



# Annual freshwater quality monitoring report for the Wellington region, 2006/07

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# Contents

<b>1.</b>	<b>Introduction</b>	<b>1</b>
<b>2.</b>	<b>Overview of RSoE monitoring programme</b>	<b>2</b>
2.1	Background	2
2.2	Monitoring objectives	2
2.3	Monitoring sites	2
2.4	Water quality variables	4
2.5	Biological monitoring	4
<b>3.</b>	<b>Physico-chemical and microbiological water quality</b>	<b>5</b>
3.1	Introduction	5
3.1.1	Cautionary note	5
3.2	Water quality index	5
3.3	Results	6
<b>4.</b>	<b>Periphyton</b>	<b>9</b>
4.1	Introduction	9
4.1.1	Cautionary note	9
4.2	Results	9
<b>5.</b>	<b>Macroinvertebrates</b>	<b>12</b>
5.1	Introduction	12
5.1.1	Cautionary note	12
5.2	Results	12
<b>6.</b>	<b>Summary</b>	<b>15</b>
<b>7.</b>	<b>References</b>	<b>16</b>
<b>8.</b>	<b>Acknowledgements</b>	<b>17</b>
	<b>Appendix 1: RSoE monitoring sites</b>	<b>18</b>
	<b>Appendix 2: Water quality variables and analytical methods</b>	<b>19</b>
	<b>Appendix 3: Biological monitoring methods</b>	<b>20</b>
	<b>Appendix 4: Physico-chemical and bacteriological data</b>	<b>21</b>
	<b>Appendix 5: Macroinvertebrate indices</b>	<b>37</b>



## 1. Introduction

Greater Wellington Regional Council (Greater Wellington) manages water quality in lakes, rivers and streams of the Wellington region for natural state, public water supply, recreation and amenity, fish spawning, and aquatic ecosystem health. Regular monitoring of physico-chemical and microbiological water quality, together with assessments of ecosystem health, are integral in managing water for these purposes.

Greater Wellington conducts a range of freshwater quality monitoring, including routine state of the environment monitoring (56 river and stream sites), recreational water quality monitoring (20 sites), lake monitoring (four sites on Lake Wairarapa), and monitoring associated with a pilot riparian rehabilitation programme (8 stream sites). In addition, where warranted, targeted water quality investigations are carried out (e.g., Warr 2007).

This report summarises the results of the Rivers State of the Environment (RSoE) monitoring programme for July 2006 to June 2007 inclusive. A report containing a detailed analysis of long-term trends is produced every six years (see Milne and Perrie 2005). Recreational water quality monitoring results are reported on separately (see Milne 2007).

## **2. Overview of RSoE monitoring programme**

### **2.1 Background**

Surface water quality has been routinely monitored in the western half of the Wellington region since 1987 and in the Wairarapa since 1991. The monitoring programme has continued to evolve since this time with changes made to the location and number of monitoring sites, the range of variables monitored, and the methods of analysis. These changes have been made to improve the representativeness and quality of the information collected (Milne and Perrie 2005).

### **2.2 Monitoring objectives**

The aims of Greater Wellington's Rivers State of the Environment (RSoE) water quality monitoring programme are to:

1. Assist in the detection of spatial and temporal changes in fresh waters.
2. Contribute to our understanding of freshwater biodiversity in the region.
3. Determine the suitability of fresh waters for designated uses.
4. Provide information to assist in targeted investigations where remediation or mitigation of poor water quality is desired.
5. Provide a mechanism to determine the effectiveness of policies and plans.

### **2.3 Monitoring sites**

There are 56 river and stream sites currently monitored under the RSoE programme (Figure 2.1, Appendix 1). These sites were chosen to represent the natural diversity of rivers and streams, and the major land uses and human activities in the region.



## **2.4 Water quality variables**

River and stream water quality is assessed at monthly intervals by measuring a range of physico-chemical and microbiological variables: dissolved oxygen, temperature, pH, conductivity, visual clarity, turbidity, faecal indicator bacteria, total organic carbon, and dissolved and total nutrients. Periphyton cover at each site is also assessed at monthly intervals. The full list of variables monitored, together with details of field and analytical methods is provided in Appendix 2.

## **2.5 Biological monitoring**

Water quality in the region's rivers and streams is also assessed through annual biological monitoring, incorporating semi-quantitative assessments of the instream periphyton and macroinvertebrate communities during stable/low flows in summer/autumn. The record and scope of monitoring differs between sites (refer Milne and Perrie 2005); those sites with substrates comprised of soft sediment have only had macroinvertebrates assessed since 2003. The assessment of periphyton communities was also extended at this time to include quantitative assessments of chlorophyll *a* concentrations and ash free dry mass, and a semi-quantitative assessment of taxonomic richness. However, these assessments are limited to sites with hard bottomed substrates (e.g., cobbles, large gravel). See Appendix 1 for RSoE site substrate types. Details of current biological monitoring methods are summarised in Appendix 3.



### 3. Physico-chemical and microbiological water quality

#### 3.1 Introduction

This section uses a water quality index (WQI) to summarise water quality across the region. This assessment, and the data summaries presented in Appendix 4, are based on physico-chemical and microbiological data collected monthly from July 2006 to June 2007 (inclusive).

The WQI and data summaries are based on 12 sampling events for all 56 sites except in the case of the Totara Stream at Stronvar (11), Parkvale Tributary at Lowes Reserve (9), and Coles Creek Tributary at Lagoon Hill Road (10). These sites were inaccessible at certain times of the year due to either logging, lambing or safety precautions (i.e., poor weather resulting in dangerous farm track conditions). In addition, due to environmental conditions, or in some cases erroneous field records, not all sites have 12 data points for all variables assessed in the field.

During data processing, any water quality variables reported as less than or greater than detection limits were replaced by values one half of the detection limit or the detection limit respectively (e.g., a value of <2 became 1, a value of >400 became 400).

##### 3.1.1 Cautionary note

Some of the field measurements (conductivity, pH, temperature, and dissolved oxygen) recorded during 2006/07 should be used with care. For the majority of this period (the first ten months), less than accurate data were obtained as a result of the type of field meters being used, and how they were being used. This was evident by a number of measurements that were outside the known range for some of the long-term RSoE monitoring sites. As the reliability of the 2006/07 field measurements has yet to be fully determined, 5<sup>th</sup> and 95<sup>th</sup> percentile values are included in Appendix 4; these values are considered to provide a more realistic range of the expected variation in field measurements at RSoE sites than the minimum and maximum values.

#### 3.2 Water quality index

A water quality index (WQI), as described in Perrie (2007), is used to facilitate inter-site comparisons of the state of water quality in the region's rivers and streams. The WQI is derived from the *median* values for the following six variables: visual clarity (black disc), dissolved oxygen (% saturation), dissolved reactive phosphorus, ammoniacal nitrogen, nitrite-nitrate nitrogen and *Escherichia coli* (*E. coli*).

The application of the WQI enables water quality at each site to be classified into one of four categories as follows:

- Excellent: median values for all 6 variables comply with guideline values

- Good: median values for 5 of the 6 variables comply with guideline values, of which dissolved oxygen is one variable that must comply<sup>1</sup>
- Fair: median values for 3 or 4 of the 6 variables comply with guideline values, of which dissolved oxygen is one variable that must comply<sup>1</sup>
- Poor: median values for <3 of the 6 variables comply with guideline values.

The guidelines used to assess the compliance of median values for the six key water quality variables in WQI are listed in Table 3.1. Refer to Perrie (2007) for further discussion on these guidelines.

Table 3.1: Physico-chemical and microbiological variables and guideline values

Variable	Guideline Value	Reference
Dissolved Oxygen (% saturation)	≥80	RMA 1991 Third Schedule
Visual Clarity (m)	≥1.6	MFE (1994)
Nitrite-Nitrate Nitrogen (mg/L)	≤0.444	ANZECC & ARMCANZ (2000)
Ammoniacal Nitrogen (mg/L)	≤0.021	ANZECC & ARMCANZ (2000)
Dissolved Reactive Phosphorus (mg/L)	≤0.010	ANZECC & ARMCANZ (2000)
<i>E. coli</i> (cfu/100 mL)	≤100	ANZECC & ARMCANZ (2000)

### 3.3 Results

Application of the WQI resulted in the following overall water quality grades for the 56 RSoE sites monitored in the Wellington region over the July 2006 to June 2007 reporting period (Figure 3.1):

- Excellent: 19 sites (33.9 %)
- Good: 7 sites (12.5 %)
- Fair: 15 sites (26.7 %)
- Poor 15 sites (26.7 %)

The majority of RSoE sites graded “excellent” (16 of 19 sites) are located on hill-fed river and stream reaches under predominantly unmodified indigenous forest cover (refer Appendix 1 for dominant land cover). These tend to be sites on rivers flowing out of the Aorangi, Tararua and Rimutaka ranges and include the Otaki, Waikanae, Waingawa and Tauherenikau rivers, and the upper reaches of the Waitohu, Hutt, Wainuiomata Waiohine and Ruamahanga rivers.

In contrast, RSoE sites graded “poor” were all located on low elevation reaches – predominantly small streams – draining pastoral (9 sites) or urban (6 sites) catchments. Sites with the poorest water quality include the Mangaone, Mangapouri, Ngarara and Mangaterere streams, and the Whangaehu River.

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<sup>1</sup> If the median dissolved oxygen concentration does not comply with the guideline value, then the WQI grade automatically drops to “poor”.

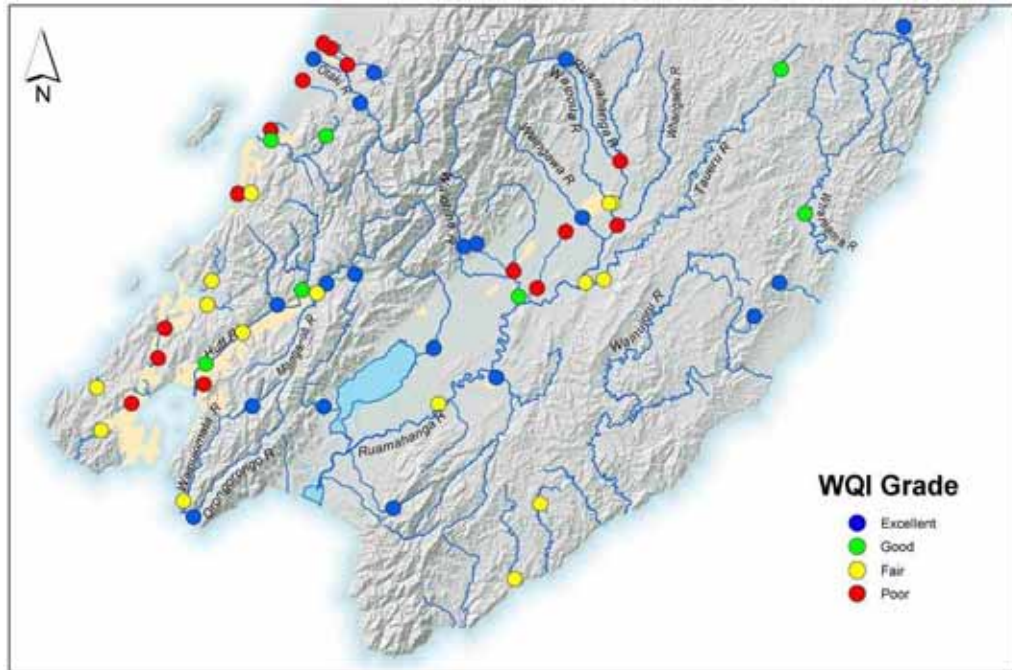


Figure 3.1: Water Quality Index grades for RSoE sites monitored at monthly intervals over June 2006 to July 2007, based on compliance of median dissolved oxygen, visual clarity, nitrite-nitrate nitrogen, ammoniacal nitrogen, dissolved reactive phosphorus and *E. coli* values with guideline values

As outlined earlier in Section 3.2, the WQI is for comparative purposes rather than an absolute measure of water quality; sites with a grade of “good”, “fair”, or “poor” are all considered degraded because the median value of at least one of the six physico-chemical or microbiological variables in the WQI exceeded a guideline value. In addition, as the WQI is based on median values (i.e., 50 % compliance), sites awarded the same water quality grade may exhibit varying degrees of compliance (from 51 to 100 %) with the guideline value, and so while two sites may fall within the same WQI class they may differ in actual water quality. Therefore to differentiate between “better” and “poorer” sites within a water quality grade, in Table 3.2 the sites within each WQI grade have been ranked based on the number of guideline exceedances for each of the six key variables (i.e., a site that exceeded a guideline on 40% of sampling occasions will be ranked lower than a site with the same WQI grade that exceeded the guideline on 10% of sampling occasions).

The water quality variables that most commonly exceeded guideline values (based on median values) were *E. coli* bacteria (28 sites failed), followed by visual clarity (26 sites failed), and dissolved reactive phosphorus (23 sites failed).

Table 3.2: Water Quality Index grades for RSoE sites monitored at monthly intervals over June 2006 to July 2007 inclusive, based on compliance of median dissolved oxygen, visual clarity, nitrite-nitrate nitrogen, ammoniacal nitrogen, dissolved reactive phosphorus and *E. coli* values with guideline values

Rank	Site No.	Site Name	Guideline Compliance (median values)					
			DO	Clarity	<i>E. coli</i>	NNN	Amm. N	DRP
<i>Excellent water quality</i>								
1	RS28	Wainuiomata R at Manuka Track	✓	✓	✓	✓	✓	✓
2	RS43	Motuwaireka S at Headwaters	✓	✓	✓	✓	✓	✓
3	RS31	Ruamahanga R at McLays	✓	✓	✓	✓	✓	✓
4	RS49	Beef Ck at Headwaters	✓	✓	✓	✓	✓	✓
5	RS44	Totara St at Stronvar	✓	✓	✓	✓	✓	✓
6	RS30	Orongorongo R at Orongorongo Stn	✓	✓	✓	✓	✓	✓
7	RS47	Waiohine R at Gorge	✓	✓	✓	✓	✓	✓
8	RS26	Whakatikei R at Riverstone	✓	✓	✓	✓	✓	✓
9	RS20	Hutt R at Te Marua Intake Site	✓	✓	✓	✓	✓	✓
10	RS41	Waingawa R at South Rd	✓	✓	✓	✓	✓	✓
11	RS56	Waiorongomai R at Forest Pk	✓	✓	✓	✓	✓	✓
12	RS52	Tauanui R at Whakatomotomo Rd	✓	✓	✓	✓	✓	✓
13	RS23	Pakuratahi R 50m d/s Farm Ck	✓	✓	✓	✓	✓	✓
14	RS03	Waitohu S at Forest Pk	✓	✓	✓	✓	✓	✓
15	RS55	Tauherenikau R at Websters	✓	✓	✓	✓	✓	✓
16	RS05	Otaki R at Pukehinau	✓	✓	✓	✓	✓	✓
17	RS06	Otaki R at Mouth	✓	✓	✓	✓	✓	✓
18	RS35	Mataikona Trib. at Sugar Loaf Rd	✓	✓	✓	✓	✓	✓
19	RS51	Huangarua R at Ponatahi Br	✓	✓	✓	✓	✓	✓
<i>Good water quality</i>								
20	RS25	Akatarawa R at Hutt confl.	✓	✓	x	✓	✓	✓
21	RS09	Waikanae R at Mangaone Walkway	✓	✓	✓	✓	✓	x
22	RS22	Hutt R at Boulcott	✓	✓	x	✓	✓	✓
23	RS10	Waikanae R at Greenaway Rd	✓	✓	✓	✓	x	✓
24	RS42	Whareama R at Gauge	✓	x	✓	✓	✓	✓
25	RS36	Taueru R at Castlehill	✓	x	✓	✓	✓	✓
26	RS48	Waiohine R at Bicknells	✓	✓	✓	✓	✓	x
<i>Fair water quality</i>								
27	RS21	Hutt R opp. Manor Park G.C.	✓	x	x	✓	✓	✓
28	RS53	Awhea R at Tora Rd	✓	x	x	✓	✓	✓
29	RS54	Coles Ck trib at Lagoon Hill Rd	✓	x	✓	✓	x	✓
30	RS32	Ruamahanga R at Te Ore Ore	✓	x	x	✓	✓	✓
31	RS40	Waipoua R at Colombo Rd Br	✓	✓	x	x	✓	✓
32	RS13	Horokiri S at Snodgrass	✓	✓	x	✓	✓	x
33	RS29	Wainuiomata R u/s of White Br	✓	x	x	✓	✓	✓
34	RS34	Ruamahanga R at Pukio	✓	x	✓	✓	x	x
35	RS33	Ruamahanga R at Gladstone Br	✓	x	✓	✓	x	x
36	RS37	Taueru R at Gladstone	✓	x	x	x	✓	✓
37	RS24	Mangaroa R at Te Marua	✓	x	x	x	✓	✓
38	RS14	Pauatahanui S at Elmwood Br	✓	x	x	✓	✓	x
39	RS17	Makara S at Kennels	✓	x	x	✓	✓	x
40	RS11	Whareroa S at Waterfall Rd	✓	x	x	✓	✓	x
41	RS18	Karori S at Makara Peak	✓	✓	x	x	✓	x
<i>Poor water quality</i>								
42	RS45	Parkvale Trib at Lowes Res.	x	✓	✓	x	✓	x
43	RS15	Porirua S at Glenside	✓	x	x	x	✓	x
44	RS38	Kopuaranga R at Stewarts	✓	x	x	x	✓	x
45	RS19	Kaiwharawhara S at Ngaio Gorge	✓	✓	x	x	x	x
46	RS01	Mangapouri S at Rahui Rd	✓	x	x	x	x	✓
47	RS46	Parkvale S at Weir	✓	x	x	x	✓	x
48	RS39	Whangaehu R 250m u/s confl.	✓	x	x	x	✓	x
49	RS50	Mangatarere S at SH 2	✓	✓	x	x	x	x
50	RS12	Whareroa S at QE Park	✓	x	x	✓	x	x
51	RS16	Porirua S at Wall Park (Milk Depot)	✓	x	x	x	x	x
52	RS27	Waiwhetu S at Wainui Hill Br	x	x	x	✓	x	x
53	RS08	Ngarara S at Field Way	x	x	x	✓	x	x
54	RS04	Waitohu S at Norfolk Cres	✓	x	x	x	x	x
55	RS07	Mangaone S at Sims Rd Br	✓	x	x	x	x	x
56	RS02	Mangapouri S at Bennetts Rd	x	x	x	x	x	x

## 4. Periphyton

### 4.1 Introduction

Assessment of periphyton data is limited to RSoE sites with hard bottomed substrates (46 of the 56 sites). Monthly observations of percent periphyton streambed cover, from July 2006 to June 2007 inclusive, and an assessment of periphyton biomass (chlorophyll *a* and Ash Free Dry Mass (AFDM)) undertaken during macroinvertebrate sampling over late summer/early autumn 2007 are compared against various MfE (2000) guidelines (Table 4.1).

Table 4.1: Guidelines used to assess periphyton stream bed cover and biomass (MfE 2000)

Instream value/variable	Mat periphyton	Filamentous periphyton
<i>Aesthetics/recreation</i>		
Maximum cover of visible stream bed	60% >0.3 cm thick	30% > 2 cm long
<i>Benthic biodiversity</i>		
Maximum chlorophyll <i>a</i>	50 mg/m <sup>2</sup>	50 mg/m <sup>2</sup>
<i>Trout habitat and angling</i>		
Maximum AFDM (mg/m <sup>2</sup> )	35 mg/m <sup>2</sup>	35 mg/m <sup>2</sup>
Maximum cover of visible stream bed	N/A	30% > 2 cm long

#### 4.1.1 Cautionary note

There is some variability in the quality of Greater Wellington's RSoE periphyton records. A comprehensive quality assurance audit of RSoE fieldsheets and database entries is to be undertaken in 2007/08. This audit is likely to result in some changes in the *stream bed cover* data presented in this report. These changes will be reflected in future RSoE reporting.

### 4.2 Results

The number of observations of periphyton stream bed cover varied among the 46 RSoE sites assessed over the reporting period with some sites missing up to nine of the possible 12 observations due to either turbid water, high flows or, on occasion, field recording errors.

Of the 46 RSoE sites, 13 exceeded the MfE (2000) guideline for filamentous periphyton stream bed cover. Most sites (nine) exceeded the guideline on just one occasion (Table 4.2). Exceedance of MfE (2000) guideline for mat-forming periphyton cover occurred at 11 RSoE sites during the reporting period, with most sites (seven) exceeding the guideline on just one occasion (Table 4.2).

Eleven RSoE sites exceeded the MfE (2000) chlorophyll *a* guideline for benthic biodiversity and two sites exceeded the MfE (2000) AFDM guideline for trout habitat and angling (Table 4.3).

Table 4.2: Summary of monthly observations at RSoE sites, over July 2006 to June 2007 inclusive, of visible stream bed cover for filamentous and mat-forming periphyton in relation to exceedances of the MfE (2000) guidelines

Site No.	Site Name	Stream bed cover (%)					
		Filamentous (>2 cm long)			Mats (>0.03 cm thick)		
		Max	n >30 % cover	n	Max	n >60 % cover	n
RS03	Waitohu S at Forest Pk	0	0	10	0	0	10
RS05	Otaki R at Pukehinau	0	0	5	0	0	5
RS06	Otaki R at Mouth	0	0	4	0	0	4
RS09	Waikanae R at Mangaone Walkway	0	0	12	0	0	12
RS10	Waikanae R at Greenaway Rd	37	1	11	63.5	1	11
RS11	Whareroa S at Waterfall Rd	40	1	9	0	0	9
RS13	Horokiri S at Snodgrass	11	0	12	9.5	0	12
RS14	Pauatahanui S at Elmwood Br	0	0	4	0	0	4
RS15	Porirua S at Glenside	20	0	10	41	0	10
RS16	Porirua S at Wall Park (Milk Depot)	26	0	9	41.5	0	9
RS17	Makara S at Kennels	0	0	12	90	2	12
RS18	Karori S at Makara Peak	4	0	11	66	1	11
RS19	Kaiwharawhara S at Ngaio Gorge	53	1	12	57	0	12
RS20	Hutt R at Te Marua Intake Site	0	0	11	0	0	11
RS21	Hutt R opp. Manor Park G.C.	2.5	0	10	22.5	0	10
RS22	Hutt R at Boulcott	6	0	7	33	0	7
RS23	Pakuratahi R 50m d/s Farm Ck	20	0	10	19	0	10
RS24	Mangaroa R at Te Marua	0	0	10	52.5	0	10
RS25	Akatarawa R at Hutt confl.	1	0	12	0.5	0	12
RS26	Whakatikei R at Riverstone	0	0	12	18	0	12
RS28	Wainuiomata R at Manuka Track	0	0	12	5	0	12
RS29	Wainuiomata R u/s of White Br	0	0	5	0	0	5
RS30	Orongorongo R at Orongorongo Stn	19	0	10	12	0	10
RS31	Ruamahanga R at McLays	0	0	9	0	0	9
RS32	Ruamahanga R at Te Ore Ore	2	0	8	29	0	8
RS33	Ruamahanga R at Gladstone Br	4	0	8	0	0	8
RS34	Ruamahanga R at Pukio	39.5	1	6	0	0	6
RS35	Mataikona Trib at Sugar Loaf Rd	21	0	11	85	1	11
RS37	Taueru R at Gladstone	62	2	6	67	1	6
RS38	Kopuaranga R at Stewarts	0	0	3	6	0	3
RS40	Waipoua R at Colombo Rd Br	2	0	10	84	1	10
RS41	Waingawa R at South Rd	0	0	10	13	0	10
RS43	Motuwaireka S at Headwaters	5	0	11	87	2	11
RS44	Totara S at Stronvar	89	1	11	93.5	3	11
RS45	Parkvale Trib at Lowes Res.	0	0	6	0	0	6
RS46	Parkvale S at Weir	100	3	6	8.5	0	6
RS47	Waiohine R at Gorge	5	0	9	25	0	9
RS48	Waiohine R at Bicknells	34.5	1	8	0	0	8
RS49	Beef Ck at Headwaters	0	0	12	82	1	12
RS50	Mangatarere S at SH 2	1.5	0	9	99	3	9
RS51	Huangaaru R at Ponatahi Br	95	4	7	83	1	7
RS52	Tauanui R at Whakatomotomo Rd	74	1	11	0	0	11
RS53	Awhea R at Tora Rd	100	4	8	49	0	8
RS54	Coles Ck Trib at Lagoon Hill Rd	34	1	7	0	0	7
RS55	Tauherenikau R at Websters	7.5	0	8	0	0	8
RS56	Waiorongomai R at Forest Pk	34	1	11	0	0	11

Table 4.3: Summary of periphyton biomass (chlorophyll *a* and AFDM) measurements collected during late summer/ autumn of 2007. Non-compliance with MfE (2000) guidelines is highlighted in bold type

Site No.	Site Name	AFDM (g/m <sup>2</sup> )	Chlorophyll <i>a</i> (mg/m <sup>2</sup> )
RS03	Waitohu S at Forest Pk	0.96	3.11
RS05	Otaki R at Pukehinau	0.55	1.90
RS06	Otaki R at Mouth	11.34	20.88
RS09	Waikanae R at Mangaone Walkway	0.86	3.61
RS10	Waikanae R at Greenaway Rd	21.05	148.46
RS11	Whareroa S at Waterfall Rd	5.13	2.74
RS13	Horokiri S at Snodgrass	8.44	49.56
RS14	Pauatahanui S at Elmwood Br	31.18	113.98
RS15	Porirua S at Glenside	6.65	39.16
RS16	Porirua S at Wall Park (Milk Depot)	2.54	11.24
RS17	Makara S at Kennels	8.46	120.05
RS18	Karori S at Makara Peak	5.72	40.63
RS19	Kaiwharawhara S at Ngaio Gorge	10.83	87.60
RS20	Hutt R at Te Marua Intake Site	0.75	1.97
RS21	Hutt R opp. Manor Park G.C.	6.14	28.74
RS22	Hutt R at Boulcott	17.40	97.87
RS23	Pakuratahi R 50m d/s Farm Ck	1.91	16.04
RS24	Mangaroa R at Te Marua	13.30	57.93
RS25	Akatarawa R at Hutt confl.	0.52	2.02
RS26	Whakatikei R at Riverstone	3.71	20.13
RS28	Wainuiomata R at Manuka Track	2.46	8.75
RS29	Wainuiomata R u/s of White Br	9.07	31.22
RS30	Orongorongo R at Orongorongo Stn	1.61	6.18
RS31	Ruamahanga R at McLays	0.36	0.75
RS32	Ruamahanga R at Te Ore Ore	1.44	11.73
RS33	Ruamahanga R at Gladstone Br	7.13	45.99
RS34	Ruamahanga R at Pukio	7.33	62.94
RS35	Mataikona Trib at Sugar Loaf Rd	2.82	4.51
RS37	Taueru R at Gladstone	67.14	241.36
RS38	Kopuaranga R at Stewarts	36.80	173.32
RS40	Waipoua R at Colombo Rd Br	8.39	34.53
RS41	Waingawa R at South Rd	0.51	1.73
RS43	Motuwaireka S at Headwaters	6.31	10.68
RS44	Totara S at Stronvar	7.39	4.78
RS45	Parkvale Trib at Lowes Res.	15.85	78.23
RS46	Parkvale S at Weir	31.03	239.10
RS47	Waiohine R at Gorge	0.13	0.33
RS48	Waiohine R at Bicknells	4.03	27.07
RS49	Beef Ck at Headwaters	1.49	8.53
RS50	Mangatarere S at SH 2	8.34	54.90
RS51	Huangarua R at Ponatahi Br	4.58	44.89
RS52	Tauanui R at Whakatomotomo Rd	3.68	10.53
RS53	Awhea R at Tora Rd	27.83	139.62
RS54	Coles Ck Trib at Lagoon Hill Rd	17.16	61.32
RS55	Tauherenikau R at Websters	3.57	18.50
RS56	Waiorongomai R at Forest Pk	5.07	10.01

## 5. Macroinvertebrates

### 5.1 Introduction

This section presents the results of macroinvertebrate sampling undertaken at the 56 RSoE sites during late summer/early autumn 2007. The Macroinvertebrate Community Index (MCI) – an index of sensitivity to a complex of environmental variables (Stark and Maxted 2007) – is used to summarise macroinvertebrate health. Additional macroinvertebrate indices (QMCI, % EPT taxa, and taxa richness) are presented in Appendix 5. Refer to Perrie (2007) for further explanation on these indices.

The quality classification, as recommended by Stark and Maxted (2007), for interpretation of the MCI scores is outlined in Table 5.1. Soft bottomed MCI scores (MCI-sb) were calculated for the ten RSoE sites with soft bottomed substrates (see Appendix 1).

Table 5.1: Interpretation of MCI-type scores (Stark and Maxted 2007)

Quality Class	MCI and MCI-sb
Excellent	>119
Good	100-119
Fair	80-99
Poor	<80

#### 5.1.1 Cautionary note

No external quality assurance (QA) checks were performed on any of the macroinvertebrate samples collected in 2006/07.

### 5.2 Results

The MCI scores for three replicate samples collected at each site are summarised in Table 5.2 along with the mean score and standard deviation. Based on mean MCI scores, the 56 RSoE sites fell into the following MCI quality classes (Figure 5.1):

- Excellent: 14 sites (25 %)
- Good: 21 sites (37.5 %)
- Fair: 14 sites (25 %)
- Poor: 7 sites (12.5 %)

There was a reasonable correlation between the MCI quality classes and WQI grades. For example, of the 14 RSoE sites with an “excellent” MCI quality class, 11 had a WQI grade of “excellent”, and three a WQI grade of “good” (refer Section 3.3). Similarly, six of the 7 RSoE sites with an MCI quality class of “poor” also had a WQI grade of “poor”. The correlation between water quality and macroinvertebrate health was not so clear in the “good” and “fair” classes, with the macroinvertebrate monitoring results often indicating better water quality than the WQI.





Table 5.2: MCI scores for RSoE sites sampled in 2007 (three replicate samples per site) and the overall MCI quality class based on the mean MCI score from the replicate samples

Site No.	Site Name	Rep. 1	Rep. 2	Rep. 3	Mean	Std Dev.	MCI Quality Class
RS01	Mangapouri S at Rahui Rd	81	77	103	87	13.71	Fair
RS02	Mangapouri S at Bennetts Rd	86	60	65	70	13.90	Poor
RS03	Waitohu S at Forest Park	144	135	130	137	7.20	Excellent
RS04	Waitohu S at Norfolk Cres.	109	92	103	101	8.43	Good
RS05	Otaki R at Pukehinau	110	132	127	123	11.04	Excellent
RS06	Otaki R at Mouth	113	115	100	109	8.07	Good
RS07	Mangaone S at Sims Rd Br	67	59	56	61	6.00	Poor
RS08	Ngarara S at Field Way	71	76	78	75	3.32	Poor
RS09	Waikanae R at Mangaone Walkway	133	140	141	138	4.18	Excellent
RS10	Waikanae R at Greenaway Rd	110	119	122	117	6.54	Good
RS11	Whareroa S at Waterfall Rd	117	109	112	113	3.89	Good
RS12	Whareroa S at QE Park	72	73	79	75	3.53	Poor
RS13	Horokiri S at Snodgrass	117	107	109	111	5.57	Good
RS14	Pauatahanui S at Elmwood Br	101	91	85	92	8.28	Fair
RS15	Porirua S at Glenside	98	87	90	91	5.54	Fair
RS16	Porirua S at Wall Park (Milk Depot)	104	83	86	91	11.08	Fair
RS17	Makara S at Kennels	94	100	93	96	3.64	Fair
RS18	Karori S at Makara Peak	90	81	93	88	6.12	Fair
RS19	Kaiwharawhara S at Ngaio Gorge	94	100	93	96	3.90	Fair
RS20	Hutt R at Te Marua Intake Site	138	135	153	142	9.48	Excellent
RS21	Hutt R opp. Manor Park G.C.	109	106	97	104	6.35	Good
RS22	Hutt R at Boulcott	108	86	103	99	11.71	Fair
RS23	Pakuratahi R 50m d/s Farm Ck	127	126	128	127	1.31	Excellent
RS24	Mangaroa R at Te Marua	113	116	106	112	5.58	Good
RS25	Akatarawa R at Hutt Confl.	119	128	123	123	4.80	Excellent
RS26	Whakaitikei R at Riverstone	120	123	117	120	2.91	Excellent
RS27	Waiwhetu S at Wainui Hill Br	76	79	81	78	2.54	Poor
RS28	Wainuiomata R at Manuka Track	134	130	131	132	2.06	Excellent
RS29	Wainuiomata R u/s White Br	89	94	107	97	8.98	Fair
RS30	Orongorongo R at Orongorongo Stn	94	97	100	97	2.95	Fair
RS31	Ruamahanga R at McLays	156	146	145	149	6.32	Excellent
RS32	Ruamahanga R at Te Ore Ore	105	117	112	111	5.76	Good
RS33	Ruamahanga R at Gladstone Br	113	105	107	108	4.22	Good
RS34	Ruamahanga R at Pukio	106	109	108	108	1.61	Good
RS35	Mataikona Trib. at Sugar Loaf Rd	125	120	119	121	3.43	Excellent
RS36	Taueru R at Castlehill	124	128	130	127	3.34	Excellent
RS37	Taueru R at Gladstone	81	97	92	90	8.42	Fair
RS38	Kopuaranga R at Stewarts	103	109	110	107	3.85	Good
RS39	Whangaehu R 250m from Confl.	66	57	68	64	6.13	Poor
RS40	Waipoua R at Colombo Rd Br	106	111	107	108	2.52	Good
RS41	Waingawa R at South Rd	109	119	129	119	10.00	Good
RS42	Whareama R at Gauge	68	75	76	73	4.81	Poor
RS43	Motuwaireka R at Headwaters	127	125	126	126	1.25	Excellent
RS44	Totara S at Stronvar	95	103	92	97	5.26	Fair
RS45	Parkvale Trib. at Lowes Res.	100	101	103	101	1.71	Good
RS46	Parkvale S at Weir	90	89	89	89	0.50	Fair
RS47	Waiohine R at Gorge	129	137	140	135	5.44	Excellent
RS48	Waiohine R at Bicknells	112	110	96	106	8.68	Good
RS49	Beef S at Headwaters	135	128	129	131	3.39	Excellent
RS50	Mangatarere S at SH 2	102	105	109	105	3.45	Good
RS51	Huangaaru R at Ponatahi Br	104	107	99	104	4.22	Good
RS52	Tauanui S at Whakatomotomo Rd	124	110	118	118	7.26	Good
RS53	Awhea R at Tora Rd	84	88	87	86	1.85	Fair
RS54	Coles Trib. at Lagoon Hill Rd	101	103	115	106	7.88	Good
RS55	Tauherenikau R at Websters	106	111	107	108	2.29	Good
RS56	Waiorongomai R at Forest Pk	108	117	112	112	4.26	Good

## 6. Summary

Using the WQI, 19 of the 56 RSoE sites were allocated water quality grades of “excellent” for the 2006/07 reporting period. Seven sites scored grades of “good” and the remaining 30 sites were split evenly between “fair” and “poor” grades.

Of the 46 RSoE sites monitored for periphyton, 13 sites exceeded the MfE (2000) stream bed cover guidelines for filamentous growths at least once and 11 sites exceeded the guideline for mat growths on one or more occasions. Chlorophyll *a* guidelines for benthic biomass were exceeded at 11 sites while the AFDM guideline for trout habitat and angling was exceeded at two sites.

Based on MCI scores, the majority of the 56 RSoE sites received quality classifications of “good” (21 sites) or excellent (14 sites). Fourteen sites were classed as “fair” and seven sites were classed as “poor”.

Water quality and macroinvertebrate health is strongly influenced by land cover, with WQI and MCI scores highest at RSoE sites located on hill-fed river and stream reaches under predominantly unmodified indigenous forest cover. In contrast, RSoE sites with poor WQI and MCI scores were all located on low elevation reaches – predominantly small streams – draining pastoral or urban catchments.

Problems with field meters, varying data collection techniques and some erroneous field documentation meant that a number of the field measurements recorded during the 2006/2007 reporting period are of questionable quality. Greater Wellington will commence a review of the field information over 2007/08, correcting and quality coding data where possible. Any changes to the data will be reflected in future RSoE reporting.

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## **8. Acknowledgements**

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## Appendix 1: RSoE monitoring sites

Site No.	Site Name	Site Coordinates		Substrate (hard or soft bottomed)	REC	Dominant land cover
		Easting	Northing			
RS01	Mangapouri S at Rahui Rd	2693390	6046615	Soft	WD/L/A/U	Pasture
RS02	Mangapouri S at Bennetts Rd	2690920	6049359	Soft	WD/L/A/P	Urban
RS03	Waitohu S at Forest Pk	2697610	6045404	Hard	CW/H/HS/IF	Indigenous forest
RS04	Waitohu S at Norfolk Cres	2689554	6050018	Soft	CW/L/HS/P	Pasture
RS05	Otaki R at Pukehinau	2695443	6040464	Hard	CW/H/HS/IF	Indigenous forest
RS06	Otaki R at Mouth	2688000	6047600	Hard	CW/H/HS/IF	Indigenous forest
RS07	Mangaone S at Sims Rd Br	2686260	6044122	Soft	WW/L/AL/P	Pasture
RS08	Ngarara S at Field Way	2681198	6036335	Soft	WW/L/AL/P	Urban
RS09	Waikanae R at Mangaone Walkway	2689992	6035353	Hard	CW/L/HS/IF	Indigenous forest
RS10	Waikanae R at Greenaway Rd	2681241	6034630	Hard	CW/L/HS/P	Indigenous forest
RS11	Whareroa S at Waterfall Rd	2678093	6026247	Hard	WW/L/HS/P	Pasture
RS12	Whareroa S at QE Park	2675995	6026115	Soft	WW/L/HS/P	Pasture
RS13	Horokiri S at Snodgrass	2671824	6012367	Hard	CW/L/HS/P	Pasture
RS14	Pauatahanui S at Elmwood Br	2671117	6008497	Hard	CW/L/HS/P	Pasture
RS15	Porirua S at Glenside	2663310	6000077	Hard	CW/L/HS/U	Urban
RS16	Porirua S at Wall Park (Milk Depot)	2664386	6004745	Hard	WW/L/HS/U	Urban
RS17	Makara S at Kennels	2653551	5995347	Hard	CW/L/HS/P	Pasture
RS18	Karori S at Makara Peak	2654234	5988585	Hard	CW/L/HS/U	Urban
RS19	Kaiwharawhara S at Ngaio Gorge	2659090	5992789	Hard	CW/L/HS/U	Urban
RS20	Hutt R at Te Marua Intake Site	2690091	6011874	Hard	CX/H/HS/IF	Indigenous forest
RS21	Hutt R opp. Manor Park G.C.	2676700	6004000	Hard	CW/H/HS/IF	Indigenous forest
RS22	Hutt R at Boulcott	2670879	5999200	Hard	CW/L/HS/IF	Indigenous forest
RS23	Pakuratahi R 50m d/s Farm Ck	2694627	6013394	Hard	CX/H/HS/IF	Indigenous forest
RS24	Mangaroa R at Te Marua	2688563	6010359	Hard	CW/L/HS/P	Pasture
RS25	Akatarawa R at Hutt confl.	2686203	6010900	Hard	CW/L/HS/IF	Indigenous forest
RS26	Whakatikei R at Riverstone	2682276	6008463	Hard	CW/L/HS/S	Indigenous forest
RS27	Waiwhetu S at Wainui Hill Br	2670587	5995855	Soft	WW/L/HS/U	Urban
RS28	Wainuiomata R at Manuka Track	2678265	5992349	Hard	CW/L/HS/IF	Indigenous forest
RS29	Wainuiomata R u/s of White Br	2667340	5977436	Hard	CW/L/HS/IF	Indigenous forest
RS30	Orongorongo R at Orongorongo	2668955	5974807	Hard	CW/H/HS/IF	Indigenous forest
RS31	Ruamahanga R at McLays	2728161	6047524	Hard	CX/H/HS/S	Indigenous forest
RS32	Ruamahanga R at Te Ore Ore	2735588	6024740	Hard	CW/L/SS/P	Pasture
RS33	Ruamahanga R at Gladstone Br	2731225	6012049	Hard	CW/L/SS/P	Pasture
RS34	Ruamahanga R at Pukio	2707855	5992730	Hard	CW/L/SS/P	Pasture
RS35	Mataikona Trib at Sugar Loaf Rd	2781839	6052625	Hard	CW/L/SS/P	Pasture
RS36	Taueru R at Castlehill	2762304	6045917	Soft	CW/L/SS/P	Pasture
RS37	Taueru R at Gladstone	2734164	6012538	Hard	CD/L/SS/P	Pasture
RS38	Kopuaranga R at Stewarts	2736773	6031289	Hard	CW/L/SS/P	Pasture
RS39	Whangaehu R 250m u/s confl.	2736281	6021129	Soft	CD/L/SS/P	Pasture
RS40	Waipoua R at Colombo Rd Br	2735032	6024611	Hard	CW/L/HS/P	Pasture
RS41	Waingawa R at South Rd	2730731	6022370	Hard	CX/H/HS/IF	Indigenous forest
RS42	Whareama R at Gauge	2766097	6022956	Soft	WW/L/SS/P	Pasture
RS43	Motuwaireka S at Headwaters	2762028	6012031	Hard	CW/L/HS/S	Indigenous forest
RS44	Totara S at Stronvar	2758038	6006645	Hard	CW/L/HS/EF	Exotic forest
RS45	Parkvale Trib at Lowes Res.	2728110	6020073	Hard	WD/L/A/P	Pasture
RS46	Parkvale S at Weir	2723533	6011190	Hard	WD/L/A/P	Pasture
RS47	Waiohine R at Gorge	2711907	6017714	Hard	CX/H/HS/IF	Indigenous forest
RS48	Waiohine R at Bicknells	2720633	6009820	Hard	CW/H/HS/P	Pasture
RS49	Beef Ck at Headwaters	2713981	6018117	Hard	CW/L/HS/S	Indigenous forest
RS50	Mangatarere S at SH 2	2719786	6013880	Hard	CW/L/HS/P	Pasture
RS51	Huangarua R at Ponatahi Br	2717030	5996934	Hard	CD/L/SS/P	Pasture
RS52	Tauanui R at Whakatomotomo Rd	2700674	5976234	Hard	CW/H/HS/IF	Indigenous forest
RS53	Awhea R at Tora Rd	2719980	5965013	Hard	WW/L/SS/P	Pasture
RS54	Coles Ck Trib at Lagoon Hill Rd	2724046	5976941	Hard	WW/L/SS/S	Indigenous forest
RS55	Tauherenikau R at Websters	2707103	6001661	Hard	CW/H/HS/IF	Indigenous forest
RS56	Waiorongomai R at Forest Pk	2689627	5992276	Hard	CW/H/HS/IF	Indigenous forest

## Appendix 2: Water quality variables and analytical methods

Laboratory	Variable	Method	Detection Limit
NA	Temperature	Field Meter - ExStik DO600 (Extech Instruments) and YSI 550A Meters	0.01 °C
NA	Dissolved Oxygen	Field Meter - ExStik DO600 (Extech Instruments) and YSI 550A Meters	0.01 mg/L
NA	Visual Clarity	Black disc	0.01 m
NA	pH	Field Meter - ExStik EC500 (Extech Instruments) and YSI 63 Meters	0.01 units
NA	Conductivity	Field Meter - ExStik EC500 (Extech Instruments) and YSI 63 Meters	0.1 uS/cm
Hills	Turbidity	Analysis using a Hach 2100N, Turbidity meter. APHA 2130 B 20th ed. 1998	0.05 NTU
Hills	Total Organic Carbon	Catalytic oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC - TIC. APHA5310 B 20th ed. 1998	0.5 mg/L
Hills	Ammoniacal Nitrogen	Filtered sample. Phenol/hyperchlorite colorimetry. Discrete Analyser. (NH <sub>4</sub> -N = NH <sub>4</sub> <sup>+</sup> -N + NH <sub>3</sub> -N) APHA 4500-NH <sub>3</sub> F (modified from manual analysis) 20th ed. 1998	0.001 mg/L
Hills	Nitrite	Automated Azo dye colorimetry, Flow induction analyser. APHA 4500-NO <sub>2</sub> <sup>-</sup> I (proposed) 20th ed. 1998	0.002 mg/L
Hills	Nitrate	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N	0.002 mg/L
Hills	Nitrate + Nitrite Nitrogen	Total oxidised nitrogen. Automated cadmium reduction, Flow injection analyser. APHA 4500-NO <sub>3</sub> <sup>-</sup> I (Proposed) 20th ed. 1998	0.002 mg/L
Hills	Total Kjeldahl Nitrogen	Kjeldahl digestion, phenol/hyperchlorite colorimetry (Discrete Analysis). APHA 4500-Norg B. (modified) 4500-NH <sub>3</sub> F (modified) 20th ed. 1998	0.1 mg/L
Hills	Total Nitrogen	Calculation: TKN + Nitrate-N + Nitrite-N	0.1 mg/L
Hills	Total Phosphorus	Acid/Persulphate Digestion Ascorbic Acid Method APHA 20 <sup>th</sup> Ed. 4500-P E (modified from manual analysis). 20th ed. 1998	0.004 mg/L
Hills	Dissolved Reactive Phosphorus	Filtered Sample. Molybdenum blue colorimetry. Discrete Analyser. APHA 4500-P E (modified from manual analysis) 21st ed. 2005	0.004 mg/L
ELS	Faecal Coliforms	APHA 21st Ed. Method 9222 D	1 cfu/100 mL
ELS	<i>E. coli</i>	APHA 21st Ed. Method 9222 G	1 cfu/100 mL

## **Appendix 3: Biological monitoring methods**

### **Periphyton**

Periphyton assessments were limited to the 46 RSoE sites with hard bottomed substrates.

#### *Monthly assessment of visible stream bed cover*

Over the reporting period, periphyton cover was determined by estimating the percentage of visible mats (>0.3 cm thick) and filaments (>2 cm long) present on the stream or river bed within a 20 cm diameter metal ring. Ten observations were made across the width of the stream or river, along a transect. If the stream or river was not wide enough for 10 observations, five observations were made across the width of the waterway in two locations at the site. Two transects of five observations (usually to 0.6 m depth) were also used where it was not possible to wade across more than half of the river's width.

Visible stream bed assessments were typically carried out in a run, as opposed to riffle or pool-type habitats.

#### *Annual assessment of biomass*

Periphyton samples for quantitative biomass assessments (chlorophyll *a* and AFDM) were collected over January to March 2007 at the time of macroinvertebrate sample collection. Sampling protocols followed quantitative method 1a (QM-1a), as outlined in the stream periphyton monitoring manual (Biggs and Kilroy 2000).

Biomass assessments were carried out on periphyton samples collected in riffle-type habitats in close proximity to macroinvertebrate sampling sites.

### **Macroinvertebrates**

Three macroinvertebrate samples were collected from cobbly riffle areas at or adjacent to each RSoE water sampling site over January to March 2007. The timing of sampling was determined at random, although no macroinvertebrate sampling was undertaken within two weeks of any flood event. Flood events were defined as flows greater than three times the median river flow.

Samples were collected with the use of a kick-net (250 um mesh size) following Protocol C1 of the national macroinvertebrate sampling protocols (Stark et al. 2001) for the 46 RSoE sites with hard bottom substrate and Protocol C2 for the ten RSoE sites with a soft bottom substrate. All samples were processed in accordance with protocol P2 (Stark et al. 2001).



## **Appendix 4: Physico-chemical and bacteriological data**

Table A4.1: Temperature (°C)

Site No.	Site Name	Median	Minimum	5 <sup>th</sup> percentile	95 <sup>th</sup> percentile	Maximum	<i>n</i>
RS01	Mangapouri S at Rahui Rd	12.0	9.9	10.6	14.7	14.8	12
RS02	Mangapouri S at Bennetts Rd	12.9	10.3	10.8	16.6	17.0	12
RS03	Waitohu S at Forest Pk	10.1	7.7	8.5	13.0	13.3	12
RS04	Waitohu S at Norfolk Cres	12.2	10.5	10.6	16.0	16.2	12
RS05	Otaki R at Pukehinou	11.4	7.7	8.5	15.1	15.3	12
RS06	Otaki R at Mouth	12.3	9.3	9.6	16.1	16.4	12
RS07	Mangaone S at Sims Rd Br	14.5	10.1	11.3	17.5	18.1	12
RS08	Ngarara S at Field Way	15.1	10.4	11.3	19.7	19.9	12
RS09	Waikanae R at Mangaone Walkway	12.3	7.6	8.5	16.6	16.9	12
RS10	Waikanae R at Greenaway Rd	14.5	10.7	10.9	19.3	20.0	12
RS11	Whareroa S at Waterfall Rd	13.1	9.4	10.2	16.3	16.7	12
RS12	Whareroa S at QE Park	15.9	10.2	11.2	19.3	19.8	12
RS13	Horokiri S at Snodgrass	15.8	10.8	10.9	21.2	22.0	12
RS14	Pauatahanui S at Elmwood Br	14.9	9.6	10.3	20.2	21.4	12
RS15	Porirua S at Glenside	14.9	9.9	10.1	20.3	21.8	12
RS16	Porirua S at Wall Park (Milk Depot)	15.5	10.7	10.8	21.4	22.4	12
RS17	Makara S at Kennels	14.9	8.9	9.7	22.7	24.7	12
RS18	Karori S at Makara Peak	14.2	10.4	10.5	19.7	21.0	12
RS19	Kaiwharawhara S at Ngaio Gorge	13.2	9.8	10.0	20.0	21.2	12
RS20	Hutt R at Te Marua Intake Site	11.1	8.6	8.9	14.2	15.1	12
RS21	Hutt R opp. Manor Park G.C.	13.6	9.2	9.5	18.4	19.2	12
RS22	Hutt R at Boulcott	13.1	9.7	9.7	18.5	18.7	12
RS23	Pakuratahi R 50m d/s Farm Ck	12.0	8.8	9.1	15.3	15.6	12
RS24	Mangaroa R at Te Marua	12.5	9.4	9.9	15.4	16.1	12
RS25	Akatarawa R at Hutt confl.	11.5	8.9	9.2	14.9	15.3	12
RS26	Whakatikei R at Riverstone	11.5	8.6	8.8	13.9	14.3	12
RS27	Waiwhetu S at Wainui Hill Br	15.1	9.9	10.6	21.1	21.6	12
RS28	Wainuiomata R at Manuka Track	11.1	8.2	8.7	15.6	16.1	12
RS29	Wainuiomata R u/s of White Br	14.6	9.9	10.1	20.4	21.0	12
RS30	Orongorongo R at Orongorongo Stn	14.5	9.1	9.6	20.3	21.0	12
RS31	Ruamahanga R at McLays	9.7	5.6	5.8	12.9	13.3	12
RS32	Ruamahanga R at Te Ore Ore	12.1	7.6	8.0	19.1	19.4	12
RS33	Ruamahanga R at Gladstone Br	13.9	8.9	9.1	22.1	22.3	12
RS34	Ruamahanga R at Pukio	12.8	8.2	8.4	18.4	18.5	12
RS35	Mataikona Trib at Sugar Loaf Rd	10.3	6.4	6.7	15.8	16.4	12
RS36	Taueru R at Castlehill	10.5	5.9	6.3	15.8	16.0	12
RS37	Taueru R at Gladstone	15.3	6.4	7.4	19.3	20.3	12
RS38	Kopuaranga R at Stewarts	12.4	7.8	7.9	16.0	16.0	12
RS39	Whangaehu R 250m u/s confl.	12.7	8.2	8.5	18.1	19.3	12
RS40	Waipoua R at Colombo Rd Br	12.9	8.0	8.0	17.6	18.0	12
RS41	Waingawa R at South Rd	13.4	7.5	8.0	21.6	21.7	12
RS42	Whareama R at Gauge	14.1	6.4	7.2	21.1	23.1	12
RS43	Motuwaireka S at Headwaters	13.9	6.6	7.7	18.7	19.0	12
RS44	Totara S at Stronvar	14.6	6.6	7.9	20.5	23.2	11
RS45	Parkvale Trib at Lowes Res.	13.6	10.1	10.5	17.3	17.9	9
RS46	Parkvale S at Weir	14.0	8.9	9.1	20.3	21.0	12
RS47	Waiohine R at Gorge	12.0	7.0	7.4	16.5	16.8	12
RS48	Waiohine R at Bicknells	13.2	8.8	9.0	19.3	19.8	12
RS49	Beef Ck at Headwaters	12.1	8.5	8.6	16.6	17.6	12
RS50	Mangatarere S at SH 2	14.5	9.2	9.5	21.2	21.3	12
RS51	Huangaaru R at Ponatahi Br	14.4	9.0	9.1	23.1	23.4	12
RS52	Tauanui R at Whakatomotomo Rd	11.8	7.5	7.5	17.8	18.1	12
RS53	Awhea R at Tora Rd	13.9	7.7	8.0	16.6	16.8	12
RS54	Coles Ck Trib at Lagoon Hill Rd	13.0	7.0	7.5	17.7	19.8	10
RS55	Tauherenikau R at Websters	14.0	8.6	9.2	25.2	25.8	12
RS56	Waiorongomai R at Forest Pk	14.3	8.6	8.9	18.7	18.8	12

Table A4.2: Dissolved Oxygen (% saturation)

Site No.	Site Name	Median	Minimum	5 <sup>th</sup> percentile	95 <sup>th</sup> percentile	Maximum	<i>n</i>
RS01	Mangapouri S at Rahui Rd	85.6	79.8	81.3	95.0	97.9	12
RS02	Mangapouri S at Bennetts Rd	75.2	42.9	46.3	88.2	88.3	12
RS03	Waitohu S at Forest Pk	99.3	94.9	95.7	108.1	110.5	12
RS04	Waitohu S at Norfolk Cres	87.9	56.5	60.2	95.1	95.3	12
RS05	Otaki R at Pukehinau	99.8	93.7	95.4	114.7	114.9	12
RS06	Otaki R at Mouth	103.4	95.0	96.9	111.7	112.2	12
RS07	Mangaone S at Sims Rd Br	86.6	22.1	40.3	101.1	101.5	12
RS08	Ngarara S at Field Way	59.9	30.8	39.0	69.8	70.6	12
RS09	Waikanae R at Mangaone Walkway	98.0	90.8	91.6	106.2	107.3	12
RS10	Waikanae R at Greenaway Rd	105.3	89.7	93.4	122.3	126.2	12
RS11	Whareroa S at Waterfall Rd	93.9	80.5	86.3	105.4	111.3	12
RS12	Whareroa S at QE Park	84.1	51.2	53.5	93.1	93.6	12
RS13	Horokiri S at Snodgrass	100.4	93.6	94.6	105.8	107.0	12
RS14	Pauatahanui S at Elmwood Br	95.8	90.2	90.2	116.3	116.3	12
RS15	Porirua S at Glenside	100.6	90.5	92.0	109.9	111.4	12
RS16	Porirua S at Wall Park (Milk Depot)	104.7	92.6	94.8	117.7	122.9	12
RS17	Makara S at Kennels	101.3	89.1	89.5	114.9	122.0	12
RS18	Karori S at Makara Peak	96.3	72.6	75.5	112.1	117.0	12
RS19	Kaiwharawhara S at Ngaio Gorge	97.8	85.4	86.4	111.2	114.6	12
RS20	Hutt R at Te Marua Intake Site	97.6	81.5	82.7	112.5	119.3	12
RS21	Hutt R opp. Manor Park G.C.	101.6	88.5	90.3	116.5	121.2	12
RS22	Hutt R at Boulcott	97.9	91.7	92.2	112.0	112.0	11
RS23	Pakuratahi R 50m d/s Farm Ck	93.2	79.3	83.1	112.7	116.0	12
RS24	Mangaroa R at Te Marua	98.0	88.2	89.0	114.1	119.6	12
RS25	Akatarawa R at Hutt confl.	98.6	91.5	94.0	117.6	118.3	12
RS26	Whakatikei R at Riverstone	102.5	91.7	92.2	113.1	116.0	12
RS27	Waiwhetu S at Wainui Hill Br	79.3	57.6	60.7	114.5	126.2	12
RS28	Wainuiomata R at Manuka Track	99.7	82.8	88.9	115.5	116.0	12
RS29	Wainuiomata R u/s of White Br	105.2	80.3	87.3	113.8	116.1	12
RS30	Orongorongo R at Orongorongo Stn	92.4	73.4	77.2	114.5	120.7	12
RS31	Ruamahanga R at McLays	95.8	85.0	85.9	109.1	109.2	12
RS32	Ruamahanga R at Te Ore Ore	97.9	86.8	87.5	114.7	119.2	12
RS33	Ruamahanga R at Gladstone Br	99.2	90.4	91.7	135.9	157.6	12
RS34	Ruamahanga R at Pukio	97.9	91.7	92.1	109.6	114.9	12
RS35	Mataikona Trib at Sugar Loaf Rd	99.5	70.0	72.3	112.0	113.7	12
RS36	Taueru R at Castlehill	94.5	83.1	83.4	116.2	121.7	12
RS37	Taueru R at Gladstone	103.7	79.1	81.5	120.3	121.0	12
RS38	Kopuaranga R at Stewarts	94.1	63.7	63.7	107.1	112.0	12
RS39	Whangaehu R 250m u/s confl.	83.1	56.5	56.7	110.8	118.1	12
RS40	Waipoua R at Colombo Rd Br	99.8	91.0	91.8	114.4	117.6	12
RS41	Waingawa R at South Rd	98.1	71.2	78.8	113.2	116.5	12
RS42	Whareama R at Gauge	90.5	60.3	71.3	107.8	110.0	12
RS43	Motuwaireka S at Headwaters	100.0	68.3	75.8	117.6	119.6	12
RS44	Totara S at Stronvar	92.0	74.4	75.1	117.5	122.7	11
RS45	Parkvale Trib at Lowes Res.	76.6	59.6	61.4	101.8	106.5	9
RS46	Parkvale S at Weir	107.3	97.4	99.7	125.0	134.3	12
RS47	Waiohine R at Gorge	103.3	77.5	82.6	133.4	140.5	12
RS48	Waiohine R at Bicknells	100.2	94.0	94.5	132.1	137.6	12
RS49	Beef Ck at Headwaters	99.5	86.9	87.8	109.8	109.8	12
RS50	Mangatarere S at SH 2	104.4	59.9	72.8	128.9	142.9	12
RS51	Huangaaru R at Ponatahi Br	114.0	92.1	92.7	137.5	147.6	12
RS52	Tauanui R at Whakatomotomo Rd	100.1	91.7	91.8	108.4	109.1	12
RS53	Awhea R at Tora Rd	94.3	82.0	82.4	127.5	136.0	12
RS54	Coles Ck Trib at Lagoon Hill Rd	92.4	68.4	69.9	114.4	121.6	10
RS55	Tauherenikau R at Websters	96.6	91.9	92.7	104.7	109.5	12
RS56	Waiorongomai R at Forest Pk	98.8	93.4	93.5	116.5	117.1	12

Table A4.3: Dissolved Oxygen (mg/L)

Site No.	Site Name	Median	Minimum	5 <sup>th</sup> percentile	95 <sup>th</sup> percentile	Maximum	<i>n</i>
RS01	Mangapouri S at Rahui Rd	9.5	8.6	8.6	10.4	10.4	12
RS02	Mangapouri S at Bennetts Rd	7.8	4.4	4.7	9.5	9.8	12
RS03	Waitohu S at Forest Pk	11.1	10.1	10.1	12.8	13.1	12
RS04	Waitohu S at Norfolk Cres	9.4	6.3	6.4	10.6	10.9	12
RS05	Otaki R at Pukehinau	11.2	9.9	10.2	12.5	13.2	12
RS06	Otaki R at Mouth	10.8	9.3	9.9	12.4	12.8	12
RS07	Mangaone S at Sims Rd Br	8.3	3.5	4.7	10.1	10.4	12
RS08	Ngarara S at Field Way	5.9	2.7	3.8	8.5	8.7	12
RS09	Waikanae R at Mangaone Walkway	10.5	9.0	9.0	11.9	12.0	12
RS10	Waikanae R at Greenaway Rd	11.0	9.0	9.4	12.3	12.4	12
RS11	Whareroa S at Waterfall Rd	9.9	7.9	8.2	11.7	12.3	12
RS12	Whareroa S at QE Park	8.3	5.2	5.8	9.0	9.1	12
RS13	Horokiri S at Snodgrass	10.2	7.6	8.3	11.6	11.8	12
RS14	Pauatahanui S at Elmwood Br	10.2	8.3	8.7	11.8	11.9	12
RS15	Porirua S at Glenside	10.1	9.1	9.2	12.2	12.6	12
RS16	Porirua S at Wall Park (Milk Depot)	10.7	9.3	9.5	11.9	12.3	12
RS17	Makara S at Kennels	10.4	8.8	8.9	12.4	12.8	12
RS18	Karori S at Makara Peak	9.7	6.8	7.1	12.1	12.7	12
RS19	Kaiwharawhara S at Ngaio Gorge	9.8	8.7	8.8	12.6	13.6	12
RS20	Hutt R at Te Marua Intake Site	10.5	8.2	8.6	13.4	14.3	12
RS21	Hutt R opp. Manor Park G.C.	11.1	8.9	9.2	12.8	13.2	12
RS22	Hutt R at Boulcott	10.3	9.2	9.3	12.5	12.8	11
RS23	Pakuratahi R 50m d/s Farm Ck	10.5	8.0	8.5	12.7	12.8	12
RS24	Mangaroa R at Te Marua	10.3	9.0	9.2	12.5	12.7	12
RS25	Akatarawa R at Hutt confl.	11.0	9.7	9.8	12.8	13.6	12
RS26	Whakatikei R at Riverstone	10.9	9.1	9.5	12.6	12.8	12
RS27	Waiwhetu S at Wainui Hill Br	7.1	5.8	6.2	11.2	12.8	12
RS28	Wainuiomata R at Manuka Track	10.4	8.3	8.9	12.6	12.7	12
RS29	Wainuiomata R u/s of White Br	10.7	8.0	8.2	12.0	12.1	12
RS30	Orongorongo R at Orongorongo Stn	9.0	7.6	7.8	12.6	12.8	12
RS31	Ruamahanga R at McLays	10.6	8.4	8.6	13.1	13.2	12
RS32	Ruamahanga R at Te Ore Ore	10.2	9.1	9.1	13.0	13.7	12
RS33	Ruamahanga R at Gladstone Br	10.6	8.9	9.2	13.3	14.3	12
RS34	Ruamahanga R at Pukio	9.9	8.7	8.8	12.0	12.4	12
RS35	Mataikona Trib at Sugar Loaf Rd	11.0	7.5	7.9	12.5	12.8	12
RS36	Taueru R at Castlehill	10.1	8.3	8.3	12.5	13.0	12
RS37	Taueru R at Gladstone	10.6	7.7	8.6	12.7	13.3	12
RS38	Kopuaranga R at Stewarts	9.3	6.3	6.6	12.3	12.4	12
RS39	Whangaehu R 250m u/s confl.	8.8	5.4	5.6	11.3	12.5	12
RS40	Waipoua R at Colombo Rd Br	10.5	9.2	9.2	12.5	13.1	12
RS41	Waingawa R at South Rd	10.2	6.7	7.6	12.6	12.9	12
RS42	Whareama R at Gauge	9.2	6.1	7.0	11.6	12.0	12
RS43	Motuwaireka S at Headwaters	10.1	7.0	7.7	13.1	13.1	11
RS44	Totara S at Stronvar	10.0	7.3	7.5	13.3	13.8	11
RS45	Parkvale Trib at Lowes Res.	7.9	5.6	5.9	11.1	11.9	9
RS46	Parkvale S at Weir	10.7	10.3	10.3	12.7	12.8	12
RS47	Waiohine R at Gorge	10.9	7.6	8.7	13.6	14.0	12
RS48	Waiohine R at Bicknells	10.9	9.6	9.8	12.9	13.3	12
RS49	Beef Ck at Headwaters	10.4	8.7	9.0	12.7	13.0	12
RS50	Mangatarere S at SH 2	11.5	6.1	7.3	13.3	13.9	12
RS51	Huangaaru R at Ponatahi Br	11.1	9.9	10.1	13.5	14.9	12
RS52	Tauanui R at Whakatomotomo Rd	11.0	8.7	8.8	12.3	13.0	12
RS53	Awhea R at Tora Rd	9.1	8.2	8.3	13.2	13.5	12
RS54	Coles Ck Trib at Lagoon Hill Rd	9.5	7.5	7.8	12.2	12.9	10
RS55	Tauherenikau R at Websters	9.7	8.8	8.8	12.0	12.4	12
RS56	Waiorongomai R at Forest Pk	10.1	8.7	9.3	11.9	12.3	11

Table A4.4: pH

Site No.	Site Name	Median	Minimum	5 <sup>th</sup> percentile	95 <sup>th</sup> percentile	Maximum	<i>n</i>
RS01	Mangapouri S at Rahui Rd	7.0	6.9	6.9	7.4	7.4	12
RS02	Mangapouri S at Bennetts Rd	7.0	6.8	6.9	7.3	7.5	12
RS03	Waitohu S at Forest Pk	7.6	6.9	7.0	8.8	9.4	12
RS04	Waitohu S at Norfolk Cres	7.1	6.8	6.8	7.3	7.3	12
RS05	Otaki R at Pukehinau	7.5	7.1	7.1	8.1	8.3	12
RS06	Otaki R at Mouth	7.7	7.0	7.2	8.3	8.4	12
RS07	Mangaone S at Sims Rd Br	7.2	6.8	6.9	7.4	7.4	12
RS08	Ngarara S at Field Way	6.9	6.7	6.7	7.2	7.3	12
RS09	Waikanae R at Mangaone Walkway	7.6	7.2	7.2	7.8	7.9	12
RS10	Waikanae R at Greenaway Rd	7.3	6.5	6.8	8.4	9.2	12
RS11	Whareroa S at Waterfall Rd	7.8	7.2	7.3	7.9	8.0	12
RS12	Whareroa S at QE Park	6.9	6.1	6.3	7.2	7.3	12
RS13	Horokiri S at Snodgrass	7.5	7.0	7.2	7.9	7.9	12
RS14	Pauatahanui S at Elmwood Br	7.5	7.1	7.2	8.4	8.6	12
RS15	Porirua S at Glenside	7.9	7.2	7.5	8.4	8.6	12
RS16	Porirua S at Wall Park (Milk Depot)	7.8	6.7	7.2	8.3	8.4	12
RS17	Makara S at Kennels	7.7	7.0	7.2	8.0	8.0	12
RS18	Karori S at Makara Peak	7.6	6.9	6.9	7.8	8.0	12
RS19	Kaiwharawhara S at Ngaio Gorge	7.9	7.5	7.5	8.2	8.2	12
RS20	Hutt R at Te Marua Intake Site	7.5	6.3	6.6	7.7	7.8	12
RS21	Hutt R opp. Manor Park G.C.	7.5	7.0	7.1	8.1	8.1	12
RS22	Hutt R at Boulcott	7.3	6.3	6.5	7.7	7.7	12
RS23	Pakuratahi R 50m d/s Farm Ck	7.2	6.8	6.9	7.6	7.7	12
RS24	Mangaroa R at Te Marua	7.3	5.9	6.5	7.6	7.7	12
RS25	Akatarawa R at Hutt confl.	7.5	6.9	7.0	8.0	8.1	12
RS26	Whakatikei R at Riverstone	7.5	6.9	6.9	7.8	7.9	12
RS27	Waiwhetu S at Wainui Hill Br	6.9	6.8	6.8	8.4	9.2	12
RS28	Wainuiomata R at Manuka Track	7.5	6.8	6.9	7.8	7.8	12
RS29	Wainuiomata R u/s of White Br	7.6	6.6	6.8	8.8	9.0	12
RS30	Orongorongo R at Orongorongo Stn	7.7	7.0	7.2	8.0	8.1	12
RS31	Ruamahanga R at McLays	7.4	7.2	7.2	7.9	7.9	12
RS32	Ruamahanga R at Te Ore Ore	7.8	6.9	7.0	8.3	8.4	12
RS33	Ruamahanga R at Gladstone Br	7.6	7.3	7.4	8.8	9.6	12
RS34	Ruamahanga R at Pukio	7.7	7.3	7.3	7.9	8.0	12
RS35	Mataikona Trib at Sugar Loaf Rd	8.1	7.2	7.3	8.2	8.3	12
RS36	Taueru R at Castlehill	7.8	7.3	7.5	7.9	7.9	12
RS37	Taueru R at Gladstone	8.2	7.7	7.8	8.4	8.4	12
RS38	Kopuaranga R at Stewarts	7.6	6.7	6.9	8.0	8.0	12
RS39	Whangaehu R 250m u/s confl.	7.3	6.9	6.9	7.8	7.9	12
RS40	Waipoua R at Colombo Rd Br	7.7	7.2	7.2	8.0	8.0	12
RS41	Waingawa R at South Rd	7.7	7.2	7.3	8.1	8.4	12
RS42	Whareama R at Gauge	7.9	7.1	7.3	8.2	8.4	12
RS43	Motuwaireka S at Headwaters	7.9	7.5	7.5	8.2	8.3	12
RS44	Totara S at Stronvar	7.7	7.0	7.2	8.4	8.5	11
RS45	Parkvale Trib at Lowes Res.	6.8	6.6	6.6	7.2	7.4	9
RS46	Parkvale S at Weir	7.9	7.0	7.0	8.7	8.7	12
RS47	Waiohine R at Gorge	7.6	6.9	7.0	8.1	8.2	12
RS48	Waiohine R at Bicknells	7.3	7.1	7.1	7.8	8.0	12
RS49	Beef Ck at Headwaters	7.8	7.2	7.3	8.2	8.3	12
RS50	Mangatarere S at SH 2	7.2	6.7	6.9	8.2	8.5	12
RS51	Huangaaru R at Ponatahi Br	8.6	7.8	7.9	8.8	8.8	12
RS52	Tauanui R at Whakatomotomo Rd	7.8	7.2	7.3	8.0	8.0	12
RS53	Awhea R at Tora Rd	8.1	7.8	7.9	8.3	8.4	12
RS54	Coles Ck Trib at Lagoon Hill Rd	7.9	7.2	7.4	8.3	8.3	10
RS55	Tauherenikau R at Websters	7.5	7.1	7.1	7.7	7.7	12
RS56	Waiorongomai R at Forest Pk	7.6	7.3	7.3	8.4	8.5	12

Table A4.5: Visual Clarity (m)

Site No.	Site Name	Median	Minimum	Maximum	<i>n</i>
RS01	Mangapouri S at Rahui Rd	0.55	0.16	1.21	12
RS02	Mangapouri S at Bennetts Rd	1.04	0.16	1.60	11
RS03	Waitohu S at Forest Pk	2.79	0.16	3.79	12
RS04	Waitohu S at Norfolk Cres	0.94	0.38	1.27	12
RS05	Otaki R at Pukehinau	1.66	0.10	5.25	12
RS06	Otaki R at Mouth	1.99	0.11	4.97	12
RS07	Mangaone S at Sims Rd Br	0.71	0.08	1.07	11
RS08	Ngarara S at Field Way	0.53	0.37	0.91	12
RS09	Waikanae R at Mangaone Walkway	3.24	1.72	5.68	12
RS10	Waikanae R at Greenaway Rd	1.84	0.34	4.21	12
RS11	Whareroa S at Waterfall Rd	0.75	0.08	1.72	12
RS12	Whareroa S at QE Park	0.52	0.03	1.08	12
RS13	Horokiri S at Snodgrass	2.33	0.83	4.42	12
RS14	Pauatahanui S at Elmwood Br	1.29	0.57	2.92	12
RS15	Porirua S at Glenside	1.53	0.18	3.18	11
RS16	Porirua S at Wall Park (Milk Depot)	1.06	0.13	2.89	12
RS17	Makara S at Kennels	1.03	0.21	3.55	12
RS18	Karori S at Makara Peak	2.96	0.05	3.70	12
RS19	Kaiwharawhara S at Ngaio Gorge	1.99	1.33	5.41	12
RS20	Hutt R at Te Marua Intake Site	3.28	0.31	5.33	12
RS21	Hutt R opp. Manor Park G.C.	1.37	0.41	3.73	12
RS22	Hutt R at Boulcott	1.66	0.35	4.44	12
RS23	Pakuratahi R 50m d/s Farm Ck	2.73	0.28	5.10	12
RS24	Mangaroa R at Te Marua	1.29	0.25	3.15	12
RS25	Akatarawa R at Hutt confl.	3.22	0.43	4.72	12
RS26	Whakatikei R at Riverstone	2.91	1.30	4.71	12
RS27	Waiwhetu S at Wainui Hill Br	0.44	0.11	1.41	12
RS28	Wainuiomata R at Manuka Track	3.22	2.32	4.82	10
RS29	Wainuiomata R u/s of White Br	1.37	0.31	2.15	12
RS30	Orongorongo R at Orongorongo Stn	1.72	0.05	4.18	12
RS31	Ruamahanga R at McLays	3.83	0.30	6.00	12
RS32	Ruamahanga R at Te Ore Ore	1.27	0.14	4.55	12
RS33	Ruamahanga R at Gladstone Br	1.19	0.06	3.82	12
RS34	Ruamahanga R at Pukio	0.90	0.04	2.93	12
RS35	Mataikona Trib at Sugar Loaf Rd	1.88	0.18	4.08	11
RS36	Taueru R at Castlehill	1.22	0.71	2.77	12
RS37	Taueru R at Gladstone	0.83	0.05	3.13	12
RS38	Kopuaranga R at Stewarts	0.88	0.13	2.38	12
RS39	Whangaehu R 250m u/s confl.	1.05	0.04	3.88	12
RS40	Waipoua R at Colombo Rd Br	2.29	0.40	4.25	12
RS41	Waingawa R at South Rd	3.06	0.76	6.70	12
RS42	Whareama R at Gauge	0.65	0.05	2.36	12
RS43	Motuwaireka S at Headwaters	2.51	1.23	3.38	10
RS44	Totara S at Stronvar	3.13	0.67	4.18	11
RS45	Parkvale Trib at Lowes Res.	2.10	0.10	2.38	5
RS46	Parkvale S at Weir	1.24	0.22	2.04	12
RS47	Waiohine R at Gorge	3.96	0.41	5.48	11
RS48	Waiohine R at Bicknells	1.78	0.37	3.98	12
RS49	Beef Ck at Headwaters	2.98	1.73	4.70	10
RS50	Mangatarere S at SH 2	1.68	0.10	4.38	12
RS51	Huangarua R at Ponatahi Br	1.90	0.03	4.08	12
RS52	Tauanui R at Whakatomotomo Rd	4.19	0.11	6.65	12
RS53	Awhea R at Tora Rd	1.59	0.02	3.95	12
RS54	Coles Ck Trib at Lagoon Hill Rd	1.12	0.46	2.40	10
RS55	Tauherenikau R at Websters	1.75	0.23	3.53	12
RS56	Waiorongomai R at Forest Pk	3.44	0.11	5.75	12

Table A4.6: Turbidity (NTU)

Site No.	Site Name	Median	Minimum	Maximum	<i>n</i>
RS01	Mangapouri S at Rahui Rd	7.7	4.0	23.5	12
RS02	Mangapouri S at Bennetts Rd	5.8	2.2	58.9	12
RS03	Waitohu S at Forest Pk	0.9	0.4	57.7	12
RS04	Waitohu S at Norfolk Cres	4.7	2.6	17.8	12
RS05	Otaki R at Pukehinau	2.4	0.4	65.2	12
RS06	Otaki R at Mouth	2.1	0.5	96.2	12
RS07	Mangaone S at Sims Rd Br	5.5	3.2	63.0	12
RS08	Ngarara S at Field Way	12.9	6.2	23.1	12
RS09	Waikanae R at Mangaone Walkway	0.7	0.3	1.9	12
RS10	Waikanae R at Greenaway Rd	1.1	0.4	19.6	12
RS11	Whareroa S at Waterfall Rd	5.4	2.0	107.0	12
RS12	Whareroa S at QE Park	8.8	3.8	147.0	12
RS13	Horokiri S at Snodgrass	1.4	0.4	5.9	12
RS14	Pauatahanui S at Elmwood Br	3.7	1.1	9.9	12
RS15	Porirua S at Glenside	2.3	0.8	48.0	12
RS16	Porirua S at Wall Park (Milk Depot)	4.3	1.4	69.4	12
RS17	Makara S at Kennels	4.6	1.1	23.7	12
RS18	Karori S at Makara Peak	1.3	0.7	101.0	12
RS19	Kaiwharawhara S at Ngaio Gorge	1.3	0.6	6.1	12
RS20	Hutt R at Te Marua Intake Site	1.0	0.3	8.8	12
RS21	Hutt R opp. Manor Park G.C.	4.0	0.4	23.7	12
RS22	Hutt R at Boulcott	2.9	0.4	48.2	12
RS23	Pakuratahi R 50m d/s Farm Ck	0.8	0.2	8.9	12
RS24	Mangaroa R at Te Marua	2.0	0.4	11.7	12
RS25	Akatarawa R at Hutt confl.	1.1	0.2	17.5	12
RS26	Whakatikei R at Riverstone	0.8	0.2	4.7	12
RS27	Waiwhetu S at Wainui Hill Br	11.1	2.4	35.7	12
RS28	Wainuiomata R at Manuka Track	1.1	0.4	2.6	12
RS29	Wainuiomata R u/s of White Br	2.5	1.3	29.2	12
RS30	Orongorongo R at Orongorongo Stn	3.4	0.3	106.0	12
RS31	Ruamahanga R at McLays	0.9	0.2	18.4	12
RS32	Ruamahanga R at Te Ore Ore	6.5	0.5	83.6	12
RS33	Ruamahanga R at Gladstone Br	4.5	0.5	128.0	12
RS34	Ruamahanga R at Pukio	6.2	0.9	358.0	12
RS35	Mataikona Trib at Sugar Loaf Rd	2.6	0.4	83.9	12
RS36	Taueru R at Castlehill	3.3	1.8	14.6	12
RS37	Taueru R at Gladstone	7.5	1.2	194.0	12
RS38	Kopuaranga R at Stewarts	5.9	0.6	218.0	12
RS39	Whangaeahu R 250m u/s confl.	4.1	0.5	62.5	12
RS40	Waipoua R at Colombo Rd Br	1.5	0.2	9.3	12
RS41	Waingawa R at South Rd	1.2	0.3	6.2	12
RS42	Whareama R at Gauge	7.7	0.8	229.0	12
RS43	Motuwaireka S at Headwaters	0.4	0.2	9.9	12
RS44	Totara S at Stronvar	0.7	0.4	14.4	11
RS45	Parkvale Trib at Lowes Res.	1.5	0.4	7.0	9
RS46	Parkvale S at Weir	2.8	1.2	19.9	12
RS47	Waiohine R at Gorge	0.8	0.2	11.9	12
RS48	Waiohine R at Bicknells	3.3	0.6	12.9	12
RS49	Beef Ck at Headwaters	0.9	0.3	3.4	12
RS50	Mangatarere S at SH 2	2.0	0.7	121.0	12
RS51	Huangaaru R at Ponatahi Br	1.4	0.4	632.0	12
RS52	Tauanui R at Whakatomotomo Rd	0.8	0.2	64.5	12
RS53	Awhea R at Tora Rd	1.6	0.4	813.0	12
RS54	Coles Ck Trib at Lagoon Hill Rd	3.9	1.4	16.7	10
RS55	Tauherenikau R at Websters	3.3	0.6	32.9	12
RS56	Waiorongomai R at Forest Pk	1.3	0.3	60.5	12

Table A4.7: Conductivity ( $\mu\text{S}/\text{cm}$ )

Site No.	Site Name	Median	Minimum	5 <sup>th</sup> percentile	95 <sup>th</sup> percentile	Maximum	<i>n</i>
RS01	Mangapouri S at Rahui Rd	203	161	178	218	221	12
RS02	Mangapouri S at Bennetts Rd	209	116	158	226	229	12
RS03	Waitohu S at Forest Pk	71	43	56	86	92	12
RS04	Waitohu S at Norfolk Cres	130	91	103	178	182	12
RS05	Otaki R at Pukehinau	56	29	41	68	71	12
RS06	Otaki R at Mouth	57	30	43	69	71	12
RS07	Mangaone S at Sims Rd Br	185	161	167	222	231	12
RS08	Ngarara S at Field Way	309	29	154	369	382	12
RS09	Waikanae R at Mangaone Walkway	78	60	65	92	93	12
RS10	Waikanae R at Greenaway Rd	93	74	74	109	110	12
RS11	Whareroa S at Waterfall Rd	232	173	184	271	272	12
RS12	Whareroa S at QE Park	255	243	244	304	307	12
RS13	Horokiri S at Snodgrass	180	147	155	207	208	12
RS14	Pauatahanui S at Elmwood Br	169	122	132	200	201	12
RS15	Porirua S at Glenside	251	172	186	297	314	12
RS16	Porirua S at Wall Park (Milk Depot)	257	212	226	279	288	12
RS17	Makara S at Kennels	276	182	207	320	321	12
RS18	Karori S at Makara Peak	218	182	186	257	278	11
RS19	Kaiwharawhara S at Ngaio Gorge	284	129	169	319	327	12
RS20	Hutt R at Te Marua Intake Site	57	34	40	74	77	12
RS21	Hutt R opp. Manor Park G.C.	95	59	62	115	122	12
RS22	Hutt R at Boulcott	84	43	47	96	97	12
RS23	Pakuratahi R 50m d/s Farm Ck	75	49	54	87	87	12
RS24	Mangaroa R at Te Marua	100	71	73	114	114	12
RS25	Akatarawa R at Hutt confl.	74	45	46	87	88	12
RS26	Whakatikei R at Riverstone	76	57	57	106	106	12
RS27	Waiwhetu S at Wainui Hill Br	212	132	137	635	642	11
RS28	Wainuiomata R at Manuka Track	97	70	70	113	115	10
RS29	Wainuiomata R u/s of White Br	139	107	116	157	158	11
RS30	Orongorongo R at Orongorongo Stn	155	107	108	170	170	12
RS31	Ruamahanga R at McLays	49	38	38	65	67	12
RS32	Ruamahanga R at Te Ore Ore	123	50	68	179	183	12
RS33	Ruamahanga R at Gladstone Br	107	68	69	134	143	12
RS34	Ruamahanga R at Pukio	124	68	70	179	186	12
RS35	Mataikona Trib at Sugar Loaf Rd	338	40	43	572	601	12
RS36	Taueru R at Castlehill	216	162	165	293	299	12
RS37	Taueru R at Gladstone	416	311	325	481	501	12
RS38	Kopuaranga R at Stewarts	256	132	147	333	335	12
RS39	Whangaehu R 250m u/s confl.	295	279	279	380	382	12
RS40	Waipoua R at Colombo Rd Br	101	64	69	124	133	12
RS41	Waingawa R at South Rd	58	46	47	77	79	12
RS42	Whareama R at Gauge	614	347	404	662	664	12
RS43	Motuwaireka S at Headwaters	298	137	174	439	440	12
RS44	Totara S at Stronvar	351	182	196	466	474	11
RS45	Parkvale Trib at Lowes Res.	171	122	135	191	193	9
RS46	Parkvale S at Weir	139	116	116	171	176	12
RS47	Waiohine R at Gorge	50	40	40	99	146	12
RS48	Waiohine R at Bicknells	66	44	49	81	82	12
RS49	Beef Ck at Headwaters	87	69	69	106	109	12
RS50	Mangatarere S at SH 2	106	68	80	136	139	12
RS51	Huangaaru R at Ponatahi Br	371	227	259	458	461	12
RS52	Tauanui R at Whakatomotomo Rd	148	103	107	183	190	12
RS53	Awhea R at Tora Rd	465	259	300	498	512	12
RS54	Coles Ck Trib at Lagoon Hill Rd	733	356	370	1187	1200	10
RS55	Tauherenikau R at Websters	60	48	50	72	74	12
RS56	Waiorongomai R at Forest Pk	117	88	90	134	134	12



Table A4.8: Total Organic Carbon (mg/L)

Site No.	Site Name	Median	Minimum	Maximum	n
RS01	Mangapouri S at Rahui Rd	7.0	3.3	14.3	12
RS02	Mangapouri S at Bennetts Rd	7.4	4.4	14.6	12
RS03	Waitohu S at Forest Pk	1.9	0.9	36.8	12
RS04	Waitohu S at Norfolk Cres	5.3	3.5	68.4	12
RS05	Otaki R at Pukehinau	1.3	<0.5	4.5	12
RS06	Otaki R at Mouth	1.2	0.6	5.1	12
RS07	Mangaone S at Sims Rd Br	6.4	4.2	29.1	12
RS08	Ngarara S at Field Way	18.7	9.3	26.4	12
RS09	Waikanae R at Mangaone Walkway	1.5	0.8	3.1	12
RS10	Waikanae R at Greenaway Rd	1.5	0.6	2.7	12
RS11	Whareoa S at Waterfall Rd	4.1	2.3	9.4	12
RS12	Whareoa S at QE Park	13.9	8.6	27.4	12
RS13	Horokiri S at Snodgrass	2.0	0.8	3.2	12
RS14	Pauatahanui S at Elmwood Br	3.4	1.3	6.3	12
RS15	Porirua S at Glenside	4.4	2.0	5.0	12
RS16	Porirua S at Wall Park (Milk Depot)	4.6	2.3	5.6	12
RS17	Makara S at Kennels	5.1	1.4	7.0	12
RS18	Karori S at Makara Peak	2.5	<0.5	4.5	12
RS19	Kaiwharawhara S at Ngaio Gorge	4.0	1.7	4.9	12
RS20	Hutt R at Te Marua Intake Site	2.5	1.2	6.5	12
RS21	Hutt R opp. Manor Park G.C.	2.5	0.9	4.6	12
RS22	Hutt R at Boulcott	2.0	1.2	9.8	12
RS23	Pakuratahi R 50m d/s Farm Ck	1.9	1.1	98.9	12
RS24	Mangaroa R at Te Marua	3.8	1.3	7.6	12
RS25	Akatarawa R at Hutt confl.	1.7	1.1	4.1	12
RS26	Whakatikei R at Riverstone	1.9	1.0	3.1	12
RS27	Waiwhetu S at Wainui Hill Br	4.8	3.7	7.9	12
RS28	Wainuiomata R at Manuka Track	2.1	1.0	3.8	12
RS29	Wainuiomata R u/s of White Br	1.8	1.0	4.6	12
RS30	Orongorongo R at Orongorongo Stn	1.6	<0.5	3.3	12
RS31	Ruamahanga R at McLays	1.2	0.7	3.1	12
RS32	Ruamahanga R at Te Ore Ore	3.6	2.9	7.5	12
RS33	Ruamahanga R at Gladstone Br	2.9	0.9	8.3	12
RS34	Ruamahanga R at Pukio	3.5	1.2	12.4	12
RS35	Mataikona Trib at Sugar Loaf Rd	3.9	2.5	5.0	12
RS36	Taueru R at Castlehill	5.5	4.2	8.4	12
RS37	Taueru R at Gladstone	5.4	1.0	9.6	12
RS38	Kopuaranga R at Stewarts	5.7	3.0	11.8	12
RS39	Whangaeahu R 250m u/s confl.	6.9	3.7	10.0	12
RS40	Waipoua R at Colombo Rd Br	3.0	<0.5	4.1	12
RS41	Waingawa R at South Rd	1.0	0.6	3.0	12
RS42	Whareama R at Gauge	6.4	4.8	10.4	12
RS43	Motuwaireka S at Headwaters	3.1	0.9	4.5	12
RS44	Totara S at Stronvar	4.4	1.5	5.0	11
RS45	Parkvale Trib at Lowes Res.	8.6	4.5	13.0	9
RS46	Parkvale S at Weir	6.2	3.7	10.2	12
RS47	Waiohine R at Gorge	1.0	0.7	2.7	12
RS48	Waiohine R at Bicknells	1.4	<0.5	19.1	12
RS49	Beef Ck at Headwaters	1.6	<0.5	3.1	12
RS50	Mangatarere S at SH 2	2.5	<0.5	7.3	12
RS51	Huangarua R at Ponatahi Br	3.9	1.4	12.4	12
RS52	Tauanui R at Whakatomotomo Rd	2.8	1.4	6.1	12
RS53	Awhea R at Tora Rd	3.9	2.1	11.0	12
RS54	Coles Ck Trib at Lagoon Hill Rd	5.6	2.7	9.9	10
RS55	Tauherenikau R at Websters	1.3	<0.5	3.9	12
RS56	Waiorongomai R at Forest Pk	1.5	0.7	4.5	12

Table A4.9: Ammoniacal Nitrogen (mg/L)

Site No.	Site Name	Median	Minimum	Maximum	<i>n</i>
RS01	Mangapouri S at Rahui Rd	0.025	<0.01	0.20	12
RS02	Mangapouri S at Bennetts Rd	0.065	0.04	0.21	12
RS03	Waitohu S at Forest Pk	0.010	<0.01	0.04	12
RS04	Waitohu S at Norfolk Cres	0.040	0.02	0.10	12
RS05	Otaki R at Pukehinau	0.013	<0.01	0.15	12
RS06	Otaki R at Mouth	0.015	<0.01	0.07	12
RS07	Mangaone S at Sims Rd Br	0.095	0.03	0.24	12
RS08	Ngarara S at Field Way	0.075	<0.01	0.14	12
RS09	Waikanae R at Mangaone Walkway	0.013	<0.01	0.06	12
RS10	Waikanae R at Greenaway Rd	0.030	<0.01	0.10	12
RS11	Whareroa S at Waterfall Rd	0.008	<0.0	0.06	12
RS12	Whareroa S at QE Park	0.085	0.03	0.19	12
RS13	Horokiri S at Snodgrass	0.005	<0.01	0.03	12
RS14	Pauatahanui S at Elmwood Br	0.015	<0.01	0.16	12
RS15	Porirua S at Glenside	0.015	<0.01	0.09	12
RS16	Porirua S at Wall Park (Milk Depot)	0.035	<0.01	0.24	12
RS17	Makara S at Kennels	0.020	<0.01	0.09	12
RS18	Karori S at Makara Peak	0.020	<0.01	0.13	12
RS19	Kaiwharawhara S at Ngaio Gorge	0.040	<0.01	0.24	12
RS20	Hutt R at Te Marua Intake Site	0.005	<0.01	0.07	12
RS21	Hutt R opp. Manor Park G.C.	0.010	<0.01	0.04	12
RS22	Hutt R at Boulcott	0.008	<0.01	0.04	12
RS23	Pakuratahi R 50m d/s Farm Ck	0.005	<0.01	0.04	12
RS24	Mangaroa R at Te Marua	0.015	<0.01	0.13	12
RS25	Akatarawa R at Hutt confl.	0.010	<0.01	0.13	12
RS26	Whakatikei R at Riverstone	0.005	<0.01	0.13	12
RS27	Waiwhetu S at Wainui Hill Br	0.120	0.02	0.49	12
RS28	Wainuiomata R at Manuka Track	0.008	<0.01	0.03	12
RS29	Wainuiomata R u/s of White Br	0.020	<0.01	0.05	12
RS30	Orongorongo R at Orongorongo Stn	0.010	<0.01	0.02	12
RS31	Ruamahanga R at McLays	0.005	<0.01	0.05	12
RS32	Ruamahanga R at Te Ore Ore	0.005	<0.01	0.05	12
RS33	Ruamahanga R at Gladstone Br	0.030	<0.01	0.09	12
RS34	Ruamahanga R at Pukio	0.025	<0.01	0.10	12
RS35	Mataikona Trib at Sugar Loaf Rd	0.005	<0.01	0.04	11
RS36	Taueru R at Castlehill	0.010	<0.01	0.04	11
RS37	Taueru R at Gladstone	0.010	<0.01	0.07	12
RS38	Kopuaranga R at Stewarts	0.020	<0.01	0.10	12
RS39	Whangaehu R 250m u/s confl.	0.008	<0.01	0.04	12
RS40	Waipoua R at Colombo Rd Br	0.008	<0.01	0.03	12
RS41	Waingawa R at South Rd	0.005	<0.01	0.06	12
RS42	Whareama R at Gauge	0.005	<0.01	0.03	12
RS43	Motuwaireka S at Headwaters	0.005	<0.01	0.03	12
RS44	Totara S at Stronvar	0.010	<0.01	0.04	11
RS45	Parkvale Trib at Lowes Res.	0.020	<0.01	0.08	9
RS46	Parkvale S at Weir	0.020	<0.01	0.12	12
RS47	Waiohine R at Gorge	0.005	<0.01	0.04	12
RS48	Waiohine R at Bicknells	0.020	<0.01	0.06	12
RS49	Beef Ck at Headwaters	0.015	<0.01	0.07	12
RS50	Mangatarere S at SH 2	0.090	<0.01	0.20	12
RS51	Huangarua R at Ponatahi Br	0.015	<0.01	0.08	12
RS52	Tauanui R at Whakatomotomo Rd	0.020	<0.01	0.08	12
RS53	Awhea R at Tora Rd	0.020	<0.01	0.10	12
RS54	Coles Ck Trib at Lagoon Hill Rd	0.030	<0.01	0.06	10
RS55	Tauherenikau R at Websters	0.015	<0.01	0.07	12
RS56	Waiorongomai R at Forest Pk	0.008	<0.01	0.09	12

Table A4.10: Nitrite-Nitrate Nitrogen (mg/L)

Site No.	Site Name	Median	Minimum	Maximum	<i>n</i>
RS01	Mangapouri S at Rahui Rd	7.565	4.850	9.480	12
RS02	Mangapouri S at Bennetts Rd	1.935	1.220	4.510	12
RS03	Waitohu S at Forest Pk	0.035	<0.002	0.078	12
RS04	Waitohu S at Norfolk Cres	0.580	0.261	1.160	12
RS05	Otaki R at Pukehinau	0.040	0.003	0.064	12
RS06	Otaki R at Mouth	0.054	0.005	0.132	12
RS07	Mangaone S at Sims Rd Br	1.940	1.520	3.540	12
RS08	Ngarara S at Field Way	0.382	0.069	1.310	12
RS09	Waikanae R at Mangaone Walkway	0.119	0.032	0.203	12
RS10	Waikanae R at Greenaway Rd	0.216	0.019	0.423	12
RS11	Wharetoa S at Waterfall Rd	0.368	0.188	0.761	12
RS12	Wharetoa S at QE Park	0.356	0.083	0.909	12
RS13	Horokiri S at Snodgrass	0.407	0.135	0.941	12
RS14	Pauatahanui S at Elmwood Br	0.237	0.063	0.729	12
RS15	Porirua S at Glenside	1.220	0.617	1.910	12
RS16	Porirua S at Wall Park (Milk Depot)	1.135	0.626	1.780	12
RS17	Makara S at Kennels	0.259	0.042	1.200	12
RS18	Karori S at Makara Peak	1.335	0.600	1.550	12
RS19	Kaiwharawhara S at Ngaio Gorge	1.240	1.030	1.430	12
RS20	Hutt R at Te Marua Intake Site	0.089	0.024	0.224	12
RS21	Hutt R opp. Manor Park G.C.	0.261	0.095	0.452	12
RS22	Hutt R at Boulcott	0.236	0.066	0.439	12
RS23	Pakuratahi R 50m d/s Farm Ck	0.282	0.114	0.406	12
RS24	Mangaroa R at Te Marua	0.560	0.278	0.830	12
RS25	Akatarawa R at Hutt confl.	0.112	0.046	0.175	12
RS26	Whakatikei R at Riverstone	0.097	0.053	0.288	12
RS27	Waiwhetu S at Wainui Hill Br	0.434	0.230	0.824	12
RS28	Wainuiomata R at Manuka Track	0.085	0.015	0.114	12
RS29	Wainuiomata R u/s of White Br	0.191	0.012	0.508	12
RS30	Orongorongo R at Orongorongo Stn	0.081	0.023	0.152	12
RS31	Ruamahanga R at McLays	0.027	0.006	0.046	12
RS32	Ruamahanga R at Te Ore Ore	0.402	0.113	1.390	12
RS33	Ruamahanga R at Gladstone Br	0.379	0.160	1.590	12
RS34	Ruamahanga R at Pukio	0.322	0.137	1.520	12
RS35	Mataikona Trib at Sugar Loaf Rd	0.008	<0.002	0.193	12
RS36	Taueru R at Castlehill	0.066	0.019	0.579	12
RS37	Taueru R at Gladstone	1.140	0.470	2.050	12
RS38	Kopuaranga R at Stewarts	0.941	0.492	1.870	12
RS39	Whangaehu R 250m u/s confl.	2.305	0.820	4.650	12
RS40	Waipoua R at Colombo Rd Br	0.800	0.422	2.650	12
RS41	Waingawa R at South Rd	0.074	0.006	0.404	12
RS42	Whareama R at Gauge	0.001	<0.002	0.699	12
RS43	Motuwaireka S at Headwaters	0.006	0.002	0.305	12
RS44	Totara S at Stronvar	0.007	<0.002	0.365	11
RS45	Parkvale Trib at Lowes Res.	4.280	3.660	5.420	9
RS46	Parkvale S at Weir	1.285	0.073	5.350	12
RS47	Waiohine R at Gorge	0.023	0.004	0.047	12
RS48	Waiohine R at Bicknells	0.322	0.101	1.300	12
RS49	Beef Ck at Headwaters	0.029	0.008	0.038	12
RS50	Mangatarere S at SH 2	1.285	0.629	3.100	12
RS51	Huangarua R at Ponatahi Br	0.179	0.045	0.965	12
RS52	Tauanui R at Whakatomotomo Rd	0.013	0.003	0.098	12
RS53	Awhea R at Tora Rd	0.019	<0.002	0.252	12
RS54	Coles Ck Trib at Lagoon Hill Rd	0.006	<0.002	0.039	10
RS55	Tauherenikau R at Websters	0.031	0.002	0.456	12
RS56	Waiorongomai R at Forest Pk	0.014	<0.002	0.056	12

Table A4.11: Total Kjeldahl Nitrogen (mg/L)

Site No.	Site Name	Median	Minimum	Maximum	<i>n</i>
RS01	Mangapouri S at Rahui Rd	0.70	0.5	1.3	12
RS02	Mangapouri S at Bennetts Rd	0.60	0.3	1.6	12
RS03	Waitohu S at Forest Pk	0.10	<0.1	0.6	12
RS04	Waitohu S at Norfolk Cres	0.30	0.3	0.9	12
RS05	Otaki R at Pukehinou	0.10	<0.1	0.2	12
RS06	Otaki R at Mouth	0.20	<0.1	0.4	12
RS07	Mangaone S at Sims Rd Br	0.60	0.4	1.4	12
RS08	Ngarara S at Field Way	0.90	0.4	1.9	12
RS09	Waikanae R at Mangaone Walkway	0.10	<0.1	0.2	12
RS10	Waikanae R at Greenaway Rd	0.10	<0.1	0.3	12
RS11	Whareroa S at Waterfall Rd	0.20	<0.1	0.9	12
RS12	Whareroa S at QE Park	0.75	0.4	1.6	12
RS13	Horokiri S at Snodgrass	0.20	0.1	0.4	12
RS14	Pauatahanui S at Elmwood Br	0.30	0.1	0.4	12
RS15	Porirua S at Glenside	0.30	0.2	0.6	12
RS16	Porirua S at Wall Park (Milk Depot)	0.30	0.2	0.6	12
RS17	Makara S at Kennels	0.30	0.2	0.7	12
RS18	Karori S at Makara Peak	0.30	<0.1	0.5	12
RS19	Kaiwharawhara S at Ngaio Gorge	0.30	0.2	0.6	12
RS20	Hutt R at Te Marua Intake Site	0.15	<0.1	0.2	12
RS21	Hutt R opp. Manor Park G.C.	0.20	<0.1	0.4	12
RS22	Hutt R at Boulcott	0.10	<0.1	0.2	12
RS23	Pakuratahi R 50m d/s Farm Ck	0.10	<0.1	0.3	12
RS24	Mangaroa R at Te Marua	0.20	<0.1	0.4	12
RS25	Akatarawa R at Hutt confl.	0.10	<0.1	0.2	12
RS26	Whakatikei R at Riverstone	0.10	<0.1	0.3	12
RS27	Waiwhetu S at Wainui Hill Br	0.40	0.2	1.1	12
RS28	Wainuiomata R at Manuka Track	0.10	<0.1	0.3	12
RS29	Wainuiomata R u/s of White Br	0.20	<0.1	0.3	12
RS30	Orongorongo R at Orongorongo Stn	0.20	<0.1	0.2	12
RS31	Ruamahanga R at McLays	0.10	<0.1	0.1	12
RS32	Ruamahanga R at Te Ore Ore	0.20	<0.1	0.7	12
RS33	Ruamahanga R at Gladstone Br	0.20	<0.1	0.9	12
RS34	Ruamahanga R at Pukio	0.20	0.1	1.4	12
RS35	Mataikona Trib at Sugar Loaf Rd	0.20	0.1	0.4	12
RS36	Taueru R at Castlehill	0.30	0.2	0.9	12
RS37	Taueru R at Gladstone	0.45	0.2	1.0	12
RS38	Kopuaranga R at Stewarts	0.30	0.2	1.9	12
RS39	Whangaehu R 250m u/s confl.	0.60	0.2	1.1	12
RS40	Waipoua R at Colombo Rd Br	0.20	0.1	0.3	12
RS41	Waingawa R at South Rd	0.10	<0.1	0.4	12
RS42	Whareama R at Gauge	0.45	0.3	0.9	12
RS43	Motuwaireka S at Headwaters	0.20	<0.1	0.3	12
RS44	Totara S at Stronvar	0.20	0.1	0.9	11
RS45	Parkvale Trib at Lowes Res.	0.80	0.2	7.8	9
RS46	Parkvale S at Weir	0.70	<0.1	1.0	12
RS47	Waiohine R at Gorge	0.10	<0.1	0.2	12
RS48	Waiohine R at Bicknells	0.15	<0.1	0.2	12
RS49	Beef Ck at Headwaters	0.10	<0.1	0.4	12
RS50	Mangatarere S at SH 2	0.40	0.3	0.8	12
RS51	Huangerua R at Ponatahi Br	0.25	0.1	1.4	12
RS52	Tauanui R at Whakatomotomo Rd	0.15	<0.1	1.1	12
RS53	Awhea R at Tora Rd	0.20	<0.1	1.1	12
RS54	Coles Ck Trib at Lagoon Hill Rd	0.20	0.2	0.3	10
RS55	Tauherenikau R at Websters	0.20	<0.1	0.3	12
RS56	Waiorongomai R at Forest Pk	0.10	<0.1	0.2	12

Table A4.12: Total Nitrogen (mg/L)

Site No.	Site Name	Median	Minimum	Maximum	n
RS01	Mangapouri S at Rahui Rd	8.15	6.2	10.0	12
RS02	Mangapouri S at Bennetts Rd	2.60	1.7	5.2	12
RS03	Waitohu S at Forest Pk	0.10	<0.1	0.7	12
RS04	Waitohu S at Norfolk Cres	0.90	0.5	1.7	12
RS05	Otaki R at Pukehinau	0.05	<0.1	0.2	12
RS06	Otaki R at Mouth	0.05	<0.1	0.4	12
RS07	Mangaone S at Sims Rd Br	2.65	1.9	4.3	12
RS08	Ngarara S at Field Way	1.15	0.5	3.2	12
RS09	Waikanae R at Mangaone Walkway	0.15	<0.1	0.4	12
RS10	Waikanae R at Greenaway Rd	0.30	<0.1	0.7	12
RS11	Whareroa S at Waterfall Rd	0.60	0.2	1.5	12
RS12	Whareroa S at QE Park	1.05	0.6	2.5	12
RS13	Horokiri S at Snodgrass	0.70	0.3	1.1	12
RS14	Pauatahanui S at Elmwood Br	0.60	0.3	1.0	12
RS15	Porirua S at Glenside	1.50	0.9	2.3	12
RS16	Porirua S at Wall Park (Milk Depot)	1.35	0.9	2.3	12
RS17	Makara S at Kennels	0.65	0.4	1.4	12
RS18	Karori S at Makara Peak	1.60	1.1	1.8	12
RS19	Kaiwharawhara S at Ngaio Gorge	1.50	1.3	1.9	12
RS20	Hutt R at Te Marua Intake Site	0.20	<0.1	0.3	12
RS21	Hutt R opp. Manor Park G.C.	0.40	0.2	0.5	12
RS22	Hutt R at Boulcott	0.30	<0.1	0.4	12
RS23	Pakuratahi R 50m d/s Farm Ck	0.40	0.1	0.5	12
RS24	Mangaroa R at Te Marua	0.80	0.5	1.0	12
RS25	Akatarawa R at Hutt confl.	0.10	<0.1	0.3	12
RS26	Whakatikei R at Riverstone	0.15	<0.1	0.5	12
RS27	Waiwhetu S at Wainui Hill Br	0.80	0.5	1.5	12
RS28	Wainuiomata R at Manuka Track	0.15	<0.1	0.4	12
RS29	Wainuiomata R u/s of White Br	0.40	<0.1	0.7	12
RS30	Orongorongo R at Orongorongo Stn	0.07	<0.1	0.3	12
RS31	Ruamahanga R at McLays	0.05	<0.1	0.2	12
RS32	Ruamahanga R at Te Ore Ore	0.55	0.2	1.7	12
RS33	Ruamahanga R at Gladstone Br	0.70	0.3	2.0	12
RS34	Ruamahanga R at Pukio	0.55	0.3	2.1	12
RS35	Mataikona Trib at Sugar Loaf Rd	0.20	0.1	0.5	11
RS36	Taueru R at Castlehill	0.40	0.2	1.0	11
RS37	Taueru R at Gladstone	1.70	1.2	2.3	12
RS38	Kopuaranga R at Stewarts	1.25	0.8	2.6	12
RS39	Whangaehu R 250m u/s confl.	2.95	1.4	5.3	12
RS40	Waipoua R at Colombo Rd Br	0.95	0.6	3.0	12
RS41	Waingawa R at South Rd	0.08	<0.1	0.5	12
RS42	Whareama R at Gauge	0.45	0.3	1.5	12
RS43	Motuwaireka S at Headwaters	0.15	<0.1	0.3	12
RS44	Totara S at Stronvar	0.20	0.1	0.9	11
RS45	Parkvale Trib at Lowes Res.	4.90	4.2	12.3	9
RS46	Parkvale S at Weir	1.90	0.4	6.1	12
RS47	Waiohine R at Gorge	0.05	<0.1	0.2	12
RS48	Waiohine R at Bicknells	0.40	0.2	1.5	12
RS49	Beef Ck at Headwaters	0.10	<0.1	0.4	12
RS50	Mangatarere S at SH 2	1.60	1.0	3.5	12
RS51	Huangarua R at Ponatahi Br	0.45	0.2	1.8	12
RS52	Tauanui R at Whakatomotomo Rd	0.05	<0.1	1.1	12
RS53	Awhea R at Tora Rd	0.25	0.2	1.3	12
RS54	Coles Ck Trib at Lagoon Hill Rd	0.30	0.2	0.3	10
RS55	Tauherenikau R at Websters	0.08	<0.1	0.6	12
RS56	Waiorongomai R at Forest Pk	0.05	<0.1	0.3	12

Table A4.13: Dissolved Reactive Phosphorus (mg/L)

Site No.	Site Name	Median	Minimum	Maximum	n
RS01	Mangapouri S at Rahui Rd	0.010	0.005	0.045	12
RS02	Mangapouri S at Bennetts Rd	0.034	0.019	0.049	12
RS03	Waitohu S at Forest Pk	0.006	0.005	0.013	12
RS04	Waitohu S at Norfolk Cres	0.016	0.011	0.024	12
RS05	Otaki R at Pukehinau	0.004	<0.004	0.006	12
RS06	Otaki R at Mouth	0.003	<0.004	0.007	12
RS07	Mangaone S at Sims Rd Br	0.027	0.020	0.039	12
RS08	Ngarara S at Field Way	0.049	0.030	0.079	12
RS09	Waikanae R at Mangaone Walkway	0.011	0.008	0.013	12
RS10	Waikanae R at Greenaway Rd	0.007	<0.004	0.176	12
RS11	Whareroa S at Waterfall Rd	0.027	0.016	0.045	12
RS12	Whareroa S at QE Park	0.045	0.035	0.087	12
RS13	Horokiri S at Snodgrass	0.013	0.008	0.020	12
RS14	Pauatahanui S at Elmwood Br	0.017	0.005	0.035	12
RS15	Porirua S at Glenside	0.024	0.014	0.050	12
RS16	Porirua S at Wall Park (Milk Depot)	0.021	0.013	0.038	12
RS17	Makara S at Kennels	0.031	0.018	0.049	12
RS18	Karori S at Makara Peak	0.051	0.011	0.077	12
RS19	Kaiwharawhara S at Ngaio Gorge	0.059	0.023	0.114	12
RS20	Hutt R at Te Marua Intake Site	0.004	<0.004	0.007	12
RS21	Hutt R opp. Manor Park G.C.	0.002	<0.004	0.010	12
RS22	Hutt R at Boulcott	0.002	<0.004	0.007	12
RS23	Pakuratahi R 50m d/s Farm Ck	0.005	<0.004	0.009	12
RS24	Mangaroa R at Te Marua	0.008	<0.004	0.021	12
RS25	Akatarawa R at Hutt confl.	0.002	<0.004	0.005	12
RS26	Whakatikei R at Riverstone	0.007	<0.004	0.011	12
RS27	Waiwhetu S at Wainui Hill Br	0.023	0.009	0.068	12
RS28	Wainuiomata R at Manuka Track	0.008	0.006	0.014	12
RS29	Wainuiomata R u/s of White Br	0.010	<0.004	0.020	12
RS30	Orongorongo R at Orongorongo Stn	0.005	<0.004	0.007	12
RS31	Ruamahanga R at McLays	0.002	<0.004	0.019	12
RS32	Ruamahanga R at Te Ore Ore	0.006	<0.004	0.029	12
RS33	Ruamahanga R at Gladstone Br	0.028	0.010	0.044	12
RS34	Ruamahanga R at Pukio	0.013	<0.004	0.043	12
RS35	Mataikona Trib at Sugar Loaf Rd	0.002	<0.004	0.007	12
RS36	Taueru R at Castlehill	0.006	<0.004	0.029	12
RS37	Taueru R at Gladstone	0.004	<0.004	0.019	12
RS38	Kopuaranga R at Stewarts	0.017	<0.004	0.038	12
RS39	Whangaehu R 250m u/s confl.	0.020	0.006	0.063	12
RS40	Waipoua R at Colombo Rd Br	0.002	<0.004	0.030	12
RS41	Waingawa R at South Rd	0.002	<0.004	0.016	12
RS42	Whareama R at Gauge	0.002	<0.004	0.011	12
RS43	Motuwaireka S at Headwaters	0.002	<0.004	0.005	12
RS44	Totara S at Stronvar	0.002	<0.004	0.002	11
RS45	Parkvale Trib at Lowes Res.	0.023	<0.004	0.038	9
RS46	Parkvale S at Weir	0.038	0.012	0.090	12
RS47	Waiohine R at Gorge	0.002	<0.004	0.020	12
RS48	Waiohine R at Bicknells	0.011	0.006	0.036	12
RS49	Beef Ck at Headwaters	0.007	0.004	0.036	12
RS50	Mangatarere S at SH 2	0.077	0.034	0.230	12
RS51	Huangarua R at Ponatahi Br	0.002	<0.004	0.037	12
RS52	Tauanui R at Whakatomotomo Rd	0.006	0.005	0.031	12
RS53	Awhea R at Tora Rd	0.002	<0.004	0.029	12
RS54	Coles Ck Trib at Lagoon Hill Rd	0.005	<0.004	0.006	10
RS55	Tauherenikau R at Websters	0.002	<0.004	0.020	12
RS56	Waiorongomai R at Forest Pk	0.002	<0.004	0.039	12

Table A4.14: Total Phosphorus (mg/L)

Site No.	Site Name	Median	Minimum	Maximum	<i>n</i>
RS01	Mangapouri S at Rahui Rd	0.039	0.030	0.124	12
RS02	Mangapouri S at Bennetts Rd	0.069	0.048	0.234	12
RS03	Waitohu S at Forest Pk	0.013	0.010	0.097	12
RS04	Waitohu S at Norfolk Cres	0.041	0.029	0.063	12
RS05	Otaki R at Pukehinau	0.009	0.005	0.090	12
RS06	Otaki R at Mouth	0.012	<0.004	0.117	12
RS07	Mangaone S at Sims Rd Br	0.061	0.049	0.256	12
RS08	Ngarara S at Field Way	0.111	0.068	0.174	12
RS09	Waikanae R at Mangaone Walkway	0.018	0.013	0.028	12
RS10	Waikanae R at Greenaway Rd	0.013	0.005	0.186	12
RS11	Whareroa S at Waterfall Rd	0.044	0.028	0.127	12
RS12	Whareroa S at QE Park	0.092	0.053	0.250	12
RS13	Horokiri S at Snodgrass	0.023	0.018	0.044	12
RS14	Pauatahanui S at Elmwood Br	0.033	0.027	0.056	12
RS15	Porirua S at Glenside	0.041	0.028	0.075	12
RS16	Porirua S at Wall Park (Milk Depot)	0.042	0.031	0.090	12
RS17	Makara S at Kennels	0.053	0.036	0.136	12
RS18	Karori S at Makara Peak	0.074	0.032	0.100	12
RS19	Kaiwharawhara S at Ngaio Gorge	0.068	0.032	0.222	12
RS20	Hutt R at Te Marua Intake Site	0.008	0.004	0.043	12
RS21	Hutt R opp. Manor Park G.C.	0.017	0.006	0.037	12
RS22	Hutt R at Boulcott	0.014	0.004	0.056	12
RS23	Pakuratahi R 50m d/s Farm Ck	0.009	0.004	0.032	12
RS24	Mangaroa R at Te Marua	0.021	0.009	0.062	12
RS25	Akatarawa R at Hutt confl.	0.006	0.005	0.028	12
RS26	Whakatikei R at Riverstone	0.015	0.005	0.052	12
RS27	Waiwhetu S at Wainui Hill Br	0.085	0.034	0.148	12
RS28	Wainuiomata R at Manuka Track	0.017	0.013	0.029	12
RS29	Wainuiomata R u/s of White Br	0.027	0.011	0.079	12
RS30	Orongorongo R at Orongorongo Stn	0.014	0.004	0.100	12
RS31	Ruamahanga R at McLays	0.005	0.005	0.039	12
RS32	Ruamahanga R at Te Ore Ore	0.022	0.006	0.137	12
RS33	Ruamahanga R at Gladstone Br	0.040	0.021	0.160	12
RS34	Ruamahanga R at Pukio	0.034	0.008	0.352	12
RS35	Mataikona Trib at Sugar Loaf Rd	0.010	0.004	0.065	12
RS36	Taueru R at Castlehill	0.025	0.016	0.051	12
RS37	Taueru R at Gladstone	0.041	0.012	0.186	12
RS38	Kopuaranga R at Stewarts	0.042	0.013	0.303	12
RS39	Whangaehu R 250m u/s confl.	0.047	0.020	0.169	12
RS40	Waipoua R at Colombo Rd Br	0.012	0.007	0.037	12
RS41	Waingawa R at South Rd	0.006	0.004	0.018	12
RS42	Whareama R at Gauge	0.024	0.009	0.200	12
RS43	Motuwaireka S at Headwaters	0.005	0.004	0.022	12
RS44	Totara S at Stronvar	0.004	0.004	0.013	11
RS45	Parkvale Trib at Lowes Res.	0.030	0.007	0.045	9
RS46	Parkvale S at Weir	0.077	0.041	0.155	12
RS47	Waiohine R at Gorge	0.005	0.004	0.019	12
RS48	Waiohine R at Bicknells	0.024	0.013	0.036	12
RS49	Beef Ck at Headwaters	0.012	0.007	0.027	12
RS50	Mangatarere S at SH 2	0.092	0.057	0.269	12
RS51	Huangarua R at Ponatahi Br	0.009	0.005	0.437	12
RS52	Tauanui R at Whakatomotomo Rd	0.012	0.006	0.075	12
RS53	Awhea R at Tora Rd	0.008	0.005	0.600	12
RS54	Coles Ck Trib at Lagoon Hill Rd	0.013	0.006	0.031	10
RS55	Tauherenikau R at Websters	0.010	0.005	0.046	12
RS56	Waiorongomai R at Forest Pk	0.005	0.004	0.072	12

Table A4.15: *E. coli* (cfu/100mL)

Site No.	Site Name	Median	Minimum	Maximum	<i>n</i>
RS01	Mangapouri S at Rahui Rd	195	28	14,000	12
RS02	Mangapouri S at Bennetts Rd	1,200	70	20,000	12
RS03	Waitohu S at Forest Pk	13	<4	800	12
RS04	Waitohu S at Norfolk Cres	375	80	9,000	12
RS05	Otaki R at Pukehinou	7	<4	100	12
RS06	Otaki R at Mouth	62	<4	200	12
RS07	Mangaone S at Sims Rd Br	750	61	8,000	12
RS08	Ngarara S at Field Way	150	24	1,000	12
RS09	Waikanae R at Mangaone Walkway	23	<4	170	12
RS10	Waikanae R at Greenaway Rd	44	<2	300	12
RS11	Whareroa S at Waterfall Rd	280	6	66,000	12
RS12	Whareroa S at QE Park	130	40	4,700	12
RS13	Horokiri S at Snodgrass	265	69	620	12
RS14	Pauatahanui S at Elmwood Br	205	63	1,300	12
RS15	Porirua S at Glenside	185	64	1,500	12
RS16	Porirua S at Wall Park (Milk Depot)	350	92	1,400	12
RS17	Makara S at Kennels	245	46	2,000	12
RS18	Karori S at Makara Peak	1,050	150	6,300	12
RS19	Kaiwharawhara S at Ngaio Gorge	1,350	130	20,000	12
RS20	Hutt R at Te Marua Intake Site	30	6	120	12
RS21	Hutt R opp. Manor Park G.C.	240	62	4,800	12
RS22	Hutt R at Boulcott	330	36	2,600	12
RS23	Pakuratahi R 50m d/s Farm Ck	44	4	1,800	12
RS24	Mangaroa R at Te Marua	150	84	1,700	12
RS25	Akatarawa R at Hutt confl.	115	26	900	12
RS26	Whakatikei R at Riverstone	28	<2	240	12
RS27	Waiwhetu S at Wainui Hill Br	1,100	100	4,100	12
RS28	Wainuiomata R at Manuka Track	6	1	100	12
RS29	Wainuiomata R u/s of White Br	115	20	1,100	12
RS30	Orongorongo R at Orongorongo Stn	23	3	72	12
RS31	Ruamahanga R at McLays	6	<2	32	12
RS32	Ruamahanga R at Te Ore Ore	120	48	6,400	12
RS33	Ruamahanga R at Gladstone Br	37	<4	1,900	12
RS34	Ruamahanga R at Pukio	86	20	3,700	12
RS35	Mataikona Trib at Sugar Loaf Rd	31	8	1,300	12
RS36	Taueru R at Castlehill	94	28	810	12
RS37	Taueru R at Gladstone	110	8	800	12
RS38	Kopuaranga R at Stewarts	260	35	8,800	12
RS39	Whangaehu R 250m u/s confl.	350	76	2,100	12
RS40	Waipoua R at Colombo Rd Br	108	12	460	12
RS41	Waingawa R at South Rd	35	14	150	12
RS42	Whareama R at Gauge	34	8	1,100	12
RS43	Motuwaireka S at Headwaters	5	<1	21	12
RS44	Totara S at Stronvar	2	<1	15	11
RS45	Parkvale Trib at Lowes Res.	22	2	140	9
RS46	Parkvale S at Weir	205	74	3,200	12
RS47	Waiohine R at Gorge	4	<4	12	12
RS48	Waiohine R at Bicknells	42	17	500	12
RS49	Beef Ck at Headwaters	6	<1	58	12
RS50	Mangatarere S at SH 2	125	38	2,600	12
RS51	Huangarua R at Ponatahi Br	56	24	1,700	12
RS52	Tauanui R at Whakatomotomo Rd	8	<2	37	12
RS53	Awhea R at Tora Rd	185	<2	1,000	12
RS54	Coles Ck Trib at Lagoon Hill Rd	72	<4	410	10
RS55	Tauherenikau R at Websters	20	4	60	12
RS56	Waiorongomai R at Forest Pk	5	<4	16	12



## Appendix 5: Macroinvertebrate indices

Table A5.1: QMCI

Site No.	Site Name	Rep. 1	Rep. 2	Rep. 3	Mean	Std Dev.
RS01	Mangapouri S at Rahui Rd	4.63	4.28	4.61	4.51	0.20
RS02	Mangapouri S at Bennetts Rd	4.86	4.46	4.12	4.48	0.37
RS03	Waitohu S at Forest Pk	8.28	8.02	7.97	8.09	0.17
RS04	Waitohu S at Norfolk Cres	4.56	4.56	4.33	4.48	0.13
RS05	Otaki R at Pukehinou	7.55	7.52	7.55	7.54	0.02
RS06	Otaki R at Mouth	7.72	7.66	6.36	7.25	0.77
RS07	Mangaone S at Sims Rd Br	4.40	4.43	4.41	4.41	0.02
RS08	Ngarara S at Field Way	4.34	4.12	4.17	4.21	0.12
RS09	Waikanae R at Mangaone Walkway	7.65	7.84	8.06	7.85	0.20
RS10	Waikanae R at Greenaway Rd	5.58	4.10	3.44	4.38	1.10
RS11	Whareroa S at Waterfall Rd	5.81	6.19	6.61	6.21	0.40
RS12	Whareroa S at QE Park	4.34	4.37	4.64	4.45	0.17
RS13	Horokiri S at Snodgrass	5.95	6.43	6.56	6.31	0.32
RS14	Pauatahanui S at Elmwood Br	3.49	3.43	3.05	3.32	0.24
RS15	Porirua S at Glenside	5.09	4.95	5.14	5.06	0.10
RS16	Porirua S at Wall Park (Milk Depot)	3.71	3.37	3.96	3.68	0.30
RS17	Makara S at Kennels	4.72	4.15	4.53	4.47	0.29
RS18	Karori S at Makara Peak	2.64	2.89	2.97	2.83	0.17
RS19	Kaiwharawhara S at Ngaio Gorge	3.85	3.41	3.40	3.55	0.26
RS20	Hutt R at Te Marua Intake Site	7.55	7.91	7.95	7.80	0.22
RS21	Hutt R opp. Manor Park G.C.	5.22	3.89	3.86	4.32	0.78
RS22	Hutt R at Boulcott	3.85	4.63	4.36	4.28	0.39
RS23	Pakuratahi R 50m d/s Farm Ck	7.32	6.86	7.38	7.19	0.28
RS24	Mangaroa R at Te Marua	4.93	4.34	4.63	4.63	0.29
RS25	Akatarawa R at Hutt confl.	6.69	7.15	6.69	6.84	0.26
RS26	Whakatikei R at Riverstone	7.28	6.82	7.30	7.13	0.27
RS27	Waiwhetu S at Wainui Hill Br	3.99	4.19	4.29	4.16	0.15
RS28	Wainuiomata R at Manuka Track	7.42	7.54	7.22	7.39	0.16
RS29	Wainuiomata R u/s of White Br	4.14	4.05	4.75	4.31	0.38
RS30	Orongorongo R at Orongorongo Stn	3.84	3.86	4.11	3.94	0.15
RS31	Ruamahanga R at McLays	7.99	7.99	8.06	8.01	0.04
RS32	Ruamahanga R at Te Ore Ore	6.08	6.73	6.96	6.59	0.45
RS33	Ruamahanga R at Gladstone Br	7.77	7.48	7.71	7.65	0.15
RS34	Ruamahanga R at Pukio	7.07	6.85	7.26	7.06	0.20
RS35	Mataikona Trib at Sugar Loaf Rd	5.55	5.96	5.22	5.58	0.37
RS36	Taueru R at Castlehill	4.92	4.66	4.26	4.62	0.34
RS37	Taueru R at Gladstone	4.41	4.64	4.52	4.52	0.11
RS38	Kopuaranga R at Stewarts	6.17	5.48	5.26	5.63	0.48
RS39	Whangaeu R 250m u/s confl.	4.48	4.61	4.77	4.62	0.15
RS40	Waipoua R at Colombo Rd Br	4.37	4.57	5.04	4.66	0.34
RS41	Waingawa R at South Rd	7.11	7.35	7.31	7.26	0.13
RS42	Whareama R at Gauge	4.01	4.02	4.13	4.06	0.07
RS43	Motuwaiereka S at Headwaters	6.22	5.52	6.18	5.97	0.40
RS44	Totara S at Stronvar	4.84	4.62	4.92	4.79	0.16
RS45	Parkvale Trib at Lowes Res.	5.41	5.09	5.03	5.17	0.20
RS46	Parkvale S at Weir	4.87	4.88	4.76	4.84	0.07
RS47	Waiohine R at Gorge	7.95	7.96	8.02	7.98	0.04
RS48	Waiohine R at Bicknells	6.81	5.91	6.82	6.51	0.52
RS49	Beef Ck at Headwaters	7.34	6.87	7.28	7.16	0.26
RS50	Mangatarere S at SH 2	5.23	5.63	5.98	5.61	0.37
RS51	Huangarua R at Ponatahi Br	6.04	5.83	5.85	5.91	0.11
RS52	Tauanui R at Whakatomotomo Rd	5.82	5.23	5.39	5.48	0.31
RS53	Awhea R at Tora Rd	4.07	3.89	4.02	3.99	0.09
RS54	Coles Ck Trib at Lagoon Hill Rd	5.72	5.51	6.84	6.03	0.71
RS55	Tauherenikau R at Websters	7.48	6.79	7.62	7.30	0.45
RS56	Waiorongomai R at Forest Pk	5.15	4.94	4.71	4.94	0.22

Table A5.2: %EPT taxa

Site No.	Site Name	Rep. 1	Rep. 2	Rep. 3	Mean	Std Dev.
RS01	Mangapouri S at Rahui Rd	0.2	0	0	0.07	0.13
RS02	Mangapouri S at Bennetts Rd	2.1	0	0	0.72	1.24
RS03	Waitohu S at Forest Pk	91.8	86.2	87.8	88.59	2.88
RS04	Waitohu S at Norfolk Cres	4.5	1.7	2.0	2.72	1.51
RS05	Otaki R at Pukehinau	90.8	91.0	88.5	90.09	1.39
RS06	Otaki R at Mouth	89.9	90.3	64.9	81.69	14.59
RS07	Mangaone S at Sims Rd Br	0.7	0	0	0.24	0.41
RS08	Ngarara S at Field Way	1.1	0.5	0.6	0.76	0.34
RS09	Waikanae R at Mangaone Walkway	86.3	87.4	89.1	87.58	1.41
RS10	Waikanae R at Greenaway Rd	64.9	33.4	23.5	40.62	21.62
RS11	Whareroa S at Waterfall Rd	50.7	75.3	63.9	63.31	12.32
RS12	Whareroa S at QE Park	0	0	0	0	0
RS13	Horokiri S at Snodgrass	78.7	73.2	78.8	76.89	3.20
RS14	Pauatahanui S at Elmwood Br	6.2	7.0	6.0	6.38	0.54
RS15	Porirua S at Glenside	47.9	45.2	42.6	45.23	2.65
RS16	Porirua S at Wall Park (Milk Depot)	59.8	22.2	17.8	33.26	23.10
RS17	Makara S at Kennels	16.5	4.0	14.3	11.60	6.69
RS18	Karori S at Makara Peak	5.1	6.0	10.5	7.22	2.90
RS19	Kaiwharawhara S at Ngaio Gorge	33.6	10.9	17.1	20.53	11.73
RS20	Hutt R at Te Marua Intake Site	83.9	93.5	93.9	90.45	5.66
RS21	Hutt R opp. Manor Park G.C.	47.7	24.5	21.5	31.24	14.35
RS22	Hutt R at Boulcott	24.6	42.6	36.1	34.42	9.07
RS23	Pakuratahi R 50m d/s Farm Ck	85.8	79.3	90.0	85.05	5.41
RS24	Mangaroa R at Te Marua	69.6	44.2	60.9	58.23	12.93
RS25	Akatarawa R at Hutt confl.	71.1	75.9	86.0	77.68	7.61
RS26	Whakatikei R at Riverstone	74.8	69.3	79.3	74.46	5.04
RS27	Waiwhetu S at Wainui Hill Br	0.1	0	0	0.04	0.07
RS28	Wainuiomata R at Manuka Track	74.3	78.2	78.9	77.16	2.49
RS29	Wainuiomata R u/s of White Br	52.8	28.3	56.6	45.88	15.32
RS30	Orongorongo R at Orongorongo Stn	7.5	5.1	19.5	10.69	7.73
RS31	Ruamahanga R at McLays	93.9	95.4	98.3	95.85	2.24
RS32	Ruamahanga R at Te Ore Ore	58.0	72.6	84.0	71.55	13.03
RS33	Ruamahanga R at Gladstone Br	91.8	79.6	92.1	87.84	7.14
RS34	Ruamahanga R at Pukio	71.2	60.5	74.9	68.84	7.48
RS35	Mataikona Trib at Sugar Loaf Rd	70.0	63.1	58.8	63.99	5.64
RS36	Taueru R at Castlehill	41.0	35.0	20.5	32.15	10.51
RS37	Taueru R at Gladstone	20.6	10.0	25.0	18.54	7.71
RS38	Kopuaranga R at Stewarts	78.6	73.4	67.9	73.29	5.36
RS39	Whangaehu R 250m u/s confl.	0.3	0	0.8	0.37	0.39
RS40	Waipoua R at Colombo Rd Br	52.6	45.0	56.6	51.41	5.89
RS41	Waingawa R at South Rd	90.5	92.5	87.2	90.05	2.65
RS42	Whareama R at Gauge	0.2	0	7.8	2.67	4.44
RS43	Motuwaireka S at Headwaters	84.6	76.4	81.6	80.89	4.18
RS44	Totara S at Stronvar	64.0	58.6	32.5	51.69	16.84
RS45	Parkvale Trib at Lowes Res.	23.4	16.3	12.3	17.33	5.59
RS46	Parkvale S at Weir	19.1	29.8	34.5	27.82	7.88
RS47	Waiohine R at Gorge	92.8	95.0	94.1	93.99	1.15
RS48	Waiohine R at Bicknells	75.2	50.5	74.1	66.62	13.98
RS49	Beef Ck at Headwaters	73.2	70.1	79.8	74.37	4.92
RS50	Mangatarere S at SH 2	60.6	49.1	52.4	54.03	5.97
RS51	Huangarua R at Ponatahi Br	61.2	60.4	50.4	57.30	6.03
RS52	Tauanui R at Whakatomotomo Rd	66.5	50.8	54.7	57.33	8.19
RS53	Awhea R at Tora Rd	2.5	7.4	17.3	9.06	7.52
RS54	Coles Ck Trib at Lagoon Hill Rd	50.7	37.4	70.1	52.76	16.47
RS55	Tauherenikau R at Websters	90.7	83.3	94.6	89.52	5.77
RS56	Waiorongomai R at Forest Pk	47.2	36.8	39.4	41.14	5.44

Table A5.3: Taxa richness

Site No.	Site Name	Rep. 1	Rep. 2	Rep. 3	Mean	Std Dev.
RS01	Mangapouri S at Rahui Rd	16	15	10	13.67	3.21
RS02	Mangapouri S at Bennetts Rd	8	15	12	11.67	3.51
RS03	Waitohu S at Forest Pk	27	35	29	30.33	4.16
RS04	Waitohu S at Norfolk Cres	13	13	11	12.33	1.15
RS05	Otaki R at Pukehinau	21	19	21	20.33	1.15
RS06	Otaki R at Mouth	15	11	17	14.33	3.06
RS07	Mangaone S at Sims Rd Br	18	20	14	17.33	3.06
RS08	Ngarara S at Field Way	20	15	14	16.33	3.21
RS09	Waikanae R at Mangaone Walkway	32	32	30	31.33	1.15
RS10	Waikanae R at Greenaway Rd	25	25	19	23.00	3.46
RS11	Whareroa S at Waterfall Rd	32	28	31	30.33	2.08
RS12	Whareroa S at QE Park	14	13	13	13.33	0.58
RS13	Horokiri S at Snodgrass	23	23	25	23.67	1.15
RS14	Pauatahanui S at Elmwood Br	18	22	17	19.00	2.65
RS15	Porirua S at Glenside	25	23	27	25.00	2.00
RS16	Porirua S at Wall Park (Milk Depot)	31	30	25	28.67	3.21
RS17	Makara S at Kennels	17	19	15	17.00	2.00
RS18	Karori S at Makara Peak	27	28	35	30.00	4.36
RS19	Kaiwharawhara S at Ngaio Gorge	25	24	24	24.33	0.58
RS20	Hutt R at Te Marua Intake Site	23	22	16	20.33	3.79
RS21	Hutt R opp. Manor Park G.C.	26	23	20	23.00	3.00
RS22	Hutt R at Boulcott	20	14	13	15.67	3.79
RS23	Pakuratahi R 50m d/s Farm Ck	25	28	24	25.67	2.08
RS24	Mangaroa R at Te Marua	27	28	25	26.67	1.53
RS25	Akatarawa R at Hutt confl.	28	27	28	27.67	0.58
RS26	Whakatikei R at Riverstone	27	28	27	27.33	0.58
RS27	Waiwhetu S at Wainui Hill Br	13	8	11	10.67	2.52
RS28	Wainuiomata R at Manuka Track	33	32	33	32.67	0.58
RS29	Wainuiomata R u/s of White Br	24	25	30	26.33	3.21
RS30	Orongorongo R at Orongorongo Stn	17	15	16	16.00	1.00
RS31	Ruamahanga R at McLays	17	14	15	15.33	1.53
RS32	Ruamahanga R at Te Ore Ore	23	18	20	20.33	2.52
RS33	Ruamahanga R at Gladstone Br	14	13	14	13.67	0.58
RS34	Ruamahanga R at Pukio	10	11	12	11.00	1.00
RS35	Mataikona Trib at Sugar Loaf Rd	31	34	30	31.67	2.08
RS36	Taueru R at Castlehill	28	22	15	21.67	6.51
RS37	Taueru R at Gladstone	24	23	17	21.33	3.79
RS38	Kopuaranga R at Stewarts	23	25	29	25.67	3.06
RS39	Whangaehu R 250m u/s confl.	24	20	24	22.67	2.31
RS40	Waipoua R at Colombo Rd Br	24	26	27	25.67	1.53
RS41	Waingawa R at South Rd	14	16	14	14.67	1.15
RS42	Whareama R at Gauge	10	11	13	11.33	1.53
RS43	Motuwaiareka S at Headwaters	30	29	36	31.67	3.79
RS44	Totara S at Stronvar	26	23	21	23.33	2.52
RS45	Parkvale Trib at Lowes Res.	21	20	18	19.67	1.53
RS46	Parkvale S at Weir	20	20	17	19.00	1.73
RS47	Waiohine R at Gorge	17	19	18	18.00	1.00
RS48	Waiohine R at Bicknells	13	18	16	15.67	2.52
RS49	Beef Ck at Headwaters	26	29	32	29.00	3.00
RS50	Mangatarere S at SH 2	19	23	20	20.67	2.08
RS51	Huangarua R at Ponatahi Br	18	19	21	19.33	1.53
RS52	Tauanui R at Whakatomotomo Rd	27	26	26	26.33	0.58
RS53	Awhea R at Tora Rd	23	18	22	21.00	2.65
RS54	Coles Ck Trib at Lagoon Hill Rd	32	37	26	31.67	5.51
RS55	Tauherenikau R at Websters	19	15	22	18.67	3.51
RS56	Waiorongomai R at Forest Pk	24	25	29	26.00	2.65