



# Call count monitoring of Northland brown kiwi 2016

Emma Craig and Megan Topia



Cover: Northland brown kiwi chick. *Photo: Edwin Smith.*

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## 1. Introduction

### 1.1 Objective

The objective of this report is to summarise the results of the 2016 call count monitoring of Northland brown kiwi (*Apteryx mantelli*), and to provide recommendations for future monitoring.

### 1.2 Background

Northland populations of kiwi have declined, mainly due to predation by stoats (*Mustela erminea*), ferrets (*M. furo*), dogs (*Canis familiaris*) and cats (*Felis catus*), and increasing land development pressures throughout the region (Pierce et al. 2006). In the early 1990s, a network of call count listening stations was established nationally in order to determine trends (stable, increasing or decreasing) in kiwi populations over time (McLennan, 1992). In 1993, 24 kiwi listening stations were established in four geographic areas in Northland (Northern, Eastern, Southern, Western) where kiwi were known to be present, with kiwi call count monitoring occurring annually since 1995. Call count surveys are one of the main tools used for assessing trends in kiwi populations and are used in Northland to:

- Monitor the trends in call counts (and hence population size) over time at the 24 original (1993) listening stations in the four geographic areas (Northern, Eastern, Western, Southern).
- Monitor the trends in kiwi populations at the growing number of kiwi management sites throughout Northland.

### 1.3 Northland listening sites

The 24 original kiwi listening stations that were established in 1993 in the four geographic areas in Northland (Pierce & Westbrooke, 2003) are mapped in Fig. 1 and listed in Table 1. In the Northern cluster six stations were established either in or on the edge of extensive forest in the Herekino-Raetia-Puketi Forests area. In the Eastern cluster six stations were established in forest remnants and extensive exotic forestry in the Bay of Islands area spanning Pururu Peninsula-Waitangi-Russell Peninsula. In the Western cluster five stations were established in extensive forest (two in Waipoua) or forest remnants (Kaitui, Trounson and Paerata). In the Southern cluster seven stations were established within 30 km of Whangarei, all northwest to northeast of the city and involving forest remnants, including two that also include areas of exotic forest (Glenbervie 7A & 9A). Over the years, many additional listening stations have been added, predominantly in areas where community groups are working to protect kiwi. The extensive involvement of local communities in the protection of kiwi and the associated expansion of the number of kiwi listening stations provides strong information on the current distribution and

density of Northland brown kiwi throughout its range (Fig. 1). Populations now extend across both public and private land in Northland, from Whakaangi in the Far North to Ponui Island in the south (Fig. 1).

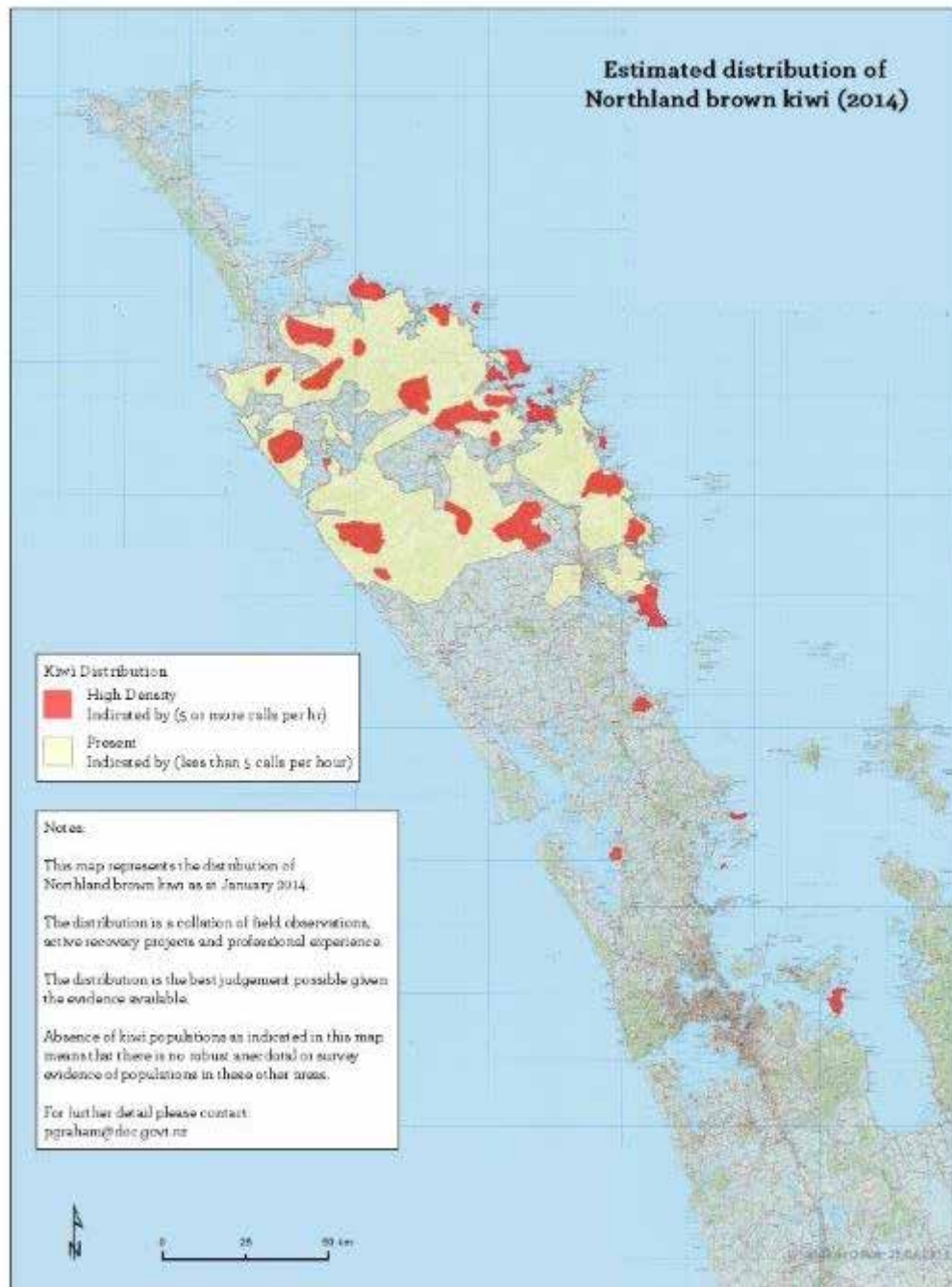


Figure 1. Northland brown kiwi distribution and relative abundance as known in 2014.

Table 1. The original Northland kiwi listening stations, grouped by geographic area with corresponding station numbers.

NORTHERN	EASTERN	WESTERN	SOUTHERN
1 Diggers Valley	10 Marsden Cross	16 Kaitui	21 Glenbervie 7A
2 Takahue	11 Puketotara	17 Trounson	22 Glenbervie 9A
4 Gartons	12 Rangitane	18 Cathedral	23 Marlow Road
5 Kaiaka	13 Waitangi No 12	19 Waipoua L/Out	24 Purua N
7 Puketi Forest	14 Mt Bledisloe	20 Paerata	25 Rarewarewa S
8 Puketi Scenic Reserve	15 Tikitikiore		26 Mimiwhangata
			27 Sandy Bay

## 2. Methods

The 2016 Northland brown kiwi call count survey followed the national kiwi call scheme methodology outlined in the Kiwi Best Practice Manual (Robertson & Colbourne 2003). Listening was carried out during the dark phase of the moon for the first 2 hours of darkness, for 4 nights. The ideal kiwi listening conditions are dry and still, so these conditions were favoured wherever possible.

Kiwi listening was carried out from 25 May to 12 June 2016, with a back-up window from 23 June to 12 July 2016.

### 2.1 2016 kiwi listening data

Kiwi listening data for 2016 were received from the following management areas:

- Mangatete
- Honeymoon Valley
- Whaakangi
- Mahinepua - Radar Hill
- Russell Peninsula
- Puketi Forest
- Waimate North
- Hupara
- Sandy Bay
- Tutukaka
- Manaia-The Nook
- Kauri Mountain
- Bream Head/Taurikura
- Motatau-Marlow
- Purua-Rarewarewa
- Waipoua-Trounson
- Tawharanui
- Marunui
- Mataia

### 3. General patterns

#### 3.1 Northland monitoring trends since 1995

Trends in call count data collected since 1995 at the 24 original listening stations (see Table 1) in the Northern, Eastern, Southern and Western survey areas are graphed for comparison in Fig. 2 and the summary data are presented in Appendix 1.

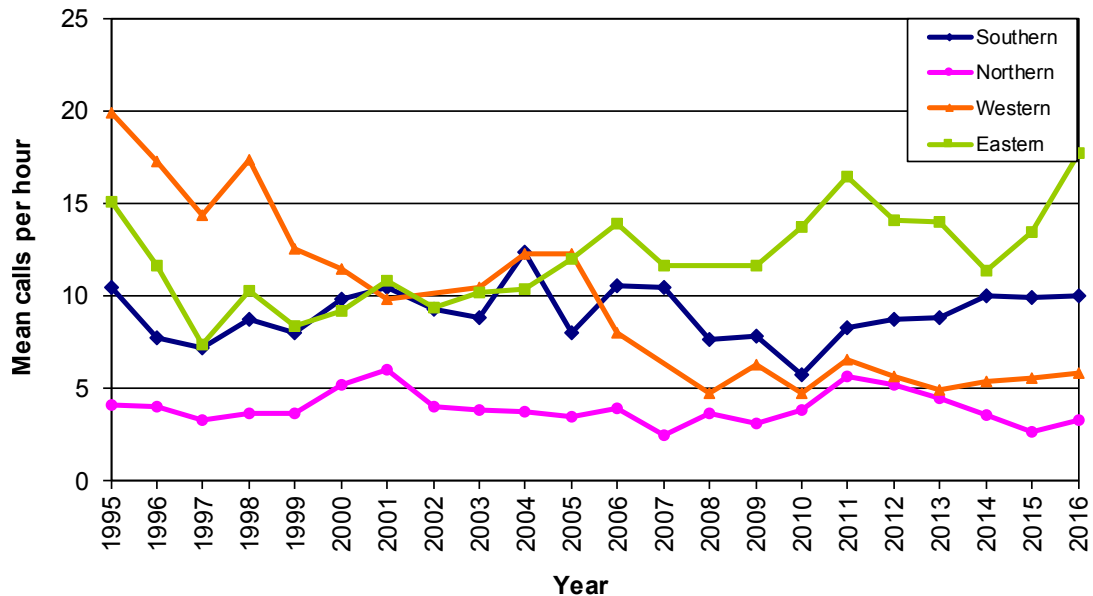


Figure 2. Mean hourly kiwi call rates for each of the original four Northland monitoring areas 1995–2016. The means for the Northern and Eastern clusters were estimated with one station each using 2015 data (Kaiaka and Puketotara), the Western cluster used 2014 data for Kaitui and Paerata, and the Southern cluster had one station missing (Glenbervie 7A, which had not been listened from since 2013), used 2015 data for one station (Glenbervie 9A), and had one hour of data missing for one station (Rarewarewa South).

#### Northern Area

In 2016, the mean hourly kiwi call rate for the Northern Area increased for the first time since 2011, climbing from 2.6 calls/hr in 2015 to 3.3 calls/hr in 2016 (Fig. 2). Although this is certainly the trend we want to see, it is worth noting that 3.3 calls/hr is still the 5th lowest mean recorded for the Northern Area since records began in 1995 (the other lows were 3.3 calls/hr in 1997; 2.4 calls/hr in 2007, 3.1 calls/hr in 2009 and 2.6 calls/hr in 2015). Much of the increase is attributable to the Puketi Scenic Reserve station (Stn 8), which had a mean call rate of 9.3 calls/hr, similar to 2013 (9.8 calls/hr), after a relatively low year in 2015 (5.4 calls/hr). The Puketi Forest station (Stn 7) was steady on 5.6 calls/hr, identical to 2015. It was fantastic to receive data for Diggers Valley (Stn 1) for the first time in 5 years, and very positive to see kiwi are holding on in this area, as indicated by the mean call rate of 2.8 calls/hr recorded there. Gartons (Stn 4) detected one kiwi in 8 hours of listening, after no kiwi being detected in 2015. Takahue (Stn 2) unfortunately detected no kiwi in 2016. This is very alarming given that means of >5 calls/hr were recorded there 3 years ago, with >11 calls/hr recorded only 2 years before that (Appendix 1). It is evident from these results that there is an urgent need for management actions in these areas where very low kiwi call rates are being recorded to ensure the likely correspondingly low populations of kiwi don't disappear altogether. Kaiaka was not listened from in 2016, but all five other stations had the full 4 nights of listening completed.



## Eastern Area

The 2016 results from the Eastern Area were excellent, with an all-time high mean kiwi call rate of 17.7 calls/hr recorded (more than 1 call/hr greater than the previous high of 16.4 calls/hr observed in 2011; Fig. 2). The pattern of increasing call counts per hour was seen across all stations, but was most evident at Tikitikiore (Stn 15), where the mean call count almost doubled from 15 calls/hr in 2015 to 25 calls/hr in 2016. This rate is the highest observed from this station. Another station with a very high call rate in 2016 was Marsden Cross (Stn 10), which had a mean of 38.6 calls/hr. This was also the highest mean call rate observed from this station, by almost 4 calls/hr. The other stations had more modest increases, with Rangitane (Stn 12) increasing from 9.5 calls/hr in 2015 to 10.9 calls/hr in 2016; Waitangi No. 12 (Stn 13) had a mean of 7.5 calls/hr, which was the highest recorded for this station since 2006 (although 4 years of data were missing), and Mt. Bledisloe's 2016 mean of 10.9 calls/hr was 3 calls/hr more than in 2015 (Appendix 1). Puketotara (Stn 11) wasn't listened from in 2016, but all five other stations had the full 4 nights of listening. All of the people working hard to protect kiwi in this area will no doubt be thrilled with these positive results.

## Southern Area

In 2016 the mean kiwi call rate for the Southern Area was stable on 10 calls/hr, (Fig. 2). Calls were recorded at five stations in 2016, and mean call rates trended down at two stations and up at three. The downward trend was observed at Marlow (Stn 23), which had a mean of 18.8 calls/hr in 2016 (compared with 20 in 2015, although the 2016 result is still high for this station). Purua North (Stn 24) dropped from 16.3 calls/hr in 2015 to 13.8 in 2016. The current rate is around the overall mean for this station (13.3 calls/hr). Rarewarewa South (Stn 25), Mimiwhangata (Stn 26) and Sandy Bay (Stn 27) all had increases in their mean call rates of <2 calls/hr. Glenbervie 7A (Stn 21) was not included, as kiwi listening data has not been collected there since 2013. This is in part due to logging operations in the area, and it is anticipated that this station will be included again in the future once logging operations are completed. Glenbervie 9A (Stn 22) was also not listened from in 2016, but as this station was listened from on 2015, the previous year's data was used. Rarewarewa South had 4 nights of listening completed, but only 1 hour was completed on the fourth night due to deteriorating weather conditions. The remaining five stations each had the recommended 4 nights of listening completed. With the exception of an outlying high mean call rate in 2004 (12.4 calls/hr), and a low mean call rate in 2010 (5.7 calls/hr), yearly mean call rates in the Southern Area have been relatively stable, ranging from 7.2 to 10.5 calls/hr (Appendix 1). This likely reflects both the excellent work undertaken to protect kiwi (including the 1080 used within the Whangarei Kiwi Sanctuary during 2014), and the areas where more needs to be done to achieve growth in the kiwi population. In the future, it is important to continue monitoring the two Glenbervie stations, particularly as predator control is now undertaken within the forest by Rayonier, and these stations are within the Kiwi Coast. Hopefully the cessation of logging and the implementation of predator control will result in an increase in kiwi call rates for these stations.

## Western Area

As with the previous few years, the mean hourly kiwi call rate for the Western Area has remained stable at 5.83 calls/hr (compared with 5.55 calls/hr in 2015; Fig. 2). Of the five stations used to monitor trends in this cluster, two were not listened from in 2016. These were Katui (Stn 16) and Paerata (Stn 20). Katui (Stn 16) has not been listened from since 2014; however the call rates from this listening station have been consistently low (with a mean of less than 1 call/hr in all 4 years during which listening has been carried out since 2008), so the 2014 data were used. Paerata (Stn 20) has also not been listened from since 2014, but as the call rates have been consistent at a mean of fewer than 2 calls/hr in the 12 years that listening has occurred since 2001, the 2014 data were also used for this report. Of the remaining three stations, the mean for Trounson North (Stn 17) increased (from 7.63 calls/hr in 2015 to 9.39 calls/hr in 2016); the mean for Cathedral (Stn 18) was stable on 7.13 calls/hr and the mean for the Waipoua Lookout (Stn 19) decreased slightly from 12.36 calls/hr in 2015 to 12 calls/hr in 2016 (Appendix 1). All stations had the full 4 nights of listening. Although it is positive to see the mean call rate for the Eastern cluster start to

trend upwards, 5 calls/hr is still a relatively low rate, especially when compared with the very high mean calling rates observed at these stations during the mid to late 1990s. Kiwi in this area need to be given as much protection as possible to ensure the population is healthy and increasing.

## 4. Trends at managed populations

Each year, the same selection of listening stations are used to compare call count rates to provide a population trend for each of the four Northland kiwi areas. Only these 'core' stations contribute data for the mean hourly call rate calculations depicted in the bar graphs for each management site provided below. It is important that kiwi coordinators prioritise kiwi listening from the core stations each year to ensure that the most accurate depictions of population trends that are occurring in management areas are obtained. The stations that are used in this analysis are listed and data summarised in Appendix 3 for each management site. These should be referred to when organising kiwi listening each year.

### 4.1 Summary of sites

#### 4.1.1 Mangatete

The 2016 kiwi listening results for Mangatete have continued a favourable upward trend, increasing from a mean of 15.9 calls/hour in 2015 to 17.9 calls/hour in 2016 (Fig. 3). Both of the two stations listened from had an increase in the mean number of kiwi calls recorded compared with 2015. Station 3 increased from 17.6 calls/hour in 2015 to 20.5 in 2016. Station 256 increased from 14.1 calls/hour in 2015 to 15.4 in 2016 (Appendix 1). Both stations were listened from for 4 nights. Although it is still early days at Mangatete in terms of both kiwi protection (Mangatete Landcare Group was established in 2012) and kiwi listening records; the mean kiwi call rate of around 18 calls per hour recorded there is phenomenal. However, the number of stations in this area is very low, and it is strongly recommended that a minimum of one, but ideally three further listening stations are added so that more robust kiwi call rate data can be obtained.

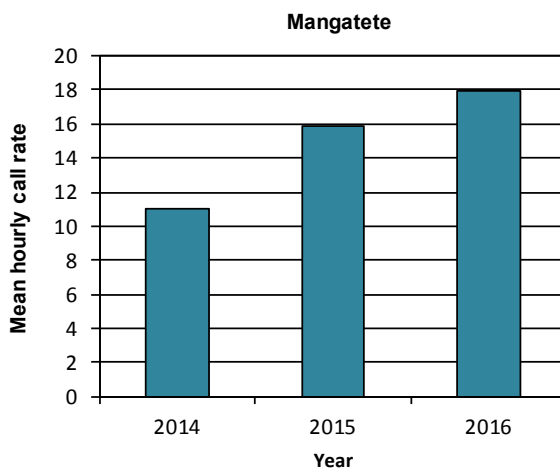


Figure 3. Trends in mean kiwi call rates at Mangatete management site.

#### 4.1.2 Honeymoon Valley

There were insufficient kiwi listening data from Honeymoon Valley for 2016 to graph the overall trend. Data were received from two stations (Stn 271; 2 nights listening with a mean of 0.5 calls/hour; and an unknown station with 4 nights of listening providing a mean of 5.63 calls/hour), compared with four stations each with 4 nights of listening completed in 2015. The 2015 mean was relatively low (1.47 calls/hr), so it was positive to see the unknown station return a mean of over 5 calls/hr. We hope to continue to receive data from this management site in the future so that call rates can be monitored and, hopefully, increase over time.

#### 4.1.3 Whakaangi

After the increased mean call rate recorded in 2015, the reduction in call rates recorded in 2016 would have been disappointing for the Whakaangi listeners. The mean number of kiwi calls heard per hour dropped from 8.08 calls/hr in 2015 to 4.67 calls/hr in 2016 (Fig. 4), the lowest mean call rate ever recorded for this management site. Seven stations were listened from for the full 4 nights; and of these stations six (Stns 131-133 and 135-137) were used to derive the mean. Five of these stations had fewer mean kiwi calls/hr than the previous year; with only one station (Stn 132) showing an increase in the mean number (an increase of 1.5 calls/hr from 4.4 in 2015 to 5.9 in 2016; Appendix 1). Station 131 recorded the largest decrease (of 9.25 calls/hr), although following the huge increase from 2014 to 2015 and the general trend of fluctuating results for this station, this result was probably not surprising. The other stations all had decreases in mean kiwi call rates of between 0.4 and 6.4 calls/hr. Although the decline in kiwi call rates at Whakaangi from 2015 to 2016 is quite steep, when compared with the data from 2010 to 2014 it seems that the 2016 data are in line with a general downward trend, and the 2015 result was an anomaly (Appendix 1). It is alarming to see this downward trend, so we hope enough measures are being applied on the ground to reverse it.

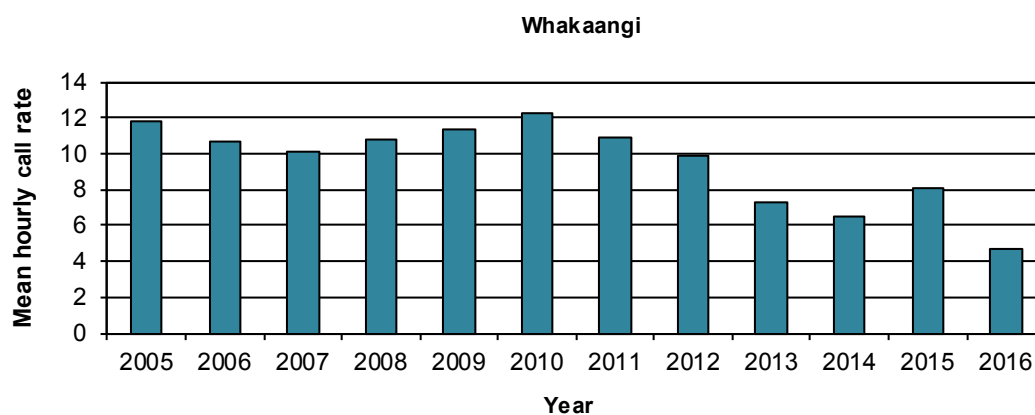


Figure 4. Trends in mean kiwi call rates at Whakaangi management site.

#### 4.1.4 Mahinepua-Radar Hill

In 2016, kiwi call counts at Mahinepua-Radar Hill showed a continuing upward trend from 2014, and with a mean of 7.8 calls/hr, the 2016 result was the second highest recorded for this management site (the highest was 10.2 calls/hr, recorded in 2012; Fig. 5). The data used to map the trend were derived from five stations, of which three had the full 4 nights of listening, and two each had 1 hour missing. Two stations (83 and 99) had similar listening results to 2015, while the remaining three stations (84, 85 and 88) had increases of between 2 and 3 calls/hr (Appendix 1). The overall trend for Mahinepua-Radar Hill is increasing mean kiwi call rates, a very positive result for kiwi in the area.

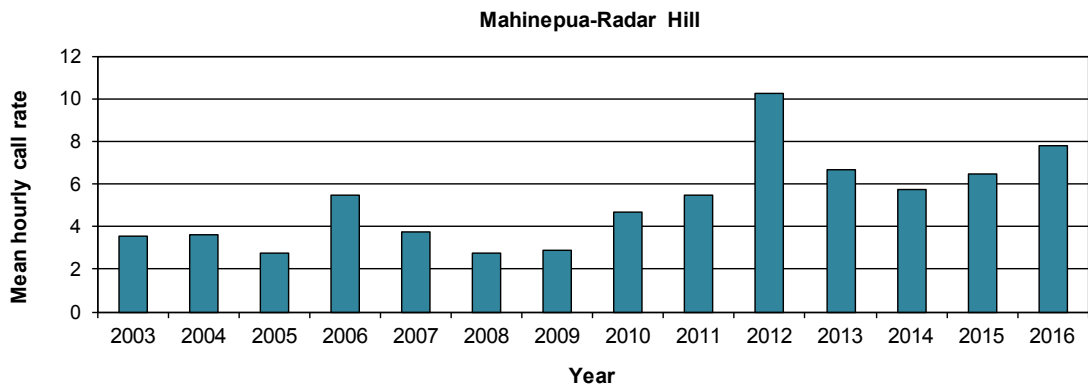


Figure 5. Trends in mean kiwi call rates at Mahinepua-Radar Hill management site.

#### 4.1.5. Russell Peninsula

Thank you to the Russell Peninsula listener who brought to our attention anomalies between the data collected in the field and the data used for this report (also see Discussion). This missing data has now been included, and the erroneous data replaced; and it does change the look of the graph for this management site. Where it previously appeared to show lower mean call rates from 2005 to 2010, followed by increasing rates from 2011 onwards; it now represents fluctuating but slowly increasing kiwi call rates, with a spike in the last 2 years. The mean call rate for 2016 was a staggering 19.7 calls/hr (Fig. 6). The data used to derive the 2016 mean came from three stations, each of which had the full 4 nights of listening. The mean number of kiwi heard per hour dropped for one of these stations (Stn 170; by around 3 calls/hr), and showed sharp increases at the other two (Stn 62 increased by 6.6 calls/hr, while Stn 15 increased by just over 10 calls/hr; Appendix 1). Once again, data from Station 173 were not recorded, so the overall mean may not be an accurate representation of what is happening at this management site, but it is safe to say that at a minimum there is a trend of slowly increasing kiwi call rates in the area, and some pockets of very high call rates. The Russell Peninsula listeners do an excellent job, and in 2016 recorded a full set of data from seven stations. It would be valuable to ensure that the core stations (15, 59, 62, 170 and 173) were listened from each year to collect comparable data across the years.

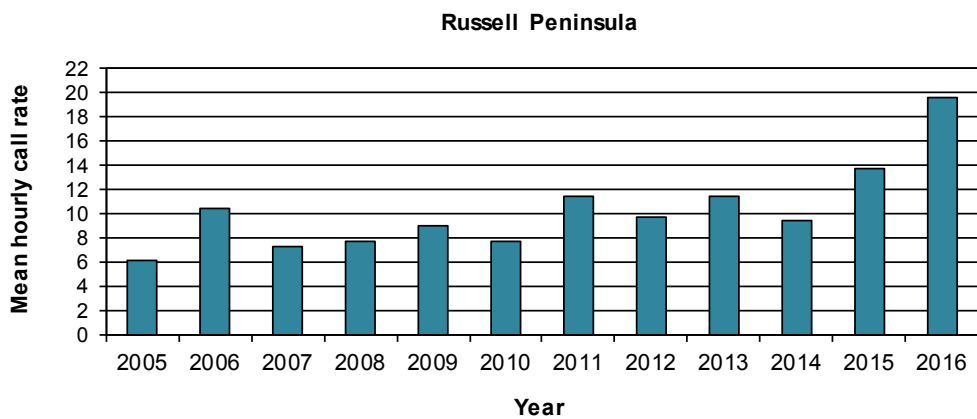


Figure 6. Trends in mean kiwi call rates at Russell Peninsula management site.

#### 4.1.6 Puketi Forest

It was good to see the mean kiwi call rate for Puketi Forest increase back to more than 4 calls/hr, after a surprisingly low result for 2015. With a mean of 4.2 calls/hr, the 2016 result is the 3<sup>rd</sup> highest recorded for this management site, and very similar to the results seen in 2011 and 2012 (a mean of 4.3 and 4.1 calls/hr, respectively; Fig. 7). The data were derived from five stations, all of which had 4 nights of listening completed. When compared with 2015, four of the stations showed increases (ranging from 0.75 to 3 calls/hr). Although the increase in the 2016 mean call count of a little over 1 call/hr from 2015 was not substantial, the trend is in the right direction (Appendix 1). The overall picture from this population over the last decade is generally low call rates with some fluctuations, and a slowly but surely increasing mean call count.

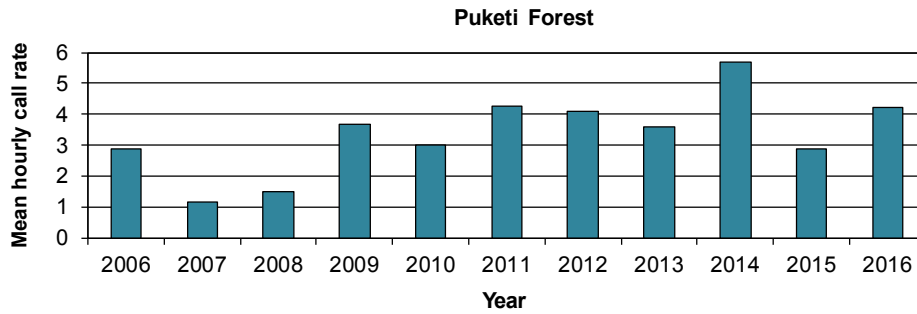


Figure 7. Trends in mean kiwi call rates at Puketi Forest management site.

#### 4.1.7 Waimate North

The mean kiwi call rate for Waimate North in 2016 was 7.55 calls/hr. This was a slight decrease from 2015 (8.06 calls/hr), but continued within the stable mean range of between 6 and 9 calls per hour observed in this management site since 2005 (Fig. 8). All five of the stations used to generate the mean were listened from for the full 4 nights. Three of these stations had minor changes between the 2015 and 2016 results ( $\pm \leq 1$ ), but two stations had more significant changes (Stn 118 increased by 2.25 calls/hr and Stn 114 decreased by 3.85 calls/hr). These likely represent normal year-to-year fluctuations due to the many variables that can affect kiwi listening results, but Stn 114 in particular should be monitored in 2017 to ensure the 2016 data were not indicative of a slump. As was discussed in the 2015 report, there is one station (Stn 113) within the Waimate North cluster that returns extremely high hourly call rates. Once again, the results for this station were very high, surpassing even the 2015 mean of 30.75 calls/hr to reach an astounding 34.5 calls/hr (Appendix 1). The listeners at this station must have been very busy!

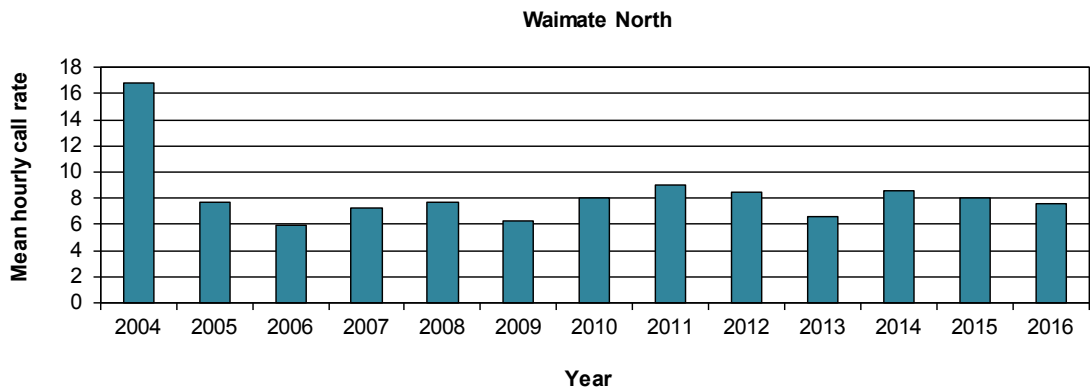


Figure 8. Trends in mean kiwi call rates at Waimate North management site.

#### 4.1.8 Hupara

Kiwi call count results for the Hupara Landcare Group management site were the highest recorded in Northland for 2016, with a mean of 21.75 calls/hr (Fig. 9). Although these results are no doubt highly pleasing for the local listeners, it is important to note that the mean was derived from only two stations (Stns 257 and 258; each with 4 nights of listening completed), so may not reflect the whole area. No data were received from Stns 245 or 246. To provide a robust annual mean call rate and trend for this management site, it is essential that data from all four key listening stations are included. Of the two stations used to derive the 2016 mean, one (Stn 258) had a minor increase from 25 to 26.4 calls/hr, whereas rates for the other station (Stn 257) virtually doubled from 9 to 17.1 calls/hr. Data were also received from one other station (station number unknown, 'Harrison's Property'), that had a mean of an incredible 35.3 calls/hr (over 4 nights of listening, with 1 hour missing from 1 night), the second highest call rate recorded in Northland for 2016 (Appendix 1).

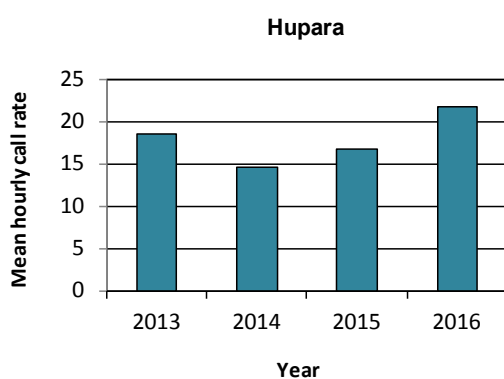


Figure 9. Trends in mean kiwi call rates at Hupara management site since 2013.

#### 4.1.9 Sandy Bay

The mean kiwi call rate for Sandy Bay increased by more than 2 calls/hr (from 4.5 calls/hr in 2015 to 6.9 calls/hr in 2016; Fig. 10). This rate is noticeably higher than the rates recorded for the other 5 years for this management site. One of the stations (Stn 260) recorded the listening data via an artificial listening device (ALD). ALDs have inherent differences and inbuilt variance and errors when compared with human listeners, so generally counts from the two approaches wouldn't be analysed together. However, the 2015 results contained ALD data from Stn 260, so it will also be used for the 2016 analysis. This may change in the future as more ALDs are deployed, so that data collected using the ALD method can be adequately compared with stations using the same method. Three stations were used to derive the 2016 mean (Stns 27, 260 and 261; all had the full 4 nights of listening completed), and all of these stations recorded call rate increases from 2015. The largest increase was observed at Stn 261, where the mean hourly call rate more than doubled from 3.9 calls/hr in 2015 to 8.5 calls/hr in 2016. This mean was the highest recorded for a single station in the Sandy Bay management site since listening began there in 1995 (Appendix 1) and probably reflects increasing efforts to sustain and grow kiwi protection methods in the area as part of the Kiwi Coast.

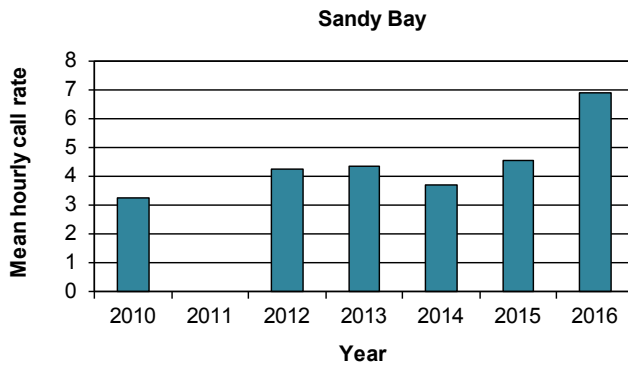


Figure 10. Trends in mean kiwi call rates at Sandy Bay management site since 2010.

#### 4.1.10 Tutukaka

The mean kiwi call rate recorded for Tutukaka for 2016 was 9.9 calls/hr, the second highest on record for this management site (the highest was a mean of 10.2 calls/hr recorded in 2012). This was an increase of more than 2 calls/hr from the 2015 mean (7.5 calls/hr; Fig. 11). It was pleasing to see this result, as intensive measures have been undertaken to protect kiwi in this area in recent years (including supplementation via translocated kiwi). These data were derived from three key listening stations (Stns 125, 126, 142), each of which had the full 4 nights of listening completed. Two of these stations (Stns 125 and 142) returned mean kiwi call rates that had increased by more than 4 calls/hr from 2015. This is quite a jump, but within the range previously observed for these stations (the third station also returned a rate within its previously observed range. All three stations have been listened from for 11–13 years; Appendix 1). It may be that these results are reflect fluctuations associated with an inherently crude survey method, or it may be that they are recording real increases in the numbers of kiwi present. Continuing kiwi listening surveys will help to clarify what is happening with the population, and these surveys need to be robust enough to provide quality information. We strongly recommend that the other core stations (Stn 144, last listened from in 2010; and Stns 28 and 143, last listened from in 2014) continue to be used to adequately indicate what is happening for kiwi within this management area.

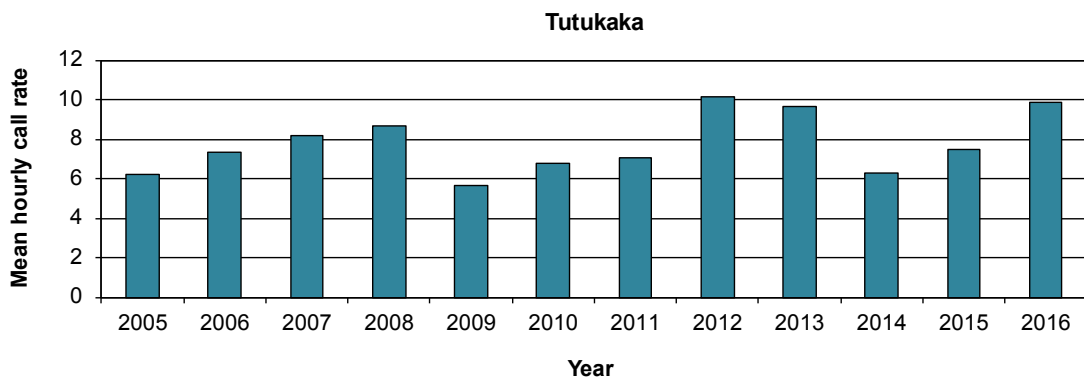


Figure 11. Trends in mean kiwi call rates at Tutukaka management site.

#### 4.1.11. Manaia-The Nook

Kiwi listening at Manaia-The Nook in 2016 resulted in a mean call rate of 8.15 calls/hr, the highest on record for this management area, and more than double the mean call rate observed only a decade ago (Fig. 12). The increase can be largely attributed to call rates recorded at one station (Stn 47), which have increased from a mean of 1.5 calls/hr in 2015 to 9.4 calls/hr in 2016, a whopping 526% increase. Of the remaining four stations used to derive the mean for this cluster, three returned similar results to 2015 (Stns 48, 49, and 71; all had changes of  $\leq 1.5$  calls/hr); and one (Stn 56) more than doubled from a mean of 1.6 calls/hr in 2015 to 3.9 calls/hr in

2016 (Appendix 1). The increases observed in this area are undoubtedly reflective of the many measures used by the community as a whole to protect kiwi in this area. Four stations were listened from for the full 4 nights, and one station (Stn 71) had 2 nights of listening completed.

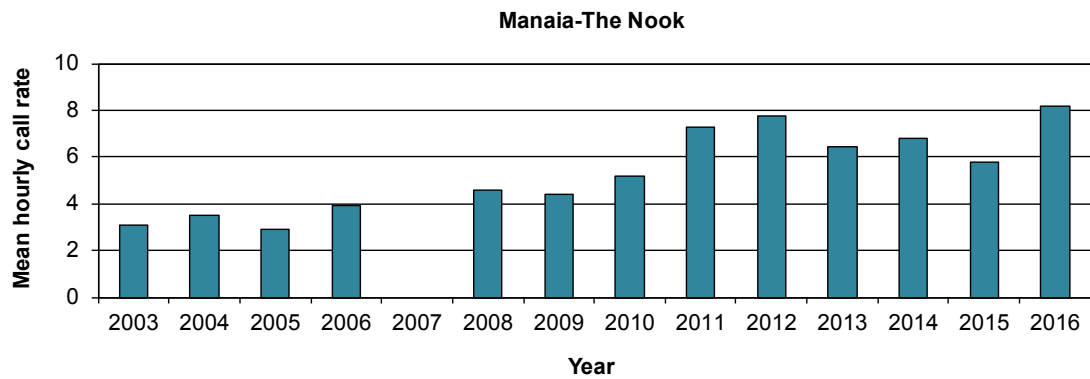


Figure 12 Trends in mean kiwi call rates at Manaia-Nook management site.

#### 4.1.12 Kauri Mountain

The 2016 kiwi listening survey showed exceptional results for the Kauri Mountain management area, with a record-high mean kiwi call rate of 7.7 calls/hr. This is 2.3 calls/hr greater than the previous high rate of 5.4 calls/hr observed in 2015 (Fig. 13). Increased call rates were observed at all five stations in this cluster, with two (Stns 73 and 74) having relatively negligible increase of <1 call/hr; and the remaining three (Stns 54, 72 and 141) having more substantial increases of around 3–4 calls/hr. For all five stations the 2016 mean was the highest on record (first equal in the case of Stn 54; Appendix 1). These results are fantastic, and a real testament to all the hard work by Backyard Kiwi and the wider community to ensure kiwi survive and thrive in the Whangarei Heads area. Four stations had the full 4 nights of listening completed, and one station (Stn 141) had 1 hour missing.

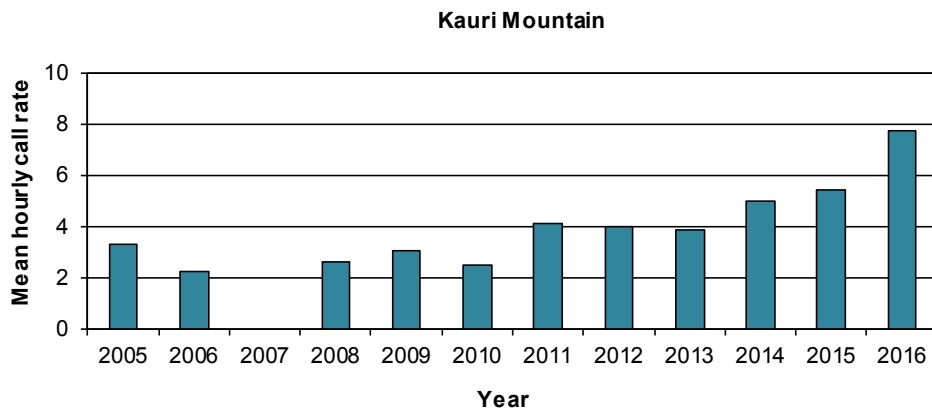


Figure 13. Trends in mean kiwi call rates at Kauri Mountain management site.

#### 4.1.13 Bream Head/Taurikura

At a mean of 6.9 calls/hr, the kiwi call results for Bream Head/Taurikura in 2016 were down slightly from the mean of 7.5 calls/hr observed in 2015 (Fig. 14). However, the 2016 result fits with the trend for this cluster of generally fewer than 3 calls/hr from 2005–2010 (with 2009 an exception); to greater than 6 calls/hr from 2011–2016, so is not unexpected. The lower call rate can be mostly attributed to Stn 42, which returned a mean of 3.75 calls/hr; down from 6.25 calls/hr in 2015. The results for this station have been highly variable for the last 5 years, with observed increases and decreases of greater than 200% between annual listening surveys (Appendix 1).



Thus the 2016 result could be due to the ‘normal’ inconsistency of results from this station, rather than reflecting an actual decline in kiwi numbers. Additionally, the data for Stn 69 not included in 2015 were included in 2016. As this station yielded the 3rd lowest mean for the stations monitored in 2016, it has skewed the result lower than it would have otherwise been. Indeed, if the data from Stn 69 were also missing for 2016, the graph would have shown slight growth from 2015. This highlights the importance of including all core stations every year, as addition or omission of single stations can influence the overall mean and obscure what is happening to the population. All four stations used to derive the mean for this cluster (Stns 39, 41, 42 and 69) were listened from for the full 4 nights. For 2017 and beyond we recommend continuing to include Stn 69, and to reinstate listening from Stn 44, if possible.

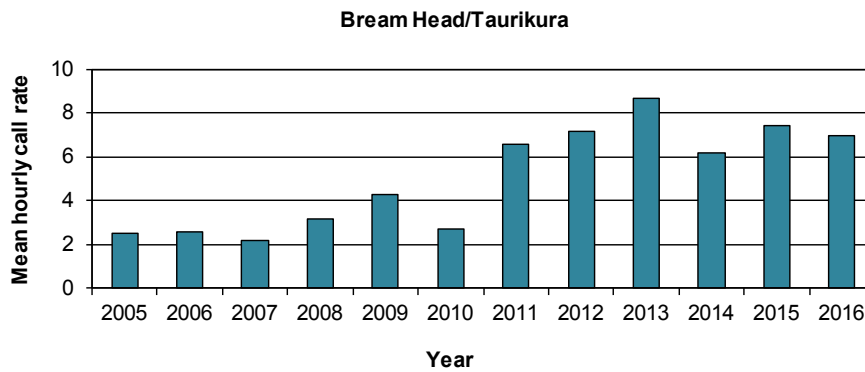


Figure 14. Trends in mean kiwi call rates at Bream Head/Taurikura management site.

#### 4.1.14 Motatau-Marlow

The mean kiwi call rate for Motatau-Marlow for 2016 was 11.5 calls/hr; the highest on record for this management area, and an increase of nearly 2 calls/hr from the mean of 9.8 calls/hr recorded in 2015 (Fig. 15). While this is cause for celebration, it should be noted that the mean was derived from only three stations (Stns 23, 68 and 129; each of which had the full 4 listening nights completed). Over time there has been inconsistent coverage of the remaining core stations for this cluster (Stn 34 not listened from since 2015; Stn 35 not listened from since 2013, and Stn 36 not listened from since 2011). Coupled with this, two of the core stations have had huge variation in their results, with annual changes of up to  $\pm 300\%$ . Only Stn 23 has had reasonably stable kiwi listening figures (Appendix 1). These factors make it more difficult to interpret the data to acquire meaningful results. It is important that the same stations are listened from annually, and if six are too many to service this often, then four or five should become a new core used to calculate the mean, with the remaining one or two listened from as time allows to check for any huge population variations.

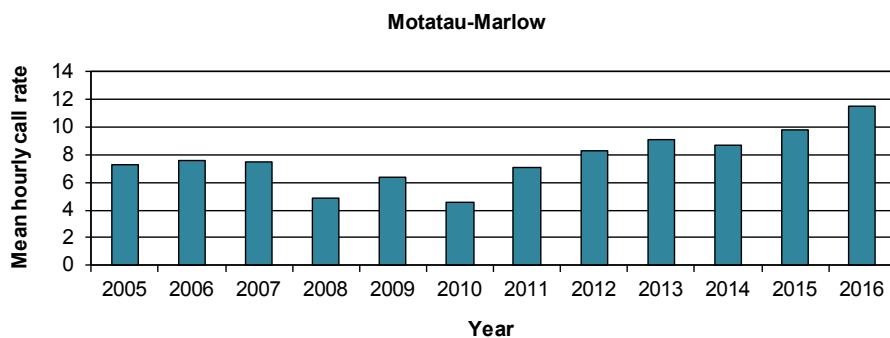


Figure 15. Trends in mean kiwi call rates at Motatau-Marlow management site.

#### 4.1.15 Purua-Rarewarewa

Kiwi call rates for the Purua-Rarewarewa management area decreased from a mean of 12.7 calls/hr in 2015 to 10.5 calls/hr in 2016, the lowest observed mean since 2005 (Fig. 16). This decrease was almost wholly due to a very large drop in the mean for Stn 139, which halved from 23.1 calls/hr in 2015 to 11.8 calls/hr in 2016. This is particularly worrying, as this station had consistent kiwi call count means of >20 calls/hr from 2013 to 2015. The other three stations had relatively minor changes; the mean for Stns 24 and 81 decreased by 2.5 and 2.25 calls/hr respectively, while the mean for Stn 25 increased by 1.6 calls/hr. Data were not received for Stn 82, which from 2012 to 2015 had a lower mean than that observed for this cluster for 2016 (Appendix 1), so the actual decrease may be greater than observed here. Three stations had the full 4 nights of listening, Stn 25 had 1 hour of data missing.

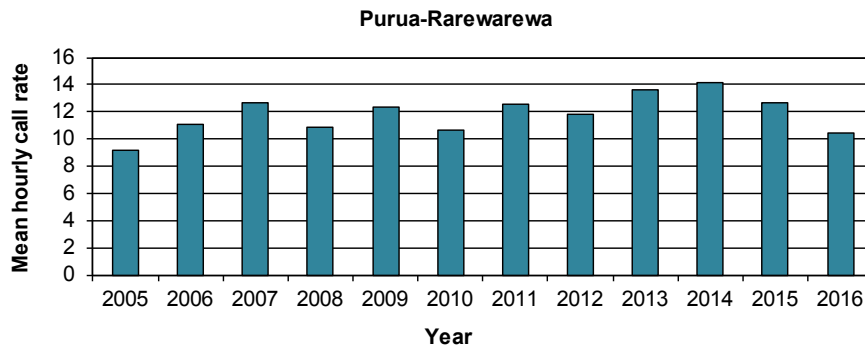


Figure 16. Trends in mean kiwi call rates at Purua-Rarewarewa management site.

#### 4.1.16 Waipoua-Trounson

The mean kiwi call rate for Waipoua-Trounson has continued its increasing trend, up from 8.72 calls/hr in 2015 to 9.75 calls/hr in 2016 (Fig. 17). However, once again the data from Stn 16 is missing, and as it has either had no data collected, or no calls have been heard there since 2010 (Appendix 1), the absence of data from this station will likely be skewing the mean higher. The very low call rates at Stn 16 appear even more extreme when the original mean of 47.6 calls/hr recorded for this station in 1995 is considered (Appendix 1). This remains the 3rd highest mean from more than two decades of kiwi listening, and sadly demonstrates that high calling rates do not guarantee a protected kiwi population. All four stations used to calculate the mean for this cluster had the full 4 nights of listening completed. Two stations (Stns 18 and 19) had similar call rates to 2015, while the remaining two stations (Stns 17 and 33) had increases of 2-3 calls/hr.

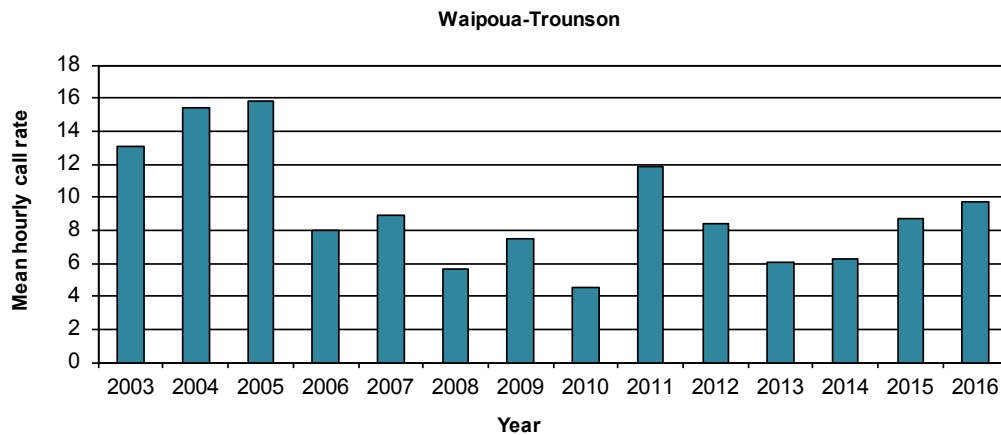


Figure 17. Trends in mean kiwi call rates at Waipoua-Trounson management site.

#### 4.1.17 Tawharanui

Tawharanui returned a mean kiwi call rate of 5.56 calls/hr for 2016, up from 4.54 calls/hr in 2015 (Fig. 17). This increase is expected for a well-protected and burgeoning population, but crossing the threshold of 5 calls/hr into the realm of high kiwi density is still worth acknowledging. The 2016 mean was derived from all six listening stations (Stns 161-166), each of which had the full 4 nights of listening completed. Four stations (Stns 161, 162, 164 and 165) had mean call count increases of between 1.4 and 3.75 calls/hr; and two stations decreased (Stn 163 by 1 call/hr; Stn 166 by 3.1 calls/hr). It is pleasing to note that the mean for each individual station is at least 4 calls/hr (Appendix 1), so the overall mean of >5 calls/hr is due to all stations being above or  $\leq 1$  calls/hr below the mean, rather than one or two stations with unusually high rates skewing the mean up.

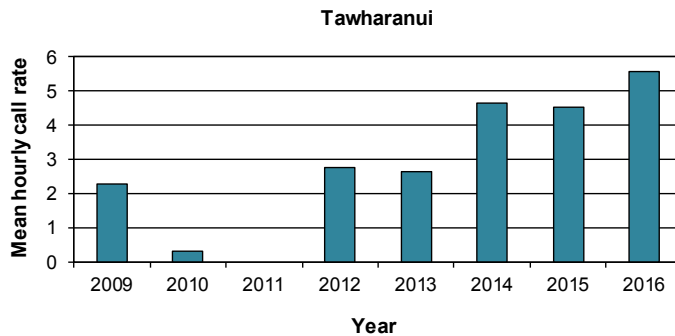


Figure 18. Trends in mean kiwi call rates at Tawharanui Open Sanctuary management site.

#### 4.1.18 Marunui

This is the first year that a graph has been included in this report for the kiwi listening effort at Marunui. The mean for 2016 was 3.6 calls/hr, an increase of 1.4 from the 2.2 calls/hr observed in 2015 (Fig. 19; Appendix 1). It is exciting to see growth in this population since the original translocation in 2013. It would be preferable to have a minimum of three (ideally, at least five) active listening stations for this cluster, so we would recommend this be considered for Marunui in the next couple of listening periods.

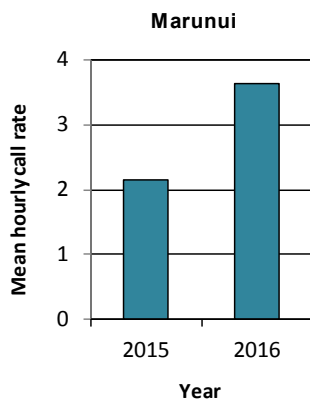


Figure 19. Trends in mean call counts at Marunui

#### 4.1.19. Mataia

Data were received from Mataia for the 2016 kiwi listening period. All of the kiwi listening data in this management area were collected via ALDs. There were 78 hours of data analysed from two stations (Stns 254 and 255), yielding a mean of 1.07 calls/hr. When just the first 2 hours of listening data were examined (to be more comparable with the human method), the mean was 1.13 calls/hr, very similar to the mean for the whole 78 hours. Both of these mean figures were close to those observed at Mataia in 2014 using human listeners (1.04 and 1.46 calls/hr; Appendix 1). More work needs to be done to ascertain how comparable the ALD and human listener data are, and how many hours of ALD data are optimum to calculate an accurate mean kiwi call rate for each station.

## 5. Discussion and general recommendations

As in other recent years, 2016 was a mainly positive year for Northland kiwi listening. Mean kiwi call rates trended up in 13 of the 19 kiwi management areas, and trended down or were data deficient in the remaining 6. As with previous years, the quality of this report can only be as good as the data received. Data quality is improving, but some key listening stations have still been missed. It is imperative that local kiwi listening coordinators ensure that the key stations are prioritised for listening each year (see Appendix 3 for station numbers if you are unsure).

There is a temptation to miss stations that have low or nil kiwi calls heard (in part due to it being much less interesting to listen from these stations). However, there is great value in including these data (this is particularly true for the original 24 stations listened from since 1995). To ensure that the monitoring of trends of kiwi throughout Northland continue to have value it is just as important that we still monitor stations where call counts are dwindling or are absent, as those that are growing. If low call rate stations are dropped off and data comes only from sites with good call rates it will not be a true indicator of what is happening over time.

It has been brought to our attention that some of the perceived increases in kiwi call counts at particular stations can be attributed to a change in listener, i.e. where an original listener has reduced capacity to hear calls, so a new listener has taken over the station and the mean call count rises dramatically. This is certainly something to be aware of, and as with any method using different humans to collect comparable data there will always be some degree of variation and error. At best we can reduce this error by ensuring all listeners are capable and up to the task. If coordinators suspect reducing call counts may be due to observer error rather than an actual decrease in calls, they could try adding a second listener or an ALD to the station (on the same nights as the original listener) as a comparison. If the results show observer error, it is probably best for the original listener to be given alternative ways to contribute to kiwi conservation, and a new listener assigned to the station.

We have also had queries surrounding the type of data that is used in this report in relation to all the data collected. Some management groups have been collecting directional data and making predictions about the number and gender of individual kiwi that are calling. This is undoubtedly useful information and all credit to the groups that are already analyzing these data for their own knowledge and use. At this stage these data haven't been included in the Northland Kiwi Call Count Monitoring reports as the directional data haven't been collected consistently by all groups, and there is variation in how the data are interpreted and presented, making it difficult to analyze them together. There has also historically been little demand for a more thorough analysis in this report, with many listeners preferring a general look at trends over time. In the future this may change, but in the meantime there is certainly no deterrent to individual groups collecting and analyzing their own data.

Along with ensuring the key stations are listened from, it is equally important that kiwi listening coordinators ensure their listeners include all the relevant data. In particular:

- The station must be identifiable to the people who enter and analyse the data for this report, and to future listeners who will repeat listening at the same station. This means that each and every kiwi listening card must include the individual station number, and this number must not be changed. Each card must also include an up-to-date GPS reference for the site. Both the station number and its GPS reference need to be written on every card, every night.
- There must be consistency in kiwi listeners. Ideally, this will mean the same person will listen from the same station for each of the 4 nights, and in subsequent years. If this is not practical, aim for at least having the same person covering the same stations for all 4 nights. The exception to this would be if a listener is no longer able to adequately detect kiwi calls, in which case a permanent replacement needs to be sought.
- Each station needs to be covered for 4 nights if at all possible. If this can't be achieved in the first planned kiwi listening period (window), it is possible to use the second window. It is more important that fewer stations are listened from for 4 nights than more stations for only 1 or 2 nights. This will produce more robust data and will give a more accurate measure of the numbers of kiwi in each area.
- Kiwi call cards need to be filled out in full, including all the fields, each listening night.
- Reduced capacity in the Whangarei Kiwi Sanctuary team means that groups are now required to enter their kiwi listening data into the spreadsheet themselves. This needs to be sent to Rolf Fuchs at the Whangarei Office, Department of Conservation, no later than 31 August in the year in which it was collected. If it is not submitted by 31 August, it will not be included in the report.
- Please ensure the data are accurate. For 2016 there were some data sent both directly, and via a coordinator. There were inconsistencies between the two sets of data, making interpretation difficult. If you notice any errors or inconsistencies in the data used for this report, please advise Rolf Fuchs immediately.

## 5.1 Other recommendations

- Provide new listeners with adequate training. This not only includes how to identify the difference between male/female kiwi calls; other species' calls that may be mistaken as kiwi; compass use and judging distances but also how to fill out the forms fully, correctly, and legibly.
- Try to map the location of calling birds during the 4 nights of listening. This will help to identify the minimum number of individuals and pairs heard from each station. As discussed above, this data is not used in this report at present, but it likely will be in the future. In the meantime, some groups are analysing these data themselves and finding some interesting results;
- If you add a new station in your area, please identify it very clearly as a new station so that it can be allocated a consistent station number. Please make sure you also provide GPS co-ordinates for the station, a name that will make sense to everyone, and any other identifying or necessary information about the station.
- Please check the station numbers listed in Appendix 1. If any of these numbers are not accurate, please let Rolf Fuchs (rfuchs@doc.govt.nz) know as soon as possible.

### **Kiwi listening 2017**

Kiwi listening for 2017 should preferably be carried out from 14 May to 2 June, with a back-up window from 13 June to 1 July.

Information about kiwi listening can be found on the Kiwis for kiwi website <http://www.kiwisforkiwi.org/resources/call-count-monitoring/>.

## 6. Acknowledgements

Thank you to all the people who carried out kiwi listening in 2016. Your time and effort in obtaining information about kiwi in your area on those cold winter nights is very much appreciated. Thanks also to local kiwi listening co-ordinators and to those people who took the time to enter the data into the spreadsheets again this year.

## 7. References

McLennan, J.A., 1992: Nationwide monitoring of kiwi populations. DSIR Land Resources Contract Report No 92/91. Wellington, Science and Research Division, Department of Conservation.

Pierce, R.J.; Gardiner, C.; Moodie, H.; Robertson, H.A.; Sporle, W. 2006: Sustainable management of brown kiwi and other threatened birds in Northland. *Wildland Consultants contract report No. 1193*.

Pierce, R.J.; Westbrooke, I.M. 2003: Call count responses of North Island brown kiwi to different levels of predator control in Northland, New Zealand. *Biological Conservation* 109(2): 175-180.

Robertson, H.A.; Colbourne, R. 2003: Kiwi (*Apteryx* spp.) Best Practice Manual. Wellington, Department of Conservation.

# Appendix 1

## Mean call count data for all Northland stations 1995–2016

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
1	Diggers Valley	1.10	2.40	4.10	2.50	2.10	3.30	4.10	3.75	3.00	3.90	3.90	2.70	1.30	2.00	1.67	-	2.50	-	-	-	-	2.75	
2	Takahue	4.30	3.50	5.50	5.40	6.30	8.40	7.90	4.50	3.30	4.75	5.30	5.00	3.60	4.90	3.13	4.75	11.38	6.88	5.25	2.38	0.13	0.00	
4	Gartons	5.60	5.00	1.20	-	0.80	2.00	8.60	-	1.50	4.10	4.90	7.10	1.50	1.25	0	0.13	0.25	0.75	0.25	0.25	0.00	0.13	
5	Kaiaka	1.70	1.30	2.40	3.40	1.60	3.50	3.00	2.10	1.90	3.75	2.80	1.50	0.00	0.75	-	1.63	1.13	0.25	1.60	1.63	2.00	-	
7	Puketi	6.60	5.40	2.10	3.00	6.00	7.60	6.40	3.50	5.00	3.40	1.50	2.30	0.80	3.90	4.00	6.88	9.38	6.25	6.25	5.88	5.63	5.63	
8	Puketi SR	5.40	6.50	4.40	4.00	5.10	6.50	6.10	6.40	8.25	9.40	2.30	5.10	7.40	8.90	9.00	7.88	9.00	11.75	9.75	7.63	5.38	9.25	
Mangateke																								
3	Lightning Hill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.50	13.50	10.00	17.63	20.5	
256	Baigents home drive	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.00	14.13	15.38	
Honeymoon Valley																								
271	H-moon Valley Green Bach	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.38	0.50	
272	H-moon Valley Lost Valley track	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.63	-	
273	H-moon Valley Central Ridge of Beth's	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.63	-	
274	H-moon Valley Greg's driveway	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.25	-	
Whakaangi																								
130	Whakaangi 1	-	-	-	-	-	-	-	-	-	-	9.00	10.40	4.60	7.60	6.33	-	-	-	-	-	-	-	-
131	Whakaangi 2	-	-	-	-	-	-	-	-	-	-	14.90	25.00	15.30	20.75	17.13	16.13	9.38	8.00	4.75	3.13	14.13	4.88	
132	Whakaangi 3	-	-	-	-	-	-	-	-	-	-	13.50	14.60	9.00	10.75	12.17	12.17	5.50	3.13	6.75	3.88	4.38	5.88	
29	Whakaangi 4	-	-	4.50	-	2.90	1.90	6.25	3.75	4.90	6.60	2.30	6.80	6.30	4.90	5.75	9.83	5.00	-	-	-	-	-	
133	Whakaangi 5	-	-	-	-	-	-	-	-	-	-	9.80	13.80	10.10	-	8.25	-	7.88	4.13	-	3.50	7.13	6.75	
134	Whakaangi 6	-	-	-	-	-	-	-	-	-	-	6.00	7.30	3.90	-	9.50	7.00	-	-	4.50	-	-	-	
135	Whakaangi 7	-	-	-	-	-	-	-	-	-	-	21.90	28.00	24.50	27.00	25.88	21.88	23.38	19.13	11.88	13.63	9.00	5.25	
136	Whakaangi 8	-	-	-	-	-	-	-	-	-	-	14.10	29.00	11.80	18.80	15.25	10.50	20.00	15.25	12.75	13.00	10.88	4.50	
137	Whakaangi 9	-	-	-	-	-	-	-	-	-	-	4.80	8.40	5.60	6.50	4.88	8.13	5	-	-	2.63	3.00	0.75	
138	Whakaangi 10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.75	4.00	5.83	4.33	3.75	2.88	0.50	-	

Continued on next page

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
140	Whakaangi 11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.63	7.63	3.88	7.13	7.25	7.63
Mahinepua-Radar Hill																							
90	Mahinepua 0	-	-	-	-	-	-	-	-	-	-	-	-	2.90	2.90	3.38	3.63	4.00	7.13	4.38	3.25	4.88	5.63
83	Mahinepua 1	-	-	-	-	-	-	-	-	3.50	-	2.60	4.10	3.50	2.60	2.38	2.25	3.13	7.50	6.75	4.25	4.75	4.25
84	Mahinepua 2	-	-	-	-	-	-	-	-	4.20	0.80	2.30	4.80	4.30	2.75	3.25	3.25	4.25	6.75	4.75	3.63	4.25	7.29
85	Mahinepua 3	-	-	-	-	-	-	-	-	5.60	4.75	4.00	5.50	5.40	3.25	5.88	5.25	5.25	10.25	5.00	5.88	5.38	7.29
88	Mahinepua 4	-	-	-	-	-	-	-	-	6.10	4.10	3.00	7.80	4.70	4.10	9.50	4.75	5.38	10.63	7.13	8.00	6.88	9.25
87	Mahinepua 5	-	-	-	-	-	-	-	-	-	-	-	-	2.40	0.90	2.00	-	-	-	-	-	-	-
86	Mahinepua 6	-	-	-	-	-	-	-	-	1.00	2.50	2.30	-	0.40	0.75	1.25	-	-	-	-	-	-	-
89	Mahinepua 7	-	-	-	-	-	-	-	-	0.90	5.90	1.80	4.80	1.90	0.40	-	-	-	-	-	-	-	-
181	Mahinepua 8	-	-	-	-	-	-	-	-	-	-	-	-	0.80	0.40	-	-	-	-	-	-	-	-
182	Mahinepua 9	-	-	-	-	-	-	-	-	-	-	-	-	0.10	0.10	-	-	-	-	-	-	-	-
183	Mahinepua 10	-	-	-	-	-	-	-	-	-	-	-	-	1.60	1.25	-	-	-	-	-	-	-	-
184	Mahinepua 11	-	-	-	-	-	-	-	-	-	-	-	-	2.90	1.25	1.25	-	-	-	-	-	-	-
98	Mahinepua 12	-	-	-	-	-	-	-	-	-	3.50	2.30	3.80	2.50	3.40	2.88	-	-	-	-	-	-	-
99	Mahinepua 13	-	-	-	-	-	-	-	-	-	3.90	3.80	7.40	7.30	5.00	9.38	7.75	9.50	160	9.63	6.88	11.00	10.88
92	Mahinepua 14	-	-	-	-	-	-	-	-	-	-	-	-	0.6	1.25	1.13	1.38	0.75	-	-	-	-	-
91	Mahinepua 15	-	-	-	-	-	-	-	-	-	-	-	-	1.00	1.10	1.63	1.75	3.13	-	-	-	-	-
93	Mahinepua 16	-	-	-	-	-	-	-	-	-	-	-	-	1.30	6.00	2.00	2.63	5.25	-	-	-	-	-
94	Mahinepua 17	-	-	-	-	-	-	-	-	-	-	-	-	2.50	4.90	5.00	3.38	6.88	-	-	-	-	-
95	Mahinepua 18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.75	-	-	-	-	-	-	-
Eastern																							
10	Marsden Cross	20.90	18.30	9.60	16.70	14.50	19.90	21.90	17.90	18.50	22.00	19.30	30.60	23.00	-	20.25	24.50	34.88	30.86	30.25	19.25	30.38	38.63
11	Puketotara	10.00	13.80	8.10	11.60	9.70	8.00	-	2.50	7.50	3.60	-	7.10	13.70	10.60	6.17	9.50	9.25	9.13	9.75	14.00	12.75	-
12	Rangitane	14.00	5.60	8.40	10.50	7.50	8.40	11.50	10.50	8.60	8.00	8.00	11.50	9.10	15.90	15.25	11.38	10.75	12.75	11.25	12.83	9.50	10.88
13	Waitangi No 12	7.60	7.60	6.30	8.90	5.30	7.10	11.50	15.10	18.40	13.75	11.50	15.50	6.30	-	-	-	-	6.75	7.38	3.00	4.75	7.50
14	Mt Bledisloe	27.10	10.90	5.50	7.90	8.80	5.10	6.40	6.75	4.90	8.90	9.10	5.50	9.60	11.25	8.25	11.38	13.71	7.38	10.75	6.75	7.88	10.88
15	Tikitikiore	10.80	13.50	6.10	6.10	4.50	6.50	2.90	3.30	3.10	6.10	3.38	13.00	7.90	11.00	12.25	12.25	13.50	17.75	14.50	12.38	15.13	25.50
Russell Peninsula																							
59	Opito Farms	-	-	-	-	-	5.70	-	9.90	-	-	4.63	13.10	6.10	9.13	6.75	4.25	5.25	8.13	6.88	11.50	10.13	-
60	Flagstaff/Te Maiki	-	-	-	-	-	3.70	1.30	1.30	-	-	-	4.30	-	6.38	-	2.50	4.25	3.88	3.25	3.25	3.88	3.38
61	Milne Ct	-	-	-	-	-	-	-	-	-	-	-	6.30	5.80	-	-	-	-	-	-	-	-	-

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STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
62	Uruti Rd	-	-	-	-	10.80	7.60	10.50	-	-	-	7.63	14.40	7.90	5.00	12.75	12.25	12.75	11.5	13.88	6.88	15.00	21.63	
156	Russell Heights	-	-	-	-	-	-	-	-	-	-	-	9.80	4.80	5.00	2.50	5.00	-	-	-	-	-	-	
170	Nikau Block	-	-	-	-	-	-	-	-	-	-	12.88	10.00	12.00	12.00	12.00	8.88	14.25	9.13	20.75	14.63	14.88	12.00	
171	Mace/Farmer	-	-	-	-	-	-	-	-	-	-	-	-	-	6.63	4.75	17.63	10.38	6.25	4.00	4.00	14.25	12.75	
172	Pipiroa Bay	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	3.00	2.00	2.75	6.00	5.38	5.63	3.00	3.25	
173	Shortlands	-	-	-	-	-	-	-	-	-	-	-	2.00	2.50	1.38	1.13	1.25	-	2.33	1.13	2.00	-	-	
174	Johnsons	-	-	-	-	-	-	-	-	-	-	-	10.00	9.75	12.75	10.00	10.00	11.38	8.5	10.13	10.25	11.25	12.75	
176	Jarvis	-	-	-	-	-	-	-	-	-	-	5.38	4.30	-	-	-	-	-	-	-	-	-	-	
177	Soloman's Gate	-	-	-	-	-	-	-	-	-	-	11.50	6.38	-	-	-	-	5.38	6.25	4.88	14.00	9.50	-	
210	Paroa Bay, Russell	-	-	-	-	-	-	-	-	-	-	-	-	4.30	-	-	-	-	-	-	-	-	-	
211	Eagles Nest	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.50	-	-	-	-	-	-	
Bay of Islands																								
146	Kauri Cliffs 1 (Pink Beach)	-	-	-	-	-	-	-	-	9.00	-	-	4.00	4.25	1.75	5.00	6.50	-	-	-	-	-	-	3.25
147	Kauri Cliffs 2 (Puriri)	-	-	-	-	-	-	-	-	-	-	-	1.50	3.00	2.75	1.00	-	-	-	-	-	-	-	-
148	Wiwiki Beach	-	-	-	-	-	-	-	-	-	-	-	32.10	-	-	-	-	-	-	-	-	-	-	-
149	Mataka Stn Gate, Purerua	-	-	-	-	-	-	-	-	-	-	-	4.00	4.10	8.25	6.75	18.5	3.25	10	6.88	-	-	-	-
150	McKenzie Rd, Purerua	-	-	-	-	-	-	-	-	-	-	-	9.50	12.10	10.25	5.00	7.50	-	2.50	-	-	-	-	-
151	Mtn Landing (Lot 30) Purerua	-	-	-	-	-	-	-	-	-	-	-	12.30	10.20	18.75	12.60	25.00	22.75	20.25	-	-	-	-	-
152	Waitoto Block	-	-	-	-	-	-	-	-	-	-	-	4.00	-	-	-	-	-	-	-	-	-	-	-
153	Aroha Island	-	-	-	-	-	-	-	-	6.88	-	-	12.60	-	-	-	-	-	-	-	-	-	-	-
154	Napia Bay	-	-	-	-	-	-	-	-	-	8.70	5.50	4.60	4.00	4.50	3.25	5.60	7.50	3.60	4.00	-	-	-	-
155	Stirlings Quarry	-	-	-	-	-	-	-	-	7.30	9.80	13.00	12.40	10.20	8.30	4.00	8.50	-	-	-	-	-	-	-
97	Kurapari Rd	-	-	-	-	-	-	-	-	12.70	8.80	9.25	10.40	5.50	6.00	6.75	4.75	2.33	5.50	7.00	-	-	-	-
138	Hupara	-	-	-	-	-	-	-	-	-	25.60	19.30	27.80	-	-	-	-	-	-	-	-	-	-	-
185	Akeake Reserve, Kerikeri	-	-	-	-	-	-	-	-	-	-	-	-	-	2.75	0.50	-	6.00	-	-	-	-	-	-
186	Cunningham Gardens, Aroha Island	-	-	-	-	-	-	-	10.75	8.63	-	-	-	-	-	-	-	8.17	-	-	-	-	-	-
187	Gaitens, Rangitane Rd, Kerikeri	-	-	-	-	-	-	-	6.33	6.88	10.00	12.00	12.63	14.70	10.50	8.00	7.25	7.50	4.75	-	-	-	-	-
188	Blacksmiths Bay (east), Kerikeri (Lex Rennes)	-	-	-	-	-	-	-	10.25	10.30	7.67	8.26	6.20	6.00	8.00	4.50	6.88	8.75	6.40	0.00	-	-	-	-

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STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
189	Doves Bay, Kerikeri (Lockyer)	-	-	-	-	4.17	-	-	2.00	-	3.78	2.46	-	-	4.50	7.50	15.25	18.25	-	-	-	-	-	
190	Rangitu, Opito Bay Road, Kerikeri	-	-	-	-	-	-	-	-	-	-	-	-	9.10	16.00	15.50	15.50	-	-	-	-	-	-	
191	Tikorangi Road, Opito Bay, Kerikeri	-	-	-	-	-	-	-	-	-	-	-	-	-	4.50	4.50	4.00	-	-	-	-	-	-	
192	Kraus, Hansen Rd, Purerua	-	-	-	-	-	-	-	-	-	3.33	-	-	-	-	11.00	-	-	-	-	-	-	-	
193	Mataka Beach, Mataka Station, Purerua	-	-	-	-	-	-	-	41.50	-	30.00	39.00	32.67	24.50	41.75	30	41.25	-	30.83	30.88	-	-	-	
194	Mataka Station, Ninepin Track, Purerua	-	-	-	-	-	-	-	-	-	30.00	-	-	-	50.75	43.50	-	18.00	-	24.00	-	-	-	
195	Mountain Landing (Lot 30) Wharengaere, Purerua	-	-	-	-	-	-	-	-	-	-	-	12.25	10.20	18.75	12.60	25.00	22.75	20.25	13.25	-	-	-	
196	Mountain Landing, Mataka Ridgeline, Purerua	-	-	-	-	-	-	-	-	-	-	-	7.50	10.10	18.00	25.50	14.25	22.00	-	-	-	-	-	
197	Mountain Landing, Paddle (Entrance), Purerua	-	-	-	-	-	-	-	-	-	-	-	8.50	10.20	12.50	14.25	17.00	-	-	-	-	-	-	
198	Mountain Landing, Poraenui Point	-	-	-	-	-	-	-	-	-	-	-	-	7.30	14.50	16.00	13.75	-	-	-	-	-	-	
199	Paoneone	-	-	-	-	-	-	-	16.67	-	-	-	-	-	-	-	-	37.60	-	11.25	-	-	-	
200	Pattersons Big Hill	-	-	-	-	-	-	-	9.00	-	-	30.50	-	4.01	20.50	70.25	33.00	35.50	-	-	-	-	-	
201	Pattersons, Rocky Bay	-	-	-	-	-	-	-	-	-	-	-	-	-	16.50	19.50	17.67	11.67	-	-	-	-	-	
202	Tapuetahi	-	-	-	-	-	-	-	-	-	-	-	5.00	-	3.00	3.25	16.50	-	-	7.38	-	-	-	
203	Wharengaere Bay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.50	15.50	-	-	-	-	-	
204	Wiroa Station	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.50	6.67	-	-	-	-	-	
205	Wiroa Station Hill 11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.50	-	-	-	-	-	-	
206	Maintenance Facility, Kauri Cliffs	-	-	-	-	-	-	-	-	-	-	-	-	-	6.50	5.00	13.13	-	-	-	-	-	6.88	
207	Waiaua Bay, Matauri X	-	-	-	-	-	-	-	-	2.25	-	-	0.50	0.50	-	-	-	-	-	-	-	-	-	-
208	Waterfall, Kauri Cliffs, Takou Bay	-	-	-	-	-	-	-	-	6.00	-	-	5.50	2.25	4.50	3.50	-	-	-	-	-	-	-	-
209	Hikurua Rd (end)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00	-	-	-	-	-	-	

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STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
212	Drivers Whitehills farm	-	-	-	-	-	-	-	-	-	-	-	-	-	7.50	2.00	8.00	8.00	7.88	-	-	-	-
213	Landcorp Takou Kiwi covenant	-	-	-	-	-	-	-	-	-	-	-	-	-	8.50	0.75	3.00	3.00	-	-	-	-	-
214	Maori Block	-	-	-	-	-	-	-	-	-	-	-	-	1.50	-	-	3.50	-	-	-	-	-	-
215	Otaha Station (south end)	-	-	-	-	-	-	-	-	-	-	-	-	3.00	-	-	3.00	-	-	-	-	-	-
216	Just past Clinton's	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00	-	-	-	-	-	-
217	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.25	-	-	-	-	-	-
219	Achtzener, Bulls Gorge, Kerikeri	-	-	-	-	-	-	-	-	-	-	-	7.00	-	6.00	11.75	5.75	2.75	-	1.88	-	-	-
220	Airstrip Rd (Baigent-Mercer)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00	-	3.25	-	-	-	-
221	Airstrip Rd (Sharp)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.00	-	-	-	-	-	-
222	Candy Bush, Puketi Road, middle ridge	-	-	-	-	-	-	-	-	-	-	-	-	-	0.75	6.00	-	-	-	-	-	-	-
223	Candy Bush, Puketi Road, red cliffs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.50	-	-	5.75	-	-	-	-
224	Candy Bush, Puketi Road, white/yellow path	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.00	-	-	11.00	-	-	-	-
225	Kauri Hills, Totara North	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.00	6.25	-	-	-	-
226	Poultons, Kerikeri River, Mangapararu Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	9.00	-	6.50	-	5.38	4.63	-	-	-
227	Puketotara Rd = 709	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.00	-	-	-	-	-	-
228	Puketotara Rd = Kearney	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.50	-	-	-	-	12.88	-
229	Waipapa Rd West, Kerikeri (Anne C.)	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-
230	Waipapa Rd West, Kerikeri (Isabella C.)	-	-	-	-	-	-	-	-	-	-	-	-	-	0.60	0.50	-	-	-	-	-	-	-
231	Waitoto, 500m west of Rhyolitic dome, Mangapararu	-	-	-	-	-	-	-	-	-	-	-	4.00	-	-	-	-	-	-	-	-	-	-
232	Waitoto, Rhyolitic dome, Mangapararu Road	-	-	-	-	-	-	-	-	-	-	-	4.50	4.60	8.00	5.00	-	-	-	-	-	-	-
233	Wharau Rd, Kerikeri (Manning)	-	-	-	-	-	-	-	-	-	-	-	-	3.60	2.50	-	5.50	3.50	4.50	-	-	-	-
234	Wharau Rd, Kerikeri (Starr)	-	-	-	-	-	-	-	-	-	-	-	-	6.25	7.00	-	-	-	-	-	-	-	-

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Puketi Forest																							
102	Bramley's Rd	-	-	-	-	-	-	-	-	-	-	-	2.50	0.50	2.00	2.00	2.75	2.75	2.5	2.00	-	3.38	2.38
103	Pirau Ridge	-	-	-	-	-	-	-	-	-	-	0.00	0.00	-	0.00	1.00	0.50	1.25	1.25	1.38	0.50	1.63	0.88
104	Pond	-	-	-	-	-	-	-	-	-	-	4.50	1.00	1.00	3.75	5.00	3.50	8.00	6.88	4.63	5.88	3.25	4.88
105	Pudding Bowl Hill	-	-	-	-	-	-	-	-	-	-	0.30	0.75	0.75	1.13	2.04	2.00	1.00	-	3.00	-	-	-
106	Takapau Track	-	-	-	-	-	-	-	-	-	-	0.00	0.00	1.00	0.00	2.50	3.25	2.98	2.57	1.38	-	1.13	1.88
107	Takapau/Pirau Rd Junction	-	-	-	-	-	-	-	-	-	-	0.50	0.50	-	1.00	2.75	1.38	3.50	1.50	1.13	0.88	1.63	1.50
108	Totara Ridge	-	-	-	-	-	-	-	-	-	-	5.75	-	-	0.75	7.13	3.50	6.13	4.63	5.88	5.00	1.75	4.13
109	Waihoanga Gorge	-	-	-	-	-	-	-	-	-	-	2.00	-	-	3.75	5.38	3.25	6.25	4.5	4.25	-	5.75	5.50
110	Waihoanga Gorge 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.50	2.50	1.50	-	4.50	-	-	-
111	Wainut	-	-	-	-	-	-	-	-	-	-	4.25	2.5	2.5	1.25	3.29	3.00	5.25	4.00	4.75	6.13	4.88	7.88
112	Stoat line 9 - Puketi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.13	4.00	3.63	1.38	4.00	1.00
259	Puketi Nature Trail	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.13	-	3.25	-	-	-
Waimate North																							
113	W1	-	-	-	-	-	-	-	-	-	23.50	15.80	24.75	-	-	25.50	25.75	23.63	23.13	23.75	27.13	30.75	34.50
114	W2	-	-	-	-	-	-	-	-	-	12.25	7.00	9.50	7.90	11.50	5.75	14.5	11.63	12.50	7.13	5.13	8.60	4.75
115	W3	-	-	-	-	-	-	-	-	-	14.90	-	-	-	-	-	-	1.00	0.00	1.00	1.38	2.00	1.25
116	W4	-	-	-	-	-	-	-	-	-	9.40	10.50	6.00	-	8.00	-	8.50	13.50	10.50	10.88	8.50	8.00	7.00
117	W5	-	-	-	-	-	-	-	-	-	5.90	1.83	3.00	-	-	-	-	-	-	-	-	-	-
118	W6	-	-	-	-	-	-	-	-	-	22.30	11.00	5.70	8.50	7.30	9.13	5.63	10.63	8.00	7.50	10.38	11.00	13.25
119	W7	-	-	-	-	-	-	-	-	-	-	5.30	6.50	-	3.10	-	-	-	-	-	-	-	-
120	W8	-	-	-	-	-	-	-	-	-	13.75	2.83	1.00	8.10	8.00	5.50	8.13	9.13	11.88	9.13	11.25	8.13	7.13
121	W9	-	-	-	-	-	-	-	-	-	5.20	3.50	2.125	2.30	3.50	-	-	-	-	1.00	5.50	2.88	7.25
122	W10	-	-	-	-	-	-	-	-	-	-	-	7.33	8.30	5.90	5.25	4.13	7.25	5.13	4.13	8.00	4.43	5.25
123	W11	-	-	-	-	-	-	-	-	-	7.07	7.75	2.00	-	-	-	-	-	-	-	-	-	-
124	W12	-	-	-	-	-	-	-	-	-	18.90	9.75	6.10	3.60	5.90	6.00	7.88	6.25	4.63	5.13	8.00	8.13	7.38
178	W13	-	-	-	-	-	-	-	-	-	-	-	-	-	4.50	2.80	-	-	-	-	-	-	-
127	W14	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00	0.88	0.50	0.00	-	-	-	-	-
128	W16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.9	2.17	-	-	-	-	-	-
Hupara																							
258	Hupara Land Care 1 (Bill's Plateau)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31.25	15.13	21.38	25.00	26.38

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STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
245	Hupara Land Care 2 (Mike Sullivan's)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20.88	11.00	16.00	-
246	Hupara Land Care 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19.38	-	-	-
257	Hupara Land Care 4 (Home Orange Tree)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.63	9.00	17.13
	Hupara Land Care Harrison's Property	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35.29
Tutukaka & Sandy Bay																							
125	TLC 1	-	-	-	-	-	-	-	-	9.75	5.90	7.10	8.80	10.90	11.60	8.13	8.63	12.38	12.00	12.14	9.63	7.38	11.50
126	TLC 2	-	-	-	-	-	-	-	-	-	8.40	7.80	9.80	10.25	6.50	-	7.38	2.75	10.00	-	6.83	10.88	9.50
142	TLC 3	-	-	-	-	-	-	-	-	-	-	3.00	4.60	3.60	3.00	-	-	9.25	8.50	7.13	5.38	4.13	8.63
28	TLC 4	-	7.30	-	-	8.00	4.40	-	-	10.70	7.25	4.40	10.00	-	-	8.17	4.50	-	-	-	6.50	-	-
143	TLC 5	-	-	-	-	-	-	-	-	-	-	4.10	6.00	3.30	7.10	4.00	2.33	3.83	-	-	3.50	-	-
144	TLC 6	-	-	-	-	-	-	-	-	-	-	9.20	-	13.00	15.20	6.50	8.75	-	-	-	-	-	-
160	TLC 7	-	-	-	-	-	-	-	-	-	-	-	4.40	-	-	4.75	4.88	-	5.50	2.13	3.00	-	-
100	Kaiatea 1	-	-	-	-	-	-	-	-	-	1.60	-	-	-	-	-	-	-	-	-	-	-	-
101	Kaiatea 2	-	-	-	-	-	-	1.20	2.00	1.25	2.10	-	-	-	-	-	-	-	-	-	-	-	-
27	Sandy Bay 1	3.60	3.40	2.80	8.00	6.10	3.30	3.50	-	3.00	-	2.50	-	-	6.75	-	5.25	-	4.17	5.50	4.25	3.88	5.75
260	Sandy Bay 2	-	-	-	-	-	-	-	-	-	-	-	4.50	-	-	3.83	3.50	2.50	4.50	-	3.00	5.88	6.38
261	Sandy Bay 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00	-	4.00	7.50	3.88	3.88	8.50
Whangarei Heads																							
39	Bream Hd 1	-	-	-	-	-	-	5.00	3.10	5.75	3.10	4.70	5.10	3.50	5.00	6.00	3.00	7.13	9.50	9.63	9.63	10.00	12.13
40	Bream Hd 2	-	-	-	-	-	-	1.20	2.00	1.25	2.10	2.40	2.00	2.80	2.00	-	-	1.25	-	-	-	-	-
41	Bream Hd 3	-	-	-	-	-	-	-	-	-	-	1.50	2.00	1.30	1.60	-	-	-	8.38	8.63	8.63	6.13	6.88
42	Bream Hd 4	-	-	-	-	-	-	1.20	2.00	1.25	2.10	2.40	2.00	1.50	3.10	2.00	2.00	5.38	5.33	7.63	2.13	6.25	3.75
69	Bream Hd 6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.88	6.75	4.38	-	5.00
44	Taurikura 1	-	-	-	-	-	-	-	-	-	-	1.50	2.00	-	4.40	4.88	3.13	12.63	9.63	10.75	-	-	-
45	Taurikura 2	-	-	-	-	-	-	-	-	-	-	-	-	-	9.00	8.50	10.88	10.25	5.50	10.38	11.88	8.63	11.25
46	Taurikura 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.50	1.88	5.88	4.63	4.00	7.50	4.75	6.00
47	Manaia 1	-	-	-	-	-	-	3.50	2.50	4.25	4.00	3.30	3.90	2.10	5.10	3.88	3.25	10.25	2.88	2.75	3.63	1.50	9.38
48	Manaia 2	-	-	-	-	-	-	4.00	4.50	4.90	5.75	4.00	5.30	7.40	7.60	8.75	10.75	8.38	16.63	13.25	15.88	15.13	15.63
49	Manaia 3	-	-	-	-	-	-	3.25	3.90	2.90	-	2.10	3.00	-	4.00	3.13	3.50	6.25	3.13	5.13	3.63	7.50	7.13
71	Manaia 8	-	-	-	-	-	-	-	1.50	0.25	1.00	1.20	2.00	1.50	1.40	1.88	0.75	2.13	-	4.63	-	3.25	4.75

Continued on next page

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
262	Manaia 9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.75	3.63	6.88	9.13	6.00	-	
54	Kauri Mtn 1	-	-	-	-	4.50	-	1.50	1.50	3.10	7.40	1.30	1.30	-	1.40	3.00	2.13	2.50	3.63	4.63	4.38	3.75	7.38	
72	Kauri Mtn 2	-	-	-	-	-	-	5.10	5.10	3.20	4.30	2.70	2.30	0.40	2.25	3.60	2.38	3.38	5.25	5.00	6.25	6.75	9.63	
73	Kauri Mtn 3	-	-	-	-	-	-	2.00	2.00	1.00	1.00	1.30	2.50	-	5.00	3.38	1.13	6.00	3.25	3.17	5.13	6.88	7.00	
74	Kauri Mtn 4	-	-	-	-	-	-	4.80	4.80	5.90	2.60	3.00	2.90	-	2.00	2.00	3.38	3.88	3.75	3.25	4.13	4.75	5.63	
141	Kauri Mtn 5	-	-	-	-	-	-	-	-	-	-	2.30	1.90	1.25	2.50	3.13	3.25	4.75	4.13	3.00	4.88	4.75	8.86	
127	The Nook 1	-	-	-	-	-	-	-	-	-	1.80	1.50	0.90	-	0.70	1.38	1.25	2.25	-	0.88	-	-	-	
56	The Nook 2	-	-	-	-	-	-	6.00	2.10	3.25	3.80	4.00	5.30	-	5.00	4.50	7.75	9.25	8.38	6.38	4.13	1.63	3.88	
128	The Nook 3	-	-	-	-	-	-	-	-	-	-	-	-	-	3.40	4.75	5.00	3.38	3.38	4.63	-	-	-	
58	Nook Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	3.75	-	3.67	4.63	1.50	-	-	-	-	
263	Craig Road	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.00	14.13	12.25	9.25	13.50	12.25	
75	McCleod Bay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.63	5.88	8.75	
Southern																								
21	Glenbervie 7A	5.00	6.40	7.10	7.50	5.00	0.50	1.00	2.40	1.00	-	1.30	-	2.40	2.50	1.88	1.75	2.63	1.13	4.25	-	-	-	-
22	Glenbervie 9A	11.20	3.80	4.30	7.30	5.90	12.60	6.75	5.25	4.50	6.50	-	1.80	2.80	2.90	1.38	2.88	1.63	6.75	6.88	2.75	2.00	-	-
23	Marlow Road	22.40	13.90	14.00	17.80	19.80	21.30	22.90	-	19.80	17.60	12.10	10.00	13.30	11.10	10.25	7.25	13.13	15.38	14.00	18.38	20.13	18.75	18.75
24	Purua North	12.10	13.00	10.30	10.50	10.60	15.00	12.75	12.50	13.25	10.90	12.60	13.60	18.30	9.90	13.50	10.00	16.13	16.00	17.63	14.88	16.25	13.75	13.75
25	Rarewarewa –early listen	-	-	-	8.00	10.40	4.60	7.00	6.50	4.60	5.90	5.60	4.80	6.00	-	-	-	-	-	-	-	-	-	-
25	Rarewarewa South	7.50	8.00	8.50	6.60	8.30	6.60	7.00	5.80	6.50	6.60	5.30	6.30	6.60	6.40	8.88	4.00	7.88	6.50	4.63	7.50	7.50	9.14	
26	Mimiwhangata	11.00	5.60	3.50	3.60	0.30	9.40	19.10	20.30	13.80	20.25	14.30	21.00	19.50	12.90	11.00	8.38	-	11.00	9.00	12.13	9.63	10.75	
34	Motatau 1	-	-	-	-	8.80	-	10.00	15.00	6.75	7.50	5.60	6.50	7.50	8.75	6.00	-	4.88	2.50	-	-	4.86	-	
35	Motatau 2	-	-	-	-	-	-	2.70	2.70	-	-	1.50	3.00	2.50	-	-	-	4.25	-	5.50	-	-	-	
36	Motatau 3	-	-	-	-	-	-	4.80	1.50	2.75	5.50	3.50	4.60	4.00	0.90	-	-	5.50	-	-	-	-	-	
38	Motatau 5	-	-	-	-	-	-	1.50	1.25	0.90	1.00	-	-	-	-	-	-	-	-	-	-	-	-	
68	Motatau 9/ Marlow 1	-	-	-	-	-	-	-	11.70	11.75	17.60	13.50	10.50	9.30	2.90	7.13	3.00	9.75	9.88	9.25	5.38	-	11.88	
81	Purua South	-	-	-	-	-	-	-	-	14.75	15.90	14.40	14.10	14.60	10.50	12.5	11.13	17.50	10.75	7.25	18.63	9.50	7.25	
82	Rarewarewa North	-	-	-	-	-	-	-	-	9.75	6.60	4.00	8.50	7.90	10.40	11.38	11.38	11.88	12.13	10.00	7.88	6.88	-	
129	Motatau 10/ Marlow 2	-	-	-	-	-	-	-	-	-	7.10	7.50	10.90	9.00	5.75	2.17	3.38	5.00	5.38	7.75	2.25	4.50	3.88	
139	Hodges Bush	-	-	-	-	-	-	-	-	-	-	9.80	13.00	16.10	17.75	15.50	16.63	9.50	13.75	28.63	22.00	23.13	11.75	
145	Whangaruru	-	-	-	-	-	-	-	-	-	-	-	6.00	6.00	10.25	13.38	10.75	24.29	13.50	9.38	7.75	4.38	10.00	
167	Kaikanui Rd	-	-	-	-	-	-	-	-	-	-	-	-	8.50	11.60	15.00	8.38	7.25	3.75	2.88	-	-	-	
168	Worsp Rd	-	-	-	-	-	-	-	-	-	-	-	-	1.80	2.40	2.00	5.75	1.38	-	-	-	0.13	2.00	
264	Whau Valley Dam	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	

Continued on next page

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
Western																								
16	Katui	47.60	39.40	20.40	28.20	17.50	16.10	14.40	-	14.90	13.90	-	4.00	-	0.00	-	0.25	-	-	0.00	0.00	-	-	-
17	Trounson North	8.50	17.30	12.50	19.00	16.00	14.30	16.10	-	15.25	19.90	22.20	15.40	-	13.75	22.33	5.75	15.13	12.00	10.00	5.25	7.63	9.38	
18	Cathedral	2.30	3.80	5.10	5.50	5.10	1.80	2.75	5.90	5.25	4.90	4.00	4.60	4.40	3.00	1.63	2.75	4.13	2.63	4.38	5.75	7.13	7.13	
19	Waipoua L/Out	30.9	24.40	30.80	27.70	21.40	21.80	14.60	8.40	16.90	22.75	23.00	7.90	11.80	6.00	6.00	9.25	15.63	8.88	10.00	12.50	12.38	12.00	
20	Paerata	9.90	1.30	3.10	6.50	2.80	3.10	1.25	-	0.00	-	-	-	0.90	1.10	1.63	0.25	0.38	1.13	0.25	0.63	-	-	
31	Te Matua Ngahere	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.25	4.13	-	-	-	-	1.17	-	
33	Trounson South	-	-	-	-	-	-	12.25	-	23.75	19.10	-	-	8.20	8.90	-	11.13	12.33	10.00	6.00	7.75	7.75	10.50	
79	Toronui Track	-	-	-	-	-	-	-	-	1.75	2.40	-	-	-	-	-	-	-	-	-	-	-	-	
96	Kawerau Rd Cr	-	-	-	-	-	-	-	-	3.40	2.00	0.30	0.40	1.00	-	-	-	-	-	-	-	-	-	
157	Opouteke CHH	-	-	-	-	-	-	-	-	-	-	-	6.60	6.10	2.80	11.25	-	-	-	-	-	-	-	
158	Pipiwai CHH	-	-	-	-	-	-	-	-	-	-	-	7.30	0.50	1.50	-	-	-	-	-	-	-	-	
179	Marlborough 13	-	-	-	-	-	-	-	-	-	-	-	-	-	6.50	-	-	-	-	-	-	-	-	
244	Maunganui Bluff	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	
265	River Road	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.00	-	-	-	2.63	-	
266	Wekaweka LC 1 (Alf's Cottage)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.20	-	-	-	-	-	
267	Wekaweka LC 2 (Rob's Place)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.67	-	
268	Wekaweka LC 3 (Libby's track)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.25	-	
13b	Site 13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.13	-	-	-	-	-	-	-	
14b	Site 14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	
16b	Marlborough Rd Site 16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.38	2.13	1.50	1.38	0.63	2.00	0.38	0.50	
18b	Site 18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.50	-	-	-	-	-	-	-	
28b	Site 28 SH12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.25	8.88	3.63	4.13	5.13	-	7.63	4.50	
30b	Site 30 SH12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.00	3.00	0.88	-	-	-	1.50	-	
31b	Site 31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.50	-	-	-	-	-	-	-	
32b	Site 32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.88	-	-	-	-	-	-	-	
Tawharanui																								
161	TWN 1 Marine triangle	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.16	0.50	-	1.25	2.25	2.88	2.63	4.00	
162	TWN 2 Trig triangle	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.16	0.67	-	3.88	1.88	1.25	2.88	6.63	
163	TWN 3 Top ecology track	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.50	0.33	-	1.63	2.00	4.63	6.00	5.00	
164	TWN 4 Possum gully	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	0.00	-	2.75	1.38	8.00	2.75	4.63	

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STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
165	TWN 5 Twin hills	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.16	0.00	-	2.25	1.88	3.25	3.50	6.75	
166	TWN 6 South coast water tank	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.83	0.33	-	4.88	6.50	8.00	9.50	6.38	
Kawau Island																								
269	Bostaquet Bay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.57	-	-	-	-	-
270	South Cove	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.40	-	-	-	-	-
Maranui																								
253	Marunui 1 (House 17 deck)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.13	2.63	4.25	
275	Marunui 2 (Pebblebrook Rd)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.67	3.00	
Mataia																								
254	Mataia 1 KLD (Top of fishing track)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.04	-	-	-
255	Mataia 2 KLD (Mid pa track)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.46	-	0.50	
	Mataia 3 KLD (Cliffs)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.75



# Appendix 2

## Summary of Northland kiwi listening data for stations listened from in 2016

STN NO.	STATION NAME	LISTENER	1		2		3		4		TOTAL	MEAN
			1	2	1	2	1	2	1	2		
Northern												
1	Diggers Valley	R. Renwick	8	1	2	2	0	1	7	1	22	2.75
2	Takahue	F. Schou	0	0	0	0	0	0	0	0	0	0.00
4	Gartons	G. Upton	0	0	0	0	0	1	0	0	1	0.13
7	Puketi	D. O'Halloran	7	5	7	5	5	3	6	7	45	5.63
8	Puketi SR	N. & E. Walker; K. & S. Grimme	13	6	8	9	10	8	15	5	74	9.25
Mangatete												
3	Lightning Hill	L. Baigent	22	21	21	11	21	14	34	20	164	20.50
256	Home drive	A. Baigent	15	15	6	16	15	26	15	15	123	15.38
Honeymoon Valley												
271	Green Bach	Y. Steinemann	0	1	1	0					2	0.50
	NZFRT reserve, campsite	M. Schmid	11	4	7	11	7	2	1	2	45	5.63
Whakaangi												
131	Wha 2	M. Langridge	4	3	4	4	4	5	8	7	39	4.88
132	Wha 3	M. Langridge	7	3	8	2	6	6	11	4	47	5.88
133	Wha 5	D. Bell	0	9	3	14	2	3	12	11	54	6.75
135	Wha 7	W. Sporle	7	5	9	6	3	2	7	3	42	5.25
136	Wha 8	P. L. & P. J. Johnston	4	5	8	3	5	1	5	5	36	4.50
137	Wha 9	A. J. Goodwin	1	0	0	1	4	0	0	0	6	0.75
140	Wha 11	J. Langridge	14	4	5	10	8	4	6	10	61	7.63
Mahinepua												
90	Site 0	C. Quinlan et al.	3	4	8	9	4	2	9	6	45	5.63
83	Site 1	R. Wright et al.	2	6	5	8	3	0	4	6	34	4.25
84	Site 2	C. Pusch et al.	6	10	8	12	1		9	5	51	7.29
85	Site 3	L. & F. Barnes	11	3	14	3	13		3	4	51	7.29
88	Site 4	M, Cox et al.	11	5	15	8	10	8	12	5	74	9.25
99	Site 13	F. Craig et al.	14	7	22	4	12	1	14	13	87	10.88
Eastern												
10	Marsden Cross	R. Booth, C. Hambrook	33	21	42	39	58	38	54	24	309	38.63
12	Rangitane	A. Walker	14	8	7	10	12	13	15	8	87	10.88
13	Waitangi No. 12	D. Lawson	5	12	4	4	11	6	12	6	60	7.50
14	Mt Bledisloe	S. McManus	8	16	9	4	8	8	19	15	87	10.88
15	Tikitikiore	L. Gordon	36	19	47	17	25	6	30	24	204	25.50
Russell												
60	Te Maiki/Flagstaff	H. Lindauer	2	6	2	5	1	5	5	1	27	3.38
62	Uruti Road	C. Richmond	27	17	30	18	24	14	26	17	173	21.63
170	Nikau Block	D. McKenzie	7	20	14	4	20	13	13	5	96	12.00
171	Mace/Farmer	M. Cadogan	12	10	11	3	8	10	34	14	102	12.75
172	Pipiroa	M. Pasco	2	3	3	0	5	7	4	2	26	3.25
174	Johnsons	M. Frankum	24	18	18	3	9	11	10	9	102	12.75
Puketi Forest												
102	Bramley's Ridge	G. Adams et al.	4	2	3	2	2	0	5	1	19	2.38

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## Appendix 1 continued

STN NO.	STATION NAME	LISTENER	1		2		3		4		TOTAL	MEAN
			1	2	1	2	1	2	1	2		
103	Pirau Ridge	B. Sutton; I. D. Wilson	1	1	0	1	2	1	0	1	7	0.88
104	Pond	I. Wilson et al.	9	12	6	3	4	1	2	2	39	4.88
106	Takapau Track	P. Hodgson	2	1	1	2	3	1	3	2	15	1.88
107	Takapau/Pirau Rd Jn	J. Mortensen et al.	0	3	1	3	1	2	0	2	12	1.50
108	Totara Ridge	I. & D. Godbert et al.	3	0	2	6	2	1	13	6	33	4.13
109	Waihoanga Gorge	C. & R. Robinson	7	2	4	5	13	4	5	4	44	5.50
111	Walnut	A. Wickham	8	5	5	8	10	15	7	5	63	7.88
112	Stoat line 9 - Puketi	D. Godbert et al.	2	0	1	0	2	0	3	0	8	1.00
Hupara												
258	Hupara Land Care 1 (Bill's Plateau)	S. Brown	21	30	39	25	22	23	26	25	211	26.38
257	Hupara Land Care 4 (Orange Tree)	S. B. Brown	7	15	32	11	20	16	24	12	137	17.13
	Hupara Land Care (Harrison's Property)	D. Harrison	51	25	48		31	25	48	19	247	35.29
Waimate North												
113	W1	P. Saunders et al.	28	28	33	33	42	26	46	40	276	34.50
114	W2	I. Kerr	2	4	1	2	7	5	6	11	38	4.75
115	W3	K. Taylor et al.	3	5	0	0	0	1	0	1	10	1.25
116	W4	H. Horrobin & N. O'Brien	6	9	8	5	7	8	7	6	56	7.00
118	W6	D. Way et al.	18	14	21	12	12	13	9	7	106	13.25
120	W8	A. Chiaroni et al.	7	10	6	7	1	1	15	10	57	7.13
121	W9	B. Brown & D. Way	14	3	10	6	5	10	7	3	58	7.25
122	W10	D. J. Liebert	7	7	5	1	9	3	5	5	42	5.25
124	W12	D. Way et al.	11	5	6	9	9	7	7	5	59	7.38
Kauri Cliffs												
146	Kauri Cliffs 1 (Pink Beach)	O. Adams	3	7	4	1	1	8	1	1	26	3.25
206	Maintenance Facility, Kauri Cliffs	C. Vestena	8	12	5	3	6	6	9	6	55	6.88
Sandy Bay												
27	Sandy Bay 1	N. Pullman	2	8	7	5	5	6	6	7	46	5.75
260	Sandy Bay 2	ALD	8	9	5	11	6	7	1	4	51	6.38
261	Sandy Bay 3	N. Pullman	7	11	9	8	4	15	3	11	68	8.50
Tutukaka												
125	TLC 1	M. Camm	16	14	13	0	26	1	13	9	92	11.50
126	TLC 2	N. Davies	14	15	4	11	8	4	15	5	76	9.50
142	TLC 3	D. & S. Young	8	7	13	10	10	4	13	4	69	8.63
Whangarei Heads												
39	Bream Head 1	W. Newbold	5	11	22	16	11	8	19	5	97	12.13
41	Bream Head 3	O. A. Petel	3	7	5	12	6	8	6	8	55	6.88
42	Bream Head 4	C. & M. Pearson	5	3	2	5	5	2	3	5	30	3.75
69	Bream Head 6	C. Cook	7	1	4	7	6	3	7	5	40	5.00
54	Kauri Mt 1	J. N. Nairn	7	7	4	8	4	2	14	13	59	7.38
72	Kauri Mt 2	A. Willetts	16	8	13	3	10	8	9	10	77	9.63
73	Kauri Mt 3	T. D. Bull	10	1	9	5	7	10	5	9	56	7.00
74	Kauri Mt 4	G. & R. Faber	0	8	8	4	5	8	8	4	45	5.63
141	Kauri Mt 5	L. Brown	19		10	6	9	0	10	8	62	8.86
47	Manaia 1	L. & J. Ogle	18	21	6	7	11	2	7	3	75	9.38
48	Manaia 2	J. Lawrence et al.	23	13	15	8	19	13	17	17	125	15.63
49	Manaia 3	P. Richards	11	4	12	3	13	4	6	4	57	7.13

Continued on next page

## Appendix 1 continued

STN NO.	STATION NAME	LISTENER	1		2		3		4		TOTAL	MEAN
			1	2	1	2	1	2	1	2		
71	Manaia 8	S. Adams	1	5	8	5					19	4.75
56	Nook 2	M. R. & J. A. Butcher	8	5	6	1	2	1	5	3	31	3.88
45	Taurikura 2	G. Pike & R. Hohmann	14	9	9	14	11	4	15	14	90	11.25
46	Taurikura 3	K. Lange	9	4	9	1	7	6			36	6.00
263	Craig Rd	C. & J. McNamara	18	4	16	11	15	10	16	8	98	12.25
75	McLeod Bay	W. & V. Biddle	14	4	10	9	10	9	8	6	70	8.75
Southern												
23	Marlow Rd	P. Davis	8	16	14	30	28	22	23	9	150	18.75
24	Purua N	R. Riegel	11	11	19	11	16	12	17	13	110	13.75
25	Rarewarewa S	G. Whimp	2	13	11	12	5	12	9		64	9.14
26	Mimiwhangata	R. N. Taylor	12	6	13	11	12	12	16	4	86	10.75
68	Motatau 9	M. R. D. Ritchie	7	10	7	14	16	9	16	16	95	11.88
81	Purua S	V. F. Crabb	1	3	5	15	3	12	10	9	58	7.25
129	Motatau 10	P. Macdonald	1	0	12	3	10	3	1	1	31	3.88
139	Hodges	G. J. Lovell	13	5	12	11	13	11	12	17	94	11.75
145	Whangaruru	R. & D. Hughes	22	12	9	2	12	8	13	2	80	10.00
168	Worsp Road	C. P. Little	0	3	3		4		1	1	12	2.00
Western												
17	Trounson Nth	D. Arnold et al.	21	12	8	5	8	13	5	3	75	9.38
18	Cathedral	J. Mclaughlin	4	9	7	2	17	9	2	7	57	7.13
19	Lookout	O. Knox & D. Arnold	14	15	5	12	9	19	8	14	96	12.00
33	Trounson Sth	M. Topia	6	3	12	6	13	14	12	18	84	10.50
16b	Malborough Rd Site 16	ALD	0	0	2	0	1	0			3	0.50
28b	Site 28 SH12	I. Farrant	5	4	4	3	7	4			27	4.50
Tawharanui												
161	TWN 1 Marine triangle	Kerry et al.	1	0	2	0	5	12	4	8	32	4.00
162	TWN 2 Trig triangle	C. Parker, R. Rose et al.	9	6	4	7	6	5	4	12	53	6.63
163	TWN 3 Top ecology track	Sally & Mike et al.	3	0	6	5	3	5	7	11	40	5.00
164	TWN 4 Possum gully	Colin & Karen et al.	5	6	7	1	2	0	11	5	37	4.63
165	TWN 5 Twin hills	Ray & Maggie et al.	9	14	5	1	9	5	8	3	54	6.75
166	TWN 6 South coast water tank	R. Williams et al.	12	2	7	6	7	4	8	5	51	6.38
Marunui												
253	House 17 Deck	J. Hawley	1	5	4	1	6	6	6	5	34	4.25
275	Pebblebrook Rd	G. Stretch	5	0	2	3	5	2	7	0	24	3.00
Mataia												
255	Mataia 2	ALD - first 2 hours	0	2	0	0	1	0			3	0.50
	Mataia 3	ALD - first 2 hours	0	3	0	0	2	5	4	0	14	1.75
255	Mataia 2	ALD - 18 hours									15	0.83
	Mataia 3	ALD - 60 hours									78	1.30

# Appendix 3

## Trends in mean kiwi call count rates from annual monitoring at selected stations of managed Northland kiwi populations

AREA	NO. STNs	STATION NUMBERS	2016 STATION NUMBERS	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Mangatete	2	3, 256	3, 256	-	-	-	-	-	-	-	-	-	-	-	11.00	15.88	17.94
Honeymoon Valley	4	271-274	insufficient data	-	-	-	-	-	-	-	-	-	-	-	-	1.47	-
Whakaangi	7-9	29, 130-137	131-133, 135-137	-	-	11.80	10.70	10.10	10.80	11.68	12.23	10.88	9.93	7.33	6.52	8.08	4.67
Mahinepua-Radar Hill	8	83-85, 87-89, 98,99	83-85, 88, 99	-	3.60	2.80	4.90	2.70	1.90	2.46	4.65	5.50	10.23	6.65	5.73	6.45	7.79
Russell Peninsula	5	15, 59, 62, 170, 173	15, 62, 170	-	-	4.53	4.01	7.04	5.35	4.61	5.54	11.44	9.77	11.4	12.83	13.78	19.7
Puketi Forest	6	102, 104-106, 108, 111	102, 104, 106, 108, 111	-	-	-	2.88	1.15	1.48	3.66	3.00	4.25	4.11	3.60	5.67	2.88	4.23
Hupara	3-4	245, 246, 257, 258	257, 258	-	-	-	-	-	-	-	-	-	-	18.46	14.67	16.67	21.75
Waimate North	5	114, 118, 120, 122, 124	114, 118, 120, 122, 124	-	10.46	4.28	-	6.80	6.48	4.68	8.05	8.98	8.43	6.6	8.55	8.06	7.55
Sandy Bay	3	27, 260, 261	27, 260, 261	-	-	-	-	-	-	-	3.25	-	4.22	4.33	3.71	4.54	6.88
Tutukaka	5	125, 126, 142, 143, 144, 28	125, 126, 142	-	-	6.24	7.30	8.21	8.68	5.67	6.77	7.05	10.17	9.63	6.25	7.46	9.875
Manata-Nook	5	47-49, 56,71	47-49, 56, 71	3.10	3.50	2.90	3.90	-	4.60	4.43	6.31	7.25	7.75	6.43	6.81	5.80	8.15
Kauri Mountain	5	54, 72-74, 141	54, 72-74, 141	-	-	3.30	2.20	-	2.60	3.02	2.45	4.10	4.00	3.83	4.95	5.38	7.7
Bream Head-Taurikura	5	39, 41, 42, 44, 69	39, 41, 42, 69	-	-	2.50	2.60	2.20	3.20	4.29	2.70	6.59	7.14	8.68	6.19	7.46	6.94
Motatau-Marlow	6	23, 34-36, 68, 129	23, 68, 129	-	-	7.30	7.60	7.50	4.90	6.39	4.54	7.08	8.28	9.13	8.67	9.83	11.5
Purua-Rarewarewa	5	24, 25, 81, 82, 139	24, 25, 81, 139	-	-	9.20	11.10	12.70	10.90	12.35	10.63	12.58	11.83	13.6	14.18	12.65	10.47
Waipoua	4	16-19, 33	17-19, 33	13.08	15.36	15.78	7.98	8.90	5.69	7.49	4.50	11.80	8.38	6.08	5.60	8.72	9.75
Tawharanui Open Sanctuary	6	161-166	161-166	-	-	-	-	-	-	2.30	0.31	-	2.77	2.65	4.67	4.54	5.56
Maranui Conservation Limited	2	253, 275	253, 275	-	-	-	-	-	-	-	-	-	-	-	1.13	2.15	3.63
Mataia Restoration Project	2	254, 255	255, 256	-	-	-	-	-	-	-	-	-	-	-	1.25	-	1.125

Note: In previous reports up to 2009: where a single station was not covered, the previous year's results were used. However, some of the stations had not been listened from for several years, so the mean call count rates for the data from 2010 and beyond were calculated only from the relevant stations listened from for that year.