3. Results

3.1 State of the Environment (SoE) sites

3.1.1 Biotic indices

Raw macroinvertebrate data is tabled in appendix C. Taxonomic richness at the 38 SoE sites ranged from two at the Ngunguru at Waipoka Rd site, to 29 at the Waipapa @ Forest Ranger, Waitangi @ Waimate Rd, and Waipoua @ SH12 Rest Area sites (Fig. 6). The mean number of taxa was 17.7 ± 2.5 (95% CI, n=38).

Waiarohia @ Kamo Tributary Culvert and Ngunguru @ Waipoka Rd were the only SoE sites which recorded no insect taxa from the orders Ephemeroptera, Plecoptera and Trichoptera. Of the 38 SoE sites which recorded EPT* taxa, the range was 7.7–72.4% (Fig. 7). Thirteen sites (34%) scored at least 40% EPT*, however 39% of sites scored below 30% EPT* taxa. The mean EPT* for all 38 SoE sites was 38.1% ± 5.4 (95% CI, n=38).

Macroinvertebrate Community Index (MCI) scores for the 38 SoE sites ranged from 60.0 (Waiarohia River at Kamo Tributary Culvert) to 135.2 (Waipoua River at State Highway 12 rest area) (Fig. 8), with a mean of 92.5 ± 5.0 (95% CI, n=38). Nine (24%) of the sites recorded MCI scores of 80 or less, which can be interpreted as water of probable severe 'organic' pollution (Boothroyd & Stark 2000). Only three sites scored above 120, which is accepted as the 'clean water' lower limit. These were Waipoua River at SH12 Rest Area, Waipapa River at Forest Ranger, and Kaeo River at Dip Rd Bridge (135.2, 126.2, and 122.9 respectively). Victoria River at Thompsons Bridge also scored highly with and MCI of 118.5.

The Semi-Quantitative Macroinvertebrate Community Index (SQMCI) results ranged from 2.73–8.21 (Fig. 9). Twelve (32%) of the sites recorded SQMCI scores of less than 4.00, which is interpreted as water of probable 'severe pollution'. Six (16%) sites scored above 6.00, which is accepted as the 'clean water' lower limit. However, a further 32% of sites were recorded just above the 'severe pollution' interpretation, which is indicated by a low-scoring mean of just 4.43 ± 0.37 (95% CI, n=38). If one factors into the equation the acknowledged index error of ± 1 SQMCI unit, up to 84% of the sites could potentially fall into the water of probable 'severe pollution' class.

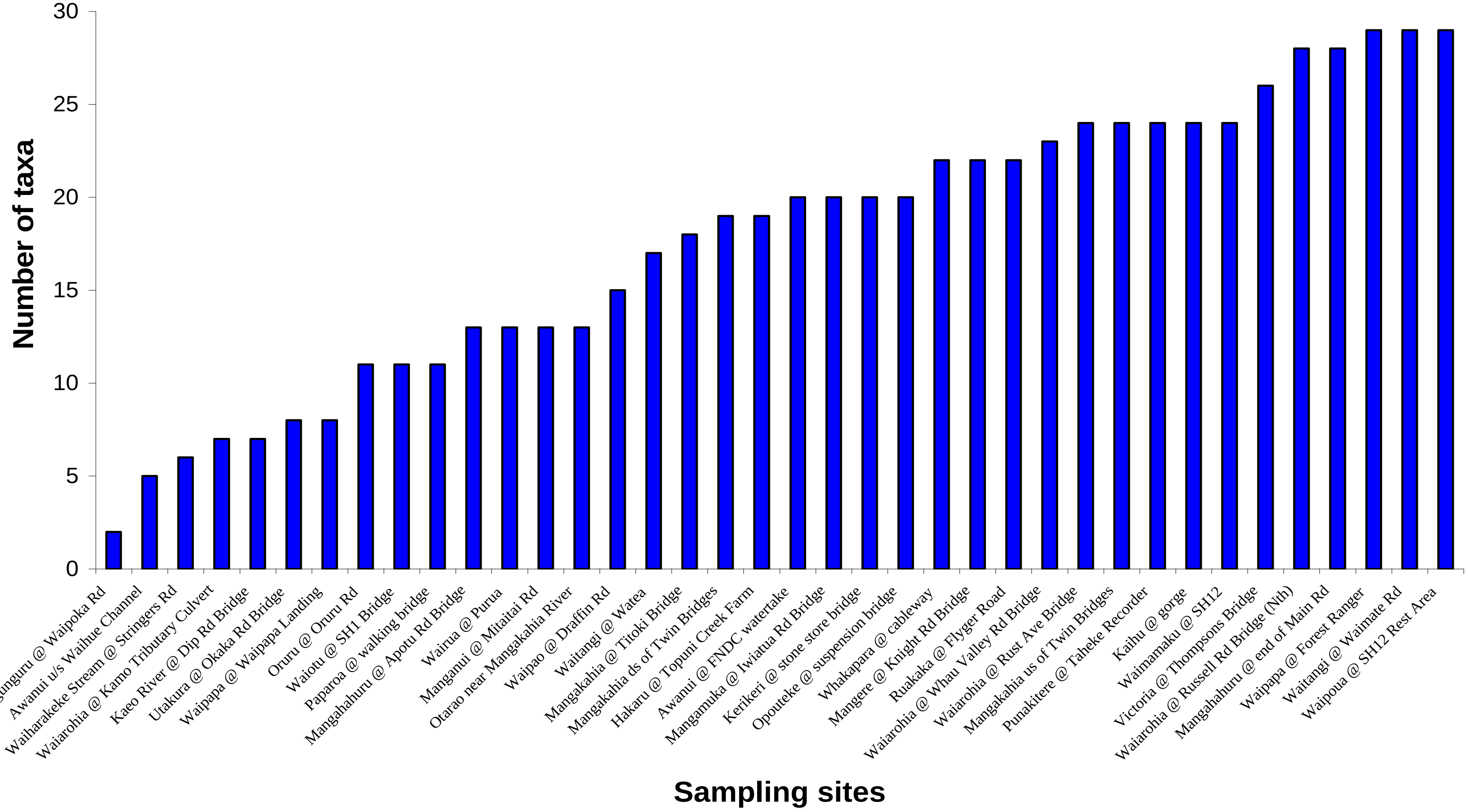

Figure 6. Number of macroinvertebrate taxa at the 38 State of Environment sites for late January 2008.

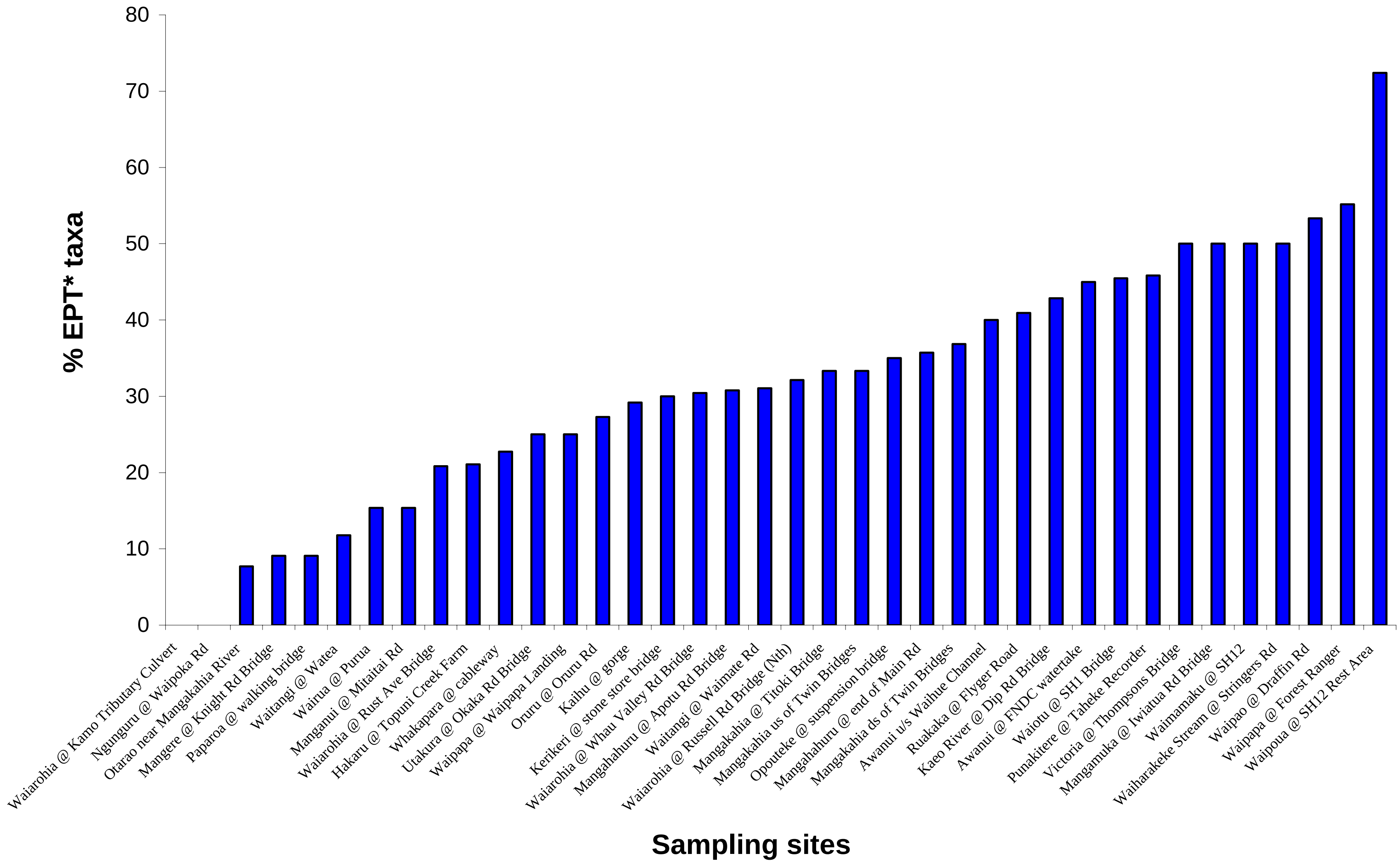

Figure 7. Percentage of Ephemeroptera, Plecoptera, or Trichoptera orders within each sample for the 38 State of Environment sites for late January 2008.

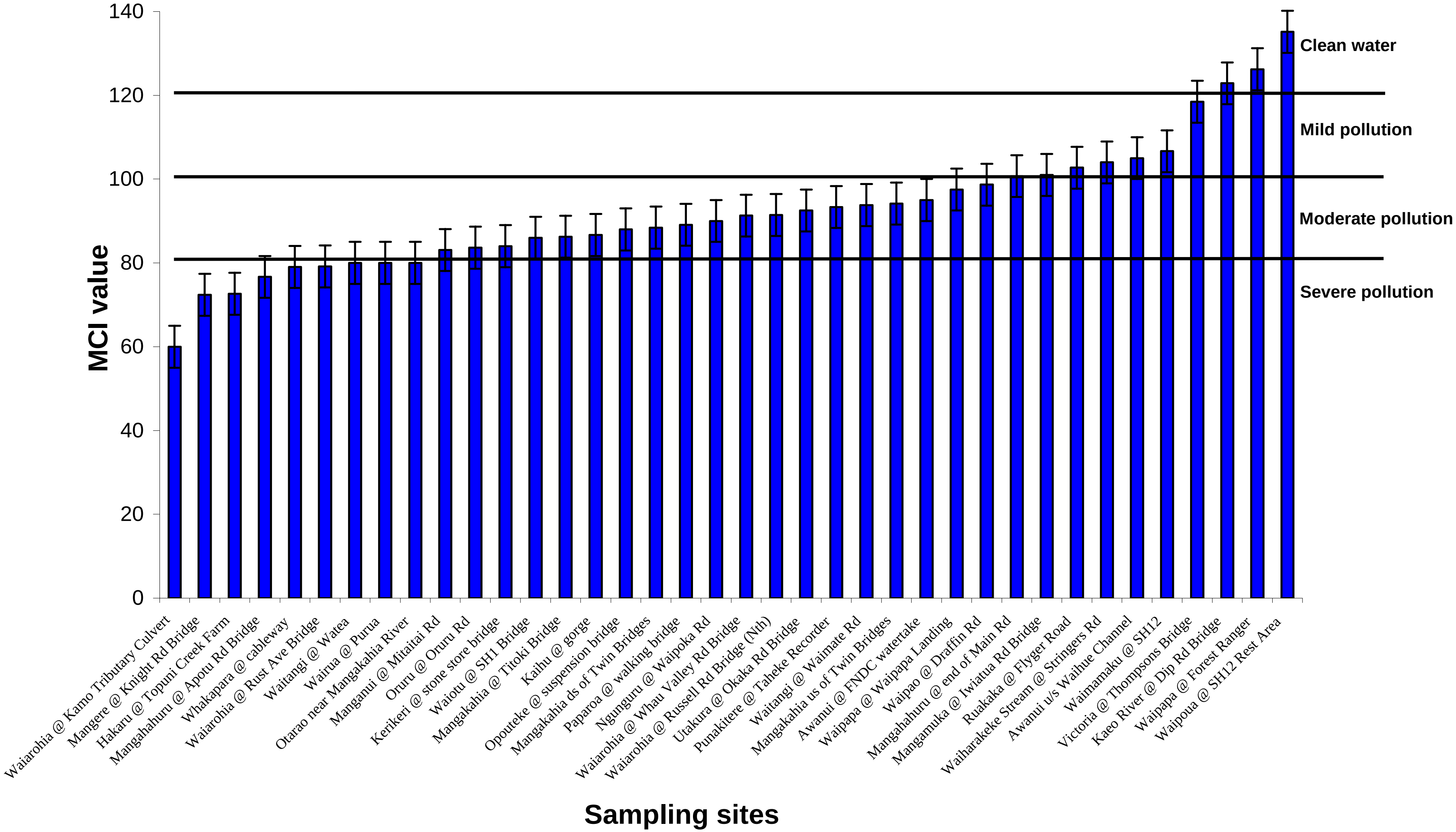

Figure 8. MCI scores for the 38 State of Environment sites for late January 2008. Error bars represent ± 5 MCI units.

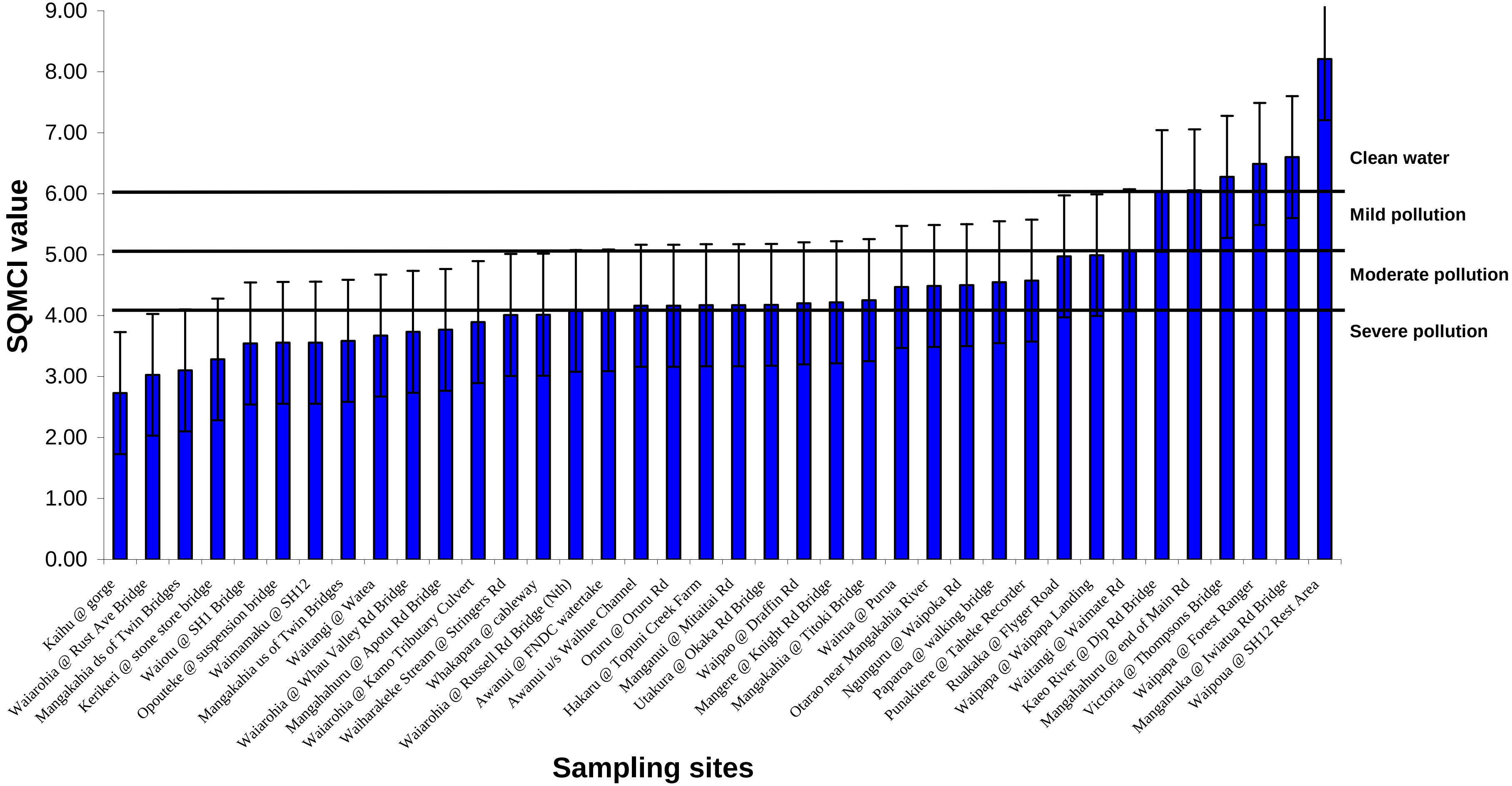

Figure 9. SQMCI scores of the 38 State of Environment sites for late January 2008. Error bars represent ± 1 SQMCI unit.

3.2 Resource Consent (RC) sites

3.2.1 Biotic indices

Raw macroinvertebrate data is tabled in appendix D. Taxonomic richness sampled at the six Resource Consent activities (upstream and downstream) ranged from six upstream of the Meatworks, to 20 upstream of the Dam (Fig. 10). The mean number of taxa was 13.3 ± 2.8 (95% CI, n=12).

The range of %EPT* taxa was 0.0–52.9% with a mean of 25.4% ± 13.6 (95% CI, n=12) (Fig. 11). Four (33%) of the sites scored highly, these being Dam upstream, Meatworks upstream, Oxidation Pond B downstream, and Oxidation Pond B upstream (50.0, 50.0, 52.9, and 52.9% respectively).

MCI values ranged from 65.7 (Wood processing d/s) to 123.0 (Dam upstream) (Fig. 12), with a mean of 90.9 ± 11.7 (95% CI, n=12). Four (33%) of the RC sites recorded MCI scores of less than 80, which can be interpreted as water of ‘probable severe pollution’ (Boothroyd & Stark 2000). One site scored above 120 (Dam upstream, 123.0), which is accepted as the ‘clean water’ lower limit.

The general array of SQMCI results indicated lower-quality conditions than the MCI results, with 75% of sites recorded in (or just above) the ‘probable severe pollution’ class. One site recorded ‘clean water’ (Dam upstream) and a second was recorded just below (Oxidation pond B upstream). Scores ranged from 2.19–7.15; the mean being 4.07 ± 0.86 (95% CI, n=12) (Fig. 13).

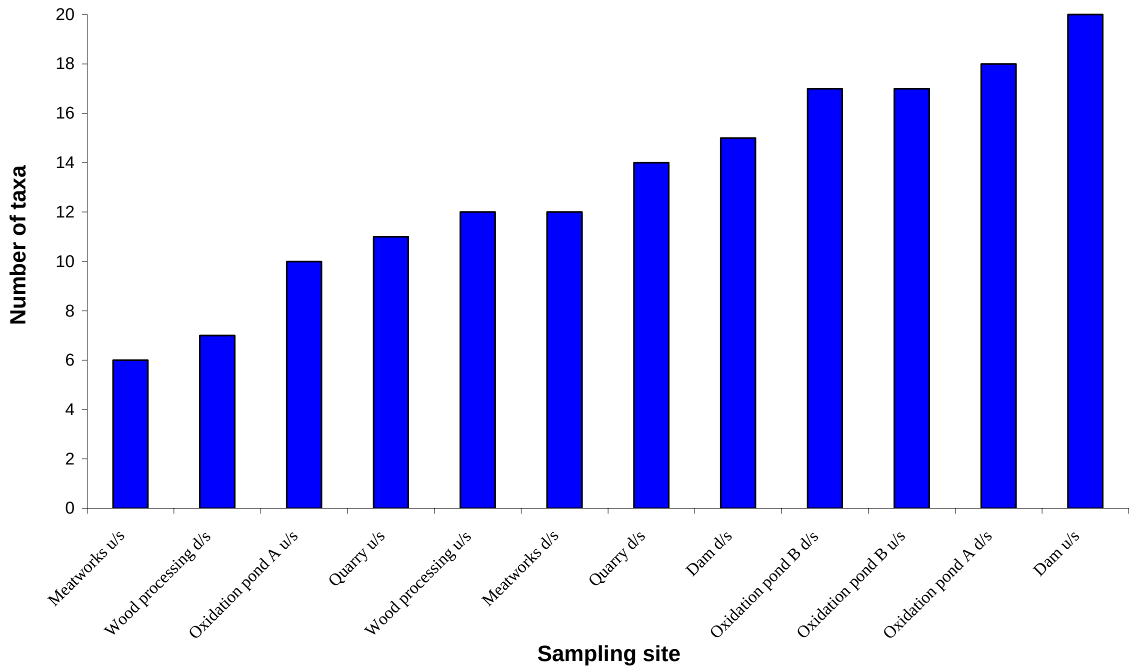

Figure 10. Number of macroinvertebrate taxa at the 6 Resource Consent activities for late January 2008, u/s = upstream, d/s = downstream.

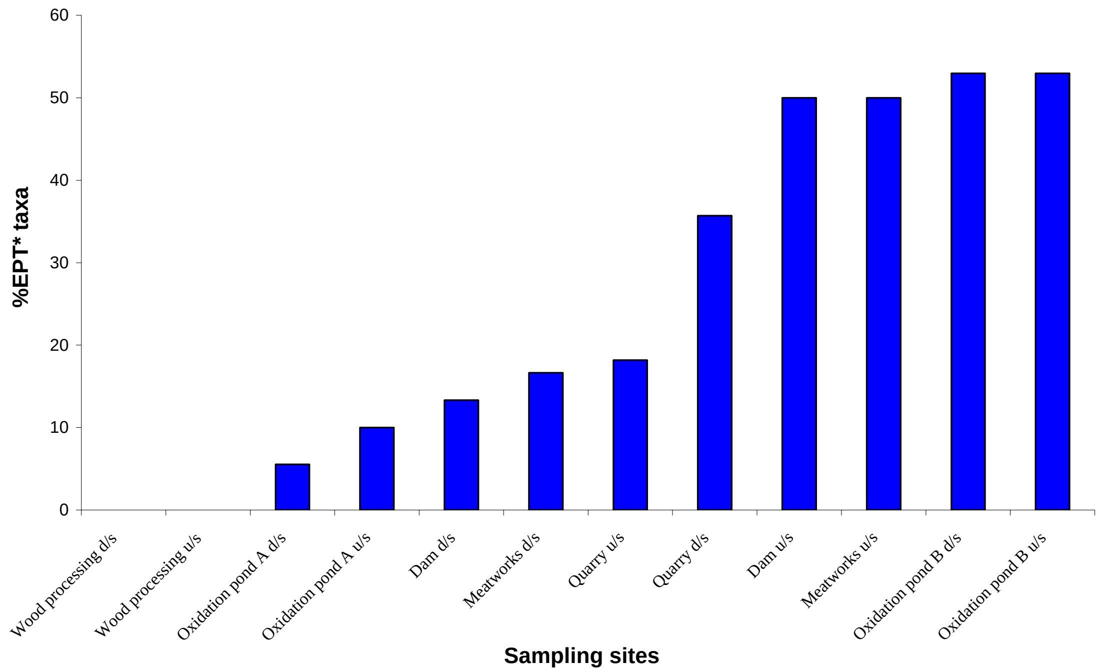

Figure 11. Percentage of Ephemeroptera, Plecoptera, and Trichoptera orders within each sample for the 6 Resource Consent activities for late January 2008, u/s = upstream, d/s = downstream.

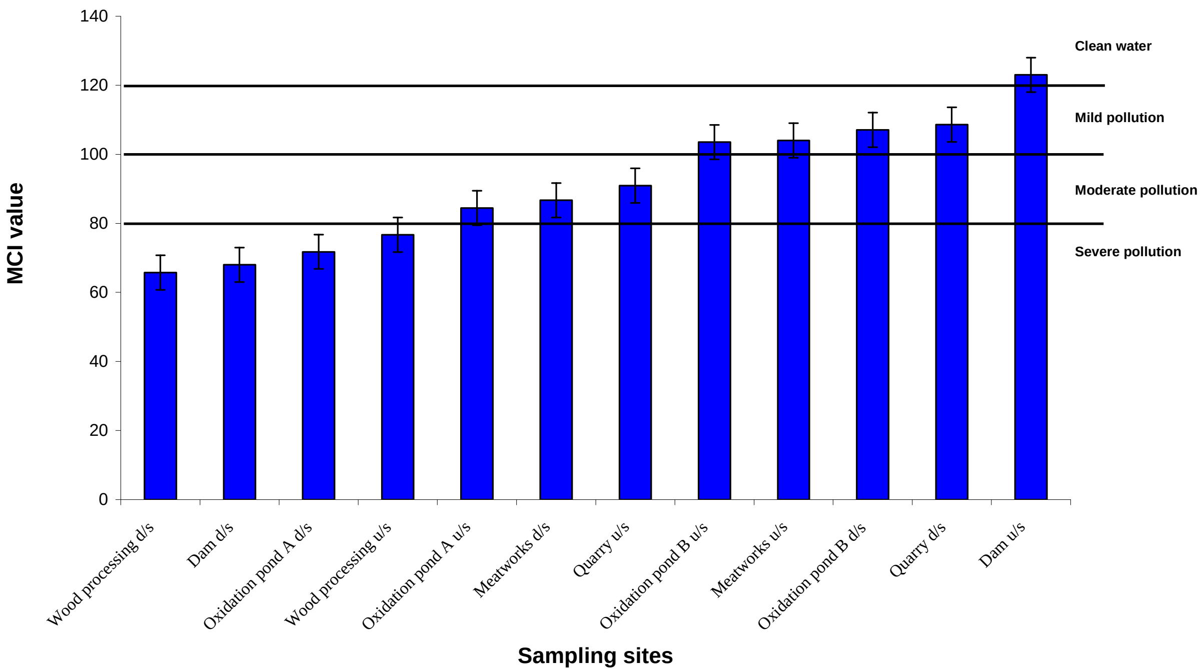

Figure 12. MCI scores for the 6 Resource Consent activities for late January 2008. Error bars represent ± 5 MCI units, which potentially separate water quality classes, u/s = upstream, d/s = downstream.

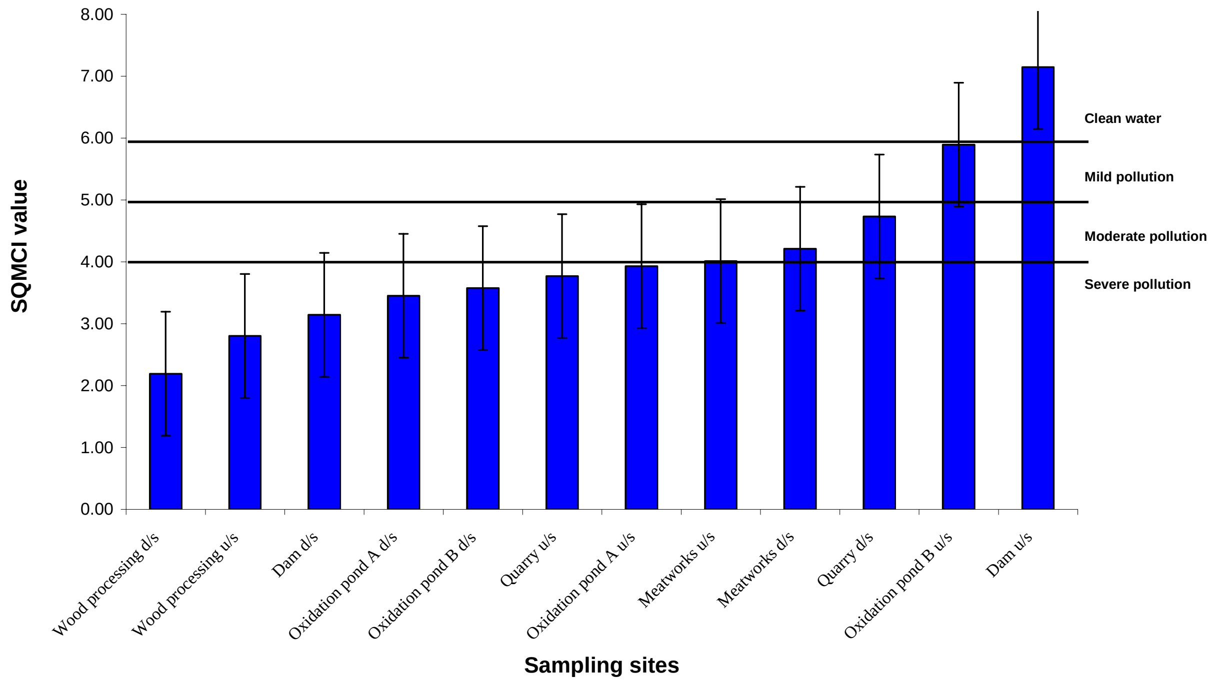

Figure 13. SQMCI scores for the 6 Resource Consent activities for late January 2008. Error bars represent ± 1 SQMCI unit, which potentially separate water quality classes, u/s = upstream, d/s = downstream.

The change in community composition, reflected through the index score, from upstream to downstream of the activity is important in determining whether the consented discharge is having adverse affects on the waterway. Four of the six resource consent locations showed no major difference between the downstream and upstream SQMCI values (Figs 14, 15) however the difference between Dam activity sites was quite dramatic. There was also an obvious difference between the Oxidation pond B sites.

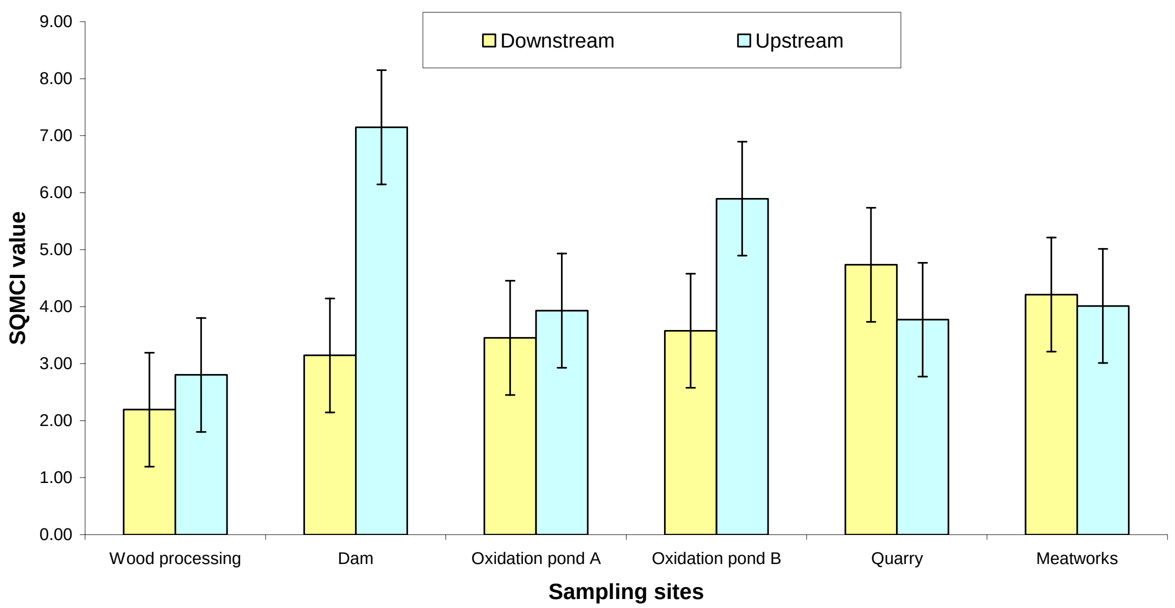

Figure 14. SQMCI values comparing the upstream and downstream sites for late January 2008. Error bars represent ± 1 SQMCI unit.

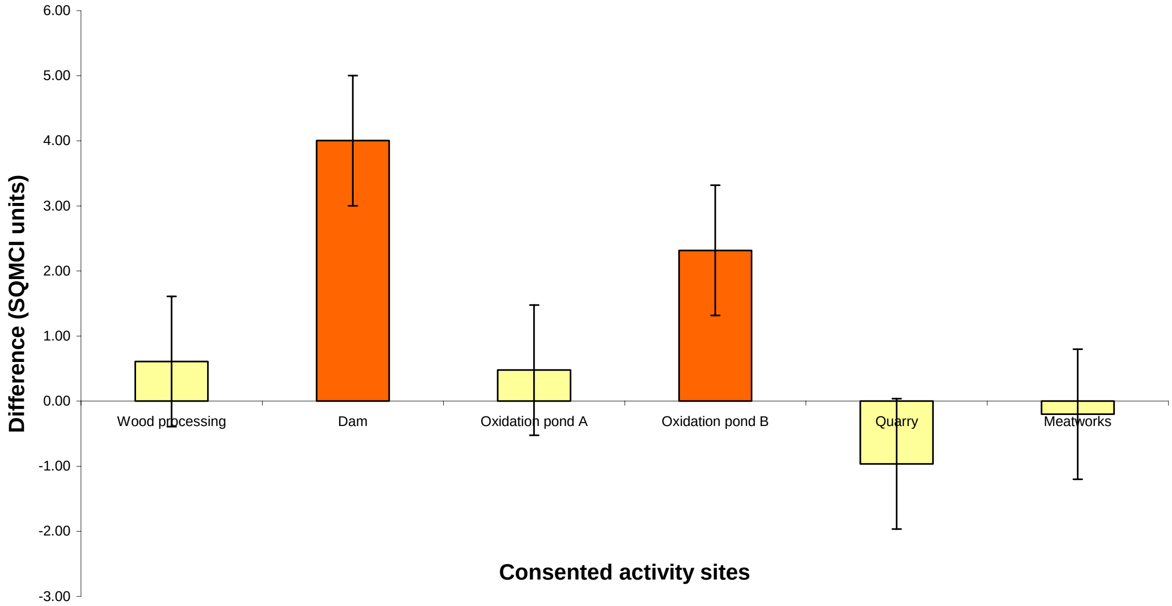

Figure 15. Resource Consent sites showing the difference between upstream and downstream in SQMCI value. Error bars represent ± 1 SQMCI unit.

3.3 Trend analysis

Analysis of 24 (of 38) SoE sites and 5 (of 6) Resource Consent activities was carried out, looking at the MCI and SQMCI results over time (Figs 16, 17). Sixteen (32%) of the 50 sites have been established over the last three years, and were considered inadequate to produce reliable trends, thus were excluded from analysis. Collier & Kelly (2006) considered that a minimum time series of eight occasions were sufficient to detect meaningful ecological (but not statistical) treads in invertebrate data, thus caution should be taken for several of the reported analyses.

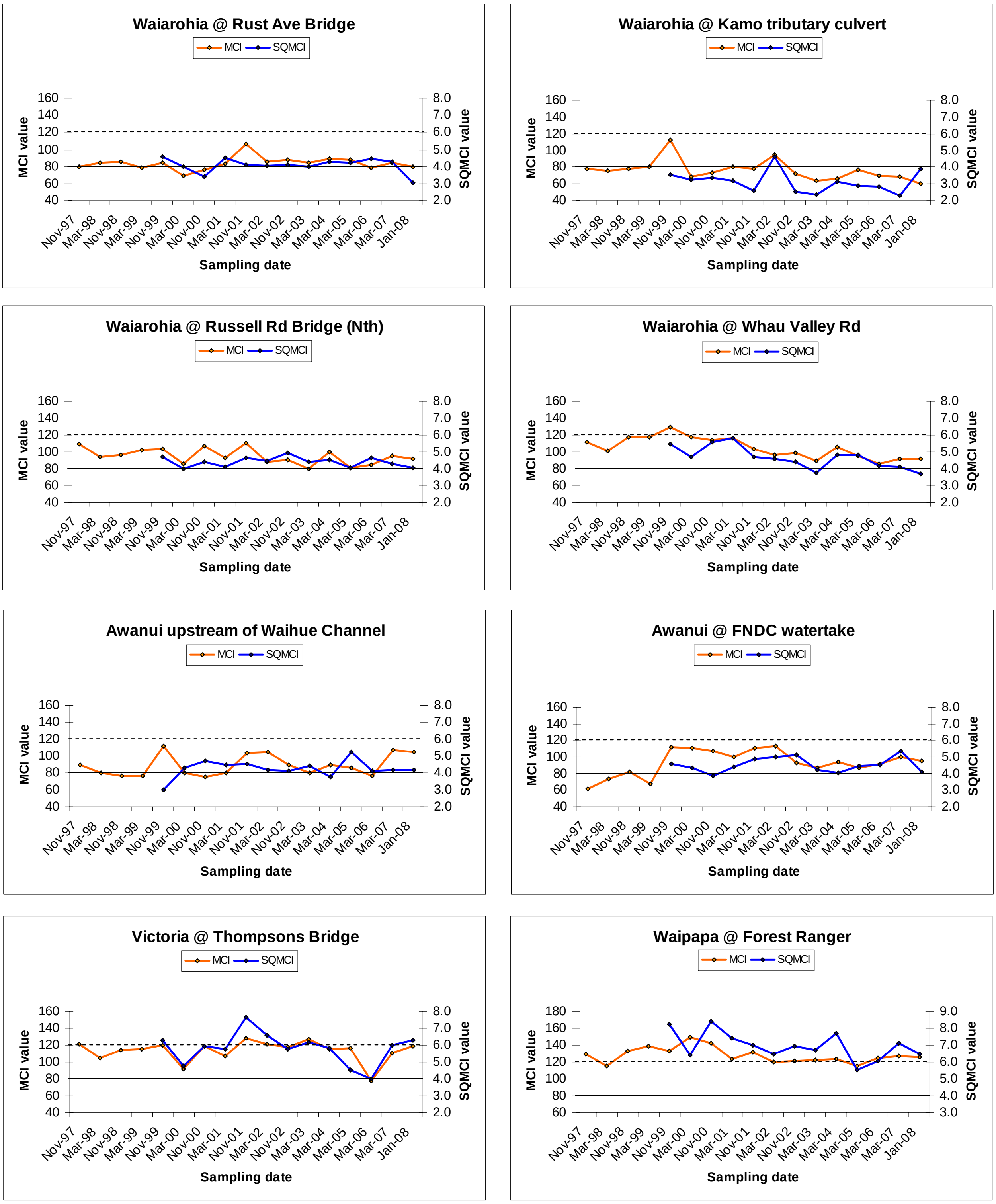

Figure 16. MCI and SQMCI trends of the SoE sites over time. Note that Waipapa @ Forest Ranger has a unique scale.

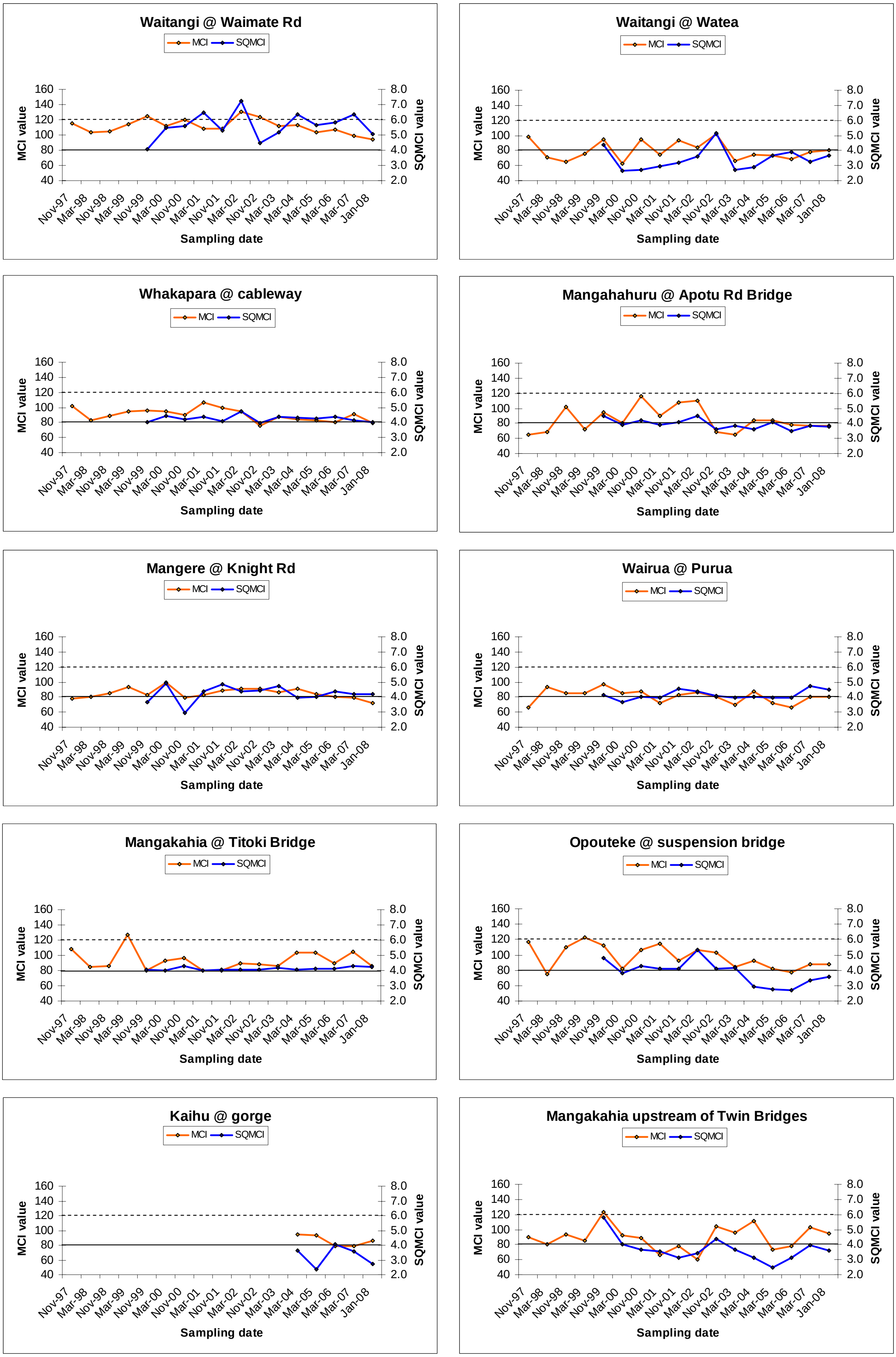

Figure 16 continued. MCI and SQMCI trends over time of the SoE sites.

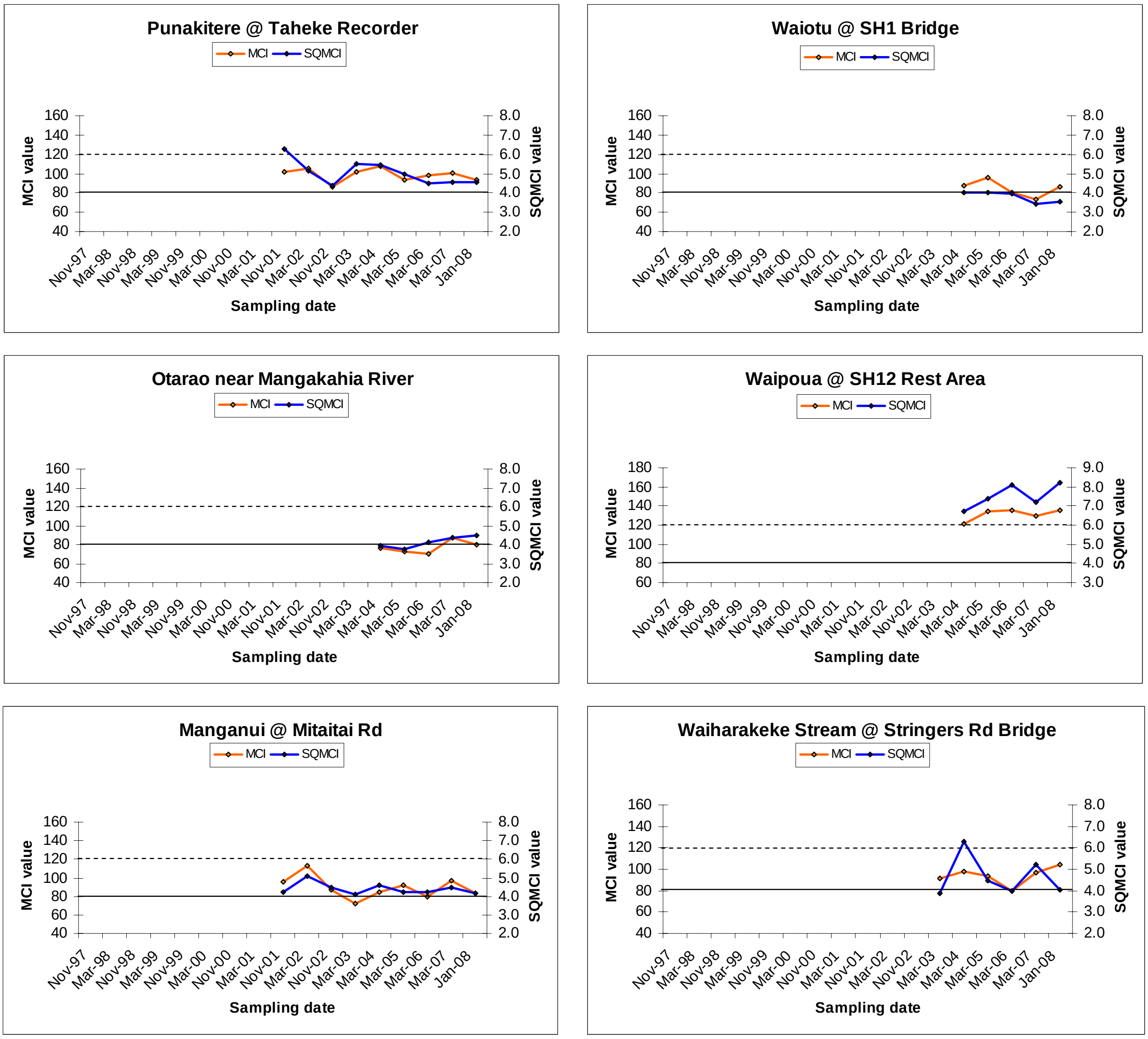

Figure 16 continued. MCI and SQMCI trends over time of the SoE sites. Note that Waipoua @ SH12 Rest Area has a unique scale.

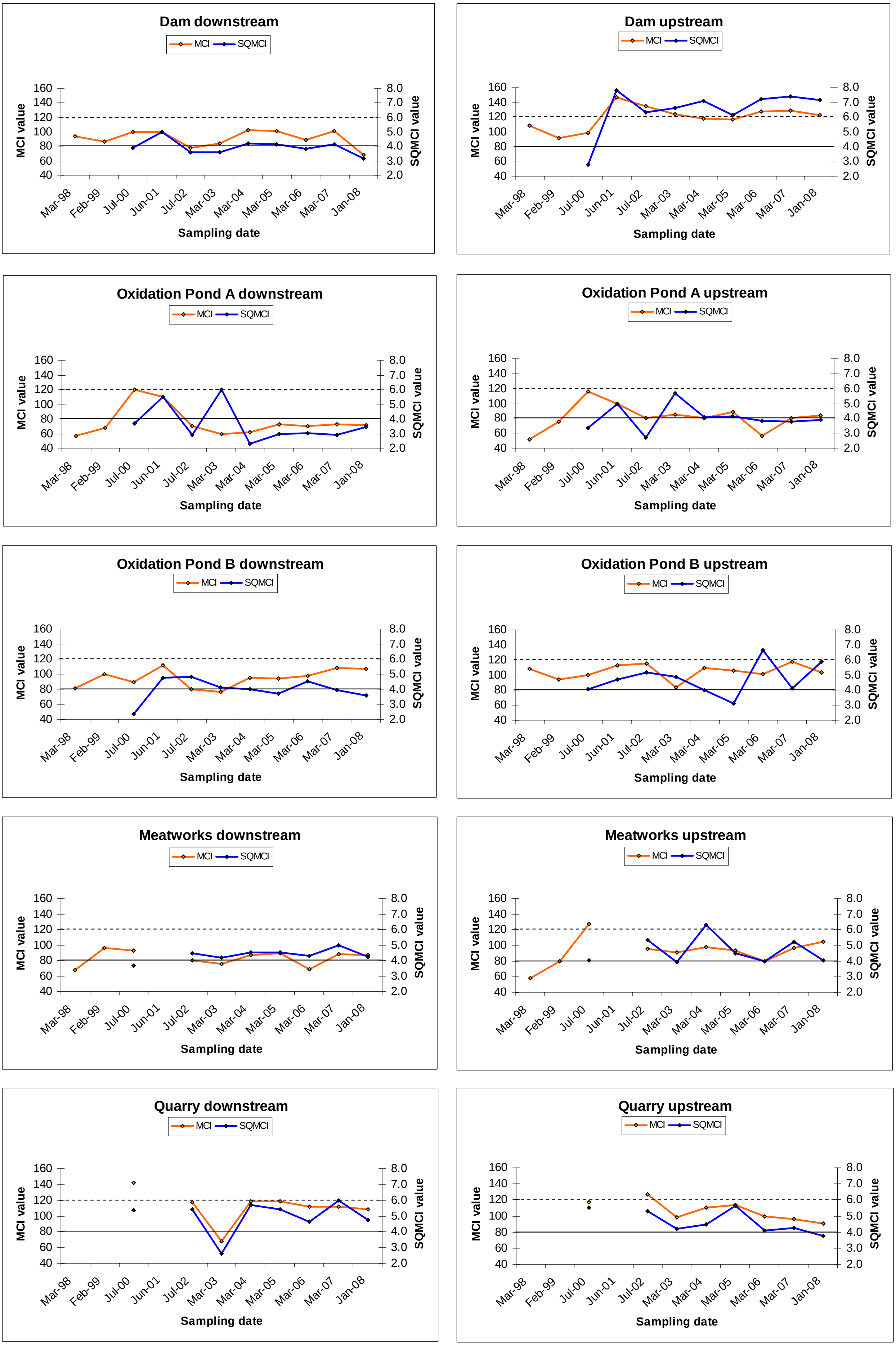

Figure 17. MCI and SQMCI trends over time of the Resource Consent activity sites.

When considering the MCI and SQMCI trend results collectively, nine (26%) of the 34 sites analysed show no statistical change (R^2 value 0.00–0.09) in stream health (Table 3). A further 18 (53%) sites indicated only a weak to modest (R^2 value 0.10–0.49) statistical change in stream health (either negative or positive). Two sites (6%), Otarao near Mangakahia River, and Waipoua at SH12 Rest Area, showed a strong statistical increase in stream health. However, the following five (15%) sites all indicated a modest to strong (R^2 value >0.30) statistical decrease in stream health:

- **Waiarohia River at Whau Valley Rd**
- Opouteke River at suspension bridge
- **Punakitere River at Taheke Recorder**
- **Waiotu River at SH1 Bridge**
- Quarry upstream

Three of these sites (indicated in bold) were also highlighted as a concern based on the 2007 monitoring programme results (Pohe & Hall 2007).

Table 3. Trends (1997–2008) in Taxonomic Richness, %EPT*, MCI, and SQMCI for the 24 SoE sites and 10 Resource Consent sites analysed. Symbols indicate the following: – = no trend (R^2 value 0.00–0.09), ↑ = weak increase (R^2 value 0.10–0.29), ↑↑ = modest increase (R^2 value 0.30–0.49), ↑↑↑ = strong increase (R^2 value >0.50), ↓ = weak decrease (R^2 value 0.10–0.29), ↓↓ = modest decrease (R^2 value 0.30–0.49), ↓↓↓ = strong decrease (R^2 value >0.50). u/s = upstream, d/s = downstream.

2008 macroinvertebrate monitoring sites	Taxonomic Richness	%EPT*	MCI	SQMCI
Waiarohia @ Rust Ave Bridge	↑	–	–	–
Waiarohia @ Russell Rd Bridge (Nth)	–	↓	↓	–
Waiarohia @ Kamo tributary culvert	–	–	↓	–
Waiarohia @ Whau Valley Rd	–	–	↓↓↓	↓↓↓
Awanui upstream of Waihue Channel	–	↑	↑	–
Awanui @ FNDC watertake	↑	↑↑	↑	–
Victoria @ Thompsons Bridge	–	–	–	–
Waipapa @ Forest Ranger	–	↓	↓	↓
Waitangi @ Waimate Rd	–	–	↓	–
Waitangi @ Watea	–	–	–	–
Whakapara @ cableway	–	–	↓	–
Mangahahuru @ Apotu Rd Bridge	↑	–	–	↓↓
Mangere @ Knight Rd Bridge	↑↑	↓↓	–	–
Wairua @ Purua	↑	↓	↓	↑
Mangakahia @ Titoki Bridge	–	–	–	↑
Opouteke @ suspension bridge	–	–	↓	↓↓
Kaihu @ gorge	↑↑↑	↓	↓↓	–
Mangakahia upstream of Twin Bridges	–	–	–	↓
Punakitere @ Taheke Recorder	↑	↑	–	↓↓
Waiotu @ SH1 Bridge	–	–	↓	↓↓↓
Otarao near Mangakahia River	↑↑↑	↑	↑	↑↑↑
Waipoua @ SH12 Rest Area	↑↑↑	↑↑↑	↑↑	↑↑
Manganui @ Mitaitai Rd	–	↑	↓	↓
Waiharakeke Stream @ Stringers Rd Bridge	↓	–	–	–
Dam d/s	–	–	–	↓
Dam u/s	↑	↑	↑	↑
Oxidation Pond A d/s	↑	–	–	↓
Oxidation Pond A u/s	–	–	–	–
Oxidation Pond B d/s	↑	↑↑	↑	–
Oxidation Pond B u/s	–	–	–	–
Meatworks d/s	–	↑↑	–	↑↑
Meatworks u/s	–	–	–	–
Quarry d/s	↑	–	–	–
Quarry u/s	↑	↓↓	↓↓↓	↓↓

4. Conclusions

The Waipoua River at the SH12 Rest Area, Waipapa River at the end of Forest Road, Victoria River at Thompson's Bridge, Mangamuka River @ Iwiatua Road Bridge (all SoE sites), and the Dam upstream site (RC) recorded clean water this year, based on MCI and SQMCI results.

Twenty-four percent of SoE sites recorded MCI scores which can be interpreted as water of probable severe 'organic' pollution and 33% of RC sites recorded MCI scores of 'probable severe pollution'. However, the general array of SQMCI results indicated lower-quality conditions than the MCI results, with 75% of sites recorded in (or just above) the 'probable severe pollution' class. Overall, a large percentage of the sites recorded either moderate or severe pollution levels, however many samples were difficult to collect this year due to steep banks, and lack of suitable habitat, possibly resulting from the severe flooding event in July 2007.

The use of MCI values for low diversity communities (such as Kaeo and Waihue Channel sites) should be treated with caution. If there are a low number of taxa, the average sensitivity score becomes less reliable. MCI values can also be unreliable in cases where several taxa may appear in a habitat in which they would not normally occur. Flood events can carry 'sensitive' taxa from the clean to the less favourable waters.

When considering the MCI and SQMCI trend results collectively, 26% of the sites analysed show no statistical change in stream health. A further 53% indicated a weak to modest statistical change (either negative or positive). Two sites (6%), Otarao near Mangakahia River, and Waipoua at SH12 Rest Area, showed a strong statistical increase in stream health. However, the following five (15%) sites all indicated a modest to strong statistical decrease in stream health:

- Waiarohia River at Whau Valley Rd
- Opouteke River at suspension bridge
- Waiotu River at SH1 Bridge
- Punakitere River at Taheke Recorder
- Quarry upstream

The first three sites listed above were also highlighted as a concern based on the 2007 monitoring programme results.

SoE sites of concern are the Waiarohia Stream @ Kamo tributary culvert, Mangere Stream @ Knight Road, and Kaihu River @ gorge, due to their low returning index scores. RC sites of concern are the Wood Processing and Oxidation Pond A sites, both the upstream and downstream. This suggests that the consented activities are probably not the immediate concern, however the waterway is of poor quality.

Stark & Maxted (2007b) have recommended reporting MCI and MCI-sb results rather than SQMCI and SQMCI-sb results, due to the temporal element involved in collecting large numbers of samples for a SoE programme. They believe that if a 'programmes' sample collecting is delayed (e.g. due to adverse weather) for several weeks, or is carried out over several weeks (due to large spatial component), it is likely that the river's conditions will change and the resulting "biotic indices will be different" when compared on a common basis. Stark & Maxted (2007b) go on to say that "This problem affects the MCI to a lesser extent than SQMCI or QMCI, because the list of species present at a site is affected less when samples are collected than the densities". In contrast, for compliance monitoring of resource consents, it is acknowledged that SQMCI and SQMCI-sb "are more suited" as samples are collected on the same day (Stark & Maxted 2007b). We have reported SQMCI to be consistent with previous years, in knowing that the complete 2008 dataset was collected within seven days.

Recently, a new protocol (Stark & Maxted 2004, 2007a) was been published for soft-bottomed streams, and although it may be more suitable, has not been implemented by the NRC yet and should be considered for future reporting. Historical data would need to be adjusted to reflect advances in biotic indices and the enhancement of biological knowledge and taxonomy (currently early data is presented with dated tolerance values).

5. References

Boothroyd, I.K & Stark, J.D. 2000. Use of invertebrates in monitoring. *In*: Collier, K.J. & Winterbourn, M.J. *eds. New Zealand stream invertebrates: ecology and implications for management*. New Zealand Limnological Society, Christchurch. Pp 344–373.

Chapman, M.A. & Lewis, M.H. 1976. *An introduction to the freshwater Crustacea of New Zealand*. William Collins Ltd. Auckland. 261 p.

Collier, K.J. & Kelly, J. 2006. Patterns and trends in the ecological condition of Waikato streams based on the monitoring of aquatic invertebrates from 1994 to 2005. Environment Waikato Technical Report 2006/04. 28 p.

Cuffney, T.F., Gurtz, M.E. & Meador, M.R. 1993 *Methods for collecting benthic invertebrate samples as part of the national water-quality assessment program*. United States Geological Survey, Report No. 93–104. 66 p. (http://water.usgs.gov/nawqa/protocols/OFR-93-406).

Frost, S., Huni, A. & Kershaw, W.E. 1971 Evaluation of a kicking technique for sampling stream bottom fauna. *Canadian Journal of Zoology 49*: 167–173.

Pohe, S.R. & Hall, T. 2007. *Northland Macroinvertebrate Monitoring Programme: 2007 monitoring report*. Unpublished report prepared by NorthTec (Applied & Environmental Sciences Department) for Northland Regional Council. 36 p.

Poynter, M. 2003. *Kaeo River Environmental Monitoring Programme. Aquatic Macroinvertebrate Survey.* Prepared by Poynter & Associates Environmental Ltd. and Amy Bazeley Ecological Services for Northland Regional Council. 9 p.

Smith, B.J. & Ward, J.B. Unpublished. *An identification guide to the New Zealand hydrobiosid caddisflies (Insecta: Trichoptera).* 151 p.

Stark, J.D. 1985. *A Macroinvertebrate Community Index of water quality for stony streams*. Water and Soil Miscellaneous Publication No 87. National Water and Soil Conservation Authority, Wellington. 53 p.

Stark, J.D. 1993. Performance of the Macroinvertebrate Community Index: effects of sampling method, sample replication, water depth, current velocity, and substratum on index values. *New Zealand Journal of Marine and Freshwater Research 27*: 463–478.

Stark, J.D. 1998. SQMCI: a biotic index for freshwater macroinvertebrate coded-abundance data. *New Zealand Journal of Marine and Freshwater Research 32*: 55–66.

Stark, J.D., Boothroyd, I. K. G., Harding, J. S., Maxted, J. R. & Scarsbrook, M. R. 2001. *Protocols for sampling macroinvertebrates in wadeable streams*. New Zealand Macroinvertebrate Working Group Report No. 1. Prepared for the Ministry for the Environment. Sustainable Management Fund Project No. 5103. 57 p.

Stark, J.D. & Maxted, J.R. 2004. *Macroinvertebrate Community Indices for Auckland's soft-bottomed streams and applications to SOE reporting*. Report prepared for Auckland Regional Council. 59 p.

Stark, J.D. & Maxted, J.R. 2007a. A biotic index for New Zealand's soft-bottomed streams. *New Zealand Journal of Marine and Freshwater Research 41*: 43–61.

Stark, J.D. & Maxted, J.R. 2007b. *A user guide for the Macroinvertebrate Community Index*. Prepared for the Ministry for the Environment. Cawthron Report No.1166. 58 p.

Winterbourn, M.J. 1973. A guide to the freshwater Mollusca of New Zealand. *Tuatara 20*: 141–159.

Winterbourn, M.J., Gregson, K.L.D. & Dolphin, C.H. 2006. Guide to the aquatic insects of New Zealand. *Bulletin of the Entomological Society of New Zealand 14*, 108 p.

6. Acknowledgements

Many thanks to Denise Austin (NorthTec Technician) for assistance with sample collection and processing. Thanks also to Nicola Bull (Northland Regional Council) for accompanying me to one of the Resource Consent sites, to Alan Bee (Northland Regional Council) for providing hydrological data prior to commencing sampling, and to Tanya Gray (Northland Regional Council) for providing site location and historical invertebrate data. I would also like to acknowledge Dr. Olivier Ball (NorthTec Senior Lecturer) for general comments and advice.

7. Appendix A

Table 4. Results of QC reported by an independent taxonomist, u/s = upstream. Note the format of the QC results has been modified to allow clarity and confidentiality within the report.

NorthTec QC samples, checked May 2008			**Mangamuka**	**Mangahahuru**	**Mangakahia**	**Manganui**	**Wood processing u/s**
Taxa	**MCI**	**MCI-sb**	**108978**	**100237**	**101038**	**102257**	**108669**
Mayfly *Austroclima*	**9**	**6.5**		C			
Mayfly *Coloburiscus*	**9**	**8.1**	R	VA			
Mayfly *Deleatidium*	**8**	**5.6**	A	A			
Mayfly *Mauiulus*	**5**	**4.1**			R		
Mayfly *Zephlebia*	**7**	**8.8**		C	A	R	
Caddisfly *Aoteapsyche*	**4**	**6.0**	C	C			
Caddisfly *Hudsonema*	**6**	**6.5**	R		R		
Caddisfly *Hydrobiosis*	**5**	**6.7**	R	C	R		
Caddisfly *Neurochorema*	**6**	**6.0**		R			
Caddisfly *Olinga*	**9**	**7.9**	R				
Caddisfly *Oxyethira*	**2**	**1.2**	R	R		C	
Caddisfly *Psilochorema*	**8**	**7.8**	C				
Caddisfly *Pycnocentria*	**7**	**6.8**	R	R	R		
Caddisfly *Pycnocentrodes*	**5**	**3.8**	C	C			
Caddisfly *Triplectides*	**5**	**5.7**		R	C	R	
Damselfly *Xanthocnemis*	**5**	**1.2**				R	R
Dobsonfly *Archichauliodes*	**7**	**7.3**	C	C			
Beetle Elmidae	**6**	**7.2**	VA	VA		R	
Beetle Hydraenidae	**8**	**6.7**		R			
Beetle Hydrophilidae	**5**	**8.0**		R			C
Beetle *Liodessus*	**5**	**4.9**					R
True Fly *Aphrophila*	**5**	**5.6**		C			
True Fly *Austrosimulium*	**3**	**3.9**	R	C		R	
True Fly *Chironomus*	**1**	**3.4**			R		
True Fly Empididae	**3**	**5.4**		R			
True Fly Ephydridae	**4**	**1.4**				C	
True Fly Eriopterini	**9**	**7.5**		R			
True Fly Muscidae	**3**	**1.6**		R			
True Fly Orthocladiinae	**2**	**3.2**	A	C	R	R	
True Fly *Polypedilum*	**3**	**8.0**	R		R		
True Fly *Stictocladius*	**8**	**8.0**	R				
True Fly Tanypodinae	**5**	**6.5**	R		R		
True Fly Tanytarsini	**3**	**4.5**	C	C			
Moth *Hygraula*	**4**	**1.3**			R		
Crustacea Cladocera	**5**	**0.7**					C
Crustacea Copepoda	**5**	**2.4**					C
Crustacea *Halicarcinus* crabs	**3**	**5.1**			C		
Crustacea Mysid shrimps	**5**	**6.4**			C		
Crustacea Ostracoda	**3**	**1.9**					VVA
Crustacea *Paracalliope*	**5**	**5.0**			VA	VA	
Crustacea *Paraleptamphopus*	**5**	**5.0**		R			
Crustacea *Paranephrops*	**5**	**8.4**		R			
Crustacea *Paratya*	**5**	**3.6**			VA	C	
MITES	**5**	**5.2**					C
Mollusc *Ferrissia*	**3**	**2.4**		R			
Mollusc *Latia*	**3**	**6.1**		R			
Mollusc *Physella*	**3**	**0.1**				R	
Mollusc *Potamopyrgus*	**4**	**2.1**	R	VA	VVA	VVA	
Mollusc Sphaeriidae	**3**	**2.9**			C		
OLIGOCHAETES	**1**	**3.8**	R	C	R		VA
LEECHES	**3**	**1.2**					C
FLATWORMS	**3**	**0.9**				R	VA
Rhabdocoel Flatworms	**3**	**0.9**					R
NEMATODES	**3**	**3.1**					R
NEMERTEANS	**3**	**1.8**	R				
HYDROIDS	**3**	**1.6**					VA
Number of Taxa			**21**	**28**	**18**	**13**	**13**
% EPT (taxa number)			**47.6%**	**39.3%**	**33.3%**	**23.1%**	**0.0%**
MCI Value			**102.9**	**101.4**	**84.4**	**83.1**	**75.4**
SQMCI Value			**5.62**	**6.13**	**4.35**	**4.16**	**2.81**
MCI-sb Value			**111.1**	**109.9**	**99.9**	**68.2**	**55.1**
SQMCI-sb			**6.26**	**5.73**	**2.98**	**2.59**	**2.02**

7. Appendix B

Table 5. Physico-chemical data (flow, water temperature, pH, dissolved oxygen, air saturated dissolved oxygen, conductivity, temperature compensated conductivity, and salinity) recorded at the 38 State of the Environment sites throughout Northland, u/s = upstream, d/s = downstream.

Site name	Flow (ms^{-2})	Temp. (°C)	pH	D.O. (mg/L)	D.O. (%)	Cond. (µS/cm)	Cond. @ 25°C[†] (µS/cm)	Sal. (ppt)
Awanui River @ FNDC watertake	1.07	24.5	7.94	8.52	102.3	195.0	197.2	0.1
Awanui River u/s of Waihue Channel	0.37	24.4	7.96	8.20	98.6	205.6	208.1	0.1
Hakaru River @ Topuni Creek Farm	0.55	20.8	7.74	8.05	89.9	163.5	177.6	0.1
Kaeo River @ Dip Road Bridge	0.47	22.0	7.32	7.96	89.7	130.5	137.1	0.1
Kaihu River @ gorge	0.63	19.6	7.70	8.27	90.1	97.1	108.2	0.1
Kerikeri River @ stone store bridge	0.64	21.9	7.26	8.15	92.6	79.0	84.1	0.0
Mangahahuru Stream @ Apotu Road	0.21	19.3	7.17	8.30	90.1	109.9	123.3	0.1
Mangahahuru Stream @ Main Road	0.51	18.2	7.20	7.63	81.2	84.2	96.7	0.0
Mangakahia River @ Titoki Bridge	0.31	22.3	7.37	7.08	81.9	126.1	133.0	0.1
Mangakahia River u/s of Twin Bridges	0.44	23.9	8.39	9.11	108.1	86.8	88.7	0.0
Mangakahia River d/s of Twin Bridges	0.43	23.6	8.28	9.18	108.5	96.5	99.1	0.1
Mangamuka River @ Iwiatua Road	0.55	24.5	7.81	8.33	100.5	148.8	150.1	0.1
Manganui River @ Mitaitai Road	0.26	23.4	7.07	5.01	59.1	189.4	195.2	0.1
Mangere Stream @ Knight Road	0.17	20.1	7.40	7.22	79.7	151.6	167.3	0.1
Ngunguru River @ Waipoka Road	-	20.7	7.02	7.01	78.1	104.0	113.1	0.1
Opouteke River @ suspension bridge	0.74	22.6	7.86	8.48	97.6	104.5	109.5	0.1
Oruru River @ Oruru Road	0.69	22.7	7.53	7.38	85.7	150.7	157.5	0.1
Otarao Stream near Mangakahia River	0.33	22.6	7.02	4.66	54.3	163.7	171.6	0.1
Paparoa Stream @ walking bridge	0.16	21.1	7.40	83.5	7.29	227.6	245.4	0.1
Punakitere River @ Taheke Recorder	0.37	21.4	7.74	7.75	88.1	117.1	125.6	0.1
Ruakaka River @ Flyger Road	0.51	19.2	7.32	6.09	66.3	193.6	217.9	0.1
Utakura River @ Okaka Road Bridge	0.21	22.3	7.68	6.82	80.6	90.3	95.1	0.0
Victoria River @ Thompsons Bridge	0.61	23.5	7.95	8.59	101.8	148.1	152.5	0.1
Waiarohia Stream @ Kamo tributary	0.23	17.0	7.63	8.49	88.0	160.7	190.1	0.1
Waiarohia Stream @ Russell Road Nth	0.36	18.1	7.68	8.15	85.7	245.0	288.5	0.1
Waiarohia Stream @ Rust Ave Bridge	0.21	18.6	7.52	8.78	93.8	235.1	267.8	0.1
Waiarohia Stream @ Whau Valley	0.27	18.1	7.53	6.77	71.9	231.7	275.0	0.1
Waiharakeke Stream @ Stringers Road	0.51	21.2	7.45	8.32	95.0	130.7	140.9	0.1
Waimamaku River @ SH12	0.49	21.9	7.88	8.36	95.3	91.5	97.3	0.0
Waiotu River @ SH1	0.22	20.1	7.32	7.48	82.5	84.5	93.2	0.0
Waipao River @ Draffin Road	0.38	19.5	8.04	11.51	126.0	168.9	188.7	0.1
Waipapa River @ Forest Ranger	0.70	21.4	7.35	8.67	98.7	98.4	105.6	0.1
Waipapa River @ Waipapa Landing	0.08	22.9	7.34	6.71	77.8	80.5	83.9	0.0
Waipoua River @ SH12 Rest Area	0.38	18.0	7.64	8.43	89.4	74.5	85.8	0.0
Wairua River @ Purua	-	22.3	7.00	6.90	79.0	112.5	118.6	0.1
Waitangi River @ Watea	0.44	23.5	7.79	7.61	88.8	119.5	123.00	0.1
Waitangi River @ Waimate Road	0.69	19.9	7.17	8.20	90.2	91.3	101.2	0.1
Whakapara River @ cableway	0.44	20.1	7.00	8.83	97.4	82.1	90.6	0.0

[†] Conductivity temperature compensated to 25°C.

Table 6. Physico-chemical data (flow, water temperature, pH, dissolved oxygen, air saturated dissolved oxygen, conductivity, temperature compensated conductivity, and salinity) recorded at the 12 Resource Consent sites throughout Northland, u/s = upstream, d/s = downstream.

Site name	Flow (ms^{-2})	Temp. (°C)	pH	D.O. (mg/L)	D.O. (%)	Cond. (µS/cm)	Cond. @ 25°C‡ (µS/cm)	Sal. (ppt)
Dam u/s	0.19	19.8	7.64	6.82	74.3	106.6	118.2	0.1
Dam d/s	0.14	18.7	7.15	9.21	98.6	123.6	140.5	0.1
Meatworks u/s	0.51	21.2	7.45	8.32	95.0	130.7	140.9	0.1
Meatworks d/s	0.66	20.7	7.51	7.67	85.5	132.0	148.3	0.1
Quarry u/s	0.58	20.4	7.80	8.83	97.7	98.4	108.4	0.1
Quarry d/s	0.25	20.4	6.86	8.04	88.1	103.8	113.7	0.1
Oxidation Pond A u/s	0.29	17.7	6.90	8.30	86.8	95.0	110.3	0.1
Oxidation Pond A d/s	0.28	18.3	6.97	8.14	85.5	114.1	131.0	0.1
Oxidation Pond B u/s	0.26	19.7	7.63	9.08	97.7	84.6	93.9	0.1
Oxidation Pond B d/s	0.29	19.9	7.39	8.84	97.1	99.6	110.4	0.1
Wood Processing u/s	<0.08	18.3	7.28	4.15	44.1	-	480.1	0.2
Wood Processing d/s	<0.08	19.0	7.30	4.53	48.9	-	315.8	0.2

‡ Conductivity temperature compensated to 25°C.

7. Appendix C

Table 7. Raw macroinvertebrate data for the State of Environment sites, January 2008. Sites marked in red have been quality controlled by an independent taxonomist.

Site Name			Waiarohia @ Rust Ave Bridge	Waiarohia @ Russell Rd Bridge (Nth)	Waiarohia @ Kamo Tributary Culvert	Waiarohia @ Whau Valley Rd Bridge	Ngunguru @ Waipoka Rd	Awanui u/s Waihue Channel	Awanui @ FNDC watertake	Victoria @ Thompsons Bridge	Utakura @ Okaka Rd Bridge	Mangamuka @ Iwiatua Rd Bridge	Oruru @ Oruru Rd	Waipapa @ Forest Ranger	Waitangi @ Waimate Rd	Waitangi @ Watea	Kaeo River @ Dip Rd Bridge	Waipapa @ Waipapa Landing	Kerikeri @ stone store bridge	Whakapara @ cableway	Mangahahuru @ Apotu Rd Bridge
Site Number			**105672**	**105674**	**105677**	**107773**	**109100**	**100370**	**100363**	**105532**	**109020**	**108978**	**108979**	**101751**	**103178**	**101752**	**102674**	**101524**	**101530**	**102249**	**100281**
TAXA	Tolerance Values																				
INSECTA	HB	SB [2]																			
Ephemeroptera																					
Acanthophlebia	7	9.6								1				20							
Ameletopsis	10	10.0												1							
Arachnocolus	8	8.1																			
Austroclima	9	6.5																			
Coloburiscus	9	8.1				5				20		1		1	1						
Deleatidium	8	5.6		5		5			1	100		100		100	20		5				
Ichthybotus	8	9.2												1							
Mauiulus	5	4.1							5			1	5								1
Neozephlebia	7	7.6		1		1															
Nesameletus	9	8.6				1				1											
Oniscigaster	10	5.1								1											
Rallidens	9	3.9												1							
Siphlaenigma	9	N/A													1						
Zephlebia	7	8.8	1	1		1		5	5		1		1	1	100	1		1	20	20	20
Plecoptera																					
Austroperla	9	8.4								1				1							
Megaleptoperla	9	7.3																			
Stenoperla	10	9.1																			
Zelandobius	5	7.4													1						
Zelandoperla	10	8.9																			
Megaloptera																					
Archichauliodes	7	7.3	1	5		1				5		1		5							
Odonata																					
Adversaeshna	5	1.4																1			
Austrolestes	6	0.7																			
Hemicordulia	5	0.4																			
Xanthocnemis	5	1.2									1				1	20		5			1
Hemiptera																					
Anisops	5	2.2																			
Microvelia	5	4.6																			
Sigara	5	2.4													1					1	
Coleoptera																					
Dytiscidae	5	0.4													5						
Elmidae	6	7.2	20	5					1	100		100		500	1	1	100		1	1	
Hydraenidae	8	6.7		1										5							
Hydrophilidae	5	8.0																			
Liodessus	5	4.9																			
Staphylinidae	5	6.2																		1	
Diptera																					
Aphrophila	5	5.6	1	5					1	5				1					5		
Austrosimulium	3	3.9	1			20				1		1	1		20					1	20
Chironominae [1]	**2**	**3.8**	1	1		5			5	20		5		5	5				5	1	1
Empididae	3	5.4																			
Ephydridae	4	1.4																			
Eriopterini	9	7.5								1				5			1				
Hexatomini	5	6.7							1												
Limonia	6	6.3				1													1		
Mischoderus	4	5.9																			
Molophilus	5	6.3								1											
Muscidae	3	1.6	1	1	1	1			1	5					5						
Orthocladiinae	2	3.2	100	20	1	1			20	5		5		20	20	20	1		100	5	20
Paradixa	4	8.5																			

Paralimnophila	6	7.4																			
Tabanidae	3	6.8								1				1							
Tanypodinae	5	6.5		1					1	1		1		5	100	5	5				
Trichoptera																					
Aoteapsyche	4	6.0	100	100		5			1	20		5		5					20		
Beraeoptera	8	7.0												1							
Costachorema	7	7.2								1									1		
Helicopsyche	10	8.6												20							
Hudsonema	6	6.5	1	1					1			1		1	5						
Hydrobiosis	5	6.7	5	5		5			1	5		1		5	5				5	5	1
Hydroptilidae [1]	2	**2.5**																			
Neurochorema	6	6.0								1									1		
Oecetis [1]	6	6.8																		1	
Olinga	9	7.9								1		1		100							
Orthopsyche	9	7.5																			
Oxyethira	2	1.2	20	1		20			1			1	5	1	20	5			1	1	20
Paroxyethira	2	3.7																			
Polyplectropus	8	8.1													1						
Psilochorema	8	7.8		1					1	1		5		20			1				
Pycnocentria	7	6.8							1			1								1	
Pycnocentrodes	5	3.8	1	20					20	20		5		100			1		5		
Triplectides	5	5.7		1				5			1		1		20	5		5		1	1
Lepidoptera																					
Hygraula	4	1.3											1								
Collembola	6	5.3				1									1	1					
Acarina	5	5.2	1	1										1							
CRUSTACEA																					
OSTRACODA	3	1.9	20	5		5					1				5	100				1	
Amphipoda	5	5.5	20	1	20	5					5		5		5	100					
Cladocera	5	0.7																		5	
Copepoda	5	2.4														1		1			
Amarinus [1]	N/A	5.1						5												5	1
Mysidae [1]	N/A	6.4																			
Paranephrops	5	8.4													1						
Paratya	5	3.6	5				100	100	5	1	100		100					100	5		
MOLLUSCA																					
Ferrissia	3	2.4	1	1		1							1			1		1	1	5	1
Gyraulus	3	1.7	1	1	5																
Latia	3	6.1																	1		
Lymnaeidae	3	1.2													1						
Melanopsis	3	1.9											1						1		
Physella	3	0.1	1	1		1					1				5	5			1	5	
Potamopyrgus	4	2.1	100	20	5	20	100	500	20		500	1	500	1	20	5		1	5	500	100
Sphaeriidae	3	2.9													1					1	
OLIGOCHAETA	1	3.8	100	5	5	1			1			1			5	20				1	
HIRUDINEA	3	1.2																		1	
PLATYHELMINTHES	3	0.9	20	5		5								1		5			1		1
NEMATODA	3	3.1																			
NEMERTEA	3	1.8	20	5	1	20				1		1			1	20			5		
CNIDARIA																					
Hydra	3	1.6																		20	
Total (Minimum) coded abundances (c_i)			542	220	38	131	200	615	93	320	610	238	621	929	377	315	114	115	185	583	188
Taxonomic richness			24	28	7	23	2	5	20	26	8	20	11	29	29	17	7	8	20	22	13
Taxonomic richness (MCI scoring taxa)			24	28	7	23	2	4	20	26	8	20	11	29	29	17	7	8	20	21	12
MCI value			79.2	91.4	60.0	91.3	90.0	105.0	95.0	118.5	92.5	101.0	83.6	126.2	93.8	80.0	122.9	97.5	84.0	79.0	76.7
MCI-SB value			78.8	90.7	56.3	89.1	57.0	101.2	101.4	119.9	72.3	104.1	73.6	125.4	83.7	70.6	118.9	69.0	84.7	76.8	75.5
SQMCI value			3.03	4.08	3.89	3.73	4.50	4.16	4.09	6.28	4.18	6.60	4.16	6.49	5.07	3.67	6.04	4.99	3.28	4.02	3.77
SQMCI-SB value			3.66	4.81	4.07	3.26	2.85	2.45	3.82	6.04	2.39	6.18	2.40	6.70	5.75	3.33	7.04	3.58	4.28	2.41	3.10
% EPT*			20.8	32.1	0.0	30.4	0.0	40.0	45.0	50.0	25.0	50.0	27.3	55.2	31.0	11.8	42.9	25.0	30.0	22.7	30.8

* Excludes *Oxyethira* & *Paroxyethira* (Hydroptilidae) [1] Addition to Stark *et al*. 2001 list. [2] Stark & Maxted 2007a. **Bold** tolerance values are assigned based on professional judgement.

Table 7 continued. Raw macroinvertebrate data for the State of Environment sites, January 2008. Sites marked in red have been quality controlled by an independent taxonomist.

Site Name			Mangahahuru @ end of Main Rd	Wairua @ Purua	Waipao @ Draffin Rd	Mangere @ Knight Rd Bridge	Mangakahia @ Titoki Bridge	Opouteke @ suspension bridge	Mangakahia us of Twin Bridges	Mangakahia ds of Twin Bridges	Punakitere @ Taheke Recorder	Waiotu @ SH1 Bridge	Kaihu @ gorge	Waipoua @ SH12 Rest Area	Waimamaku @ SH12	Manganui @ Mitaitai Rd	Ruakaka @ Flyger Road	Hakaru @ Topuni Creek Farm	Paparoa @ walking bridge	Otarao near Mangakahia River	Waiharakeke Stream @ Stringers Rd Bridge
Site Number			**100237**	**101753**	**108941**	**101625**	**101038**	**102258**	**103307**	**109096**	**105231**	**102248**	**102256**	**103304**	**109098**	**102257**	**105008**	**109021**	**108977**	**107045**	**100007**
TAXA	Tolerance Values																				
INSECTA	HB	SB [2]																			
Ephemeroptera																					
Acanthophlebia	7	9.6												5			1				
Ameletopsis	10	10.0												1							
Arachnocolus	8	8.1												1							
Austroclima	9	6.5	20		5									1							
Coloburiscus	9	8.1	20		1									20	5						
Deleatidium	8	5.6	20						20	5				100	5						
Ichthybotus	8	9.2																			
Mauiulus	5	4.1			1		1	1	1	1	1				1		5				1
Neozephlebia	7	7.6												1							
Nesameletus	9	8.6												100							
Oniscigaster	10	5.1																			
Rallidens	9	3.9									5			5	1						
Siphlaenigma	9	N/A																			
Zephlebia	7	8.8	20	1	20	20	5			5	20	5	1	1	1	1	20	5		1	1
Plecoptera																					
Austroperla	9	8.4						1							1						
Megaleptoperla	9	7.3							1		1			1							
Stenoperla	10	9.1												1							
Zelandobius	5	7.4																			
Zelandoperla	10	8.9																			
Megaloptera																					
Archichauliodes	7	7.3	5					5	1	1			1	5	1		1				
Odonata																					
Adversaeshna	5	1.4																	1		
Austrolestes	6	0.7																	1		
Hemicordulia	5	0.4																			
Xanthocnemis	5	1.2		1		1										1			5	1	
Hemiptera																					
Anisops	5	2.2																	1		
Microvelia	5	4.6																	1		
Sigara	5	2.4		5		1															
Coleoptera																					
Dytiscidae	5	0.4				5					1										
Elmidae	6	7.2	100					5	5	5	20		1	5	1	1					
Hydraenidae	8	6.7	1																		
Hydrophilidae	5	8.0	1	1																	
Liodessus	5	4.9																			
Staphylinidae	5	6.2																		1	
Diptera																					
Aphrophila	5	5.6	1					5	1	5			1	20	5						
Austrosimulium	3	3.9	5		20	20	1	1	1			20	1	1	5	1	1			5	
Chironominae [1]	**2**	**3.8**	5	1	1	1	1	5	100	100	1	1	5	1	100		5	20		1	
Empididae	3	5.4	1																		
Ephydridae	4	1.4														1					
Eriopterini	9	7.5	1																		
Hexatomini	5	6.7															1				
Limonia	6	6.3																			
Mischoderus	4	5.9							1				1								
Molophilus	5	6.3																			
Muscidae	3	1.6	1			1		20	1	20			1		5			1			
Orthocladiinae	2	3.2	5	1	20	5	1	20	5	20	20	20	500	5	5	1	1	20		1	
Paradixa	4	8.5				1											1				
Paralimnophila	6	7.4																			
Tabanidae	3	6.8																			

Tanypodinae	5	6.5					1	1	1	5	5			1			1	1			
Trichoptera																					
Aoteapsyche	4	6.0	5					20	5	20			5	20	20			20			
Beraeoptera	8	7.0											1								
Costachorema	7	7.2												1	1						
Helicopsyche	10	8.6												100							
Hudsonema	6	6.5			1		1				5			1			1	1			
Hydrobiosis	5	6.7	5		5		1	5	5	5	1	1	20	5	5						
Hydroptilidae [1]	2	**2.5**																			
Neurochorema	6	6.0	1					1	5	1	1		5	1	1						
Oecetis [1]	6	6.8									1	1									
Olinga	9	7.9							1					20	1		1				
Orthopsyche	9	7.5																			
Oxyethira	2	1.2	1	1	100	5		20	5	5	1	20			5	1		5	1	1	
Paroxyethira	2	3.7				1				1									1		
Polyplectropus	8	8.1						1						1			1				
Psilochorema	8	7.8															1				
Pycnocentria	7	6.8	1		100		1				5	1									
Pycnocentrodes	5	3.8	5		20			20	20	5	20		5	5	20		1	5			
Triplectides	5	5.7	5	5		100	20				20	5	1			1	20		5		1
Lepidoptera																					
Hygraula	4	1.3					1														
Collembola	6	5.3				1															
Acarina	5	5.2							1				1		5		1			1	
CRUSTACEA																					
OSTRACODA	3	1.9																1			
Amphipoda	5	5.5	1	100	5	100	100		1				100			100	20	20	100	500	
Cladocera	5	0.7																			
Copepoda	5	2.4																			
Amarinus [1]	N/A	5.1		1		5	5					1								1	1
Mysidae [1]	N/A	6.4					5														
Paranephrops	5	8.4	1														1				
Paratya	5	3.6					100								20	5	100	100	500	5	5
MOLLUSCA																					
Ferrissia	3	2.4	5			1			1		1		5					1			
Gyraulus	3	1.7																1			
Latia	3	6.1	1					1		1	5		5					1			
Lymnaeidae	3	1.2																			
Melanopsis	3	1.9																			
Physella	3	0.1		1	1	1							5			1		5		1	
Potamopyrgus	4	2.1	20	100	500	500	500	20	20	20	100	100	20	5	20	500	20	20	500	500	500
Sphaeriidae	3	2.9				20	5				1										
OLIGOCHAETA	1	3.8	5			1	1	5			5				1		5	1			
HIRUDINEA	3	1.2		1					1												
PLATYHELMINTHES	3	0.9				5					1		5			1		1			
NEMATODA	3	3.1																			
NEMERTEA	3	1.8				1		20	5	5	1		20								
CNIDARIA																					
Hydra	3	1.6											1								
Total (Minimum) coded abundances (c_i)			262	219	800	796	750	177	208	230	242	175	711	434	235	615	209	229	1116	1019	509
Taxonomic richness			28	13	15	22	18	20	24	19	24	11	24	29	24	13	22	19	11	13	6
Taxonomic richness (MCI scoring taxa)			28	12	15	21	16	20	24	19	24	10	24	29	24	13	22	19	11	12	5
MCI value			100.7	80.0	98.7	72.4	86.3	88.0	94.2	88.4	93.3	86.0	86.7	135.2	106.7	83.1	102.7	72.6	89.1	80.0	104.0
MCI-SB value			109.8	74.3	94.8	67.5	96.3	97.2	93.2	95.9	90.6	98.4	90.2	133.5	104.2	68.9	118.9	73.2	58.0	76.8	98.0
SQMCI value			6.05	4.47	4.20	4.22	4.25	3.55	3.59	3.10	4.57	3.54	2.73	8.21	3.56	4.17	4.97	4.17	4.55	4.49	4.01
SQMCI-SB value			6.27	3.80	2.95	3.23	2.98	3.44	4.01	3.92	4.12	2.73	3.61	7.26	4.09	2.69	4.56	3.81	3.09	3.80	2.14
% EPT*			35.7	15.4	53.3	9.1	33.3	35.0	33.3	36.8	45.8	45.5	29.2	72.4	50.0	15.4	40.9	21.1	9.1	7.7	50.0

* Excludes *Oxyethira* & *Paroxyethira* (Hydroptilidae) [1] Addition to Stark *et al*. 2001 list. [2] Stark & Maxted 2007a. **Bold** tolerance values are assigned based on professional judgement.

7. Appendix D

Table 8. Raw macroinvertebrate data for the Resource Consent sites, January 2008. Sites marked in red have been quality controlled by an independent taxonomist.

Site Name			LVL plant d/s	LVL plant u/s	Ngatitara d/s	Ngatitara u/s	Hikurangi OP d/s	Hikurangi OP u/s	Affco d/s	Affco u/s	Kaikohe d/s	Kaikohe u/s	Imerys Tableware d/s	Imerys Tableware u/s
Site Number			**108670**	**108669**	**106508**	**106509**	**100280**	**100279**	**100010**	**100007**	**103317**	**103316**	**103824**	**103823**
TAXA	Tolerance Values													
INSECTA	HB	SB [2]												
Ephemeroptera														
Acanthophlebia	7	9.6												
Ameletopsis	10	10.0												
Arachnocolus	8	8.1												
Austroclima	9	6.5				1					1	1		
Coloburiscus	9	8.1				20					20	20	1	
Deleatidium	8	5.6				100					20	20		
Ichthybotus	8	9.2				1								
Mauiulus	5	4.1								1		5		
Neozephlebia	7	7.6				20								
Nesameletus	9	8.6				1					1	5		
Oniscigaster	10	5.1												
Rallidens	9	3.9												
Siphlaenigma	9	N/A												
Zephlebia	7	8.8						1	5	1		1		
Plecoptera														
Austroperla	9	8.4												
Megaleptoperla	9	7.3												
Stenoperla	10	9.1												
Zelandobius	5	7.4												
Zelandoperla	10	8.9											1	
Megaloptera														
Archichauliodes	7	7.3				20					5	1	1	1
Odonata														
Adversaeshna (formerly *Aeshna*)	5	1.4												
Austrolestes	6	0.7												
Hemicordulia	5	0.4						1						
Xanthocnemis	5	1.2		1			1	1	1					
Hemiptera														
Anisops	5	2.2												
Microvelia	5	4.6							1					
Sigara	5	2.4					1							
Coleoptera														
Dytiscidae	5	0.4		1										
Elmidae	6	7.2				5					5		5	5
Hydraenidae	8	6.7				1								
Hydrophilidae	5	8.0		1			1							
Liodessus	5	4.9	1											
Staphylinidae	5	6.2			1									
Diptera														
Aphrophila	5	5.6				1						1	1	1
Austrosimulium	3	3.9			5	5	5	20	1			1	5	20
Chironominae [1]	**2**	**3.8**			1		1				1	1		
Empididae	3	5.4												
Ephydridae	4	1.4												
Eriopterini	9	7.5												
Hexatomini	5	6.7												
Limonia	6	6.3												
Mischoderus	4	5.9				1							1	1
Molophilus	5	6.3												
Muscidae	3	1.6			1									
Orthocladiinae	2	3.2			20	1	5	1			20	5	5	5
Paradixa	4	8.5												
Paralimnophila	6	7.4			1	5								
Tabanidae	3	6.8												
Tanypodinae	5	6.5			1	1	1	1						

Trichoptera														
Aoteapsyche	4	6.0			5	20					100	5	1	
Beraeoptera	8	7.0												
Costachorema	7	7.2									1			
Helicopsyche	10	8.6												
Hudsonema	6	6.5												
Hydrobiosis	5	6.7			5	5	1				1	1		1
Hydroptilidae [1]	2	**2.5**						1						
Neurochorema	6	6.0												
Oecetis [1]	6	6.8												
Olinga	9	7.9												
Orthopsyche	9	7.5											5	1
Oxyethira	2	1.2			1		5							1
Paroxyethira	2	3.7												
Polyplectropus	8	8.1												
Psilochorema	8	7.8				1								
Pycnocentria	7	6.8									1			
Pycnocentrodes	5	3.8				1					5	20		
Triplectides	5	5.7							1	1			1	
Lepidoptera														
Hygraula	4	1.3												
Collembola	6	5.3							1					
Acarina	5	5.2		5										
CRUSTACEA														
OSTRACODA	3	1.9	100	500	1									
Amphipoda	5	5.5				1		1	20				1	
Cladocera	5	0.7		20			1							
Copepoda	5	2.4	1	5										
Amarinus [1]	N/A	5.1					5	5		1				
Mysidacea [1]	N/A	6.4												
Paranephrops	5	8.4												
Paratya	5	3.6							100	5				
MOLLUSCA														
Ferrissia (formerly *Gundlachia*)	3	2.4					1				1	1	1	
Gyraulus	3	1.7							1					
Latia	3	6.1												
Lymnaeidae	3	1.2					1							
Melanopsis	3	1.9												
Physella (formerly *Physa*)	3	0.1					20		1					
Potamopyrgus	4	2.1			20		100	500	500	500	20	20	20	20
Sphaeriidae	3	2.9												
OLIGOCHAETA	1	3.8	100	100	5				1		100	5		
HIRUDINEA	3	1.2	1	5			1							
PLATYHELMINTHES	3	0.9	20	20	1		20				20			
NEMATODA	3	3.1		1										
NEMERTEA	3	1.8	20		1		20							1
CNIDARIA														
Hydra	3	1.6		20										
Total (Minimum) coded abundances (c_i)			243	679	69	211	190	532	633	509	322	113	49	57
Taxonomic richness			7	12	15	20	18	10	12	6	17	17	14	11
Taxonomic richness (MCI scoring taxa)			7	12	15	20	17	9	12	5	17	17	14	11
MCI value			65.7	76.7	68.0	123.0	71.8	84.4	86.7	104.0	107.1	103.5	108.6	90.9
MCI-SB value			48.3	50.7	76.0	129.1	58.2	78.4	77.2	98.0	105.9	106.2	113.3	95.3
SQMCI value			2.19	2.80	3.14	7.15	3.45	3.93	4.21	4.01	3.58	5.89	4.73	3.77
SQMCI-SB value			2.60	2.14	3.47	6.33	1.93	2.22	2.51	2.14	4.69	5.00	4.21	3.65
%EPT*			0.0	0.0	13.3	50.0	5.6	10.0	16.7	50.0	52.9	52.9	35.7	18.2

* Excludes *Oxyethira* & *Paroxyethira* (Hydroptilidae) [1] Addition to Stark *et al*. 2001 list. [2] Stark & Maxted 2007a. **Bold** tolerance values are assigned based on professional judgement.