



Rivers Water Quality and Ecology monitoring programme

Annual data report, 2017/18

A Mitchell
M Heath

Environmental Science Department

For more information, contact the Greater Wellington Regional Council:

Wellington
PO Box 11646

T 04 384 5708
F 04 385 6960
www.gw.govt.nz




Masterton
PO Box 41

T 06 378 2484
F 06 378 2146
www.gw.govt.nz

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www.gw.govt.nz
info@gw.govt.nz

Report prepared by:	A Mitchell	Environmental Monitoring Officer	
	M Heath	Senior Environmental Scientist	M W Heath.
Report reviewed by:	Bryn Hickson Rowden	Environmental Monitoring Assistant	
Report approved for release by:	M Oliver	Team Leader, Environmental Science	 Date: 19/02/19

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1. Introduction

This report summarises the key results from the Rivers Water Quality and Ecology (RWQE) monitoring programme for the period 1 July 2017 to 30 June 2018 inclusive. The RWQE programme incorporates monthly monitoring of water quality, fine sediment and periphyton cover across a network of 44 river and stream sites in the Wellington Region¹. Monthly assessments of periphyton biomass are undertaken at a subset of the RWQE sites, while macroinvertebrate community composition and habitat quality are assessed annually in summer/autumn at most of the RWQE sites.

In addition to the routine monitoring outlined above, this report also summarises the 2017/18 results of the ecological monitoring trial, which started in 2015/16. This ecologically focused trial aims to assess ecosystem health, via measurements of macroinvertebrates, fish community composition and habitat quality, at 50 new monitoring sites that have been selected randomly across the region.

The suitability of rivers for contact recreation purposes is reported separately under Greater Wellington Regional Council's (GWRC) recreational water quality monitoring programme; for the 2017/18 results, see Brasell and Conwell (2019). Information on river and stream flows is reported under GWRC's hydrological monitoring programme (see Harkness 2018).

¹ Note fine sediment and periphyton cover is only assessed at hard bottom sites.

2. Overview of monitoring programme

River and stream water quality has been routinely monitored in the western part 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 (see Milne and Perrie (2005) and Perrie et al. (2012) for details). However, since September 2003, the RWQE monitoring programme has remained largely unchanged, with only minor changes to the existing suite of monitoring sites and variables.

The broader RWQE programme encompasses the targeted investigations that are related to riverine water quality and ecology. Information on the specific investigations conducted in 2017/18, including outputs and/or interim results, can be found in Appendix 1.

2.1 Monitoring objectives

The overall objective of GWRC's RWQE monitoring programme is to provide robust information on state and trends in river and stream condition across the Wellington Region.

To achieve this objective, the aims of the RWQE monitoring programme are to:

1. Assist in the detection of spatial and temporal patterns in water quality and ecosystem health in Wellington's rivers and streams;
2. Contribute to our understanding of freshwater biodiversity in the Wellington Region;
3. Determine the suitability of rivers and streams for designated uses;
4. Provide information to assist in targeted investigations where remediation or mitigation of poor water quality or ecosystem health is desired; and
5. Provide information required to determine the effectiveness of regional plans and policies.

2.2 Monitoring network

Water quality and ecosystem health are currently monitored at 44 river and stream sites (Figure 2.1, Appendix 2). These sites were chosen to represent the major land uses and human activities, and also the natural diversity of rivers and streams, in the wider Wellington Region.

2.2.1 Changes to the monitoring network

No major changes were made to the RWQE monitoring network during 2017/18. However, Site RS47 (Waiohine River at Gorge) was removed from the network and replaced by a new monitoring Site RS62 (Waiohine River at Gorge Rd Carpark), which is located 500m upstream. This change was made because site RS47 was no longer considered safe to sample.

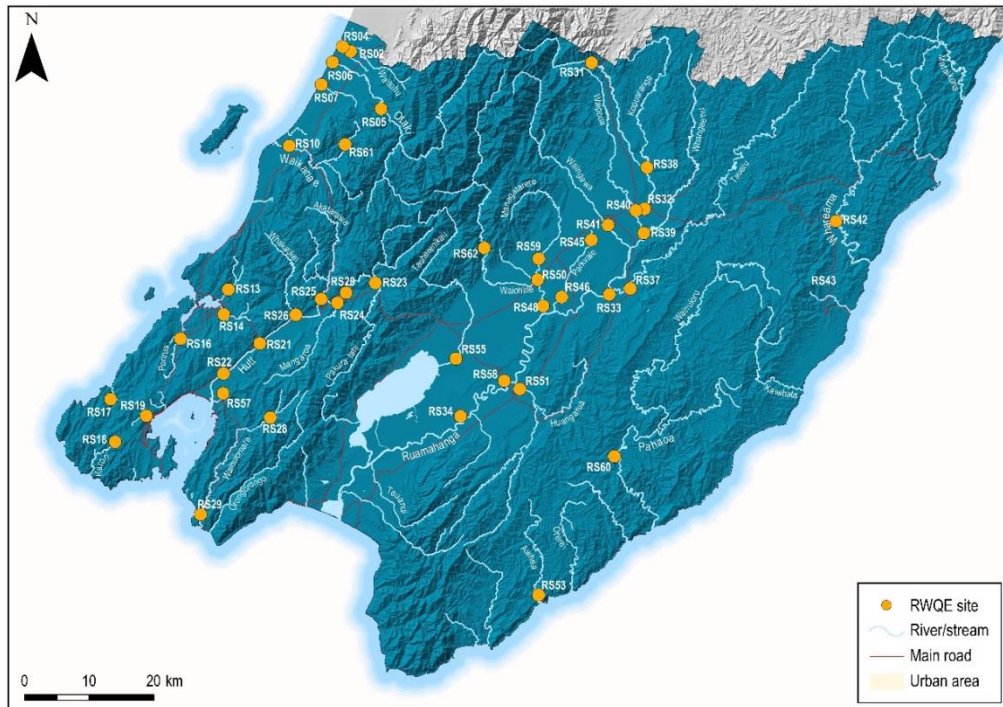


Figure 2.1: RWQE sites monitored between July 2017 and June 2018

2.3 Monitoring variables

An overview of the physico-chemical, biological and habitat variables that were monitored across the network of 44 RWQE sites in 2017/18 is provided in Table 2.1. Further information is outlined in Sections 2.3.1 to 2.3.4, and a full list of variables monitored, together with details of field and analytical methods, is provided in Appendix 3.

Table 2.1: Overview of physicochemical, biological and habitat variables that are monitored across the RWQE network (maximum sites assessed = 44)

Physico-chemical variables	No. of RWQE sites
Monthly water quality sampling – core variables*	44
Monthly analysis of dissolved copper and zinc (total copper and zinc)	9(6)
Monthly analysis of TSS** and SSC**	17
Biological variables/assessments	No. of RWQE sites
Monthly periphyton cover	37
Monthly periphyton biomass	16
Annual macroinvertebrate	42
Habitat quality variables/assessments	No. of RWQE sites
Monthly fine sediment cover	37
Annual rapid habitat assessment	41

*Core water quality variables include temperature, dissolved oxygen, visual clarity, pH, conductivity, turbidity, faecal indicator bacteria, and dissolved and total nutrients.

**TSS = Total Suspended Sediment; SSC = Suspended Sediment Concentration.

2.3.1 Water quality variables

River and stream water quality is assessed at monthly intervals by measuring a range of physicochemical and microbiological variables. The full list of variables monitored, together with details of field and analytical methods, is provided in Appendix 3.

2.3.2 Ecosystem health variables

RWQE sites are also assessed for indicators of ecosystem health. This includes:

- Semi-quantitative assessments of macroinvertebrate communities during stable/low flows in summer/autumn. In 2017/18, assessments of macroinvertebrate communities were assessed at 42 of the 44 RWQE sites.
- Monthly assessments of periphyton biomass. Sixteen RWQE sites were assessed in 2017/18.

Details of current biological monitoring methods are summarised in Appendix 3.

2.3.3 Habitat variables

Habitat assessments are undertaken annually coinciding with macroinvertebrate sample collection. During 2017/18 this occurred at 41 of the 44 RWQE sites (during summer/early autumn). This assessment provides an indication of the condition of the physical habitat and its ability to support stream biota. Details of current habitat assessment methods are summarised in Appendix 3.

2.3.4 Changes to monitoring variables in 2017/18

Monthly deposited sediment monitoring was re-instated at hard-bottom² sites in 2017/18.

² A hard-bottomed stream is one where the substrate is dominated by particles of gravel size or greater

3. Physico-chemical and microbiological water quality

3.1 Approach to analysis

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 (eg, a value of >400 became 400). The exception is minimum values reported in the tabulated summaries in Appendices 4 and 5 (ie, if a value was reported as <2 then the minimum value presented is <2).

3.1.1 Water Quality Index

In this section a water quality index is used as a comparative measure to summarise water quality across the Wellington Region, based on physicochemical and microbiological data collected monthly from July 2017 to June 2018 inclusive (see Appendix 4 for tabulated data). A water quality index (WQI), as described by Perrie (2007) and Perrie et al. (2012), 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 of 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 comply³
- 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
- Poor: median values for <3 of the 6 variables comply with guideline values, or the median dissolved oxygen concentration/value does not comply with the guideline value.

The guidelines used in the WQI assessment are listed in Table 3.1 below.

³ If the median dissolved oxygen concentration does not comply with the guideline value, then the WQI grade will automatically drop to 'poor'.

Table 3.1: Physicochemical and microbiological variables and guideline values used in GWRC's WQI

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)
E.coli (cfu/100mL)	≤100	ANZECC & ARMCANZ (2000)

As outlined in Perrie (2007), 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 to some degree because the median value of at least one of the six physico-chemical or microbiological variables in the WQI did not comply with a guideline value. In addition, as the WQI is based on median values (ie, 50% compliance), sites awarded the same water quality grade may exhibit varying degrees of compliance (from 51 to 100%) with the guideline value.

3.1.2 National Policy Statement for Freshwater Management 2014 (NPS-FM 2014) attribute states

In addition to the calculation of WQI scores, RWQE monitoring data were assessed against the water quality and ecological attribute (or parameter) tables set out in Appendix 2 of the NPS-FM 2014 (MFE 2014). These attribute tables are an integral component of the National Objectives Framework (NOF) and are designed to help guide decisions related to the protection of particular values, namely ecosystem and human health.

In this report, attribute states for *E.coli*, ammoniacal nitrogen, and nitrate nitrogen are summarised in Table 3.2 and presented in Appendix 4 (Tables A4.11, A4.12 & A4.19). The sampling statistics used to derive these attribute states are specific to each attribute, and are outlined in Table 3.2. Periphyton biomass attribute states are presented in Section 4.

Table 3.2: Attribute states and guideline values taken from the National Objectives Framework (MfE 2014)

	<i>E.coli</i> /100mL*			
	% exceedances over 540 cfu/100mL	% exceedances over 260 cfu/100mL	Median	95 th percentile of <i>E.coli</i> /100mL
A	<5%	<20%	≤130	≤540
B	5-10%	20-30%	≤130	≤1000
C	10-20%	30-34%	≤130	≤1200
D	20-30%	34-50%	>130 ≤260	>1200
E	>30%	>50%	>260	>1200
	Ammoniacal nitrogen (mg/L)			
	Median		Maximum	
A	≤0.03		≤0.05	
B	>0.03 and ≤0.24		>0.05 and ≤0.40	
C	>0.24 and ≤1.30		>0.40 and ≤2.20	
D	>1.30		>2.20	
	Nitrate nitrogen (mg/L)			
	Median		95 th percentile	
A	≤1.0		≤1.5	
B	>1.0 and ≤2.4		>1.5 and ≤3.5	
C	>2.4 and ≤6.9		>3.5 and ≤9.8	
D	>6.9		>9.8	

*Note that attribute states for *E. coli* are calculated using a minimum of 60 data points over a maximum of five years. Attribute state is determined by satisfying all numeric attribute states.

3.1.3 Metals

Metal (copper and zinc) concentrations are compared against ANZECC (2000) chronic toxicity ‘trigger values’ (95% level of protection). Because water hardness affects the toxicity of some metals, where metal concentrations exceed trigger values, site-specific, hardness-modified trigger values are calculated based on recommendations and calculations in ANZECC (2000). Since the availability of water hardness data varied across the ten sites during 2017/18, the calculation of hardness-modified trigger values and application of the trigger values are undertaken in the following two ways:

- For the five sites where total hardness was analysed in monthly water samples, the hardness-modified trigger value is calculated for each sampling occasion and compared against the metal concentration from that occasion. A breach of the chronic toxicity guidelines is defined as occurring when a site exceeds its hardness-modified trigger value on more than 50% of sampling occasions; and,
- For the three sites where total hardness was not analysed in monthly water samples, the hardness-modified trigger value is calculated based on the median water hardness value generated from monthly monitoring over

July 2012 to June 2013. A breach of the chronic toxicity guideline is defined as occurring when the median metal concentration from monthly sampling over 2017/18 exceeds this site-specific, hardness modified trigger value.

3.2 Results

3.2.1 Water Quality Index

Application of the WQI resulted in the following overall water quality grades for the 44 RWQE sites monitored in the Wellington Region over the July 2017 to June 2018 period (Figure 3.1, Table 3.3).

- Excellent: 13 sites (30%)
- Good: 9 sites (20%)
- Fair: 13 sites (30%)
- Poor: 9 sites (20%)

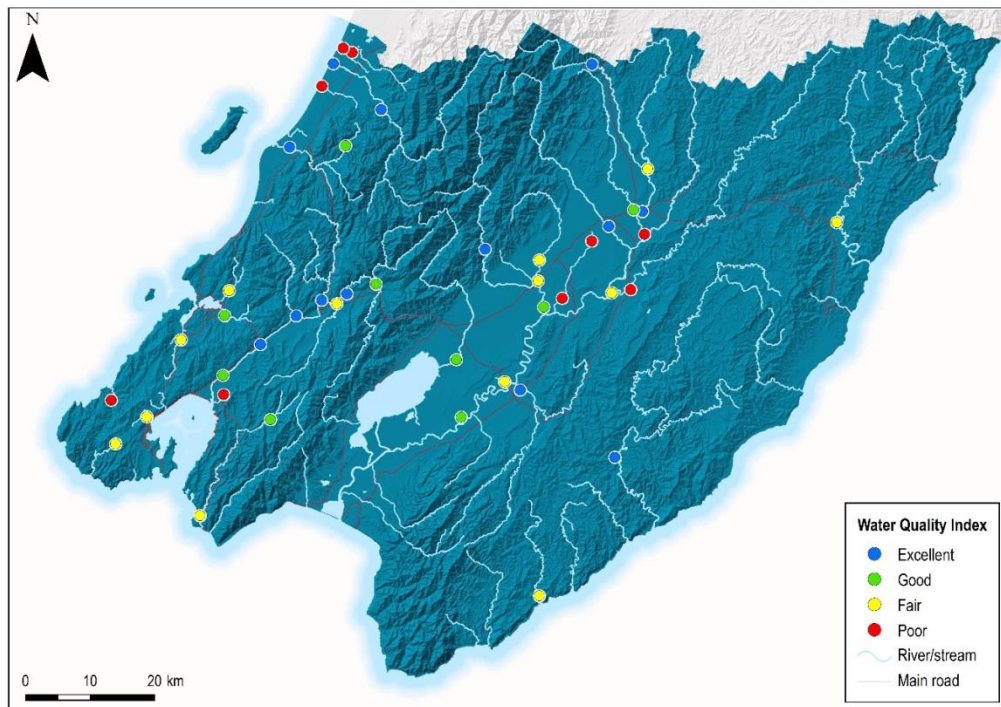


Figure 3.1: Water Quality Index grades for RWQE sites sampled at monthly intervals between July 2017 and June 2018, based on compliance of median dissolved oxygen, visual clarity, nitrite-nitrate nitrogen, ammoniacal nitrogen, dissolved reactive phosphorus and E.coli values with guideline values

Table 3.3: Water Quality Index grades for RWQE sites sampled at monthly intervals over July 2017 to June 2018 inclusive, based on compliance of median nitrite-nitrate nitrogen, dissolved reactive phosphorus (DRP), dissolved oxygen (DO), visual clarity (black disc), ammoniacal nitrogen and *E.coli* values with guideline values

Site code	Site name	Nitrite-Nitrate Nitrogen	Dissolved Reactive Phosphorus	Dissolved Oxygen % Sat (Field)	Black Disc	Ammoniacal Nitrogen	<i>E.coli</i>
Excellent water quality							
RS31	Ruamahanga River at McLays	✓	✓	✓	✓	✓	✓
RS20	Hutt River at Te Marua Intake Site	✓	✓	✓	✓	✓	✓
RS26	Whakatikei River at Riverstone	✓	✓	✓	✓	✓	✓
RS41	Waingawa River at South Rd	✓	✓	✓	✓	✓	✓
RS06	Otaki River at Mouth	✓	✓	✓	✓	✓	✓
RS05	Otaki River at Pukehinau	✓	✓	✓	✓	✓	✓
RS10	Waikanae River at Greenaway Rd	✓	✓	✓	✓	✓	✓
RS25	Akatarawa River at Hutt Confluence	✓	✓	✓	✓	✓	✓
RS21	Hutt River Opposite Manor Park Golf Club	✓	✓	✓	✓	✓	✓
RS60	Pahaoa River at Hinakura	✓	✓	✓	✓	✓	✓
RS32	Ruamahanga River at Te Ore Ore	✓	✓	✓	✓	✓	✓
RS62	Waiohine River at Gorge Rd Carpark	✓	✓	✓	✓	✓	✓
RS51	Huanga River at Ponatahi Bridge	✓	✓	✓	✓	✓	✓
Good water quality							
RS55	Tauherenikau River at Websters	✓	✓	✓	✗	✓	✓
RS23	Pakuratahi River 50m Below Farm Creek	✓	✓	✓	✓	✓	✗
RS28	Wainuiomata River at Manuka Track	✓	✗	✓	✓	✓	✓
RS22	Hutt River at Boulcott	✓	✓	✓	✓	✓	✗
RS61	Waikanae River at Footbridge on Mangaone Walkway	✓	✗	✓	✓	✓	✓
RS40	Waipoua River at Colombo Rd Bridge	✗	✓	✓	✓	✓	✓
RS48	Waiohine River at Bicknells	✓	✓	✓	✓	✓	✗
RS14	Pauatohanui Stream at Elmwood Bridge	✓	✓	✓	✓	✓	✗
RS34	Ruamahanga River at Pukio	✓	✓	✓	✗	✓	✓
Fair water quality							
RS29	Wainuiomata River Dnstr of White Bridge	✓	✗	✓	✓	✓	✗
RS42	Whareama River at Gauge	✓	✓	✓	✗	✓	✗
RS33	Ruamahanga River at Gladstone Bridge	✓	✗	✓	✗	✓	✓
RS13	Horokiri Stream at Snodgrass	✗	✓	✓	✓	✓	✗
RS24	Mangaroa River at Te Marua	✓	✓	✓	✗	✓	✗
RS58	Ruamahanga River at Waihenga Bridge	✓	✗	✓	✗	✓	✓
RS53	Awhea River at Tora Rd	✓	✓	✓	✗	✓	✗
RS50	Mangatarere River at State Highway 2	✗	✗	✓	✓	✓	✓
RS59	Enaki Stream D/S site for Riparian	✗	✗	✓	✓	✓	✗
RS38	Kopuaranga River at Stuarts	✗	✗	✓	✓	✓	✗
RS19	Kaiwharawhara Stream at Ngaio Gorge	✗	✗	✓	✓	✓	✗
RS16	Porirua Stream at Milk Depot	✗	✗	✓	✓	✓	✗
RS18	Karori Stream at Makara Peak Mountain Bike Park	✗	✗	✓	✓	✓	✗
Poor water quality							
RS45	Parkvale tributary at Lowes Reserve	✗	✗	✗	✓	✓	✓
RS37	Taueru River at Gladstone	✗	✗	✓	✗	✓	✗
RS17	Makara Stream at Kennels	✗	✗	✓	✗	✓	✗
RS39	Whangaehu River at 250m from Confluence	✗	✗	✓	✗	✓	✗
RS46	Parkvale Stream at Renalls Weir	✗	✗	✓	✗	✓	✗
RS57	Waiwhetu Stream at Whites Line East	✗	✗	✓	✓	✗	✗
RS04	Waitohu Stream at Norfolk Crescent	✓	✗	✓	✗	✗	✗
RS02	Mangapouri Stream at Bennetts Rd	✗	✗	✗	✗	✗	✗
RS07	Mangaone Stream at Sims Road Bridge	✗	✗	✗	✗	✗	✗

3.2.2 National Objective Framework (NOF) attribute states

Attribute states for *E.coli* for all 44 RWQE sites are summarised in Table 3.4. For ammoniacal nitrogen and nitrate nitrogen three years of data (July 2015 to June 2018) was used to derive attribute state, while five years of data was used for *E. coli* (July 2013 to June 2018).

Table 3.4: Summary of NOF attribute states for RWQE sites sampled at monthly intervals between July 2017 and June 2018 inclusive

Attribute state	No. of sites	Percentage of sites (%)
<i>E.coli</i>*		
A	15	34
B	8	18
C	2	5
D	8	18
E	11	25
Ammoniacal nitrogen		
A	39	89
B	5	11
C	0	0
D	0	0
Nitrate nitrogen**		
A	33	77
B	9	21
C	1	2
D	0	0

*Note that attribute states for *E.coli* are determined by using a minimum of 60 data points over a maximum of five years.

**Waiohine River at Gorge Rd Carpark is not included in this assessment did not have enough data to calculate a NOF grade

3.2.3 Metals

Median concentrations of dissolved copper did not exceed the ANZECC (2000) default trigger values, but concentrations of dissolved zinc exceeded the guidelines at two sites (Waiwhetu at White Lines East and Karori Stream at Makara Peak Mountain Bike Park). Once local water hardness was taken into account and the site-specific, hardness-modified trigger values applied, Waiwhetu at White Lines East and Karori Stream at Makara Peak Mountain Bike Park still exceeded their modified guidelines for Zinc. There were no exceedances for copper after the hardness-modified trigger values were applied. Summary statistics for heavy metals can be found in Appendix 5.

4. Periphyton

4.1 Approach to analysis

4.1.1 Monthly assessment of periphyton cover

Assessments of periphyton are limited to RWQE sites with hard substrates (Figure 4.1). Monthly observations of percent streambed periphyton cover (filamentous and mat-forming periphyton) from July 2017 to June 2018 inclusive at 37 sites are compared against the periphyton composite cover guidelines (Matheson et al. 2012). The threshold for nuisance mat cover is twice that for filamentous periphyton cover, so the periphyton weighted composite cover (PeriWCC) can be defined as filamentous periphyton cover + mat periphyton cover/2 with a nuisance guideline of ≥ 30 .

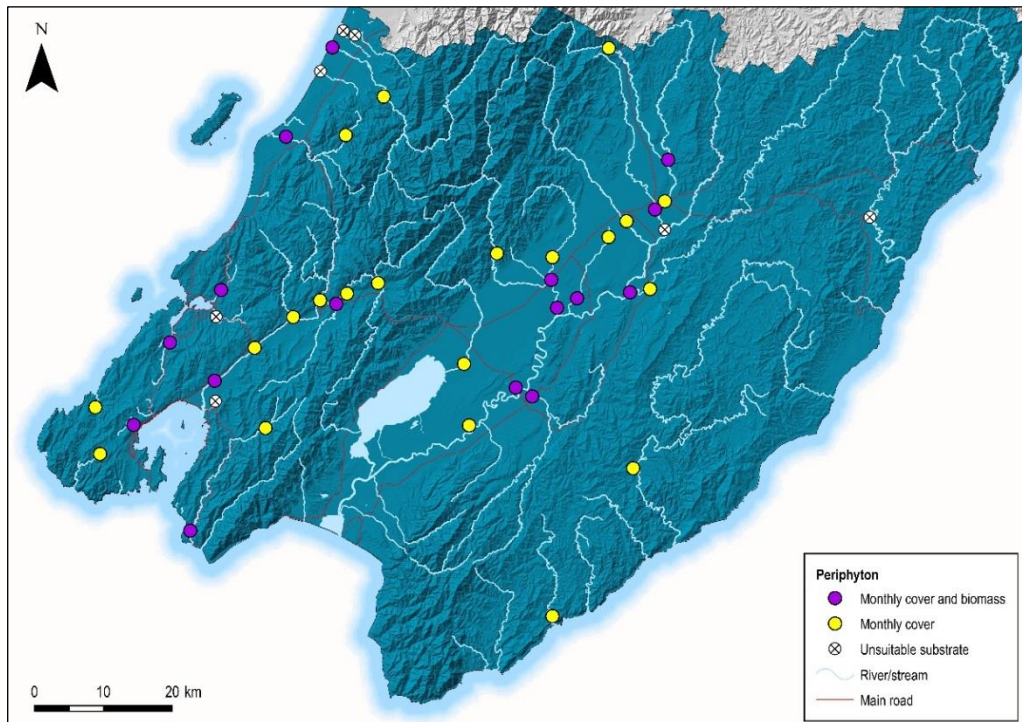


Figure 4.1: Periphyton monitoring sites with hard-bottomed substrates where monthly observations of periphyton cover and, in some cases, monthly biomass (chlorophyll *a*) samples were collected during 2017/18. RWQE sites with unsuitable substrates for periphyton growth that were not sampled are also indicated

Monthly cover assessments of potentially toxic mat-forming cyanobacteria are compared against the MfE and MoH (2009) interim guidelines (Table 4.1).

Table 4.1: MfE/MoH (2009) alert level framework for benthic cyanobacteria cover

Alert level	Guideline
Green	$\leq 20\%$ coverage of potentially toxic cyanobacteria attached to substrate
Amber	20-50% coverage of potentially toxic cyanobacteria attached to substrate
Red	$> 50\%$ coverage of potentially toxic cyanobacteria attached to substrate

4.1.2 Monthly periphyton biomass sampling

Sixteen RWQE sites (Figure 4.1) were sampled monthly from July 2017 to June 2018 for periphyton biomass. Due to high flows or, at one site, limited site access, sampling could not occur in every sampling month. Monthly chlorophyll *a* concentrations are summarised and assessed against the NPS-FM bottom line of 200 mg/m² (Table 4.2) and have been assigned a preliminary attribute state based on monthly data collected since August 2015 (max *n* = 35).

The NPS-FM specifies that three years of monthly data (ie, 36 data points) are required to undertake an assessment against biomass (Chl *a*) thresholds (MfE, 2015). Monitoring at six of the biomass sites began in July 2016 (max *n* =24) and at one site (Waipoua River at Colombo Road Bridge) in July 2017 (max *n* =12). Thus, these results should be considered initial assessments as there is insufficient data to benchmark against NPS-FM thresholds, which require three years of data.

Table 4.2: Attribute states and guideline values for periphyton biomass assessment taken from the National Objectives Framework (MfE 2014)

Attribute state	Default class – exceeded no more than 8% of samples (mg/m ²)	Productive class – exceeded no more than 17% of samples (mg/m ²)
A	≤50	≤50
B	>50 and ≤120	>50 and ≤120
C	>120 and ≤200	>120 and ≤200
D	>200	>200

Some rivers and streams have higher periphyton biomass than others due to natural factors such as long accrual periods and nutrient enriched geology (MfE 2015). In MfE (2015); these types of rivers are classed as “productive” and all other rivers are classed as “default” because they are the dominant class across New Zealand. Application of the NPS-FM bottom line threshold and attribute states differ between these two river classes (productive and default). For a breach to occur in a productive class river, the threshold needs to be exceeded on more than six occasions over a three year period. For a breach to occur in a default class river, the threshold needs to be only exceeded on more than three occasions (MfE 2015). Based on the criteria for determining productive and default river classes in MfE (2015), one of the 16 RWQE sites is considered to be within this productive class: Huangarua River at Ponatahi Bridge. Therefore, the other 15 RWQE sites sampled are within the default class.

4.2 Results

4.2.1 Monthly assessment of periphyton cover and cyanobacteria

The number of observations of streambed periphyton cover made during the reporting period varied among the 37 RWQE sites due to either site access being restricted or because turbid water or high flows prevented periphyton assessments being carried out on some occasions. Of the 37 RWQE sites with periphyton cover observations, 15 exceeded the Matheson et al. (2012) weighted composite cover periphyton guideline on at least one sampling occasion (Table 4.3). The sites that most often exceeded the guideline were the Huangarua River at Ponatahi Bridge (6 times) and Kopuaranga at Stuarts (4 times). These sites are both located in catchments dominated by pastoral land use. The Hutt River at Manor Park was the only site during 2017/2018 to exceed the cyanobacteria amber alert guideline, which it did so on three occasions. The red alert level was not exceeded at any of the monitoring sites.

Table 4.3: Summary of monthly observations at RWQE sites between July 2017 and June 2018 (inclusive), of visible streambed periphyton cover in relation to exceedance of the Matheson et. al. (2012) and MfE & MoH (2009) guidelines. Values in bold indicate a guideline exceedance

Whaitua	Site Name	Site number	n	PeriWCC*		Cyanobacterial mat cover >0.2 cm thick		
				Max	n>30	Max	n 20-50%	n >50%
Kapiti Coast	Otaki River at Pukehinou	RS05	9	32	1	0	0	0
	Otaki River at Mouth	RS06	9	60	3	1	0	0
	Waikanae River at Greenaway Rd	RS10	11	52	1	6	0	0
	Waikanae River at Footbridge on Mangaone Walkway	RS61	12	3	0	0	0	0
Te Awarua-o-Porirua	Horokiri Stream at Snodgrass	RS13	9	79	1	1	0	0
	Porirua Stream at Milk Depot	RS16	9	61	1	0	0	0
Te Whanganui-a-Tara	Makara Stream at Kennels	RS17	7	24	0	2	0	0
	Karori Stream at Makara Peak Mountain Bike Park	RS18	8	13	0	11	0	0
	Kaiwharawhara Stream at Ngaio Gorge	RS19	9	17	0	0	0	0
	Hutt River at Te Marua Intake Site	RS20	9	4	0	7	0	0
	Hutt River Opposite Manor Park Golf Club	RS21	8	30	0	27	3	0
	Hutt River at Boulcott	RS22	7	82	1	5	0	0
	Pakuratahi River 50m Below Farm Creek	RS23	10	14	0	9	0	0
	Mangaroa River at Te Marua	RS24	9	66	2	6	0	0
	Akatarawa River at Hutt Confluence	RS25	10	3	0	5	0	0
	Whakatikei River at Riverstone	RS26	10	6	0	4	0	0
	Wainuiomata River at Manuka Track	RS28	12	38	1	1	0	0
	Wainuiomata River Dnstr of White Bridge	RS29	12	34	1	5	0	0
Ruamahanga	Ruamahanga River at McLays	RS31	8	3	0	9	0	0
	Ruamahanga River at Te Ore Ore	RS32	11	7	0	1	0	0
	Ruamahanga River at Gladstone Bridge	RS33	8	16	0	17	0	0
	Ruamahanga River at Pukio	RS34	5	10	0	0	0	0
	Taueru River at Gladstone	RS37	7	56	2	3	0	0
	Kopuaranga River at Stuarts	RS38	9	79	4	20	0	0
	Waipoua River at Colombo Rd Bridge	RS40	9	23	0	9	0	0
	Waingawa River at South Rd	RS41	11	11	0	7	0	0
	Parkvale tributary at Lowes Reserve	RS45	10	0	0	0	0	0
	Parkvale Stream at Renalls Weir	RS46	8	12	0	1	0	0
	Waiohine River at Bicknells	RS48	8	9	0	6	0	0
	Mangatarere River at State Highway 2	RS50	7	48	1	2	0	0
	Huangaaru River at Ponatahi Bridge	RS51	8	80	6	16	0	0
	Waiohine River at Gorge Rd Carpark	RS62	6	2	0	0	0	0
	Tauherenikau River at Websters	RS55	6	4	0	0	0	0
	Ruamahanga River at Waihenga Bridge	RS58	6	38	1	1	0	0
Enaki Stream D/S site for Riparian	RS59	10	0	0	0	0	0	
Eastern Wairapa	Pahaoa River at Hinakura	RS60	9	14	0	4	0	0
	Awhea River at Tora Rd	RS53	7	60	3	0	0	0

* Note that the maximum PeriWCC values do not represent maximum filamentous and/or mat algae cover over the sampling period, but the maximum value calculated using the PeriWCC index.

4.2.2 Monthly periphyton biomass sampling

Median chlorophyll *a* concentrations ranged from 1.3 mg/m² (Waiohine River at Bicknells) to 161.5 mg/m² (Kopuaranga River at Stuarts) and maximum chlorophyll *a* concentrations ranged from 49.0 mg/m² (Waiohine River at Bicknells) to 734.4 mg/m² (Kopuaranga River at Stuarts) (Table 4.4). Two sites, the Kopuaranga River at Stuarts and Mangaroa River at Te Marua has already exceeded the NPS-FM bottom line (attribute state 'D'). While three years of monthly data is yet to be collected, it seems likely that the Huangarua River Ponatahi Bridge will also exceed the national bottom line; this site is currently assigned to the 'C' attribute state based on 18 sampling points.

Table 4.4: Summary of periphyton biomass (chlorophyll *a*) from monthly sampling during August 2015 to July 2018. The number of sampling occasions a site exceeded the NPS-FM bottom line of 200mg/m³ and the current NPS-FM attribute state are also presented.

Site No.	Site name	n	Chlorophyll <i>a</i> (mg/m ²)			Current NPS-FM attribute state
			Median	Max	n >200	
RS06	Ōtaki River at Mouth	33	3.0	75.0	0	A
RS10	Waikanae River at Greenaway Rd	21	2.7	120.8	0	A
RS13	Horokiri Stream at Snodgrass	31	35.7	525.5	2	C
RS16	Porirua Stream at Wall Pk	32	22.1	177.3	0	B
RS19	Kaiwharawhara Stream at Ngaio Gorge	20	40.4	216.7	1	C
RS22	Hutt River at Boulcott	29	3.0	388.5	1	B
RS24	Mangaroa River at Te Marua	30	67.1	327.3	3	D
RS29	Wainuiomata River d/s White Br	18	18.7	375.2	2	C
RS33	Ruamahanga River at Gladstone Br	26	1.8	124.6	0	B
RS58	Ruamahanga River at Waihenga	17	4.9	302.4	1	A
RS38	Kopuaranga River at Stuarts*	31	161.5	734.4	13	D
RS40	Waipoa River at Colombo Rd Br [#]	8	37.3	196.0	0	B
RS46	Parkvale Stream at weir	22	19.9	273.9	1	B
RS48	Waiohine River at Bicknells	15	1.3	49.0	0	A
RS50	Mangatarere Stream at SH2	17	8.1	329.6	2	C
RS51	Huangarua River at Ponatahi Br*	18	88.7	363.4	5	C

*This site is classed as "productive" based on MfE (2015) criteria. All others are as "default".

[#] New sites added in 2017/18.

5. Macroinvertebrates

Macroinvertebrate sampling was undertaken at 42 RWQE sites during summer 2017/18. The Macroinvertebrate Community Index (MCI), an index of sensitivity to a wide range of environmental variables (Stark & Maxted 2007), is used to summarise macroinvertebrate health. Additional macroinvertebrate indices (QMCI, %EPT taxa, and taxa richness) are presented in Appendix 6. Refer to Perrie et al. (2012) for further explanation of these indices. Site RS47 (Waiohine River at Gorge) has been removed from the network and replaced by a new monitoring Site RS62 (Waiohine River at Gorge Rd Carpark), which is located 500m upstream. Both sites were sampled for macroinvertebrates in 2017/18.

The quality classifications, as recommended by the Proposed Natural Resources Plan (PNRP) for the Wellington Region, for interpretation of the MCI scores are outlined in Table 5.1. Soft bottomed MCI scores (MCI-sb) have also been calculated for the seven RWQE sites that were sampled which have soft substrates (See Appendix 2).

Table 5.1: MCI quality classification based on Clapcott and Goodwin (2014) and PNRP outcomes for the Wellington Region

River class		MCI quality class (2017/18 MCI score)				PNRP outcomes (MCI scores based on three year rolling median)	
		Poor	Fair	Good	Excellent	All rivers	Significant rivers
1	Steep, hard sedimentary	<110	110-120	120-130	≥130	≥ 120	≥ 130
2	Mid-gradient, coastal and hard sedimentary	<80	80-105	105-130	≥130	≥ 105	≥ 130
3	Mid-gradient, soft sedimentary	<80	80-105	105-130	≥130	≥ 105	≥ 130
4	Lowland, large, draining ranges	<90	90-110	110-130	≥130	≥ 110	≥ 130
5	Lowland, large, draining plains and eastern Wairarapa	<80	80-100	100-120	≥120	≥ 100	≥ 120
6	Lowland, small	<80	80-100	100-120	≥120	≥ 100	≥ 120

5.1 Results

The MCI scores based on one sample collected from each monitoring site are presented in Table 5.2. The 42 RWQE sites fell into the following MCI quality classes (Figure 5.1):

- Excellent: 5 sites (12%)
- Good: 16 sites (38%)
- Fair: 16 sites (38%)
- Poor: 5 sites (12%)

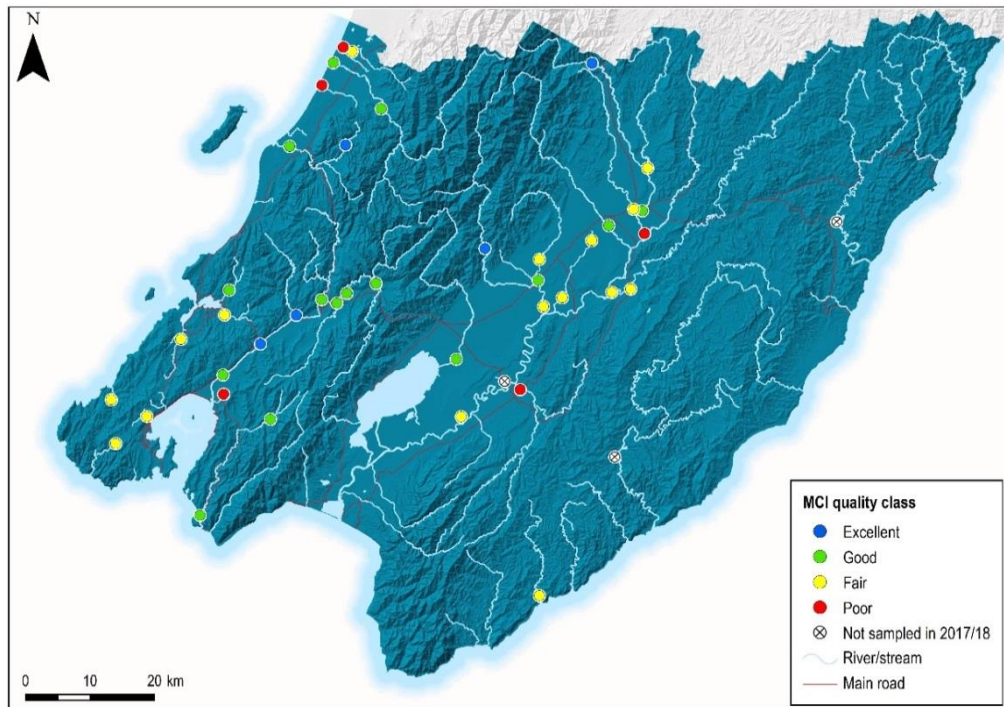


Figure 5.1: MCI quality classes for the 42 RWQE sites, determined from one sampling event over summer 2017/18. Sites that would normally be sampled but were not during 2017/18 are also indicated. Map includes discontinued site RS47.

Table 5.2: MCI scores and quality classes based on Clapcott and Goodwin (2014) classifications for RWQE sites sampled in 2017/2018

Whaitua	Site Name	Site Number	River Class	MCI Score	2017/2018 MCI class (based on river class)	Three year rolling MCI score median	Significant river?	PNRP objective
Kapiti Coast	Mangapouri Stream at Bennetts Rd*	RS02	6	80 (88)*	Fair	88.00	N	Not meeting
	Waitohu Stream at Norfolk Crescent*	RS04	5	71 (80)*	Poor	84.20#	N	Not meeting
	Otaki River at Pukehinau	RS05	1	123	Good	122.50	Y	Not meeting
	Otaki River at Mouth	RS06	4	111	Good	111.00	Y	Not meeting
	Mangaone Stream at Sims Road Bridge*	RS07	5	65 (78)	Poor	65.05	N	Not meeting
	Waikanae River at Greenaway Rd	RS10	4	114	Good	114.29	Y	Not meeting
	Waikanae River at Footbridge on Mangaone Walkway	RS61	4	136	Excellent	139.30#	Y	Meeting
Te Awarua-o-Porirua	Horokiri Stream at Snodgrass	RS13	2	120	Good	118.50	N	Meeting
	Pauatahanui Stream at Elmwood Bridge*	RS14	2	96 (102)	Fair	100.40	N	Meeting
	Porirua Stream at Milk Depot	RS16	2	86	Fair	85.71	N	Not meeting
Te Whanganui-a-Tara	Makara Stream at Kennels	RS17	2	100	Fair	113.60#	N	Not meeting
	Karori Stream at Makara Peak Mountain Bike Park	RS18	2	98	Fair	93.10	N	Not meeting
	Kaiwharawhara Stream at Ngaio Gorge	RS19	2	94	Fair	93.79	N	Not meeting
	Hutt River at Te Marua Intake Site	RS20	1	125	Good	138.00	Y	Meeting
	Hutt River Opposite Manor Park Golf Club	RS21	4	131	Excellent	121.70	Y	Not meeting
	Hutt River at Boulcott	RS22	4	117	Good	113.00	Y	Not meeting
	Pakuratahi River 50m Below Farm Creek	RS23	1	121	Good	120.67	Y	Not meeting
	Mangaroa River at Te Marua	RS24	1	121	Good	121.00	Y	Not meeting
	Akatarawa River at Hutt Confluence	RS25	1	122	Good	128.40	Y	Not meeting
	Whakatikei River at Riverstone	RS26	4	139	Excellent	131.40	Y	Meeting
	Wainuiomata River at Manuka Track	RS28	1	127	Good	130.30	Y	Meeting
	Wainuiomata River Downstream of White Bridge	RS29	4	113	Good	111.20	Y	Not meeting
	Waiwhetu at Whites Line East	RS57	6	67 (68)	Poor	59.70	N	Not meeting
	Wairarapa Coast	Whareama River at Gauge	RS42	5	Not sampled in 17/18			N
Awhea River at Tora Rd		RS53	5	84	Fair	84.20	Y	Not meeting
Pahaoa River at Hinakura		RS60	5	Not sampled in 17/18			N	N/A
Ruamahanga	Ruamahanga River at McLays	RS31	1	133	Excellent	132.80	N	Meeting
	Ruamahanga River at Te Ore Ore	RS32	4	114	Good	114.29	N	Meeting
	Ruamahanga River at Gladstone Bridge	RS33	4	107	Fair	106.70	N	Not meeting
	Ruamahanga River at Pukio	RS34	4	109	Fair	107.50	N	Not meeting
	Taueru River at Gladstone	RS37	3	95	Fair	84.80	N	Not meeting
	Kopuaranga Stream at Stewarts	RS38	5	90	Fair	90.37	N	Not meeting
	Whangaehu River at 250m from Confluence*	RS39	3	52 (78)	Poor	60.00	N	Not meeting
	Waipoua River at Colombo Road Bridge	RS40	4	103	Fair	102.50	N	Not meeting
	Waingawa River at South Rd	RS41	4	114	Good	114.12	Y	Not meeting
	Parkvale Tributary at Lowes Reserve	RS45	6	90	Fair	93.30#	N	Not meeting
	Parkvale Stream at weir	RS46	5	88	Fair	88.00#	N	Not meeting
	Waiohine River at Gorge†	RS47	1	128	Good	135.40	Y	Meeting
	Waiohine River at Bicknells	RS48	4	104	Fair	106.70	Y	Not meeting
	Mangatarere River at State Highway 2*	RS50	4	117 (110)	Good	109.50	Y	Not meeting
	Huangarua River at Ponatahi Bridge	RS51	4	86	Poor	91.50	N	Not meeting
	Tauherenikau River at Websters	RS55	4	121	Good	115.20#	Y	Not meeting
	Ruamahanga River at Waihenga Bridge	RS58	4	Not sampled in 17/18			N	N/A
	Enaki Stream - Downstream site for RIPARIAN	RS59	4	103	Fair	insufficient data	N	N/A
Waiohine River at Gorge Rd Carpark	RS62	1	131	Excellent	insufficient data	Y	N/A	

*MCI-sb scores that were used to apply quality classes at soft-bottomed sites while values in brackets are the MCI-hb scores for these sites

#Sites with a rolling mean calculated using three data points but not from the last three consecutive years

† Discontinued site

6. Habitat Quality

6.1 Approach to analysis

Habitat assessments were undertaken at 41 RWQE sites at the time annual macroinvertebrate samples were collected during summer 2017/18. Note site RS47 (Waiohine River at Gorge) was not assessed for habitat quality in 2017/18 although invertebrates were collected for comparison with the new Waiohine River site RS62 (Waiohine River at Gorge Rd carpark), 500m downstream.

A summary of the overall habitat scores for each site is provided (individual scores for each of the ten components that make up the overall habitat score can be found in Appendix 7); these overall scores provide an indication of the physical stream habitat condition and its ability to support stream biota.

6.2 Results

Overall habitat scores ranged from 25 (Waitohu Stream at Norfolk Crescent) to 99 (Ruamahanga River at McLays) (Table 6.1).

Table 6.1: Overall habitat quality scores based on a one-off assessment at RWQE sites during 2017/18

Whaitua	Site name	Site no.	River class	Substrate	Overall habitat score
Kapiti	Mangapouri Stream at Bennetts Rd	RS02	6	Soft	42
	Waitohu Stream at Norfolk Crescent	RS04	5	Soft	25
	Ōtaki River at Pukehinau	RS05	1	Hard	85.5
	Ōtaki River at Mouth	RS06	4	Hard	69.5
	Mangaone Stream at Sims Road Br	RS07	5	Soft	29
	Waikanae River at Greenaway Rd	RS10	4	Hard	77
	Waikanae River at Footbridge on M. Walkway	RS61	2	Hard	97
Te Awarua-o-Porirua	Horokiri Stream at Snodgrass	RS13	2	Hard	48.5
	Pauatahanui Stream at Elmwood Br	RS14	2	Soft	65
	Porirua Stream at Milk Depot	RS16	2	Hard	39
Te Whanganui-a-Tara	Makara Stream at Kennels	RS17	2	Hard	49
	Karori Stream at Makara Peak M.B Park	RS18	2	Hard	58
	Kaiwharawhara Stream at Ngaio Gorge	RS19	2	Hard	72
	Hutt River at Te Marua Intake Site	RS20	1	Hard	82.5
	Hutt River Opposite Manor Park Golf Club	RS21	4	Hard	61
	Hutt River at Boulcott	RS22	4	Hard	55
	Pakuratahi River 50m Below Farm Creek	RS23	1	Hard	77
	Mangaroa River at Te Marua	RS24	1	Hard	77.5
	Akatarawa River at Hutt Confl.	RS25	1	Hard	88
	Whakatiwai River at Riverstone	RS26	4	Hard	87
	Wainuiomata River at Manuka Track	RS28	1	Hard	93.5
	Wainuiomata River d/s of White Br	RS29	4	Hard	59.5
	Waiwhetu Stream at Whites Line East	RS57	6	Soft	30
Wairarapa coast	Whareama River at Gauge	RS42	5	Soft	Not assessed
	Awhea River at Tora Rd	RS53	5	Hard	40.5
	Pahaoa River at Hinakura	RS60	5	Hard	Not assessed
Ruamahanga	Ruamahanga River at McLays	RS31	1	Hard	99
	Ruamahanga River at Te Ore Ore	RS32	4	Hard	55.5
	Ruamahanga River at Gladstone Br	RS33	4	Hard	70.5
	Ruamahanga River at Pukio	RS34	4	Hard	44
	Taueru River at Gladstone	RS37	3	Hard	47
	Kopuaranga River at Stuarts	RS38	5	Hard	44.5
	Whangaehu River at 250m from Confl.	RS39	3	Soft	59
	Waipoua River at Colombo Rd Br	RS40	4	Hard	67
	Waingawa River at South Rd	RS41	4	Hard	61.5
	Parkvale tributary at Lowes Reserve	RS45	6	Hard	55
	Parkvale Stream at Renalls Weir	RS46	5	Hard	41
	Waiohine River at Gorge	RS47	1	Hard	81
	Waiohine River at Bicknells	RS48	4	Hard	72.5
	Mangatarere River at State Highway 2	RS50	4	Hard	53
	Huangarua River at Ponatahi Br	RS51	4	Hard	45
	Tauherenikau River at Websters	RS55	4	Hard	67
	Ruamahanga River at Waihenga Br	RS58	4	Hard	Not assessed
Enaki Stream d/s site for Riparian	RS59	4	Hard	55.5	

7. Additional river monitoring trials undertaken in 2017/18

7.1 Ecologically focused assessments at sites selected randomly

7.1.1 Approach to analysis

As part of this trial, one-off assessments of habitat quality, macroinvertebrate communities and fish communities were undertaken at 19 sites during summer/autumn of 2017/18 (Figure 7.1). Macroinvertebrate⁴ and habitat data have been summarised as per the analyses detailed in Sections 5 and 6, respectively, and fish community data has been summarised and tabulated. The Index of Biotic Integrity (IBI) was calculated for each site to provide an indication of overall fish community condition and interpretation of scores was based on recommended classes in Joy (2004; Table 7.1). Further site details, macroinvertebrate metrics and full habitat scores can be found in Appendix 8.

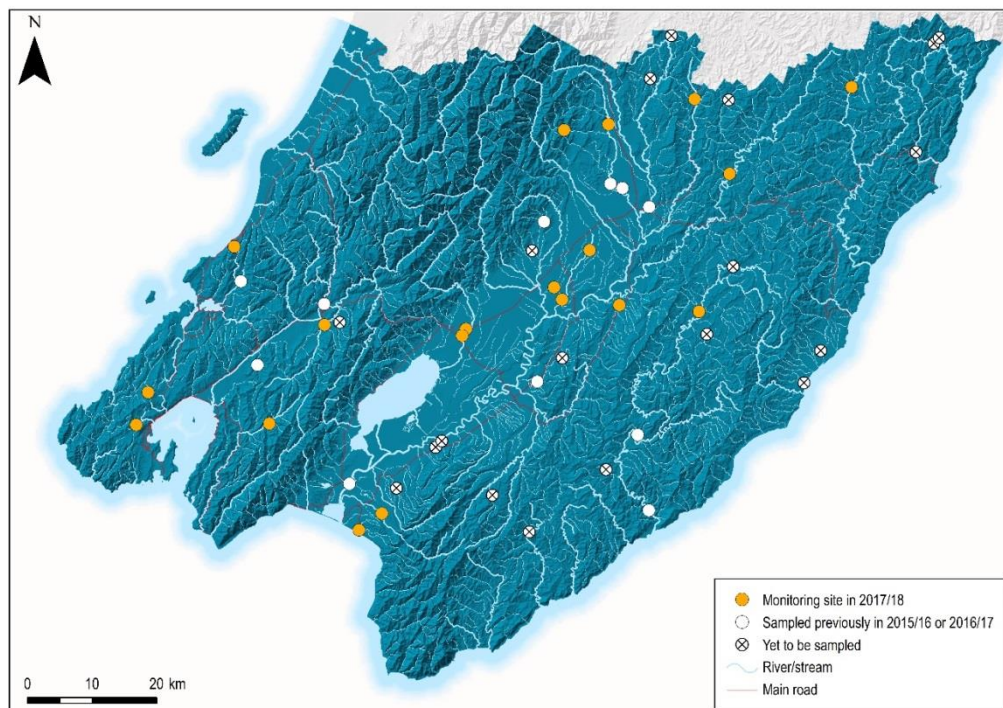


Figure 7.1: The proposed network* of 50 randomly selected sites for development of an ecologically focused monitoring programme. The 19 sites sampled during 2017/18 are indicated, as are sites sampled in 2015/16, 2016/17 and those yet to be sampled. Note that the site network is still being developed and many sites need to be visited and assessed for their suitability (e.g., are they permanently flowing, whether they can be accessed safely and where required, the landowners allow access).

⁴ As only one year of macroinvertebrate data is available for these sites, MCI scores have only been compared against the thresholds provided in Clapcott and Goodwin (2014).

Table 7.1: Attributes and suggested thresholds for interpretation of IBI scores for the Wellington Region from Joy (2004)

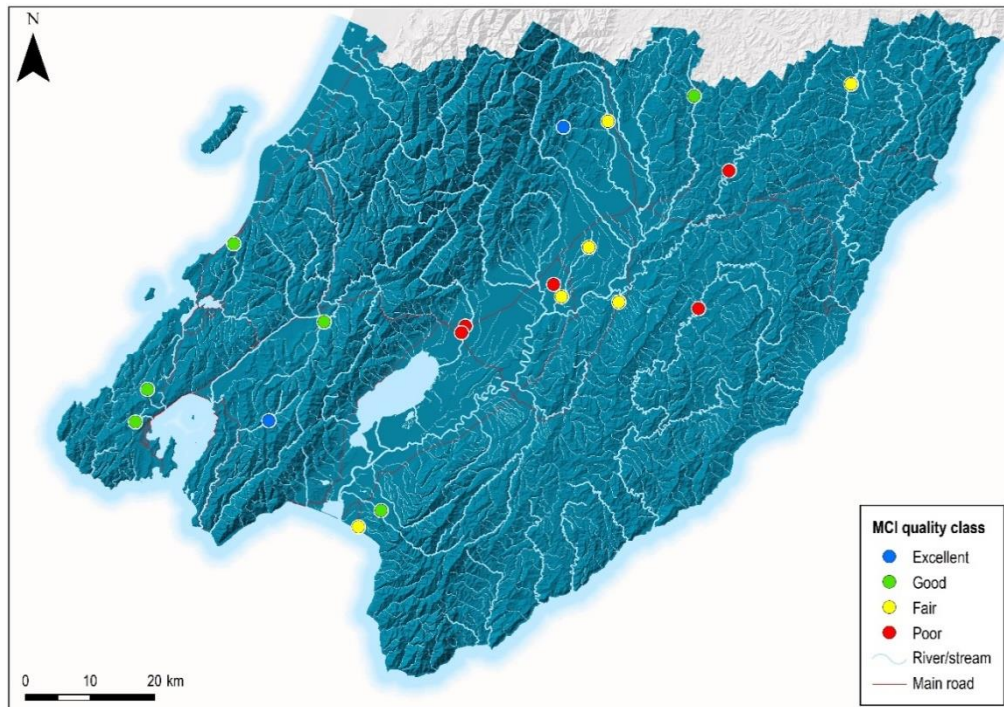
IBI score	Integrity class	Attributes
52–60	Excellent	Comparable to the best situations without human disturbance; all regionally expected species for the stream position are present. Site is above the 97th percentile of Wellington sites.
48–51	Very good	Site is above the 90th percentile of all Wellington sites; species richness is slightly less than best for the region.
38–47	Good	Site is above the 70th percentile of Wellington sites but species richness and habitat or migratory access reduced some signs of stress.
30–37	Fair	Score is just above average but species richness is significantly reduced habitat and or access impaired.
18–29	Poor	Site is less than average for Wellington region IBI scores, less than the 50th percentile, thus species richness and or habitat are severely impacted.
2–17	Very poor	Site is impacted or migratory access almost non-existent.
0	No native fish	Site is grossly impacted or access for fish is non-existent.

7.2 Results

The MCI scores and overall habitat scores based on one assessment undertaken at each monitoring site are presented in Table 7.2. MCI scores ranged from 54 (Wainuioru River at Hakakino Road) to 141 (Mikimiki Stream at Mikimiki Road). The lowest habitat score was recorded at Waiohine River tributary at Waitangi Road (21) and the highest at the Mikimiki Stream at Mikimiki Road (97).

Table 7.2: MCI scores, MCI quality classes (based on Clapcott and Goodwin (2014)) and overall habitat scores for the 19 sites that were surveyed as part of the development of an ecologically focused monitoring programme

Whaitua	Site Number	Site name	MCI	MCI quality class (based on river class)	Overall habitat score (out of 100)
Te Awarua-o-Porirua	RAN038	Horokiri Stream trib. off Paekakariki Hill Rd	109	Good	33
Te Whanganui-a-Tara	RAN050	Ohariu Stream trib. at Rifle Range Rd	106	Good	44
	RAN086	Kaiwharawhara Stream at Otari Wilton's Bush	110	Good	86
	RAN089	Mangaroa River u/s Mangaroa Hill Rd	115	Good	68
	RAN041	Wainuiomata River d/s of Manuka track	134	Excellent	86
Wairarapa Coast	RAN030	Wainuioru River at Hakakino Rd*	54 (71)	Poor	37
	RAN043	Whareama River at Annedale Rd	84	Fair	24
Ruamahanga	RAN007	Waiohine River trib. at Waitangi Rd*	62 (78)	Poor	21
	RAN017	Tauherenikau River trib. d/s SH2*	65 (66)	Poor	30
	RAN037	Tauherenikau River trib. off Camp Rd*	67 (72)	Poor	33
	RAN051	Maungatawhetau Stream at Te Whiti Rd	98	Fair	47
	RAN052	Whangaehu River at Whangaehu Valley Rd	106	Fair	53
	RAN063	Waipoua River u/s Mikimiki Rd	104	Fair	65
	RAN071	Parkvale Stream u/s Weir	80	Fair	42
	RAN072	Taueru River off Te Ore Ore Bideford Rd*	73 (81)	Poor	53
	RAN080	Turanganui River at Te Rata Rd	121	Good	78
	RAN083	Parkvale Stream trib. at Perrys Rd*	80 (86)	Fair	32
	RAN084	Mikimiki Stream at Mikimiki Rd	141	Excellent	97



*MCI-sb scores that were used to apply quality classes at soft-bottomed sites while values in brackets are the MCI-hb scores for these sites

Figure 7.2: MCI quality classes for the 19 Regional Ecology sites, determined from one sampling event over summer 2017/18

Based on IBI classes, fish community condition at the 19 sites surveyed ranged from Very poor (Waiohine River tributary at Waitangi Road) to Excellent (Turanganui River at Te Rata Road). Seventeen species of fish, including koura (freshwater crayfish), were recorded across the 19 sites surveyed (Table 7.3). Of these species, 14 are indigenous and three (perch, rudd and brown trout) are introduced.

Table 7.3: Fish species (and numbers) and koura (freshwater crayfish) caught at the 19 sites that were surveyed as part of the development of an ecologically focused monitoring programme that utilises sites randomly selected across the region

Whaitua	Site code	Site name	Longfin eel	Shortfin eel	Elver	Inanga	Banded kokoiu	Koaro	Dwarf galaxias	Cran's bully	Upland bully	Common bully	Redfin bully	Torrent fish	Black flounder	Common smelt	Brown trout	Perch	Rudd	Koura	IBI score	IBI class	
Te Awarua-o-Porirua	RAN038*	Horokiri Stream trib. off Paekakariki Hill Rd		2																	22	Poor	
Te Whanganui-a-Tara	RAN050*	Ohariu Stream trib. at Rifle Range Rd																			0	No fish	
	RAN086*	Kaiwharawhara Stream at Otari Wilton's Bush	1			54															22	Poor	
	RAN089#	Mangaroa River u/s Mangaroa Hill Rd	49	2								220					12				40	Good	
	RAN041*	Wainuiomata River d/s of Manuka track	2					1	286												42	Good	
Eastern Wairarapa	RAN030**	Wainuioru River at Hakakino Rd	5	3						1								2			32	Fair	
	RAN043**	Whareama River at Annedale Rd	8	1		2				46			1			1				4	50	Very good	
Ruamahanga	RAN007**	Waiohine River trib. at Waitangi Rd		10																	14	Very poor	
	RAN017*	Tauherenikau River trib. d/s SH2		23		1				1	1										1	26	Poor
	RAN037**	Tauherenikau River trib. off Camp Rd		58		3						4										22	Poor
	RAN051*	Maungatawhetau Stream at Te Whiti Rd		2						7	75										42	22	Poor
	RAN052**	Whangaehu River at Whangaehu Valley Rd	8							93											4	28	Poor
	RAN063#	Waipoua River u/s Mikimiki Rd	5	5								31			1			23			2	44	Good
	RAN071*	Parkvale Stream u/s Weir	2	8	3	1						1									4	28	Poor
	RAN072**	Taueru River off Te Ore Ore Bideford Rd	28	53						2		78									50	30	Fair
	RAN080*	Turanganui River at Te Rata Rd	2			2		3			168	1	15		1						14	52	Excellent
	RAN083**	Parkvale Stream trib. at Perrys Rd	4	5							24										10	26	Poor
	RAN084*	Mikimiki Stream at Mikimiki Rd	1					1													3	36	Fair
	RAN096**	Whangaimoana Stream at Beach Rd	6			325						4									1	22	Poor

* Sampled using backpack electric fishing protocols in Joy et al. (2013).

** Sampled using netting and trapping protocols in Joy et al. (2013).

Sampled using an in-house, in-development combination of backpack electric fishing protocols and netting/trapping protocols for larger non-wadeable rivers

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Appendix 1: Targeted investigations

Urban Stream Biodiversity Monitoring Programme

Together with Wellington City Council, the Marine and Freshwater team are implementing an 'Urban Stream Biodiversity Monitoring Programme' to identify and monitor the biodiversity values of Wellington City's urban streams. During December 2017 to April 2018, assessments were carried out in six catchments.

1. Karori (ten sites)
2. Ngauranga (seven sites)
3. Moturoa (two sites)
4. Papawai (one site)
5. Kaiwharawhara (six sites) – assessments carried out over a second year because of high flows in 2016/17.
6. Owhiro (eight sites) – assessments carried out over a second year because of high flows in 2016/17.

Table A1.1: Location of sites surveyed in 2017/2018 for the Urban Stream Biodiversity Monitoring Programme and the results of the fish, habitat and macroinvertebrate surveys

Catchment	Site name	NZTM site coordinates	
		Easting	Northing
Karori	Karori Stream at Karori Park	1744364	5427914
	Karori Stream at Castlemaine Cl	1743683	5427716
	Karori Stream at Makara Peak Mt Bike Park	1744172	5426832
	Karori Stream at Makara coast	1740810	5422784
	South Makara Stream tributary at South Makara Rd	1740757	5425769
	South Makara Stream at South Makara Rd	1741073	5425812
	Karori Stream at South Karori Rd	1742983	5425857
	Karori Stream opposite Sunshine Ave	1744767	5428033
	Karori Stream at Darwin St	1745133	5428246
	Karori Stream at Futuna Cl	1745538	5428496
Ngauranga	Ngauranga Stream at Newlands Rd	1752495	5434600
	Ngauranga Stream near Alex Moore Pk	1750877	5434751
	Ngauranga Stream at Mount Kaukau	1749706	5432995
	Ngauranga Stream at Tyers Stream Reserve	1751279	5432530
	Ngauranga Stream at Taylor Prestons	1750988	5433168
	Ngauranga Stream at Ngauranga Gorge rail crossing	1751828	5432782
	Ngauranga Stream 400m above mouth	1751929	5432617
Moturoa	Moturoa Stream at bottom of Central Pk	1747943	5426484
	Moturoa Stream at top of Central Pk	1747797	5426191
Papawai	Papawai Stream at Prince of Wales Pk	1748260	5425613
Kaiwharawhara	Kaiwharawhara Stream below the dam	1746821	5427786
	Kaiwharawhara Stream below piped section	1746803	5429875
	Kaiwharawhara Stream at Otari Wilton's Bush	1747267	5430239
	Kaiwharawhara Stream below Korimoko confluence	1748416	5430848
	Korimoko Stream at Girl Guides	1747744	5431638
	Kaiwharawhara Stream at Ngaio Gorge	1749056	5431083
Owhiro	Owhiro Stream upstream of TNT Landfill	1747176	5423681
	Owhiro Stream below Landfill Rd Confluence	1747045	5422955
	Owhiro Stream at Stream landfill gate on Landfill Rd	1746241	5423044
	Owhiro Stream upstream of Murchison St	1747073	5422719
	Owhiro Stream downstream of Happy Valley Rd	1747198	5421644

Table A1.2: Urban stream biodiversity Monitoring Programme fish, habitat macroinvertebrate (MCI and MCI quality class) results summary table

Catchment	Site name	Fish													Overall habitat score	MCI score	MCI quality class
		Longfin eel	Shortfin eel	Banded kokopu	Giant kokopu	Unidentified kokopu	Koaro	Inanga	Upland bully	Redfin bully	Koura	Trout	Grey mullet	Unidentified eel			
Karori	Karori Stream at Karori Park	13	-	-	-	-	-	-	3	-	-	-	-	20	65	73.3	Poor
	Karori Stream at Castlemaine Cl	-	-	7	-	-	3	-	-	-	-	-	-	-	93	122.1	Good
	Karori Stream at Makara Peak Mt Bike Park	5	-	-	-	-	-	-	2	-	-	-	-	2	58	97.6	Fair
	Karori Stream at Makara coast	23	-	-	-	-	-	-	22	-	3	-	-	-	64	93.3	Fair
	South Makara Stream tributary at South Makara Rd	1	-	7	-	-	21	-	-	-	5	-	-	-	83	128.6	Good
	South Makara Stream at South Makara Rd	4	-	1	1	-	-	-	2	-	1	-	-	-	73.5	109.6	Good
	Karori Stream at South Karori Rd	5	-	-	-	-	5	-	4	-	-	1	-	-			
	Karori Stream opposite Sunshine Ave	1	1	-	-	-	-	-	-	-	4	-	-	2	59	90.8	Fair
	Karori Stream at Darwin St	2	-	-	-	-	-	-	-	-	1	-	-	-	64	72.3	Poor
	Karori Stream at Futuna Cl	-	1	-	-	-	-	-	-	-	-	-	-	-			
Ngauranga	Ngauranga Stream at Newlands Rd	-	-	1	-	-	-	-	-	-	-	-	-	-	43	58.5	Poor
	Ngauranga Stream near Alex Moore Pk	-	-	1	-	-	-	-	-	-	-	-	-	-	58	61.7	Poor
	Ngauranga Stream at Mount Kaukau	-	-	5	-	-	-	-	-	-	-	-	-	-	88	130.7	Excellent
	Ngauranga Stream at Tyers Stream Reserve	-	-	-	-	-	5	-	-	-	2	-	-	-	75	85.7	Fair
	Ngauranga Stream at Taylor Prestons	-	-	-	-	-	-	-	-	-	-	-	-	-	33.5	88.9	Fair
	Ngauranga Stream at Ngauranga Gorge rail crossing	20	-	-	-	-	-	2	-	-	-	-	-	-			
	Ngauranga Stream 400m above mouth	15	1	-	-	-	-	13	-	-	-	-	-	10	73	81.1	Fair
Moturoa	Moturoa Stream at bottom of Central Pk	-	-	4	-	-	6	-	-	-	1	-	-	-	73	107.3	Good
	Moturoa Stream at top of Central Pk	-	-	1	-	-	-	-	-	-	1	-	-	-	66	96.2	Fair

Catchment	Site name	Longfin eel	Shortfin eel	Banded kokopu	Giant kokopu	Unidentified kokopu	Koaro	Inanga	Upland bully	Redfin bully	Koura	Trout	Grey mullet	Unidentified eel	Overall habitat score	MCI score	MCI quality class
Papawai	Papawai Stream at Prince of Wales Pk	-	-	6	-	-	-	-	-	-	3	-	-	-	61	101.1	Fair
Kaiwharawhara.	Kaiwharawhara Stream below the dam	-	-	-	-	-	-	-	-	-	-	-	-	-	76.5	85	Fair
	Kaiwharawhara Stream below piped section	-	-	-	-	-	-	-	-	-	-	-	-	-	83.5	87	Fair
	Kaiwharawhara Stream at Otari Wilton's Bush	1	-	54	-	-	-	-	-	-	-	-	-	1	86	110	Good
	Kaiwharawhara Stream below Korimoko confluence	-	-	-	-	-	-	-	-	-	-	-	-	-	75	92	Fair
	Korimoko Stream at Girl Guides	-	-	-	-	-	-	-	-	-	-	-	-	-	74.5	106.9	Good
	Kaiwharawhara Stream at Ngaio Gorge	-	-	-	-	-	-	-	-	-	-	-	-	-	72	93.8	Fair
Owhiro	Owhiro Stream upstream of TNT Landfill	9	-	1	-	-	-	-	-	-	2	-	-	1			
	Owhiro Stream below Landfill Rd Confluence	4	-	5	-	-	-	-	-	-	-	-	-	-			
	Owhiro Stream at Stream landfill gate on Landfill Rd	2	-	-	-	-	-	-	-	-	-	-	-	-			
	Owhiro Stream upstream of Murchison St	-	-	-	-	-	-	-	-	-	-	-	-	-			
	Owhiro Stream downstream of Happy Valley Rd	1	-	-	-	-	-	-	-	-	-	-	-	-			
	Karori Stream at Karori Park	-	-	-	-	-	-	-	-	-	-	-	-	-			
	Karori Stream at Castlemaine Cl	5	-	1	-	-	-	-	-	1	-	-	-	-	63	87.8	Fair
	Karori Stream at Makara Peak Mt Bike Park	15	3	-	-	-	-	-	7	-	-	-	2	1			

Appendix 2: Monitoring sites

Table A2.1: RWQE monitoring sites

Whaitua	Site no.	Site name	NZTM site coordinates		Substrate (hard or soft bottomed)	River class	Dominant land cover
			Easting	Northing			
Kapiti Coast	RS02	Mangapouri Stream at Bennetts Rd	1780903	5487645	Soft	6	Urban
	RS04	Waitohu Stream at Norfolk Crescent	1779537	5488304	Soft	5	Pasture
	RS05	Ōtaki River at Pukehinau	1785426	5478749	Hard	1	Indigenous Forest
	RS06	Ōtaki River at Mouth	1777983	5485886	Hard	4	Indigenous Forest
	RS07	Mangaone Stream at Sims Road Bridge	1776242	5482408	Soft	5	Pasture
	RS10	Waikanae River at Greenaway Rd	1771223	5472915	Hard	4	Indigenous Forest
	RS61	Waikanae River at Footbridge on M. Walkway	1779900	5473149	Hard	2	Indigenous Forest
Te Awarua-o-Porirua	RS13	Horokiri Stream at Snodgrass	1761804	5450653	Hard	2	Pasture
	RS14	Pauatahanui Stream at Elmwood Bridge	1761097	5446783	Soft	2	Pasture
	RS16	Porirua Stream at Milk Depot	1754366	5443031	Hard	2	Urban
Te Whanganui-a-Tara	RS17	Makara Stream at Kennels	1743530	5433635	Hard	2	Pasture
	RS18	Karori Stream at Makara Peak M.B Park	1744213	5426874	Hard	2	Urban
	RS19	Kaiwharawhara Stream at Ngaio Gorge	1749069	5431077	Hard	2	Urban
	RS20	Hutt River at Te Marua Intake Site	1780071	5450158	Hard	1	Indigenous Forest
	RS21	Hutt River Opposite Manor Park Golf Club	1766679	5442285	Hard	4	Indigenous Forest
	RS22	Hutt River at Boulcott	1760858	5437486	Hard	4	Indigenous Forest
	RS23	Pakuratahi River 50m Below Farm Creek	1784607	5451677	Hard	1	Indigenous Forest
	RS24	Mangaroa River at Te Marua	1778543	5448643	Hard	1	Pasture
	RS25	Akatarawa River at Hutt Confluence	1776183	5449184	Hard	1	Indigenous Forest
	RS26	Whakatikei River at Riverstone	1772256	5446748	Hard	4	Indigenous Forest
	RS28	Wainuiomata River at Manuka Track	1768242	5430634	Hard	1	Indigenous Forest
	RS29	Wainuiomata River Dnstr of White Bridge	1757316	5415724	Hard	4	Indigenous Forest
	RS57	Waiwhetu Stream at Whites Line East	1760977	5434510	Soft	6	Urban
	Eastern Wairarapa	RS42	Whareama River at Gauge	1856090	5461229	Soft	5
RS53		Awhea River at Tora Rd	1809951	5403289	Hard	5	Pasture
RS60		Pahaoa River at Hinakura	1821678	5424774	Hard	5	Pasture
Ruamahanga	RS31	Ruamahanga River at McLays	1818149	5485809	Hard	1	Indigenous Forest
	RS32	Ruamahanga River at Te Ore Ore	1825574	5463019	Hard	4	Pasture
	RS33	Ruamahanga River at Gladstone Bridge	1821208	5450327	Hard	4	Pasture
	RS34	Ruamahanga River at Pukio	1797832	5431010	Hard	4	Pasture
	RS37	Taueru River at Gladstone	1824148	5450815	Hard	3	Pasture
	RS38	Kopuaranga River at Stuarts	1826761	5469569	Hard	5	Pasture
	RS39	Whangaehu River at 250m from Confluence	1826267	5459407	Soft	3	Pasture
	RS40	Waipoua River at Colombo Rd Bridge	1825018	5462890	Hard	4	Pasture
	RS41	Waingawa River at South Rd	1820716	5460649	Hard	4	Indigenous Forest
	RS45	Parkvale tributary at Lowes Reserve	1818094	5458352	Hard	6	Pasture
	RS46	Parkvale Stream at Renalls Weir	1813515	5449469	Hard	5	Pasture
	RS48	Waiohine River at Bicknells	1810615	5448099	Hard	4	Pasture
	RS50	Mangatarere River at State Highway 2	1809768	5452160	Hard	4	Pasture
	RS51	Huanguarua River at Ponatahi Bridge	1807009	5435213	Hard	4	Pasture
	RS55	Tauherenikau River at Websters	1797082	5439942	Hard	4	Pasture
	RS58	Ruamahanga River at Waihenga Bridge	1804602	5436488	Hard	4	Pasture
	RS59	Enaki Stream D/S site for Riparian	1809953	5455425	Hard	4	Pasture
RS61	Waiohine River at Gorge Rd Carpark	1801515	5457098	Hard	1	Indigenous Forest	

Table A2.2: Monitoring site coordinates and details for the 19 sites that were trialled as part of the development of an ecologically focused monitoring programme that utilises sites randomly selected across the region

Whaitua	Site Number	Site name	NZTM site coordinates		Distance inland	Elevation	Substrate (hard or soft bottomed)	River class	Dominant land cover
			Easting	Northing					
Te Awarua-o-Porirua	RAN038	Horokiri stream trib. off Paekakariki Hill Rd	1762540	5457856	13062	182	Hard	2	Pasture
	RAN050	Ohariu stream trib. at Rifle Range Rd	1749167	5435276	13043	131	Hard	2	Pasture
Te Whanganui-a-Tara	RAN086	Kaiwharawhara stream at Otari Wilton's Bush	1747310	5430236	3791	59	Hard	2	Urban
	RAN089	Mangaroa river u/s Mangaroa Hill Rd	1776552	5445742	37095	126	Hard	4	Pasture
	RAN041	Wainuiomata river d/s of Manuka track	1767980	5430419	30809	141	Hard	1	Indigenous forest
Eastern Wairarapa	RAN030	Wainuioru river at Hakakino Rd	1834650	5447803	93632	145	Soft	3	Pasture
	RAN043	Whareama river at Annedale Rd	1858319	5482602	59754	77	Hard	3	Pasture
Ruamahanga	RAN007	Waiohine river trib. at Waitangi Rd	1812170	5451525	83838	59	Soft	5	Pasture
	RAN017	Tauherenikau river trib. d/s SH2	1798487	5445098	44543	39	Soft	6	Pasture
	RAN037	Tauherenikau river trib. off Camp Rd	1797883	5444055	44543	29	Soft	6	Pasture
	RAN051	Maungatawhetau stream at Te Whiti Rd	1822290	5448796	93535	69	Hard	6	Pasture
	RAN052	Whangaehu river at Whangaehu Valley Rd	1833975	5480733	142484	194	Hard	6	Pasture
	RAN063	Waipoua river u/s Mikimiki Rd	1820605	5476828	126681	215	Hard	4	Pasture
	RAN071	Parkvale stream u/s Weir	1813400	5449626	79928	47	Hard	5	Pasture
	RAN072	Taueru river off Te Ore Ore Bideford Rd	1839389	5469168	146763	109	Soft	3	Pasture
	RAN080	Turanganui river at Te Rata Rd	1785429	5416494	12129	49	Hard	4	Scrub
	RAN083	Parkvale stream trib. at Perrys Rd	1817662	5457306	92242	97	Soft	6	Pasture
RAN084	Mikimiki stream at Mikimiki Rd	1813712	5475943	133457	293	Hard	1	Indigenous forest	

Appendix 3: Monitoring variables and methods

A summary of the physicochemical and biological parameters monitored at each RWQE site during 2017/18 is provided in Table A3.1. All sites are sampled monthly for core water quality variables (i.e. dissolved oxygen, temperature, pH, conductivity, visual clarity, turbidity, faecal indicator bacteria and dissolved and total nutrients).

Table A3.1: Summary of the variables monitored at each RWQE sites during 2017/18

Whaitua	Site no.	Site name	Dissolved copper & zinc	Total copper & zinc	Total suspended solids and suspended sediment concentration	Monthly periphyton cover	Monthly periphyton biomass	Macroinvertebrates and habitat assessment
Kapiti Coast	RS02	Mangapouri Stream at Bennetts Rd	✓	✓	✗	✗	✗	✓
	RS04	Waitohu Stream at Norfolk Crescent	✗	✗	✗	✗	✗	✓
	RS05	Ōtaki River at Pukehinau	✗	✗	✗	✓	✗	✓
	RS06	Ōtaki River at Mouth	✗	✗	✗	✓	✓	✓
	RS07	Mangaone Stream at Sims Road Bridge	✗	✗	✗	✗	✗	✓
	RS10	Waikanae River at Greenaway Rd	✓	✗	✓	✓	✓	✓
Te Awarua-o-Porirua	RS61	Waikanae River at Footbridge on Mangaone Walkway	✗	✗	✗	✓	✗	✓
	RS13	Horokiri Stream at Snodgrass	✗	✗	✓	✓	✓	✓
	RS14	Pauatahanui Stream at Elmwood Bridge	✗	✗	✓	✗	✗	✓
Te Whanganui-a-Tara	RS16	Porirua Stream at Milk Depot	✓	✓	✓	✓	✗	✓
	RS17	Makara Stream at Kennels	✗	✗	✓	✓	✗	✓
	RS18	Karori Stream at Makara Peak M.B Park	✓	✓	✗	✓	✗	✓
	RS19	Kaiwharawhara Stream at Ngaio Gorge	✓	✓	✗	✓	✓	✓
	RS20	Hutt River at Te Marua Intake Site	✗	✗	✗	✓	✗	✓
	RS21	Hutt River Opposite Manor Park Golf Club	✓	✗	✓	✓	✗	✓
	RS22	Hutt River at Boulcott	✓	✗	✓	✓	✓	✓
	RS23	Pakuratahi River 50m Below Farm Creek	✗	✗	✗	✓	✗	✓
	RS24	Mangaroa River at Te Marua	✗	✗	✗	✓	✓	✓
	RS25	Akatarawa River at Hutt Confluence	✗	✗	✗	✓	✗	✓
	RS26	Whakatikei River at Riverstone	✗	✗	✗	✓	✗	✓
	RS28	Wainuiomata River at Manuka Track	✗	✗	✗	✓	✗	✓
	RS29	Wainuiomata River Dnstr of White Bridge	✗	✗	✗	✓	✓	✓
RS57	Waiwhetu Stream at Whites Line East	✓	✓	✗	✗	✗	✓	
Eastern Wairarapa	RS42	Whareama River at Gauge	✗	✗	✓	✗	✗	✗
	RS53	Awhea River at Tora Rd	✗	✗	✗	✓	✗	✓
	RS60	Pahaoa River at Hinakura	✗	✗	✓	✗	✗	✗
Ruamahanga	RS31	Ruamahanga River at McLays	✗	✗	✗	✓	✗	✓
	RS32	Ruamahanga River at Te Ore Ore	✗	✗	✓	✓	✗	✓
	RS33	Ruamahanga River at Gladstone Bridge	✗	✗	✓	✓	✓	✓
	RS34	Ruamahanga River at Pukio	✗	✗	✓	✓	✗	✓
	RS37	Taueru River at Gladstone	✗	✗	✓	✓	✗	✓
	RS38	Kopuaranga River at Stuarts	✗	✗	✓	✓	✓	✓
	RS39	Whangaehu River at 250m from Confluence	✗	✗	✓	✗	✗	✓
	RS40	Waipoua River at Colombo Rd Bridge	✓	✓	✗	✓	✓	✓
	RS41	Waingawa River at South Rd	✗	✗	✗	✓	✗	✓
	RS45	Parkvale tributary at Lowes Reserve	✗	✗	✗	✓	✗	✓
	RS46	Parkvale Stream at Renalls Weir	✗	✗	✗	✓	✗	✓
	RS48	Waiohine River at Bicknells	✗	✗	✗	✓	✓	✓
	RS50	Mangatarere River at State Highway 2	✗	✗	✗	✓	✓	✓
	RS51	Huangarua River at Ponatahi Bridge	✗	✗	✗	✓	✓	✓
	RS55	Tauherenikau River at Websters	✗	✗	✓	✓	✗	✓
	RS58	Ruamahanga River at Waihenga Bridge	✗	✗	✓	✓	✓	✗
RS59	Enaki Stream D/S site for Riparian	✗	✗	✗	✗	✗	✓	
RS62	Waiohine River at Gorge Rd Carpark	✗	✗	✗	✗	✗	✓	

Physicochemical and microbiological water quality

Core water quality variables measured/analysed at each RWQE site are presented in Table A3.2. Where practical, individual RWQE monitoring sites are sampled at the same time of the month (and usually at the same time of the day) and all sites on a river or stream are sampled on the same day. Field meters are calibrated on the morning of the day of sampling and on the return. Water samples are collected in mid-stream (where possible), typically in run-type habitat from a representative reach of stream. Samples requiring laboratory analysis are placed in chilly bins with ice and couriered overnight to RJ Hill Laboratories in Hamilton. Water samples for heavy metal and dissolved nutrient analysis were all laboratory filtered.

Table A3.2: RWQE field and analytical water quality methods and detection limits

Variable	Method	Detection limit
Water temperature	Field meter – generally YSI ProODO	0.01 °C
Dissolved oxygen	Field meter – generally YSI ProODO	0.01 mg/L
Visual clarity	Black disc (20 mm disc if clarity <0.5 m, 60 mm disc for clarity between 0.5 m and 1.5 m, 200 mm disc for clarity >1.5 m)	0.01 m
pH	Field meter – generally YSI Professional Plus	0.01 units
Conductivity	Field meter – generally YSI Professional Plus	0.1 µS/cm
Turbidity	Analysis using a Hach 2100N, Turbidity meter. APHA 2130 B 22nd Ed. 2012	0.05 NTU
Total suspended solids	Filtration using Whatman 934 AH, Advantec GC-50 or 1-2 equivalent filters (nominal pore size 1.2–1.5µm), gravimetric determination. APHA 2540 D 22nd Ed. 2012	2 mg/L
Suspended sediment concentration	Filtration using Advantec GC-50 or equivalent 125mm diameter filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. Entire sample filtered. No correction for density. Note: g/m ³ units are equivalent to mg/L. ASTM D3977-97 (Modified).	10 mg/L
Ammoniacal nitrogen	Filtered sample. Phenol/hyperchlorite colorimetry. Discrete Analyser. (NH ₄ -N = NH ₄ ⁺ -N + NH ₃ -N) APHA 4500-NH ₃ F (modified from manual analysis) 22nd Ed. 2012	0.005 mg/L
Nitrite nitrogen	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO ₃ - I (Modified) 22nd Ed. 2012	0.001 mg/L
Nitrate nitrogen	Calculation: (Nitrate-N + Nitrite-N) – Nitrite-N	0.001 mg/L
Nitrate + nitrite nitrogen	Total oxidised nitrogen. Automated cadmium reduction, Flow injection analyser. APHA 4500-NO ₃ - I (Modified) 22nd Ed. 2012	0.001 mg/L
Total Kjeldahl nitrogen	Kjeldahl digestion, phenol/hyperchlorite colorimetry (Discrete Analysis). APHA 4500-N Org C. (modified) 4500-NH ₃ F (modified) 22nd Ed. 2012	0.1 mg/L
Total nitrogen	Calculation: TKN + Nitrate-N + Nitrite-N	0.11 mg/L
Total phosphorus	Total Phosphorus digestion, ascorbic acid colorimetry. Discrete Analyser. APHA 4500-P E (modified from manual analysis) 22nd Ed. 2012	0.004 mg/L
Dissolved reactive phosphorus	Filtered sample. Molybdenum blue colorimetry. Discrete Analyser. APHA 4500-P E (modified from manual analysis) 22nd Ed. 2012	0.001 mg/L
Faecal coliforms	APHA 9222D 22nd Ed. 2012	1 cfu/100mL
E. coli	APHA 9222G 22nd Ed. 2012	1 cfu/100mL
Total recoverable copper	Nitric/Hydrochloric acid extraction, 85°C, 2.75 hr, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0005 mg/L
Total recoverable zinc	Nitric/Hydrochloric acid extraction, 85°C, 2.75 hr, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.001 mg/L
Dissolved copper	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd Ed. 2012	0.0005 mg/L
Dissolved zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd Ed. 2012	0.0010 mg/L
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd Ed. 2013	0.05 mg/L
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd Ed. 2014	0.02 mg/L
Dissolved Organic Carbon	Filtered sample, Supercritical persulphate oxidation. APHA 5310 C (modified) 22nd ed. 2012.	0.5 mg/L
Total hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 mg/L as CaCO ₃

Periphyton

Formal periphyton assessments are limited to the 38 RWQE sites with hard substrates.

Monthly assessment of visible streambed cover

Periphyton cover is determined by estimating the percentage of mat (>1 mm thick) cyanobacterial mat (>1 mm thick) and filamentous (>2 cm long) periphyton present on the stream or river bed. Note that cover of mat and cyanobacterial mat-periphyton are mutually exclusive (ie, cyanobacterial mat cover >1 mm thick will be counted as separate from mat-periphyton). A total of 20 observations are taken at each site from two transects of ten observations, or, if the stream or river is not wide enough or too swift to wade across more than half of the river's width, four transects of five observations. Each observation is typically made with an underwater viewer and covers an approximate area of a 30 cm diameter circle.

Visible streambed periphyton cover assessments are carried out equally in both run and riffle-type habitats if these are present at a sampling site/reach.

Monthly assessment of biomass

Periphyton samples for quantitative biomass assessments (chlorophyll *a*) are collected on a monthly basis. During 2017/18, chlorophyll *a* samples were collected from 15 of the 44 RWQE sites with hard substrates. Sampling protocols involved collecting samples from a run habitat and following modified versions of quantitative methods 1b (QM-1b) and 3 (QM-3) as outlined by Biggs and Kilroy (2000)⁵. This involves pooling periphyton samples from 10 rocks into a single composite sample for analysis (See Greenfield (2016)⁶ for further details).

Macroinvertebrates

A single macroinvertebrate sample is collected at or adjacent to 40 of the 44 RWQE water sampling sites during summer/early autumn. The timing of sampling is determined at random, although macroinvertebrate sampling is, where practicable, avoided within two weeks of any flood event (flood events are defined as flows greater than three times the median river flow).

Samples are collected with the use of a kick-net (0.5 mm mesh size) following Protocol C1 of the national macroinvertebrate sampling protocols (Stark et al. 2001)⁷ for the 40 sites with hard substrate (in riffle habitat) and Protocol C2 for the six sites with a soft substrate. All samples are processed in accordance with Protocol P2 (Stark et al. 2001).

Sampling undertaken at the five sites that were trialled as part of the development of an ecologically focused monitoring programme that utilises sites randomly selected across the region followed the above approach used at RWQE sites. Four out of the five sites trialled were considered to have hard substrate.

⁵ Biggs B and Kilroy C. 2000. *Stream periphyton monitoring manual*. National Institute for Water and Atmosphere, Christchurch

⁶ Greenfield S. 2016. Use of periphyton cover to estimate chlorophyll *a* concentration: Performance of Canterbury conversion factors in Wellington Region rivers. Greater Wellington Regional Council, Publication No. GW/ESCI-T-16/90, Wellington.

⁷ Stark JD, Boothroyd, IKG, Harding JS, Maxted JR and Scarsbrook MR. 2001. *New Zealand Macroinvertebrate Working Group Report No. 1*. Prepared for the Ministry for the Environment, Sustainable Management Fund Project No. 5103

Habitat quality

Habitat assessments are undertaken annually at the 40 RWQE sites during summer/early autumn when invertebrates samples are collected following the updated methods outlined in Clapcott (2015⁸; cf. earlier protocols in Clapcott, 2013⁹). This assessment provides an indication of the condition of the physical habitat and its ability to support stream biota, and incorporates the following variables: deposited sediment cover, invertebrate habitat abundance and diversity, fish habitat abundance and diversity, hydraulic heterogeneity, bank erosion and vegetation, and riparian width and shade. Each category is scored between 1 ('poor') and 10 ('excellent'). Summation of individual scores provides an overall total habitat quality score for each site (lowest and highest possible scores are 10 and 100, respectively).

This methodology was developed with a focus on wadeable hard-bottomed streams (Clapcott 2015) and hence its applicability to other stream/river types has not been explored. Sampling undertaken at the five sites that were trialled as part of the development of an ecologically focused monitoring programme that utilises sites randomly selected across the region also followed this approach.

Fish

Assessments of fish communities were undertaken at 19 sites trialled as part of the ecologically focused monitoring programme applied at sites randomly selected across the region. Eight and nine of these sites were surveyed using the netting/trapping and backpack electric fishing protocols in Joy et al. (2013)¹⁰, respectively. The remaining two sites were located on larger rivers that were unsuitable for the Joy et al. (2013) protocols. At one of these sites (RAN089), netting/trapping in deeper water habitat and backpack electric fishing was undertaken in suitable shallow water habitat and at the other site (RAN063), only backpack electric fishing in suitable shallow water habitat was undertaken. It's important to note that the fishing undertaken at the two larger river sites was to help the development of a suitable methodology for assessing fish communities in larger rivers as no national protocols exist. It is likely that this methodology will be refined as the monitoring programme develops. The Index of Biotic Integrity (IBI) was calculated to help facilitate inter-site comparisons and provide an indication of overall fish community condition. The IBI is a combination of six metrics that was developed specifically to assess the condition of New Zealand's fish fauna and takes into account the fact that many species exhibit diadromous life histories (ie, often migrate between the ocean and freshwater at some point in their lifecycle). The IBI compares the species found at a site with those expected to be at a site, while taking into account natural changes that occur with distance inland and elevation. For full details of the IBI see Joy and Death (2004)¹¹ and Joy (2004)¹².

⁸ Clapcott JE. 2015. *National rapid habitat assessment protocol development for streams and rivers*. Report No. 2649 prepared for Northland Regional Council by the Cawthron Institute, Nelson.

⁹ Clapcott JE. 2013. *Rapid habitat assessment workshop*. Report no. 2445 prepared for Hawkes Bay Regional Council by the Cawthron Institute, Nelson.

¹⁰ Joy M, David B and Lake M. 2013. *New Zealand Freshwater Fish Sampling Protocols, Part 1: Wadeable Rivers & Streams*. Massey University, Palmerston North.

¹¹ Joy M and Death R. 2004. *Application of the index of biotic integrity methodology to New Zealand freshwater fish communities*. Environmental Management, 34: 415–428.

Joy M, David B and Lake M. 2013. *New Zealand Freshwater Fish Sampling Protocols, Part 1: Wadeable Rivers & Streams*. Massey University, Palmerston North.

¹² Joy M. 2004. *A fish index of biotic integrity for the Wellington region*. Report prepared for Greater Wellington Regional Council.

IBI scores were generated for each site in a Microsoft Excel spreadsheet macro using a version of the IBI calibrated for the Wellington region (Joy 2004). IBI scores can range from 0 (no fish present) to 60, with a score of 60 indicating that all fish expected to be present were found. Interpretation of IBI scores was undertaken using the classes recommended in Joy (2004) and outlined in Table 7.1.

Appendix 4: Physiochemical and microbiological data of RWQE sites sampled montly from July 2017 to June 2018

Table A4.1: Water Temperature (°C)

Whaitua	Site Name	Site number	Median	Minimum	5th percentile	95th percentile	n*
Kapiti Coast	Mangapouri Stream at Bennetts Rd	RS02	15.4	7.7	8.5	17.8	12
	Waitohu Stream at Norfolk Crescent	RS04	14.8	7.5	8.1	18.5	12
	Otaki River at Pukehinau	RS05	11.1	5.6	6.6	16.3	12
	Otaki River at Mouth	RS06	14.3	7.2	7.8	20.2	12
	Mangaone Stream at Sims Road Bridge	RS07	13.8	7.4	8.7	18.3	12
	Waikanae River at Footbridge on Mangaone Walkway	RS61	12.6	5.5	7.0	16.3	12
	Waikanae River at Greenaway Rd	RS10	15.9	8.7	8.9	23.1	12
Te Awarua-o-Porirua	Horokiri Stream at Snodgrass	RS13	12.4	7.4	8.4	19.9	12
	Pauatahanui Stream at Elmwood Bridge	RS14	12.1	7.0	7.4	19.9	12
	Porirua Stream at Milk Depot	RS16	13.5	8.4	9.2	21.1	12
Te Whanganui-a-Tara	Makara Stream at Kennels	RS17	14.6	7.9	9.2	23.9	12
	Karori Stream at Makara Peak Mountain Bike Park	RS18	13.5	10.1	10.6	20.4	12
	Kaiwharawhara Stream at Ngaio Gorge	RS19	13.9	8.5	9.5	22.2	12
	Hutt River at Te Marua Intake Site	RS20	11.5	7.5	7.6	17.7	12
	Hutt River Opposite Manor Park Golf Club	RS21	14.0	9.8	9.9	22.5	12
	Hutt River at Boulcott	RS22	14.3	10.0	10.1	23.0	12
	Pakuratahi River 50m Below Farm Creek	RS23	12.1	8.3	8.4	17.3	12
	Mangaroa River at Te Marua	RS24	13.3	9.5	9.5	18.8	12
	Akatarawa River at Hutt Confluence	RS25	12.2	7.6	8.3	19.1	12
	Whakatikei River at Riverstone	RS26	12.5	7.7	8.3	19.9	12
	Wainuiomata River at Manuka Track	RS28	10.1	7.4	7.7	15.0	12
	Wainuiomata River Dnstr of White Bridge	RS29	13.8	8.6	9.2	20.2	12
	Waiwhetu Stream at Whites Line East	RS57	15.0	10.7	11.1	20.5	12
Eastern Wairapa	Whareama River at Gauge	RS42	11.9	7.8	8.2	23.8	12
	Awhea River at Tora Rd	RS53	15.2	7.8	9.2	23.9	12
	Pahaoa River at Hinakura	RS60	13.5	6.8	7.1	22.5	11
Ruamahanga	Ruamahanga River at McLays	RS31	8.4	5.6	5.7	18.4	10
	Ruamahanga River at Te Ore Ore	RS32	13.1	8.2	8.4	22.2	12
	Ruamahanga River at Gladstone Bridge	RS33	14.0	8.6	8.7	22.5	12
	Ruamahanga River at Pukio	RS34	13.7	8.6	9.0	24.4	9
	Taueru River at Gladstone	RS37	13.9	6.5	7.2	20.1	11
	Kopuaranga River at Stuarts	RS38	13.7	7.6	8.2	20.1	11
	Whangaehu River at 250m from Confluence	RS39	15.4	7.5	8.2	21.6	11
	Waipoua River at Colombo Rd Bridge	RS40	15.0	9.4	9.6	22.4	12
	Waingawa River at South Rd	RS41	14.6	8.2	8.6	23.7	12
	Parkvale tributary at Lowes Reserve	RS45	13.3	10.9	11.4	15.2	10
	Parkvale Stream at Renalls Weir	RS46	14.8	9.3	9.4	21.4	12
	Waiohine River at Bicknells	RS48	13.1	8.5	8.8	18.2	11
	Mangatarere River at State Highway 2	RS50	13.6	8.4	9.2	17.5	12
	Huangarua River at Ponatahi Bridge	RS51	12.7	8.6	9.2	21.6	12
	Tauherenikau River at Websters	RS55	10.9	7.4	8.1	18.1	11
	Ruamahanga River at Waihenga Bridge	RS58	13.8	9.2	9.3	24.1	11
Enaki Stream D/S site for Riparian	RS59	12.2	7.9	8.5	18.3	11	
Waiohine River at Gorge Rd Carpark	RS62	9.3	5.8	6.3	17.2	9	

*a lower n count for some sites reflects sampling occasions where sites could not be accessed

Table A4.2: Dissolved Oxygen (% saturation)

Whaitua	Site Name	Site Number	Median	Minimum	5th percentile	95th percentile	n*
Kapiti Coast	Mangapouri Stream at Bennetts Rd	RS02	73.4	18.7	31.8	94.3	12
	Waitohu Stream at Norfolk Crescent	RS04	87.3	66.7	71.5	95.4	12
	Otaki River at Pukehinau	RS05	101.1	99.5	99.6	102.7	12
	Otaki River at Mouth	RS06	102.5	95.3	96.0	113.9	12
	Mangaone Stream at Sims Road Bridge	RS07	78.3	46.0	53.2	85.7	12
	Waikanae River at Footbridge on Mangaone Walkway	RS61	100.1	97.5	98.5	103.1	12
	Waikanae River at Greenaway Rd	RS10	103.1	91.4	95.6	111.6	12
Te Awarua-o-Porirua	Horokiri Stream at Snodgrass	RS13	98.6	95.4	95.6	106.8	11
	Pauatahanui Stream at Elmwood Bridge	RS14	93.2	79.0	80.5	98.0	11
	Porirua Stream at Milk Depot	RS16	102.6	97.8	98.3	138.2	11
Te Whanganui-a-Tara	Makara Stream at Kennels	RS17	100.5	87.0	89.6	119.1	11
	Karori Stream at Makara Peak Mountain Bike Park	RS18	99.0	88.2	91.8	114.4	11
	Kaiwharawhara Stream at Ngaio Gorge	RS19	100.6	96.3	97.2	117.1	11
	Hutt River at Te Marua Intake Site	RS20	100.6	99.0	99.3	103.7	11
	Hutt River Opposite Manor Park Golf Club	RS21	105.2	99.1	99.7	111.4	11
	Hutt River at Boulcott	RS22	103.4	91.6	92.3	110.8	11
	Pakuratahi River 50m Below Farm Creek	RS23	97.1	95.0	96.0	102.0	11
	Mangaroa River at Te Marua	RS24	101.5	96.3	96.8	110.2	11
	Akatarawa River at Hutt Confluence	RS25	101.4	100.0	100.2	103.8	11
	Whakatikei River at Riverstone	RS26	101.7	101.0	101.2	106.8	11
	Wainuiomata River at Manuka Track	RS28	99.8	97.0	97.7	103.5	12
	Wainuiomata River Dnstr of White Bridge	RS29	96.4	81.8	84.1	101.3	12
	Waiwhetu Stream at Whites Line East	RS57	113.3	55.9	71.7	173.0	12
Eastern Wairarapa	Whareama River at Gauge	RS42	93.8	68.5	73.2	97.4	11
	Awhea River at Tora Rd	RS53	104.0	83.9	90.6	138.8	12
	Pahaoa River at Hinakura	RS60	96.5	93.4	93.7	103.9	11
Ruamahanga	Ruamahanga River at McLays	RS31	97.3	95.9	96.0	99.5	10
	Ruamahanga River at Te Ore Ore	RS32	98.0	96.8	96.9	118.8	12
	Ruamahanga River at Gladstone Bridge	RS33	96.2	94.5	94.6	118.1	12
	Ruamahanga River at Pukio	RS34	96.3	94.0	94.3	113.2	9
	Taueru River at Gladstone	RS37	89.1	73.3	75.5	99.2	11
	Kopuaranga River at Stuarts	RS38	101.8	94.1	94.3	124.3	10
	Whangaehu River at 250m from Confluence	RS39	103.0	67.8	79.3	150.5	10
	Waipoua River at Colombo Rd Bridge	RS40	103.8	97.2	97.8	115.0	11
	Waingawa River at South Rd	RS41	101.8	96.5	97.2	112.9	11
	Parkvale tributary at Lowes Reserve	RS45	67.4	62.7	63.0	75.0	10
	Parkvale Stream at Renalls Weir	RS46	100.8	57.6	69.9	110.7	12
	Waihine River at Bicknells	RS48	98.7	88.2	89.3	102.5	11
	Mangatarere River at State Highway 2	RS50	94.8	86.5	89.4	113.1	12
	Huangarua River at Ponatahi Bridge	RS51	100.7	91.4	93.1	139.5	12
	Tauherenikau River at Websters	RS55	99.3	91.1	94.5	106.0	11
	Ruamahanga River at Waihenga Bridge	RS58	97.9	94.3	94.9	138.0	11
	Enaki Stream D/S site for Riparian	RS59	92.0	77.2	83.0	96.4	11
Waihine River at Gorge Rd Carpark	RS62	99.4	95.9	96.8	101.1	9	

*a lower n count for some sites reflects sampling occasions where sites could not be accessed

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

Whaitua	Site Name	Site Number	Median	Minimum	5th percentile	95th percentile	n*
Kapiti Coast	Mangapouri Stream at Bennetts Rd	RS02	7.39	1.77	3.04	10.37	12
	Waitohu Stream at Norfolk Crescent	RS04	9.18	6.29	7.10	10.34	12
	Otaki River at Pukehinau	RS05	11.11	9.55	9.92	12.51	12
	Otaki River at Mouth	RS06	10.98	8.58	9.43	12.64	12
	Mangaone Stream at Sims Road Bridge	RS07	7.99	4.33	5.02	9.50	12
	Waikanae River at Footbridge on Mangaone Walkway	RS61	10.50	9.81	9.82	12.24	12
	Waikanae River at Greenaway Rd	RS10	10.52	8.65	9.10	12.32	12
Te Awarua-o-Porirua	Horokiri Stream at Snodgrass	RS13	10.78	8.75	8.78	12.27	11
	Pauatahanui Stream at Elmwood Bridge	RS14	9.95	7.12	7.31	11.42	11
	Porirua Stream at Milk Depot	RS16	10.87	9.73	9.78	12.28	11
Te Whanganui-a-Tara	Makara Stream at Kennels	RS17	10.52	7.72	8.27	11.98	11
	Karori Stream at Makara Peak Mountain Bike Park	RS18	10.36	8.41	8.89	10.78	11
	Kaiwharawhara Stream at Ngaio Gorge	RS19	10.37	9.66	9.75	11.09	11
	Hutt River at Te Marua Intake Site	RS20	10.78	8.97	9.41	11.72	11
	Hutt River Opposite Manor Park Golf Club	RS21	10.51	9.40	9.49	11.67	11
	Hutt River at Boulcott	RS22	10.13	9.08	9.29	11.24	11
	Pakuratahi River 50m Below Farm Creek	RS23	10.32	9.30	9.38	10.98	11
	Mangaroa River at Te Marua	RS24	10.36	9.97	10.02	11.56	11
	Akatarawa River at Hutt Confluence	RS25	10.60	9.13	9.45	11.68	11
	Whakatikei River at Riverstone	RS26	10.80	9.34	9.63	11.72	11
	Wainuiomata River at Manuka Track	RS28	11.06	9.53	9.73	12.14	12
	Wainuiomata River Dnstr of White Bridge	RS29	10.19	7.89	7.90	11.16	12
	Waiwhetu Stream at Whites Line East	RS57	11.22	5.15	7.32	16.17	12
Eastern Wairapa	Whareama River at Gauge	RS42	10.17	6.91	6.92	11.24	11
	Awhea River at Tora Rd	RS53	11.15	7.50	8.29	11.62	12
	Pahaoa River at Hinakura	RS60	9.98	8.19	8.31	11.77	11
Ruamahanga	Ruamahanga River at McLays	RS31	11.41	8.92	9.19	12.23	10
	Ruamahanga River at Te Ore Ore	RS32	10.65	9.02	9.42	11.51	12
	Ruamahanga River at Gladstone Bridge	RS33	10.33	9.64	9.68	11.21	12
	Ruamahanga River at Pukio	RS34	10.28	8.84	9.00	11.15	9
	Taueru River at Gladstone	RS37	9.49	6.67	7.01	11.14	11
	Kopuaranga River at Stuarts	RS38	10.94	9.94	9.96	11.79	10
	Whangaehu River at 250m from Confluence	RS39	10.75	7.20	8.02	13.72	10
	Waipoua River at Colombo Rd Bridge	RS40	10.76	9.68	9.80	11.43	11
	Waingawa River at South Rd	RS41	10.69	8.88	9.05	11.77	11
	Parkvale tributary at Lowes Reserve	RS45	7.10	6.36	6.38	8.22	10
	Parkvale Stream at Renalls Weir	RS46	10.19	4.94	6.24	11.78	12
	Waiohine River at Bicknells	RS48	10.49	8.42	8.62	11.42	11
	Mangatarere River at State Highway 2	RS50	10.20	8.52	8.78	11.22	12
	Huangarua River at Ponatahi Bridge	RS51	10.97	8.11	8.21	14.87	12
	Tauherenikau River at Websters	RS55	10.98	8.48	9.00	11.74	11
	Ruamahanga River at Waihenga Bridge	RS58	10.77	10.04	10.07	11.76	11
Enaki Stream D/S site for Riparian	RS59	9.97	7.03	7.83	11.24	11	
Waiohine River at Gorge Rd Carpark	RS62	11.41	8.84	9.43	12.31	9	

*a lower n count for some sites reflects sampling occasions where sites could not be accessed

Table A4.4: pH - Laboratory

Whaitua	Site Name	Site Number	Median	Minimum	5th percentile	95th percentile	n*
Kapiti Coast	Mangapouri Stream at Bennetts Rd	RS02	7.10	6.90	6.90	7.29	12
	Waitohu Stream at Norfolk Crescent	RS04	7.05	6.80	6.91	7.44	12
	Otaki River at Pukehinau	RS05	7.20	6.80	6.91	7.65	12
	Otaki River at Mouth	RS06	7.25	6.90	6.96	7.65	12
	Mangaone Stream at Sims Road Bridge	RS07	7.10	6.70	6.76	7.59	12
	Waikanae River at Footbridge on Mangaone Walkway	RS61	7.20	6.80	6.91	7.54	12
	Waikanae River at Greenaway Rd	RS10	7.25	6.80	6.97	7.49	12
Te Awarua-o-Porirua	Horokiri Stream at Snodgrass	RS13	7.20	7.10	7.10	7.49	12
	Pauatahanui Stream at Elmwood Bridge	RS14	7.30	6.80	6.91	7.55	12
	Porirua Stream at Milk Depot	RS16	7.45	7.00	7.06	8.45	12
Te Whanganui-a-Tara	Makara Stream at Kennels	RS17	7.40	7.00	7.06	7.70	12
	Karori Stream at Makara Peak Mountain Bike Park	RS18	7.40	7.00	7.00	7.60	12
	Kaiwharawhara Stream at Ngaio Gorge	RS19	7.70	7.30	7.41	8.54	12
	Hutt River at Te Marua Intake Site	RS20	7.30	6.90	6.90	7.40	12
	Hutt River Opposite Manor Park Golf Club	RS21	7.25	6.70	6.76	7.79	12
	Hutt River at Boulcott	RS22	7.25	6.80	6.86	7.55	12
	Pakuratahi River 50m Below Farm Creek	RS23	7.10	6.60	6.66	7.55	12
	Mangaroa River at Te Marua	RS24	7.20	6.80	6.80	7.79	12
	Akatarawa River at Hutt Confluence	RS25	7.25	7.00	7.00	7.64	12
	Whakatikei River at Riverstone	RS26	7.35	6.80	6.97	7.95	12
	Wainuiomata River at Manuka Track	RS28	7.30	6.70	6.81	7.60	12
	Wainuiomata River Dnstr of White Bridge	RS29	7.25	7.00	7.00	7.70	12
	Waiwhetu Stream at Whites Line East	RS57	7.20	6.80	6.86	7.69	12
Eastern Wairarapa	Whareama River at Gauge	RS42	8.00	7.70	7.76	8.09	12
	Awhea River at Tora Rd	RS53	8.05	7.40	7.62	8.25	12
	Pahaoa River at Hinakura	RS60	7.80	7.70	7.70	8.05	12
Ruamahanga	Ruamahanga River at McLays	RS31	7.25	7.00	7.05	7.66	10
	Ruamahanga River at Te Ore Ore	RS32	7.55	7.10	7.16	8.14	12
	Ruamahanga River at Gladstone Bridge	RS33	7.45	7.10	7.16	7.89	12
	Ruamahanga River at Pukio	RS34	7.40	7.20	7.20	8.02	10
	Taueru River at Gladstone	RS37	7.80	7.70	7.76	8.04	12
	Kopuaranga River at Stuarts	RS38	8.10	7.60	7.60	8.20	11
	Whangaehu River at 250m from Confluence	RS39	7.70	7.20	7.40	7.95	11
	Waipoua River at Colombo Rd Bridge	RS40	7.55	7.10	7.21	7.85	12
	Waingawa River at South Rd	RS41	7.65	6.50	6.89	7.89	12
	Parkvale tributary at Lowes Reserve	RS45	6.90	6.60	6.65	7.38	10
	Parkvale Stream at Renalls Weir	RS46	7.25	7.00	7.00	7.59	12
	Waiohine River at Bicknells	RS48	7.20	6.90	6.95	7.50	11
	Mangatarere River at State Highway 2	RS50	7.05	6.80	6.86	7.48	12
	Huangarua River at Ponatahi Bridge	RS51	8.00	7.30	7.63	8.44	12
	Tauherenikau River at Websters	RS55	7.30	7.00	7.06	7.74	12
	Ruamahanga River at Waihenga Bridge	RS58	7.50	7.10	7.16	8.47	12
	Enaki Stream D/S site for Riparian	RS59	7.10	6.90	6.95	7.65	11
	Waiohine River at Gorge Rd Carpark	RS62	7.40	7.00	7.00	7.66	9

*a lower n count for some sites reflects sampling occasions where sites could not be accessed

Table A4.5: Visual Clarity (m)

Whaitua	Site Name	Site code	Median	Minimum	Maximum	n*
Kapiti Coast	Mangapouri Stream at Bennetts Rd	RS02	0.58	0.37	15.99	10
	Waitohu Stream at Norfolk Crescent	RS04	0.66	0.28	8.84	10
	Otaki River at Pukehinau	RS05	2.41	0.51	9.70	12
	Otaki River at Mouth	RS06	2.54	0.45	8.05	12
	Mangaone Stream at Sims Road Bridge	RS07	0.53	0.20	1.00	11
	Waikanae River at Footbridge on Mangaone Walkway	RS61	3.16	1.24	5.91	12
	Waikanae River at Greenaway Rd	RS10	4.74	0.82	6.20	12
Te Awarua-o-Porirua	Horokiri Stream at Snodgrass	RS13	2.73	0.03	3.60	12
	Pauatahanui Stream at Elmwood Bridge	RS14	1.85	0.05	4.13	12
	Porirua Stream at Milk Depot	RS16	2.27	0.16	3.46	12
Te Whanganui-a-Tara	Makara Stream at Kennels	RS17	1.53	0.10	2.52	12
	Karori Stream at Makara Peak Mountain Bike Park	RS18	1.83	0.18	6.51	12
	Kaiwharawhara Stream at Ngaio Gorge	RS19	3.53	0.38	6.95	12
	Hutt River at Te Marua Intake Site	RS20	4.01	0.16	7.85	12
	Hutt River Opposite Manor Park Golf Club	RS21	4.04	0.12	5.83	12
	Hutt River at Boulcott	RS22	2.09	0.14	6.17	12
	Pakuratahi River 50m Below Farm Creek	RS23	4.07	0.18	7.02	12
	Mangaroa River at Te Marua	RS24	1.54	0.13	3.36	12
	Akatarawa River at Hutt Confluence	RS25	4.52	0.65	7.56	12
	Whakatikei River at Riverstone	RS26	3.71	0.82	7.33	12
	Wainuiomata River at Manuka Track	RS28	3.93	1.93	5.58	12
	Wainuiomata River Dnstr of White Bridge	RS29	2.17	0.75	3.98	12
	Waiwhetu Stream at Whites Line East	RS57	1.65	0.44	4.75	12
Eastern Wairarapa	Whareama River at Gauge	RS42	0.59	0.12	2.03	11
	Awhea River at Tora Rd	RS53	1.33	0.04	3.54	12
	Pahaoa River at Hinakura	RS60	2.23	0.23	3.69	12
Ruamahanga	Ruamahanga River at McLays	RS31	4.58	1.17	15.99	8
	Ruamahanga River at Te Ore Ore	RS32	2.05	0.36	5.01	12
	Ruamahanga River at Gladstone Bridge	RS33	1.05	0.37	4.82	12
	Ruamahanga River at Pukio	RS34	0.83	0.13	3.56	9
	Taueru River at Gladstone	RS37	0.74	0.15	2.55	12
	Kopuaranga River at Stuarts	RS38	2.43	0.14	3.99	11
	Whangaehu River at 250m from Confluence	RS39	0.83	0.17	2.23	11
	Waipoua River at Colombo Rd Bridge	RS40	4.49	0.85	5.71	11
	Waingawa River at South Rd	RS41	5.67	1.38	7.90	11
	Parkvale tributary at Lowes Reserve	RS45	2.02	1.60	3.53	9
	Parkvale Stream at Renalls Weir	RS46	1.47	0.20	2.82	12
	Waiohine River at Bicknells	RS48	2.25	0.11	4.95	11
	Mangatarere River at State Highway 2	RS50	2.76	0.03	5.02	12
	Huangarua River at Ponatahi Bridge	RS51	1.99	0.14	4.41	12
	Tauherenikau River at Websters	RS55	1.07	0.26	6.94	10
	Ruamahanga River at Waihenga Bridge	RS58	1.06	0.11	3.48	12
	Enaki Stream D/S site for Riparian	RS59	2.30	0.03	4.60	11
	Waiohine River at Gorge Rd Carpark	RS62	4.85	0.19	6.84	9

*a lower n count for some sites reflects sampling occasions where sites could not be accessed

Table A4.6: Turbidity (NTU)

Whaitua	Site Name	Site no.	Median	Minimum	Maximum	n*
Kapiti Coast	Mangapouri Stream at Bennetts Rd	RS02	7.1	2.7	11.5	12
	Waitohu Stream at Norfolk Crescent	RS04	6.5	3.8	25.0	12
	Otaki River at Pukehinau	RS05	1.5	0.4	13.4	12
	Otaki River at Mouth	RS06	1.8	0.4	17.2	12
	Mangaone Stream at Sims Road Bridge	RS07	7.7	3.8	34.0	12
	Waikanae River at Footbridge on Mangaone Walkway	RS61	0.9	0.5	2.0	12
	Waikanae River at Greenaway Rd	RS10	0.6	0.3	7.6	12
Te Awarua-o-Porirua	Horokiri Stream at Snodgrass	RS13	1.3	0.7	220.0	12
	Pauatahanui Stream at Elmwood Bridge	RS14	2.3	1.0	190.0	12
	Porirua Stream at Milk Depot	RS16	2.4	1.0	39.0	12
Te Whanganui-a-Tara	Makara Stream at Kennels	RS17	3.9	2.1	80.0	12
	Karori Stream at Makara Peak Mountain Bike Park	RS18	2.4	0.6	43.0	12
	Kaiwharawhara Stream at Ngaio Gorge	RS19	1.5	0.3	13.8	12
	Hutt River at Te Marua Intake Site	RS20	0.7	0.2	38.0	12
	Hutt River Opposite Manor Park Golf Club	RS21	0.8	0.3	86.0	12
	Hutt River at Boulcott	RS22	1.4	0.3	99.0	12
	Pakuratahi River 50m Below Farm Creek	RS23	0.7	0.4	44.0	12
	Mangaroa River at Te Marua	RS24	1.4	0.5	82.0	12
	Akatarawa River at Hutt Confluence	RS25	0.4	0.2	6.0	12
	Whakatikei River at Riverstone	RS26	0.7	0.3	6.6	12
	Wainuiomata River at Manuka Track	RS28	0.7	0.5	1.2	12
	Wainuiomata River Dnstr of White Bridge	RS29	1.5	0.7	4.4	12
	Waiwhetu Stream at Whites Line East	RS57	3.6	1.2	15.6	12
Eastern Wairarapa	Whareama River at Gauge	RS42	5.5	1.3	163.0	12
	Awhea River at Tora Rd	RS53	12.1	0.4	550.0	12
	Pahaoa River at Hinakura	RS60	1.9	0.6	97.0	12
Ruamahanga	Ruamahanga River at McLays	RS31	0.6	0.2	4.0	10
	Ruamahanga River at Te Ore Ore	RS32	1.8	0.3	18.0	12
	Ruamahanga River at Gladstone Bridge	RS33	3.6	0.3	16.4	12
	Ruamahanga River at Pukio	RS34	5.8	0.7	51.0	10
	Taueru River at Gladstone	RS37	6.1	0.7	87.0	12
	Kopuaranga River at Stuarts	RS38	1.3	0.5	76.0	11
	Whangaehu River at 250m from Confluence	RS39	3.9	1.5	36.0	11
	Waipoua River at Colombo Rd Bridge	RS40	0.0	0.3	4.0	12
	Waingawa River at South Rd	RS41	1.4	0.3	3.6	12
	Parkvale tributary at Lowes Reserve	RS45	0.4	0.2	1.6	10
	Parkvale Stream at Renalls Weir	RS46	2.6	0.7	31.0	12
	Waiohine River at Bicknells	RS48	2.0	0.5	67.0	11
	Mangatarere River at State Highway 2	RS50	1.3	0.5	250.0	12
	Huangarua River at Ponatahi Bridge	RS51	2.3	0.6	82.0	12
	Tauherenikau River at Websters	RS55	3.6	0.4	20.0	12
	Ruamahanga River at Waihenga Bridge	RS58	4.3	0.6	59.0	12
Enaki Stream D/S site for Riparian	RS59	1.9	0.4	240.0	11	
Waiohine River at Gorge Rd Carpark	RS62	0.8	0.2	0.0	9	

*a lower n count for some sites reflects sampling occasions where sites could not be accessed

Table A4.7: Total Suspended Solids (mg/L)

Whaitua	Site Name	Site code	Median	Minimum	Maximum	n*
Kapiti Coast	Waikanae River at Greenaway Rd	RS10	1	<2	8	12
Te Awarua-o-Porirua	Horokiri Stream at Snodgrass	RS13	2.5	<2	300	12
	Pauatahanui Stream at Elmwood Bridge	RS14	2.5	<2	260	12
	Porirua Stream at Milk Depot	RS16	3	<2	44	12
Te Whanganui-a-Tara	Makara Stream at Kennels	RS17	4	<2	125	12
	Hutt River Opposite Manor Park Golf Club	RS21	1	<2	151	12
	Hutt River at Boulcott	RS22	1	<2	130	12
Eastern Wairarapa	Whareama River at Gauge	RS42	6.5	<2	200	12
	Pahaoa River at Hinakura	RS60	1	<2	118	12
Ruamahanga	Ruamahanga River at Te Ore Ore	RS32	3	<2	26	12
	Ruamahanga River at Gladstone Bridge	RS33	4	<2	19	12
	Ruamahanga River at Pukio	RS34	5.5	<2	54	10
	Taueru River at Gladstone	RS37	7.5	<2	95	12
	Kopuaranga River at Stuarts	RS38	3	<2	118	11
	Whangaehu River at 250m from Confluence	RS39	3	<2	35	11
	Tauherenikau River at Websters	RS55	5.5	<2	21	12
Ruamahanga River at Waihenga Bridge	RS58	4	<2	58	12	

*a lower n count for some sites reflects sampling occasions where sites could not be accessed

Table A4.8: Suspended Sediment (mg/L)

Whaitua	Site Name	Site code	Median	Minimum	Maximum	n*
Kapiti Coast	Waikanae River at Greenaway Rd	RS10	5	<10	5	12
Te Awarua-o-Porirua	Horokiri Stream at Snodgrass	RS13	5	<10	320	12
	Pauatahanui Stream at Elmwood Bridge	RS14	5	<10	260	12
	Porirua Stream at Milk Depot	RS16	5	<10	42	12
Te Whanganui-a-Tara	Makara Stream at Kennels	RS17	5	<10	160	12
	Hutt River Opposite Manor Park Golf Club	RS21	5	<10	280	12
	Hutt River at Boulcott	RS22	5	<10	147	12
Eastern Wairarapa	Whareama River at Gauge	RS42	5	<10	250	12
	Pahaoa River at Hinakura	RS60	5	<10	125	12
Ruamahanga	Ruamahanga River at Te Ore Ore	RS32	5	<10	30	12
	Ruamahanga River at Gladstone Bridge	RS33	5	<10	19	12
	Ruamahanga River at Pukio	RS34	5	<10	51	10
	Taueru River at Gladstone	RS37	11	<10	92	12
	Kopuaranga River at Stuarts	RS38	5	<10	114	11
	Whangaehu River at 250m from Confluence	RS39	5	<10	34	11
	Tauherenikau River at Websters	RS55	5	<10	27	12
Ruamahanga River at Waihenga Bridge	RS58	5	<10	50	12	

*a lower n count for some sites reflects sampling occasions where sites could not be accessed

Table A4.9: Electrical Conductivity – Field meter ($\mu\text{m}/\text{cm}$)

Whaitua	Site Name	Site Number	Median	Minimum	5th percentile	95th percentile	n*
Kapiti Coast	Mangapouri Stream at Bennetts Rd	RS02	210	186	191	222	12
	Waitohu Stream at Norfolk Crescent	RS04	150	117	118	202	12
	Otaki River at Pukehinau	RS05	63	52	53	78	12
	Otaki River at Mouth	RS06	68	53	55	79	12
	Mangaone Stream at Sims Road Bridge	RS07	204	145	170	228	12
	Waikanae River at Footbridge on Mangaone Walkway	RS61	91	77	79	96	12
	Waikanae River at Greenaway Rd	RS10	104	91	95	116	12
Te Awarua-o-Porirua	Horokiri Stream at Snodgrass	RS13	214	160	169	232	12
	Pauatahanui Stream at Elmwood Bridge	RS14	191	124	137	215	12
	Porirua Stream at Milk Depot	RS16	250	164	192	282	12
Te Whanganui-a-Tara	Makara Stream at Kennels	RS17	278	222	227	325	12
	Karori Stream at Makara Peak Mountain Bike Park	RS18	229	191	197	241	12
	Kaiwharawhara Stream at Ngaio Gorge	RS19	303	195	219	318	11
	Hutt River at Te Marua Intake Site	RS20	73	54	55	85	12
	Hutt River Opposite Manor Park Golf Club	RS21	94	74	74	108	12
	Hutt River at Boulcott	RS22	94	67	71	111	12
	Pakuratahi River 50m Below Farm Creek	RS23	87	62	67	92	12
	Mangaroa River at Te Marua	RS24	111	87	89	118	12
	Akatarawa River at Hutt Confluence	RS25	82	62	66	96	12
	Whakatikei River at Riverstone	RS26	115	91	94	130	12
	Wainuiomata River at Manuka Track	RS28	114	96	101	119	12
	Wainuiomata River Dnstr of White Bridge	RS29	153	127	132	162	12
	Waiwhetu Stream at Whites Line East	RS57	226	101	153	237	12
Eastern Wairapa	Whareama River at Gauge	RS42	625	401	453	719	12
	Awhea River at Tora Rd	RS53	460	323	347	600	12
	Pahaoa River at Hinakura	RS60	348	101	181	457	11
Ruamahanga	Ruamahanga River at McLays	RS31	45	33	36	67	9
	Ruamahanga River at Te Ore Ore	RS32	133	86	90	202	10
	Ruamahanga River at Gladstone Bridge	RS33	123	76	80	160	10
	Ruamahanga River at Pukio	RS34	163	60	75	179	8
	Taueru River at Gladstone	RS37	432	291	320	580	11
	Kopuaranga River at Stuarts	RS38	328	177	193	390	11
	Whangaehu River at 250m from Confluence	RS39	384	301	313	428	11
	Waipoua River at Colombo Rd Bridge	RS40	110	82	88	136	12
	Waingawa River at South Rd	RS41	59	48	48	73	12
	Parkvale tributary at Lowes Reserve	RS45	177	159	163	187	10
	Parkvale Stream at Renalls Weir	RS46	153	136	136	177	12
	Waiohine River at Bicknells	RS48	75	40	57	88	11
	Mangatarere River at State Highway 2	RS50	114	63	66	136	12
	Huangarua River at Ponatahi Bridge	RS51	393	231	287	537	12
	Tauherenikau River at Websters	RS55	67	46	46	387	11
	Ruamahanga River at Waihenga Bridge	RS58	164	77	86	174	10
Enaki Stream D/S site for Riparian	RS59	117	85	96	121	11	
Waiohine River at Gorge Rd Carpark	RS62	52	32	39	60	9	

*a lower n count for some sites reflects sampling occasions where sites could not be accessed

Table A4.10: Ammonical nitrogen (mg/L)

Whaitua	Site Name	Site Number	Median	Minimum	5th percentile	95th percentile	n*
Kapiti Coast	Mangapouri Stream at Bennetts Rd	RS02	0.0545	<0.0050	0.0025	0.1319	12
	Waitohu Stream at Norfolk Crescent	RS04	0.0380	<0.0050	0.0025	0.0595	12
	Otaki River at Pukehinau	RS05	0.0025	<0.0050	0.0025	0.0025	12
	Otaki River at Mouth	RS06	0.0025	<0.0050	0.0025	0.0025	12
	Mangaone Stream at Sims Road Bridge	RS07	0.0985	0.0190	0.0229	0.1753	12
	Waikanae River at Footbridge on Mangaone Walkway	RS61	0.0025	<0.0050	0.0025	0.0025	12
	Waikanae River at Greenaway Rd	RS10	0.0025	<0.0050	0.0025	0.0244	12
Te Awarua-o-Porirua	Horokiri Stream at Snodgrass	RS13	0.0025	<0.0050	0.0025	0.0249	12
	Pauatahanui Stream at Elmwood Bridge	RS14	0.0025	<0.0050	0.0025	0.0249	12
	Porirua Stream at Milk Depot	RS16	0.0070	<0.0050	0.0025	0.1043	12
Te Whanganui-a-Tara	Makara Stream at Kennels	RS17	0.0025	<0.0050	0.0025	0.0323	12
	Karori Stream at Makara Peak Mountain Bike Park	RS18	0.0110	<0.0050	0.0025	0.0534	12
	Kaiwharawhara Stream at Ngaio Gorge	RS19	0.0043	<0.0050	0.0025	0.0322	12
	Hutt River at Te Marua Intake Site	RS20	0.0025	<0.0050	0.0025	0.0059	12
	Hutt River Opposite Manor Park Golf Club	RS21	0.0025	<0.0050	0.0025	0.0217	12
	Hutt River at Boulcott	RS22	0.0025	<0.0050	0.0025	0.0325	12
	Pakuratahi River 50m Below Farm Creek	RS23	0.0025	<0.0050	0.0025	0.0151	12
	Mangaroa River at Te Marua	RS24	0.0025	<0.0050	0.0025	0.0241	12
	Akatarawa River at Hutt Confluence	RS25	0.0025	<0.0050	0.0025	0.0050	12
	Whakatikei River at Riverstone	RS26	0.0025	<0.0050	0.0025	0.0025	12
	Wainuiomata River at Manuka Track	RS28	0.0025	<0.0050	0.0025	0.0036	12
	Wainuiomata River Dnstr of White Bridge	RS29	0.0075	<0.0050	0.0025	0.0139	12
	Waiwhetu Stream at Whites Line East	RS57	0.0280	<0.0050	0.0025	0.0870	12
Eastern Wairapa	Whareama River at Gauge	RS42	0.0025	<0.0050	0.0025	0.0254	12
	Awhea River at Tora Rd	RS53	0.0025	<0.0050	0.0025	0.0248	12
	Pahaoa River at Hinakura	RS60	0.0025	<0.0050	0.0025	0.0091	12
Ruamahanga	Ruamahanga River at McLays	RS31	0.0025	<0.0050	0.0025	0.0087	10
	Ruamahanga River at Te Ore Ore	RS32	0.0025	<0.0050	0.0025	0.0060	12
	Ruamahanga River at Gladstone Bridge	RS33	0.0070	<0.0050	0.0025	0.0924	12
	Ruamahanga River at Pukio	RS34	0.0055	<0.0050	0.0025	0.0383	10
	Taueru River at Gladstone	RS37	0.0105	<0.0050	0.0025	0.0422	12
	Kopuaranga River at Stuarts	RS38	0.0025	<0.0050	0.0025	0.0230	11
	Whangaehu River at 250m from Confluence	RS39	0.0025	<0.0050	0.0025	0.0245	11
	Waipoua River at Colombo Rd Bridge	RS40	0.0025	<0.0050	0.0025	0.0091	12
	Waingawa River at South Rd	RS41	0.0025	<0.0050	0.0025	0.0088	12
	Parkvale tributary at Lowes Reserve	RS45	0.0025	<0.0050	0.0025	0.0025	10
	Parkvale Stream at Renalls Weir	RS46	0.0025	<0.0050	0.0025	0.0290	12
	Waiohine River at Bicknells	RS48	0.0090	<0.0050	0.0025	0.0195	11
	Mangatarere River at State Highway 2	RS50	0.0120	<0.0050	0.0025	0.1411	12
	Huangarua River at Ponatahi Bridge	RS51	0.0025	<0.0050	0.0025	0.0140	12
	Tauherenikau River at Websters	RS55	0.0025	<0.0050	0.0025	0.0074	12
	Ruamahanga River at Waihenga Bridge	RS58	0.0025	<0.0050	0.0025	0.0439	12
	Enaki Stream D/S site for Riparian	RS59	0.0070	<0.0050	0.0025	0.0120	11
Waiohine River at Gorge Rd Carpark	RS62	0.0025	<0.0050	0.0025	0.0025	9	

*a lower n count for some sites reflects sampling occasions where sites could not be accessed

Table A4.11: Ammonical nitrogen (mg/L) pH adjusted NOF

Whaitua	Site Name	Site code	Median	Minimum	Maximum	95th percentile	NOF attribute state	n*
Kapiti Coast	Mangapouri Stream at Bennetts Rd	RS02	0.024	0.001	0.065	0.057	B	12
	Waitohu Stream at Norfolk Crescent	RS04	0.017	0.001	0.029	0.028	A	12
	Otaki River at Pukehinau	RS05	0.001	0.001	0.002	0.002	A	12
	Otaki River at Mouth	RS06	0.001	0.001	0.002	0.002	A	12
	Mangaone Stream at Sims Road Bridge	RS07	0.046	0.010	0.084	0.081	B	12
	Waikanae River at Footbridge on Mangaone Walkway	RS61	0.001	0.001	0.002	0.002	A	12
	Waikanae River at Greenaway Rd	RS10	0.001	0.001	0.030	0.015	A	12
Te Awarua-o-Porirua	Horokiri Stream at Snodgrass	RS13	0.001	0.001	0.014	0.013	A	12
	Pauatahanui Stream at Elmwood Bridge	RS14	0.001	0.001	0.018	0.011	A	12
	Porirua Stream at Milk Depot	RS16	0.008	0.001	0.063	0.045	B	12
Te Whanganui-a-Tara	Makara Stream at Kennels	RS17	0.002	0.001	0.019	0	A	12
	Karori Stream at Makara Peak Mountain Bike Park	RS18	0.006	0.001	0.034	0	A	12
	Kaiwharawhara Stream at Ngaio Gorge	RS19	0.006	0.002	0.03	0	A	12
	Hutt River at Te Marua Intake Site	RS20	0.001	0.001	0.005	0.003	A	12
	Hutt River Opposite Manor Park Golf Club	RS21	0.001	0.001	0.016	0.009	A	12
	Hutt River at Boulcott	RS22	0.001	0.001	0.027	0.013	A	12
	Pakuratahi River 50m Below Farm Creek	RS23	0.001	0.001	0.010	0.006	A	12
	Mangaroa River at Te Marua	RS24	0.002	0.001	0.015	0.010	A	12
	Akatarawa River at Hutt Confluence	RS25	0.001	0.001	0.002	0.002	A	12
	Whakatikei River at Riverstone	RS26	0.001	0.001	0.002	0.002	A	12
	Wainuiomata River at Manuka Track	RS28	0.001	0.001	0.002	0.002	A	12
	Wainuiomata River Dnstr of White Bridge	RS29	0.004	0.001	0.008	0.007	A	12
	Waiwhetu Stream at Whites Line East	RS57	0.016	0.001	0.038	0.035	A	12
Eastern Wairapa	Whareama River at Gauge	RS42	0.003	0.002	0.019	0.019	A	12
	Awhea River at Tora Rd	RS53	0.003	0.001	0.037	0.023	A	12
	Pahaoa River at Hinakura	RS60	0.002	0.002	0.009	0.006	A	12
Ruamahanga	Ruamahanga River at McLays	RS31	0.001	0.001	0.008	0.005	A	11
	Ruamahanga River at Te Ore Ore	RS32	0.002	0.001	0.006	0.005	A	12
	Ruamahanga River at Gladstone Bridge	RS33	0.003	0.001	0.060	0.054	B	12
	Ruamahanga River at Pukio	RS34	0.003	0.001	0.023	0.020	A	12
	Taueru River at Gladstone	RS37	0.008	0.002	0.035	0.031	A	12
	Kopuaranga River at Stuarts	RS38	0.003	0.002	0.021	0.018	A	11
	Whangaehu River at 250m from Confluence	RS39	0.002	0.002	0.015	0.015	A	11
	Waipoua River at Colombo Rd Bridge	RS40	0.002	0.001	0.010	0.006	A	12
	Waingawa River at South Rd	RS41	0.002	0.001	0.008	0.006	A	12
	Parkvale tributary at Lowes Reserve	RS45	0.001	0.001	0.002	0.001	A	10
	Parkvale Stream at Renalls Weir	RS46	0.002	0.001	0.012	0.012	A	12
	Waihine River at Bicknells	RS48	0.004	0.001	0.012	0.011	A	12
	Mangatarere River at State Highway 2	RS50	0.005	0.001	0.076	0.076	B	12
	Huangarua River at Ponatahi Bridge	RS51	0.003	0.001	0.017	0.013	A	12
	Tauherenikau River at Websters	RS55	0.002	0.001	0.004	0.003	A	12
	Ruamahanga River at Waihenga Bridge	RS58	0.004	0.001	0.027	0.022	A	12
	Enaki Stream D/S site for Riparian	RS59	0.003	0.001	0.008	0.008	A	11
Waihine River at Gorge Rd Carpark	RS62	0.001	0.001	0.002	0.002	A	10	

*a lower n count for some sites reflects sampling occasions where sites could not be accessed

Table A4.12: Nitrate nitrogen (mg/L)

Whaitua	Site Name	Site code	Median	Minimum	Maximum	Hazen 95th	NOF	n*
Kapiti Coast	Mangapouri Stream at Bennetts Rd	RS02	1.645	0.036	3.100	3.050	B	12
	Waitohu Stream at Norfolk Crescent	RS04	0.395	0.124	0.860	0.841	A	12
	Otaki River at Pukehinau	RS05	0.044	0.005	0.064	0.063	A	12
	Otaki River at Mouth	RS06	0.060	<0.001	0.089	0.089	A	12
	Mangaone Stream at Sims Road Bridge	RS07	1.615	0.770	2.600	2.600	B	12
	Waikanae River at Footbridge on Mangaone Walkway	RS61	0.130	0.083	0.240	0.234	A	12
	Waikanae River at Greenaway Rd	RS10	0.220	0.049	0.350	0.341	A	12
Te Awarua-o-Porirua	Horokiri Stream at Snodgrass	RS13	0.570	0.025	1.170	1.167	A	12
	Pauatahanui Stream at Elmwood Bridge	RS14	0.235	<0.001	0.740	0.730	A	12
	Porirua Stream at Milk Depot	RS16	1.060	0.099	1.690	1.686	B	12
Te Whanganui-a-Tara	Makara Stream at Kennels	RS17	0.440	<0.001	1.480	1.434	A	12
	Karori Stream at Makara Peak Mountain Bike Park	RS18	1.285	1.060	1.500	1.493	B	12
	Kaiwharawhara Stream at Ngaio Gorge	RS19	1.085	0.700	1.340	1.328	B	12
	Hutt River at Te Marua Intake Site	RS20	0.057	0.017	0.128	0.126	A	12
	Hutt River Opposite Manor Park Golf Club	RS21	0.167	0.097	0.320	0.311	A	12
	Hutt River at Boulcott	RS22	0.162	0.025	0.310	0.302	A	12
	Pakuratahi River 50m Below Farm Creek	RS23	0.152	0.097	0.290	0.287	A	12
	Mangaroa River at Te Marua	RS24	0.415	0.350	0.610	0.610	A	12
	Akatarawa River at Hutt Confluence	RS25	0.035	<0.001	0.230	0.218	A	12
	Whakatikei River at Riverstone	RS26	0.121	0.003	0.370	0.364	A	12
	Wainuiomata River at Manuka Track	RS28	0.049	0.022	0.078	0.077	A	12
	Wainuiomata River Dnstr of White Bridge	RS29	0.142	0.020	0.410	0.409	A	12
	Waiwhetu Stream at Whites Line East	RS57	0.510	0.146	0.710	0.704	A	12
Eastern Wairarapa	Whareama River at Gauge	RS42	0.011	<0.001	0.430	0.413	A	12
	Awhea River at Tora Rd	RS53	0.057	<0.001	0.290	0.283	A	12
	Pahaoa River at Hinakura	RS60	0.023	<0.001	0.430	0.422	A	12
Ruamahanga	Ruamahanga River at McLays	RS31	0.024	<0.001	0.044	0.044	A	10
	Ruamahanga River at Te Ore Ore	RS32	0.355	0.137	0.820	0.820	A	12
	Ruamahanga River at Gladstone Bridge	RS33	0.415	0.150	0.910	0.900	A	12
	Ruamahanga River at Pukio	RS34	0.300	<0.001	0.820	0.820	A	10
	Taueru River at Gladstone	RS37	0.575	0.310	1.220	1.199	A	12
	Kopuaranga River at Stuarts	RS38	0.990	0.370	1.130	1.129	A	11
	Whangaehu River at 250m from Confluence	RS39	0.850	0.380	2.100	2.051	B	11
	Waipoua River at Colombo Rd Bridge	RS40	0.810	0.410	1.610	1.602	B	12
	Waingawa River at South Rd	RS41	0.055	0.020	0.145	0.145	A	12
	Parkvale tributary at Lowes Reserve	RS45	3.950	2.900	4.900	4.900	C	10
	Parkvale Stream at Renalls Weir	RS46	1.240	<0.001	3.200	3.150	B	12
	Waiohine River at Bicknells	RS48	0.380	0.118	0.580	0.579	A	11
	Mangatarere River at State Highway 2	RS50	1.030	0.280	1.580	1.562	B	12
	Huangarua River at Ponatahi Bridge	RS51	0.255	0.028	0.790	0.756	A	12
	Tauherenikau River at Websters	RS55	0.050	0.027	0.100	0.099	A	12
	Ruamahanga River at Waihenga Bridge	RS58	0.355	<0.001	0.840	0.833	A	12
	Enaki Stream D/S site for Riparian	RS59	0.690	0.091	1.400	1.394	A	11
Waiohine River at Gorge Rd Carpark	RS62	0.032	0.014	0.052	Too few Values	9		

*a lower n count for some sites reflects sampling occasions where sites could not be accessed

Table A4.13: Nitrate-nitrite nitrogen (mg/L)

Whaitua	Site Name	Site code	Median	Minimum	Maximum	n*
Kapiti Coast	Mangapouri Stream at Bennetts Rd	RS02	1.665	0.042	3.100	12
	Waitohu Stream at Norfolk Crescent	RS04	0.405	0.129	0.870	12
	Otaki River at Pukehinau	RS05	0.045	0.006	0.064	12
	Otaki River at Mouth	RS06	0.060	<0.001	0.090	12
	Mangaone Stream at Sims Road Bridge	RS07	1.635	0.780	2.600	12
	Waikanae River at Footbridge on Mangaone Walkway	RS61	0.130	0.085	0.240	12
	Waikanae River at Greenaway Rd	RS10	0.225	0.050	0.350	12
Te Awarua-o-Porirua	Horokiri Stream at Snodgrass	RS13	0.575	0.027	1.180	12
	Pauatahanui Stream at Elmwood Bridge	RS14	0.240	<0.001	0.740	12
	Porirua Stream at Milk Depot	RS16	1.060	0.103	1.700	12
Te Whanganui-a-Tara	Makara Stream at Kennels	RS17	0.450	<0.001	1.480	12
	Karori Stream at Makara Peak Mountain Bike Park	RS18	1.285	1.070	1.530	12
	Kaiwharawhara Stream at Ngaio Gorge	RS19	1.090	0.700	1.340	12
	Hutt River at Te Marua Intake Site	RS20	0.058	0.018	0.128	12
	Hutt River Opposite Manor Park Golf Club	RS21	0.169	0.098	0.320	12
	Hutt River at Boulcott	RS22	0.164	0.026	0.310	12
	Pakuratahi River 50m Below Farm Creek	RS23	0.153	0.099	0.300	12
	Mangaroa River at Te Marua	RS24	0.415	0.350	0.610	12
	Akatarawa River at Hutt Confluence	RS25	0.036	<0.001	0.230	12
	Whakatikei River at Riverstone	RS26	0.124	0.005	0.370	12
	Wainuiomata River at Manuka Track	RS28	0.049	0.022	0.079	12
	Wainuiomata River Dnstr of White Bridge	RS29	0.143	0.021	0.410	12
	Waiwhetu Stream at Whites Line East	RS57	0.520	0.152	0.720	12
Eastern Wairapa	Whareama River at Gauge	RS42	0.013	<0.001	0.430	12
	Awhea River at Tora Rd	RS53	0.058	0.002	0.290	12
	Pahaoa River at Hinakura	RS60	0.024	<0.001	0.430	12
Ruamahanga	Ruamahanga River at McLays	RS31	0.024	<0.001	0.044	10
	Ruamahanga River at Te Ore Ore	RS32	0.355	0.138	0.820	12
	Ruamahanga River at Gladstone Bridge	RS33	0.415	0.157	0.920	12
	Ruamahanga River at Pukio	RS34	0.300	<0.001	0.830	10
	Taueru River at Gladstone	RS37	0.580	0.310	1.230	12
	Kopuaranga River at Stuarts	RS38	0.990	0.380	1.130	11
	Whangaehu River at 250m from Confluence	RS39	0.850	0.400	2.100	11
	Waipoua River at Colombo Rd Bridge	RS40	0.810	0.420	1.610	12
	Waingawa River at South Rd	RS41	0.055	0.020	0.146	12
	Parkvale tributary at Lowes Reserve	RS45	3.950	2.900	4.900	10
	Parkvale Stream at Renalls Weir	RS46	1.250	<0.001	3.300	12
	Waiohine River at Bicknells	RS48	0.380	0.120	0.580	11
	Mangatarere River at State Highway 2	RS50	1.035	0.290	1.580	12
	Huangarua River at Ponatahi Bridge	RS51	0.255	0.029	0.800	12
	Tauherenikau River at Websters	RS55	0.051	0.027	0.101	12
	Ruamahanga River at Waihenga Bridge	RS58	0.360	<0.001	0.840	12
	Enaki Stream D/S site for Riparian	RS59	0.700	0.093	1.400	11
Waiohine River at Gorge Rd Carpark	RS62	0.033	0.014	0.052	9	

*a lower n count for some sites reflects sampling occasions where sites could not be accessed

Table A4.14: Total kjeldahl nitrogen (mg/L)

Whaitua	Site Name	Site code	Median	Minimum	Maximum	n*
Kapiti Coast	Mangapouri Stream at Bennetts Rd	RS02	0.580	0.340	1.120	12
	Waitohu Stream at Norfolk Crescent	RS04	0.355	0.270	0.580	12
	Otaki River at Pukehinau	RS05	<0.1	<0.1	0.170	12
	Otaki River at Mouth	RS06	<0.1	<0.1	0.180	12
	Mangaone Stream at Sims Road Bridge	RS07	0.520	0.370	0.730	12
	Waikanae River at Footbridge on Mangaone Walkway	RS61	<0.1	<0.1	0.160	12
	Waikanae River at Greenaway Rd	RS10	<0.1	<0.1	0.150	12
Te Awarua-o-Porirua	Horokiri Stream at Snodgrass	RS13	0.195	<0.1	2.100	12
	Pauatahanui Stream at Elmwood Bridge	RS14	0.215	0.120	1.740	12
	Porirua Stream at Milk Depot	RS16	0.250	0.180	0.900	12
Te Whanganui-a-Tara	Makara Stream at Kennels	RS17	0.370	0.250	1.260	12
	Karori Stream at Makara Peak Mountain Bike Park	RS18	0.220	0.150	3.800	12
	Kaiwharawhara Stream at Ngaio Gorge	RS19	0.240	0.190	0.500	12
	Hutt River at Te Marua Intake Site	RS20	<0.1	<0.1	0.230	12
	Hutt River Opposite Manor Park Golf Club	RS21	0.125	<0.1	0.360	12
	Hutt River at Boulcott	RS22	0.110	<0.1	0.380	12
	Pakuratahi River 50m Below Farm Creek	RS23	0.125	<0.1	0.250	12
	Mangaroa River at Te Marua	RS24	0.200	0.110	0.570	12
	Akatarawa River at Hutt Confluence	RS25	<0.1	<0.1	0.190	12
	Whakatikei River at Riverstone	RS26	<0.1	<0.1	0.180	12
	Wainuiomata River at Manuka Track	RS28	<0.1	<0.1	0.130	12
	Wainuiomata River Dnstr of White Bridge	RS29	0.120	<0.1	0.270	12
	Waiwhetu Stream at Whites Line East	RS57	0.225	0.120	0.390	12
Eastern Wairarapa	Whareama River at Gauge	RS42	0.400	0.310	0.860	12
	Awhea River at Tora Rd	RS53	0.245	0.160	1.810	12
	Pahaoa River at Hinakura	RS60	0.250	0.170	0.630	12
Ruamahanga	Ruamahanga River at McLays	RS31	<0.1	<0.1	0.050	10
	Ruamahanga River at Te Ore Ore	RS32	0.155	<0.1	0.310	12
	Ruamahanga River at Gladstone Bridge	RS33	0.195	<0.1	0.310	12
	Ruamahanga River at Pukio	RS34	0.195	0.130	1.290	10
	Taueru River at Gladstone	RS37	0.515	0.210	0.940	12
	Kopuaranga River at Stuarts	RS38	0.310	0.200	0.960	11
	Whangaehu River at 250m from Confluence	RS39	0.620	0.470	1.210	11
	Waipoua River at Colombo Rd Bridge	RS40	0.190	0.110	0.400	12
	Waingawa River at South Rd	RS41	<0.1	<0.1	0.150	12
	Parkvale tributary at Lowes Reserve	RS45	0.365	0.260	0.600	10
	Parkvale Stream at Renalls Weir	RS46	0.505	0.370	1.510	12
	Waiohine River at Bicknells	RS48	0.110	<0.1	0.240	11
	Mangatarere River at State Highway 2	RS50	0.235	0.120	1.470	12
	Huangarua River at Ponatahi Bridge	RS51	0.255	0.160	0.650	12
	Tauherenikau River at Websters	RS55	<0.1	<0.1	0.170	12
	Ruamahanga River at Waihenga Bridge	RS58	0.180	0.110	0.400	12
	Enaki Stream D/S site for Riparian	RS59	0.200	0.160	2.500	11
Waiohine River at Gorge Rd Carpark	RS62	<0.1	<0.1	0.200	9	

*a lower n count for some sites reflects sampling occasions where sites could not be accessed

Table A4.15: Total nitrogen (mg/L)

Whaitua	Site Name	Site code	Median	Minimum	Maximum	n*
Kapiti Coast	Mangapouri Stream at Bennetts Rd	RS02	2.350	0.510	3.500	12
	Waitohu Stream at Norfolk Crescent	RS04	0.810	0.470	1.240	12
	Otaki River at Pukehinau	RS05	0.110	<0.11	0.230	12
	Otaki River at Mouth	RS06	0.130	<0.11	0.200	12
	Mangaone Stream at Sims Road Bridge	RS07	2.250	1.150	3.300	12
	Waikanae River at Footbridge on Mangaone Walkway	RS61	0.200	0.160	0.310	12
	Waikanae River at Greenaway Rd	RS10	0.310	0.150	0.460	12
Te Awarua-o-Porirua	Horokiri Stream at Snodgrass	RS13	0.735	0.160	3.300	12
	Pauatahanui Stream at Elmwood Bridge	RS14	0.450	0.160	2.400	12
	Porirua Stream at Milk Depot	RS16	1.320	0.350	2.400	12
Te Whanganui-a-Tara	Makara Stream at Kennels	RS17	0.855	0.280	2.700	12
	Karori Stream at Makara Peak Mountain Bike Park	RS18	1.490	1.390	5.300	12
	Kaiwharawhara Stream at Ngaio Gorge	RS19	1.375	1.040	1.610	12
	Hutt River at Te Marua Intake Site	RS20	0.160	0.110	0.340	12
	Hutt River Opposite Manor Park Golf Club	RS21	0.300	0.200	0.680	12
	Hutt River at Boulcott	RS22	0.290	0.130	0.690	12
	Pakuratahi River 50m Below Farm Creek	RS23	0.285	0.180	0.440	12
	Mangaroa River at Te Marua	RS24	0.645	0.560	1.120	12
	Akatarawa River at Hutt Confluence	RS25	0.125	<0.11	0.420	12
	Whakatikei River at Riverstone	RS26	0.210	<0.11	0.550	12
	Wainuiomata River at Manuka Track	RS28	0.140	<0.11	0.180	12
	Wainuiomata River Dnstr of White Bridge	RS29	0.315	0.110	0.560	12
	Waiwhetu Stream at Whites Line East	RS57	0.765	0.270	0.990	12
Eastern Wairarapa	Whareama River at Gauge	RS42	0.400	0.320	1.250	12
	Awhea River at Tora Rd	RS53	0.305	0.170	1.950	12
	Pahaoa River at Hinakura	RS60	0.275	0.180	0.980	12
Ruamahanga	Ruamahanga River at McLays	RS31	<0.11	<0.11	0.140	10
	Ruamahanga River at Te Ore Ore	RS32	0.545	0.250	1.130	12
	Ruamahanga River at Gladstone Bridge	RS33	0.655	0.310	1.140	12
	Ruamahanga River at Pukio	RS34	0.465	0.170	2.100	10
	Taueru River at Gladstone	RS37	1.185	0.880	1.450	12
	Kopuaranga River at Stuarts	RS38	1.330	1.050	1.440	11
	Whangaehu River at 250m from Confluence	RS39	1.470	0.880	2.700	11
	Waipoua River at Colombo Rd Bridge	RS40	0.990	0.520	1.870	12
	Waingawa River at South Rd	RS41	0.140	<0.11	0.280	12
	Parkvale tributary at Lowes Reserve	RS45	4.250	3.400	5.200	10
	Parkvale Stream at Renalls Weir	RS46	1.960	0.420	3.900	12
	Waiohine River at Bicknells	RS48	0.480	0.220	0.690	11
	Mangatarere River at State Highway 2	RS50	1.395	0.480	1.840	12
	Huangarua River at Ponatahi Bridge	RS51	0.480	0.190	1.450	12
	Tauherenikau River at Websters	RS55	0.140	<0.11	0.210	12
	Ruamahanga River at Waihenga Bridge	RS58	0.540	0.140	1.130	12
	Enaki Stream D/S site for Riparian	RS59	1.080	0.260	3.000	11
Waiohine River at Gorge Rd Carpark	RS62	<0.11	<0.11	0.220	9	

*a lower n count for some sites reflects sampling occasions where sites could not be accessed

Table A4.16: Dissolved reactive phosphorus (mg/L)#

Whaitua	Site Name	Site code	Median	Minimum	Maximum	n*
Kapiti Coast	Mangapouri Stream at Bennetts Rd	RS02	0.030	0.023	0.050	12
	Waitohu Stream at Norfolk Crescent	RS04	0.016	0.0092	0.025	12
	Otaki River at Pukehinau	RS05	0.005	<0.004	0.007	12
	Otaki River at Mouth	RS06	0.004	<0.001	0.007	12
	Mangaone Stream at Sims Road Bridge	RS07	0.028	0.0137	0.038	12
	Waikanae River at Footbridge on Mangaone Walkway	RS61	0.013	0.0109	0.019	12
	Waikanae River at Greenaway Rd	RS10	0.006	<0.001	0.011	12
Te Awarua-o-Porirua	Horokiri Stream at Snodgrass	RS13	0.006	<0.001	0.020	12
	Pauatahanui Stream at Elmwood Bridge	RS14	0.009	0.0036	0.017	12
	Porirua Stream at Milk Depot	RS16	0.017	0.006	0.023	12
Te Whanganui-a-Tara	Makara Stream at Kennels	RS17	0.021	0.0116	0.068	12
	Karori Stream at Makara Peak Mountain Bike Park	RS18	0.028	0.0152	0.050	12
	Kaiwharawhara Stream at Ngaio Gorge	RS19	0.034	0.0167	0.054	12
	Hutt River at Te Marua Intake Site	RS20	0.002	<0.001	0.004	12
	Hutt River Opposite Manor Park Golf Club	RS21	0.003	<0.001	0.008	12
	Hutt River at Boulcott	RS22	0.003	<0.001	0.008	12
	Pakuratahi River 50m Below Farm Creek	RS23	0.003	<0.001	0.006	12
	Mangaroa River at Te Marua	RS24	0.008	0.0015	0.015	12
	Akatarawa River at Hutt Confluence	RS25	0.002	<0.001	0.005	12
	Whakatikei River at Riverstone	RS26	0.004	<0.001	0.009	12
	Wainuiomata River at Manuka Track	RS28	0.011	0.0089	0.014	12
	Wainuiomata River Dnstr of White Bridge	RS29	0.011	0.008	0.021	12
	Waiwhetu Stream at Whites Line East	RS57	0.019	0.0085	0.034	12
Eastern Wairapa	Whareama River at Gauge	RS42	0.005	0.0016	0.029	12
	Awhea River at Tora Rd	RS53	0.008	0.0022	0.037	12
	Pahaoa River at Hinakura	RS60	0.005	0.0016	0.016	11
Ruamahanga	Ruamahanga River at McLays	RS31	0.002	<0.001	0.004	10
	Ruamahanga River at Te Ore Ore	RS32	0.005	<0.001	0.009	12
	Ruamahanga River at Gladstone Bridge	RS33	0.012	<0.001	0.032	12
	Ruamahanga River at Pukio	RS34	0.009	<0.001	0.017	10
	Taueru River at Gladstone	RS37	0.024	0.0044	0.038	11
	Kopuaranga River at Stuarts	RS38	0.014	0.0087	0.021	10
	Whangaehu River at 250m from Confluence	RS39	0.036	<0.004	0.088	11
	Waipoua River at Colombo Rd Bridge	RS40	0.004	0.0018	0.007	12
	Waingawa River at South Rd	RS41	0.003	<0.004	0.008	12
	Parkvale tributary at Lowes Reserve	RS45	0.011	0.0099	0.032	10
	Parkvale Stream at Renalls Weir	RS46	0.022	0.0038	0.068	12
	Waiohine River at Bicknells	RS48	0.008	<0.004	0.012	11
	Mangatarere River at State Highway 2	RS50	0.013	<0.004	0.043	12
	Huangarua River at Ponatahi Bridge	RS51	0.006	<0.001	0.031	12
	Tauherenikau River at Websters	RS55	0.002	<0.001	0.004	12
	Ruamahanga River at Waihenga Bridge	RS58	0.012	<0.001	0.024	12
	Enaki Stream D/S site for Riparian	RS59	0.014	<0.004	0.024	11
	Waiohine River at Gorge Rd Carpark	RS62	0.003	<0.004	0.005	9

*a lower n count for some sites reflects sampling occasions where sites could not be accessed

#two different lab methods were used for this data to derive DRP, each had different detection limits. The two detection limits were <0.001 and <0.004. In this table the upper limit for all of the data was used (<0.004).

Table A4.17: Total phosphorus (mg/L)

Whaitua	Site Name	Site code	Median	Minimum	Maximum	n*
Kapiti Coast	Mangapouri Stream at Bennetts Rd	RS02	0.085	0.047	0.156	12
	Waitohu Stream at Norfolk Crescent	RS04	0.052	0.027	0.075	12
	Otaki River at Pukehinau	RS05	0.008	<0.004	0.015	12
	Otaki River at Mouth	RS06	0.004	<0.004	0.013	12
	Mangaone Stream at Sims Road Bridge	RS07	0.068	0.039	0.126	12
	Waikanae River at Footbridge on Mangaone Walkway	RS61	0.017	0.012	0.035	12
	Waikanae River at Greenaway Rd	RS10	0.010	0.004	0.024	12
Te Awarua-o-Porirua	Horokiri Stream at Snodgrass	RS13	0.013	0.005	0.280	12
	Pauatahanui Stream at Elmwood Bridge	RS14	0.025	0.012	0.230	12
	Porirua Stream at Milk Depot	RS16	0.029	0.015	0.106	12
Te Whanganui-a-Tara	Makara Stream at Kennels	RS17	0.055	0.023	0.170	12
	Karori Stream at Makara Peak Mountain Bike Park	RS18	0.040	0.026	0.410	12
	Kaiwharawhara Stream at Ngaio Gorge	RS19	0.048	0.027	0.063	12
	Hutt River at Te Marua Intake Site	RS20	0.004	<0.004	0.048	12
	Hutt River Opposite Manor Park Golf Club	RS21	0.006	<0.004	0.124	12
	Hutt River at Boulcott	RS22	0.008	<0.004	0.114	12
	Pakuratahi River 50m Below Farm Creek	RS23	0.006	<0.004	0.200	12
	Mangaroa River at Te Marua	RS24	0.016	0.011	0.136	12
	Akatarawa River at Hutt Confluence	RS25	0.003	<0.004	0.016	12
	Whakatikei River at Riverstone	RS26	0.010	<0.004	0.021	12
	Wainuiomata River at Manuka Track	RS28	0.015	0.005	0.020	12
	Wainuiomata River Dnstr of White Bridge	RS29	0.018	0.012	0.029	12
	Waiwhetu Stream at Whites Line East	RS57	0.037	0.016	0.080	12
Eastern Wairapa	Whareama River at Gauge	RS42	0.025	0.015	0.144	12
	Awhea River at Tora Rd	RS53	0.029	<0.004	0.390	12
	Pahaoa River at Hinakura	RS60	0.018	0.007	0.121	12
Ruamahanga	Ruamahanga River at McLays	RS31	0.003	<0.004	0.021	11
	Ruamahanga River at Te Ore Ore	RS32	0.010	<0.004	0.032	12
	Ruamahanga River at Gladstone Bridge	RS33	0.024	<0.004	0.047	12
	Ruamahanga River at Pukio	RS34	0.026	0.004	0.064	12
	Taueru River at Gladstone	RS37	0.054	0.010	0.155	12
	Kopuaranga River at Stuarts	RS38	0.030	0.015	0.142	11
	Whangaehu River at 250m from Confluence	RS39	0.072	0.032	0.167	11
	Waipoua River at Colombo Rd Bridge	RS40	0.009	<0.004	0.019	12
	Waingawa River at South Rd	RS41	0.005	<0.004	0.011	12
	Parkvale tributary at Lowes Reserve	RS45	0.017	0.012	0.046	10
	Parkvale Stream at Renalls Weir	RS46	0.049	0.030	0.178	12
	Waiohine River at Bicknells	RS48	0.015	0.007	0.032	12
	Mangatarere River at State Highway 2	RS50	0.023	0.012	0.230	12
	Huangarua River at Ponatahi Bridge	RS51	0.013	<0.004	0.099	12
	Tauherenikau River at Websters	RS55	0.007	<0.004	0.026	12
	Ruamahanga River at Waihenga Bridge	RS58	0.026	0.004	0.092	12
	Enaki Stream D/S site for Riparian	RS59	0.022	0.013	0.340	11
Waiohine River at Gorge Rd Carpark	RS62	0.005	<0.004	0.023	10	

*a lower n count for some sites reflects sampling occasions where sites could not be accessed

Table A4.18: E.coli (cfu/100mL)

Whaitua	Site Name	Site code	Median	Minimum	Maximum	n*
Kapiti Coast	Mangapouri Stream at Bennetts Rd	RS02	1,200	500	3,900	12
	Waitohu Stream at Norfolk Crescent	RS04	900	500	2,200	12
	Otaki River at Pukehinau	RS05	7	<1	32	12
	Otaki River at Mouth	RS06	26	7	120	12
	Mangaone Stream at Sims Road Bridge	RS07	1,550	420	3,300	12
	Waikanae River at Footbridge on Mangaone Walkway	RS61	12	2	70	12
	Waikanae River at Greenaway Rd	RS10	30	12	110	12
Te Awarua-o-Porirua	Horokiri Stream at Snodgrass	RS13	435	80	4,900	12
	Pauatahanui Stream at Elmwood Bridge	RS14	280	70	6,100	12
	Porirua Stream at Milk Depot	RS16	1350	700	15,000	12
Te Whanganui-a-Tara	Makara Stream at Kennels	RS17	335	60	5,300	12
	Karori Stream at Makara Peak Mountain Bike Park	RS18	1700	270	130,000	12
	Kaiwharawhara Stream at Ngaio Gorge	RS19	460	70	2,900	12
	Hutt River at Te Marua Intake Site	RS20	31	12	270	12
	Hutt River Opposite Manor Park Golf Club	RS21	80	24	2,500	12
	Hutt River at Boulcott	RS22	105	14	3,200	12
	Pakuratahi River 50m Below Farm Creek	RS23	125	10	360	12
	Mangaroa River at Te Marua	RS24	220	50	1,000	12
	Akatarawa River at Hutt Confluence	RS25	66	12	220	12
	Whakatikei River at Riverstone	RS26	35.5	3	260	12
	Wainuiomata River at Manuka Track	RS28	8.5	<1	340	12
	Wainuiomata River Dnstr of White Bridge	RS29	125	34	1,800	12
	Waiwhetu Stream at Whites Line East	RS57	340	150	3,500	12
Eastern Wairarapa	Whareama River at Gauge	RS42	170	10	2,300	12
	Awhea River at Tora Rd	RS53	120	31	8,000	12
	Pahaoa River at Hinakura	RS60	58	21	800	12
Ruamahanga	Ruamahanga River at McLays	RS31	7	<1	110	10
	Ruamahanga River at Te Ore Ore	RS32	75	32	410	12
	Ruamahanga River at Gladstone Bridge	RS33	46	17	360	12
	Ruamahanga River at Pukio	RS34	91	23	380	10
	Taueru River at Gladstone	RS37	120	40	4,100	12
	Kopuaranga River at Stuarts	RS38	150	50	3,100	10
	Whangaehu River at 250m from Confluence	RS39	210	60	1,400	9
	Waipoua River at Colombo Rd Bridge	RS40	90	28	460	11
	Waingawa River at South Rd	RS41	16	2	330	12
	Parkvale tributary at Lowes Reserve	RS45	17	1	60	10
	Parkvale Stream at Renalls Weir	RS46	1,150	70	14,000	12
	Waihine River at Bicknells	RS48	140	12	320	11
	Mangatarere River at State Highway 2	RS50	90	15	4,100	12
	Huangarua River at Ponatahi Bridge	RS51	90	10	1,700	12
	Tauherenikau River at Websters	RS55	27	13	280	12
	Ruamahanga River at Waihenga Bridge	RS58	70	10	1,200	12
	Enaki Stream D/S site for Riparian	RS59	170	44	11,000	11
Waihine River at Gorge Rd Carpark	RS62	7	1	39	9	

*a lower n count for some sites reflects sampling occasions where sites could not be accessed

Table A4.19: E.coli NOF attributes† (cfu/100mL)

Whaitua	Site Name	Site code	95th	Hazen 95th	Median	% over 540	%over 260	NOF	Swimmable	n*d
Kapiti Coast	Mangapouri Stream at Bennetts Rd	RS02	18,000	18,000	1,200	90	100	E	N	60
	Waitohu Stream at Norfolk Crescent	RS04	2,220	2,400	700	60	85	E	N	60
	Otaki River at Pukehinau	RS05	45	62	5	0	2	A	Y	60
	Otaki River at Mouth	RS06	186	235	26	2	5	A	Y	60
	Mangaone Stream at Sims Road Bridge	RS07	5,030	5,300	1,100	75	98	E	N	60
	Waikanae River at Footbridge on Mangaone Walkway	RS61	69	220	14	0	4	A	Y	23
	Waikanae River at Greenaway Rd	RS10	147	205	25	3	5	A	Y	60
Te Awarua-o-Porirua	Horokiri Stream at Snodgrass	RS13	4,900	4,945	380	34	62	E	N	61
	Pauatahanui Stream at Elmwood Bridge	RS14	6,005	6,050	270	17	52	E	N	60
	Porirua Stream at Milk Depot	RS16	6,910	6,955	1,500	88	97	E	N	59
Te Whanganui-a-Tara	Makara Stream at Kennels	RS17	6,050	6,500	375	30	65	E	N	60
	Karori Stream at Makara Peak Mountain Bike Park	RS18	5,110	7,900	1,400	83	98	E	N	60
	Kaiwharawhara Stream at Ngaio Gorge	RS19	5,015	5,150	620	53	77	E	N	60
	Hutt River at Te Marua Intake Site	RS20	151	155	19	0	2	A	Y	60
	Hutt River Opposite Manor Park Golf Club	RS21	580	1,300	80	5	13	D	N	60
	Hutt River at Boulcott	RS22	615	750	60	7	15	B	Y	60
	Pakuratahi River 50m Below Farm Creek	RS23	820	1,000	80	7	15	B	Y	60
	Mangaroa River at Te Marua	RS24	1,355	1,850	185	20	37	D	N	60
	Akatarawa River at Hutt Confluence	RS25	286	340	50	2	7	A	Y	60
	Whakatikei River at Riverstone	RS26	222	240	22	2	3	A	Y	60
	Wainuiomata River at Manuka Track	RS28	91	96	4	0	2	A	Y	59
	Wainuiomata River Dnstr of White Bridge	RS29	1,135	1,450	110	7	22	D	N	60
	Waiwhetu Stream at Whites Line East	RS57	5,080	5,800	455	43	72	E	N	60
Eastern Wairapa	Whareama River at Gauge	RS42	2,030	2,165	140	22	37	D	N	59
	Awhea River at Tora Rd	RS53	1,255	1,750	61	12	18	D	N	60
	Pahaoa River at Hinakura	RS60	287	440	60	4	9	A	Y	23
Ruamahanga	Ruamahanga River at McLays	RS31	41	42	7	0	0	A	Y	55
	Ruamahanga River at Te Ore Ore	RS32	586	640	70	7	15	B	Y	60
	Ruamahanga River at Gladstone Bridge	RS33	1,105	1,150	36	7	10	C	Y	60
	Ruamahanga River at Pukio	RS34	485	642	49	5	15	B	Y	59
	Taueru River at Gladstone	RS37	815	883	120	10	20	C	Y	59
	Kopuaranga River at Stuarts	RS38	1,930	2,515	160	17	25	D	N	59
	Whangaehu River at 250m from Confluence	RS39	4,800	6,600	160	14	30	D	N	57
	Waipoua River at Colombo Rd Bridge	RS40	710	755	49	7	10	B	Y	59
	Waingawa River at South Rd	RS41	148	220	13	2	5	A	Y	60
	Parkvale tributary at Lowes Reserve	RS45	57	59	16	0	0	A	Y	53
	Parkvale Stream at Renalls Weir	RS46	1,830	1,965	350	29	63	E	N	59
	Waiohine River at Bicknells	RS48	230	230	49	0	3	A	Y	59
	Mangatarere River at State Highway 2	RS50	815	950	130	8	15	B	Y	60
	Huangarua River at Ponatahi Bridge	RS51	557	620	75	7	15	B	Y	60
	Tauherenikau River at Websters	RS55	190	190	21	2	3	A	Y	58
	Ruamahanga River at Waihenga Bridge	RS58	436	706	50	4	13	B	Y	23
	Enaki Stream D/S site for Riparian	RS59	1,500	1,500	100	9	23	D	N	56
Waiohine River at Gorge Rd Carpark	RS62	29	38	7	0	0	A	Y	11	

*a lower n count for some sites reflects sampling occasions where sites could not be accessed.

†NOF based on five years' worth of data June 2013 - July 2018

Table A4.20: Faecal coliforms (cfu/100mL)

Whaitua	Site Name	Site code	Median	Minimum	Maximum	n*
Kapiti Coast	Mangapouri Stream at Bennetts Rd	RS02	2350	600	4400	12
	Waitohu Stream at Norfolk Crescent	RS04	1200	540	2700	12
	Otaki River at Pukehinau	RS05	7.5	<1	41	12
	Otaki River at Mouth	RS06	27	11	220	12
	Mangaone Stream at Sims Road Bridge	RS07	1600	540	4400	12
	Waikanae River at Footbridge on Mangaone Walkway	RS61	17	2	70	12
	Waikanae River at Greenaway Rd	RS10	48	15	130	12
Te Awarua-o-Porirua	Horokiri Stream at Snodgrass	RS17	550	60	6800	12
	Pauatahanui Stream at Elmwood Bridge	RS18	2500	390	170000	12
	Porirua Stream at Milk Depot	RS19	520	90	4000	12
Te Whanganui-a-Tara	Makara Stream at Kennels	RS20	32	14	320	12
	Karori Stream at Makara Peak Mountain Bike Park	RS21	100	33	2500	12
	Kaiwharawhara Stream at Ngaio Gorge	RS22	130	34	4900	12
	Hutt River at Te Marua Intake Site	RS23	165	36	530	12
	Hutt River Opposite Manor Park Golf Club	RS24	330	50	1400	12
	Hutt River at Boulcott	RS25	95	12	320	12
	Pakuratahi River 50m Below Farm Creek	RS26	46	6	300	12
	Mangaroa River at Te Marua	RS28	9	<1	440	12
	Akatarawa River at Hutt Confluence	RS29	165	49	2100	12
	Whakatikei River at Riverstone	RS57	475	210	4200	12
	Wainuiomata River at Manuka Track	RS42	190	18	2300	12
	Wainuiomata River Dnstr of White Bridge	RS53	120	35	10000	12
	Waiwhetu Stream at Whites Line East	RS60	60	47	800	12
Eastern Wairapa	Whareama River at Gauge	RS31	9	<1	120	10
	Awhea River at Tora Rd	RS32	75	44	500	12
	Pahaoa River at Hinakura	RS33	55.5	24	400	12
Ruamahanga	Ruamahanga River at McLays	RS13	550	90	5100	12
	Ruamahanga River at Te Ore Ore	RS14	445	80	6100	12
	Ruamahanga River at Gladstone Bridge	RS16	1800	900	16000	12
	Ruamahanga River at Pukio	RS34	96	35	380	10
	Taueru River at Gladstone	RS37	175	50	4100	12
	Kopuaranga River at Stuarts	RS38	185	70	3400	10
	Whangaehu River at 250m from Confluence	RS39	250	60	1600	9
	Waipoua River at Colombo Rd Bridge	RS40	110	33	460	11
	Waingawa River at South Rd	RS41	17	3	610	12
	Parkvale tributary at Lowes Reserve	RS45	19.5	3	70	10
	Parkvale Stream at Renalls Weir	RS46	1500	80	14000	12
	Waihine River at Bicknells	RS48	180	21	350	11
	Mangatarere River at State Highway 2	RS50	125	24	4100	12
	Huangarua River at Ponatahi Bridge	RS51	90	12	2300	12
	Tauherenikau River at Websters	RS55	31	13	330	12
	Ruamahanga River at Waihenga Bridge	RS58	120	21	1500	11
	Enaki Stream D/S site for Riparian	RS59	240	45	13000	11
Waihine River at Gorge Rd Carpark	RS62	9	1	54	9	

*a lower n count for some sites reflects sampling occasions where sites could not be accessed

Appendix 5: Tabulated metals data

Table A5.1: Summary of dissolved copper (mg/L) concentrations measured at eight RWQE sites between July 2016 and June 2017 (D.L =detection limit). The percentages of samples exceeding the ANZECC (2000) default and hardness-modified trigger values (TVs) are also presented

Whaitua	Site Name	Site code	Median	Minimum	Maximum	n*	n <D.L	% of samples (n) above ANZECC (2000) guidelines (>50%)	
								Default trigger value (≤0.0014)	Hardness modified trigger value
Kapiti Coast	Mangapouri Stream at Bennetts Rd	RS02	0.0009	0.0003	0.0019	12	11	25	0
	Waikanae River at Greenaway Rd	RS10	0.0003	0.0003	0.0003	12	0	Median Complies*	Median Complies*
Te Awarua-o-Porirua	Porirua Stream at Milk Depot	RS16	0.0011	0.0006	0.0022	12	12	33	17
Te Whanganui-a-Tara	Karori Stream at Makara Peak Mountain Bike Park	RS18	0.0014	0.0007	0.0124	12	12	42	42
	Kaiwharawhara Stream at Ngaio Gorge	RS19	0.0014	0.0008	0.0029	12	12	25	8
	Hutt River Opposite Manor Park Golf Club	RS21	0.0003	0.0003	0.0010	12	2	Median Complies*	Median Complies*
	Hutt River at Boulcott	RS22	0.0003	0.0003	0.0005	12	1	Median Complies*	Median Complies*
	Waiwhetu Stream at Whites Line East	RS57	0.0011	0.0006	0.0029	12	12	33	25
Ruamahanga	Waipoua River at Colombo Rd Bridge	RS40	0.0003	0.0003	0.0003	12	0	0	0

*Note the assessment against guidelines is different for these sites; refer Section 3.2.1 for more information

Table A5.2: Summary of dissolved zinc (mg/L) concentration measured at eight RWQE sites between July 2016 and June 2017 (D.L = detection limit). The percentages of samples exceeding the ANZECC (2000) default and hardness-modified trigger values (TVs) are also presented

Whaitua	Site Name	Site code	Median	Minimum	Maximum	n*	n <D.L	% of samples (n) above ANZECC (2000) guidelines (>50%)	
								Default trigger value (≤0.008)	Hardness modified trigger value
Kapiti Coast	Mangapouri Stream at Bennetts Rd	RS02	0.0024	0.0013	0.0065	12	12	0	0
	Waikanae River at Greenaway Rd	RS10	0.0005	0.0005	0.0005	12	0	Median Complies*	Median Complies*
Te Awarua-o-Porirua	Porirua Stream at Milk Depot	RS16	0.0064	0.0016	0.0163	12	12	42	25
Te Whanganui-a-Tara	Karori Stream at Makara Peak Mountain Bike Park	RS18	0.0157	0.0090	0.0620	12	12	100	98
	Kaiwharawhara Stream at Ngaio Gorge	RS19	0.0064	0.0012	0.0133	12	12	33	25
	Hutt River Opposite Manor Park Golf Club	RS21	0.0005	0.0005	0.0043	12	2	Median Complies*	Median Complies*
	Hutt River at Boulcott	RS22	0.0005	0.0005	0.0018	12	1	Median Complies*	Median Complies*
	Waiwhetu Stream at Whites Line East	RS57	0.0148	0.0015	0.0560	12	12	75	58
Ruamahanga	Waipoua River at Colombo Rd Bridge	RS40	0.0005	0.0005	0.0005	12	0	0	0

*Note the assessment against guidelines is different for these sites; refer Section 3.2.1 for more information

Table A5.3: Summary of total recoverable copper (mg/L) concentrations measured at six RWQE sites between July 2017 and June 2018

Whaitua	Site Name	Site code	Median	Minimum	Maximum	n*
Kapiti Coast	Mangapouri Stream at Bennetts Rd	RS02	0.0013	0.0006	0.0013	12
Te Awarua-o-Porirua	Porirua Stream at Milk Depot	RS16	0.0014	0.0009	0.0014	12
Te Whanganui-a-Tara	Karori Stream at Makara Peak Mountain Bike Park	RS18	0.0016	0.0008	0.0016	12
	Kaiwharawhara Stream at Ngaio Gorge	RS19	0.0017	0.0010	0.0017	12
	Waiwhetu Stream at Whites Line East	RS57	0.0012	0.0006	0.0012	12
Ruamahanga	Waipoua River at Colombo Rd Bridge	RS40	0.0003	0.0003	0.0003	12

Table A5.4: Summary of total recoverable Zinc (mg/L) concentrations measured at six RWQE sites between July 2017 and June 2018

Whaitua	Site Name	Site code	Median	Minimum	Maximum	n*
Kapiti Coast	Mangapouri Stream at Bennetts Rd	RS02	0.0038	0.0019	0.0075	12
Te Awarua-o-Porirua	Porirua Stream at Milk Depot	RS16	0.0078	0.0036	0.0340	12
Te Whanganui-a-Tara	Karori Stream at Makara Peak Mountain Bike Park	RS18	0.0179	0.0110	0.1570	12
	Kaiwharawhara Stream at Ngaio Gorge	RS19	0.0075	0.0023	0.0197	12
	Waiwhetu Stream at Whites Line East	RS57	0.0170	0.0021	0.0710	12
Ruamahanga	Waipoua River at Colombo Rd Bridge	RS40	0.0006	0.0006	0.0024	12

Appendix 6: Additional macroinvertebrate indices for RWQE

Table A6.1: QMCI, %EPT taxa and taxa richness scores for RWQE sites sampled in summer 2017/18

Whaitua	Site Number	Site Name	QMCI**	%EPT* taxa	Taxa richness
Kapiti Coast	RS02	Mangapouri Stream at Bennetts Rd**	4.51 (4.44)	13.33	30
	RS04	Waitohu Stream at Norfolk Crescent**	4.11 (4.59)	8.33	24
	RS05	Otaki River at Pukehinau	7.73	54.17	24
	RS06	Otaki River at Mouth	6.89	50.00	20
	RS07	Mangaone Stream at Sims Road Bridge**	3.31 (4.33)	6.67	30
	RS10	Waikanae River at Greenaway Rd	6.70	46.43	28
	RS61	Waikanae River at Footbridge on Mangaone Walkway	8.15	68.57	35
Te Awarua-o-Porirua	RS13	Horokiri Stream at Snodgrass	4.44	61.90	21
	RS14	Pauatahanui Stream at Elmwood Bridge**	5.04 (4.97)	28.57	35
	RS16	Porirua Stream at Milk Depot	3.39	23.81	21
Wellington Harbour and Hutt Valley	RS17	Makara Stream at Kennels	5.15	43.48	23
	RS18	Karori Stream at Makara Peak Mountain Bike Park	2.59	26.92	26
	RS19	Kaiwharawhara Stream at Ngaio Gorge	2.84	31.03	29
	RS20	Hutt River at Te Marua Intake Site	7.68	56.52	23
	RS21	Hutt River Opposite MaNr Park Golf Club	6.61	59.26	27
	RS22	Hutt River at Boulcott	4.05	47.83	23
	RS23	Pakuratahi River 50m Below Farm Creek	6.71	51.61	31
	RS24	Mangaroa River at Te Marua	5.23	54.55	22
	RS25	Akatarawa River at Hutt Confluence	7.67	60.71	28
	RS26	Whakatikei River at Riverstone	6.84	64.52	31
	RS28	Wainuiomata River at Manuka Track	6.73	61.54	39
	RS29	Wainuiomata River Downstream of White Bridge	5.68	48.00	25
Eastern Wairarapa	RS42	Whareama River at Gauge	Not sampled in 17/18		
	RS53	Awhea River at Tora Rd	4.55	31.58	19
	RS60	Pahaoa River at Hinakura	Not sampled in 17/18		
Ruamahanga	RS31	Ruamahanga River at McLays	7.49	60.00	25
	RS32	Ruamahanga River at Te Ore Ore	5.91	47.62	21
	RS33	Ruamahanga River at Gladstone Bridge	5.84	50.00	16
	RS34	Ruamahanga River at Pukio	7.23	50.00	22
	RS37	Taueru River at Gladstone	6.35	34.62	26
	RS38	Kopuaranga Stream at Stewarts	3.56	34.48	29
	RS39	Whangaehu River at 250m from Confluence**	3.22	5.56	18
	RS40	Waipoua River at Colombo Road Bridge	4.97	41.67	24
	RS41	Waingawa River at South Rd	7.87	47.06	17
	RS45	Parkvale Tributary at Lowes Reserve	3.94	24.24	33
	RS46	Parkvale Stream at weir	4.17	40.91	22
	RS47	Waiohine River at Gorge	7.67	68.42	19
	RS48	Waiohine River at Bicknells	6.84	50.00	20
	RS50	Mangatarere River at State Highway 2**	5.90 (5.14)	50.00	26
	RS51	Huangarua River at Ponatahi Bridge	3.72	20.00	25
	RS55	Tauherenikau River at Websters	6.54	60.00	20
RS58	Ruamahanga River at Waihenga Bridge	Nt sampled in 17/18			
RS59	Enaki Stream - Downstream site for RIPARIAN	6.34	41.94	31	
RS62	Waiohine River at Gorge Rd Carpark	7.70	65.00	20	

* Pollution tolerant EPT taxa (Oxyethira and Paroxythira) were excluded from this calculation

**softbottom site (hardbottom QMCI shown in brackets)

Appendix 7: Habitat scores for RWQE sites assessed in summer 2017/18

Table A7.1: Rapid habitat scores for RWQE sites collected in summer 2017/18

Whaitua	Site Name	Site code	Deposited sediment	Invertebrate habitat diversity	Invertebrate habitat abundance	Fish cover diversity	Fish cover abundance	Hydraulic heterogeneity	Bank erosion	Bank vegetation	Riparian width	Riparian shade	Total
Kapiti Coast	Mangapouri Stream at Bennetts Rd	RS02	1	4	1	6	7	1	8	6	3.5	4.5	42
	Waitohu Stream at Norfolk Crescent	RS04	1	2	1	2	6	1	3	3.5	2.5	3	25
	Otaki River at Pukehinau	RS05	9	9	10	8	9	10	9	8	9.5	4	85.5
	Otaki River at Mouth	RS06	7	7	8	7	8	8.5	8.5	5.5	8	2	69.5
	Mangaone Stream at Sims Road Bridge	RS07	1	2	1	2	5	1	8	3	3	3	29
	Waikanae River at Footbridge on Mangaone Walkway	RS61	9.5	10	10	10	9.5	9	9	10	10	10	97
	Waikanae River at Greenaway Rd	RS10	9	8	8	8	8	9	8	7	8	4	77
Te Awarua-o-Porirua	Horokiri Stream at Snodgrass	RS13	5	4	4	4	4	3	9	2	8.5	5	48.5
	Pauatahanui Stream at Elmwood Bridge	RS14	1.5	6	2.5	7	6	5	9	10	9	9	65
	Porirua Stream at Milk Depot	RS16	7.5	6	4	4	3	3	7	1.5	1.5	1.5	39
Te Whanganui-a-Tara	Makara Stream at Kennels	RS17	1	8	1	8	8	3	8	4	3	5	49
	Karori Stream at Makara Peak Mountain Bike Park	RS18	7	6	5	5	5	4	8	6	6	6	58
	Kaiwharawhara Stream at Ngaio Gorge	RS19	8	6	4	7	7	6	7	8	10	9	72
	Hutt River at Te Marua Intake Site	RS20	9	8	9	8	8	9	8.5	8.5	9.5	5	82.5
	Hutt River Opposite Manor Park Golf Club	RS21	9	6	4	7	6	7	9	5	6	2	61
	Hutt River at Boulcott	RS22	4	4	4	7	6	5	8	6	7	4	55
	Pakuratahi River 50m Below Farm Creek	RS23	9	8	8	7	8	8	9	6	9	5	77
	Mangaroa River at Te Marua	RS24	9	8	8	8	8.5	8	9	5.5	7.5	6	77.5
	Akatarawa River at Hutt Confluence	RS25	8	10	9	8	8	10	10	8.5	9.5	7	88
	Whakatikei River at Riverstone	RS26	8	9	9	9	7	8	9	10	10	8	87
	Wainuiomata River at Manuka Track	RS28	10	10	9	9	9.5	9	9	10	10	8	93.5
	Wainuiomata River Dnstr of White Bridge	RS29	9	10	10	7	6	9	4	2	1.5	1	59.5
Waiwhetu Stream at Whites Line East	RS57	1	2	1	3	6	1	7	2	2	5	30	

Whaitua	Site Name	Site code	Deposited sediment	Invertebrate habitat diversity	Invertebrate habitat abundance	Fish cover diversity	Fish cover abundance	Hydraulic heterogeneity	Bank erosion	Bank vegetation	Riparian width	Riparian shade	Total
Eastern Wairapa	Whareama River at Gauge	RS42	Not sampled										
	Awhea River at Tora Rd	RS53	8	2	2	3	3	2	5.5	5	8	2	40.5
	Pahaoa River at Hinakura	RS60	Not sampled										
Ruamahanga	Ruamahanga River at McLays	RS31	10	10	10	10	10	10	10	10	10	9	99
	Ruamahanga River at Te Ore Ore	RS32	8	6	3	5	5	5	8	5	7.5	3	55.5
	Ruamahanga River at Gladstone Bridge	RS33	9	7	7	7	7	8	9	6	8.5	2	70.5
	Ruamahanga River at Pukio	RS34	7	5	6	5	4	4	7	3	2	1	44
	Taueru River at Gladstone	RS37	4	3	2	7	6	3	7	4	9	2	47
	Kopuaranga River at Stuarts	RS38	6	7	2	4	4	6	5.5	2	3	5	44.5
	Whangaehu River at 250m from Confluence	RS39	1	8	8	6	8	6	8	4	5	5	59
	Waipoua River at Colombo Rd Bridge	RS40	9	7	7	7	8	6	8	4	5	6	67
	Waingawa River at South Rd	RS41	10	6	8	5	6	7	3.5	4	10	2	61.5
	Parkvale tributary at Lowes Reserve	RS45	1	8	1	4	8	1	3	9	10	10	55
	Parkvale Stream at Renalls Weir	RS46	7	6	1	6	6	2	6	2.5	1.5	3	41
	Waiohine River at Bicknells	RS48	9	8	9	7	7	9	9	4.5	9	1	72.5
	Mangatarere River at State Highway 2	RS50	6	7	2	5	5	6	8	5	5	4	53
	Huangarua River at Ponatahi Bridge	RS51	5	4	2	4	4	4	7	5	6	4	45
	Tauherenikau River at Websters	RS55	6	7	10	5	5	5	9	5	9	6	67
	Ruamahanga River at Waihenga Bridge	RS58	Not sampled										
Enaki Stream D/S site for Riparian	RS59	6	9	3	7	7	7	3.5	5	3	5	55.5	
Waiohine River at Gorge Rd Carpark	RS62	10	10	10	8	8	10	8	8.5	9.5	3	85	

Table A7.2: Rapid Habitat assessment scores for the random ecology network 2017/2018

Whaitua	Site Number	Site name	Deposited sediment	Invertebrate habitat diversity	Invertebrate habitat abundance	Fish cover diversity	Fish cover abundance	Hydraulic heterogeneity	Bank erosion	Bank vegetation	Riparian width	Riparian shade	Sum
Te Awarua-o-Porirua	RAN038	Horokiri stream trib. off Paekakariki Hill Rd	1	2	1	4	8	2	8	2	2	4	33
Te Whanganui-a-Tara	RAN050	Ohariu stream trib. at Rifle Range Rd	5	5	7	4	8	3	6	2	1	3	44
	RAN086	Kaiwharawhara stream at Otari Wilton's Bush	8	7	6	9	9	9	9	9	10	10	86
	RAN089	Mangaroa river u/s Mangaroa Hill Rd	9	10	5	9	8	5	5	6	6	5	68
	RAN041	Wainuiomata river d/s of Manuka track	10	10	9	10	9	10	8	6	10	4	86
Eastern Wairarapa	RAN030	Wainuioru river at Hakakino Rd	1	5	1	5	6	4	5	4	1	5	37
	RAN043	Whareama river at Annedale Rd	1	5	1	4	6	2	1	1	1	2	24
Ruamahanga	RAN007	Waiohine river trib. at Waitangi Rd	1	4	1	2	6	1	2	1	1	2	21
	RAN017	Tauherenikau river trib. d/s SH2	1	2	1	4	2	3	8	3	4	2	30
	RAN037	Tauherenikau river trib. off Camp Rd	1	2	1	1	9	2	10	3	3	1	33
	RAN051	Maungatawhetau stream at Te Whiti Rd	2	5	1	7	8	5	7	4	4	4	47
	RAN052	Whangaehu river at Whangaehu Valley Rd	1	10	1	10	6	2	4	6	6	8	53
	RAN063	Waipoua river u/s Mikimiki Rd	9	7	6	6	6	8	9	5	6	3	65
	RAN071	Parkvale stream u/s Weir	7	6	1	4	7	3	7	3	2	2	42
	RAN072	Taueru river off Te Ore Ore Bideford Rd	1	6	1	8	9	1	6	4	9	8	53
	RAN080	Turanganui river at Te Rata Rd	10	9	8	9	7	5	10	6	10	5	78
	RAN083	Parkvale stream trib. at Perrys Rd	1	6	1	5	7	2	5	2	1	3	32
RAN084	Mikimiki stream at Mikimiki Rd	9	10	9	10	10	10	10	10	9	10	97	

Appendix 8: Additional monitoring data

Table A8.1: QMCI, %EPT taxa and taxa richness scores for the 19 sites that were trialled as part of an ecologically focussed monitoring programme that utilises randomly selected across the region

Whaitua	Site Number	Site name	QMCI**	%EPT* taxa	Taxa Richness
Te Awarua-o-Porirua	RAN038	Horokiri Stream trib. off Paekakariki Hill Rd	5	29	21
Te Whanganui-a-Tara	RAN050	Ohariu Stream trib. at Rifle Range Rd	5	42	36
	RAN086	Kaiwharawhara Stream at Otari Wilton's Bush	4	48	29
	RAN089	Mangaroa River u/s Mangaroa Hill Rd	6	53	30
	RAN041	Wainuiomata River d/s of Manuka track	8	67	36
Eastern Wairarapa	RAN030	Wainuioru River at Hakakino Rd**	2 (4)	5	22
	RAN043	Whareama River at Annedale Rd	4	16	19
Ruamahanga	RAN007	Waiohine River trib. at Waitangi Rd**	4 (3)	0	21
	RAN017	Tauherenikau River trib. d/s SH2**	3 (3)	11	18
	RAN037	Tauherenikau River trib. off Camp Rd**	3 (2)	14	21
	RAN051	Maungatawhetau Stream at Te Whiti Rd	4	48	21
	RAN052	Whangaehu River at Whangaehu Valley Rd	5	48	21
	RAN063	Waipoua River u/s Mikimiki Rd	5	43	23
	RAN071	Parkvale Stream u/s Weir	4	29	17
	RAN072	Taueru River off Te Ore Ore Bideford Rd**	3 (4)	8	24
	RAN080	Turanganui River at Te Rata Rd	7	60	15
	RAN083	Parkvale Stream trib. at Perrys Rd**	4 (4)	15	27
RAN084	Mikimiki Stream at Mikimiki Rd	8	64	28	

* Pollution tolerant EPT taxa (Oxyethira and Paroxythira) were excluded from this calculation

** Softbottom site (hardbottom QMCI shown in brackets)