2020

Call count monitoring of Northland brown kiwi 2019

Emma Craig

Department of Conservation
Te Papa Atawhai

New Zealand Government

Cover: Kiwi feather. *Photo: Emma Craig.*

Whangarei Office, Department of Conservation, PO Box 842, Whangarei 0140, New Zealand. Phone +64 9 470 3300

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1. Introduction

1.1 Objective

The objective of this report is to provide a summary of the 2019 results for Northland brown kiwi (*Apteryx mantelli*) call count monitoring, and to provide recommendations for future monitoring.

1.2 Background

Northland populations of kiwi had declined mainly due to predation by stoats (*Mustela erminea*), ferrets (*M. furo*), dogs (*Canis familiaris*) and cats (*Felis catus*), along with increasing land development pressures throughout the region (Pierce et al. 2006). In the early 1990s, a network of kiwi call count listening stations was established nationally to determine trends (stable, increasing or decreasing) in kiwi populations over time (McLennan 1992). In 1993, 24 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 carried out 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 areas throughout Northland.

1.3 Northland listening sites

The 24 original kiwi listening stations that were established in 1993 at the four geographic areas (Pierce & Westbrooke 2003) are mapped in Figure 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-Raetea-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 Purerua Peninsula-Waitangi-Russell Peninsula. In the Western cluster five stations are in extensive forest (two in Waipoua) or forest remnants (Kaitui, Trounson and Paerata). The Southern cluster comprises seven stations within 30 km of Whangarei, all northwest to northeast of the city and involving forest remnants, including two that also include exotic forests (Glenbervie 7A & 9A). Over the years since 1993 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.

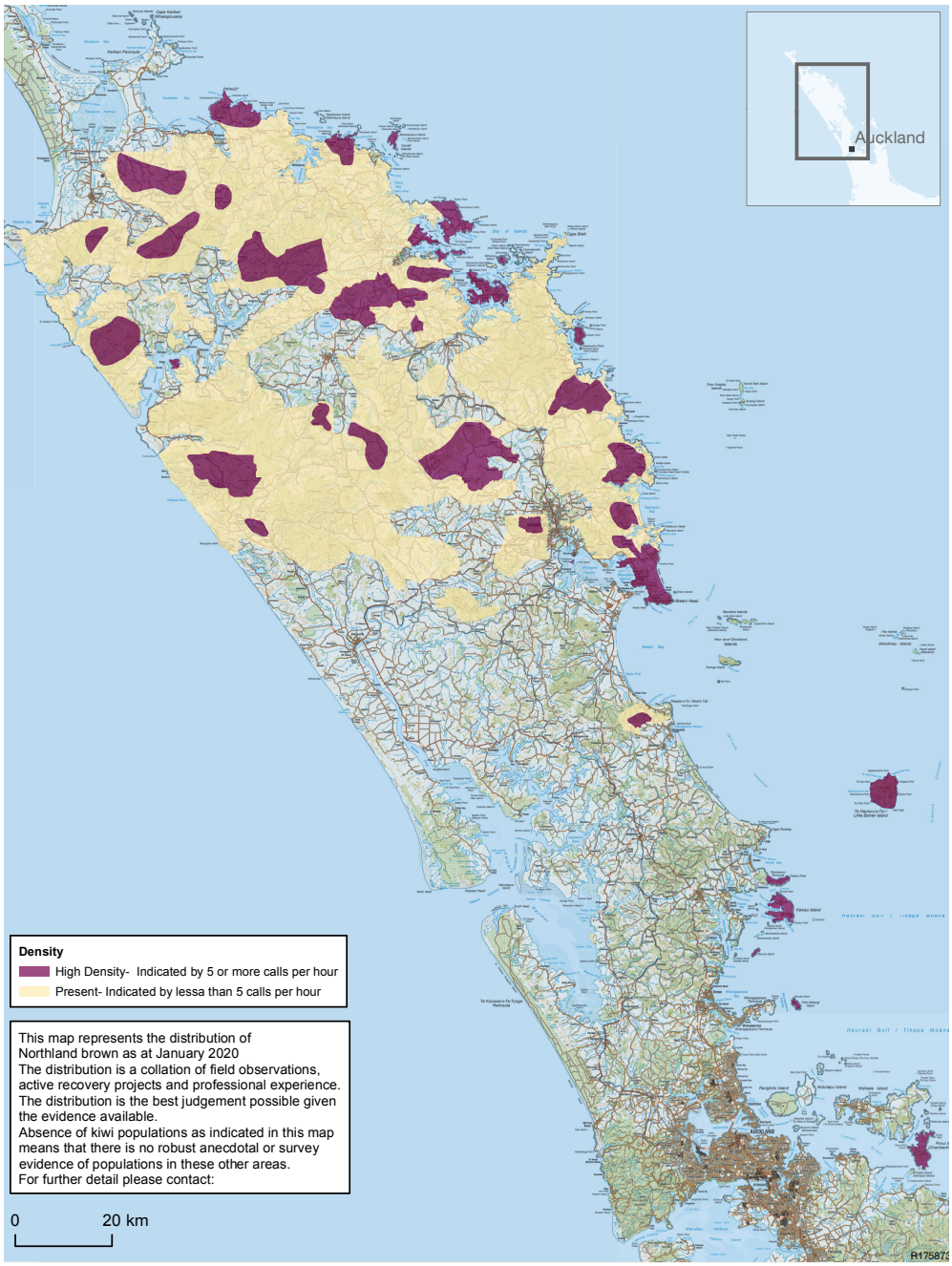

Figure 1. Northland kiwi distribution and relative abundance as known in 2020.

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 2019 Northland brown kiwi call count survey followed the recommendations made by Robertson & Colbourne in the Kiwi Best Practice Manual (2003 and 2017; the relevant instructions from the latter are included in Appendix 1) and aligns with the findings of Colbourne & Digby (2016). Kiwi calls were listened for and counted during the first 2 hours of darkness, and during the dark phase of the moon, for 4 nights per station (n = 8 hours). Wherever possible quiet conditions were favoured, with little or no wind, rain, or background noise. At times the survey conditions varied slightly from those described above. This is noted in the report when it is relevant to the results presented. Kiwi listening was carried out from 22 May to 10 June 2019, with a back-up window from 20 June to 9 July 2019. The back-up window was used more in 2019 than in previous years, primarily due to an expectation that the very dry autumn preceding the breeding season would result in a delayed start to the higher call rates associated with courtship and mating.

2.1 2019 kiwi listening data

In addition to the original clusters, kiwi listening data for 2019 were received from the following management areas:

- Mangatete
- Whaakangi
- Mahinepua
- Bay of Islands
- Russell
- 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
- Kawau Island

Data were also received for clusters at Pukenui and Piroa for the first time in 2019. No data were received for Honeymoon Valley in 2019.

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 2018 data for all Northland listening stations are presented and summarised in Appendices 2, 3 and 4.

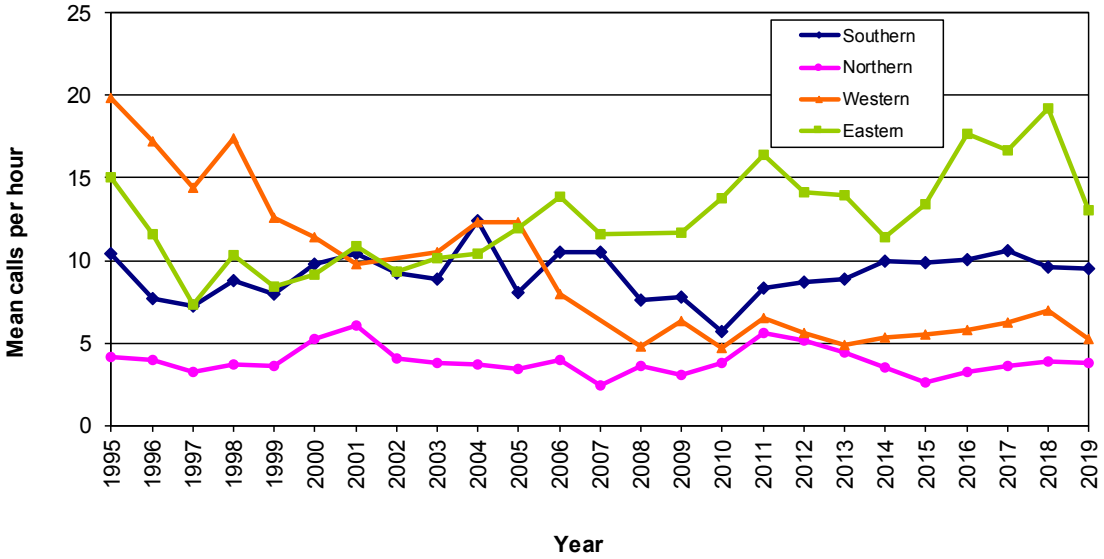

Figure 2. Mean hourly kiwi call rates per hour for each of the original four Northland monitoring areas 1995–2019. The mean for the Northern cluster was estimated using the 2017 data for one station (Diggers); the 2016 data for two stations (Takahue and Gartons); and the 2015 data for one station (Kaiaka). The mean for the Eastern cluster was estimated using the 2018 data for one station (Puketotara). The mean for the Western cluster was estimated using the 2014 data for one station (Paerata), 3 nights only for two stations (Katui and Lookout), and with the third night of listening being shortened to 1 hr 15 mins for one station (Cathedral). The mean for the Southern cluster was estimated using an ALD for two stations (Glenbervie 7A and Glenbervie 9A).

Northern Area

The mean for the Northern cluster was 3.79 kiwi calls/hr, which was similar to the 2018 result of 3.9 kiwi calls/hr (Fig. 2). As was observed in 2018, the mean hourly kiwi call rate for this cluster was effectively calculated in 2019 using data from only two stations, as data were not received for Digger's Valley (Station 1; data not received since 2017); Takahue or Gartons (stations 2 and 4 respectively; data not received from either since 2016); or Kaiaka (Station 5; data not received since 2015). There was a decrease at Puketi Forest (Station 7) from a mean of 8.25 calls/hr in 2018 to 7.38 in 2019. Puketi Scenic Reserve (Station 8) increased slightly from a mean of 12.13 kiwi calls/hr in 2018 to 12.38 in 2019. Both stations had 4 full nights of kiwi listening completed. The 2019 result was the highest on record for this station after the previous record in 2018. Although the mean for this cluster has always been the lowest of the four original clusters (at generally fewer than 5 calls/hr), it has shown the least variation since listening recorded began in 1995. As mentioned in the 2018 report, more value could be placed on the validity of the trends for this cluster if the mean number of kiwi calls/hr had been calculated from all six stations. It would be very helpful to include all (or at a minimum, some) of the missed stations in the 2020 survey.

Eastern Area

A substantial decrease was observed for the Eastern cluster, from a mean of 19.2 kiwi calls/hr observed in 2018 to 13 in 2019 (Fig. 2). The pattern of a lower call rate in 2018 was observed across five of the six stations. The greatest change was observed at Tikitikiore/Station 15, where there

was a mean of 7.8 calls/hr heard in 2019, down from 26.6 in 2018. The 2019 result was the lowest since 2007, and the first time that a mean of fewer than 10 calls/hr have been recorded since then. It will be vital to continue listening at this station for 2020 and beyond to ascertain whether the 2019 result was an anomaly due to a change in call rates (perhaps due to weather variables), or an indication of a change in the kiwi population in the area. It is known that kiwi populations can crash rapidly, particularly in the presence of a predator that targets the adults. Hopefully this is not the case at Tikitikiore. Two of the stations had unusually high kiwi call rates in 2018, and the 2019 results appeared to be a return to the rates typically observed for these stations (Rangitane/Station 12 – 18.1 calls/hr in 2018 and 10.1 in 2019; Mt Bledisloe/Station 14 – 12.8 calls/hr in 2018 and 7.6 in 2019). In the case of Marsden Cross/Station 10 there was a peak of mean kiwi calls between 38.6 and 39.6 from 2016 to 2018 inclusive, but the 2019 result of 30.8 calls/hr was more similar to the results for this station prior to 2016. This suggests that for these stations the kiwi population hasn't changed; rather, the existing population were calling more frequently, or being heard more readily in 2018 than 2019. There was little change observed at Waitangi No. 12/Station 13 between 2018 and 2019 (a mean of 6 calls/hr in 2018 and 5.8 in 2019). One station (Puketotara/Station 11) increased from a mean of 14 kiwi calls/hr in 2018 to 16.1 in 2019. This was one of few stations throughout Northland which had an increase in call rates from the previous year. All six stations had 4 full nights of listening completed.

Southern Area

For the second year in a row there was a decrease in the mean number of kiwi calls recorded in the Southern cluster, albeit a very slight one (from 9.6 calls/hr in 2018 to 9.5 in 2019; Fig. 2). Four full nights of listening was competed at each of the seven stations. Rarewarewa South/Station 25 returned the highest result since records at this station began (a mean of 12.9 calls/hr, in 2019, up from 10.3 in 2018). Mimiwhangata/Station 26 had an increase in mean kiwi calls heard when compared with the 2018 data (from 9.8 calls/hr in 2018 to 11.1 in 2019). Glenbervie 9A/Station 22 also had an increase, although listening wasn't carried out for this station in 2018, so the comparison was made with the 2017 data (5.3 calls/hr in 2017; 8.1 in 2019). The 2019 result was the highest call rate recorded for this station since 2000, and the third highest since listening began. It was positive to see growth in this area that has regularly returned mean kiwi call rates of less than 3 calls/hr. In both 2017 and 2019 the data were recorded via ALD. The other four stations all had decreases in mean kiwi calls heard from 2018 to 2019. Glenbervie 7A/Station 21 had a minor change (from 3.9 calls/hr in 2018 to 3.1 in 2019); with the remaining stations (Marlow Road/Station 23; Purua North/Station 24; Sandy Bay/Station 27) all decreasing (from 18.4 to 16.4 calls/hr; from 13.5 to 11.0 calls/hr; and from 6 to 3.6 calls/hr respectively). The 2019 results were within the typical range for Marlow Road/Station 23 and Sandy Bay/Station 27, but the lowest result since 2010 for Purua North/Station 24. With the probable exception of Glenbervie 9A/Station 22, the changes recorded at the stations in the Southern cluster were likely to be natural fluctuation due to slight differences in the number of kiwi calling, or the ability of listeners to hear the calls.

Western Area

For the first time since 2013 there was a decrease in the mean number of kiwi calls/hr heard in the Western cluster, from 7 calls/hr in 2018 to 5.3 in 2019 (Fig. 2). This change was primarily due to a large decrease at two stations (Katui/Station 16 – from 5 calls/hr in 2018 to 1 in 2019; and Trounson/Station 17 – from 13.5 calls/hr in 2018 to 9.4 in 2019). The 2018 result was the highest for Katui/Station 16 since 2004, and although it was fantastic to see a mean of >5 calls/hr for this station it must be remembered that the decreased rate of 1 call/hr in 2019 was still relatively high when compared with the results of recent years, and still a firm and positive indication that kiwi remain in the area. There have been quite variable results at Trounson/Station 17 over the years, and the 2019 result was within the typical range of the mean kiwi calls recorded there. Cathedral Grove/Station 18 and Waipoua Lookout/Station 19 both returned similar results in 2019 when compared with 2018 (from a mean of 6 calls/hr in 2018 to 5.2 in 2019; and from a mean of 9.6 calls/hr in 2018

to 10 in 2019; a reverse of the trend typically seen in 2019). As has been noted in previous reports, Paerata/Station 20 had not been listened from since 2014. Two of the stations (Katui/Station 16, and Waipoua Lookout/Station 19) only had 3 full nights of listening completed, and Cathedral Grove/Station 18 had 3.6 nights of listening competed. If all stations had 4 full nights of listening completed it may have altered the results for this cluster

4. Trends at managed populations

Each year, the same selection of listening stations are used to compare call rates over time to provide population trends for management areas. Only these core stations contribute data for the mean hourly call rate calculations depicted in the bar graphs for each management area 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 and should be referred to when organising kiwi listening each year.

4.1 Summary of areas

4.1.1 Mangatete

The mean number of kiwi calls recorded at the Mangatete cluster declined from 17.6 calls/hr in 2018 to 13.2 in 2019 (Fig. 3). Although low for this cluster, 13.2 calls/hr is still high and likely indicates a relatively high population of kiwi in the area. Of the two stations where listening was carried out, Station 3 had a slight decrease (from a mean 17.6 calls/hr in 2018 to 16 in in 2019); and Station 256 had a large decrease (from a mean 17.5 calls/hr in 2018 to 10.4 in 2019). The 2019 result for Station 256 was the lowest on record for that station. Both stations were listened from for 4 full nights. As with all the clusters it is important that long-term monitoring is continued so that any multi-year downward trends can be identified and sufficient resources directed to protect the kiwi in the area. As mentioned in previous reports, adding further stations in the Mangatete area will increase the validity of the data collected.

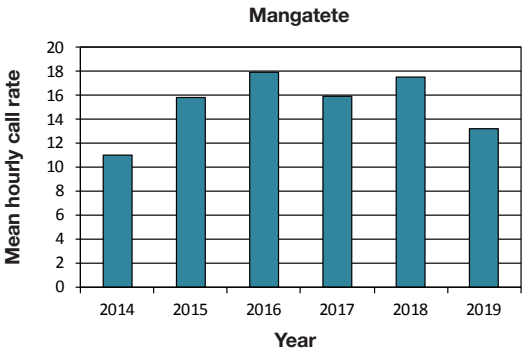

Figure 3. Trends in mean kiwi call rates (calls/hr) at Mangatete management area.

4.1.2 Honeymoon Valley

No data were received for Honeymoon Valley for 2019. It would be beneficial to re-establish listening in this cluster for 2020 and beyond.

4.1.3 Whakaangi

Unfortunately, the overall downward trend in mean kiwi call rates seen over the last decade at the Whakaangi cluster continued in 2019. The mean call rate in 2019 was only 2.1 calls/hr, just over half of the 4 calls/hr recorded in 2018, and the lowest mean on record for this cluster (Fig. 4). For the first 7 years of kiwi listening at this cluster there were always >10 calls/hr heard, but since 2012 the rates have all been <10 calls/hr, and generally decreasing. However, only three stations were listened from in 2019. Station 137 had no change from 2018 (steady at a mean of 1.8 calls/hr); Station 135 had a very slight increase (up from 2.6 calls/hr in 2018 to 3.3 in 2019); and Station 136 had a substantial decrease (from 7.3 calls/hr in 2018 to 1.3 in 2019). Originally, nine stations which made up the core group for this cluster, but several of these have not been listened from for some years (Station 130 not since 2009, Station 29 not since 2011 and Station 134 not since 2013). These stations had an annual mean >2.1 kiwi calls/hr in most (Station 29) or all (Stations 130 and 134) years prior to the listening surveys ceasing, so their absence could be contributing to a lower than accurate cluster mean. However, the mean rates for the three stations that were listened from in 2019 are much lower than previously recorded, so the overall downward trend could well be indicative of fewer kiwi in the area

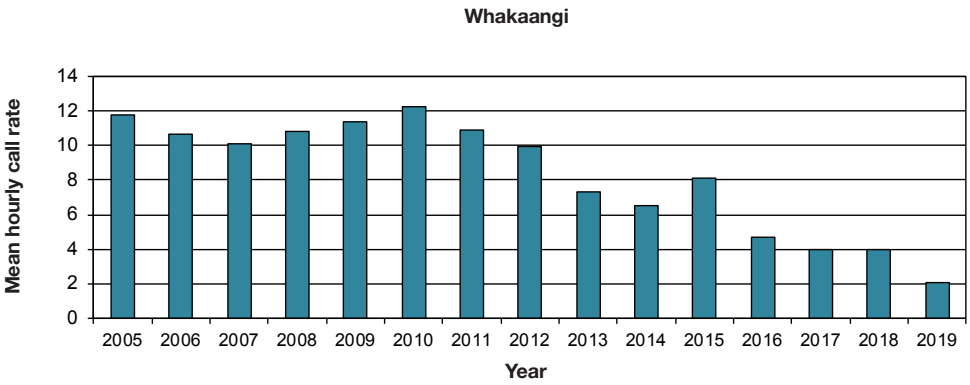

Figure 4. Trends in mean kiwi call rates (calls/hr) at Whakaangi management area.

4.1.4 Mahinepua-Radar Hill

For the first time since 2010, the mean number of kiwi calls heard at Mahinepua-Radar Hill was fewer than 5 calls/hr (4.7 calls/hr, Fig. 5). This was a substantial decrease from the mean of 11 calls/hr heard in 2018. The 2018 peak showed a similar pattern to that observed in 2012, with far fewer calls heard in the years immediately prior to and following a year of relatively high calls. The 2019 data were derived from four listening stations, each of which had 4 full nights of listening completed. Data weren't received from Station 99 for this cluster. Station 99 had tended to have mean kiwi calls/hr >10 in recent years, so the absence of these data may have contributed to the lower cluster mean. There was little change noted at Station 88 (a mean of 7.5 calls/hr in 2017, not listened from in 2018, and mean of 8 calls/hr in 2019), and the 2019 data were similar to or a little higher than the mean number of kiwi calls generally heard there. The other three stations all recorded large decreases. Mean call rates at Station 85 more than halved from 12.5 calls/hr in 2018 to 5.8 in 2019, although 2018 was a year of unusually high call rates and the 2019 data were more similar to those generally observed. Station 83 decreased from 8.2 calls/hr in 2018 to 2.1 in 2019. The 2019 result was the lowest since records began for that station in 2003. Station 84 decreased by the greatest margin, from a mean of 12.3 calls/hr in 2018 to 2.8 in 2019. A result this low hadn't been observed for that station since 2008. In isolation, any of the decreases might be viewed as an anomaly, with an expectation that results would return to the usual observations in the near future. However, having three stations show substantial deceases in the same year does cause a little concern. The 2020 kiwi listening data will help to establish whether the pattern of falling call rates is related to low/delayed call rates in 2019, or a decrease in kiwi numbers.

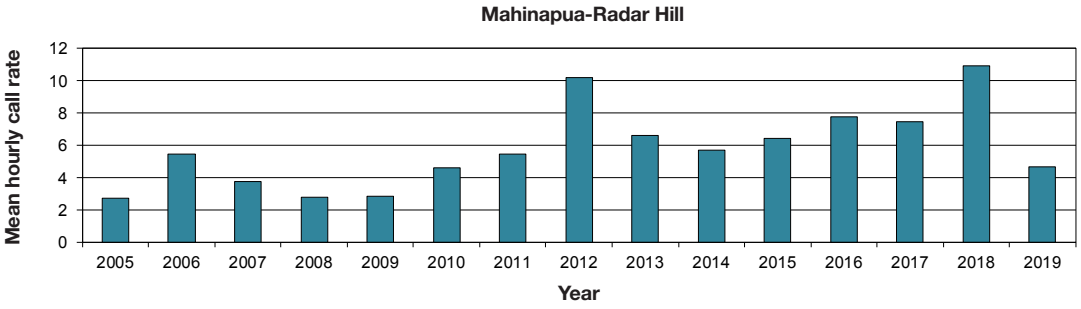

Figure 5. Trends in mean kiwi call rates (calls/hr) at Mahinepua-Radar Hill management area.

4.1.5 Russell Peninsula

There was a dramatic decrease in the mean number of kiwi calls heard at Russell Peninsula, which reduced by more than half from a mean of 16.5 calls/hr in 2018 to 7.5 in 2019 (Fig. 6). Five stations were used to calculate the mean for this cluster, and the pattern of decrease was observed across all of them. All but one had 4 full nights of listening completed (Station 170 had 3 nights completed). Station 15 decreased from a mean of 24.6 calls/hr in 2018 to 7.8 in 2019. The 2019 result was the lowest observed since 2005 and was much lower than the observed rate over the previous few years. Station 170 recorded a similar pattern; decreasing from 16.1 calls/hr in 2018 to 5.8 in 2019. This was also the lowest on record since 2005; and it was about half of the mean number of kiwi calls typically seen at this station. Although it may have been a contributing factor, it was unlikely that a shorter survey period (3 v. 4 nights) could fully explain such a difference in results. In 2019, the mean call rate at Station 173 returned from the anomalous 2018 result of 11.1 calls/hr to a more usual mean of 1.4 kiwi calls/hr. It is not known why there is such a stark difference between the 2018 data and those for other years. There might have been a biological factor causing kiwi to call much more frequently than usual in 2018; however, there was a combination of different listeners at the station in 2018, so the observed difference may in part be due to observer bias. The potential for errors in the data due to observer bias can be reduced by utilising the same listeners at the same stations for multiple years. Stations 59 and 62 had smaller decreases, and the 2019 results were within the range generally recorded (Station 59: 13.5 calls/hr in 2018, 10.1 in 2019; Station 62: 17.1 calls/hr in 2018; 11.9 in 2019). It was alarming to see such a drop in mean call rates for the Russell Peninsula cluster. It will be vital to continue to monitor these key stations in 2020 to better understand what is happening with kiwi in the area

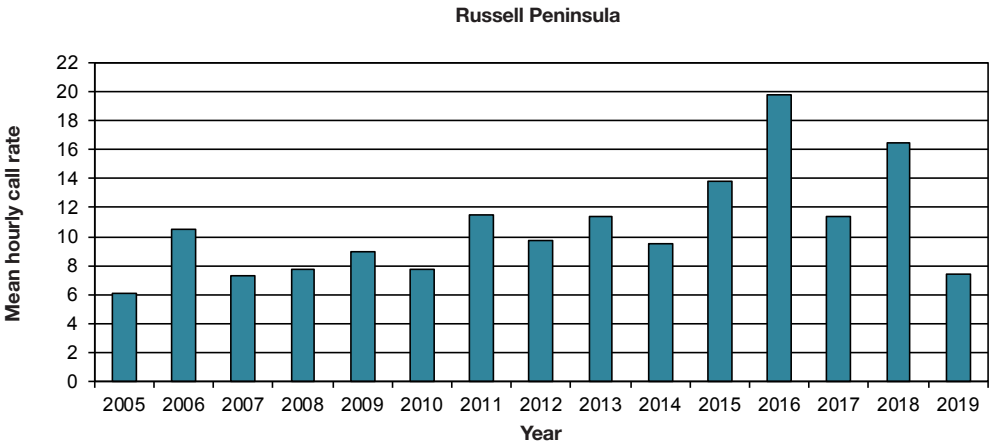

Figure 6. Trends in mean kiwi call rates (calls/hr) at Russell Peninsula management area.

4.1.6 Puketi Forest

After a higher than usual peak in mean kiwi calls rates at the Puketi cluster in 2018, the 2019 rate decreased to be more aligned with the results typically observed there (from a mean of 6 calls/hr in 2018 to 4.2 in 2019; Fig. 7). Five stations were listened from (each for 4 full nights), and the pattern of a lower mean call rate compared with 2018 was seen at four of the stations. Station 102 decreased from a mean of 3.9 calls/hr in 2018 to 1.0 in 2019. Although a mean of 1.0 calls/hr was the lowest since 2007, it is not much lower than that typically observed, so this change could be due to natural fluctuation. Station 111 showed a similar pattern, with 5.4 mean calls/hr in 2018 and 3.1 in 2019. The 2019 result was the lowest since 2010. Station 104 decreased by about one third, from a mean of 9.5 calls/hr in 2018 to 6.1 in 2019. In this instance the 2018 data were atypical, with the 2019 result more similar to that generally observed. Station 108 had a smaller decrease in mean call rates (from 6.8 calls/hr in 2018 to 5.4 in 2019). There have been variable results for this station, and the 2019 result was still reasonably high compared with previous years. None of these decreases were of concern in isolation, but it was noticeable that four out of the five stations exhibited a pattern of fewer calls in 2019. Station 106 was the only one with an increase in mean calls, from 4.5 calls/hr in 2018 to 5.4 in 2019. This station had been listened from since 2006, and the 2019 mean was the highest recorded. The co-ordinator for this cluster advised that some stations (105 and 110) weren't listened from in 2019 due to their being very remote, and no listeners being available. An ALD might be a useful tool to use for these stations if listeners can't be secured for 2020 and beyond.

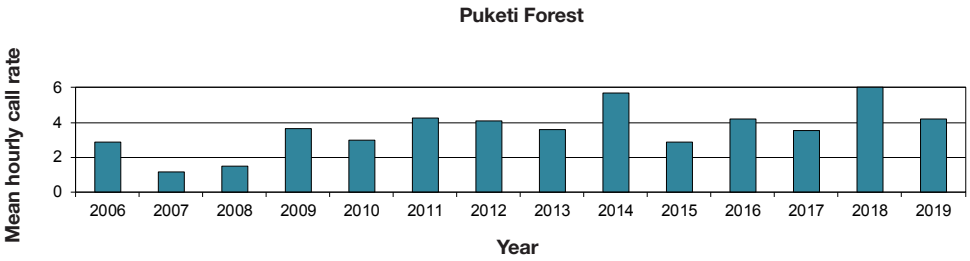

Figure 7. Trends in mean kiwi call rates (calls/hr) at Puketi Forest management area.

4.1.7 Waimate North

There was a sizable decrease in the mean number of kiwi calls heard at the Waimate North cluster (from 10.9 calls/hr in 2018 to 7.3 in 2019). However, no data were received for Station 113. As discussed in last year's report, the Waimate North kiwi listeners requested that this station be included in their graphing and annual analysis. This station generally had very high mean kiwi call rates (>25 calls/hr for the previous 5 years), so its exclusion (or inclusion) when deriving the mean makes such a large difference that it masks the changes observed at the other stations. Five stations were listened from (each for 4 nights), and of these three recorded a decrease in mean kiwi call rates from 2018 to 2019 (Station 114: 7.6 calls/hr in 2018 to 6.8 in 2019; Station 118: 15.9 calls/hr in 2018 to 9.8 in 2019; Station 120: 5.6 calls/hr in 2018 to 5.1 in 2019); and two had an increase (Station 122: 4.4 calls/hr in 2018 to 7 in 2019; Station 124: 5.5 calls/hr in 2018 to 7.8 in 2019). All of the 2019 results were within the range usually observed at the respective stations for the previous few years, so are likely due to natural fluctuations in calling rates. The observed 'decrease' is due to the exclusion of data from Station 113. It will be useful to include this station in the 2020 listening survey.

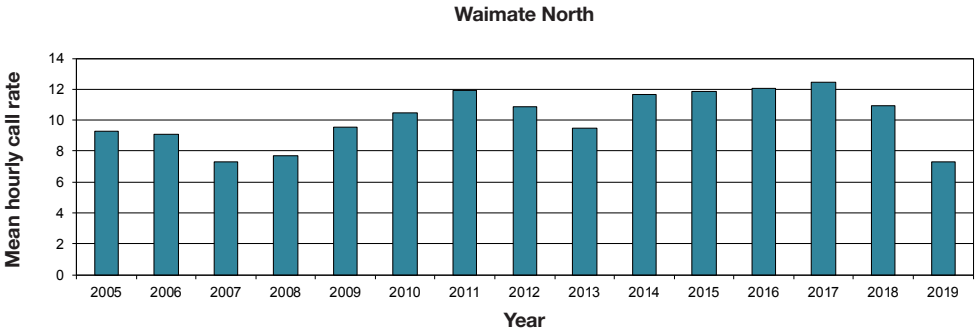

Figure 8. Trends in mean kiwi call rates (calls/hr) at Waimate North management area (excluding Station 113).

4.1.8 Hupara

At Hupara, the mean number of kiwi calls decreased from 22.3 calls/hr in 2018 to 17.7 in 2019 (Fig. 9). The 2019 result was within the previously observed range for this cluster, and was similar to the mean rates for 2017, 2015 and 2013 (16.8, 16.7 and 18.5 calls/hr, respectively). As with previous years, the 2019 mean was derived from two stations, each of which had 4 full nights of listening completed. There was little change at Station 258, with mean call rates dropping slightly from 24.8 calls/hr in 2018 to 24.1 in 2019. The mean number of kiwi calls heard at this station has been relatively stable since 2014. The call rate at Station 257 almost halved, from 19.9 kiwi calls/hr in 2018 to 11.3 in 2019. There has been a reasonable amount of variation at this station, and the 2019 result was within the previously observed range. It is not known why the number of kiwi calls heard are more consistent at Station 258 than Station 257, but there was nothing in the 2019 data to suggest a change in the size of the kiwi population in the area.

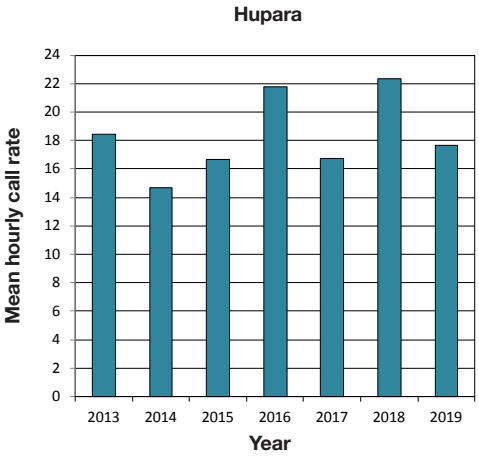

Figure 9. Trends in mean kiwi call rates (calls/hr) at Hupara management area.

4.1.9 Sandy Bay

Unfortunately, the downward trend discussed in the 2018 report has continued for the Sandy Bay cluster, with the mean call rate dropping further, from 7.0 calls/hr in 2017 to 4.9 in 2018, then to 2.5 in 2019 (Fig. 10). The 2019 result was the lowest on record for this cluster. It was derived from three stations, each of which had 4 full nights of listening completed. The data for two stations (260 and 261) were collected via ALD (as per previous years). All three stations had lower kiwi call rates in 2019 than in 2018. Station 27 decreased from a mean of 6.0 kiwi calls/hr in 2018 to 3.6 in 2019. Station 261 decreased by the greatest margin, from a mean of 4.8 kiwi calls/hr in 2018 to 1.6 in 2019. The 2019 result was the second lowest recorded for this station (the lowest was a mean of 1.0 kiwi calls/hr, observed in 2010). Station 260 had the lowest mean since listening began for this

station, with 2.4 calls/hr recorded in 2019. It is not known why the number of kiwi calls heard at this cluster have decreased so dramatically since 2017, but it will be vital to continue monitoring kiwi calls at these stations in 2020 and beyond to increase understanding about what is happening with kiwi in the area

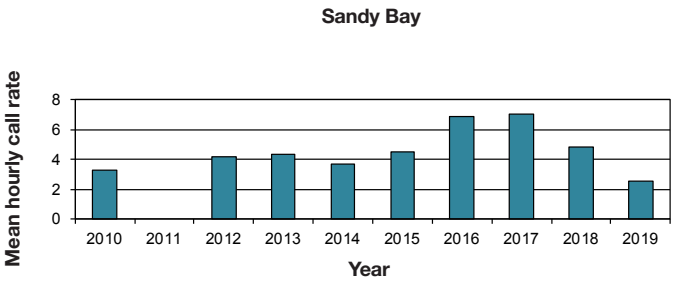

Figure 10. Trends in mean kiwi call rates (calls/hr) at Sandy Bay management area.

4.1.10 Tutukaka

The Tutukaka cluster recorded a decrease in mean kiwi calls; from 12.5 calls/hr in 2018 to 11 in 2019 (Fig. 11). Although lower than the previous year, the 2019 result was still relatively high for this cluster, and generally high for kiwi call rates across Northland. The mean was calculated using just two stations, both of which had fewer calls heard in 2019 than in 2018. Station 125 decreased from a mean of 17.6 calls/hr in 2018 to 12.5 in 2019. This was a substantial drop, but the 2019 result was still high for this station compared with all other years when listening has been carried out. The particularly high result recorded in 2018 is likely an anomaly, and 2019 a return to normal for this station. Call rates at station 28 also decreased, but by a smaller margin (from a mean of 12 calls/hr in 2018 to 10.1 in 2019). This station has had variable results, and both the 2018 and 2019 results are within the range typically recorded there. It was difficult to draw any meaningful conclusions from the results for this cluster, as the number and configuration of core stations listened from has changed from year to year. Both stations were listened from for 4 full nights.

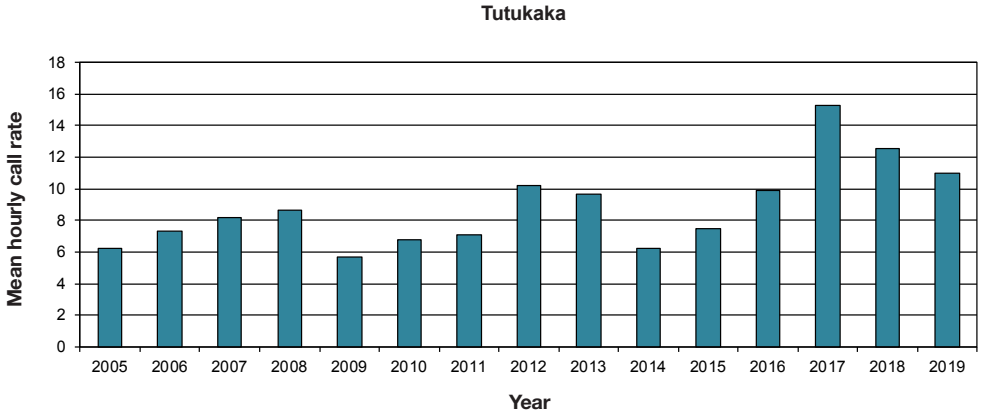

Figure 11. Trends in mean kiwi call rates (calls/hr) at Tutukaka management area.

4.1.11 Manaia-The Nook

The mean number of kiwi calls heard at Manaia-Nook almost halved, falling from 9.0 calls/hr in 2018 to 4.8 in 2019 (Fig. 12). The 2019 mean was the lowest in a decade for this cluster. This sizable decrease was a result of falling call rates across all four stations that were listened from. The greatest difference was seen at Station 47, with the 2019 mean (4.5 calls/hr) only one third of that recorded in 2018 (13.5 calls/hr; the highest ever recorded for this station). This station

has typically had variable results which may explain some of the observed difference. The same listener was used at this station over several years, so the recent variation was not likely to be due to observer bias. Station 48 also had a large decrease, dropping from a mean of 15.3 calls/hr in 2018 to 8.9 in 2019 (the lowest mean recorded for this station since 2011). Stations 56 and 71 each decreased by a smaller amount (from a mean of 6.1 calls/hr in 2018 to 4.0 in 2019 for Station 56; and from a mean of 3.1 calls/hr in 2018 to 1.8 in 2019 for Station 71). The 2019 results were both within the typical ranges previously observed for these stations. All stations had 4 full nights of listening completed, but for Stations 47 and 48 the fourth night of listening was carried out over 1 day at the end of the second listening window. It was not expected that this slight deviation from the prescribed window would have had a noticeable influence over the results. Station 49 was usually included in the analysis for this cluster, but no listening was carried out there in 2019. The range for this station had been 2.1–9.3 calls/hr, so it is not known how the absence of data from this one station will have changed the observed mean.

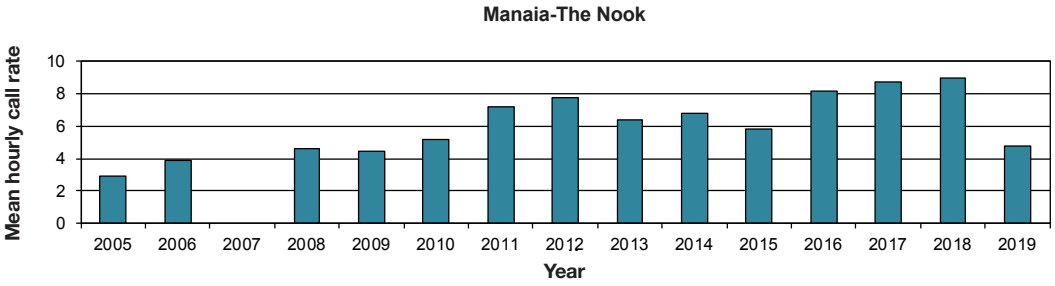

Figure 12. Trends in mean kiwi call rates (calls/hr) at Manaia-Nook management area.

4.1.12 Kauri Mountain

The mean number of kiwi calls heard at the Kauri Mountain cluster was lower in 2019 than 2018 (decreasing from 5.5 calls/hr in 2018 to 5.1 in 2019; Fig. 13). The downward trend for this cluster has been evident since 2017. Although fewer calls were heard in 2019, the observed difference was only 0.4 calls/hr, and the 2019 mean stayed above the 5 calls/hr threshold. Four stations were listened from, and each had 4 full nights of listening completed. Stations 54, 72 and 74 recorded fewer calls/hr in 2019 than in 2018 (Station 54: 5.1 calls/hr in 2018 to to 4.5 in 2019; Station 72: 5.6 calls/hr in 2018 to 4.9 in 2019; Station 74: 5.8 calls/hr in 2018 to 4.5 in 2019). All of the results were within the range typically observed at these stations, but the mean of 4.9 calls/hr at Station 72 was the lowest observed there since 2011. Station 141 showed a different trend, increasing very slightly from a mean of 6.3 calls/hr in 2018 to 6.4 in 2019. Although this was a very minor increase, it was notable as being one of the few stations across Northland which recorded more calls in 2019 than 2018. Station 73 was usually also used to derive the mean for this cluster, but it was not listened from in 2019. The mean there was 4.8 calls/hr in 2018, and the calls heard there have been reasonably closely aligned with the cluster mean in the past, so it was unlikely that the absence of this data for 1 year will have a significant effect on the overall results.

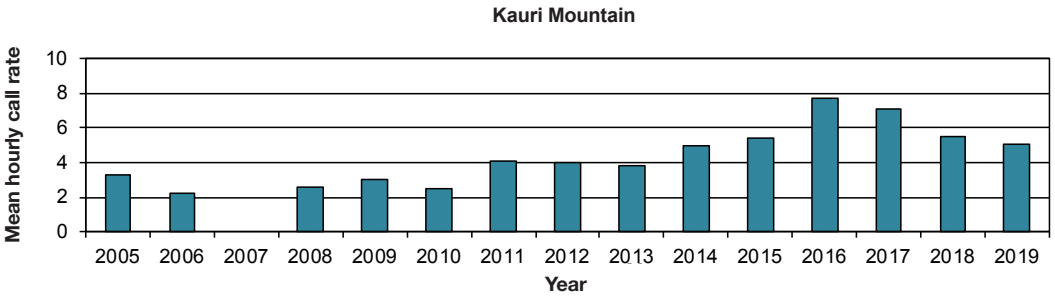

Figure 13. Trends in mean kiwi call rates (calls/hr) at Kauri Mountain management area.

4.1.13 Bream Head/Taurikura

There was a small decrease in mean call rates for the Bream Head/Taurikura cluster (from 6.9 calls/hr in 2018 to 5.9 in 2019; Fig. 14). Of the five stations that had been used to calculate the annual mean for this cluster (Stations 39, 41, 42, 44 [not listened from since 2013], 69), only the Bream Head stations were listened from in 2019. There were stations at Taurikura that were listened from, but none of these were the core stations, so the 2019 result only reflects what is happening at Bream Head. Station 39 decreased from a mean of 11.3 calls/hr in 2018 to 8.0 in 2019. These results were both within the range typically seen for this station. Only 2 full nights of listening were completed for Station 39. This change in methodology reduced the reliability of the 2019 result. The mean number of kiwi calls heard at Station 41 reduced from 4.5 calls/hr in 2018 to 3.0 in 2019). A mean of 3 calls/hr is low for this station and was the lowest recorded result since 2008 (note: kiwi listening was not carried out here from 2009 to 2011). Call rates also dropped at Station 42, from a mean of 8.5 calls/hr in 2018 to 6.8 in 2019. The 2018 result of 8.5 calls/hr was quite high for this station, with the 2019 result being a return to the rates generally recorded. Both stations 41 and 42 had 4 full nights of kiwi listening completed. Station 69 had a mean of 3.3 calls/hr in both 2017 and 2018, so the absence of data from this station has likely resulted in the 2019 cluster mean being higher than it would have been had the data been available.

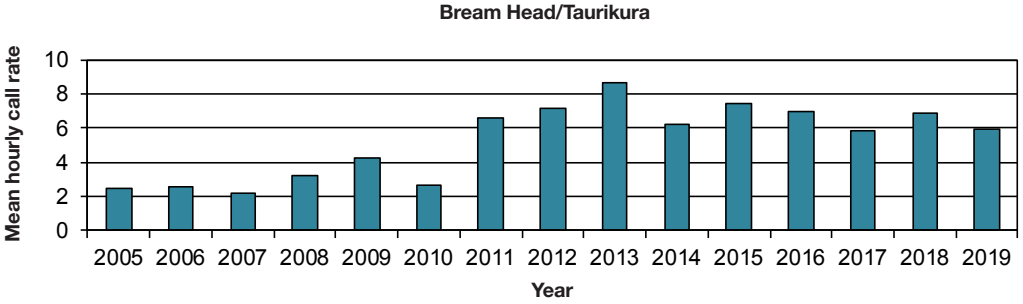

Figure 14. Trends in mean kiwi call rates (calls/hr) at Bream Head/Taurikura management area.

4.1.14 Motatau-Marlow

There was very little change in the mean number of kiwi calls recorded for the Motatau-Marlow cluster (11.0 calls/hr in 2018 to 10.9 in 2019; Fig. 15). Although this was a slight downward trend, it was notable that the decrease was less extreme than that seen in many of the clusters for 2019. Two stations had more calls heard in 2019 than 2018: Station 68 increased from a mean of 9.5 calls/hr in 2018 to 10.5 in 2019; and Station 129 increased slightly from a mean of 5.2 calls/hr in 2018 to 5.9 in 2019. Station 23 decreased from a mean of 18.4 calls/hr in 2018 to 16.4 in 2019. None of the mean number of calls for either 2018 or 2019 for this cluster were notable for being atypically more or fewer than that generally observed. There were 3 full nights of listening completed at Station 68, and 4 full nights for stations 23 and 129. It was positive to see the call rates for the Motatau-Marlow cluster remaining consistently high.

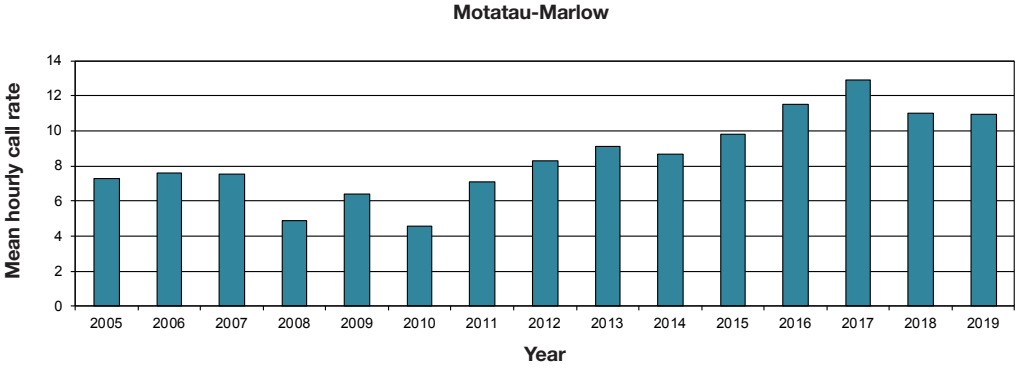

Figure 15. Trends in mean kiwi call rates (calls/hr) at Motatau-Marlow management area.

4.1.15 Purua-Rarewarewa

The mean kiwi call rate at the Purua-Rarewarewa cluster decreased from 15.4 calls/hr in 2018 to 13.9 in 2019 (Fig. 16). As in 2018, the major difference was due at Station 81; but instead of the increase reported for 2018, a decrease was observed in 2019 (from a mean of 29.8 calls/hr in 2018 to 19.5 in 2019). Although this was a sizable reduction (>10 calls/hr), the 2019 result is still high, and the second highest recorded mean for this station. Station 139 also recorded a decrease in mean call rates (from 15.5 calls/hr in 2018 to 12.8 in 2019). Results for this station are typically quite variable, and the 2019 results are within the usual observed range. The difference between 2018 and 2019 is likely due to natural fluctuation in call rates rather than a change in kiwi population density. The survey period for Station 139 was delayed by 1 hour past the ideal listening time for all 4 nights. It would be preferable if all listeners followed the same methodology, including the start and finish times of listening periods. The number of kiwi calls heard at Station 82 more than doubled, from a mean of 6.3 calls/hr in 2018 to 13.4 in 2019. The 2019 result is the highest on record for this station. A record high mean call rate was also observed at Station 25 (up from 10.3 calls/hr in 2018 to 12.9 in 2019); this being the highest mean recorded there since listening began in 1995. These results are a positive reflection of the kiwi density in the area. Station 24 had a mean of 11.0 calls/hr in 2019 (the lowest recorded there since 2010). This station was not listened from in 2018 but had a mean of 13.5 calls/hr in 2017. Being able to include this station in 2019 is positive, as it will have increased the validity of the cluster mean. All five stations had 4 full nights of listening completed

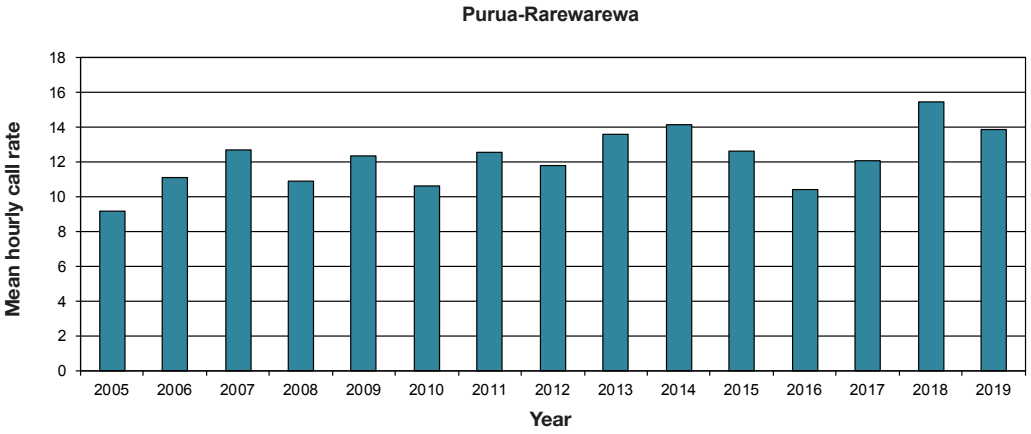

Figure 16. Trends in mean kiwi call rates (calls/hr) at Purua-Rarewarewa management area.

4.1.16 Waipoua-Trounson

At the Waipoua-Trounson cluster, mean kiwi call rates decreased slightly from 8.4 calls/hr in 2018 to 7.6 in 2019, although the rates for both years are within the normal range observed for this cluster. Five stations were listened from in 2019; two recorded increased mean call rates; one had a decline; and two had very little change (<1 call/hr). Station 16 decreased from a mean of 5.0 calls/hr in 2018 to 1.0 in 2019. The 2018 result was very high for this station in recent years, and 1.0 call/hr is still positive as it shows the continued presence of kiwi in the area. Station 17 showed a similar pattern, decreasing from a mean of 13.5 calls/hr in 2018 to 9.4 in 2019. As with Station 16, the 2018 result was high, and the 2019 result is more typical when compared with recent years. Station 33 was one of the few Northland stations that had a sizable increase between 2018 and 2019, from a mean of 7.9 calls/hr in 2018 to 12.5 in 2019. The 2019 result is the highest for this station since 2004. Mean call rates for Stations 18 and 19 were in the typically observed range, with only minor changes (a slight decrease to 5.2 calls/hr and a slight increase to 10.0 calls/hr respectively). Stations 17 and 33 had 4 full nights of listening completed, Stations 16 and 19 had 3 full nights completed, and Station 18 had 3 full nights and 1 partial night (1 hour 15 minutes) completed.

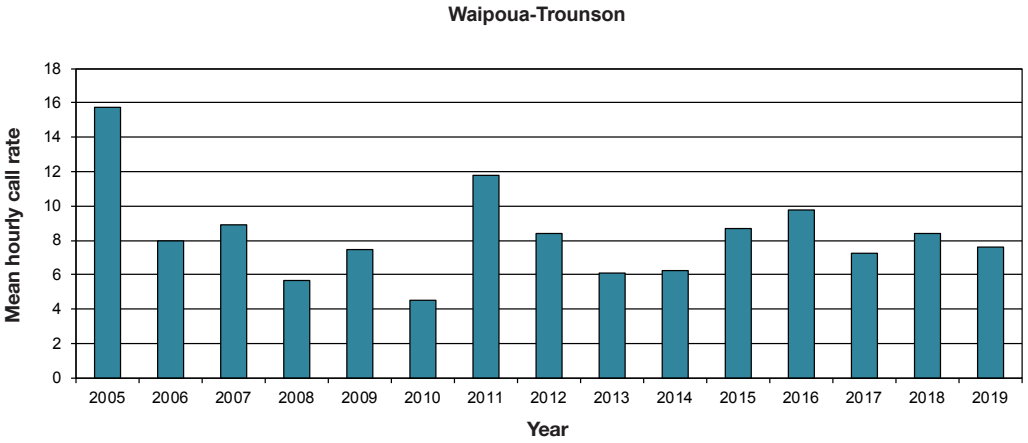

Figure 17. Trends in mean kiwi call rates (calls/hr) at Waipoua-Trounson management area.

4.1.17 Tawharanui

The Tawharanui cluster had a decrease in mean kiwi call rates (from 7.3 calls/hr in 2018 to 6.1 in 2019). However, this was the second highest recorded mean for this cluster (Fig. 18) and was still >1 call/hr above the 5 calls/hr threshold. The greatest change was seen at Station 161, where the mean number of kiwi calls heard went from 4.1 calls/hr in 2018 to 0.9 in 2019. The 2019 result was the lowest on record for this station, and it is important that listening is continued here in 2020 and beyond to monitor future changes in the results. Station 162 also had a decrease in the mean call rate (from 10.8 calls/hr in 2018 to 7.9 in 2019), but the 2019 mean was still relatively high for this station, and the second highest recorded there. Stations 164 and 166 had lower mean kiwi call rates (Station 164: 7.0 calls/hr in 2018 to 4.8 in 2019; Station 166: 12.6 calls/hr in 2018 to 11.0 in 2019). The results for both of these stations have tended to be variable, and the 2019 results were still relatively high (the third and second highest on record, respectively). Stations 163 and 165 both had higher mean call rates in 2019 (Station 163: 4.4 calls/hr in 2018 to 4.9 in 2019; Station 165: 4.8 calls/hr in 2018 to 6.4 in 2019). Once again, all six stations were listened from for 4 full nights. Although there was a lower mean call rate in 2019 than in 2018, the decrease was less pronounced than for many other clusters, and two of the six stations had increased call rates.

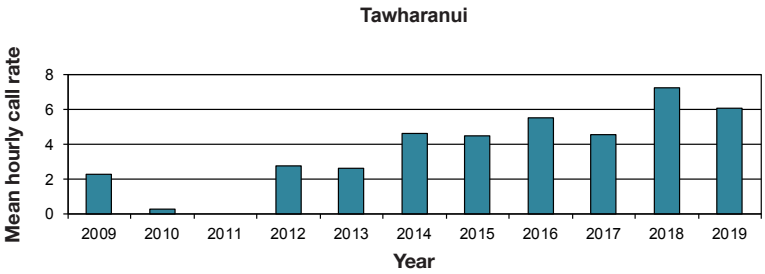

Figure 18. Trends in mean kiwi call rates (calls/hr) at Tawharanui Open Sanctuary management area.

4.1.18 Marunui

Insufficient kiwi listening data were received in 2019 to create a cluster mean and graph for Marunui. Data were received from one station (Station 253, listened from for 4 full nights; mean call rate of 3.6 calls/hr in 2019). This was 1 call/hr lower than the cluster mean of 4.6 calls/hr in 2018, but with only one station listened from these data aren't comparable. Station 253 had a mean of 5.6 kiwi calls/hr in 2018, and 3.3 calls/hr in 2017, so there has been some variation, and the 2019 result was within the known range for the station. It will be very useful to reinstate kiwi listening at both stations 253 and 275 in 2020 and beyond

4.1.19 Mataia

Data were received from four stations in the Mataia cluster in 2019, and two of these were the regular stations used to calculate the annual mean kiwi call rate. No mean was calculated in 2018, but the 2019 mean increased from 2.9 calls/hr in 2017 to 3.6 in 2019; Fig. 19). Both stations that were used to calculate the cluster mean were listened from for 4 full nights, and both had their highest recorded mean in 2019 (Station 254: 4.6 calls/hr in 2019; Station 255: 2.6 calls/hr in 2019). It was very positive to see a general pattern of increasing mean call rates at this cluster, particularly given that call rates have tended to be down across Northland in 2019. As with previous surveys for this cluster, all data were collected using ALDs.

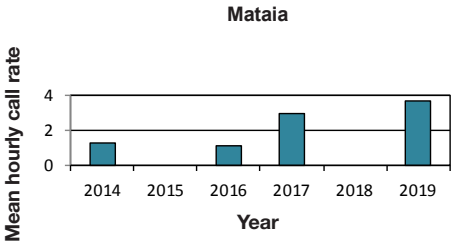

Figure 19. Trends in mean kiwi call rates (calls/hr) at Mataia management area.

4.1.20 Kawau Island

We have now received 5 years of data from three stations on Kawau Island (stations 277, 278 and 279). This means that a cluster mean and subsequent graph are able to be created for Kawau Island this year (Fig. 20). The mean number of kiwi calls heard have been relatively stable, with only a small variation (from a minimum of 1.9 calls/hr in 2015 and 2016; and a maximum of 2.9 calls/hr in 2017). Both 2018 and 2019 had mean call rates of 2.7 calls/hr. Kawau Island was the only cluster of monitored Northland brown kiwi where there was not a decrease in mean kiwi call rates between 2018 and 2019. All 2019 data were collected via ALDs. Stations 277 and 279 had 4 full nights of listening completed, and Station 278 had 3 nights. It will be interesting to monitor this cluster longer term to ascertain whether the population is increasing.

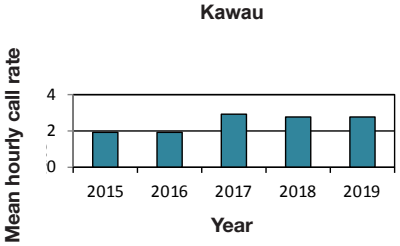

Figure 20. Trends in mean kiwi call rates (calls/hr) at Kawau management area.

4.1.21 Pukenui

Data were received from Pukenui for the first time in 2019. It is excellent to see this population building despite the close proximity to Whangarei. The standard kiwi listening methodology wasn't used for this cluster, but there were low call rates heard (between 0 and 3 calls/hr). Low rates would be expected for a new and growing populations such as this. It would be valuable for a core set of stations (3–5) to be selected that will be listened from (using the standard methods) consistently each year. This will enable solid baseline date for this cluster to be established, and the growth of the population monitored over time.

4.1.22 Piroa

Data were also received from Piroa for the first time in 2019. It was fantastic to have kiwi monitored back in that area of their historical range after many years of absence. Two stations were listened from (290 and 291; each for 4 full nights), with a mean of 1.5 and 1.75 kiwi calls/hr, and a range of 0–4 calls/hr. It will be useful to monitor these stations over time to see if these figures increase. It will be worth considering adding more listening stations to this cluster to ensure a robust mean is able to be calculated.

5. Discussion and general recommendations

The 2019 Northland brown kiwi call count survey had a pronounced pattern of decreasing call rates between 2018 and 2019. Of the original four clusters where kiwi listening had been carried out since 1995, two (Northern and Southern) showed only minor decreases; Western had a moderate decrease; and Eastern had a more substantial decrease. Although this pattern was not unique (all four original clusters trended down in 1996, 1997, 1999, 2002 and 2007), it was the first time that it had happened since 2007, and the knowledge and ability around kiwi management had increased dramatically in the intervening 12 years. Of the other 17 clusters where a mean could be calculated from the 2019 data, 16 had a decrease in the mean number of kiwi calls heard when compared with 2018, and one (Kawau Island) had no change between 2018 and 2019. An increase was noted at one cluster (Mataia), but this was a comparison with data between 2017 and 2019, as there were insufficient data in 2018 to derive a cluster mean. Four clusters had very large decreases of between 47% and 57%; four had large decreases of between 20% and 30%; five had moderate decreases of between 10% and 20%; and the remaining two had slight decreases of >10%.

Typically, we would expect to see a range of trends in the kiwi listening results across Northland, so a pattern of all stations following the same pattern may be due to a region-wide event. According to the Northland Regional Council 2019 climate report (https://www.nrc.govt.nz/environment/river-and-rainfall-data/hydrology-climate-report/2019/april/april-climate-report-2019/), early 2019 and into autumn were particularly dry and warm across Northland, with some pockets of more extreme conditions (e.g. Whangarei Heads). The combination of dry and warm climatic conditions probably affected kiwi directly (through dehydration, heat exhaustion etc.) and indirectly (through reduced food availability etc.). The resulting relatively poor condition of the kiwi due to either or both factors likely delayed the start of the breeding season (and therefore also delayed the corresponding higher calling rates during courtship generally seen at the start of the breeding season in May). This phenomenon was noted by Todd Hamilton (Whangarei Heads kiwi listening coordinator), who reported that a combination of a dry autumn and early May listening window (due to moon phases) resulted in unusually low kiwi call rates. The Whangarei Heads listeners were encouraged to use the second listening window to mitigate some of the factors resulting in lower call rates in the first window, but unfortunately poor weather and resulting heavy surf limited listening ability during this period, so call rates were still well down on the previous year.

It is vital that kiwi listening is continued as fully as possible in 2020 so that the effects of the postulated 2019 delayed breeding season can be separated from any genuine changes in kiwi abundance. At the time of writing (February 2020), Northland was experiencing a prolonged summer drought, so the 2020 kiwi listening may also have atypical results due to weather conditions. Although somewhat alarming, it may be of some comfort to kiwi listeners that the pattern of fewer calls in 2019 was not unique to their station or cluster.

There were several examples of non-standard data being collected during the 2019 listening period. This makes it less valid to compare the data over time, and in some cases may make the

data unusable. Given the effort it takes listeners to obtain the data, it is worth ensuring that the data can be used as intended to increase our knowledge and understanding of kiwi populations. As well as following the general guidelines for kiwi listening, it is important to ensure that the ideal weather conditions are met wherever possible. It is more preferable to use the second window (or even miss nights) than it is to try to conduct the kiwi listening survey in marginal weather/listening conditions. If the first listening window gets missed or is unable to be used due to sub-optimal weather conditions, it is important to wait until the second listening window to resume the survey, rather than continue with listening between the two windows. It was clear that some listeners were adjusting their survey periods to include calls heard just before or just after the survey started/finished. It is best to work to a pre-determined listening window (e.g. 6 pm – 8 pm), and not include any calls heard outside this time (this information can be recorded in the 'notes' section if need be). It is acceptable to use ALDs in place of human listeners (and ALDs are certainly preferable to no listening being completed, particularly at stations that have been listened from for a long time), but it is imperative that all other aspects of the method remain the same; including the same listening windows, and the same time of night (first 2 hours of darkness). If longer listening periods or extra nights are used for general interest, or for comparisons that a particular cluster want to analyse themselves that is fine, but there is no need to include any of the 'extra' data with the annual kiwi call scheme data as it won't be able to be used.

As was noted in the 2018 and 2019 call count monitoring reports, it is very important that the recent version of the kiwi listening spreadsheet template (created in 2018) is the only template that is used to store and collate the data from the 2020 kiwi listening period and beyond. This does not replace the paper field sheets, but the database that the field sheets are used to populate. If listeners have any trouble with accessing or using the new template, they can contact the local kiwi listening co-ordinator or the Whangarei DOC Office.

As well as the four original clusters listened from since 1995, there are now 22 additional clusters (with Pukenui and Piroa being added in 2019). The length and breadth of this data set is increasing and becoming more valuable annually. Although not able to give any measure of absolute abundance, this method can be used to determine relative abundance, and the longer the study continues the more we can learn about the big picture of what is happening for Northland brown kiwi. It is important to note the correlation between calls heard and kiwi present is stronger in areas of high kiwi density; although changes in a population (e.g. death, emigration or immigration resulting in new pairs forming) may result in higher call counts as pair bonds are strengthened and territorial disputes are resolved (Robertson & Colbourne 2017).

It is important that coordinators ensure that all core stations are listened from, and that listeners include all the relevant data. Please note that kiwi listening data should include the following:

- The station is identifiable to those who enter and analyse the data for this report, and to future listeners who will repeat listening at the same station. This means that every kiwi listening card must include the individual station number (see Appendix 1), and this number must not be changed. If it is a new station that will be listened from consistently please add the comment 'station number required' or similar in the comments field, and a number will be assigned in the subsequent report. Each card must also include an up-to-date GPS reference for the site. Both the stations number and GPS reference need to be written on every card, every night.
- There is consistency in kiwi listeners. Ideally this will mean the same person will listen from the same station for each of the full 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 the listener is no longer able to adequately detect kiwi calls, in which case a permanent replacement should be sought.
- Each station needs to be covered for 4 full nights, if possible. If this can't be finished in the first kiwi listening 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 1–2 nights. This will produce more robust data and will give a more accurate measure of kiwi in your area.

- Kiwi call cards need to be filled out in full, including all the fields, each 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 Ayla Wiles at DOC's Whangarei Area Office, 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. If you notice any errors or inconsistencies in the data used for this report, please advise Ayla Wiles 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. The updated Kiwi Best Practice Manual (Robertson & Colbourne 2017) is a useful tool.
- Try to map the location of calling birds during the 4 listening nights. This will help to identify the minimum number of individuals and pairs heard from each station. As discussed above, these data are not used in this report at present, but may be in the future. In the meantime, those groups who are analysing these data themselves are finding some interesting results.
- If you add a new listening 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 Ayla Wiles (awiles@doc.govt.nz) know as soon as possible.

5.1.1 Kiwi listening 2020

Kiwi listening for 2020 should preferably be carried out from 10 May to 30 May, with a back-up window from 9 June to 28 June. This window starts reasonably early in May, and with the early 2020 drought there may be low calling rates this early in the season. There was some consideration given to having a June window as the main listening period, with July as the back-up to counter the climatic extremes. However, after discussion with Hugh Robertson it was decided it would be more beneficial to stick with the status quo both for reasons of continuity, and because if the kiwi don't have a late breeding season then by late June the males would be well into incubation and call rates would decrease. It may be sensible to consider spreading listening nights across the two windows for 2020.

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 2019, and a special thanks to those who monitored multiple stations, or have been listening for multiple years. Your time and effort in obtaining information about kiwi in your area on those relatively cold winter nights is very much appreciated. Thanks also to local kiwi listening co-ordinators and to those who took the time to enter the data into the spreadsheets again this year.

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Appendix 1

Kiwi call survey methods (from the Kiwi Best Practice Manual, Robertson & Colbourne 2017)

1. Go through the Kiwi Call Scheme card methods and fields before you go out. You may also wish to practice or refresh your skills by listening to the calls of kiwi at: http://nzbirdsonline.org.nz/
2. Choose listening sites that cover a wide listening area, preferably on a prominent knob, spur, hilltop, ridgeline or riverflat, away from loud river, stream, sea, traffic or hut noise. However, do not be put off listening from a campsite in thick bush if that is the most practical way of conducting a count.
3. Neighbouring listening sites should preferably be at least 1 km apart to increase the overall coverage.
4. On a topographical map, or GIS map system, estimate the listening range from each listening site – at many places, a ridge or spur will cut out distant calls from certain directions or the habitat in some directions may be unsuitable for kiwi, and so the listening range may be far from circular.
5. Before departing to the listening sites, remember to synchronise your watch with others who are listening in the same general area, so that you can better determine if a bird was heard at multiple sites.
6. Arrive at the listening site with enough time to get ready for recording. Remember that if your listening site is on a hill, you will require some time to cool off and to then pile some clothing on and prepare your forms before you will be ready to listen. Have all of your clothing and gear handy, so that you do not make unnecessary noise during the survey.
7. Start your listening period no earlier than 30 minutes after local sunset. Sunset times are available from http://www.linz.govt.nz/hydro/nautical-info/astronomical-info and on many GPS units.
8. Preferably do your listening in the first 2 hours of darkness (from 30 minutes after local sunset). Listening conditions are often best on a dark night, with little or no wind, rain or other noise, but counts in any conditions will still be valuable. Try to listen for a 2-hour period, because call rates will tend to average out, but listening periods of different durations are acceptable. Avoid doing a short listen simply to include a call that you heard when you were not otherwise intending to do a survey – in this situation, you are better off filling out a Kiwi Reporting Scheme card. Record any birds that called outside your planned listening period in the 'Notes' section, rather than, for example, adding onto the count the pair that called when you were packing up your gear!
9. At the end of each hour of listening, total up the number of calls heard and estimate the number of individual males and females you heard calling (allowing for movement of birds during your listening period) in the 'Notes' section.
10. Do not solicit calls from kiwi by using tapes or shepherd's whistles in the first hour of listening, and only do so later in the night if it is important to determine if kiwi are present at the site. In this case, make sure that this is clear in your notes, along with the times that the calls were broadcast.
11. If you hear other teams broadcasting calls from another site, record this information on your card, along with the time, estimated distance and direction – it may be that you have heard a bird responding to their broadcast rather than the broadcast itself.

12. At the end of the second hour, summarise your data in the field (while information is fresh in your mind):
    - Total up the number of calls heard in the second hour and estimate the number of individual kiwi you heard calling.
    - Add the two counts together and estimate the total number of birds heard during the 2-hour period, again allowing for movement of birds over the whole 2-hour period. Note that one male calling four times is a quite different biological result from four males which each called once.
13. Describe the listening site well (e.g. at cairn on terrace 5 m south of where the track drops down the true right (eastern) bank of the large stony creek, 1200 m west of Cameron's Hut, North Hurunui Valley) so that the exact same listening spot can be used.in future surveys.
14. Photocopy or scan the card for you own records, and then send the original card or the scanned copy to the Kiwi Call Scheme Coordinator.

How to complete the Kiwi Call Scheme card:

CARD NUMBER Leave the top right-hand space blank. If you wish to link the card to the number of a listening station in the area surveyed, use the 'Notes' section on the card.

OBSERVER If more than one person listened from a listening station, give the name of the most experienced observer first. For each new observer, provide the address and affiliation on the first card only. This information is not required on subsequent cards unless addresses or affiliations change.

LOCALITY NAME Provide, in order, the province, the offshore island name (if applicable), the forest or reserve name and the nearest named locality or feature (such as river, stream, trig, etc.), followed by a brief description of the exact location of the listening station (use the 'Notes' section if you run out of space). For example, Southland, Stewart Island/Rakiura, Rakiura National Park, Mason Bay, sand hill 100 m east of Island Hill Homestead. This location will be further verified by the grid reference. This enables all records from Southland or Stewart Island/Rakiura to be sorted. If possible, include a photocopy of a map of the area with the listening stations marked on it, and the estimated listening extent over suitable habitat, even if you did not hear any birds calling throughout the marked area.

GRID REFERENCE Wherever possible, use the Topo50 map series, which is the official topographical map series used by the New Zealand emergency services. These maps cover the entire country. If you are using a GPS system, you should change the settings on your GPS receiver to 'NZGD2000', the datum used by Topo50, or to the 'New Zealand TM' (Transverse Mercator) position format and 'WGS 84' map datum, which is coincident with NZGD2000. If you do not have access to these maps or have a lot of data in the older grid reference, you can still use the metric NZMS 260 series maps and keep your GPS unit set to the 'New Zealand' position and the map datum set as 'NZGD49' or 'NZGD1949'. However, the grid references will need to be converted later from the NZ Map Grid to the NZ Transverse Mercator projection (NZGD2000) using a conversion programme such as that available at http://apps.linz.govt.nz/coordinate-conversion. For the section labelled 'Series', either put T50 to indicate Topo50, or 260 to indicate that you have used the NZMS260 map series. Ignore the N S X on old versions of the card and enter the Sheet Name for NZMS 260 maps. You should use grid references rather than the alternative decimal latitude/longitude system. Grid references are easy to interpret on maps and it is straightforward to work out how far each point is from adjacent points – something that cannot be done with latitudes/longitudes. The grid reference should be given to 7 places for the easting (horizontal) and 7 places for the northing (vertical), i.e. to the nearest metre, even though old versions of the Kiwi Call Scheme card have only 5 spaces available. You can download maps as image files (TIFF and GeoTIFF formats) and data files (Shape and IFF formats), or you can purchase paper maps from local retailers.

NOTES If kiwi are heard in the area but do not call during the listening period, please note this fact. This information is important for distribution analyses. If more space is required for notes, continue writing under the entry of the last call heard on the back of the card (upon completion of the listening period).

WIND This is a subjective score of the average influence of wind on your count. In general, calm and light winds will not reduce the ability to hear birds calling, moderate winds may result in the loss of distant calls, and strong winds will make distant calls very difficult to detect, especially if there is a lot of noise from the wind in trees nearby. If the weather or noise conditions change markedly during a count, fill in separate cards for the different parts of the count.

RAIN This is a subjective score of the average influence of rain during your count. Noise from rainfall can reduce the listening range, and so moderate rain should be scored when you feel that the results have been affected by the noise of rainfall.

TEMPERATURE This is a subjective score of the average temperature during your count. Note accurate readings if you have them available.

CLOUD COVER This is a subjective score of the average cloud cover during your count.

GROUND CONDITIONS This is a subjective score of the average ground conditions during your count.

NOISE This is a subjective score of interference to listening caused by other types of noise, such as river, waterfall, traffic or sea noise, talking by non-listening members of the party, or noise from other animals, e.g. petrels calling, cows mooing or frogs croaking. Avoid noisy conditions wherever possible.

MOONLIGHT This is a subjective score of how bright the moonlight was, averaged over the listening period. Some early studies on brown kiwi, in particular, showed that they called noticeably less often on bright, moonlit nights. Interim results of more recent work indicate that this may not always be the case; however, until these data are fully analysed, it is best to continue to plan surveys on dark nights wherever possible.

LISTENING COVERAGE When listening from a ridge on a calm night, choose 'wide' as the descriptive term. When listening from a campsite in a gully, underline 'narrow'. When listening in a gully with a noisy creek and pouring rain … head back to your tent!

MAJOR HABITAT TYPES Mark a maximum of three categories of vegetation types found within the listening zone. If the types of vegetation present are not listed, circle 17 and explain in the notes. Developed farmland is typical New Zealand pasture, and is well fenced, intensively grazed and has few trees. Undeveloped farmland has rank grasses interspersed with mānuka, gorse and other scrub throughout, and may include extensively grazed river flats or frost flats.

MINUTES LISTENED Give the total time that calls were listened for, in minutes. The number of calls will eventually be expressed as a number of calls per hour. As a general rule of thumb, 1 hour per station is a good continuous period for listening for kiwi calls. Do not listen for more than 3 consecutive hours in a single night, as your concentration will rapidly diminish beyond this. Do not be tempted to 'start' listening as soon as you hear a kiwi calling or to 'finish' a count as soon as a bird has called.

CALLS Record calls according to the species calling, sex (M/F), time, compass bearing that the kiwi called from and the estimated distance (metres). If you are not confident of estimating distance, then write 'near', 'moderate' or 'distant'. A call is made up of a series of notes, ranging from just 1–2 to about 25. Because it is the call rate that is important, if two calls from the same individual are more than a minute apart, record these calls on separate lines. If a pair duet (male or female responds during or shortly after the call of its partner), indicate that these calls are linked. In some species, a duet will comprise alternating calls, with a number of notes from one bird followed by a number of notes from its partner, and then a number from the original bird,

and so on; regard this series of calls as being just one call from each member of the pair, unless one of the calls is obviously from a third bird. At the completion of listening, estimate the number of individuals you heard during the listening period, taking into account the possibility that birds may have moved around during this time.

OTHER ANIMALS HEARD Record other animal species that you heard calling during the listening period, and make an estimate of their abundance using the following criteria:
Few = 1–2 individuals, Moderate = 3–6 individuals, Many = 6+ individuals.

Appendix 2

Mean call count data (calls/hr) for all Northland stations 1995–2018

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	2017
1	Diggers Valley	1.1	2.4	4.1	2.50	2.1	3.3	4.1	3.8	3.0	3.9	3.9	2.7	1.3	2.0	1.7	–	2.5	–	–	–	–	2.8	0.9
2	Takahue	4.3	3.5	5.5	5.40	6.3	8.4	7.9	4.5	3.3	4.8	5.3	5.0	3.6	4.9	3.1	4.8	11.4	6.9	5.3	2.4	0.1	0.0	–
4	Gartons	5.6	5.0	1.2	–	0.8	2.0	8.6	–	1.5	4.1	4.9	7.1	1.5	1.3	0	0.1	0.3	0.8	0.3	0.3	0.0	0.1	–
5	Kaiaka	1.7	1.3	2.4	3.40	1.6	3.5	3.0	2.1	1.9	3.8	2.8	1.5	0.0	0.8	–	1.6	1.1	0.3	1.6	1.6	2.0	–	–
7	Puketi	6.6	5.4	2.1	3.00	6.0	7.6	6.4	3.5	5.0	3.4	1.5	2.3	0.8	3.9	4.0	6.9	9.4	6.3	6.3	5.9	5.6	5.6	9.8
8	Puketi SR	5.4	6.5	4.4	4.00	5.1	6.5	6.1	6.4	8.3	9.4	2.3	5.1	7.4	8.9	9.0	7.9	9.0	11.8	9.8	7.6	5.4	9.3	9.0

STN NO.	STATION NAME	2018	2019
1	Diggers Valley	–	–
2	Takahue	–	–
4	Gartons	–	–
5	Kaiaka	–	–
7	Puketi	8.3	7.4
8	Puketi SR	12.1	12.4

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	2017
Mangatete																								
3	Lightning Hill	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	15.5	13.5	10.0	17.6	20.5	17.1
256	Baigents home drive	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	12.0	14.1	15.4	14.8

STN NO.	STATION NAME	2018	2019
Mangatete			
3	Lightning Hill	17.6	16.0
256	Baigents home drive	17.5	10.4

Continued on next page

Appendix 2 continued

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	2017
Honeymoon Valley																								
271	H-moon Valley Green Bach	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.4	0.5	–
272	H-moon Valley Lost Valley track	–	–	–	–	–	–	–	–	–	–	–	–	-	-	–	–	–	–	–	–	0.6	–	–
273	H-moon Valley Central Ridge of Beth's	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4.6	–	–
274	H-moon Valley Greg's driveway	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.3	–	–
	NZFRT reserve, campsite	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5.6	5.1
	Toa Toa Ridge	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019
Honeymoon Valley			
271	H-moon Valley Green Bach	0.0	–
272	H-moon Valley Lost Valley track	–	–
273	H-moon Valley Central Ridge of Beth's	–	–
274	H-moon Valley Greg's driveway		–
	NZFRT reserve, campsite	4.4	–
	Toa Toa Ridge	0.5	–

Continued on next page

Appendix 2 continued

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	2017
Whakaangi																								
130	Whakaangi 1	–	–	–	–	–	–	–	–	–	–	9.0	10.4	4.6	7.6	6.3	–	–	–	–	–	–	–	–
131	Whakaangi 2	–	–	–	–	–	–	–	–	–	–	14.9	25.0	15.3	20.8	17.1	16.1	9.4	8.0	4.8	3.1	14.1	4.9	–
132	Whakaangi 3	–	–	–	–	–	–	–	–	–	–	13.5	14.6	9.0	10.8	12.2	12.2	5.5	3.1	6.8	3.9	4.4	5.9	–
29	Whakaangi 4	–	–	4.5	–	2.9	1.9	6.3	3.8	4.9	6.6	2.3	6.8	6.3	4.9	5.8	9.8	5.0	–	–	–	–	–	–
133	Whakaangi 5	–	–	–	–	–	–	–	–	–	–	9.8	13.8	10.1	–	8.3	–	7.9	4.1	–	3.5	7.1	6.8	–
134	Whakaangi 6	–	–	–	–	–	–	–	–	–	–	6.0	7.3	3.9	–	9.5	7.0	–	–	4.5	–	–	–	–
135	Whakaangi 7	–	–	–	–	–	–	–	–	–	–	21.9	28.0	24.5	27.0	25.9	21.9	23.4	19.1	11.9	13.6	9.0	5.3	0.5
136	Whakaangi 8	–	–	–	–	–	–	–	–	–	–	14.1	29.0	11.8	18.8	15.3	10.5	20.0	15.3	12.8	13.0	10.9	4.5	6.8
137	Whakaangi 9	–	–	–	–	–	–	–	–	–	–	4.8	8.4	5.6	6.5	4.9	8.1	5.0	–	–	2.6	3.0	0.8	4.8
138	Whakaangi 10	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8.8	4.0	5.8	4.3	3.8	2.9	0.5	–	–
140	Whakaangi 11	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	16.6	7.6	3.9	7.1	7.3	7.6	7.6
	Whakaangi 12	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–							

STN NO.	STATION NAME	2018	2019
Whakaangi			
130	Whakaangi 1	–	–
131	Whakaangi 2	2.8	–
132	Whakaangi 3	4.2	–
29	Whakaangi 4	–	–
133	Whakaangi 5	5.2	–
134	Whakaangi 6	–	–
135	Whakaangi 7	2.6	3.3
136	Whakaangi 8	7.3	1.3
137	Whakaangi 9	1.8	1.8
138	Whakaangi 10	–	–
140	Whakaangi 11	8.9	2.8
	Whakaangi 12	12.0	–

Continued on next page

Appendix 2 continued

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	2017
Mahinepua-Radar Hill																								
90	Mahinepua 0	–	–	–	–	–	–	–	–	–	–	–	–	2.9	2.9	3.4	3.6	4.0	7.1	4.4	3.3	4.9	5.6	5.4
83	Mahinepua 1	–	–	–	–	–	–	–	–	3.5		2.6	4.1	3.5	2.6	2.4	2.3	3.1	7.5	6.8	4.3	4.8	4.3	7.9
84	Mahinepua 2	–	–	–	–	–	–	–	–	4.2	0.8	2.3	4.8	4.3	2.8	3.3	3.3	4.3	6.8	4.8	3.6	4.3	7.3	6.3
85	Mahinepua 3	–	–	–	–	–	–	–	–	5.6	4.8	4.0	5.5	5.4	3.3	5.9	5.3	5.3	10.3	5.0	5.9	5.4	7.3	6.4
88	Mahinepua 4	–	–	–	–	–	–	–	–	6.1	4.1	3.0	7.8	4.7	4.1	9.5	4.8	5.4	10.6	7.1	8.0	6.9	9.3	7.5
87	Mahinepua 5	–	–	–	–	–	–	–	–	–	–	–	–	2.4	0.9	2.0	–	–	–	–	–	–	–	–
86	Mahinepua 6	–	–	–	–	–	–	–	–	1.0	2.5	2.3	–	0.4	0.8	1.3	–	–	–	–	–	–	–	–
89	Mahinepua 7	–	–	–	–	–	–	–	–	0.9	5.9	1.8	4.8	1.9	0.4	–	–	–	–	–	–	–	–	–
181	Mahinepua 8	–	–	–	–	–	–	–	–	–	–	–	–	0.8	0.4	–	–	–	–	–	–	–	–	–
182	Mahinepua 9	–	–	–	–	–	–	–	–	–	–	–	–	0.1	0.1	–	–	–	–	–	–	–	–	–
183	Mahinepua 10	–	–	–	–	–	–	–	–	–	–	–	–	1.6	1.3	–	–	–	–	–	–	–	–	–
184	Mahinepua 11	–	–	–	–	–	–	–	–	–	–	–	–	2.9	1.3	1.3	–	–	–	–	–	–	–	–
98	Mahinepua 12	–	–	–	–	–	–	–	–	–	3.5	2.3	3.8	2.5	3.4	2.9	–	–	–	–	–	–	–	–
99	Mahinepua 13	–	–	–	–	–	–	–	–	–	3.9	3.8	7.4	7.3	5.0	9.4	7.8	9.5	16.0	9.6	6.9	11.0	10.8	9.3
92	Mahinepua 14	–	–	–	–	–	–	–	–	–	–	–	–	0.6	1.3	1.1	1.4	0.8	–	–	–	–	–	–
91	Mahinepua 15	–	–	–	–	–	–	–	–	–	–	–	–	1.0	1.1	1.6	1.8	3.1	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019
Mahinepua-Radar Hill			
90	Mahinepua 0	6.1	2.0
83	Mahinepua 1	8.1	2.1
84	Mahinepua 2	12.3	2.8
85	Mahinepua 3	12.5	5.8
88	Mahinepua 4	–	8.0
87	Mahinepua 5	–	-
86	Mahinepua 6	–	-
89	Mahinepua 7	–	-
181	Mahinepua 8	–	-
182	Mahinepua 9	–	-
183	Mahinepua 10	–	-
184	Mahinepua 11	–	-

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Appendix 2 continued

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	2017
Mahinepua-Radar Hill																								
93	Mahinepua 16	–	–	–	–	–	–	–	–	–	–	–	–	1.3	6.0	2.0	2.6	5.3	–	–	–	–	–	–
94	Mahinepua 17	–	–	–	–	–	–	–	–	–	–	–	–	2.5	4.9	5.0	3.4	6.9	–	–	–	–	–	–
95	Mahinepua 18	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.8	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019
Mahinepua-Radar Hill			
93	Mahinepua 16	–	-
94	Mahinepua 17	–	-
95	Mahinepua 18	–	-

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	2017
Eastern																								
10	Marsden Cross	20.9	18.3	9.6	16.7	14.5	19.9	21.9	17.9	18.5	22.0	19.3	30.6	23.0	-	20.3	24.5	34.9	30.9	30.3	19.3	30.4	38.6	38.8
11	Puketotara	10.0	13.8	8.1	11.6	9.7	8.0	–	2.5	7.5	3.6	–	7.1	13.7	10.6	6.2	9.5	9.3	9.1	9.8	14.0	12.75	–	11.0
12	Rangitane	14.0	5.6	8.4	10.5	7.5	8.4	11.5	10.5	8.6	8.0	8.0	11.5	9.1	15.9	15.3	11.4	10.8	12.8	11.3	12.8	9.5	10.9	10.1
13	Waitangi No 12	7.6	7.6	6.3	8.9	5.3	7.1	11.5	15.1	18.4	13.8	11.5	15.5	6.3	–	–	–	–	6.8	7.4	3.0	4.8	7.5	11.5
14	Mt Bledisloe	27.1	10.9	5.5	7.9	8.8	5.1	6.4	6.8	4.9	8.9	9.1	5.5	9.6	11.3	8.3	11.4	13.7	7.4	10.8	6.8	7.9	10.9	8.3
15	Tikitikiore	10.8	13.5	6.1	6.1	4.5	6.5	2.9	3.3	3.1 (12.3)	6.1 (7.1)	3.4	13.0	7.9	11.0	12.3 (5.3)	12.3	13.5	17.8	14.5	12.4	15.1	25.5	20.4

STN NO.	STATION NAME	2018	2019
Eastern			
10	Marsden Cross	39.6	30.8
11	Puketotara	14.0	16.1
12	Rangitane	18.1	10.1
13	Waitangi No 12	6.0	5.8
14	Mt Bledisloe	12.8	7.6
15	Tikitikiore	24.6	7.8

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Appendix 2 continued

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	2017
Russell Peninsula																								
59	Opito Farms	–	–	–	–	–	5.7	–	9.9	–	–	4.6	13.1	6.1	9.13	6.75	4.3	5.3	8.1	6.9	11.5	10.1	–	13.5
60	Flagstaff/Te Maiki	–	–	–	–	–	3.7	1.3	1.3	–	–	–	4.3	–	6.4	–	2.5	4.3	3.9	3.3	3.3	3.9	3.4	5.8
61	Milne Ct	–	–	–	–	–	–	–	–	–	–	–	6.3	5.8	–	–	–	–	–	–	–	–	–	–
62	Uruti Rd	–	–	–	–	–	10.8	7.6	10.5	–	–	7.7	14.4	7.9	5.0	12.8	12.3	12.8	11.5	13.9	6.9	15.0	21.6	11.1
156	Russell Heights	–	–	–	–	–	–	–	–	–	–	–	9.8	4.8	5.0	2.5	5.0	–	–	–	–	–	–	–
170	Nikau Block	–	–	–	–	–	–	–	–	–	–	12.9	10.0	12.0	12.0	12.0	8.9	14.3	9.1	20.8	14.6	14.9	12.0	10.4
171	Mace/Farmer	–	–	–	–	–	–	–	–	–	–	–	–	–	6.6	4.75	17.6	10.4	6.3	4.0	4.0	14.3	12.8	21.6
172	Pipiroa Bay	–	–	–	–	–	–	–	–	–	–	–	–	–	0.0	3.0	2.0	2.8	6.0	5.4	5.6	3.0	3.3	3.6
173	Shortlands	–	–	–	–	–	–	–	–	–	–	–	2.0	2.5	1.4	1.1	1.3	–	2.3	1.1	2.0	–	–	1.3
174	Johnsons	–	–	–	–	–	–	–	–	–	–	–	10.0	9.8	12.8	10.0	10.0	11.4	8.5	10.1	10.3	11.3	12.8	12.3
176	Jarvis	–	–	–	–	–	–	–	–	–	–	5.4	4.3	–	–	–	–	–	–	–	–	–	–	–
177	Soloman's Gate	–	–	–	–	–	–	–	–	–	–	11.5	6.4	–	–	–	–	5.4	6.3	4.9	14.0	9.5	–	9.3
210	Paroa Bay, Russell	–	–	–	–	–	–	–	–	–	–	–	–	4.3	–	–	–	–	–	–	–	–	–	–
211	Eagles Nest	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4.5	–	–	–	–	–	–	–
	Ngaiotonga	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019
Russell Peninsula			
59	Opito Farms	13.5	10.1
60	Flagstaff/Te Maiki	5.0	4.9
61	Milne Ct	–	-
62	Uruti Rd	17.1	11.9
156	Russell Heights	–	-
170	Nikau Block	16.1	5.8
171	Mace/Farmer	32.2	19.4
172	Pipiroa Bay	4.8	7.0
173	Shortlands	11.1	1.4
174	Johnsons	11.9	5.6
176	Jarvis	–	-
177	Soloman's Gate	–	5.5
210	Paroa Bay, Russell	–	-
211	Eagles Nest	–	-
	Ngaiotonga	–	3.9

Continued on next page

Appendix 2 continued

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	2017
Bay of Islands																								
146	Kauri Cliffs 1 (Pink Beach)	–	–	–	–	–	–	–	–	9.0	–	–	4.0	4.3	1.8	5.0	6.5	–	–	–	–	–	3.3	–
147	Kauri Cliffs 2 (Puriri)	–	–	–	–	–	–	–	–	–	–	–	1.5	3.0	2.8	1.0	–	–	–	–	–	–	–	–
148	Wiwiki Beach	–	–	–	–	–	–	–	–	–	–	–	32.1	–	–	–	–	–	–	–	–	–	–	–
149	Mataka Stn Gate, Purerua	–	–	–	–	–	–	–	–	–	–	–	4.0	4.1	8.3	6.8	18.5	3.3	10.0	6.9	–	–	–	–
150	McKenzie Rd, Purerua	–	–	–	–	–	–	–	–	–	–	–	9.5	12.1	10.3	5.0	7.5	–	2.5	–	–	–	–	–
151	Mtn Landing (Lot 30) Purerua	–	–	–	–	–	–	–	–	–	–	–	12.3	10.2	18.8	12.6	25.0	22.8	20.3	–	–	–	–	–
152	Waitoto Block	–	–	–	–	–	–	–	–	–	–	–	4.0	–	–	–	–	–	–	–	–	–	–	–
153	Aroha Island	–	–	–	–	–	–	–	–	6.9	–	–	12.6	–	–	–	–	–	–	–	–	–	–	–
154	Napia Bay	–	–	–	–	–	–	–	–	–	8.7	5.50	4.6	4.0	4.5	3.3	5.6	7.5	3.6	4.0	–	–	–	–
155	Stirlings Quarry	–	–	–	–	–	–	–	–	7.3	9.8	13.00	12.4	10.2	8.3	4.0	8.5	–	–	–	–	–	–	–
97	Kurapari Rd	–	–	–	–	7.1	–	–	–	12.7	8.8	9.25	10.4	5.5	6.0	6.8	4.8	2.3	5.5	7.0	–	–	–	–
138	Hupara	–	–	–	–	–	–	–	–	–	25.6	19.30	27.8	–	–	–	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019
Bay of Islands			
146	Kauri Cliffs 1 (Pink Beach)	–	–
147	Kauri Cliffs 2 (Puriri)	–	–
148	Wiwiki Beach	–	–
149	Mataka Stn Gate, Purerua	–	–
150	McKenzie Rd, Purerua	–	–
151	Mtn Landing (Lot 30) Purerua	–	–
152	Waitoto Block	–	–
153	Aroha Island	–	–
154	Napia Bay	–	–
155	Stirlings Quarry	–	–
97	Kurapari Rd	–	–
138	Hupara	–	–

Continued on next page

Appendix 2 continued

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	2017
Bay of Islands																								
185	Akeake Reserve, Kerikeri	–	–	–	–	–	–	–	–	–	–	–	–	–	2.8	0.5	–	6.0	–	–	–	–	–	–
186	Cunningham Gardens, Aroha Island	–	–	–	–	–	–	–	10.8	8.6	–	–	–	–	–	–	–	8.2	–	–	–	–	–	–
187	Gaitens, Rangitane Rd, Kerikeri	–	–	–	–	10.0	–	12.8	6.3	6.9	10.0	12.0	12.6	14.7	10.5	8.0	7.3	7.5	4.8	–	–	–	–	–
188	Blacksmiths Bay (east), Kerikeri (Lex Rennes)	–	–	–	–	–	–	–	10.3	10.3	7.7	8.3	6.2	6.0	8.0	4.5	6.9	8.8	6.40	0.0	–	–	–	–
189	Doves Bay, Kerikeri (Lockyer)	–	–	–	–	4.2	–	–	2.0	–	3.8	2.5	–	–	4.5	7.5	15.3	18.3	–	–	–	–	–	–
190	Rangitu, Opito Bay Road, Kerikeri	–	–	–	–	–	–	–	–	–	–	–	–	9.1	16.0	15.5	15.5	–	–	–	–	–	–	–
191	Tikorangi Road, Opito Bay, Kerikeri	–	–	–	–	–	–	–	–	–	–	–	–	–	4.5	4.5	4.0	–	–	–	–	–	–	–
192	Kraus, Hansen Rd, Purerua	–	–	–	–	–	–	–	–	–	3.3	–	–	–	–	11.0		–	–	–	–	–	–	–
193	Mataka Beach, Mataka Station, Purerua	–	–	–	–	–	–	–	41.5	–	30.0	39.0	32.7	24.5	41.8	30.0	41.3	–	30.83	30.9	–	–	–	–

STN NO.	STATION NAME	2018	2019
Bay of Islands			
185	Akeake Reserve, Kerikeri	–	–
186	Cunningham Gardens, Aroha Island	–	4.8
187	Gaitens, Rangitane Rd, Kerikeri	–	-
188	Blacksmiths Bay (east), Kerikeri (Lex Rennes)	–	–
189	Doves Bay, Kerikeri (Lockyer)	–	–
190	Rangitu, Opito Bay Road, Kerikeri	–	–
191	Tikorangi Road, Opito Bay, Kerikeri	–	–
192	Kraus, Hansen Rd, Purerua	–	–
193	Mataka Beach, Mataka Station, Purerua	–	–

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Appendix 2 continued

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	2017
Bay of Islands																								
194	Mataka Station, Ninepin Track, Purerua	–	–	–	–	–	–	–	–	–	30.0	–	–	–	50.8	43.5	–	18.0	–	24.0	–	–	–	–
195	Mountain Landing (Lot 30) Wharengaere, Purerua	–	–	–	–	–	–	–	–	–	–	–	12.3	10.2	18.8	12.6	25.0	22.8	20.25	13.3	–	–	–	–
196	Mountain Landing, Mataka Ridgeline, Purerua	–	–	–	–	–	–	–	–	–	–	–	7.5	10.1	18.0	25.5	14.3	22.0	–	–	–	–	–	–
197	Mountain Landing, Paddle (Entrance), Purerua	–	–	–	–	–	–	–	–	–	–	–	8.5	10.2	12.5	14.3	17.0	–	–	–	–	–	–	–
198	Mountain Landing, Poraenui Point	–	–	–	–	–	–	–	–	–	–	–	–	7.3	14.5	16.0	13.8	–	–	–	–	–	–	–
	Top Vineyard Villa	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Twin tanks	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
199	Paoneone	–	–	–	–	–	–	–	16.7	–	–	–	–	–	–	–	–	37.6	–	11.3	–	–	–	–

STN NO.	STATION NAME	2018	2019
Bay of Islands			
194	Mataka Station, Ninepin Track, Purerua	–	–
195	Mountain Landing (Lot 30) Wharengaere, Purerua	–	–
196	Mountain Landing, Mataka Ridgeline, Purerua	–	–
197	Mountain Landing, Paddle (Entrance), Purerua	–	–
198	Mountain Landing, Poraenui Point	–	–
	Top Vineyard Villa	36.9	28.9
	Twin tanks	42.6	32.9
199	Paoneone	–	–

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Appendix 2 continued

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	2017
Bay of Islands																								
200	Pattersons Big Hill	–	–	–	–	–	–	–	9.0	–	–	30.5	–	4.0	20.5	70.3	33.0	35.5	–	–	–	–	–	–
201	Pattersons, Rocky Bay	–	–	–	–	–	–	–	–	–	–	–	–	–	16.5	19.5	17.7	11.7	–	–	–	–	–	–
202	Tapuaetahi	–	–	–	–	–	–	–	–	–	–	–	5.0	–	3.0	3.3	16.5		-	7.4	–	–	–	–
203	Wharengaere Bay	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	14.5	15.5	–	–	–	–	–	–
204	Wiroa Station	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4.5	6.7	–	–	–	–	–	–
205	Wiroa Station Hill 11	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.5	–	–	–	–	–	–	–
206	Maintenance Facility, Kauri Cliffs	–	–	–	–	–	–	–	–	–	–	–	–	–	6.5	5.0	13.1	–	–	–	–	–	6.9	–
207	Waiaua Bay, Matauri X	–	–	–	–	–	–	–	–	2.3	–	–	0.5	0.5	–	–	–	–	–	–	–	–	–	–
208	Waterfall, Kauri Cliffs, Takou Bay	–	–	–	–	–	–	–	–	6.0	–	–	5.5	2.3	4.5	3.5	–	–	–	–	–	–	–	–
209	Hikurua Rd (end)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.0	–	–	–	–	–	–	–
212	Drivers Whitehills farm	–	–	–	–	–	–	–	–	–	–	–	–	–	7.5	2.0	8.0	8.0	7.9	–	–	–	–	–
213	Landcorp Takou Kiwi covenant	–	–	–	–	–	–	–	–	–	–	–	–	–	8.5	0.8	3.0	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019
Bay of Islands			
200	Pattersons Big Hill	–	–
201	Pattersons, Rocky Bay	–	–
202	Tapuaetahi	–	–
203	Wharengaere Bay	–	–
204	Wiroa Station	–	–
205	Wiroa Station Hill 11	–	–
206	Maintenance Facility, Kauri Cliffs	–	–
207	Waiaua Bay, Matauri X	–	–
208	Waterfall, Kauri Cliffs, Takou Bay	–	–
209	Hikurua Rd (end)	–	–
212	Drivers Whitehills farm	–	–
213	Landcorp Takou Kiwi covenant	–	–

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Appendix 2 continued

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	2017
Bay of Islands																								
214	Maori Block	–	–	–	–	–	–	–	–	–	–	–	–	1.5	–	–	3.5	–	–	–	–	–	–	–
215	Otaha Station (south end)	–	–	–	–	–	–	–	–	–	–	–	–	3.0	–	–	3.0	–	–	–	–	–	–	–
216	Just past Clinton's	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.0	–	–	–	–	–	–	–
217	End of Te Ra Rd	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.3	–	–	–	–	–	–	–
219	Achtzhener, Bulls Gorge, Kerikeri	–	–	–	–	–	–	–	–	–	–	–	7.0	–	6.0	11.8	5.8	2.8	–	1.9	–	–	–	–
220	Airstrip Rd (Baigent-Mercer)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.0	–	3.3	–	–	–	–	–
221	Airstrip Rd (Sharp)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5.0	–	–	–	–	–	–	–
222	Candy Bush, Puketi Road, middle ridge	–	–	–	–	–	–	–	–	–	–	–	–	–	0.8	6.0	–	–	–	–	–	–	–	–
223	Candy Bush, Puketi Road, red cliffs	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8.5	–	-	5.8	–	–	–	–	–
224	Candy Bush, Puketi Road, white/yellow path	–	–	–	–	–	–	–	–	–	–	–	–	–	–	11.0	–	-	11.0	–	–	–	–	–

STN NO.	STATION NAME	2018	2019
Bay of Islands			
214	Maori Block	–	–
215	Otaha Station (south end)	–	–
216	Just past Clinton's	–	–
217	End of Te Ra Rd	–	–
219	Achtzhener, Bulls Gorge, Kerikeri	–	–
220	Airstrip Rd (Baigent-Mercer)	–	–
221	Airstrip Rd (Sharp)	–	–
222	Candy Bush, Puketi Road, middle ridge	–	–
223	Candy Bush, Puketi Road, red cliffs	–	–
224	Candy Bush, Puketi Road, white/yellow path	–	–

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Appendix 2 continued

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	2017
Bay of Islands																								
225	Kauri Hills, Totara North	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.0	6.3	–	–	–	–	–
226	Poultons, Kerikeri River, Mangaparerua Rd	–	–	–	–	–	–	–	–	–	–	–	–	–	9.0	–	6.5	–	5.4	4.6	–	–	–	–
227	Puketotara Rd = 709	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	10.0	–	–	–	–	–	–	13.8
228	Puketotara Rd = Kearney	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.5	–	–	–	–	12.9	–	–
229	Waipapa Rd West, Kerikeri (Anne C.)	–	–	–	–	–	–	–	–	–	–	–	–	–	0.0	–	–	–	–	–	–	–	–	–
230	Waipapa Rd West, Kerikeri (Isabella C.)	–	–	–	–	–	–	–	–	–	–	–	–	–	0.6	0.5	–	–	–	–	–	–	–	–
231	Waitoto, 500m west of Rhyolitic dome, Mangaparerua	–	–	–	–	–	–	–	–	–	–	–	4.0	–	–	–	–	–	–	–	–	–	–	–
232	Waitoto, Rhyolitic dome, Mangaparerua Road	–	–	–	–	–	–	–	–	–	–	–	4.5	4.6	8.0	5.0	–	–	–	–	–	–	–	–
233	Wharau Rd, Kerikeri (Manning)	–	–	–	–	–	–	–	–	–	–	–	–	3.6	2.5	–	5.5	3.5	4.5	–	–	–	–	–

STN NO.	STATION NAME	2018	2019
Bay of Islands			
225	Kauri Hills, Totara North	–	–
226	Poultons, Kerikeri River, Mangaparerua Rd	12.3	9.0
227	Puketotara Rd = 709	–	–
228	Puketotara Rd = Kearney	–	–
229	Waipapa Rd West, Kerikeri (Anne C.)	–	–
230	Waipapa Rd West, Kerikeri (Isabella C.)	–	–
231	Waitoto, 500m west of Rhyolitic dome, Mangaparerua	–	–
232	Waitoto, Rhyolitic dome, Mangaparerua Road	–	–
233	Wharau Rd, Kerikeri (Manning)	–	–

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Appendix 2 continued

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	2017
Bay of Islands																								
234	Wharau Rd, Kerikeri (Starr)	–	–	–	–	–	–	–	–	–	–	–	–	6.3	7.0	–	–	–	–	–	–	–	–	–
	Lodore Rd	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6.9
	Paddock 35	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Rangihoura	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
282	Palm Drive	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Te Puke	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019
Bay of Islands			
234	Wharau Rd, Kerikeri (Starr)	–	–
	Lodore Rd	–	12.0
	Paddock 35	12.1	9.1
	Rangihoura	–	34.4
282	Palm Drive	–	0.9
	Te Puke	–	0.6

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Appendix 2 continued

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	2017
Puketi Forest																								
102	Bramley's Rd	–	–	–	–	–	–	–	–	–	–	–	2.5	0.5	2.0	2.0	2.8	2.8	2.5	2.0	–	3.4	2.4	2.3
103	Pirau Ridge	–	–	–	–	–	–	–	–	–	–	–	0.0	–	0.0	1.0	0.5	1.3	1.3	1.4	0.5	1.6	0.9	1.0
104	Pond	–	–	–	–	–	–	–	–	–	–	–	4.5	1.0	3.8	5.0	3.5	8.0	6.9	4.6	5.9	3.3	4.9	2.9
105	Pudding Bowl Hill	–	–	–	–	–	–	–	–	–	–	–	0.3	0.8	1.1	2.0	2.0	1.0	–	3.0	–	–	–	–
106	Takapau Track	–	–	–	–	–	–	–	–	–	–	–	0.0	1.0	0.0	2.5	3.3	2.4	2.6	1.4	–	1.1	1.9	4.9
107	Takapau/Pirau Rd Junction	–	–	–	–	–	–	–	–	–	–	–	0.5	–	1.0	2.8	1.4	3.5	1.5	1.1	0.9	1.6	1.5	1.4
108	Totara Ridge	–	–	–	–	–	–	–	–	–	–	–	5.8	–	0.8	7.1	3.5	6.1	4.6	5.9	5.0	1.8	4.1	2.4
109	Waihoanga Gorge	–	–	–	–	–	–	–	–	–	–	–	2.0	–	3.8	5.4	3.3	6.3	4.5	4.3	–	5.8	5.5	4.4
110	Waihoanga Gorge 2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.5	2.5	1.5	–	4.5	–	–	–	–
111	Walnut	–	–	–	–	–	–	–	–	–	–	–	4.3	2.5	1.3	3.3	3.0	5.3	4.0	4.8	6.1	4.9	7.9	5.3
112	Stoat line 9 - Puketi	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5.1	4.0	3.6	1.4	4.0	1.0	3.6
259	Puketi Nature Trail	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3.1	–	3.3	–	–	–	–

STN NO.	STATION NAME	2018	2019
Puketi Forest			
102	Bramley's Rd	3.9	1.0
103	Pirau Ridge	–	2.3
104	Pond	9.5	6.1
105	Pudding Bowl Hill	–	–
106	Takapau Track	4.5	5.4
107	Takapau/Pirau Rd Junction	3.6	1.6
108	Totara Ridge	6.8	5.4
109	Waihoanga Gorge	8.1	7.1
110	Waihoanga Gorge 2	–	–
111	Walnut	5.4	3.1
112	Stoat line 9 - Puketi	3.4	4.0
259	Puketi Nature Trail	–	3.3

Continued on next page

Appendix 2 continued

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	2017
Waimate North																								
113	W1	–	–	–	–	–	–	–	–	–	23.5	15.8	24.8	–	–	25.5	25.8	23.6	23.1	23.8	27.1	30.8	34.5	31.4
114	W2	–	–	–	–	–	–	–	–	–	12.3	7.0	9.5	7.9	11.5	5.8	14.5	11.6	12.5	7.1	5.1	8.6	4.8	8.8
115	W3	–	–	–	–	–	–	–	–	–	14.9	–	–	–	–	–	–	1.0	0.0	1.0	1.4	2.0	1.3	1.1
116	W4	–	–	–	–	–	–	–	–	–	9.4	10.5	6.0	–	8.0	–	8.5	13.5	10.5	10.9	8.5	8.0	7.0	12.1
117	W5	–	–	–	–	–	–	–	–	–	5.9	1.8	3.0	–	–	–	–	–	–	–	–	–	–	–
118	W6	–	–	–	–	–	–	–	–	–	22.3	11.0	5.7	8.5	7.3	9.1	5.6	10.6	8.0	7.5	10.4	11.0	13.3	10.9
119	W7	–	–	–	–	–	–	–	–	–	–	5.3	6.5	–	3.1	–	–	–	–	–	–	–	–	–
120	W8	–	–	–	–	–	–	–	–	–	13.8	2.8	1.0	8.1	8.0	5.5	8.1	9.1	11.9	9.1	11.3	8.1	7.1	5.3
121	W9	–	–	–	–	–	–	–	–	–	5.2	3.5	2.1	2.3	3.5	–	–	–	–	1.0	5.5	2.9	7.3	2.6
122	W10	–	–	–	–	–	–	–	–	–	–	–	7.3	8.3	5.9	5.3	4.1	7.3	5.1	4.1	8.0	4.4	5.3	–
123	W11	–	–	–	–	–	–	–	–	–	7.1	7.8	2.0	–	–	–	–	–	–	–	–	–	–	–
124	W12	–	–	–	–	–	–	–	–	–	18.9	9.8	6.1	3.6	5.9	6.0	7.9	6.3	4.6	5.1	8.0	8.1	7.4	6.1
178	W13	–	–	–	–	–	–	–	–	–	–	–	–	–	4.5	2.8	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019
Waimate North			
113	W1	26.6	
114	W2	7.6	
115	W3	–	
116	W4	9.4	
117	W5	–	
118	W6	15.9	
119	W7	–	
120	W8	5.6	
121	W9	–	
122	W10	4.4	
123	W11	–	
124	W12	5.5	
178	W13		7.8

Continued on next page

Appendix 2 continued

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	2017
Waimate North																								
127	W14	–	–	–	–	–	–	–	–	–	–	–	–	–	1.0	0.9	0.5	0.0	–	–	–	–	–	–
128	W16	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.9	2.2	–	–	–	–	–	–	
	Sacro Bosco	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.9

STN NO.	STATION NAME	2018	2019
Waimate North			
127	W14		–
128	W16		–
	Sacro Bosco	0.9	–

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	2017
Hupara																								
258	Hupara Land Care 1 (Bill's Plateau)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	31.3	15.1	21.4	25.0	26.4	21.4
245	Hupara Land Care 2 (Mike Sullivan's)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	20.9	11.0	16.0	–	–
246	Hupara Land Care 3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	19.4	–	–	–	–
257	Hupara Land Care 4 (Home Orange Tree)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	11.6	9.0	17.1	12.1
	Hupara Land Care Harrison's Property	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	35.3	–

STN NO.	STATION NAME	2018	2019
Hupara			
258	Hupara Land Care 1 (Bill's Plateau)	24.8	24.1
245	Hupara Land Care 2 (Mike Sullivan's)	–	–
246	Hupara Land Care 3	–	–
257	Hupara Land Care 4 (Home Orange Tree)	19.9	11.3
	Hupara Land Care Harrison's Property	–	–

Continued on next page

Appendix 2 continued

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	2017
Tutukaka & Sandy Bay																								
125	TLC 1	–	–	–	–	–	–	–	–	9.8	5.9	7.1	8.8	10.9	11.6	8.1	8.6	12.4	12.0	12.1	9.6	7.4	11.5	13.8
126	TLC 2	–	–	–	–	–	–	–	–	–	8.4	7.8	9.8	10.3	6.5	–	7.4	2.8	10.0	–	6.8	10.9	9.5	16.9
142	TLC 3	–	–	–	–	–	–	–	–	–	–	3.0	4.6	3.6	3.0	–	–	9.3	8.5	7.1	5.4	4.1	8.6	–
28	TLC 4	-	7.3	–	–	8.0	4.4	-	-	10.7	7.3	4.4	10.0	–	–	8.2	4.5	–	–	–	6.50	–	–	–
143	TLC 5	–	–	–	–	–	–	–	–	–	–	4.1	6.0	3.3	7.1	4.0	2.3	3.8	–	–	3.5	–	–	–
144	TLC 6	–	–	–	–	–	–	–	–	–	–	9.2	–	13.0	15.2	6.5	8.8	–	–	–	–	–	–	–
160	TLC 7	–	–	–	–	–	–	–	–	–	–	–	4.4	–	–	4.8	4.9	–	5.5	2.1	3.0	–	–	–
100	Kaiatea 1	–	–	–	–	–	–	–	–	–	1.6	–	–	–	–	–	–	–	–	–	–	–	–	–
101	Kaiatea 2	–	–	–	–	–	–	1.2	2.0	1.3	2.1	–	–	–	–	–	–	–	–	–	–	–	–	–
27	Sandy Bay 1	3.6	3.4	2.8	8.0	6.1	3.3	3.5	–	3.0	–	2.5	–	–	6.8	–	5.3	–	4.2	5.5	4.3	3.9	5.8	6.3
260	Sandy Bay 2	–	–	–	–	–	–	–	–	–	–	–	4.5	–	–	3.8	3.5	2.5	4.5	–	3.0	5.9	6.4	9.3
261	Sandy Bay 3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.0	–	4.0	7.5	3.9	3.9	8.5	5.5
	Rayonnier Forest	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5.1
	Sandy Bay Farms	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019
Tutukaka & Sandy Bay			
125	TLC 1	17.6	12.5
126	TLC 2	14.9	–
142	TLC 3	5.6	–
28	TLC 4		10.1
143	TLC 5	–	–
144	TLC 6	–	–
160	TLC 7	–	–
100	Kaiatea 1	–	–
101	Kaiatea 2	–	–
27	Sandy Bay 1	6.0	3.6
260	Sandy Bay 2	3.6	2.4
261	Sandy Bay 3	4.8	1.6
	Rayonnier Forest	–	–
	Sandy Bay Farms	4.8	6.1

Continued on next page

Appendix 2 continued

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	2017
Tutukaka & Sandy Bay																								
	Te Toiroa	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Pukenui Rd	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Ngahere Pines	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019
Tutukaka & Sandy Bay			
	Te Toiroa	14.0	5.1
	Pukenui Rd	6.1	–
	Ngahere Pines	15.0	–

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	2017
Whangarei Heads																								
39	Bream Hd 1	–	–	–	–	–	–	5.0	3.1	5.8	3.1	4.7	5.1	3.5	5.0	6.0	3.0	7.1	9.5	9.6	9.6	10.0	12.1	7.4
40	Bream Hd 2	–	–	–	–	–	–	1.2	2.0	1.3	2.1	2.4	2.0	2.8	2.0	–	–	1.3	–	–	–	–	–	–
41	Bream Hd 3	–	–	–	–	–	–	–	–	–	–	1.5	2.0	1.3	1.6	–	–	–	8.4	8.6	8.6	6.1	6.9	6.0
42	Bream Hd 4	–	–	–	–	–	–	1.2	2.0	1.3	2.1	2.4	2.0	1.5	3.1	2.0	2.0	5.4	5.3	7.6	2.1	6.3	3.8	6.8
42	Bream Hd 4	–	–	–	–	–	–	1.2	2.0	1.3	2.1	2.4	2.0	1.5	3.1	2.0	2.0	5.4	5.3	7.6	2.1	6.3	3.8	6.8
69	Bream Hd 6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.9	6.8	4.4	–	5.0	3.3
44	Taurikura 1	–	–	–	–	–	–	–	–	–	–	1.5	2.0	–	4.4	4.9	3.1	12.6	9.6	10.8	–	–	–	–

STN NO.	STATION NAME	2018	2019
Whangarei Heads			
39	Bream Hd 1	11.3	8.0
40	Bream Hd 2	–	–
41	Bream Hd 3	4.5	3.0
42	Bream Hd 4	8.5	6.8
42	Bream Hd 4	8.5	–
69	Bream Hd 6	3.3	–
44	Taurikura 1	–	8.4

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Appendix 2 continued

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	2017
Whangarei Heads																								
46	Taurikura 3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.5	1.9	5.9	4.6	4.0	7.5	4.8	6.0	–
47	Manaia 1	–	–	–	–	–	–	3.5	2.5	4.3	4.0	3.3	3.9	2.1	5.1	3.9	3.3	10.3	2.9	2.8	3.6	1.5	9.4	8.8
48	Manaia 2	–	–	–	–	–	–	4.0	4.5	4.9	5.8	4.0	5.3	7.4	7.6	8.8	10.8	8.4	16.6	13.3	15.9	15.1	15.6	13.5
49	Manaia 3	–	–	–	–	–	–	3.3	3.9	2.9	–	2.1	3.0	–	4.0	3.1	3.5	6.3	3.1	5.1	3.6	7.5	7.1	9.3
71	Manaia 8	–	–	–	–	–	–	–	1.5	0.3	1.0	1.2	2.0	1.5	1.4	1.9	0.8	2.1	–	4.6	–	3.3	4.8	3.9
262	Manaia 9	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7.8	3.6	6.9	9.1	6.0	–	10.0
54	Kauri Mtn 1	–	–	–	–	–	–	4.5	1.5	–	3.1	7.4	1.3	–	1.4	3.0	2.1	2.5	3.6	4.6	4.4	3.8	7.4	6.5
72	Kauri Mtn 2	–	–	–	–	–	–	–	5.1	3.2	4.3	2.7	2.3	0.4	2.3	3.6	2.4	3.4	5.3	5.0	6.3	6.8	9.6	7.1
73	Kauri Mtn 3	–	–	–	–	–	–	–	2.0	1.0	1.0	1.3	2.5	–	5.0	3.4	1.1	6.0	3.3	3.2	5.1	6.9	7.0	6.8
74	Kauri Mtn 4	–	–	–	–	–	–	–	4.8	5.9	2.6	3.0	2.9	–	2.0	2.0	3.4	3.9	3.8	3.3	4.1	4.8	5.6	6.1
141	Kauri Mtn 5	–	–	–	–	–	–	–	–	–	–	2.3	1.9	1.3	2.5	3.1	3.3	4.8	4.1	3.0	4.9	4.8	8.9	8.9
127	The Nook 1	–	–	–	–	–	–	–	–	–	1.8	1.5	0.9	–	0.7	1.4	1.3	2.3	–	0.9	–	–	–	–
56	The Nook 2	–	–	–	–	–	–	6.0	2.1	3.3	3.8	4.0	5.3	–	5.0	4.5	7.8	9.3	8.4	6.4	4.1	1.6	3.9	8.5
58	Nook Rd	–	–	–	–	–	–	–	–	–	–	–	–	–	3.8	–	3.7	4.6	1.5	–	–	–	–	–

STN NO.	STATION NAME	2018	2019
Whangarei Heads			
46	Taurikura 3	4.8	4.5
47	Manaia 1	13.5	8.9
48	Manaia 2	15.3	–
49	Manaia 3	6.8	1.8
71	Manaia 8	3.1	–
262	Manaia 9	–	4.5
54	Kauri Mtn 1	5.1	4.9
72	Kauri Mtn 2	5.6	–
73	Kauri Mtn 3	4.8	4.5
74	Kauri Mtn 4	5.8	6.4
141	Kauri Mtn 5	6.3	3.0
127	The Nook 1	–	4.0
56	The Nook 2	6.1	–
128	The Nook 3	–	–
58	Nook Rd	–	7.0

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Appendix 2 continued

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	2017
Whangarei Heads																								
263	Craig Road	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6.0	14.1	12.3	9.3	13.5	12.3	10.6
75	McCleod Bay	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	9.6	5.9	8.8	7.4
	Maungatika Scenic Reserve 1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.0	0.9	0.4	0.8
	Owhiwa Road Kauri Villas	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019
Whangarei Heads			
263	Craig Road	14.3	3.0
75	McCleod Bay	7.3	–
	Maungatika Scenic Reserve 1	0.1	–
	Owhiwa Road Kauri Villas	0.4	–

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	2017
Southern																								
21	Glenbervie 7A	5.0	6.4	7.1	7.5	5.0	0.5	1.0	2.4	1.0	–	1.3	–	2.4	2.5	1.9	1.8	2.6	1.1	4.3	–	–	–	1.9
22	Glenbervie 9A	11.2	3.8	4.3	7.3	5.9	12.6	6.8	5.3	4.5	6.5	–	1.8	2.8	2.9	1.4	2.9	1.6	6.8	6.9	2.8	2.0	–	5.3
283	Glenbervie 10																							
284	Glenbervie 11																							
23	Marlow Road	22.4	13.9	14.0	17.8	19.8	21.3	22.9	–	19.8	17.6	12.1	10.0	13.3	11.1	10.3	7.3	13.1	15.4	14.0	18.4	20.1	18.8	21.1
24	Purua North	12.1	13.0	10.3	10.5	10.6	15.0	12.8	12.5	13.3	10.9	12.6	13.6	18.3	9.9	13.5	10.0	16.1	16.0	17.6	14.9	16.3	13.8	13.5

STN NO.	STATION NAME	2018	2019
Southern			
21	Glenbervie 7A	3.9	3.1
22	Glenbervie 9A	–	8.1
283	Glenbervie 10	–	2.5
284	Glenbervie 11	–	2.4
23	Marlow Road	18.4	16.4
24	Purua North	–	11.0

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Appendix 2 continued

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	2017
Southern																								
25	Rarewarewa – early listen	–	–	–	8.0	10.4	4.6	7.0	6.5	4.6	5.9	5.6	4.8	6.0	–	–	–	–	–	–	–	–	–	–
25	Rarewarewa South	7.5	8.0	8.5	6.6	8.3	6.6	7.0	5.8	6.5	6.6	5.3	6.3	6.6	6.4	8.9	4.0	7.9	6.5	4.6	7.5	7.5	9.1	11.3
26	Mimiwhangata	11.0	5.6	3.5	3.6	0.3	9.4	19.1	20.3	13.8	20.3	14.3	21.0	19.5	12.9	11.0	8.4	–	11.0	9.0	12.1	9.6	10.8	14.6
34	Motatau 1	–	–	–	–	8.8	–	10.0	15.0	6.8	7.5	5.6	6.5	7.5	8.8	6.0	–	4.9	2.5	–	–	4.9	–	–
35	Motatau 2								2.7	–	–	1.5	3.0	2.5	–	–	–	4.3	–	5.5	–	–	–	–
36	Motatau 3	–	–	–	–	–	–	4.8	1.5	2.8	5.5	3.5	4.6	4.0	0.9	–	–	5.5	–	–	–	–	–	–
38	Motatau 5	–	–	–	–	–	–	1.5	1.3	0.9	1.0	–	–	–	–	–	–	–	–	–	–	–	–	–
68	Motatatu 9 / Marlow 1	–	–	–	–	–	–	–	11.7	11.8	17.6	13.5	10.5	9.3	2.9	7.1	3.0	9.8	9.9	9.3	5.4	–	11.9	11.8
81	Purua South	–	–	–	–	–	–	–	–	14.8	15.9	14.4	14.1	14.6	10.5	12.5	11.1	17.5	10.8	7.3	18.6	9.5	7.3	11.5
82	Rarewarewa North	–	–	–	–	–	–	–	–	9.8	6.6	4.0	8.5	7.9	10.4	11.8	11.4	11.9	12.1	10.0	7.9	6.9	–	8.1
129	Motatau 10 / Marlow 2	–	–	–	–	–	–	–	–	–	7.1	7.5	10.9	9.0	5.8	2.2	3.4	5.0	5.4	7.8	2.3	4.5	3.9	5.9
139	Hodges Bush	–	–	–	–	–	–	–	–	–	–	9.8	13.0	16.1	17.8	15.5	16.6	9.5	13.8	28.6	22.0	23.1	11.8	16.0
145	Whangaruru	–	–	–	–	–	–	–	–	–	–	–	6.0	6.0	10.3	13.4	10.8	24.3	13.5	9.4	7.8	4.4	10.0	5.4
167	Kaikanui Rd	–	–	–	–	–	–	–	–	–	–	–	–	8.5	11.6	15.0	8.4	7.3	3.8	2.9	–	–	–	–

STN NO.	STATION NAME	2018	2019
Southern			
25	Rarewarewa – early listen	–	–
25	Rarewarewa South	10.3	12.9
26	Mimiwhangata	9.8	11.1
34	Motatau 1	–	–
35	Motatau 2	–	–
36	Motatau 3	–	10.5
38	Motatau 5	–	19.5
68	Motatatu 9 / Marlow 1	9.5	13.4
81	Purua South	29.8	5.9
82	Rarewarewa North	6.3	12.8
129	Motatau 10 / Marlow 2	5.2	6.0
139	Hodges Bush	15.5	–
145	Whangaruru	3.5	–
167	Kaikanui Rd	–	–

Continued on next page

Appendix 2 continued

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	2017
Southern																								
168	Worsp Rd	–	–	–	–	–	–	–	–	–	–	–	–	1.8	2.4	2.0	5.8	1.4	–	–	–	0.1	2.0	–
264	Whau Valley Dam	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.0	–	–	–	–	–	–
	Tanekaha 1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3.0
	Tanekaha 2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.1
	Hay Rd	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019
Southern			
168	Worsp Rd	–	–
264	Whau Valley Dam	–	–
	Tanekaha 1	–	–
	Tanekaha 2	–	–
	Hay Rd	1.7	–

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	2017
Pukenui																								
285	Pukenui Loop Track	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
286	Whau Valley Dam	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
287	Pukenui Loop by B Line	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
288	Steps on Loop Line (between N and O)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
289	Forest Edge Smithville	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019
Pukenui			
285	Pukenui Loop Track	–	0.5
286	Whau Valley Dam	–	0.3
287	Pukenui Loop by B Line	–	0.0
288	Steps on Loop Line (between N and O)	–	0.3
289	Forest Edge Smithville	–	1.8

Continued on next page

Appendix 2 continued

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	2017
Western																								
16	Katui	47.6	39.4	20.4	28.2	17.5	16.1	14.4	–	14.9	13.9	–	4.0	–	0.0	–	0.3	–	–	0.0	0.0	–	–	1.5
17	Trounson North	8.5	17.3	12.5	19.0	16.0	14.3	16.1	–	15.3	19.9	22.2	15.4	–	13.8	22.3	5.8	15.1	12.0	10.0	5.3	7.6	9.4	11.1
18	Cathedral	2.3	3.8	5.1	5.5	5.1	1.8	2.8	5.9	5.3	4.9	4.0	4.6	4.4	3.0	1.6	2.8	4.1	2.6	4.4	5.8	7.1	7.1	6.1
19	Waipoua L/Out	30.9	24.4	30.8	27.7	21.4	21.8	14.6	8.4	16.9	22.8	23.0	7.9	11.8	6.0	6.0	9.3	15.6	8.9	10.0	12.5	12.4	12.0	11.6
20	Paerata	9.9	1.3	3.1	6.5	2.8	3.1	1.3	–	0.0	–	–	–	0.9	1.1	1.6	0.3	0.4	1.1	0.3	0.6	–	–	–
31	Te Matua Ngahere	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3.3	4.1	–	–	–	–	1.2	–	3.4
33	Trounson South	–	–	–	–	–	–	12.3	–	23.8	19.1	–	–	8.2	8.9	–	11.1	12.3	10.0	6.0	7.8	7.8	10.5	5.9
79	Toronui Track	–	–	–	–	–	–	–	–	1.8	2.4	–	–	–	–	–	–	–	–	–	–	–	–	–
96	Kawerau Rd Cr	–	–	–	–	–	–	–	–	3.4	2.0	0.3	0.4	1.0	–	–	–	–	–	–	–	–	–	–
157	Opouteke CHH	–	–	–	–	–	–	–	–	–	–	–	6.6	6.1	2.8	11.3	–	–	–	–	–	–	–	–
158	Pipiwai CHH	–	–	–	–	–	–	–	–	–	–	–	7.3	0.5	1.5	–	–	–	–	–	–	–	–	–
179	Marlborough 13	–	–	–	–	–	–	–	–	–	–	–	–	–	6.5	–	–	–	–	–	–	–	–	–
244	Maunganui Bluff	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.0	–	–	–	–
265	River Road	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.0	–	–	–	2.6	–	5.0

STN NO.	STATION NAME	2018	2019
Western			
16	Katui	5.0	1.0
17	Trounson North	13.5	9.4
18	Cathedral	6.0	5.2
19	Waipoua L/Out	9.6	10.0
20	Paerata	–	–
31	Te Matua Ngahere	2.0	2.5
33	Trounson South	7.9	12.5
79	Toronui Track		
96	Kawerau Rd Cr		
157	Opouteke CHH		
158	Pipiwai CHH		
179	Marlborough 13		
244	Maunganui Bluff		
265	River Road		

Continued on next page

Appendix 2 continued

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	2017
Western																								
266	Wekaweka LC 1 (Alf's Cottage)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.2	–	–	–	–	–	–
267	Wekaweka LC 2 (Rob's Place)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.7	–	0.1
268	Wekaweka LC 3 (Libby's track)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.3	–	1.3
	Wekaweka (The drop)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Wekaweka (1052 Wekaweka Road)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
13b	Site 13	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5.1	–	–	–	–	–	–	–	–
14b	Site 14	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.0	–	–	–	–	–	–	–	–
16b	Marlborough Rd Site 16	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4.4	2.1	1.5	1.4	0.6	2.0	0.4	0.5	1.0
18b	Site 18	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.5	–	–	–	–	–	–	–	–
28b	Site 28 SH12	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6.3	8.9	3.6	4.1	5.1	–	7.6	4.5	8.4
30b	Site 30 SH12	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.0	3.0	0.9	–	–	–	1.5	–	–

STN NO.	STATION NAME	2018	2019
Western			
266	Wekaweka LC 1 (Alf's Cottage)		
267	Wekaweka LC 2 (Rob's Place)		
268	Wekaweka LC 3 (Libby's track)		
	Wekaweka (The drop)		
	Wekaweka (1052 Wekaweka Road)	–	0.6
13b	Site 13	–	–
14b	Site 14	–	–
16b	Marlborough Rd Site 16	0.0	1.0
18b	Site 18	–	–
28b	Site 28 SH12	5.1	6.5
30b	Site 30 SH12	0.4	–

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Appendix 2 continued

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	2017
Western																								
31b	Site 31	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.5	–	–	–	–	–	–	–	–
32b	Site 32	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.9	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019
Western			
31b	Site 31	–	–
32b	Site 32	–	–

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	2017
Tawharanui																								
161	TWN 1 Marine triangle	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8.2	0.5	–	1.3	2.3	2.9	2.6	4.0	4.4
162	TWN 2 Trig triangle	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.2	0.7	–	3.9	1.9	1.3	2.9	6.6	5.9
163	TWN 3 Top ecology track	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.5	0.3	–	1.6	2.0	4.6	6.0	5.0	4.5
164	TWN 4 Possum gully	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.0	0.0	–	2.8	1.4	8.0	2.8	4.6	2.4
165	TWN 5 Twin hills	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.2	0.0	–	2.3	1.9	3.3	3.5	6.8	7.3
166	TWN 6 South coast water tank	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.8	0.3	–	4.9	6.5	8.0	9.5	6.4	3.0

STN NO.	STATION NAME	2018	2019
Tawharanui			
161	TWN 1 Marine triangle	4.1	0.9
162	TWN 2 Trig triangle	10.8	7.9
163	TWN 3 Top ecology track	4.4	4.9
164	TWN 4 Possum gully	7.0	4.8
165	TWN 5 Twin hills	4.8	6.4
166	TWN 6 South coast water tank	12.6	11.6

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Appendix 2 continued

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	2017
Kawau Island																								
269	Bostaquet Bay	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5.57	–	–	–	–	–
270	South Cove	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.40	–	–	–	–	–
277	Skid 1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.8	1.1	2.3
278	Skid 2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.7	1.5	2.8
279	Harris Bay	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.1	3.1	3.5

STN NO.	STATION NAME	2018	2019
Kawau Island			
269	Bostaquet Bay	–	–
270	South Cove	–	–
277	Skid 1	2.4	3.5
278	Skid 2	2.8	2.2
279	Harris Bay	2.8	2.3

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	2017
Piroa																								
290	1 PBL Trig	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
291	2 Cullen	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019
Piroa			
290	1 PBL Trig	–	1.5
291	2 Cullen	–	1.8

Continued on next page

Appendix 2 continued

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	2017
Maranui																								
253	Marunui 1 (House 17 deck)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.1	2.6	4.3	3.3
275	Marunui 2 (Pebblebrook Rd)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.7	3.0	6.9

STN NO.	STATION NAME	2018	2019
Maranui			
253	Marunui 1 (House 17 deck)		
275	Marunui 2 (Pebblebrook Rd)		

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	2017
Mataia																								
254	Mataia 1 KLD (Top of fishing track)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.0	–	–	4.0
255	Mataia 2 KLD (Mid pa track)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.5	–	0.5	1.9
	Mataia 3 KLD (Cliffs)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.8	–
280	Mataia 4 (Quarry)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
281	Mataia 5 (Hooper's Bush)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019
Mataia			
254	Mataia 1 KLD (Top of fishing track)		
255	Mataia 2 KLD (Mid pa track)		
	Mataia 3 KLD (Cliffs)		
280	Mataia 4 (Quarry)		
281	Mataia 5 (Hooper's Bush)	–	2.3

Appendix 3

Summary of Northland kiwi listening data (calls/hr) for stations listened from in 2018

STN NO.	STATION NAME	LISTENER	1		2		3		4		TOTAL	MEAN
			1	*2*	*1*	*2*	*1*	*2*	*1*	*2*		
Northern												
7	Puketi	D. O'Halloran	3	9	4	5	10	6	15	7	59	7.38
8	Puketi SR	N. & E. Walker	15	8	16	12	13	9	12	14	99	12.38
Mangatete												
3	Lightning Hill	L. Baigent	8	19	11	14	11	6	32	27	128	16.00
256	Home drive	A. Baigent	21	6	13	8	9	8	15	3	83	10.38
Whakaangi												
135	Wha 7	B. Jarvis	5	4	1	4	0	1	8	3	26	3.25
136	Wha 8	G. Seon	0	0	7	2	0	1	0	0	10	1.25
137	Wha 9	D. Bell	0	2	3	2	2	2	1	2	14	1.75
140	Wha 11	M. & T. Aldrich / Vujcich	3	5	3	0	–	–	–	–	11	2.75
Mahinepua												
90	Site 0	S. Moore, S. Porter et al.	0	3	0	0	3	1	2	7	16	2.00
83	Site 1	M. Wilson et al.	3	3	0	2	2	0	1	6	17	2.13
84	Site 2	T. Kay, F. Craig et al.	2	3	1	2	2	0	3	9	22	2.75
85	Site 3	F. Barnes, J. Atwell et al.	15	7	3	3	5	0	11	2	46	5.75
88	Site 4	C. Pusch, T. Hawtin et al.	13	13	1	6	10	6	11	4	64	8.00
Eastern												
10	Marsden Cross	C. Hambrook	33	29	26	30	34	39	24	31	246	30.75
11	Puketotara	A. Kearney	11	9	20	18	15	19	18	19	129	16.13
12	Rangitane	A. Walker, D. Bayens-Wright, F. Corbett	5	5	11	7	7	14	20	12	81	10.13
13	Waitangi No. 12	D. Lawson	7	18	3	8	0	0	1	9	46	5.75
14	Mt Bledisloe	H. Harris	8	4	10	17	4	5	8	5	61	7.63
15	Tikitikikiore	L. Gordon	13	9	4	8	10	0	14	4	62	7.75
Bay of Islands												
186	Aroha Island	V. Pankhurst	7	5	2	4	5	5	6	4	38	4.75
232	Rhyolithic dome	ALD	0	1	0	1	0	0	0	0	2	0.25
231	500 m W of dome	ALD	0	1	0	1	2	0	1	0	5	0.63
219	Pukewhau	S. Wright	2	1	1	0	0	0	3	0	7	0.88
	390 Lodore Road	R. Hutchings	16	21	8	14	12	12	6	7	96	12.00
227	709 Puketotara	A. Kearney	17	3	18	13	11	6	15	9	92	11.50
	Paddock 35	J. Hutchings	4	15	4	15	9	16	4	6	73	9.13
	Rangihoura	L. Wright	25	27	48	35	37	37	27	39	275	34.38
226	Poulton	A. Mentor	9	8	7	1	10	11	15	11	72	9.00
58	Waitangi Forest / Te Puke	T. Holland	2	3	0	0	0	0	0	0	5	0.63
	The Landing – Villa	B. Michalick / A. Apiatia	30	28	58	35	35	20	13	12	231	28.88
	The Landing – Twin tanks	D. Hawker / R. Frear	38	40	25	28	40	28	38	26	263	32.88
282	Palm Drive (new)	S. Rogers	0	0	1	0	2	2	1	1	7	0.88
Russell												
59	Opito Farms	S. Sharp	13	8	3	16	17	6	13	5	81	10.13
60	Te Maiki / Flagstaff	L. Alexander	4	7	6	1	11	0	6	4	39	4.88
62	Uruti Road	C. Richmond	8	17	7	15	10	8	19	11	95	11.88

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Appendix 3 continued

STN NO.	STATION NAME	LISTENER	1		2		3		4		TOTAL	MEAN
			1	*2*	*1*	*2*	*1*	*2*	*1*	*2*		
170	Nikau Block	L. Gordon	9	8	5	3	5	5	–	–	35	5.83
171	Mace/Farmer	M. Cadogan	23	13	19	16	30	29	18	7	155	19.38
172	Pipiroa	M. Pasco	12	0	9	3	8	5	9	10	56	7.00
173	Shortlands	M. Cadogan	2	2	4	1	0	0	2	0	11	1.38
174	Johnsons	M. Frankum	2	5	8	2	8	5	4	11	45	5.63
	Solomons Gate	P. Sharpe	7	7	4	6	7	4	6	3	44	5.50
	Ngaiotonga	ALD	4	2	3	5	12	1	4	0	31	3.88
Puketi Forest												
102	Bramley's Ridge	G. Adams, S. Manunui, A. Linton	2	0	1	1	1	3	0	0	8	1.00
103	Pirau Road	ALD	1	1	0	2	0	2	4	8	18	2.25
104	Pond	I. Wilson et al.	12	3	2	3	12	7	5	5	49	6.13
106	Takapau Track	P. Hodgson	1	8	6	8	5	1	8	6	43	5.38
107	Takapau / Pirau Rd Jn	J. Mortensen et al.	0	0	2	0	1	10	0	0	13	1.63
108	Totara Ridge	A. Blackmore et al.	5	2	1	4	6	6	16	3	43	5.38
109	Waihoanga Gorge	C. & R .Robinson	6	11	8	3	11	7	6	5	57	7.13
111	Walnut	G. Adams, S. Manunui, A. Blackmore	0	1	5	4	8	3	2	2	25	3.13
112	Stoat line 9 – Puketi	I. Wilson et al.	7	4	4	8	6	2	1	0	32	4.00
259	Nature Trail	B. Sutton et al.	1	0	3	9	2	5	3	3	26	3.25
Hupara												
258	HLC 1	S. Brown	29	23	14	20	30	28	24	25	193	24.13
257	HLC 4	S. Brown	5	10	9	14	10	19	11	12	90	11.25
Waimate North												
114	W2	C. Matthews	5	8	6	2	4	5	5	19	54	6.75
116	W4	H. Horrobin	8	9	5	7	3	2	14	13	61	7.63
118	W6	D. Way	11	7	6	8	6	14	11	15	78	9.75
120	W8	A. Chiaroni et al.	6	8	4	3	6	8	2	4	41	5.13
122	W10	D. Way, K. Ferris, J. Little	3	6	9	14	12	5	4	3	56	7.00
124	W12	D. Way	10	4	9	4	12	4	11	8	62	7.75
Sandy Bay												
27	Sandy Bay 1	N. Pullman	0	2	2	4	9	7	2	3	29	3.63
260	Sandy Bay 2	ALD	1	1	2	2	1	3	4	5	19	2.38
261	Sandy Bay 3	ALD	1	3	1	1	1	2	1	3	13	1.63
292	Sandy Bay Farms	ALD	6	6	6	9	4	5	5	8	49	6.13
Tutukaka												
125	TLC 1	M. Camm	13	9	14	8	14	14	14	14	100	12.50
28	TLC 4	S. Seitzer	9	13	20	9	10	4	9	7	81	10.13
293	Te Toiroa	ALD	9	2	3	4	5	2	12	4	41	5.13
Whangarei Heads												
39	Bream Head 1	R. & W. Newbold	11	9	7	5	–	–	–	–	32	8.00
41	Bream Head 3	O. Petel	2	5	2	2	3	2	6	2	24	3.00
42	Bream Head 4	T. Hall	7	3	5	8	11	7	7	6	54	6.75
54	Kauri Mt 1	J. Nairn	6	3	4	1	6	4	4	8	36	4.50
72	Kauri Mt 2	ALD	4	5	5	6	6	2	6	5	39	4.88
74	Kauri Mt 4	G. & R. Faber	1	1	8	3	5	0	8	10	36	4.50
141	Kauri Mt 5	L. Brown	5	6	7	4	8	5	6	10	51	6.38
47	Manaia 1	L. Ogle	5	3	3	2	5	7	4	7	36	4.50
48	Manaia 2	F. Clayton, Z. Bell	11	12	7	13	2	12	3	11	71	8.88
71	Manaia 8	W. Fieldhouse, L. Penney	3	1	2	2	2	4	0	0	14	1.75
127	Nook 1	ALD	3	3	5	1	4	2	5	1	24	3.00

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Appendix 3 continued

STN NO.	STATION NAME	LISTENER	1		2		3		4		TOTAL	MEAN
			1	*2*	*1*	*2*	*1*	*2*	*1*	*2*		
56	Nook 2	C. Brown	1	1	4	6	5	7	7	1	32	4.00
45	Taurikura 2	G. Pike, R. Dean	8	14	10	3	9	8	4	11	67	8.38
46	Taurikura 3	K. Lange	6	2	6	1	3	7	5	2	32	4.00
263	Craig Rd	T. Hamilton, C. & J. McNamara	9	7	12	2	3	3	11	9	56	7.00
75	McLeod Bay	W. & V. Biddle	6	2	7	1	0	2	–	–	18	3.00
Southern												
21	Glenbervie 7A	ALD	14	5	1	0	4	0	1	0	25	3.13
22	Glenbervie 9A	ALD	11	8	4	16	5	10	6	5	65	8.13
283	Glenbervie 10 (new)	ALD	0	2	0	5	6	0	4	2	19	2.38
284	Glenbervie 11 (new)	ALD	1	1	2	2	4	4	3	3	20	2.50
26	Mimiwhangata	R. Taylor	14	9	13	1	12	18	11	11	89	11.13
68	Motatau 9	N. Hawkins	17	14	6	8	11	7	–	–	63	10.50
24	Purua N	R. Riegel	5	9	11	17	21	10	9	6	88	11.00
81	Purua S	J. Brady	19	24	16	17	19	23	20	18	156	19.50
25	Rarewarewa N	C. Robles	15	8	9	10	13	16	21	15	107	13.38
82	Rarewarewa S	C. Robles	13	9	18	10	13	13	19	8	103	12.88
129	Motatau 10	I. King	6	10	1	7	0	7	5	11	47	5.88
139	Hodges	G. Lovell	18	6	21	3	20	8	15	11	102	12.75
23	Marlow Road	C. Robles	5	11	19	16	24	19	26	11	131	16.38
145	Whangaruru	R. & D. Hughs	12	8	6	3	4	3	-	-	36	6.00
Pukenui												
285	Pukenui Loop Track	J. Brady	1	0	–	–	–	–	–	–	1	0.50
286	Whau Valley Dam	J. Brady / A. Wiles	0	0	1	0	0	1	–	–	2	0.33
287	Pukenui Loop – B line	T. Cook	0	0	–	–	–	–	–	–	0	0.00
288	1st steps N & O lines	T. Cook / K. Hackett	1	0	0	0	–	–	–	–	1	0.25
289	Forest edge Smithville	B. Lovell	3	1	3	0	–	–	–	–	7	1.75
Piroa												
290	1 PBL Trig	A .Neill	0	0	3	4	3	1	0	1	12	1.50
291	2 Cullen	P. Hunt	1	0	1	2	1	4	3	2	14	1.75
Western												
16	Katui	A. Meduna	0	1	0	3	2	0	-	-	6	1.00
17	Trounson Nth	M. Leach / A. McLeod	16	10	12	13	4	6	8	6	75	9.38
18	Cathedral	J. McLaughlin	4	8	7	6	4	0	3	6	38	5.24
19	Lookout	O. Knox	17	10	16	8	3	6	-	-	60	10.00
31	Te Matua Ngahere	K. Donovan	2	8	3	0	5	0	2	0	20	2.50
33	Trounson Sth	R. Booth	12	5	10	13	14	15	18	13	100	12.50
16b	Malborough Rd Site 16	M. Calder	0	0	0	2	3	1	-	-	6	1.00
28b	Site 28 SH12	M. Topia	6	5	8	2	10	8	-	-	39	6.50
267	Wekaweka LC 2 (Rob's Place)	R. Anderton	1	0	0	3	2	1	0	1	8	1.00
268	Wekaweka LC 3 (Libby's track)	L. Hooten	1	0	1	1	1	0	1	1	6	0.75
	1052 Wekaweka Road	A. Keall	1	1	1	0	1	0	1	0	5	0.63
Tawharanui												
161	TWN 1 Marine triangle	M. Vanderkolk et al.	5	1	0	0	0	1	0	0	7	0.88
162	TWN 2 Trig triangle	M. Wakefield et al.	11	4	4	11	5	6	9	13	63	7.88

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Appendix 3 continued

STN NO.	STATION NAME	LISTENER	1		2		3		4		TOTAL	MEAN
			1	*2*	*1*	*2*	*1*	*2*	*1*	*2*		
163	TWN 3 Top ecology track	M. Richardson et al.	6	6	0	4	7	11	2	3	39	4.88
164	TWN 4 Possum gully	C. Binstead et al.	2	3	2	2	14	3	7	5	38	4.75
165	TWN 5 Twin hills	D. Moody et al.	6	7	5	7	1	7	14	4	51	6.38
166	TWN 6 South coast water tank	R. Williams et al.	13	8	11	16	12	7	16	10	93	11.63
Marunui												
253	House 17 Deck	J. Hawley et al.	5	2	3	2	2	8	6	1	29	3.63
Mataia												
254	Mataia 1	ALD	8	5	5	6	1	6	4	2	37	4.63
255	Mataia 2	ALD	2	1	0	2	5	2	6	3	21	2.63
280	Mataia 4 (Quarry)	ALD	2	7	2	3	2	3	2	3	24	3.00
281	Mataia 5 (Hooper's)	ALD	0	5	2	–	–	–	–	–	7	2.33
Kawau Island												
277	Skid 1	ALD	5	0	6	4	6	2	4	1	28	3.50
278	Skid 2	ALD	1	0	5	2	3	2	–	–	13	2.17
279	Harris Bay	ALD	1	0	3	4	4	0	4	2	18	2.25

Appendix 4

Trends in mean kiwi call rates (calls/hr) from annual monitoring at selected stations of managed Northland kiwi populations

AREA	NO. STNs	STATION NUMBERS	2017 STATION NUMBERS	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Mangatete	2	3, 256	3, 256	–	–	–	–	–	–	–	–	–	–	–	11.0	15.9	17.9	15.9	17.6	13.2
Honeymoon Valley	4	271–274	No data for 2019	–	–	–	–	–	–	–	–	–	–	–	–	1.5	–	–	–	–
Whakaangi	7–9	29, 130–137	135, 136, 137	–	–	11.8	10.7	10.1	10.8	11.7	12.2	10.9	9.9	7.3	6.5	8.1	4.7	4.0	4.0	2.1
Mahinepua-Radar Hill	8	83–85, 87–89, 98, 99	83, 84, 85, 88	–	3.6	2.8	4.9	2.7	1.9	2.5	4.7	5.5	10.2	6.7	5.7	6.5	7.8	7.5	11.0	4.7
Russell Peninsula	5	15, 59, 62, 170, 173	15, 59, 62, 170, 173	–	–	4.5	4.0	7.0	5.4	4.6	5.5	11.5	9.8	11.4	12.8	13.8	19.7	11.3	16.5	7.4
Puketi Forest	6	102, 104–106, 108, 111	102, 104, 106, 108, 111	–	–	–	2.9	1.2	1.5	3.7	3.0	4.3	4.1	3.6	5.7	2.9	4.2	3.5	6.0	4.2
Hupara	3–4	245, 246, 257, 258	257, 258	–	–	–	–	–	–	–	–	–	–	18.5	14.7	16.7	21.8	16.8	22.3	17.7
Waimate North	6	113, 114, 118, 120, 122, 124	114, 118, 120, 122, 124	–	10.5	4.3	–	6.8	6.5	4.7	8.1	9.0	8.4	6.6	8.6	8.1	7.6	7.8	10.9	7.3
Sandy Bay	3	27, 260, 261	27, 260, 261	–	–	–	–	–	–	–	3.3	–	4.2	4.3	3.7	4.5	6.9	7.0	4.9	2.5
Tutukaka	6	125, 126, 142, 143, 144, 28	125, 28	–	–	6.2	7.3	8.2	8.7	5.7	6.8	7.0	10.2	9.6	6.3	7.5	9.9	15.3	12.5	11.0
Manaia-Nook	5	47–49, 56, 71	47, 48, 56, 71	3.1	3.5	2.9	3.9	–	4.6	4.4	6.3	7.3	7.8	6.4	6.8	5.8	8.2	8.8	9.0	4.8
Kauri Mountain	5	54, 72–74,141	54, 72, 74, 141	–	–	3.3	2.2	–	2.6	3.0	2.5	4.1	4.0	3.8	5.0	5.4	7.7	7.1	5.5	5.1
Bream Head-Taurikura	5	39, 41, 42, 44, 69	39, 41, 42	–	–	2.5	2.6	2.2	3.2	4.3	2.7	6.6	7.1	8.7	6.2	7.5	6.9	5.8	6.9	5.9
Motatau-Marlow	6	23, 34–36, 68, 129	23, 68, 129	–	–	7.3	7.6	7.5	4.9	6.4	4.5	7.1	8.3	9.1	8.7	9.8	11.5	12.9	11.0	10.9
Purua-Rarewarewa	5	24, 25, 81, 82, 139	24, 25, 81, 82, 139	–	–	9.2	11.1	12.7	10.9	12.4	10.6	12.6	11.8	13.6	14.2	12.7	10.5	12.1	15.4	13.9
Waipoua	5	16–19, 33	16–19, 33	13.1	15.4	15.8	8.0	8.9	5.7	7.5	4.5	11.8	8.4	6.1	5.6	8.7	9.8	7.3	8.4	7.6
Tawharanui	6	161–166	161–166	–	–	–	–	–	–	2.3	0.3	–	2.8	2.65	4.7	4.5	5.6	4.6	7.3	6.1
Maranui	2	253, 275	Insufficient data	–	–	–	–	–	–	–	–	–	–	–	1.1	2.2	3.6	5.1	4.6	–
Mataia	2	254, 255	254, 255	–	–	–	–	–	–	–	–	–	–	–	1.3	–	1.1	2.9	–	3.6
Kawau	3	277, 278, 279	277, 278, 279	–	–	–	–	–	–	–	–	–	–	–	–	1.9	1.9	2.9	2.7	2.7

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.