4.9	Pipistrellus nathusii

Transect 3: 18th April 2011

Chunk (0-5 minutes is chunk 1, 5-10 minutes is chunk 2 and so on)	Time (from the start of the snapshot) ms	No. of bats	No. of echolocation calls	No. of social call sequences	Peak frequency (KHz)	Duration (ms)	Suggested species
0	0	1	1	0	26.0	4.7	Eptesicus serotinus
1	12295	1	1	0	39.7	7.0	Pipistrellus nathusii
4	14497	1	1	0	51.0	11.1	Miniopterus schreibersii
7	22332	1	1	0	57.4	3.4	Pipistrellus pygmaeus
8	21189	1	2	0	50.5	8.9	Miniopterus schreibersii
16	3596	1	3	0	52.5	8.4	Miniopterus schreibersii

Transect 4: 20.04.2011

Chunk (0-5 minutes is chunk 1, 5-10 minutes is chunk 2 and so on)	Time (from the start of the snapshot) ms	No. of bats	No. of echolocation calls	No. of social call sequences	Peak frequency (KHz)	Duration (ms)	Suggested species
1	6126	1	2	0	52.0	7.9	Miniopterus schreibersii
	6834	1	2	0	52.0	8.5	Miniopterus schreibersii
	7534	1	3	0	42.7	7.9	Pipistrellus nathusii
	7889	1	2	0	40.2	7.9	Pipistrellus nathusii
10	22938	1	2	0	0	3.9	Pipistrellus nathusii
	27865	1	1	0	53.4	8.2	Pipistrellus pygmaeus
	28218	1	1	0	53.4	4.0	Pipistrellus pygmaeus
11	2438	1	2	0	44.6	6.9	Pipistrellus pipistrellus
	14404	1	1	0	42.7	5.4	Pipistrellus pipistrellus or Pipistrellus nathusii
	21090	1	1	0	42.7	5.7	Pipistrellus pipistrellus or Pipistrellus nathusii

APPENDIX 3. CAR TRANSECT SURVEY RESULTS MAY 2011

Transect 1: 16.05.11

Chunk No (every chunk is 5 min long)	Time (start from the snapshot) ms	No. of bats	No. of echolocation calls	No. of social call sequencies	Peak frequency (KHz)	Duration (ms)	Suggested species
5	5299	1	3	0	52.1	4.0	Miniopterus schreibersii
	5651	1	4	0	51.2	7.2	Miniopterus schreibersii
	6005	1	2	0	50.2	8.5	Miniopterus schreibersii
	7763	1	3	0	49.2	8.7	Miniopterus schreibersii
	8117	1	2	0	49.3	9.7	Miniopterus schreibersii
	11636	1	1	0	41.4	8.6	Pipistrellus nathusii
	14450	1	3	0	51.8	7.9	Miniopterus schreibersii
6	8383	1	3	0	37.0	7.1	Pipistrellus nathusii
7	10057	1	3	0	51.6	9.3	Miniopterus schreibersii
	12168	1	1	0	41.9	4.2	Pipistrellus nathusii
	12520	1	3	0	41.4	4.8	Pipistrellus nathusii
	12872	1	3	0	41.4	3.9	Pipistrellus nathusii
	13224	1	2	0	42.3	3.8	Pipistrellus nathusii
	13575	1	2	0	42.8	4.6	Pipistrellus nathusii
	14280	1	4	0	42.8	5.8	Pipistrellus nathusii
	14635	1	3	0	40.4	6.1	Pipistrellus nathusii
	14985	1	2	0	40.4	4.8	Pipistrellus nathusii
	22728	1	3	0	51.4	11.1	Miniopterus schreibersii

	23433	1	1	0	50.2	7.7	Miniopterus schreibersii
8	15953	1	1	0	35.5	9.2	Hypsugo savii or Pipistrellus nathusii
	23697	1	2	0	40.4	6.5	Pipistrellus nathusii
	24402	1	1	0	51.6	7.6	Miniopterus schreibersii
9	18333	1	2	0	37.9	6.7	Pipistrellus nathusii
10	11559	1	2	0	40.4	7.0	Pipistrellus nathusii
	12614	1	2	0	38.4	6.1	Pipistrellus nathusii
	13318	1	1	0	40.9	5.4	Pipistrellus nathusii
	22823	1	3	0	42.3	4.2	Pipistrellus nathusii
	23173	1	4	0	43.3	4.5	Pipistrellus pipistrellus or Pipistrellus nathusii
11	10066	1	3	0	53.1	5.7	Miniopterus schreibersii
	10419	1	1	0	49.7	11.5	Miniopterus schreibersii
14	4176	1	4	0	50.7	10.2	Miniopterus schreibersii
17	14479	1	1	0	49.2	10.8	Miniopterus schreibersii
18	8062	1	4	0	51.8	9.0	Miniopterus schreibersii
	8412	1	3	0	49.7	10.3	Miniopterus schreibersii
	8764	1	2	0	49.2	7.9	Miniopterus schreibersii

Transect 2: 14.05.10

Chunk	Time (from the start of the snapshot) ms	No. of bats	No. of echolocation calls	No. of social call sequences	Peak frequency (KHz)	Duration (ms)	Suggested species
1	29644	1	2	0	40.9	4.9	Pipistrellus nathusii
5	28950	1	2	0	30.4	6.5	Pipistrellus nathusii
	29300	1	2	0	39.9	7.5	Pipistrellus nathusii

	29654	1	2	0	38.9	8.8	Pipistrellus nathusii
6	10562	1	2	0	40.4	6.5	Pipistrellus nathusii
7	3088	1	2	0	50.2	10.7	Miniopterus schreibersii
	4494	1	2	0	36.5	9.5	Pipistrellus nathusii
	17516	1	3	0	52.1	10.1	Miniopterus schreibersii
	17869	1	2	0	49.2	8.7	Miniopterus schreibersii
	19980	1	1	0	50.7	10.7	Miniopterus schreibersii
	23852	1	4	0	51.6	11.3	Miniopterus schreibersi
	27018	1	2	0	40.4	6.9	Pipistrellus nathusii
9	1507	1	1	0	20.8	5.1	Nyctalus noctula
	1859	1	2	0	22.8	8.8	Nyctalus noctula
	2213	1	1	0	22.8	7.9	Nyctalus noctula
10	3532	1	2	0	39.9	7.4	Pipistrellus nathusii
	3886	1	3	0	41.4	3.9	Pipistrellus nathusii
13	16300	1	2	0	38.4	6.7	Pipistrellus nathusii
	16650	1	2	0	39.4	5.5	Pipistrellus nathusii
	17004	1	2	0	38.4	7.4	Pipistrellus nathusii
	17356	1	2	0	37.9	7.4	Pipistrellus nathusii
	18763	2	7	0	49.2	8.4	Miniopterus schreibersi
					52.1	7.5	Miniopterus schreibersi
	19819	1	4	0	50.7	10.1	Miniopterus schreibersi
14	24662	1	2	0	50.7	7.3	Miniopterus schreibersi
17	15958	1	2	0	50.7	7.3	Miniopterus schreibersii
18	18689	1	2	0	40.4	5.8	Pipistrellus nathusii
19		0	0	0	0	0	No bats
	648000	1	1	0	47.6	7.5	Pipistrellus pipistrellus

Transect 3:15.05.10

Chunk No (every chunk is 5 min long)	Time (start from the snapshot) ms	No. of bats	No. of echolocation calls	No. of social call sequencies	Peak frequency (KHz)	Duration (ms)	Suggested species
0							no bats
1	3260	1	3	0	52.6	4.1	Miniopterus schreibersii
4	12148	1	1	0	48.5	9.5	Pipistrellus pipistrellus
10	11626	1	2	0	35.5	5.6	Myotis sp.
	17257	1	1	0	23.3	14.0	Nyctalus leisleri or Vespertilio murinus or Eptesicus serotinus
11	12948	1	1	0	36.5	8.0	Pipistrellus nathusii
	21744	1	2	0	47.2	3.6	Myotis sp. 45 KHz Phonetic type
12	24826	1	2	0	27.2	8.0	Eptesicus serotinus
13	78430	1	1	0	26.7	4.8	Eptesicus serotinus
	8126	1	1	0	27.7	7.6	Eptesicus serotinus
	8549	1	1	0	27.2	6.5	Eptesicus serotinus
	8900	1	1	0	24.7	11.6	Eptesicus serotinus
	9603	1	1	0	24.2	11.2	Eptesicus serotinus
	9955	2	2	0	37.4	7.8	Pipistrellus nathusii
					25.2	12.8	Eptesicus serotinus
	10308	2	3	0	35.0	8.9	Pipistrellus nathusii
					25.7	11.4	Eptesicus serotinus
	10659	1	2	0	27.2	7.1	Eptesicus serotinus
	11364	1	1	0	25.7	10.4	Eptesicus serotinus
	16642	1	2	0	26.7	9.3	Eptesicus serotinus
	16994	1	1	0	27.7	7.5	Eptesicus serotinus
14	27817	1	2	0	39.4	6.2	Pipistrellus nathusii
18	2127	1	4	0	44.8	2.9	Myotis 45 KHz Phonetic type

Transect 4: 18.05.10

Chunk No (every chunk is 5 min long)	Time (start from the snapshot) ms	No. of bats	No. of echolocation calls	No. of social call sequencies	Peak frequency (KHz)	Duration (ms)	Suggested species
3	17669	1	2	0	26.5	12.4	Eptesicus serotinus
	18022	1	2	0	26.0	8.2	Eptesicus serotinus
9	23822	1	2	0	50.5	8.5	Miniopterus schreibersii

APPENDIX 4. CAR TRANSECT SURVEY RESULTS JUNE 2011

Transect 1: 13.06.2011

Chunk	Time (from the start of the snapshot) ms	No. of bats	No. of echolocation calls	No. of social call sequences	Peak frequency (KHz)	Duration (ms)	Suggested species
3	24398	1	2	0	33.5	10.3	Hypsugo savii
	24746	1	2	0	33.5	11.3	Hypsugo savii
	25100	1	2	0	33.5	9.3	Hypsugo savii
	25452	1	1	0	33.0	11.5	Hypsugo savii
5	9792	1	3	0	50.2	11.2	Miniopterus schreibersii
6	3014	1	1	0	51.2	8.9	Miniopterus schreibersii
9	4513	1	1	0	33.5	12.2	Hypsugo savii
	4866	1	1	0	34.5	10.5	Hypsugo savii
	5215	1	1	0	34.5	11.5	Hypsugo savii
	5570	1	3	0	34.6	9.8	Hypsugo savii
10	8649	1	1	0	24.2	17.1	Eptesicus serotinus
	14632	1	2	0	25.2	10.7	Eptesicus serotinus
	14983	1	2	0	25.7	10.1	Eptesicus serotinus
	15336	1	1	0	24.2	12.3	Eptesicus serotinus
	15687	1	1	0	27.2	12.8	Eptesicus serotinus
	16042	1	1	0	24.7	9.4	Eptesicus serotinus
	16392	1	1	0	24.7	10.8	Eptesicus serotinus
	16745	1	1	0	25.2	11.2	Eptesicus serotinus
	17445	1	2	0	25.2	9.0	Eptesicus serotinus

	17801	1	2	0	25.7	17.7	Eptesicus serotinus
	18150	1	1	0	23.3	14.3	Eptesicus serotinus
	18505	1	1	0	23.3	12.3	Eptesicus serotinus
	22374	1	3	0	49.2	5.1	Myotis sp. 45 KHz Phonetic type
11	1170	1	1	0	51.2	10.2	Miniopterus schreibersii
	1524	1	1	0	49.7	10.2	Miniopterus schreibersii
	7155	1	2	0	51.6	7.3	Miniopterus schreibersii
	7857	1	1	0	49.7	7.2	Miniopterus schreibersii
	8564	1	1	0	50.7	7.5	Miniopterus schreibersii
12	15514	1	2	0	34.5	9.7	Hypsugo savii
	15866	1	2	0	33.4	11.8	Hypsugo savii
	25017	1	3	0	36.5	7.4	Hypsugo savii
	25387	1	3	0	34.0	9.8	Hypsugo savii
	28184	1	3	0	38.9	6.3	Pipistrellus nathusii
	28538	2	5	0	38.0	10.2	Pipistrellus nathusii
					37.9	7.2	Pipistrellus nathusii
13	642	1	1	0	39.9	4.8	Pipistrellus nathusii
	993	2	3	0	35.5	10.9	Hypsugo savii or Pipistrellus nathusii
					37.9	7.7	Pipistrellus nathusii
	1698	1	1	0	37.0	7.4	Pipistrellus nathusii
	2402	1	2	0	34.5	8.3	Hypsugo savii or Pipistrellus nathusii
	3107	1	2	0	35.0	6.8	Hypsugo savii or Pipistrellus nathusii
	3458	1	1	0	33.5	9.2	Hypsugo savii
	3810	1	2	0	37.0	9.6	Pipistrellus nathusii
	4162	1	1	0	35.0	7.5	Hypsugo savii or Pipistrellus nathusii
	4512	1	1	0	35.0	7.5	Hypsugo savii or Pipistrellus nathusii
	5220	1	1	0	36.5	8.2	Hypsugo savii or Pipistrellus nathusii
	8385	2	3	0	37.0	8.1	Pipistrellus nathusii

					37.9	9.5	Pipistrellus nathusii
	8739	3	3	0	38.4	6.7	Pipistrellus nathusii
					36.0	8.6	Hypsugo savii or Pipistrellus nathusii
					36.0	7.2	Hypsugo savii or Pipistrellus nathusii
	10498	2	3	0	37.9	6.9	Pipistrellus nathusii
					35.5	10.2	Hypsugo savii or Pipistrellus nathusii
	10849	1	1	0	34.5	7.5	Hypsugo savii or Pipistrellus nathusii
	12962	1	1	0	37.8	7.8	Pipistrellus nathusii
	14370	1	2	0	39.4	11.3	Pipistrellus nathusii
	16482	1	2	0	34.5	10.0	Hypsugo savii or Pipistrellus nathusii
	16834	1	1	0	34.5	9.4	Hypsugo savii or Pipistrellus nathusii
	20705	2	5	0	38.9	6.4	Pipistrellus nathusii
					37.0	6.9	Pipistrellus nathusii
	21056	2	3	0	35.5	7.6	Hypsugo savii or Pipistrellus nathusii
					37.0	9.3	Pipistrellus nathusii
	23872	1	2	0	37.4	7.5	Pipistrellus nathusii
	24224	1	1	0	37.0	9.6	Pipistrellus nathusii
	24578	2	2	0	26.7	15.0	Eptesicus serotinus
					35.5	8.8	Hypsugo savii or Pipistrellus nathusii
	24929	1	1	0	25.2	11.5	Eptesicus serotinus
	26686	1	1	0	36.0	10.7	Hypsugo savii or Pipistrellus nathusii
	27041	1	2	0	35.0	9.2	Hypsugo savii or Pipistrellus nathusii
	27392	1	2	0	35.0	9.0	Hypsugo savii or Pipistrellus nathusii
14	6541	1	2	0	24.2	16.3	Eptesicus serotinus
	6889	2	3	0	26.2	15.8	Eptesicus serotinus
					31.6	5.8	undetermined
	7243	1	1	0	23.8	16.9	Eptesicus serotinus
	7595	1	1	0	25.2	15.0	Eptesicus serotinus

	16043	1	7	0	45.3	5.3	Myotis sp. 45 KHz Phonetic type
	16394	1	2	0	39.9	4.8	Myotis sp. 45 KHz Phonetic type
	21320	1	1	0	36.0	9.7	Hypsugo savii or Pipistrellus nathusii
	21671	1	1	0	35.0	11.7	Hypsugo savii or Pipistrellus nathusii
	22025	1	2	0	36.5	10.1	Hypsugo savii or Pipistrellus nathusii
15	469	1	1	0	27.2	7.0	Eptesicus serotinus
	820	2	4	0	26.2	12.8	Eptesicus serotinus
					52.6	8.7	Miniopterus schreibersii
	1525	1	2	0	25.2	8.2	Eptesicus serotinus
	3987	1	2	0	36.0	12.9	Hypsugo savii or Pipistrellus nathusii
	4339	2	3	0	35.5	10.7	Hypsugo savii or Pipistrellus nathusii
					35.0	13.4	Hypsugo savii or Pipistrellus nathusii
	4692	1	1	0	35.5	9.1	Hypsugo savii or Pipistrellus nathusii
	8564	1	1	0	35.5	10.5	Hypsugo savii or Pipistrellus nathusii
	8916	1	1	0	26.2	9.0	Eptesicus serotinus
	9268	1	1	0	24.7	18.4	Eptesicus serotinus
	9617	1	1	0	25.7	13.8	Eptesicus serotinus
	9972	1	2	0	25.7	10.2	Eptesicus serotinus
	10324	1	1	0	25.7	15.2	Eptesicus serotinus
	10674	2	2	0	35.0	10.6	Hypsugo savii or Pipistrellus nathusii
					24.7	9.8	Eptesicus serotinus
	18416	1	1	0	44.8	3.1	Myotis sp. 45 KHz Phonetic type
16	2491	1	1	0	33.0	15.3	Hypsugo savii
	11641	1	3	0	41.4	5.7	Myotis sp. 45 KHz Phonetic type
	11996	1	2	0	40.9	5.2	Myotis sp. 45 KHz Phonetic type

Transect 2: 14.06.11

Chunk No (every chunk is 5 min long)	Time (start from the snapshot) ms	No. of bats	No. of echolocation calls	No. of social call sequencies	Peak frequency (KHz)	Duration (ms)	Suggested species
4	6402	1	2	0	34.0	12.3	Hypsugo savii
5	24973	1	2	0	26.7	9.3	Eptesicus serotinus
	25326	1	2	0	24.5	11.8	Eptesicus serotinus
8	22960	1	3	0	49.3	8.9	Miniopterus schreibersii
	25774	1	3	0	50.2	7.3	Miniopterus schreibersii
9	2109	1	2	0	54.8	3.1	Pipistrellus pygmaeus or Miniopterus schreibersii
10	29125	1	2	0	52.4	9.0	Miniopterus schreibersii
12	8541	1	1	0	26.2	12.1	Eptesicus serotinus
	8895	1	1	0	23.8	16.0	undetermined
	9247	1	2	0	23.3	11.6	Undetermined

Transect 3: 15.06.11

Chunk No (every chunk is 5 min long)	Time (start from the snapshot) ms	No. of bats	No. of echolocation calls	No. of social call sequencies	Peak frequency (KHz)	Duration (ms)	Suggested species
8	27218	1	1	0	26.2	13.3	Eptesicus serotinus
	27570	1	1	0	24.7	14.9	Eptesicus serotinus
9	15868	1	2	0	24.2	13.7	Eptesicus serotinus
	16220	1	1	0	27.2	11.9	Eptesicus serotinus
10	10853	2	3	0	50.2	8.4	Miniopterus schreibersii

					51.8	8.1	Miniopterus schreibersii
	11203	1	3	0	49.2	9.5	Miniopterus schreibersii
	22467	1	3	0	49.7	9.8	Miniopterus schreibersii
	22816	1	4	0	53.1	9.3	Miniopterus schreibersii
11	4075	1	3	0	40.9	7.1	Pipistrellus nathusii
12	6450	1	3	0	50.7	9.3	Miniopterus schreibersii
14	15778	1	1	0	52.1	7.2	Miniopterus schreibersii
	20350	1	2	0	23.8	14.9	Eptesicus serotinus
	20703	1	1	0	25.7	13.5	Eptesicus serotinus
	21054	1	2	0	25.2	11.3	Eptesicus serotinus
	23520	1					undetermined
	26688	1	1	0	25.7	9.6	Eptesicus serotinus
	27040	1	1	0	25.2	9.8	Eptesicus serotinus
	27392	1	1	0	25.2	15.3	Eptesicus serotinus
	27743	1	2	0	25.7	14.3	Eptesicus serotinus
	28096	1	1	0	24.7	14.9	Eptesicus serotinus
	28447	1	1	0	25.2	12.8	Eptesicus serotinus
	28798	1	1	0	25.2	12.8	Eptesicus serotinus
	29151	1	1	0	25.2	9.4	Eptesicus serotinus
15	1258	1	2	0	26.6	9.8	Eptesicus serotinus
	1611	1	2	0	27.2	15.8	Eptesicus serotinus
	3373	1	2	0	25.7	12.3	Eptesicus serotinus
	3721	1	17	0			undetermined
	4073	1	3	0	29.1	5.7	Eptesicus serotinus
16	18064	1	1	0	24.2	12.7	Eptesicus serotinus
17	5655	1	1	0	26.2	13.8	Eptesicus serotinus
18	24926	1	2	0	35.0	11.7	Hypsugo savii or Pipistrellus nathusii
19	12165	1	3	0	25.7	10.4	Eptesicus serotinus

	12519	1	2	0	24.0	11.0	Eptesicus serotinus
	12869	1	2	0	24.2	9.6	Eptesicus serotinus
	13221	1	3	0	25.2	9.2	Eptesicus serotinus
	13575	1	2	0	24.7	10.3	Eptesicus serotinus
20	11022	1	2	0	38.4	8.9	Pipistrellus nathusii
	11374	1	3	0	38.4	10.4	Pipistrellus nathusii
	11726	1	1	0	37.9	8.1	Pipistrellus nathusii

Transect 4: 18.06.10

Chunk No (every chunk is 5 min long)	**Time (start from the snapshot) ms**	**No. of bats**	**No. of echolocation calls**	**No. of social call sequencies**	**Peak frequency (KHz)**	**Duration (ms)**	**Suggested species**
0	10974	1	1	0	39.9	4.5	Pipistrellus nathusii
	24348	1	1	0	22.8	15.9	Vespertilio murinus or Nyctalus leisleri or Nyctalus noctula
1	14058	1	2	0	25.7	10.8	Eptesicus serotinus
	14410	1	3	0	26.2	12.4	Eptesicus serotinus
	15114	1	1	0	26.7	8.7	Eptesicus serotinus
	15465	1	2	0	26.2	9.2	Eptesicus serotinus
	16167	1	2	0	26.7	9.6	Eptesicus serotinus
	16520	1	1	0	25.2	9.3	Eptesicus serotinus
	16873	1	1	0	19.8	14.2	Nyctalus noctula
2	20011	1	2	0	34.5	13.1	Hypsugo savii
	21364	1	2	0	34.5	11.9	Hypsugo savii
	21714	1	1	0	34.5	11.6	Hypsugo savii
	23121	1	1	0	33.0	13.5	Hypsugo savii

	23475	1	2	0	32.9	17.1	Hypsugo savii
	23825	1	1	0	32.1	10.3	Hypsugo savii
4	13801	1	2	0	25.7	10.2	Eptesicus serotinus
	14154	1	3	0	27.2	8.6	Eptesicus serotinus
	14506	1	1	0	24.7	11.1	Eptesicus serotinus
5	5269	1	2	0	32.6	19.0	Hypsugo savii
	5622	1	2	0	32.1	20.0	Hypsugo savii
	9492	2	7	0	38.4	7.5	Pipistrellus nathusii
					35.5	8.7	Pipistrellus nathusii
	20755	1	1	0	36.0	11.3	Pipistrellus nathusii
	21106	1	2	0	36.5	12.9	Pipistrellus nathusii
	24978	1	1	0	33.0	13.9	Hypsugo savii
	25330	1	1	0	32.6	13.6	Hypsugo savii
	25683	1	1	0	33.5	14.5	Hypsugo savii
	26035	1	2	0	32.6	16.1	Hypsugo savii
6	13983	1	2	0	39.4	6.8	Pipistrellus nathusii
	17855	1	2	0	27.7	9.5	Eptesicus serotinus
	18205	1	2	0	27.2	9.3	Eptesicus serotinus
	18559	1	1	0	28.1	10.4	Eptesicus serotinus
	18912	1	3	0	27.2	10.5	Eptesicus serotinus
	23839	1	2	0	34.5	9.2	Hypsugo savii
7	17418	1	1	0	35.5	11.3	Pipistrellus nathusii or Hypsugo savii
	25513	1	3	0	50.7	7.8	Miniopterus schreibersii
	25864	1	2	0	50.7	7.7	Miniopterus schreibersii
	27271	1	12	0			undetermined
	27623	1	2	0	34.0	9.5	Hypsugo savii
	27975	1	2	0	34.0	13.5	Hypsugo savii
	28327	1	1	0	32.6	12.2	Hypsugo savii

	28680	1	2	0	33.5	10.6	Hypsugo savii
	29032	1	6	0			undetermined
	29383	1	1	0	32.6	13.5	Hypsugo savii
	29737	1	2	0	34.5	12.3	Hypsugo savii
8	87	1	2	0	33.0	13.2	Hypsugo savii
	437	1	2	0	33.0	14.3	Hypsugo savii
	1142	1	1	0	33.0	11.3	Hypsugo savii
	1495	1	3	0	34.5	6.7	Hypsugo savii
	1847	1	1	0	33.5	11.1	Hypsugo savii
	2199	1	2	0	32.6	12.6	Hypsugo savii
	4311	1	2	0	51.2	9.1	Miniopterus schreibersii
	4662	1	1	0	51.2	6.4	Miniopterus schreibersii
	28947	1	3	0	50.2	9.9	Miniopterus schreibersii
	29298	1	1	0	50.2	7.9	Miniopterus schreibersii
9	11617	1	1	0	27.7	11.7	Eptesicus serotinus
	11967	1	2	0	24.7	10.7	Eptesicus serotinus
10	25256	1	2	0	32.6	10.7	Hypsugo savii
	25607	1	2	0	32.1	14.1	Hypsugo savii
	29479	1	2	0	37.9	9.5	Pipistrellus nathusii
11	4405	1	1	0	34.0	13.8	Hypsugo savii
	18132	1	3	0	27.7	10.3	Eptesicus serotinus
	18483	2	6	0	28.6	12.7	Eptesicus serotinus
					26.2	16.4	Eptesicus serotinus
	18838	1	2	0	27.2	9.7	Eptesicus serotinus
	19539	1	2	0	25.7	9.8	Eptesicus serotinus
	22707	1	1	0	27.2	9.1	Eptesicus serotinus
	23060	1	2	0	27.2	4.9	Eptesicus serotinus
	23412	1	1	0	26.2	6.7	Eptesicus serotinus

12	6080	1	2	0	27.2	13.9	Eptesicus serotinus
	6435	1	1	0	26.9	18.1	Eptesicus serotinus
	6783	1	1	0	24.2	11.2	Eptesicus serotinus
13	29576	1	2	0	32.1	5.1	Myotis myotis/blythii
14	15413	1	1	0	23.8	11.2	Vespertilio murinus or Nyctalus leisleri or Nyctalus noctula
	15765	1	1	0	24.2	10.2	Vespertilio murinus or Nyctalus leisleri or Nyctalus noctula
	18933	1	2	0	24.2	10.2	Vespertilio murinus or Nyctalus leisleri or Nyctalus noctula
	22452	1	2	0	25.2	11.5	Eptesicus serotinus
	23155	1	1	0	28.1	7.4	Eptesicus serotinus
	23509	1	2	0	26.7	10.1	Eptesicus serotinus
	23859	1	1	0	27.2	10.0	Eptesicus serotinus
	24213	1	2	0	29.6	9.1	Eptesicus serotinus
	24564	1	3	0	27.7	9.7	Eptesicus serotinus
	24916	1	1	0	32.1	6.3	Eptesicus serotinus
	25266	1	1	0	25.7	11.6	Eptesicus serotinus
	25620	1	1	0	30.1	6.7	Eptesicus serotinus
	25971	1	1	0	26.2	12.1	Eptesicus serotinus
	27379	1	1	0	40.4	8.2	Pipistrellus nathusii
15	13216	1	3	0	37.0	9.9	Pipistrellus nathusii
	14624	1	1	0	24.7	8.9	Eptesicus serotinus
	14976	1	3	0	25.2	13.6	Eptesicus serotinus
	15327	1	2	0	26.2	10.4	Eptesicus serotinus
	15679	1	2	0	24.9	14.0	Eptesicus serotinus
	16030	1	1	0	24.7	14.0	Eptesicus serotinus
	16384	1	2	0	24.2	15.9	Eptesicus serotinus
16	9259	1	2	0	40.9	5.0	Pipistrellus nathusii
19	3372	1	4	0	50.2	9.6	Miniopterus schreibersii
	13579	1	2	0	34.0	5.8	Myotis myotis/blythii

APPENDIX 5. CAR TRANSECT SURVEY RESULTS JULY 2011

Transect 1:14.07.10

Chunk	Time (from the start of the snapshot) ms	No. of bats	No. of echolocation calls	No. of social call sequences	Peak frequency (KHz)	Duration (ms)	Suggested species
0	2458	1	3	0	29.1	6.5	Eptesicus serotinus
	2809	1	2	0	30.6	7.5	Eptesicus serotinus
	7386	1	3	0	42.4	3.9	Pipistrellus nathusii
2	2285	1	1	0	28.1	6.0	Eptesicus serotinus
	2636	2	2	0	26.2	10.9	Eptesicus serotinus
					41.4	6.0	Pipistrellus nathusii
	7211	1	4	0	36.1	9.1	Pipistrellus nathusii
	9675	1	1	0	41.4	6.3	Pipistrellus nathusii
	11435	1	3	0	37.0	8.8	Pipistrellus nathusii
	11787	2	5	0	34.8	10.2	Hypsugo savii
					34.0	10.7	Hypsugo savii
	19531	1	3	0	34.0	10.4	Hypsugo savii
	25162	2	7	0	42.3	3.8	Pipistrellus nathusii
					46.2	4.5	Pipistrellus pipistrellus
	25515	2	6	0	40.9	6.4	Pipistrellus nathusii
					37.4	5.6	Pipistrellus nathusii
	25865	2	8	0	42.8	4.3	Pipistrellus nathusii
					37.4	5.7	Pipistrellus nathusii
	26218	1	4	0	34.0	10.9	Hypsugo savii

3	10643	1	1	0	37.4	7.0	Pipistrellus nathusii
	10997	1	3	0	36.5	10.7	Pipistrellus nathusii
	11350	1	3	0	37.0	10.7	Pipistrellus nathusii
	11701	1	1	0	35.0	9.3	Pipistrellus nathusii or Hypsugo savii
	15571	1	2	0	27.2	9.1	Eptesicus serotinus
	15924	1	1	0	29.1	8.0	Eptesicus serotinus
	16275	1	2	0	27.7	5.9	Eptesicus serotinus
	22612	1	2	0	27.2	12.3	Eptesicus serotinus
	22963	1	2	0	26.7	11.9	Eptesicus serotinus
	23317	1	2	0	26.2	13.4	Eptesicus serotinus
	23668	1	3	0	27.2	12.1	Eptesicus serotinus
5	17157	1	3	0	28.1	10.2	Eptesicus serotinus
	17509	1	2	0	27.2	11.5	Eptesicus serotinus
	17862	1	2	0	27.2	12.9	Eptesicus serotinus
	18215	1	3	0	29.6	10.4	Eptesicus serotinus
	18565	1	3	0	27.2	10.0	Eptesicus serotinus
	21030	1	1	0	29.6	4.9	Eptesicus serotinus
6	11791	1	2	0	27.7	10.6	Eptesicus serotinus
	12143	1	2	0	28.6	10.7	Eptesicus serotinus
	12495	1	3	0	28.1	12.0	Eptesicus serotinus
	12847	1	2	0	30.6	6.7	Eptesicus serotinus
7	12760	1	2	0	27.2	11.7	Eptesicus serotinus
	13114	1	2	0	24.7	11.6	Eptesicus serotinus
	14168	1	2	0	28.1	5.8	Eptesicus serotinus
	14519	1	2	0	25.7	14.4	Eptesicus serotinus
	15225	1	3	0	26.7	10.9	Eptesicus serotinus
8	5634	1	1	0	37.9	10.7	Pipistrellus nathusii
11	7134	1	1	0	26.7	6.6	Eptesicus serotinus

	7487	1	1	0	25.7	11.1	Eptesicus serotinus
	7839	1	3	0	26.7	12.4	Eptesicus serotinus
	8191	2	3	0	37.9	8.7	Pipistrellus nathusii
					25.7	10.0	Eptesicus serotinus
	21917	1	2	0	25.2	11.7	Eptesicus serotinus
	29659	1	2	0	26.7	10.2	Eptesicus serotinus
12	1065	1	3	0	52.1	5.8	Miniopterus schreibersii
	1417	1	3	0	28.1	10.2	Eptesicus serotinus
	1768	1	1	0	26.7	7.7	Eptesicus serotinus
14	15674	1	1	0	32.1	12.8	Hypsugo savii
15	17701	1	1	0	34.5	8.5	Hypsugo savii
17	4854	2	3	0	36.0	8.5	Pipistrellus nathusii or Hypsugo savii
					40.9	5.5	Pipistrellus nathusii
	5206	1	2	0	35.5	11.3	Pipistrellus nathusii or Hypsugo savii
18	18143	1	1	0	28.1	7.5	Eptesicus serotinus
	18495	1	3	0	28.6	11.1	Eptesicus serotinus
	18846	1	3	0	29.1	10.4	Eptesicus serotinus
	19199	1	2	0	27.2	10.2	Eptesicus serotinus
	19550	1	2	0	25.7	11.7	Eptesicus serotinus
	19903	1	1	0	26.7	9.5	Eptesicus serotinus
19	2570	1	2	0	28.1	8.6	Eptesicus serotinus
	2922	1	1	0	24.7	13.6	Eptesicus serotinus
	28987	1	3	0	52.1	5.1	Miniopterus schreibersii
21	9084	1	1	0	51.6	6.3	Miniopterus schreibersii
	9434	1	3	0	28.1	7.1	Eptesicus serotinus
	9786	1	1	0	27.2	8.8	Eptesicus serotinus
	10138	1	1	0	29.6	6.6	Eptesicus serotinus
	10492	1	2	0	26.7	9.7	Eptesicus serotinus

	11546	1	2	0	27.7	7.9	Eptesicus serotinus
	11899	1	3	0	26.7	11.9	Eptesicus serotinus
	12604	1	1	0	34.0	12.7	Hypsugo savii
	12956	1	2	0	33.5	7.9	Hypsugo savii
	13306	1	2	0	36.4	7.0	Pipistrellus nathusii or Hypsugo savii

Transect 2: 15.07.10

Chunk	**Time (from the start of the snapshot) ms**	**No. of bats**	**No. of echolocation calls**	**No. of social call sequences**	**Peak frequency (KHz)**	**Duration (ms)**	**Suggested species**
1	10223	1	3	0	34.6	12.1	Hypsugo savii or Pipistrellus nathusii
	10574	1	3	0	35.5	11.1	Hypsugo savii or Pipistrellus nathusii
	10924	1	2	0	35.5	12.4	Hypsugo savii or Pipistrellus nathusii
2	23860	1	3	0	40.9	6.5	Pipistrellus nathusii
	24212	1	2	0	40.4	4.5	Pipistrellus nathusii
4	8550	1	2	0	36.5	12.4	Hypsugo savii or Pipistrellus nathusii
	8903	1	1	0	36.0	11.9	Hypsugo savii or Pipistrellus nathusii
	9257	1	3	0	37.0	12.0	Pipistrellus nathusii
	9608	1	4	0	37.9	7.8	Pipistrellus nathusii
	9959	1	2	0	36.0	12.3	Hypsugo savii or Pipistrellus nathusii
	10312	1	2	0	35.5	10.2	Hypsugo savii or Pipistrellus nathusii
5	17614	1	2	0	35.0	10.3	Hypsugo savii or Pipistrellus nathusii
	17966	1	2	0	34.0	12.3	Hypsugo savii or Pipistrellus nathusii
	18320	1	2	0	34.0	12.1	Hypsugo savii
	20428	1	2	0	35.5	10.5	Hypsugo savii or Pipistrellus nathusii

	20780	1	2	0	35.0	12.8	Hypsugo savii or Pipistrellus nathusii
8	8906	1	2	0	51.2	9.1	Miniopterus schreibersii
	12427	1	2	0	37.4	7.3	Pipistrellus nathusii
	12779	1	2	0	37.0	10.2	Pipistrellus nathusii
	13128	1	2	0	37.4	6.4	Pipistrellus nathusii
9	2133	1	3	0	53.1	5.6	Miniopterus schreibersii
	2483	1	3	0	50.7	5.3	Miniopterus schreibersii
	2836	1	3	0	51.2	6.5	Miniopterus schreibersii
	3189	1	3	0	51.2	10.5	Miniopterus schreibersii
	3539	1	3	0	50.7	6.4	Miniopterus schreibersii
	3891	1	2	0	51.2	9.1	Miniopterus schreibersii
	18319	1	1	0	41.4	8.5	Pipistrellus nathusii
10	18424	1	2	0	77.6	46.5	Rhinolophus ferrumequinum
	21401	1	2	0	27.2	4.3	Eptesicus serotinus
	21754	1	3	0	28.1	7.9	Eptesicus serotinus
11	19203	1	1	0	36.5	11.1	Hypsugo savii or Pipistrellus nathusii
	19554	1	1	0	35.0	14.7	Hypsugo savii or Pipistrellus nathusii
	20256	1	1	0	34.5	14.6	Hypsugo savii or Pipistrellus nathusii
14	6620	1	2	0	32.6	15.4	Hypsugo savii
	6972	1	1	0	32.1	11.3	Hypsugo savii
15	1255	1	1	0	37.9	9.1	Pipistrellus nathusii
	6181	1	1	0	34.5	8.7	Hypsugo savii
	6532	1	1	0	35.5	10.1	Hypsugo savii or Pipistrellus nathusii
	6887	1	1	0	36.0	11.5	Hypsugo savii or Pipistrellus nathusii
	13572	1	1	0	37.0	7.4	Pipistrellus nathusii
	13924	1	6	0	42.3	5.3	Pipistrellus nathusii

Transect 3: 16.07.11

Chunk	Time (from the start of the snapshot) ms	No. of bats	No. of echolocation calls	No. of social call sequences	Peak frequency (KHz)	Duration (ms)	Suggested species
0	1949	1	2	0	47.2	3.3	Myotis sp. 45 KHz Phonetic type
2	9172	1	4	0	44.8	5.1	Pipistrellus pipistrellus
	9525	1	7	0			undetermined
	9876	1	3	0	40.9	7.9	Pipistrellus nathusii
5	12788	1	1	0	34.5	7.9	Hypsugo savii or Pipistrellus nathusii
	13141	1	1	0	34.0	8.1	Hypsugo savii
	13493	1	1	0	34.0	10.7	Hypsugo savii
6	7778	1	3	0	39.4	8.1	Pipistrellus nathusii
7	17198	1	2	0	40.4	4.6	Pipistrellus nathusii
8	922	1	3	0	35.0	11.2	Hypsugo savii or Pipistrellus nathusii
	1274	1	2	0	34.5	12.5	Hypsugo savii or Pipistrellus nathusii
	6551	2	9	0	37.0	11.2	Pipistrellus nathusii
					41.9	5.9	Pipistrellus nathusii
	6904	1	3	0	36.5	9.9	Pipistrellus nathusii
	12535	1	2	0	38.9	6.0	Pipistrellus nathusii
	13943	1	2	0	35.5	14.5	Hypsugo savii or Pipistrellus nathusii
	14293	1	1	0	36.5	11.5	Hypsugo savii or Pipistrellus nathusii
	14647	1	2	0	36.5	14.1	Hypsugo savii or Pipistrellus nathusii
11	6298	1	1	0	51.6	3.1	Miniopterus schreibersii
	12281	1	1	0	35.0	12.4	Hypsugo savii or Pipistrellus nathusii
12	15715	1	6	0	52.1	7.9	Miniopterus schreibersii
	19588	1	4	0	52.6	8.5	Miniopterus schreibersii
	22053	1	5	0	51.2	8.5	Miniopterus schreibersii

13	12464	1	1	0	49.3	7.4	Miniopterus schreibersii
15	20039	1	1	0	25.7	12.3	Eptesicus serotinus
16	17137	1	3	0	49.2	8.2	Miniopterus schreibersii
17	15996	1	2	0	35.0	11.4	Hypsugo savii or Pipistrellus nathusii
	16348	1	2	0	35.5	10.1	Hypsugo savii or Pipistrellus nathusii
19	6676	1	4	0	32.6	5.6	Undetermined

Transect 4: 18.07.10

Chunk No (every chunk is 5 min long)	**Time (start from the snapshot) ms**	**No. of bats**	**No. of echolocation calls**	**No. of social call sequencies**	**Peak frequency (KHz)**	**Duration (ms)**	**Suggested species**
4	23420	1	1	0	50.6	11.0	Miniopterus schreibersii
5	4676	1	1	0	49.5	11.4	Miniopterus schreibersii
6	14087	1	4	0	51.6	8.0	Miniopterus schreibersii
7	27721	1	2	0	50.2	10.9	Miniopterus schreibersii
10	5087	1	2	0	26.2	15.3	Eptesicus serotinus
	5439	2	5	0	50.2	13.5	Miniopterus schreibersii
					24.7	13.9	Eptesicus serotinus
	8959	1	2	0	27.7	5.1	Eptesicus serotinus
	9312	1	2	0	28.1	4.7	Eptesicus serotinus
	9664	1	3	0	27.7	5.3	Eptesicus serotinus
	15645	1	2	0	28.1	6.4	Eptesicus serotinus
	15996	1	1	0	27.2	11.2	Eptesicus serotinus
	16350	1	3	0	55.1	4.5	Pipistrellus pygmaeus
	16702	1	2	0	26.2	12.8	Eptesicus serotinus

	17054	1	1	0	52.1	5.3	Miniopterus schreibersii
	17406	2	6	0	28.1	10.6	Eptesicus serotinus
					54.6	6.9	Pipistrellus pygmaeus
	18814	1	2	0	29.1	6.1	Eptesicus serotinus
	19164	1	1	0	27.7	12.2	Eptesicus serotinus
	19516	1	1	0	27.2	9.1	Eptesicus serotinus
	24445	1	2	0	27.2	4.3	Eptesicus serotinus
	29371	1	2	0	40.4	5.1	Pipistrellus nathusii
	29724	1	1	0	39.9	6.4	Pipistrellus nathusii
11	71	2	4	0	39.9	4.7	Pipistrellus nathusii
					27.2	7.2	Eptesicus serotinus
	425	1	2	0	26.7	11.7	Eptesicus serotinus
	776	1	1	0	30.1	6.7	Eptesicus serotinus
	1129	1	1	0	27.2	7.9	Eptesicus serotinus
	1833	1	2	0	30.1	4.7	Eptesicus serotinus
	2184	1	3	0	30.1	6.4	Eptesicus serotinus
	3943	1	2	0	25.2	15.8	Eptesicus serotinus
	4646	1	1	0	29.1	6.9	Eptesicus serotinus
	5354	1	1	0	30.6	9.9	Eptesicus serotinus
	6059	1	2	0	52.1	4.7	Miniopterus schreibersii
	8518	1	2	0	32.6	5.3	undetermined
	9223	1	3	0	28.1	8.4	Eptesicus serotinus
	11334	1	2	0	31.1	6.0	Eptesicus serotinus
	11685	1	3	0	27.2	9.6	Eptesicus serotinus
	12040	1	2	0	30.1	8.3	Eptesicus serotinus
	12390	1	3	0	31.6	5.8	Eptesicus serotinus
	13094	2	5	0	51.2	9.5	Miniopterus schreibersii
					32.6	4.5	Eptesicus serotinus

	14502	1	2	0	33.0	4.6	undetermined
	14854	1	2	0	32.6	8.5	undetermined
	15557	1	3	0	51.6	8.7	Miniopterus schreibersii
	18727	1	2	0	26.2	8.1	Eptesicus serotinus
	22597	1	2	0	26.2	6.8	Eptesicus serotinus
	24709	1	4	0	27.7	9.5	Eptesicus serotinus
	25059	1	2	0	34.0	6.4	Hypsugo savii
	25413	1	1	0	30.6	10.4	Eptesicus serotinus
	26469	1	1	0	26.7	8.9	Eptesicus serotinus
	28579	1	1	0	27.2	8.4	Eptesicus serotinus
	29282	1	2	0	31.6	6.3	Eptesicus serotinus
	29638	1	2	0	24.7	9.5	Eptesicus serotinus
12	336	1	2	0	25.2	8.8	Eptesicus serotinus
	690	1	3	0	26.2	7.4	Eptesicus serotinus
	1744	1	1	0	50.2	12.3	Miniopterus schreibersii
	2096	1	1	0	49.2	10.4	Miniopterus schreibersii
	4206	1	1	0	26.7	9.2	Eptesicus serotinus
	4912	1	3	0	27.7	9.4	Eptesicus serotinus
	5615	1	4	0	32.6	3.7	undetermined
	6320	1	2	0	28.6	6.1	Eptesicus serotinus
	6672	1	3	0	28.1	9.5	Eptesicus serotinus
	7023	1	1	0	27.7	10.8	Eptesicus serotinus
	7375	2	6	0	53.8	5.1	Miniopterus schreibersii
					29.6	8.6	Eptesicus serotinus
	7727	1	4	0	50.7	10.2	Miniopterus schreibersii
	8434	1	3	0	51.6	9.4	Miniopterus schreibersii
	9488	1	1	0	27.2	8.3	Eptesicus serotinus
	10544	1	4	0	51.6	6.6	Miniopterus schreibersii

	10895	1	4	0	50.2	9.9	Miniopterus schreibersii
	13711	1	1	0	29.1	8.3	Eptesicus serotinus
	14063	1	2	0	27.2	7.3	Eptesicus serotinus
	17231	1	4	0	27.2	10.0	Eptesicus serotinus
	17584	1	1	0	26.7	7.2	Eptesicus serotinus
	18640	1	2	0	27.2	10.3	Eptesicus serotinus
	29547	1	2	0	40.9	4.1	Myotis 45 KHz Phonetic type
13	13977	1	1	0	37.4	9.3	Pipistrellus nathusii
	25240	1	3	0	59.0	4.0	Pipistrellus pygmaeus
	29461	1	1	0	26.2	8.4	Eptesicus serotinus
14	161	1	1	0	26.2	13.0	Eptesicus serotinus
	514	2	5	0	34.0	12.0	Hypsugo savii
					55.5	5.4	Pipistrellus pygmaeus
	865	1	1	0	32.1	10.7	Hypsugo savii
	7554	1	1	0	26.7	5.0	Eptesicus serotinus
	7905	1	2	0	38.9	5.2	Pipistrellus nathusii
	8256	1	2	0	36.5	6.2	Pipistrellus nathusii
	11074	1	1	0	54.6	3.8	Pipistrellus pygmaeus
	15296	1	2	0	26.2	11.4	Eptesicus serotinus
	15648	1	1	0	26.7	7.1	Eptesicus serotinus
	17058	1	2	0	27.2	9.5	Eptesicus serotinus
	17761	1	1	0	27.2	9.6	Eptesicus serotinus
	18111	1	1	0	26.7	10.3	Eptesicus serotinus
	18818	1	1	0	51.6	5.4	Miniopterus schreibersii
	28679	1	2	0	52.1	5.7	Miniopterus schreibersii
15 to 19	the file is damaged						

APPENDIX 6. CAR TRANSECT SURVEY RESULTS AUGUST 2011

Transect 1: 16.08.10

Chunk	Time (from the start of the snapshot) ms	No. of bats	No. of echolocation calls	No. of social call sequences	Peak frequency (KHz)	Duration (ms)	Suggested species
0	21396	1	3	0	40.4	8.8	Pipistrellus nathusii
	21748	1	3	0	39.9	9.5	Pipistrellus nathusii
	22099	1	4	0	42.8	5.4	Pipistrellus nathusii
	23155	1	5	0	41.4	6.8	Pipistrellus nathusii
	23506	1	3	0	40.9	7.9	Pipistrellus nathusii
	23861	1	3	0	39.9	8.8	Pipistrellus nathusii
	25618	1	2	0	26.7	6.0	Eptesicus serotinus
	25971	2	10	0	29.6	5.5	Eptesicus serotinus
					36.5	9.0	Hypsugo savii or Pipistrellus nathusii
	26619	1	1	0	33.5	14.3	Hypsugo savii
1	4064	1	3	0	35.5	10.5	Hypsugo savii
	4417	1	4	0	35.5	7.2	Hypsugo savii
	4769	1	1	0	34.0	10.1	Hypsugo savii
	11456	1	1	0	35.5	11.4	Hypsugo savii
	29053	1	1	0	32.6	17.9	Hypsugo savii
2	14540	1	1	0	34.5	7.9	Hypsugo savii
	15244	1	3	0	30.6	6.8	Eptesicus serotinus
	15597	1	2	0	27.2	7.9	Eptesicus serotinus
	26856	1	2	0	30.1	6.6	Eptesicus serotinus

	27209	2	6	0	30.1	6.3	Eptesicus serotinus
					40.4	6.3	Pipistrellus nathusii
3	24662	1	2	0	37.4	7.0	Pipistrellus nathusii
	25014	1	4	0	37.4	7.4	Pipistrellus nathusii
4	20354	1	1	0	41.9	6.1	Pipistrellus nathusii
	20707	1	4	0	41.4	6.7	Pipistrellus nathusii
5	12880	1	2	0	28.6	9.9	Eptesicus serotinus
	13230	1	2	0	26.7	13.4	Eptesicus serotinus
	20973	1	2	0	25.1	6.8	Eptesicus serotinus
7	18691	1	3	0	38.4	7.7	Pipistrellus nathusii
	19043	1	1	0	36.5	9.4	Pipistrellus nathusii
	22916	1	2	0	37.0	6.8	Pipistrellus nathusii
	24675	1	3	0	39.9	6.8	Pipistrellus nathusii
	26435	1	1	0	37.9	5.9	Pipistrellus nathusii
	26786	1	3	0	38.9	5.1	Pipistrellus nathusii
	27141	1	2	0	36.0	11.0	Pipistrellus nathusii
8	20719	1	3	0	52.6	12.2	Miniopterus schreibersii
	21071	1	1	0	52.1	7.6	Miniopterus schreibersii
9	574	1	1	0	52.1	7.3	Miniopterus schreibersii
	925	1	6	0	51.2	8.6	Miniopterus schreibersii
	1279	1	1	0	52.8	4.9	Miniopterus schreibersii
	1630	1	1	0	51.2	9.9	Miniopterus schreibersii
13	1994	1	1	0	39.4	4.6	Pipistrellus nathusii
	7979	1	1	0	26.2	10.9	Eptesicus serotinus
	8685	1	2	0	30.6	6.0	Eptesicus serotinus
	9033	1	2	0	26.2	13.3	Eptesicus serotinus
	9388	1	1	0	28.6	8.2	Eptesicus serotinus
	11851	1	2	0	38.9	7.9	Pipistrellus nathusii

	12203	1	1	0	39.4	8.0	Pipistrellus nathusii
14	1911	1	2	0	39.4	7.4	Pipistrellus nathusii
	2265	1	1	0	39.4	5.9	Pipistrellus nathusii
	2615	1	3	0	41.4	8.7	Pipistrellus nathusii
	2968	1	1	0	51.9	6.2	Miniopterus schreibersii
	4023	1	1	0	37.4	7.8	Pipistrellus nathusii
	9301	1	3	0	53.6	4.5	Miniopterus schreibersii
	27602	1	5	0	42.4	3.9	Pipistrellus nathusii
	29012	1	1	0	26.7	5.4	Eptesicus serotinus
	29366	1	2	0	26.2	6.1	Eptesicus serotinus
	29716	1	2	0	27.2	5.5	Eptesicus serotinus
15	67	1	2	0	26.2	10.2	Eptesicus serotinus
	421	1	1	0	26.2	12.2	Eptesicus serotinus
	770	1	2	0	27.2	10.6	Eptesicus serotinus
	1474	1	3	0	32.1	5.9	Eptesicus serotinus
	3234	1	2	0	34.5	11.4	Hypsugo savii
	3586	1	2	0	36.0	6.8	Hypsugo savii or Pipistrellus nathusii
	3940	2	2	0	26.2	10.0	Eptesicus serotinus
					35.0	11.4	Hypsugo savii or Pipistrellus nathusii
	4289	1	2	0	35.5	10.1	Hypsugo savii or Pipistrellus nathusii
	4641	1	2	0	36.5	9.4	Hypsugo savii or Pipistrellus nathusii
	4994	1	2	0	35.5	7.8	Hypsugo savii or Pipistrellus nathusii
	6050	1	1	0	25.7	14.0	Eptesicus serotinus
	8160	1	1	0	39.4	7.9	Pipistrellus nathusii
	9216	1	2	0	25.2	13.4	Eptesicus serotinus
	9571	1	1	0	27.7	6.9	Eptesicus serotinus
17	3066	1	3	0	52.1	6.0	Miniopterus schreibersii
	5176	1	3	0	51.6	8.6	Miniopterus schreibersii

	7641	1	2	0	26.2	12.0	Eptesicus serotinus
	13977	1	3	0	52.1	10.7	Miniopterus schreibersii
18	1572	1	1	0	34.5	9.6	Hypsugo savii or Pipistrellus nathusii
19	8527	1	2	0	35.0	12.3	Hypsugo savii or Pipistrellus nathusii
	8881	1	1	0	34.5	11.9	Hypsugo savii or Pipistrellus nathusii
	9230	1	2	0	34.5	10.5	Hypsugo savii or Pipistrellus nathusii
20	15834	1	2	0	39.4	8.5	Pipistrellus nathusii
	16185	1	2	0	38.4	10.0	Pipistrellus nathusii
21	13287	1	2	0	26.2	8.8	Eptesicus serotinus
	13639	1	1	0	27.7	9.2	Eptesicus serotinus
	13990	1	2	0	26.2	11.5	Eptesicus serotinus
	14342	1	2	0	27.7	12.9	Eptesicus serotinus

Transect 2: 17.08.10

Chunk	**Time (from the start of the snapshot) ms**	**No. of bats**	**No. of echolocation calls**	**No. of social call sequences**	**Peak frequency (KHz)**	**Duration (ms)**	**Suggested species**
3	4572	1	1	0	33.5	13.4	Hypsugo savii
	5979	1	3	0	37.9	6.9	Pipistrellus nathusii
	24984	1	2	0	53.1	3.6	Miniopterus schreibersii
	25336	2	5	0	37.9	7.4	Pipistrellus nathusii
					52.6	3.7	Miniopterus schreibersii
	25688	1	2	0	34.5	8.9	Hypsugo savii or Pipistrellus nathusii
4	1316	1	4	0	52.1	5.7	Miniopterus schreibersii
	1668	1	4	0	49.7	10.3	Miniopterus schreibersii

	2020	1	2	0	50.7	7.2	Miniopterus schreibersii
	6596	1	3	0	36.5	12.6	Pipistrellus nathusii
7	703	1	3	0	35.5	8.5	Myotis myotis/blythii
8	19618	1	3	0	27.7	11.3	Eptesicus serotinus
	21733	1	2	0	37.0	9.3	Pipistrellus nathusii
	23140	1	2	0	34.7	11.4	Hypsugo savii or Pipistrellus nathusii
	27361	1	5	0	41.4	10.5	Pipistrellus nathusii
9	14605	1	2	0	42.8	4.1	Pipistrellus nathusii
	16365	1	2	0	37.9	10.1	Pipistrellus nathusii
11	3167	1	1	0	26.7	12.3	Eptesicus serotinus
	3520	1	1	0	24.7	14.4	Eptesicus serotinus
	3873	1	2	0	26.7	7.4	Eptesicus serotinus
14	4666	1	2	0	35.0	13.4	Hypsugo savii or Pipistrellus nathusii
	7832	1	1	0	34.5	15.5	Hypsugo savii or Pipistrellus nathusii
	8185	1	1	0	34.5	12.2	Hypsugo savii or Pipistrellus nathusii
	8536	1	1	0	34.5	9.9	Hypsugo savii or Pipistrellus nathusii
15	20065	1	3	0	39.4	7.0	Pipistrellus nathusii
	20415	1	3	0	40.9	7.4	Pipistrellus nathusii
	20768	1	1	0	38.9	8.9	Pipistrellus nathusii
	21117	1	12	0			Pipistrellus nathusii
16	4490	1	1	0	26.2	11.5	Eptesicus serotinus
	4843	1	2	0	25.7	11.7	Eptesicus serotinus

Transect 3: 18.08.11

Chunk	Time (from the start of the snapshot) ms	No. of bats	No. of echolocation calls	No. of social call sequences	Peak frequency (KHz)	Duration (ms)	Suggested species
4	8796	1	3	0	41.4	6.1	Pipistrellus nathusii
	21467	1	2	0	37.4	8.0	Pipistrellus nathusii
5	262	1	3	0	55.5	7.2	Pipistrellus pygmaeus
	3430	1	1	0	25.7	13.4	Eptesicus serotinus
	23842	1	1	0	25.7	12.5	Eptesicus serotinus
	24195	1	1	0	26.7	8.8	Eptesicus serotinus
	24548	1	1	0	26.2	10.6	Eptesicus serotinus
	24900	1	2	0	26.7	12.2	Eptesicus serotinus
	25252	1	2	0	26.2	8.5	Eptesicus serotinus
	25604	1	4	0			Eptesicus serotinus
	25955	1	3	0			Eptesicus serotinus
6	176	1	5	0	28.1	8.7	Eptesicus serotinus
	878	1	2	0	27.2	9.6	Eptesicus serotinus
	1228	1	1	0	27.2	15.4	Eptesicus serotinus
	1580	1	1	0	26.2	15.2	Eptesicus serotinus
	1935	1	1	0	27.7	8.9	Eptesicus serotinus
	2990	1	5	0	42.8	5.8	Pipistrellus nathusii
	3343	1	4	0	42.3	3.8	Pipistrellus nathusii
7	15573	1	1	0	27.7	8.6	Eptesicus serotinus
	25075	1	1	0	35.5	9.0	Pipistrellus nathusii or Hypsugo savii
9	26661	1	2	0	34.5	11.1	Pipistrellus nathusii or Hypsugo savii
10	19886	1	2	0	40.4	5.8	Pipistrellus nathusii

	24111	1	10	0			undetermined
	28686	1	2	0	26.2	9.9	Eptesicus serotinus
	29037	1	2	0	26.7	9.8	Eptesicus serotinus
12	23587	1	1	0	25.2	10.2	Eptesicus serotinus
	23935	1	1	0	23.3	15.0	undetermined
13	28073	1	5	0	51.6	6.6	Miniopterus schreibersii
15	13466	1	2	0	41.4	10.0	Pipistrellus nathusii
18	888	1	2	0	36.0	10.5	Pipistrellus nathusii or Hypsugo savii
	1241	1	1	0	35.5	10.7	Pipistrellus nathusii or Hypsugo savii
19	22973	1	2	0	34.0	11.1	Pipistrellus nathusii or Hypsugo savii
	23326	1	1	0	34.5	9.8	Pipistrellus nathusii or Hypsugo savii
20	713	1	2	0	42.3	5.1	Pipistrellus nathusii

Transect 4: 19.08.11

Chunk	Time (from the start of the snapshot) ms	No. of bats	No. of echolocation calls	No. of social call sequences	Peak frequency (KHz)	Duration (ms)	Suggested species
2	24036	1	2	0	40.4	10.7	Pipistrellus nathusii
	24387	1	1	0	39.9	10.1	Pipistrellus nathusii
4	18575	1	1	0	50.2	8.8	Miniopterus schreibersii
	20335	1	4	0	52.6	8.0	Miniopterus schreibersii
6	23321	1	2	0	41.9	5.3	Pipistrellus nathusii
7	13374	1	4	0	40.9	5.1	Pipistrellus nathusii
	13727	1	2	0	42.3	3.2	Pipistrellus nathusii
	27102	1	2	0	42.6	3.9	Pipistrellus nathusii

10	8446	1	1	0	51.2	8.5	Miniopterus schreibersii
	9150	1	1	0	50.7	11.1	Miniopterus schreibersii
	12671	1	2	0	52.1	6.5	Miniopterus schreibersii
	15838	1	1	0	50.2	7.5	Miniopterus schreibersii
	16190	1	1	0	32.6	12.1	Hypsugo savii
	16541	1	2	0	32.1	13.5	Hypsugo savii
	18652	1	1	0	50.2	9.0	Miniopterus schreibersii
	23581	1	2	0	51.2	14.1	Miniopterus schreibersii
	24285	1	1	0	52.8	9.8	Miniopterus schreibersii
	24637	1	1	0	51.2	8.4	Miniopterus schreibersii
11	6952	1	1	0	50.2	9.5	Miniopterus schreibersii
	14692	1	1	0	52.1	6.3	Miniopterus schreibersii
	15048	1	1	0	51.2	10.9	Miniopterus schreibersii
	21380	1	1	0	25.2	9.7	Eptesicus serotinus
12	5103	1	1	0	50.7	11.2	Miniopterus schreibersii
	14957	1	2	0	35.5	11.2	Pipistrellus nathusii or Hypsugo savii
	21995	1	3	0	50.2	10.9	Miniopterus schreibersii
	22347	1	6	0	52.1	8.7	Miniopterus schreibersii
	23051	1	1	0	26.2	12.9	Eptesicus serotinus
	23755	1	1	0	21.3	16.6	undetermined
	25163	1	1	0	28.1	7.2	Eptesicus serotinus
	25513	1	2	0	27.7	7.1	Eptesicus serotinus
13	786	1	1	0	34.5	11.8	Pipistrellus nathusii or Hypsugo savii
	13810	1	1	0	49.7	9.5	Miniopterus schreibersii
	18033	1	1	0	27.2	10.9	Eptesicus serotinus
	18384	1	1	0	26.2	7.2	Eptesicus serotinus
	18738	1	1	0	27.2	11.3	Eptesicus serotinus
	19793	1	6	0			Eptesicus serotinus

	20144	1	1	0	27.2	11.4	Eptesicus serotinus
	20497	1	1	0	29.1	7.3	Eptesicus serotinus
	20848	1	2	0	28.6	9.6	Eptesicus serotinus
	21201	1	1	0	30.6	7.2	Eptesicus serotinus
	21553	1	1	0	26.2	12.6	Eptesicus serotinus
	21905	1	2	0	26.7	12.3	Eptesicus serotinus
	22257	1	2	0	28.1	8.7	Eptesicus serotinus
	22607	2	4	0	26.2	11.9	Eptesicus serotinus
					42.3	6.8	Pipistrellus nathusii or Hypsugo savii
	22962	2	2	0	26.7	10.7	Eptesicus serotinus
					40.4	8.5	Pipistrellus nathusii
	23313	1	1	0	28.1	7.8	Eptesicus serotinus
	23666	1	1	0	27.2	13.5	Eptesicus serotinus
	24016	1	1	0	27.2	10.0	Eptesicus serotinus
	24368	2	2	0	26.7	7.9	Eptesicus serotinus
					49.7	11.1	Miniopterus schreibersii
	24720	1	2	0	27.2	11.4	Eptesicus serotinus
	25073	1	1	0	26.2	7.5	Eptesicus serotinus
14	1403	1	2	0	37.4	6.7	Pipistrellus nathusii
	9499	1	1	0	26.7	9.2	Eptesicus serotinus
	9850	1	1	0	24.2	16.7	Eptesicus serotinus
	10552	1	4	0	43.3	4.3	Myotis 45 KHz Phonetic type
	14777	1	1	0	38.4	6.5	Pipistrellus nathusii
15	6594	1	3	0	37.4	9.3	Pipistrellus nathusii
	7295	1	2	0	34.0	10.2	Pipistrellus nathusii or Hypsugo savii
18	340	1	1	0	24.2	13.9	undetermined
	695	1	2	0	27.2	11.1	Eptesicus serotinus
	1047	1	1	0	25.7	12.1	Eptesicus serotinus

1398	1	1	0	24.7	10.6	Eptesicus serotinus
1750	1	1	0	24.2	8.5	undetermined
5622	1	1	0	24.7	7.7	Eptesicus serotinus

APPENDIX 7. CAR TRANSECT SURVEY RESULTS SEPTEMBER 2011

Transect 1: 13.09.11

Chunk	Time (from the start of the snapshot) ms	No. of bats	No. of echolocation calls	No. of social call sequences	Min. frequency (KHz)	Duration (ms)	Suggested species
0	6741	1	2	0	33.9	9.9	Hypsugo savii
	7091	1	2	0	33.5	10.7	Hypsugo savii
	21523	1	1	0	40.4	10.1	Pipistrellus nathusii
	27505	1	2	0	35.5	11.0	Hypsugo savii or Pipistrellus nathusii
	27859	2	10	0	37.9	9.0	Pipistrellus nathusii
					37.4	5.1	Pipistrellus nathusii
	28210	3	11	0	37.0	5.8	Pipistrellus nathusii
					35.5	9.3	Hypsugo savii or Pipistrellus nathusii
					43.8	4.0	Pipistrellus pipistrellus or Pipistrellus nathusii
	29563	2	3	0	33.5	9.6	Hypsugo savii
					35.5	8.5	Hypsugo savii or Pipistrellus nathusii
	28915	1	2	0	33.5	13.0	Hypsugo savii
1	11935	1	2	0	40.4	8.4	Pipistrellus nathusii
	12639	1	3	0	42.3	6.3	Pipistrellus nathusii
	15454	1	1	0	34.0	15.4	Hypsugo savii
	16156	2	3	0	34.0	10.4	Hypsugo savii
					39.4	5.9	Pipistrellus nathusii
	16510	2	3	0	41.9	7.5	Pipistrellus nathusii
					32.6	13.2	Hypsugo savii

	16861	1	4	0	41.4	5.6	Pipistrellus nathusii
	18994	1	1	0	51.2	7.4	Miniopterus schreibersii
	19325	1	3	0	50.7	8.1	Miniopterus schreibersii
	21790	1	2	0	50.2	9.9	Miniopterus schreibersii
	26364	1	3	0	49.7	7.7	Miniopterus schreibersii
	27772	1	4	0	51.2	8.7	Miniopterus schreibersii
	28123	1	4	0	50.2	10.3	Miniopterus schreibersii
	28828	1	1	0	51.6	10.0	Miniopterus schreibersii
2	3049	1	1	0	25.2	9.7	Eptesicus serotinus
	3403	2	6	0	28.1	8.0	Eptesicus serotinus
					37.9	9.2	Pipistrellus nathusii
	3755	1	2	0	26.7	11.7	Eptesicus serotinus
	4457	1	1	0	34.5	9.5	Hypsugo savii
	6220	1	2	0	25.6	13.9	Eptesicus serotinus
	10439	2	4	0	34.0	13.4	Hypsugo savii
					34.0	12.1	Hypsugo savii
	10795	2	3	0	35.5	10.5	Hypsugo savii or Pipistrellus nathusii
					34.5	11.6	Hypsugo savii
	11147	1	3	0	34.5	14.7	Hypsugo savii
	11496	2	3	0	36.0	7.2	Hypsugo savii or Pipistrellus nathusii
					34.5	10.8	Hypsugo savii
	11851	1	2	0	34.0	10.9	Hypsugo savii
	12554	1	1	0	34.5	12.6	Hypsugo savii
	13610	1	2	0	38.4	13.0	Pipistrellus nathusii
	14312	1	1	0	51.2	5.8	Miniopterus schreibersii
	16774	1	1	0	33.5	12.5	Hypsugo savii
	17128	1	2	0	33.5	11.9	Hypsugo savii
	21000	1	1	0	35.0	11.1	Hypsugo savii or Pipistrellus nathusii

21352	1	1	0	36.0	11.2	Hypsugo savii or Pipistrellus nathusii
22407	1	1	0	34.5	13.6	Hypsugo savii or Pipistrellus nathusii
22760	2	3	0	35.5	10.9	Hypsugo savii or Pipistrellus nathusii
				33.5	12.7	Hypsugo savii
23110	1	2	0	33.5	11.6	Hypsugo savii
23463	1	2	0	31.1	12.4	Hypsugo savii
23818	2	2	0	30.6	14.5	undetermined
				25.7	17.6	Eptesicus serotinus
24167	1	1	0	25.7	13.7	Eptesicus serotinus
24519	1	2	0	26.7	9.7	Eptesicus serotinus
24871	2	2	0	25.2	12.2	Eptesicus serotinus
				34.5	12.0	Hypsugo savii or Pipistrellus nathusii
25222	2	4	0	35.0	10.6	Hypsugo savii or Pipistrellus nathusii
				25.7	15.6	Eptesicus serotinus
25576	4	10	0	34.5	10.1	Hypsugo savii or Pipistrellus nathusii
				38.9	8.2	Pipistrellus nathusii
				36.5	8.4	Pipistrellus nathusii
				25.2	10.9	Eptesicus serotinus
25928	2	4	0	38.4	7.8	Pipistrellus nathusii
				34.0	10.4	Hypsugo savii
26278	1	2	0	24.2	12.5	Eptesicus serotinus
26631	1	1	0	24.2	11.4	Eptesicus serotinus
26982	2	3	0	35.0	10.3	Hypsugo savii or Pipistrellus nathusii
				25.7	9.7	Eptesicus serotinus
27336	1	1	0	26.2	6.8	Eptesicus serotinus
27686	2	5	0	41.4	9.4	Pipistrellus nathusii
				28.6	7.2	Eptesicus serotinus
28039	2	6	0	40.4	5.6	Pipistrellus nathusii

					26.7	10.5	Eptesicus serotinus
	28390	1	2	0	29.6	5.9	Eptesicus serotinus
	29447	1	1	0	38.4	5.7	Pipistrellus nathusii
3	23380	1	2	0	26.7	6.2	Eptesicus serotinus
	23732	1	3	0	27.2	8.8	Eptesicus serotinus
	24083	1	2	0	24.7	13.7	Eptesicus serotinus
	24436	1	2	0	27.2	7.9	Eptesicus serotinus
5	15465	1	1	0	27.2	6.8	Eptesicus serotinus
	15815	1	2	0	26.7	12.6	Eptesicus serotinus
	21096	1	3	0	40.4	6.0	Pipistrellus nathusii
	22856	1	1	0	40.9	7.8	Pipistrellus nathusii
	26726	1	3	0	40.9	5.8	Pipistrellus nathusii
6	1650	1	1	0	26.2	9.3	Eptesicus serotinus
	2004	2	4	0	26.2	13.4	Eptesicus serotinus
					41.9	6.7	Pipistrellus nathusii
	2355	1	1	0	26.7	12.9	Eptesicus serotinus
	3411	1	1	0	38.4	7.9	Pipistrellus nathusii
	3764	1	2	0	39.4	8.0	Pipistrellus nathusii
	6580	1	2	0	49.7	9.1	Miniopterus schreibersii
	9395	1	1	0	38.4	9.0	Pipistrellus nathusii
	17842	1	2	0	37.9	7.7	Pipistrellus nathusii
	18195	1	3	0	39.4	9.1	Pipistrellus nathusii
	18546	1	2	0	37.9	8.6	Pipistrellus nathusii
	19954	1	1	0	34.5	15.7	Hypsugo savii or Pipistrellus nathusii
	20306	1	2	0	33.0	16.4	Hypsugo savii
	21361	1	2	0	36.5	12.6	Hypsugo savii or Pipistrellus nathusii
	21714	1	2	0	35.0	11.1	Hypsugo savii or Pipistrellus nathusii
7	7550	1	1	0	24.2	11.7	Eptesicus serotinus

	7902	1	1	0	23.8	12.8	Eptesicus serotinus
	9308	1	1	0	43.8	3.9	Pipistrellus nathusii or Pipistrellus pipistrellus
	9661	1	2	0	45.8	4.2	Pipistrellus pipistrellus
	10010	1	3	0	46.2	2.8	Pipistrellus pipistrellus
	13886	1	3	0	40.9	5.2	Pipistrellus nathusii
	14238	1	1	0	38.9	6.6	Pipistrellus nathusii
	20221	1	3	0	26.7	9.6	Eptesicus serotinus
8	25415	1	4	0	52.1	7.7	Miniopterus schreibersii
	25766	1	1	0	52.3	8.5	Miniopterus schreibersii
9	14	1	1	0	25.2	12.3	Eptesicus serotinus
	342	1	1	0	24.7	11.9	Eptesicus serotinus
	2097	1	3	0	37.0	3.2	Pipistrellus nathusii
	2451	1	3	0	37.9	7.0	Pipistrellus nathusii
	2804	1	2	0	37.0	8.9	Pipistrellus nathusii
	3153	2	5	0	39.9	5.0	Pipistrellus nathusii
					35.5	8.3	Hypsugo savii or Pipistrellus nathusii
	3507	1	2	0	34.5	11.4	Hypsugo savii or Pipistrellus nathusii
	3858	1	2	0	34.5	13.2	Hypsugo savii or Pipistrellus nathusii
10	10111	1	2	0	26.7	5.2	Eptesicus serotinus
	13627	1	1	0	37.9	10.1	Pipistrellus nathusii
	17498	1	2	0	25.7	12.2	Eptesicus serotinus
	17849	1	2	0	24.2	14.1	Eptesicus serotinus
	18205	1	2	0	24.2	10.5	Eptesicus serotinus
11	4743	1	3	0	35.0	10.4	Hypsugo savii or Pipistrellus nathusii
	5095	1	3	0	34.5	9.2	Hypsugo savii or Pipistrellus nathusii
	5447	1	2	0	35.5	10.4	Hypsugo savii or Pipistrellus nathusii
	7909	1	4	0	41.9	4.8	Pipistrellus nathusii
	12838	1	2	0	37.0	7.2	Pipistrellus nathusii

	13541	1	2	0	40.9	6.4	Pipistrellus nathusii
	14950	1	2	0	37.0	7.6	Pipistrellus nathusii
	21988	1	2	0	40.4	9.8	Pipistrellus nathusii
13	349	1	4	0	45.8	5.3	Pipistrellus pipistrellus
	703	2	10	0	42.8	5.0	Pipistrellus nathusii
					45.3	6.3	Pipistrellus pipistrellus
	1050	1	3	0	38.9	7.2	Pipistrellus nathusii
	1759	2	7	0	44.8	5.7	Pipistrellus pipistrellus
					41.4	8.0	Pipistrellus nathusii
	2108	1	4	0	40.9	7.2	Pipistrellus nathusii
	2463	1	4	0	48.7	4.3	Pipistrellus pipistrellus
	2812	1	2	0	34.5	11.0	Hypsugo savii or Pipistrellus nathusii
	3518	1	1	0	47.7	3.0	Pipistrellus pipistrellus
	3868	2	4	0	42.3	4.9	Pipistrellus nathusii
					41.9	6.8	Pipistrellus nathusii
	5276	1	4	0	40.4	5.5	Pipistrellus nathusii
	5630	1	3	0	38.4	6.9	Pipistrellus nathusii
	5980	2	4	0	43.8	6.6	Pipistrellus nathusii or Pipistrellus pipistrellus
					42.2	7.3	Pipistrellus nathusii
	9148	2	8	0	38.9	6.4	Pipistrellus nathusii
					41.4	6.6	Pipistrellus nathusii
	10205	1	2	0	42.8	5.0	Pipistrellus nathusii
	10555	1	3	0	40.4	5.5	Pipistrellus nathusii
	10910	1	1	0	40.4	5.6	Pipistrellus nathusii
	11259	1	2	0	40.9	6.1	Pipistrellus nathusii
	26744	1	2	0	38.9	9.2	Pipistrellus nathusii
14	6949	1	2	0	37.9	7.9	Pipistrellus nathusii
	7654	2	6	0	26.7	13.6	Eptesicus serotinus

					40.9	7.8	Pipistrellus nathusii
	8006	2	3	0	25.2	17.4	Eptesicus serotinus
					35.5	9.8	Hypsugo savii or Pipistrellus nathusii
	8359	2	6	0	40.9	8.4	Pipistrellus nathusii
					38.3	4.0	Pipistrellus nathusii
	8710	1	3	0	40.9	9.9	Pipistrellus nathusii
	22788	1	1	0	34.5	13.3	Hypsugo savii or Pipistrellus nathusii
	23138	1	1	0	35.0	9.0	Pipistrellus nathusii
	24196	1	1	0	25.2	10.4	Eptesicus serotinus
	24549	2	4	0	26.7	14.1	Eptesicus serotinus
					39.9	9.2	Pipistrellus nathusii
	24900	1	1	0	36.0	10.9	Hypsugo savii or Pipistrellus nathusii
	24253	3	3	0	24.2	17.0	Eptesicus serotinus
					35.0	9.9	Hypsugo savii or Pipistrellus nathusii
					40.9	5.0	Pipistrellus nathusii
	25804	1	1	0	40.9	7.0	Pipistrellus nathusii
	25957	1	1	0	39.4	9.8	Pipistrellus nathusii
	28420	1	1	0	34.0	11.3	Hypsugo savii
	28771	1	2	0	32.1	8.8	Hypsugo savii
15	5456	1	1	0	37.0	9.3	Pipistrellus nathusii
	6510	1	2	0	37.9	8.3	Pipistrellus nathusii
	7219	1	2	0	41.4	6.5	Pipistrellus nathusii
16	1852	1	2	0	38.4	9.7	Pipistrellus nathusii
	22969	1	2	0	39.9	8.0	Pipistrellus nathusii
	23320	1	2	0	40.4	5.2	Pipistrellus nathusii
	27194	1	3	0	50.7	6.7	Miniopterus schreibersii
17	4584	1	1	0	35.0	13.1	Hypsugo savii or Pipistrellus nathusii
	4932	1	3	0	34.5	13.2	Hypsugo savii or Pipistrellus nathusii

	5286	1	2	0	35.0	10.5	Hypsugo savii or Pipistrellus nathusii
18	15056	1	1	0	50.7	6.5	Miniopterus schreibersii
19	19898	1	1	0	35.5	10.4	Hypsugo savii or Pipistrellus nathusii
	25176	1	4	0	40.9	8.0	Pipistrellus nathusii
	25528	1	2	0	40.4	8.8	Pipistrellus nathusii
	25878	1	2	0	38.4	11.0	Pipistrellus nathusii
	26232	1	2	0	39.9	8.5	Pipistrellus nathusii
20	11716	1	4	0	39.4	6.9	Pipistrellus nathusii
	20868	1	2	0	37.4	7.8	Pipistrellus nathusii
	21221	1	2	0	36.0	11.2	Hypsugo savii or Pipistrellus nathusii
	21571	1	2	0	37.9	7.3	Pipistrellus nathusii

Transect 2: 14.09.10

Chunk	**Time (from the start of the snapshot) ms**	**No. of bats**	**No. of echolocation calls**	**No. of social call sequences**	**Peak frequency (KHz)**	**Duration (ms)**	**Suggested species**
0	7795	1	5	0	52.6	7.3	Miniopterus schreibersii
	8499	1	4	0	51.6	7.7	Miniopterus schreibersii
	12718	1	2	0	52.0	5.7	Miniopterus schreibersii
	13074	2	10	0	54.1	4.0	Pipistrellus pygmaeus
					52.1	8.7	Miniopterus schreibersii
	13425	1	4	0	49.7	10.1	Miniopterus schreibersii
	13777	1	2	0	55.5	3.4	Pipistrellus pygmaeus
	14481	1	6	0	50.2	9.3	Miniopterus schreibersii
	14832	1	5	0	50.2	7.3	Miniopterus schreibersii
	15185	1	4	0	51.6	6.7	Miniopterus schreibersii

	15891	1	3	0	52.1	4.7	Miniopterus schreibersii
1	7355	1	2	0	39.9	9.1	Pipistrellus nathusii
	11929	1	3	0	51.6	8.9	Miniopterus schreibersii
	25656	1	2	0	28.6	7.1	Eptesicus serotinus
	26009	1	2	0	27.2	10.8	Eptesicus serotinus
2	6211	1	3	0	26.7	11.3	Eptesicus serotinus
	6562	1	2	0	26.7	9.2	Eptesicus serotinus
	6916	1	2	0	25.7	12.8	Eptesicus serotinus
	29088	1	1	0	26.7	11.9	Eptesicus serotinus
	29438	1	2	0	26.7	10.6	Eptesicus serotinus
	29791	1	2	0	27.2	10.0	Eptesicus serotinus
3	0	1	1	0	28.6	8.0	Eptesicus serotinus
4	51	1	1	0	34.5	12.5	Hypsugo savii ot Piupistrellus nathusii
	404	2	4	0	34.0	12.5	Hypsugo savii ot Piupistrellus nathusii
					26.7	8.8	Eptesicus serotinus
	756	1	3	0	24.7	12.3	Eptesicus serotinus
	5685	1	2	0	34.5	11.0	Hypsugo savii ot Piupistrellus nathusii
	28560	1	1	0	37.4	9.5	Piistrellus nathusii
5	7709	1	2	0	25.2	11.3	Eptesicus serotinus
	8061	1	1	0	26.7	8.9	Eptesicus serotinus
	8411	1	2	0	25.2	11.9	Eptesicus serotinus
	8762	1	3	0	28.1	8.1	Eptesicus serotinus
	10172	1	3	0	36.5	7.7	Hypsugo savii ot Piupistrellus nathusii
	10524	1	4	0	35.0	8.9	Hypsugo savii ot Piupistrellus nathusii
	10876	1	1	0	34.5	14.0	Hypsugo savii ot Piupistrellus nathusii
	11229	1	2	0	34.5	14.8	Hypsugo savii ot Piupistrellus nathusii
	27769	1	2	0	26.7	13.5	Eptesicus serotinus
	28118	2	3	0	25.2	16.3	Eptesicus serotinus

					26.2	11.6	Eptesicus serotinus
	28473	2	4	0	23.3	17.8	Eptesicus serotinus
					28.1	8.7	Eptesicus serotinus
	28824	1	2	0	25.7	13.4	Eptesicus serotinus
	29177	1	2	0	24.7	14.2	Eptesicus serotinus
	29529	1	1	0	23.8	16.1	Eptesicus serotinus
6	228	1	3	0	26.0	11.2	Eptesicus serotinus
	1635	1	1	0	36.0	12.0	Hypsugo savii ot Piupistrellus nathusii
	9733	1	3	0	26.7	4.2	Eptesicus serotinus
7	13868	2	2	0	38.9	7.6	Pipistrellus nathusii
					27.2	9.5	Eptesicus serotinus
	14220	2	4	0	37.4	11.2	Pipistrellus nathusii
					24.2	14.3	Eptesicus serotinus
	16329	1	2	0	36.5	10.8	Hypsugo savii ot Piupistrellus nathusii
	16663	1	4	0	37.4	7.8	Pipistrellus nathusii
	19500	1	2	0	42.8	4.6	Pipistrellus nathusii
9	13690	1	2	0	35.5	10.9	Hypsugo savii ot Piupistrellus nathusii
10	20644	1	2	0	27.7	7.2	Eptesicus serotinus
	20997	2	4	0	37.4	7.4	Pipistrellus nathusii
					27.7	8.0	Eptesicus serotinus
	21349	1	2	0	28.1	9.2	Eptesicus serotinus
	21700	1	1	0	27.7	6.8	Eptesicus serotinus
	22048	1	2	0	27.2	9.5	Eptesicus serotinus
	22404	2	4	0	34.5	5.1	Hypsugo savii ot Piupistrellus nathusii
					26.2	14.3	Eptesicus serotinus
	22758	2	3	0	25.2	9.4	Eptesicus serotinus
					28.6	7.3	Eptesicus serotinus
	23106	1	3	0	27.7	9.1	Eptesicus serotinus

	23460	2	5	0	40.9	6.6	Pipistrellus nathusii
					28.1	11.2	Eptesicus serotinus
	23812	1	1	0	37.4	11.0	Pipistrellus nathusii
	24162	2	6	0	40.4	5.5	Pipistrellus nathusii
					37.9	9.0	Pipistrellus nathusii
	24514	1	2	0	38.8	8.5	Pipistrellus nathusii
	24866	1	1	0	39.4	5.8	Pipistrellus nathusii
11	8588	1	1	0	25.7	6.7	Eptesicus serotinus
	8943	1	1	0	26.2	5.2	Eptesicus serotinus
	9294	1	2	0	27.2	7.5	Eptesicus serotinus
	9646	1	2	0	26.2	10.8	Eptesicus serotinus
	9997	2	4	0	36.0	16.3	Hypsugo savii ot Piupistrellus nathusii
					27.2	9.8	Eptesicus serotinus
	10346	2	4	0	27.2	8.9	Eptesicus serotinus
					24.7	15.2	Eptesicus serotinus
	10702	1	1	0	25.7	10.3	Eptesicus serotinus
	11053	1	2	0	26.7	11.8	Eptesicus serotinus
	11404	2	3	0	38.4	8.7	Pipistrellus nathusii
					25.2	12.9	Eptesicus serotinus
	11755	1	1	0	26.2	10.3	Eptesicus serotinus
12	4629	1	3	0	35.0	12.0	Hypsugo savii ot Piupistrellus nathusii
13	3133	1	2	0	39.9	7.6	Pipistrellus nathusii
	3489	1	2	0	40.4	9.3	Pipistrellus nathusii
	16859	1	2	0	28.6	7.1	Eptesicus serotinus
	19676	1	1	0	23.3	16.1	Eptesicus serotinus
	20029	1	1	0	24.4	12.6	Eptesicus serotinus
14	935	1	1	0	36.0	10.8	Hypsugo savii ot Piupistrellus nathusii
	1989	1	1	0	40.4	8.3	Pipistrellus nathusii

15	4367	1	6	0	49.7	14.8	Miniopterus schreibersii
	5070	1	4	0	46.7	5.6	Pipistrellus pipistrellus
	6125	1	1	0	43.8	4.3	Pipistrellus pipistrellus
	22317	1	2	0	29.1	12.1	Eptesicus serotinus
	27596	1	1	0	25.7	11.0	Eptesicus serotinus
	27949	1	1	0	24.2	9.6	Eptesicus serotinus

Transect 3: 16.09.10

Chunk	**Time (from the start of the snapshot) ms**	**No. of bats**	**No. of echolocation calls**	**No. of social call sequences**	**Peak frequency (KHz)**	**Duration (ms)**	**Suggested species**
0	29211	1	3	0	40.4	4.8	Pipistrellus nathusii
	29564	1	2	0	39.9	5.5	Pipistrellus nathusii
1	17860	1	1	0	41.4	5.6	Pipistrellus nathusii
	18918	1	4	0	42.5	5.4	Pipistrellus nathusii
	19268	1	3	0	41.4	6.4	Pipistrellus nathusii
	19621	1	2	0	40.9	7.3	Pipistrellus nathusii
2	26220	1	1	0	40.4	9.6	Pipistrellus nathusii
	26572	1	1	0	39.9	9.9	Pipistrellus nathusii
	26925	1	2	0	38.4	9.3	Pipistrellus nathusii
	27278	1	1	0	39.4	7.7	Pipistrellus nathusii
3	24023	1	1	0	50.7	10.7	Miniopterus schreibersii
5	23146	1	3	0	27.2	10.9	Eptesicus serotins
	23499	1	1	0	25.7	14.9	Eptesicus serotins
6							no bats

7	8540	2	5	0	49.7	9.9	Miniopterus schreibersii
					24.2	8.7	Eptesicus serotins
	8893	1	2	0	26.7	7.8	Eptesicus serotins
	9245	1	1	0	26.2	11.7	Eptesicus serotins
	9600	1	1	0	27.7	5.7	Eptesicus serotins
	9949	1	1	0	25.7	8.4	Eptesicus serotins
	10304	1	2	0	26.2	12.5	Eptesicus serotins
	12765	1	1	0	24.2	9.6	Eptesicus serotins
	13117	1	1	0	23.8	13.9	Eptesicus serotins
8	9512	1	1	0	34.5	14.9	Hypsugo savii or Pipistrellus nathusii
	26053	1	3	0	35.5	6.5	Myotis myotis/blythii
	27110	1	2	0	33.5	5.7	Myotis myotis/blythii
	27461	1	1	0	32.6	6.9	Myotis myotis/blythii
9	5202	1	3	0	40.4	5.7	Pipistrellus nathusii
	11184	1	3	0	40.9	8.6	Pipistrellus nathusii
	11536	2	2	4	40.9	6.1	Pipistrellus nathusii
							undetermined
	11890	2	5	0	37.0	7.1	Pipistrellus nathusii
					40.4	7.3	Pipistrellus nathusii
	13295	1	3	0	39.9	7.5	Pipistrellus nathusii
	13649	1	3	0	39.4	5.3	Pipistrellus nathusii
	15056	1	3	0	42.3	5.1	Pipistrellus nathusii
	18928	1	3	0	41.4	6.9	Pipistrellus nathusii
15	3271	1	1	0	37.9	10.7	Pipistrellus nathusii
	13830	1	2	0	26.2	13.4	Eptesicus serotins
	17702	1	1	0	37.4	10.1	Pipistrellus nathusii
	18054	1	2	0	37.9	9.1	Pipistrellus nathusii
	19463	1	2	0	38.9	11.5	Pipistrellus nathusii

	20870	1	1	0	32.6	14.6	Hypsugo savii
17	25272	1	2	0	41.4	4.1	Pipistrellus nathusii
	25622	1	2	0	40.9	8.0	Pipistrellus nathusii
	28440	1	3	0	27.7	5.2	Eptesicus serotins
	28791	1	3	0	26.7	16.1	Eptesicus serotins
	29143	1	2	0	26.2	11.4	Eptesicus serotins
	29496	1	1	0	24.2	10.4	Eptesicus serotins
18	0	1	1	0	23.3	10.1	Eptesicus serotins
	196	1	1	0	21.8	11.6	Nyctalus sp. or Vespertilio murinus
	548	1	1	0	21.3	11.0	Nyctalus sp. or Vespertilio murinus
	5827	1	2	0	42.8	4.3	Pipistrellus nathusii

Transect 4: 17.09.10

Chunk	**Time (from the start of the snapshot) ms**	**No. of bats**	**No. of echolocation calls**	**No. of social call sequences**	**Peak frequency (KHz)**	**Duration (ms)**	**Suggested species**
1	15061	1	2	0	40.4	9.6	Pipistrellus nathusii
	15412	1	1	0	39.9	10.3	Pipistrellus nathusii
	15783	1	1	0	39.4	10.8	Pipistrellus nathusii
6	555	1	1	0	40.9	9.1	Pipistrellus nathusii
	905	1	1	0	40.9	9.2	Pipistrellus nathusii
	5482	1	2	0	23.8	10.7	Eptesicus serotinus
	5834	1	2	0	26.7	10.5	Eptesicus serotinus
	6188	1	1	0	24.7	13.7	Eptesicus serotinus
8	13405	1	2	0	39.4	9.4	Pipistrellus nathusii

	13758	1	1	0	38.0	10.1	Pipistrellus nathusii
	14814	1	1	0	51.2	10.4	Miniopterus schreibersii
	19037	1	3	0	41.4	5.1	Pipistrellus nathusii
	20447	1	2	0	39.9	9.1	Pipistrellus nathusii
9	10153	1	2	0	28.1	6.2	Eptesicus serotinus
10	42	2	2	0	37.0	9.8	Pipistrellus nathusii
					26.7	11.6	Eptescus serotinus
	395	2	3	0	40.9	8.5	Pipistrellus nathusii
					34.5	11.8	Hypsugo savii
	743	2	5	0	39.9	9.3	Pipistrellus nathusii
					34.5	11.9	Hypsugo savii
	1097	1	1	0	39.4	7.4	Pipistrellus nathusii
	1449	1	1	0	29.1	8.6	Eptescus serotinus
	12008	1	1	0	27.2	8.6	Eptescus serotinus
	22920	1	1	0	27.7	10.1	Eptescus serotinus
	23270	1	2	0	26.7	11.1	Eptescus serotinus
11	2765	1	1	0	24.9	9.2	Eptescus serotinus
	3470	1	1	0	20.3	15.3	Nyctalus noctula
	13676	1	1	0	24.7	15.2	Eptescus serotinus
	14028	1	1	0	24.7	15.9	Eptescus serotinus
	15084	1	2	0	27.2	16.0	Eptescus serotinus
	16140	1	6	0			undtermined
	17196	1	1	0	26.2	15.2	Eptescus serotinus
	17547	1	1	0	24.7	9.1	Eptescus serotinus
	20364	1	1	0	26.7	13.1	Eptescus serotinus
	21417	1	1	0	24.7	16.9	Eptescus serotinus
	21775	1	1	0	24.2	18.1	Eptescus serotinus
	22474	1	1	0	24.2	16.2	Eptescus serotinus

	22826	1	1	0	24.2	10.9	Eptescus serotinus
	23884	1	1	0	24.7	12.1	Eptescus serotinus
12	2319	1	1	0	50.2	11.7	Miniopterus schreibersii
	11120	1	4	0	50.7	10.5	Miniopterus schreibersii
	17102	1	2	0	35.5	11.0	Hypsugo savii or Pipistrellus nathusii
	17454	1	1	0	36.0	9.8	Hypsugo savii or Pipistrellus nathusii
	17807	1	1	0	36.0	10.0	Hypsugo savii or Pipistrellus nathusii
13	5747	1	2	0	26.2	7.4	Eptescus serotinus
	10675	1	1	0	37.9	9.7	Pipistrellus nathusii
	14547	1	2	0	24.7	13.4	Eptescus serotinus
	14898	1	1	0	24.7	14.0	Eptescus serotinus
	15953	1	1	0	37.9	12.5	Pipistrellus nathusii
	16659	1	1	0	50.7	10.1	Miniopterus schreibersii
	17009	1	1	0	50.2	8.9	Miniopterus schreibersii
	18067	1	2	0	37.4	10.8	Pipistrellus nathusii
14	2488	1	2	0	40.9	6.1	Pipistrellus nathusii
	2839	1	2	0	41.9	7.2	Pipistrellus nathusii
	3192	1	2	0	38.9	7.3	Pipistrellus nathusii
	8119	1	1	0	27.7	9.1	Eptescus serotinus
	9878	1	1	0	36.0	10.4	Hypsugo savii or Pipistrellus nathusii
	10232	1	2	0	35.0	11.3	Hypsugo savii or Pipistrellus nathusii
	10583	1	2	0	35.5	10.5	Hypsugo savii or Pipistrellus nathusii
	10933	1	2	0	34.5	11.5	Hypsugo savii or Pipistrellus nathusii
	13044	1	1	0	35.0	11.8	Hypsugo savii or Pipistrellus nathusii
	13398	2	3	0	35.5	10.4	Hypsugo savii or Pipistrellus nathusii
	13400	1	2	0	26.2	13.4	Eptescus serotinus
	14455	1	1	0	25.2	12.8	Eptescus serotinus
	14804	1	1	0	25.2	12.9	Eptescus serotinus

	15861	1	1	0	24.7	12.4	Eptescus serotinus
	19027	1	1	0	40.9	7.8	Pipistrellus nathusii
	24310	1	1	0	37.5	8.2	Pipistrellus nathusii
	24659	1	1	0	36.0	10.4	Pipistrellus nathusii
	25012	1	1	0	36.5	12.2	Pipistrellus nathusii
	25715	1	2	0	37.0	11.1	Pipistrellus nathusii
	26066	1	1	0	36.0	9.9	Pipistrellus nathusii
	26419	1	2	0	37.0	9.1	Pipistrellus nathusii
15	635	1	1	0	38.4	10.0	Pipistrellus nathusii
	1339	1	1	0	25.7	11.7	Eptescus serotinus
	1690	2	3	0	25.2	13.1	Eptescus serotinus
					26.2	12.7	Eptescus serotinus
	2043	1	2	0	25.2	14.2	Eptescus serotinus
	2746	2	2	0	25.7	12.6	Eptescus serotinus
					24.2	17.7	Eptescus serotinus
	3099	1	1	0	25.7	11.0	Eptescus serotinus
	3452	1	1	0	23.8	7.9	Eptescus serotinus
	3805	1	2	0	28.6	6.7	Eptescus serotinus
	4506	1	1	0	23.8	13.7	Eptescus serotinus
	4860	1	1	0	24.2	7.0	Eptescus serotinus
	5564	2	4	0	24.7	9.2	Eptescus serotinus
					37.0	12.1	Pipistrellus nathusii
	5915	1	1	0	37.0	8.7	Pipistrellus nathusii
	8380	2	4	0	36.5	10.2	Pipistrellus nathusii
					25.7	8.7	Eptescus serotinus
	8729	1	2	0	23.3	12.8	Eptescus serotinus
	9082	1	1	0	18.8	19.5	Nyctalus noctula
	9433	1	1	0	40.9	9.6	Pipistrellus nathusii

	9785	1	1	0	24.2	10.2	Eptescus serotinus
	17880	1	1	0	51.8	11.0	Miniopterus schreibersii
16	15324	1	1	0	23.8	19.2	Eptescus serotinus
	15677	1	1	0	26.7	11.7	Eptescus serotinus
	19197	1	2	0	25.7	7.1	Eptescus serotinus
18	6891	1	3	0	51.2	11.3	Miniopterus schreibersii
	27105	1	3	0	38.4	8.2	Pipistrellus nathusii
	27458	1	1	0	37.0	12.2	Pipistrellus nathusii

APPENDIX 8. CAR TRANSECT SURVEY RESULTS OCTOBER 2011

Transect 1: 15.10.10

Chunk	Time (from the start of the snapshot) ms	No. of bats	No. of echolocation calls	No. of social call sequences	Peak frequency (KHz)	Duration (ms)	Suggested species
0	6595	1	4	0	44.8	2.3	undetermined
	6948	1	2	0	41.4	4.3	undetermined
	7300	1	7	0	45.8	3.8	undetermined
2	20146	1	1	0	51.0	10.4	Miniopterus schreibersii
	20496	1	2	0	50.0	10.7	Miniopterus schreibersii
4	28415	1	1	0	53.1	6.1	Miniopterus schreibersii

Transect 2: 19.10.11

Chunk	Time (from the start of the snapshot) ms	No. of bats	No. of echolocation calls	No. of social call sequences	Peak frequency (KHz)	Duration (ms)	Suggested species
0	13323	1	3	0	51.5	9.2	Miniopterus schreibersii
	13676	1	3	0	51.3	8.6	Miniopterus schreibersii
3	8135	1	1	0	38.3	8.0	Pipistrellus nathusii
4	6638	1	3	0	42.2	6.4	Pipistrellus nathusii
	6991	1	3	0	42.2	7.1	Pipistrellus nathusii
	7341	1	2	0	40.7	9.1	Pipistrellus nathusii

	7694	1	3	0	41.7	6.1	Pipistrellus nathusii
	18251	1	3	0	38.8	9.3	Pipistrellus nathusii
	18605	1	2	0	37.3	7.6	Pipistrellus nathusii
	18956	1	2	0	37.3	8.3	Pipistrellus nathusii
5	6550	1	2	0	26.0	16.2	Eptesicus serotinus
	6904	1	1	0	25.5	11.5	Eptesicus serotinus
	7253	1	1	0	24.1	16.8	Eptesicus serotinus
	7608	1	1	0	23.1	16.4	Eptesicus serotinus
	7957	1	1	0	23.6	14.5	Eptesicus serotinus
	8312	1	1	0	23.6	16.0	Eptesicus serotinus
	9013	1	2	0	23.6	14.4	Eptesicus serotinus
	9368	1	1	0	24.1	13.8	Eptesicus serotinus
	9717	1	1	0	23.1	16.0	Eptesicus serotinus
	10072	1	1	0	23.6	17.4	Eptesicus serotinus
	10420	1	1	0	25.0	15.6	Eptesicus serotinus
	10774	1	1	0	25.0	12.9	Eptesicus serotinus
	11477	1	1	0	26.0	11.8	Eptesicus serotinus
	11829	1	2	0	26.5	8.7	Eptesicus serotinus
	12183	1	1	0	26.0	11.7	Eptesicus serotinus
	12534	1	1	0	27.5	11.2	Eptesicus serotinus
	12886	1	1	0	24.6	11.2	Eptesicus serotinus
6	26173	1	2	0	39.7	9.1	Pipistrellus nathusii
	26524	1	1	0	40.7	9.5	Pipistrellus nathusii
	26877	1	2	0	39.3	9.2	Pipistrellus nathusii
	27230	1	2	0	39.7	8.9	Pipistrellus nathusii
8	3122	1	3	0	42.7	5.1	Pipistrellus nathusii
	3474	1	1	0	40.7	5.9	Pipistrellus nathusii
	4178	1	1	0	49.0	9.5	Miniopterus schreibersii

	26351	1	2	0	50.5	8.5	Miniopterus schreibersii
9	1624	1	2	0	40.7	9.5	Pipistrellus nathusii
	1978	1	1	0	39.3	6.8	Pipistrellus nathusii
	6202	1	2	0	40.7	8.5	Pipistrellus nathusii
	6552	1	1	0	37.8	7.7	Pipistrellus nathusii
	22742	1	2	0	41.2	5.1	Pipistrellus nathusii
10	8577	1	1	0	40.2	8.2	Pipistrellus nathusii
	8927	1	2	0	39.7	9.3	Pipistrellus nathusii
	9282	1	2	0	40.2	9.2	Pipistrellus nathusii
	9630	1	1	0	39.7	8.4	Pipistrellus nathusii
	9984	1	1	0	40.2	8.9	Pipistrellus nathusii
16	9809	1	5	0	51.0	7.1	Miniopterus schreibersii

Transect 3: 17.10.10

Chunk	Time (from the start of the snapshot) ms	No. of bats	No. of echolocation calls	No. of social call sequences	Peak frequency (KHz)	Duration (ms)	Suggested species
5	1091	1	2	0	39.3	8.9	Pipistrellus nathusii
10	3804	1	2	0	25.0	5.5	Eptesicus serotinus
	4156	1	1	0	26.0	8.1	Eptesicus serotinus
	4510	1	1	0	25.5	4.8	Eptesicus serotinus
13	27812	1	1	0	52.5	10.3	Miniopterus schreibersii
17	15473	1	1	0	53.1	3.5	Miniopterus schreibersii

Transect 4: 04.11.10

Chunk	Time (from the start of the snapshot) ms	No. of bats	No. of echolocation calls	No. of social call sequences	Peak frequency (KHz)	Duration (ms)	Suggested species
8	6110	1	1	0	39.4	6.2	Pipistrellus nathusii
16	19150	1	1	0	24.2	8.7	Vespertilio murinus
	19853	1	1	0	22.8	11.7	Vespertilio murinus
	20204	1	1	0	24.7	9.9	Vespertilio murinus
	21260	1	1	0	23.8	8.9	Vespertilio murinus

APPENDIX 9. RESULTS OF SEARCHER EFFICIENCY TRIAL JUNE 2010

Searcher:	Ivaylo Raykov		
Date carcass placed	Turbine No.	Carcass No.	Found? (Y/N)
17.06.2011	29	1	Y
17.06.2011	29	2	Y
17.06.2011	29	3	Y
17.06.2011	29	4	Y
17.06.2011	29	5	N
17.06.2011	29	6	Y
17.06.2011	9	7	Y
17.06.2011	9	8	N
17.06.2011	9	9	N
19.06.2011	18	10	Y
19.06.2011	18	11	N
19.06.2011	18	12	Y
19.06.2011	18	13	Y
19.06.2011	18	14	Y
19.06.2011	18	15	Y
19.06.2011	18	16	Y
19.06.2011	19	17	N
19.06.2011	19	18	N
19.06.2011	19	19	N
19.06.2011	19	20	N
19.06.2011	19	21	Y
20.06.2011	17	22	Y
20.06.2011	17	23	N
20.06.2011	17	24	N
20.06.2011	17	25	Y

APPENDIX 10. RESULTS OF SEARCHER EFFICIENCY TRIAL OCTOBER 2010

Searcher:	Stefan Mitev		
Date carcass placed	Turbine No.	Carcass No.	Found? (Y/N)
21.10.2011	29	1	Y
21.10.2011	29	2	Y
21.10.2011	29	3	Y
21.10.2011	29	4	Y
21.10.2011	29	5	Y
21.10.2011	29	6	Y
21.10.2011	29	7	Y
21.10.2011	29	8	Y
22.10.2011	26	9	N
22.10.2011	26	10	Y
22.10.2011	26	11	Y
22.10.2011	26	12	Y
22.10.2011	26	13	Y
22.10.2011	26	14	N
22.10.2011	26	15	Y
22.10.2011	8	16	N
22.10.2011	8	17	N
22.10.2011	8	18	N
22.10.2011	8	19	Y
22.10.2011	8	20	N
22.10.2011	8	21	Y
22.10.2011	8	22	Y
22.10.2011	8	23	Y
22.10.2011	8	24	N
22.10.2011	8	25	N
23.10.2011	46	26	N
23.10.2011	46	27	N
23.10.2011	46	28	N
23.10.2011	46	29	Y
23.10.2011	46	30	N
23.10.2011	46	31	Y
23.10.2011	46	32	Y
23.10.2011	46	33	Y
23.10.2011	46	34	N
23.10.2011	46	35	Y
23.10.2011	46	36	Y
23.10.2011	37	37	Y
23.10.2011	37	38	N
23.10.2011	37	39	Y
23.10.2011	37	40	N
23.10.2011	37	41	Y

23.10.2011	37	42	Y
23.10.2011	37	43	Y
23.10.2011	37	44	Y

APPENDIX 11. RESULTS OF CARCASS REMOVAL TRIAL JUNE 2010

Turbine no.	Carcass no.	Date carcass left out	Day after positioning																								
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
29	1	17.06.2011	Y	Y	Y	N																						
29	2	17.06.2011	N																									
29	3	17.06.2011	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N												
29	4	17.06.2011	Y	Y	Y	Y	Y	N																				
29	5	17.06.2011	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
29	6	17.06.2011	Y	N																								
9	7	17.06.2011	N																									
9	8	17.06.2011	Y	N																								
9	9	17.06.2011	Y	Y	Y	N																						
18	10	19.06.2011	Y	Y	Y	Y	Y	Y	Y	Y	N																	
18	11	19.06.2011	Y	Y	Y	N																						
18	12	19.06.2011	Y	Y	Y	Y	Y	Y	Y	Y	N																	
18	13	19.06.2011	Y	N																								
18	14	19.06.2011	Y	N																								
18	15	19.06.2011	Y	Y	Y	Y	N																					
18	16	19.06.2011	Y	N																								
19	17	19.06.2011	N																									
19	18	19.06.2011	Y	Y	Y	Y	N																					
19	19	19.06.2011	Y	Y	Y	N																						
19	20	19.06.2011	N																									
19	21	19.06.2011	Y	Y	Y	Y	N																					
17	22	20.06.2011	Y	Y	N																							
17	23	20.06.2011	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N			

Turbine no.	Carcass no.	Date carcass left out	Day after positioning																								
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
17	**24**	**20.06.2011**	Y	Y	N																							
17	**25**	**20.06.2011**	Y	Y	N																							

Status (Y = present, N = missing)

APPENDIX 12. RESULTS OF CARCASS REMOVAL TRIAL OCTOBER 2010

			Day after positioning													
Turbine no.	Carcass no.	Date carcass left out	1	2	3	4	5	6	7	8	9	10	11	12	13	14
29	1	21/10/2011	Y	Y	Y	Y	Y	Y	N							
29	2	21/10/2011	Y	Y	Y	Y	Y	Y	N							
29	3	21/10/2011	Y	Y	Y	Y	Y	Y	N							
29	4	21/10/2011	Y	Y	Y	Y	Y	Y	N							
29	5	21/10/2011	Y	Y	Y	Y	Y	Y	Y	Y	N					
29	6	21/10/2011	Y	Y	Y	Y	Y	Y	N							
29	7	21/10/2011	Y	Y	Y	Y	Y	Y	Y	Y	Y	N				
29	8	21/10/2011	Y	Y	Y	Y	Y	Y	N							
26	9	22/10/2011	Y	Y	Y	Y	Y	N								
26	10	22/10/2011	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
26	11	22/10/2011	Y	Y	Y	Y	Y	N								
26	12	22/10/2011	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
26	13	22/10/2011	Y	Y	Y	Y	Y	Y	N							
26	14	22/10/2011	Y	Y	Y	Y	Y	N								
26	15	22/10/2011	Y	Y	Y	Y	Y	Y	Y	N						
8	16	22/10/2011	Y	Y	Y	Y	Y	Y	Y	Y	N					
8	17	22/10/2011	Y	Y	Y	Y	Y	N								
8	18	22/10/2011	Y	Y	Y	Y	Y	N								
8	19	22/10/2011	Y	Y	Y	Y	Y	N								
8	20	22/10/2011	Y	Y	Y	Y	Y	N								
8	21	22/10/2011	Y	Y	Y	Y	Y	Y	Y	Y	N					
8	22	22/10/2011	Y	Y	Y	Y	Y	Y	Y	Y	N					
8	23	22/10/2011	Y	Y	Y	Y	Y	Y	Y	Y	N					
8	24	22/10/2011	Y	Y	Y	Y	Y	N								

Turbine no.	Carcass no.	Date carcass left out	Day after positioning 1	2	3	4	5	6	7	8	9	10	11	12	13	14
8	25	22/10/2011	Y	Y	Y	Y	Y	N								
46	26	23/10/2011	Y	Y	Y	Y	N									
46	27	23/10/2011	Y	Y	Y	Y	N									
46	28	23/10/2011	Y	Y	Y	Y	N									
46	29	23/10/2011	Y	Y	Y	Y	N									
46	30	23/10/2011	Y	Y	Y	Y	N									
46	31	23/10/2011	Y	Y	Y	Y	N									
46	32	23/10/2011	Y	Y	Y	Y	N									
46	33	23/10/2011	Y	Y	Y	Y	N									
46	34	23/10/2011	Y	Y	Y	Y	N									
46	35	23/10/2011	Y	Y	Y	Y	N									
46	36	23/10/2011	Y	Y	Y	Y	N									
37	37	23/10/2011	Y	Y	Y	Y	N									
37	38	23/10/2011	Y	Y	Y	Y	N									
37	39	23/10/2011	Y	Y	Y	Y	N									
37	40	23/10/2011	Y	Y	Y	Y	N									
37	41	23/10/2011	Y	Y	Y	Y	N									
37	42	23/10/2011	Y	Y	Y	Y	N									
37	43	23/10/2011	Y	Y	Y	Y	N									
37	44	23/10/2011	Y	Y	Y	Y	N									

Status (Y = present, N = missing)