Technical Report 28

Ecological Technical Report 2: Herpetofauna

NZ TRANSPORT AGENCY
WAKA KOTAHI

1 MacKays to Peka Peka Expressway

Revision History

Revision Nº	Prepared By	Description	Date
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Document Acceptance

Action	Name	Signed	Date
Prepared by	Jonathan Ruffell		8/11/11
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Appendices

1. Executive summary

The NZ Transport Agency (NZTA) proposes to construct an approximately 16km proposed Expressway between MacKay's Crossing (Raumati South) and Peka Peka (approximately 3km north of Waikanae) (NZTA 2010). This document presents an assessment of the effects of the proposed Expressway construction on native herpetofauna.

Herpetofaunal communities were assessed by:

- searching the Department of Conservation's (DoC's) BioWeb Herpetofauna Database for records of lizards and frogs within the wider landscape,
- assessing the suitability of habitat onsite, and
- actively searching for terrestrial and arboreal lizards using artificial refuges (AR) and spotlight searches, respectively.

Five native lizard species were recorded in the Herpetofauna Database within 3km of the proposed Alignment, and the habitat assessment demonstrated that high quality terrestrial and arboreal lizard habitat was present onsite. Conversely, habitat was unsuitable for native frogs. During our active searches we located common skinks (Oligosoma polychroma) at 54.5% of our AR sampling sites, and common or unidentified skinks (i.e. those which escaped prior to identification) at 68.2% of sites. No other lizards were detected.

Common skinks were abundant and widespread in the dense grassland areas of the proposed Alignment, but appeared to be rare in or absent from other habitat types. The unidentified skinks were probably common skinks. It is possible that other species are present onsite, but if so they are likely to occur only in low numbers.

We recommend that the potential effects of works on common skinks be mitigated by creating areas of high quality lizard habitat. If our recommendations are followed, the effects of the proposed Expressway construction on resident herpetofauna and their habitats will be adequately mitigated.

2. Introduction

The NZTA proposes to construct an approximately 16km proposed Expressway between MacKay's Crossing (Raumati South) and Peka Peka (approximately 3km north of Waikanae) (NZTA 2010). The proposed Expressway forms part of the Wellington Northern Corridor, the development of which is considered to be of national significance (NZTA 2010).

The construction of the proposed Expressway may affect habitats which are occupied by native herpetofauna (amphibians and reptiles). All native herpetofauna are fully protected under the

Wildlife Act (1953). This document presents an assessment of the ecological effects (AEcE) of the proposed construction of the preferred route on native herpetofauna and their habitats. Measures to ensure that the Project's effects are adequately mitigated are discussed.

3. Methods

The assessment included a search of the Department of Conservation's (DoC's) BioWeb Herpetofauna Database, an assessment of the suitability of habitat onsite, and active searches for terrestrial and arboreal lizards. These methods are described in more detail below.

3.1. Herpetofauna database search

The purpose of the Herpetofauna Database search was to determine which species occur in the wider area, and to determine whether any species had previously been located onsite. The Database was searched for all records within a 10km radius of the works footprint.

3.2. Habitat assessment

In conjunction with the active searches (see below), the quality of habitat onsite was assessed to help determine the probable distribution of herpetofaunal communities. We determined the nature and extent of habitat onsite using aerial imagery and the Land Cover Database 2 (LCDB2). We also viewed the majority of habitat while selecting the active survey sites (see Section 3.3).

The quality of terrestrial lizard habitat was assessed primarily on the basis of refuge availability and openness, whereas arboreal lizard quality was assessed primarily on the availability of native shrubs and trees, and in particular kanuka. Native frog habitat was assessed on the availability of well-shaded, hard-bottomed streams bordered by native bush.

3.3. Lizard surveys

3.4. Terrestrial lizard survey

Terrestrial lizards were surveyed using ARs, each of which consisted of an approximately 500mm x 500mm Onduline roofing tile. A total of 220 ARs were distributed across the site in 22 groups of 10 (see Map 1 for sampling locations and Appendix 28.A for greater methodological detail). Note that 24 sites were initially established, but two of these (16 and 22) were discontinued due to their being disturbed by the public. We chose the locations of these sites on the basis of representativeness of habitat types, geographic distribution and accessibility. ARs were checked for lizard occupancy two or three times over the course of the survey, with a minimum of four weeks left between checks (see Appendix 28.A).

Most lizard surveys also incorporate a search of existing terrestrial refugia (e.g. pieces of deadwood, stones etc) present onsite. In the present study, the vast majority of suitable habitat

consisted of thick ground tier vegetation which could not be easily searched. Thus, while existing refugia were searched where encountered, this method contributed only minimally to the overall search effort.

Because a variety of habitat types were present onsite which terrestrial lizards could potentially inhabit (e.g. grasslands, pine forest, kanuka), we assessed habitat preferences by comparing lizard abundance between habitats. This was done by grouping each AR and captured skink into one of the below habitat categories, then calculating the number of skinks caught per AR within each group.

- Dense grass with or without other ground tier species, no trees,
- Sparse grass beneath trees, or
- Pines.

Note that to avoid pseudoreplication (i.e. counting the same individual multiple times), we restricted the dataset to the maximum number of skinks captured per survey site at any one time.

3.5. Arboreal lizard survey

Survey sites for arboreal lizards were determined during the habitat assessment (see Section 3.2). Lizards were searched for at night using powerful spotlights. A car battery-powered spotlight was used in road-accessible areas, whereas hand-held 'Dolphin' or head-mounted 'LED Lenser' spotlights were otherwise used. The trunks, branches and foliage of suitable vegetation (specifically native trees and shrubs) were scanned for lizards. See Map 1 and Appendix 28.B for search locations and Appendix 28.C for greater methodological detail.

3.6. Frog survey

It was determined during the habitat assessment that the area was unsuitable for native frogs. Thus, we did not actively search for individuals.

4. Results

4.1. Herpetofauna database search

Five native lizard species were recorded in DoC's Herpetofauna Database, including two threatened species (see Table 1). One introduced species of frog was also recorded (see Table 1). The most commonly recorded native species was the common skink (eight records), with Wellington green geckos also recorded fairly often (four records). All native species occurred close to the proposed Alignment (≤3km), with most species occurring within 500m (see Table 1). Note that to limit lizard poaching, DoC has requested that these records not been mapped

Table 1 Herpetofauna Located Within 10km of the Proposed Construction Footprint in DoC's Herpetofauna Database.

Major taxon	Latin name	Common name	Conservation status1	No. records ≤10km from Alignment	Closest record to Alignment
Gecko	Naultinus elegans punctatus	Wellington green gecko	Threatened, at risk, declining	4	0.5
	Hoplodactylus maculatus	Common gecko	Protected, not threatened	3	2.5
Skink	Oligosoma polychroma	Common skink	Protected, not threatened	8	<0.5
	Oligosoma ornatum	Ornate skink	Threatened, at risk, decliningCD PD	2	3
	Oligosoma aeneaum	Copper skink	Protected, not threatened	2	<0.5
	-	Unidenitified skink	Unknown	2	<0.5
Frog	Litoria raniformis	Golden bell from	Introduced	6	<0.5
	Litoria sp.	Unidentified frog	Introduced	2	1
No. native species					5
No. native records					19
No. introduced species					1
No. introduced records					8

[1]From Hitchmough et al (2010). CD = conservation dependent, PD = partial decline

Records of marine herpetofauna (sea turtles and snakes) have been omitted.

4.2. Habitat assessment

4.2.1. Terrestrial lizards

Much of the habitat within the southern two-thirds of the Alignment was highly suitable for terrestrial lizards. Here, large areas were covered in dense grass and associated ground-tier species – characteristics preferred by native terrestrial lizards due to the abundance of refuges and openness. Heading northwards, habitat was often unsuitable due to grazing, however, pockets of dense ground tier vegetation persisted around the borders of bush patches, under fencelines and at roadside verges.

The areas of bush and wetlands within the Alignment were generally suboptimal for terrestrial lizards due to their shady character and often sparse ground tier. However, the sunnier perimeters of these areas often represented high quality habitat.

4.2.2. Arboreal lizards

The majority of the proposed Alignment represented low quality arboreal lizard habitat due to the absence of suitable tree species. However, a number of bush patches/wetlands were optimal due to their being composed of preferred tree species (e.g. kanuka). The locations of these search sites are presented in Map 1 and Appendix 28.B. Arboreal lizards are highly selective of their habitat, and the areas of exotic bush/trees onsite were unsuitable.

4.2.3. Active searches for lizards

Terrestrial lizards

We observed common skinks at 12 of the 22 sites (54.5%), unidentified skinks at 13 sites (59.1%), and common or unidentified skinks at 15 sites (68.2%) (see Map 2). Note that unidentified skinks were those which escaped prior to identification. No other species were recorded. Regarding the number of individuals observed, we found a minimum of 17 common skinks on 68 occasions (see Appendix 28.A for further explanation), and unidentified skinks on 36 occasions.

Skinks were observed at virtually all sites where long, thick grass was present, and were not recorded at any other site. The average capture rates within dense grass were 0.144 common skinks and 0.138 unidentified skinks per AR, respectively (see Figure 1).

Because there were obvious differences in capture rates between ‘dense grass’, ‘trees above sparse grass’ and ‘pine’ habitats, we used the Poisson distribution1 to test how rare skinks would

[1] The Poisson distribution gives the probability that a given number of events occur assuming a known average rate, λ, for those events. We used this distribution to test the probability that no skinks (the given number of events mentioned above) would be found in the ‘pine’ and ‘trees above sparse grass’ habitats assuming that

need to be in each habitat before we would expect to find none if present and given our sampling effort. Here, the probability of detection (λ – the single parameter requiring estimation under the Poisson distribution) was estimated as the number of skinks observed per AR across the grassland habitats multiplied by the number of ARs laid in each habitat.

Our analysis revealed that if capture rates (indicative of skink densities) were similar between the 'pine'/'trees above sparse grass' and the 'dense grass' habitats, we would have a near 100% chance of locating ≥1 skink in all habitat types given our sampling effort (see Figure 2). Indeed, even if capture rates were a quarter of that observed in the grassland habitats, we would still have a 90.9% and 71.8% chance of locating at ≥1 skink in the 'pine' and 'trees above sparse grass' habitats, respectively (see Figure 2). Indeed, the probability of locating ≥1 skink only dropped below 50% at capture rates approximately one eighth and one sixteenth that of the grassland habitat amongst 'pines' and 'trees above sparse grass', respectively (see Figure 2).

4.3. Figure 4-1 Number of skinks caught per AR in different habitat types.

Note that capture rates were estimated using the maximum number of individuals observed in a single trip for each site. This was to avoid recounting the same individual twice, but meant that capture rates have almost certainly been underestimated.

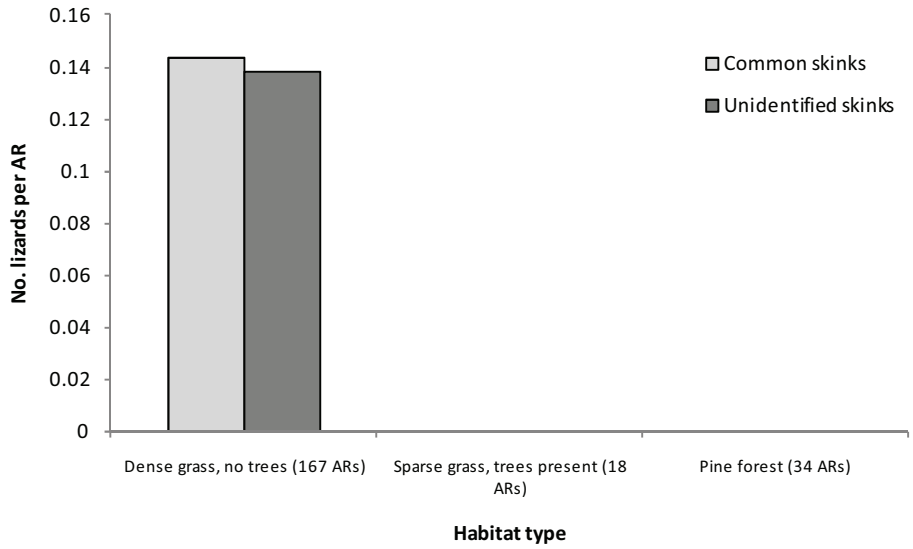

Figure 4-2 The probability of locating at least one skink in the 'trees above sparse grass' and 'pine forest' habitats given the number of ARs used and assuming various capture rates.

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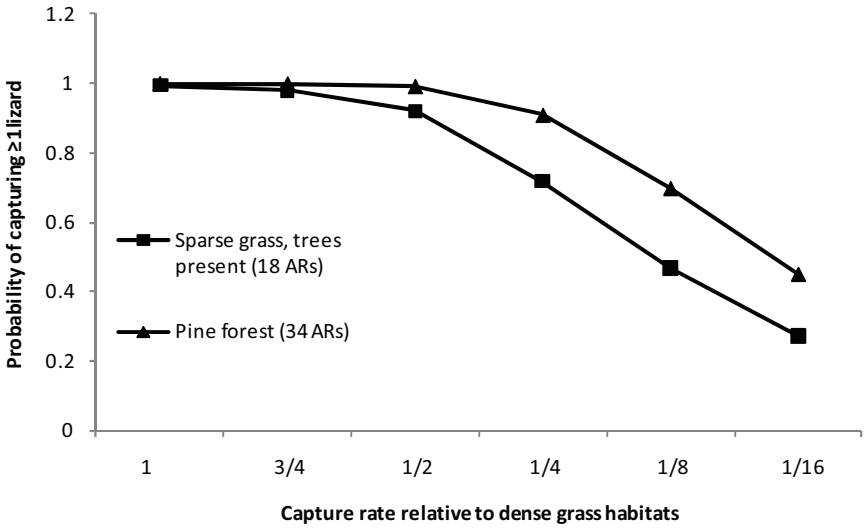
capture probabilities were the same as observed in the 'dense grass' habitats (the known average rate, λ). Paraphrased, we used this distribution to test the probability of finding no skinks in the 'pine' or 'trees above sparse grass' habitats if they occurred at similar densities to that observed amongst dense grass.



4.4. Arboreal lizards

Following the results of the habitat assessment and scoping during our first site visit, it was determined that six bush patches were present within the works footprint which could potentially support arboreal lizards (see Map 1, Appendices 28.B and 28.C). A total of 40 person hours were spent searching for arboreal lizards at these sites (see Appendix 28.C). No lizards were found. We note that excessively thick undergrowth prevented a comprehensive survey of the 'El Rancho' wetland site (see Map 1, Appendix 28.B).

5. Discussion

Our study demonstrated that common skinks are abundant in most or all dense grasslands across the proposed Alignment. This habitat type was prevalent, particularly in the southern two thirds of the proposed Expressway. Unidentified skinks were also frequently observed, however these were probably all common skinks.

No other lizards were recorded, and this suggests that other species are either absent from the Alignment or occur only at low densities. While our survey was comprehensive, the latter cannot be ruled out given the crypticism of native lizards, the suitability of habitat (for both terrestrial and arboreal species), and the fact that the Herpetofauna Database confirmed that several additional species (the copper skink, ornate skink, common gecko and Wellington green gecko) occur in the wider landscape. Conversely, native frogs are extremely unlikely to occur onsite due to the absence of suitable habitat.

Regarding the potential occupation of other habitat types, our Poisson analysis demonstrated that it would be highly unlikely for skinks to occur in the 'pine' or 'trees above sparse grass' habitats unless they were much rarer than in dense grassland. This contention assumes that detection

probabilities either accurately reflect rarity or are lower in the grassland habitats, but we believe the latter to be correct.

Absence from or rarity in tree-covered habitats probably reflects excessive shade and/or the absence of dense ground tier vegetation. Additionally, it is our experience that even superficially suitable areas of pines (i.e. those which are open and with dense ground cover) are only rarely occupied by lizards. It is likely that pines alter microhabitat conditions to be unfavourable to lizard habitation.

6. Conclusions and recommendations

Common skinks were abundant and widespread across the site, and probably occur in most or all areas of dense grass. Conversely, this species is likely to be rare or absent from tree-covered areas, probably due to excessive shade and/or the lack of a dense ground tier. Other lizard species are known to occur within the wider landscape, and we cannot rule out the possibility that they are present onsite at low densities. Native frogs are highly unlikely to occur onsite due to a total absence of suitable habitat.

Our assessment produces the below recommendations. We believe that the effects of proposed Expressway construction on resident herpetofauna and their habitats will be adequately mitigated if these recommendations are followed.

- We consider that there are insufficient ecological grounds to recommend relocating common skinks from the works footprint. This is because a) the species is abundant, widespread and not threatened; b) it would be difficult to relocate more than a small proportion of the population; c) potential release sites with suitable habitat probably already hold their carrying capacity of common skinks; d) greater ecological gains would be achieved by creating lizard additional habitat (see below); and e) common skinks are likely to colonise created habitat unassisted. However, it is an offence to kill or injure protected lizards or disturb their habitats under the Wildlife Act 1953, and consequently a relocation or an 'Authority to Distrurb Protected Wildlife' permit will be required to ensure compliance with this legislation If the latter option is desired, NZTA will need to liase with DoC to confirm that this is acceptable. While it is possible that lizard species other than the common skink occur onsite (including two threatened species), these are unlikely to be present in significant numbers. Further, it would be extremely difficult to find and relocate any such individuals if they were present.
- While we comprehensively searched the majority of terrestrial and arboreal lizard habitat onsite, we could only access a small portion of the 'El Rancho' wetland due to excessively thick undergrowth. If the proposed Expressway passes through this vegetation, a series of tracks should be cut through the construction zone to allow the area to be comprehensively searched for arboreal lizards.

- As alluded to above, the creation of lizard habitat should be included in landscape plans. Terrestrial lizards prefer open environments with abundant refuges, and the edges of plantings are conducive to these characteristics because they are naturally open and promote the growth of a thick ground tier. We recommend designating and managing such edges as lizard habitat, and planting appropriate ground tier species such as toe toe (*Austroderia toetoe*, *A. fulvida*), meadow rice grass (*Microlaena stipoides*), blueberry grass (*Dianella nigra*) and flax (*Phormium tenax*).
- Optimal arboreal lizard habitat consists of native shrubs and trees, and particularly kanuka (*Kunzea ericoides*). Landscape plans should also incorporate these species.
- A qualified herpetologist should review landscape plans to ensure that they provide high quality lizard habitat.

References

Hitchmough, R.A., Hoare, J.M., Jamieson, H., Newman, D., Tocher, M.D., Anderson, P.J., Lettink, M., and Whitaker, A.H. 2010. Conservation status of New Zealand reptiles, 2009. New Zealand Journal of Zoology 37:3. P203-224.

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Appendix 28.A

Details of the AR Survey

Appendix 28.A: Details of the AR Survey

CS = common skink, US = unidentified skink. The locations of survey sites and lizards captured are presented in Maps 1 and 2, respectively. All ARs were laid in late September 2010 except for those at Sites 1, 7 and 23, which were laid in late October 2010.

	Results By Survey Date						Totals		
	26-28.10.10		6-8.12.10		16-17.02.11		CS		US
Site	CS	US	CS	US	CS	US	Minimum No. Individuals[1]	Total No. Captures[1]	Total No. Captures[1]
1	n/a[2]		0	0	1	0	1	1	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	5	0	2	1	0	1	5	7	2
5	2	0	2	2	0	1	2	4	3
6	1	0	0	2	1	1	1	2	3
7	n/a[2]		0	0	0	0	0	0	0
8	0	0	0	0	1	0	1	1	0
9	0	1	0	1	0	0	0	0	2
10	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0
13	1	0	1	2	0	0	1	2	2
14	0	2	2	1	0	0	2	2	3
15	0	2	0	0	0	0	0	0	2
16							n/a[2]		
17	1	1	3	2	0	0	3	4	3
18	1	3	3	0	0	0	3	4	3
19	0	1	0	1	0	1	0	0	3
20	0	1	2	1	0	1	2	2	3
21	0	1	2	1	0	0	2	2	2
22							n/a[2]		
23	n/a[2]		0	0	0	0	0	0	0
24	0	3	0	2	1	0	1	1	5
Total[1]	11	15	17	16	4	5	17	68	36

[1]Note that because skinks may have been recaptured between trips, the total number of captures may overestimate the total number of individuals captured. Conversely, the 'minimum no. individuals' is the maximum number captured at a site during one survey, and is likely to underestimate the total number of individuals captured. We have not presented the minimum number of unidentified skinks captured because these may have been recorded as common skinks elsewhere in the study.

[2] Sites 16 and 22 were disturbed between initial establishment and the first check and were subsequently excluded from the survey. To compensate, three new sites (1, 7 and 23) were re-established, but consequently were only checked for lizard occupancy twice.

Appendix 28.B

Maps of Individual Spotlight Search Sites

Appendix 28.B: Maps of Individual Spotlight Search Sites

The locations of these sites within the wider landscape are shown in Map 1.

Appendix 28.C

Effort Invested in the Night-Time Search for Arboreal Lizards

Appendix 28.C: Effort Invested in the Night-Time Search For Arboreal Lizards

No lizards were found during the search.

Date	Time	No. searchers	Person hours	Search method	Location[1]	Mapped location number[1]	Habitat	Weather
21/09/2010	1900-2100	2	4	HHS	Mountain Bike Club	D	Tea tree scrub	Locally calm, mild, dry
21/09/2010	2110-2155	1	0.75	HHS	Raumati Rd Pony Club	E	Tea tree scrub	Locally calm, mild, dry
22/09/2010	1900-2000	2	1	CBS	Raumati Sth Peatlands and surrounds	F	Tea tree scrub	Variable wind but primarily calm, dry, mild
22/09/2010	2000-2115	2	2.5	HHS	Raumati Sth Peatlands and surrounds	F	Tea tree scrub	Variable wind but primarily calm, dry, mild
26/10/2010	2030-2045	2	0.5	CBS	Ti Kouka Wetland	B	Regenerating native vegetation: mahoe, / tea tree	Calm, still, mild, dry
26/10/2010	2100-2145	2	1.5	HHS	Ngarara Wetland	A	Tea tree scrub	Calm, still, mild, dry
26/10/2010	2145-1015	2	1	CBS	Ngarara Wetland	A	Tea tree scrub	Calm, still, mild, dry
26/10/2010	2245-0030	2	3.5	HHS	Mountain Bike Club	D	Tea tree scrub	Calm, still, mild, dry
27/10/2010	2015-2115, 2230-2300	2	3	HHS	Raumati Sth Peatlands and surrounds	F	Tea tree scrub	Calm, still, mild, dry
27/10/2010	2130-2215	2	1.5	HHS	Raumati Rd Pony Club	E	Tea tree scrub	Calm, still, mild, dry
27/10/2010	2215-2230	2	0.5	CBS	Raumati Sth Peatlands and surrounds	F	Tea tree scrub	Calm, still, mild, dry
6/12/2010	2100-2215	2	2.5	HHS	El Rancho wetland (west of Puriri Rd)	C	Tea tree scrub	Calm, humid, warm, light drizzle and breeze
6/12/2010	2220-2235	2	0.5	HHS	Ngarara Wetland	A	Tea tree scrub	Calm, humid, warm, light drizzle and breeze
6/12/2010	2235-2250	2	0.5	CBS	Ngarara Wetland	A	Tea tree scrub	Calm, humid, warm, light drizzle and breeze
6/12/2010	2250-2350	2	2	HHS	Ngarara Wetland	A	Tea tree scrub	Calm, humid, warm, light drizzle and breeze
6/12/2010	0015-0100	2	1.5	HHS	Raumati Sth Peatlands and surrounds	6	Tea tree scrub	Calm, humid, warm, light drizzle and breeze

Date	Time	No. searchers	Person hours	Search method	Location[1]	Mapped location number[1]	Habitat	Weather
6/12/2010	0100-0130	2	1	CBS	Raumati Sth Peatlands and surrounds	6	Tea tree scrub	Calm, humid, warm, light drizzle and breeze
7/12/2010	2100-2230	2	3	HHS	Mountain Bike Club	D	Tea tree scrub	Warm, occasional showers, light breeze
7/12/2010	2230-2245	2	0.5	CBS	Raumati Rd Pony Club	E	Tea tree scrub	Warm, occasional showers, light breeze
7/12/2010	2300-0015	2	2.5	HHS	Raumati Rd Pony Club	E	Tea tree scrub	Warm, occasional showers, light breeze
8/12/2010	2100-2245	2	3.5	HHS	Raumati Sth Peatlands and surrounds	F	Tea tree scrub	Mild, clear, still, dry
8/12/2010	2245-2300	1	0.25	CBS	Raumati Sth Peatlands and surrounds	F	Tea tree scrub	Mild, clear, still, dry
16/02/2011	2245-2300	2	0.5	CBS	Raumati Sth Peatlands and surrounds	F	Tea tree scrub	Warm, calm, dry
16/02/2011	2300-2345	2	1.5	HHS	Raumati Sth Peatlands and surrounds	F	Tea tree scrub	Warm, calm, dry
16/02/2011	2345-0000	2	0.5	CBS	Raumati Sth Peatlands and surrounds	F	Tea tree scrub	Warm, calm, dry
Total number of person hrs								
Raumati Sth Peatlands and surrounds								15.75
Mountain Bike Club								10.5
Raumati Rd Pony Club								5.25
Ngarara Wetland								5.5
El Rancho wetland (west of Puriri Rd)								2.5
Ti Kouka Wetland								0.5
Total								40

[1]See Map1 for the location of sampling sites.