Freshwater Macroinvertebrate State of the Environment Monitoring Report 2019-2023

Technical Report 24-89

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Executive summary

Benthic macroinvertebrates are aquatic species that play a crucial role in freshwater ecology. They respond to environmental variables including water quality, hydrology, and habitat, and are used worldwide as sub-indicators of stream health as they respond to human pressures, are taxonomically diverse, and are easy to sample.

Taranaki Regional Council (the Council) established its State of the Environment (SoE) monitoring programme in 1995, with the overall aim being to report on state and trends in freshwater health, to inform the development of RMA policies and to support the region's freshwater ecosystems. This programme is made up of a number of individual monitoring activities, many of which are undertaken and managed on an annual basis. Prior to 2022/23, macroinvertebrate fauna surveys were undertaken in spring (October to December) and summer (February to May). Since that time, surveys have been taken once a year during summer (February to May), following recommendations from the previous annual report. The methodology has remained relatively unchanged over time, and there are currently 67 sites monitored throughout 35 rivers and streams across the Taranaki region.

This annual report includes an assessment of Council's macroinvertebrate data against attributes set out in the *National Policy Statement for Freshwater Management 2020* (NPS-FM) in addition to an assessment against regionally-derived tolerance values and bands for Macroinvertebrate Community Index (MCI). This report therefore covers national macroinvertebrate tolerance values as well as National Objective Framework (NOF) bands for MCI, Semi-Quantitative MCI (SQMCI) and Average Score Per Metric (ASPM), with the inclusion of new data from the four monitoring years spanning 2019 to 2023. The report comprises three main sections: a regional state analysis of taxa richness and MCI scores using traditional regionally-derived scores and bands; a national state analysis of MCI, SQMCI, and ASPM using nationally-derived five-year medians and bands as required by the NPS-FM, and; a regional trend analysis of MCI scores using traditional regionally-derived scores.

The most recent monitoring year (2022/23), was assessed using regionally-derived MCI scores. Three sites (5%) were categorised as having 'excellent' health, 12 sites (19%) were categorised as having 'very good' health, 24 sites (37%) were categorised as having 'good' health, 21 sites (33%) were categorised as having 'fair' health, three sites (5%) were categorised as having 'poor' health, and one site (1%) was categorised as having 'very poor' health. Two new maximum scores and one new minimum were recorded.

The results indicated a gradual decline in macroinvertebrate community health in a downstream direction. Sites classified as 'excellent' are predominantly located near or within the boundaries of Te Papa-Kura-o-Taranaki, whereas sites scoring 'fair' or lower are closer to the coast. Enhancing stream health, especially at sites in the lower reaches of ring plain streams, is unlikely to be significant or meaningful without substantial improvements in habitat and water quality. Such improvements involve initiatives such as riparian fencing/planting and redirecting discharges from dairy pond treatment systems away from direct surface water disposal to land irrigation.

Analysis comparing data to NPS-FM NOF attributes showed that 52 of the 67 sites (78%) reported five-year median MCI scores above the national bottom line (≥90), with 15 sites (22%) falling below this threshold, indicating severe organic pollution or nutrient enrichment. Most sites (29, or 43%) were in band C, suggesting moderate pollution, while 12 sites (18%) were in band A, indicating pristine conditions. For SQMCI, 41 sites (61%) had median scores above the national bottom line (≥4.5), and 26 sites (39%) were below, reflecting severe pollution. The distribution was more evenly distributed across bands compared to MCI. There were 18 sites (27%) in band A, the highest proportion among the three metrics. For ASPM, 59 sites (88%) reported scores above the national bottom line (≥0.3), while 8 sites (12%) were below. Most

sites (34, or 51%) fell within band B, suggesting mild pollution, with only 9 sites (13%) in band A, indicating the lowest proportion of pristine conditions among the metrics assessed.

Overall, all three NPS-FM metrics show that water quality is higher within or near the boundary of Te Papa-Kura-o-Taranaki and decreases with distance from it. Band A sites are concentrated within or around the boundary for all metrics. Both MCI and ASPM showed similar patterns of distribution, with ASPM having smaller pockets of poor quality band D sites. The SQMCI attribute had the most pronounced indication of poor water quality.

In addition to reporting on state, a summary of the full 28 years (long-term) and the latest ten years (short-term) of data is provided to assess trends over time. Fifty-six sites had sufficient data (at least 10 years' of monitoring data) to perform a trend analysis. For long-term trends, 42 out of 56 (75%) sites had improving trends, while eight sites (14%) degraded. The remaining six sites were indeterminate. In contrast, short-term trends for the monitoring period of 2013 to 2023 were quite different, and indicated only 20 sites (34.5%) had improving trends, while 18 sites (31%) had degrading trends. The remaining 20 sites (34.5%) were indeterminate. When comparing the long-term and short-term datasets, the short-term trends had a more even distribution of positive, negative and indeterminate trends, with there now being over twice the amount of degrading sites than shown in the long-term trends. Typically, the sites which had healthy in-stream communities at the start of the monitoring programme have not shown large improvements in trend analyses, while sites with long-term trends showing the highest improvements were in relatively 'poor' health at the start of the monitoring programme.

For the 2023/24 monitoring year, the SoE programme will continue its freshwater macroinvertebrate monitoring using the same methods as in 2018/19, with some updates following recommendations including adding new sites to better represent underrepresented FMUs or catchment types (e.g., spring-fed) and reviewing the appropriateness of an existing site on the Uruti Stream. Where appropriate, site changes will be discussed with iwi/hapū, stakeholder and/or catchment community groups to explore additional data integration or alignment with other monitoring efforts. Annual updates on macroinvertebrate data trends will be maintained, and further analysis of the factors affecting macroinvertebrate health will be conducted to support policy and SoE reporting. Additionally, a comparison of regionally and nationally derived tolerance values and MCI scores will be performed to evaluate result similarities.

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1. Introduction

1.1 Background

Benthic (meaning "bottom-dwelling") macroinvertebrates encompass a diverse range of aquatic species that play a crucial role in freshwater ecology. They include small aquatic animals such as worms and crayfish (kōura) and the aquatic larval stages of insects such as mayflies, stoneflies, and caddisflies. Macroinvertebrates are found in and around water bodies, attaching themselves to rocks, vegetation, logs and sticks or burrowed into the bottom sand and sediments. Macroinvertebrates play integral roles in stream food webs, and their dynamics are shaped by physical, chemical, and biological conditions of the stream. They feed on organic matter such as periphyton, plants and macrophytes, debris, and each other. Additionally, they serve as important in-stream food sources for fish and wading birds. Macroinvertebrates in their larval stage will emerge from the water as adults, becoming food for terrestrial animals like birds, bats, and spiders.

Macroinvertebrates are recognised globally as sub-indicators of stream ecosystem health due to their diverse taxonomy, responsiveness to human impacts, and ease of sampling. Derived from community composition, macroinvertebrate indices effectively reflect the impacts of multiple stressors, serving as reliable indicators of overall stream ecosystem condition (Clapcott et al., 2017). They respond sensitively to changes in water quality, flow regime, habitat structure, and invasive species, making them capable of highlighting upstream stressors like habitat degradation or pollution (NEMS, 2022). For instance, discharge of effluent into a stream can diminish populations of sensitive taxa while potentially increasing those tolerant to such stressors.

Physico-chemical and biological monitoring are both critical for comprehensive freshwater management, and they offer complimentary insights into river health. Water quality monitoring measures physical and chemical parameters such as temperature, pH, and nutrient levels, and provides immediate data on the conditions of a water body. In contrast, biological monitoring assesses the health of aquatic communities such as macroinvertebrates, and reflects the cumulative effects of these conditions over time. By combining both approaches, the Council can gain a fuller understanding of how chemical changes impact the ecosystem, track long-term trends, and make informed decisions about resource management and impacts on freshwater.

1.2 General

The *Resource Management Act 1991* (RMA) has established requirements for local authorities to undertake environmental monitoring. Section 35 of the RMA requires local authorities to monitor, among other things, the state of the environment of their region or district, to the extent that is appropriate to enable them to effectively carry out their functions under the Act.

To this effect, Taranaki Regional Council (the Council) has established a state of the environment monitoring (SoE) programme for the region. This programme is outlined in the Council's 'State of the Environment Monitoring Procedures Document', which was prepared in 1997. The monitoring programme is based on the significant resource management issues that were identified in the *Council's Regional Policy Statement for Taranaki 1994*. The overall aim being to report on the state and trends of freshwater health to enhance the effectiveness of RMA policies and to support the region's freshwater ecosystems.

The SoE programme is made up of a number of individual monitoring activities, many of which are undertaken and managed on an annual basis (from 1 July to 30 June). For these monitoring activities, summary reports are produced to summarise regional environmental monitoring in relation to state and

trends. SoE reports also act as 'building blocks' towards the preparation of the regional state of the environment report every five years.

Traditionally, the Council has only reported on macroinvertebrate fauna using regionally-derived macroinvertebrate tolerance values for the calculations of the Macroinvertebrate Community Index (MCI) as well as regional bands and grading systems from these calculations (Taranaki Regional Council, 1997b). More recently, the Government's *National Policy Statement for Freshwater Management 2020* (NPS-FM) has made it compulsory for every regional council to monitor and report on stream health using various freshwater macroinvertebrate metrics. This report has been updated to incorporate these national standards, transitioning from using only regionally-derived tolerance values and bands for MCI calculations to include national macroinvertebrate tolerance values and National Objective Framework (NOF) bands for MCI, Semi-Quantitative MCI (SQMCI) and Average Score Per Metric (ASPM), using methodology suggested by the NPS-FM. These changes and additions are reiterated throughout the remaining sections of this report when necessary, but are summarised in the methodology.

This report summarises the results from 28 years of macroinvertebrate monitoring data up until June 2023, but will primarily focus on four monitoring years between July 2019 and June 2023, which covers the data period since the previous SoE macroinvertebrates report. This report has three main sections:

1. Regional State: assessing the current health of macroinvertebrate communities using the traditional regionally-derived score and band system using taxa richness and MCI;
2. National State: assessing the current state of macroinvertebrate communities using nationally-derived tolerance values and NOF bands using five-year medians for three attributes (macroinvertebrate community composition (MCI), semi-quantitative macroinvertebrate community index (SQMCI), and average score per metric (ASPM)), as suggested by the NPS-FM, and;
3. Regional Trend: identifying the long-term (28 years) and short-term (10 years) MCI trends using regionally-derived tolerance values to determine if macroinvertebrate health is improving or degrading at the monitored sites.

2. Monitoring methodology

2.1 Program design

Macroinvertebrates have been monitored annually under the SoE programme (from 1 July to 30 June) since the programme was initiated in 1995, with the methodology remaining largely unchanged over the years. The 2023 monitoring year marked the twenty-eighth consecutive year of this programme. Traditionally, monitoring surveys were conducted twice annually, once during spring (October to December) and again during summer (February to May). However, a recent review of the macroinvertebrate SoE programme concluded that reducing sampling frequency to once a year during summer (February to May) was appropriate (D. Sutherland, personal communication). This report includes both spring and summer results for the 2019/20 to 2021/22 monitoring periods, while presenting only summer results for the 2022/23 monitoring period.

Since its commencement, the programme has seen the inclusion and exclusion of various sites, with a total of 67 sites currently monitored. Most recently, nine new sites across the Eastern Hill Country and Coastal Terrace areas were added to fulfil the NPS-FM requirement of representative monitoring across all Freshwater Management Units (FMUs) within the region. Additionally, one site in the Mangawhero Stream was removed based on recommendations from the previous 2018/19 SoE Annual Report. This decision was made due to the site's poor habitat conditions, which did not accurately represent the stream's water quality or its catchment.

Due to the extensive duration of the data record and consistent methodology employed throughout the programme's history, it has accumulated statistically complete and robust data. Moreover, the dataset's length enables reliable detection of long-term trends. The methodology for the programme is comprehensively detailed in Taranaki Regional Council (1997b) and summarised below. Results will continue to be reported on a river/stream basis, with regional and national analyses presented separately to avoid confusion due to differences in methodology. This approach allows for the retention of Council-based indices and trend analyses for the full dataset while ensuring compliance with recent NPS-FM standards. Further details of these analyses can be found in the Environmental Parameters section.

The integration of the physico-chemical monitoring programme with the biological monitoring programme helps provide a more comprehensive assessment of freshwater health, as the physico-chemical data can be useful for interpreting biological monitoring results. These additional data help to establish the environmental conditions that may have influenced the presence, abundance, and overall state of macroinvertebrate communities, allowing for a more accurate assessment of the ecological health of each site. By aligning monitoring programmes, we ensure a better understanding of freshwater ecosystems in the region, where changes in water quality can be directly correlated to biological response, thereby enhancing the effectiveness of management strategies.

2.1.1 Site locations

All 67 sites in the freshwater biological SoE programme for the Taranaki region are described in Table 1 and illustrated in Figure 1. A history of site selection can be found in Appendix 1.

Note: Table is ordered in alphabetical order by site code, and rivers/streams with multiple sites are listed from upstream to downstream

Table 1 Freshwater biological monitoring sites in the State of the Environment Monitoring programme

River/stream	Site	Site code	River Environment Classification (REC) class[1]	GPS location	
				E	N
Herekawe Stream	Centennial Drive	HRK000085	WW/L/VA/U/MO/MG	1688283	5674972
Huatoki Stream	Hadley Drive	HTK000350	WX/L/VA/P/MO/LG	1693349	5671486
	Huatoki Domain	HTK000425	WW/L/VA/P/MO/LG	1693041	5673404
	Molesworth St	HTK000745	WW/L/VA/U/MO/MG	1692800	5676424
Kapoaiaia Stream	Wiremu Road	KPA000250	CX/H/VA/P/MO/MG	1678009	5652025
	Wataroa Road	KPA000700	CX/H/VA/P/MO/MG	1672739	5652272
	Cape Egmont	KPA000950	CX/L/VA/P/MO/LG	1665690	5652452
Kaūpokonui River	Opunake Road	KPK000250	CX/H/VA/IF/MO/MG	1698088	5639231
	U/S Kaponga oxi ponds	KPK000500	CX/H/VA/P/MO/MG	1698609	5634423
	U/S Lactose Co.	KPK000660	CX/H/VA/P/MO/LG	1697613	5629791
	Upper Glenn Road	KPK000880	CW/H/VA/P/MO/LG	1693026	5622705
	Near mouth	KPK000990	CW/L/VA/P/HO/LG	1691209	5620444
Kurapete Stream	U/S Inglewood WWTP	KRP000300	WX/L/VA/P/LO/LG	1705087	5665510
	D/S Inglewood WWTP	KRP000660	WW/L/VA/P/LO/LG	1709239	5667481
Katikara Stream	Carrington Road	KTK000150	CW/L/VA/P/HO/LG	1683566	5657855
	Beach	KTK000248	WX/L/VA/P/MO/LG	1676597	5667473
Makara Stream	120m U/S confluence with Waitara River	MAA000900	WW/L/SS/P/MO/MG	1717268	5669453
Mangorei Stream	SH3	MGE000970	CX/L/VA/P/MO/LG	1696094	5671500
Mangaehu River	Raupuha Road	MGH000950	CW/L/SS/P/HO/LG	1726300	5639062
Manganui River	SH3	MGN000195	CX/H/VA/P/MO/LG	1708871	5651282
	Bristol Road	MGN000427	CX/L/VA/P/HO/MG	1711210	5667887
Mangatī Stream	D/S Railway line	MGT000488	WN/L/VA/P/LO/LG	1700095	5678043
	Te Rima Place, Bell Block	MGT000520	WW/L/VA/U/LO/LG	1699385	5679103
Makuri Stream	30m D/S Raupuha Road	MKR000495	WW/L/SS/P/MO/LG	1723795	5641478
Maketawa Stream	Opp Derby Road	MKW000200	CX/H/VA/IF/MO/MG	1702192	5656304
	Tarata Road	MKW000300	CX/H/VA/P/MO/LG	1708784	5665231
Moumahaki Stream	Moumahaki at Johnston Road	MMK000050	WW/L/SS/P/MO/LG	1745684	5598975
Mangaoreti Stream	U/S of Avenue Rd Bridge	MNT000950	WW/L/SS/P/LO/LG	1722557	5682900
Mangaoraka Stream	Corbett Road	MRK000420	WW/L/VA/P/MO/LG	1702538	5676320
Mangaroa Stream	Vanners landfarm, Lower Ball Road	MRO000210	WD/L/VA/P/MO/LG	1720698	5602911

[1] The New Zealand River Environmental Classification (REC) system is a framework used to categorize rivers and river segments based on their physical and environmental characteristics, helping to standardize river management and research by providing a consistent basis for comparison. It provides a context for inventories of river/stream resources and a spatial framework for effects assessment, policy development, developing monitoring programmes, and interpretations of state of the environment reporting.

River/stream	Site	Site code	River Environment Classification (REC) class[1]	GPS location	
				E	N
Matau Stream	U/S confluence with unnamed trib.	MTA000068	CW/L/SS/P/LO/MG	1733965	5661062
Mangawhero Stream	D/S Mangawharawhara S	MWH000490	CN/L/VA/P/MO/LG	1710795	5632738
Pātea River	Barclay Road	PAT000200	CX/H/VA/IF/MO/MG	1702620	5646598
	Swansea Road	PAT000315	CX/H/VA/P/MO/LG	1711801	5644382
	Skinner Road	PAT000360	CW/L/VA/P/HO/LG	1715919	5644681
Pūnehu Stream	Wiremu Road	PNH000200	CX/H/YA/IF/MO/MG	1687323	5637020
	SH45	PNH000900	CW/L/VA/P/MO/LG	1677946	5627786
Stony (Hangatahua) River	Mangatete Road	STY000300	CX/H/VA/S/MO/MG	1677460	5657823
	SH45	STY000400	CX/H/VA/S/MO/MG	1674632	5661558
Timaru Stream	Carrington Road	TMR000150	CX/H/VA/IF/LO/HG	1684423	5659634
	SH45	TMR000375	CX/L/VA/P/MO/MG	1679509	5665554
Tāngāhoe River	Upper Valley	TNH000090	WW/L/SS/P/MO/LG	1725340	5626101
	Tangahoe Vly Rd bridge	TNH000200	WW/L/SS/P/HO/LG	1719126	5622681
	D/S rail bridge	TNH000515	WW/L/SS/P/HO/LG	1715751	5612470
Uruti River	SH3 Bridge	URU000198	WW/L/SS/P/MO/LG	1732463	5688339
Waiau Stream	Inland North Road	WAI000110	WW/L/VA/P/MO/LG	1714587	5680018
Waiau Stream (2)	Approx 1.2 km U/S of Hawkin Road	WIU000700	WD/L/VA/P/MO/LG	1744324	5590101
Waiongana Stream	SH3a	WGA000260	CX/L/VA/P/MO/LG	1705159	5669554
	Devon Road	WGA000450	WW/L/VA/P/MO/LG	1704063	5680381
Waingongoro River	700m D/S Nat Park	WGG000115	CX/H/VA/IF/LO/MG	1700835	5645086
	Opunake Road	WGG000150	CX/H/VA/P/LO/MG	1705692	5642523
	Eltham Road	WGG000500	CW/L/VA/P/MO/LG	1710576	5634824
	Stuart Road	WGG000665	CW/L/VA/P/HO/MG	1709784	5632049
	SH45	WGG000895	CW/L/VA/P/HO/LG	1704042	5618667
	Ohawe Beach	WGG000995	CW/L/VA/P/HO/MG	1702531	5617624
Waiwhakaiho River	National Park	WKH000100	CX/H/VA/IF/LO/HG	1696096	5658351
	SH3 (Egmont Village)	WKH000500	CX/H/VA/P/MO/MG	1698297	5666893
	Constance St (NP)	WKH000920	CX/H/VA/P/HO/LG	1695827	5677271
	Adjacent to L Rotomanu	WKH000950	CX/H/VA/P/HO/LG	1696587	5678336
Waiokura Stream	Skeet Road	WKR000500	WW/L/VA/P/MO/LG	1698807	5628892
	Manaia Golf Course	WKR000700	WW/L/VA/P/MO/LG	1697636	5622019
Waimōku Stream	Lucy's Gully	WMK000100	WW/L/VA/P/LO/HG	1681324	5666240
	Beach	WMK000298	WW/L/VA/P/MO/MG	1681725	5669851
Whenuakura River	Nicholson Road	WNR000450	WW/L/SS/P/HO/LG	1732757	5598479
Waikaramarama Stream	Waikaramarama Road - D/S of first bridge	WMR000100	WW/L/SS/P/LO/LG	1730866	5692865
Waitara River	Autawa Road	WTR000540	WX/L/SS/P/HO/LG	1720719	5663669
	Mamaku Road	WTR000850	WX/L/SS/P/HO/LG	1708384	5678739

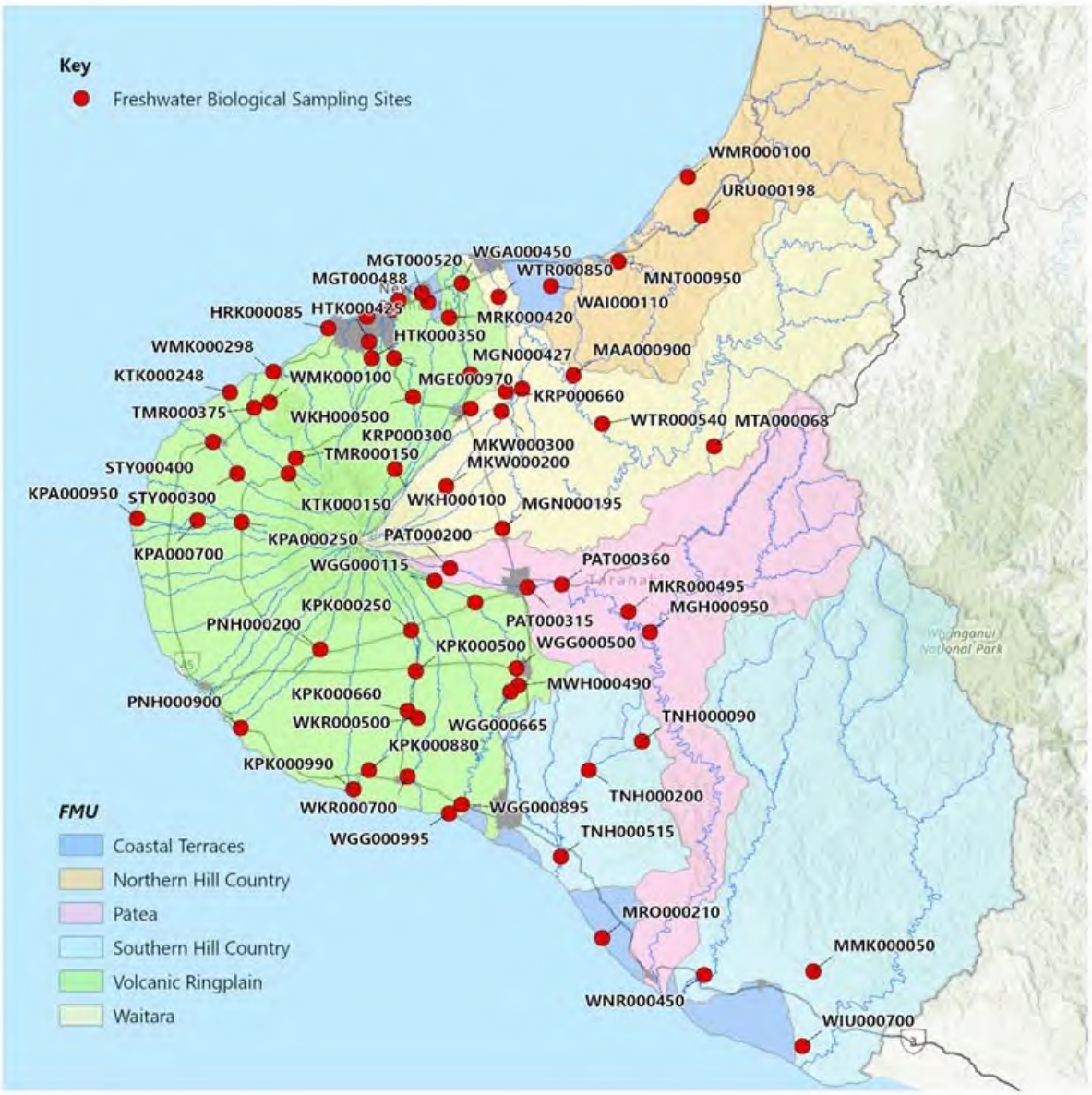

Figure 1 Freshwater biological monitoring sites in the State of the Environment Monitoring

Note: Freshwater Management Units (FMUs) are yet to be finalized and are subject to adoption of the Land and Water Plan

2.2 Sample collection and analysis

The standard '400ml kick-sampling' and occasionally the '400ml vegetation-sweep sampling' techniques were used to collect benthic (bottom-dwelling) macroinvertebrates from various sampling sites in selected catchments in the Taranaki region (Taranaki Regional Council, 1997b). The 'kick-sampling' and 'vegetation-sweep' sampling techniques are very similar to Protocols C1 (hard-bottomed, semi-quantitative) and C2 (soft-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark et al., 2001).

Samples were preserved with ethanol for later sorting and identification. This was carried out using a stereomicroscope, using protocols P1 (coded-abundance) and P2 (fixed-200) of NZMWG protocols for sampling macroinvertebrates in wadeable streams (Stark et al., 2001). In addition to a fixed 200 count, macroinvertebrate taxa were placed in abundance categories for each sample (Table 2).

Table 2 Macroinvertebrate abundance categories

Abundance category	Number of individuals
R (rare)	1-4
C (common)	5-19
A (abundant)	20-99
VA (very abundant)	100-499
XA (extremely abundant)	500+

2.2.1 Environmental parameters and indicators

2.2.1.1 Taxonomic richness

The number of macroinvertebrate taxa identified in each sample serves as an indicator of community richness at each site. It's important to note that high taxonomic richness does not necessarily indicate a pristine or healthy community. Sites with mild nutrient enrichment can often have higher taxonomic richness than pristine sites. Therefore, caution is required when interpreting results solely based on taxonomic richness (Stark and Maxted, 2007). From taxa identification, we can also calculate EPT number and EPT percentage from the taxa richness and macroinvertebrate abundances. EPT stands for Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies) which are three pollution sensitive insect orders. For this SoE report, while taxa richness is recorded and reported, it will not be used as an indicator of stream health due to these complexities and variations.

2.2.1.2 Macroinvertebrate Community Index (MCI)

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams. Highly 'sensitive' taxa are assigned the highest score of 10, while the most 'tolerant' taxa score 1. The MCI value is calculated by averaging the scores obtained from a list of taxa taken from one site, and multiplying by a scaling factor of 20. The MCI assesses the overall sensitivity of macroinvertebrate communities to primarily the effects of nutrient enrichment but has been used to assess a range of other pressures such as hydrological changes, sedimentation, and toxic pollutants. Communities considered more 'sensitive' typically inhabit less polluted waterways.

In all previous SoE macroinvertebrate reports sensitivity scores and bands for certain taxa had been modified in accordance with Taranaki experience (see Taranaki Regional Council, 1997b). Stark (1998) provides statistically significant detectable differences for the protocols used by the Council (10.8 MCI units). For this report, if differences between MCI scores are greater than 11 units, then we consider them to be significantly different (i.e., a downstream site scoring 11 units less than the upstream site may therefore be indicative of a degradation of health downstream). This generic adaption is considered to provide more resolution of stream 'health' as it provides precise upper and lower MCI and SQMCI score bands than the earlier grading classification (Stark and Fowles, 2015). Despite the acknowledgement that the boundaries between gradings may be fuzzy (Stark and Maxted, 2007), these gradings can assist with the assessment of trends in long-term temporal data.

Previously, the Council has only used regionally-derived tolerance values for the calculations of macroinvertebrate indices, as well as regional bands and grading systems from these calculations (see Taranaki Regional Council, 1997b). However, this report also applies the nationally-derived macroinvertebrate tolerance values and National Objective Framework (NOF) bands defined in Stark & Maxted (2007) as suggested by the NPS-FM. The NPS-FM requires sampling between November-April and reporting on five-year medians, rather than single survey scores. To overcome discrepancies with data and

reducing sampling to once annually, the NPS-FM five-year medians were calculated using only summer values from the previous five years, rather than incorporating spring values.

For reporting on five-year medians, NOF attribute bands as described by the NPS-FM were used. It differs from that used in previous reports and that of Stark & Maxted (2007). The Council system modifies Stark & Maxted (2007) by using a six band grading system while the NPS-FM differs from that of Stark & Maxted (2007) by the nomenclature used (e.g., 'band A' instead of 'excellent'), and where the bands sit in relation to MCI scores. The NPS-FM bands are more conservative in that band A is equal to or above 130 MCI units while in Stark and Maxted (2007) the equivalent band would be equal to or above 120. This is important to note that although this report presents results from both a regional and national perspective, the national perspective may not be useful when comparing to previous reports as this could make it appear that the health of a site has deteriorated when in fact it is a change in methodology. Reporting on both bands together aims to lessen any discrepancies. The NPS-FM will require councils to ensure that waterways have a minimum MCI score of 90 units based on the most recent five-year median.

Details of the MCI attribute and bands as described in Taranaki Regional Council (1997b) are described in Table 3, while details of MCI and NOF bands as described in the NPS-FM are described in Table 4.

Table 3 Generic MCI gradation of biological water quality conditions adapted for Taranaki streams and rivers

Council Grading	Council MCI	Colour Code	Stark's classification
Excellent	≥140		Excellent
Very Good	120-139		
Good	100-119		Good
Fair	80-99		Fair
Poor	60-79		Poor
Very Poor	<60		

2.2.1.3 Semi Quantitative MCI (SQMCI)

The NPS-FM requires that QMCI is calculated alongside MCI. Traditionally, the Council uses the semi-quantitative version (SQMCI; Stark 1998 & 1999) which is calculated from the taxa present at each site. The SQMCI is calculated by multiplying each taxon score by a loading factor (related to its abundance), summing these products, and dividing by the sum of the loading factors. The loading factors are 1 for rare (R), 5 for common (C), 20 for abundant (A), 100 for very abundant (VA) and 500 for extremely abundant (XA). Unlike the MCI, the SQMCI is not multiplied by a scaling factor of 20. As a result, its corresponding range of values is 20x lower than MCI. The SQMCI produces very similar values to the QMCI, and can generally be considered analogous to the QMCI in terms of interpreting SQMCI scores in relation to NPS-FM requirements.

In previous SoE reports, SQMCI scores were not reported on in individual site analyses. This is due to Stark & Maxted (2007) considering the MCI to be a more appropriate index for SoE monitoring and discussion. Therefore, in this report, more emphasis has been placed on the MCI in the regional results. However, five-year medians using nationally-derived values has been reported in the national results section, as the NPS-FM requires councils to ensure that waterways have a minimum QMCI score of 4.5 units.

Details of the QMCI numeric attributes as described in the NPS-FM are in Table 4. The SQMCI scores calculated will use the same band and state descriptions.

Table 4 NOF Attribute – Macroinvertebrates (1 of 2). Source: MfE, 2020

Value (and component)	Ecosystem health (aquatic life)	
Freshwater body type	Wadeable rivers	
Attribute unit	Macroinvertebrate Community Index (MCI) score; Quantitative Macroinvertebrate Community Index (QMCI) score	
Attribute band and description	**Numeric attribute states**	
	QMCI	MCI
A Macroinvertebrate community, indicative of pristine conditions with almost no organic pollution or nutrient enrichment.	≥6.5	≥130
B Macroinvertebrate community indicative of mild organic pollution or nutrient enrichment. Largely composed of taxa sensitive to organic pollution/nutrient enrichment.	≥5.5 and <6.5	≥110 and <130
C Macroinvertebrate community indicative of moderate organic pollution or nutrient enrichment. There is a mix of taxa sensitive and insensitive to organic pollution/nutrient enrichment.	≥4.5 and <5.5	≥90 and <110
National bottom line	**4.5**	**90**
D Macroinvertebrate community indicative of severe organic pollution or nutrient enrichment. Communities are largely composed of taxa insensitive to inorganic pollution/nutrient enrichment.	<4.5	<90
MCI and QMCI scores to be determined using annual samples taken between 1 November and 30 April with either fixed counts with at least 200 individuals, or full counts, and with current state calculated as the five-year median score. All sites for which the deposited sediment attribute does not apply, whether because they are in river environment classes shown in Table 25 in Appendix II C or because they require alternate habitat monitoring under clause 3.25 are to use soft sediment sensitivity scores and taxonomic resolution as defined in table A1.1 in Clapcott et al., 2017 Macroinvertebrate metrics for the National Policy Statement for Freshwater Management. Cawthron Institute: Nelson, New Zealand. (see clause 1.8). MCI and QMCI to be assessed using the method defined in Stark JD, and Maxted, JR. 2007 A user guide for the Macroinvertebrate Community Index. Cawthron Institute: Nelson, New Zealand (See Clause 1.8), except for sites for which the deposited sediment attribute does not apply, which require use of the soft-sediment sensitivity scores and taxonomic resolution defined in table A1.1 in Clapcott et al., 2017 Macroinvertebrate metrics for the National Policy Statement for Freshwater Management. Cawthron Institute: Nelson, New Zealand. (see clause 1.8).		

2.2.1.4 Average Score Per Metric (ASPM)

The NPS-FM also requires reporting of ASPM, introducing a third numeric attribute state to assess macroinvertebrate community health. ASPM is a multiple index metric that uses MCI, EPT number and EPT percentage scores (Collier, 2008). EPT stands for Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies) which are three pollution sensitive insect orders. ASPM standardises the three metrics by dividing values by the maximum values to obtain a value between 0 and 1. For this report maximum values are those used by the NPS-FM (MCI = 200, EPT number = 29, and EPT percentage = 100) which is derived from Collier (2008). The standardised values are then averaged to produce the ASPM. The NPS-FM requires councils ensure that streams have a minimum ASPM score of 0.3 units.

ASPM is not an attribute calculated using regional tolerance values, and thus will only be included in the national analysis section of this report. Details of the ASPM numeric attribute as described in the NPS-FM are in Table 5.

Table 5 NOF Attribute – Macroinvertebrates (2 of 2). Source: MfE, 2020

Value (and component)	Ecosystem health (aquatic life)
Freshwater body type	Wadeable rivers
Attribute unit	Macroinvertebrate Average Score Per Metric (ASPM)
Attribute band and description	**Numeric attribute states ASPM score**
A Macroinvertebrate communities have high ecological integrity, similar to that expected in reference conditions.	≥0.6
B Macroinvertebrate communities have mild-to-moderate loss of ecological integrity	<0.6 and ≥0.4
C Macroinvertebrate communities have moderate-to severe loss of ecological integrity.	<0.4 and ≥0.3
National bottom line	**0.3**
D Macroinvertebrate communities have severe loss of ecological integrity.	<0.3
ASPM scores to be determined using annual samples taken between 1 November and 30 April with either fixed counts with at least 200 individuals, or full counts, and with current state calculated as the five-year median score. All sites for which the deposited sediment attribute does not apply, whether because they are in river environment classes shown in Table 25 in Appendix II C or because they require alternate habitat monitoring under clause 3.25, are to use soft-sediment sensitivity scores and taxonomic resolution as defined in table A1.1 in Clapcott et al., 2017. Macroinvertebrate metrics for the National Policy Statement for Freshwater Management. Cawthron Institute: Nelson, New Zealand. (see clause 1.8) When normalising scores for the ASPM, use the following minimums and maximums: %EPT-abundance (0-100), EPT-richness (0-29), MCI (0-200) using the method of Kevin J Collier (2008). Average score per metric: An alternative metric aggregation method for assessing wadeable stream health. New Zealand Journal of Marine and Freshwater Research, 42:4, 367-378, DOI: 10.1080/00288330809509965. (see clause 1.8)	

2.2.1.5 Predictive measures using the MCI

In previous SoE reports, measured MCI values were compared against two separate predictive models.

The first predictive model applied data from ring plain rivers and streams where the source of flow was within Te Papa-Kura-o-Taranaki. The intention being to establish an expected relationship between MCI scores and distance from stream/river source (Te Papa-Kura-o-Taranaki boundary) for sites on the ring plain. A generic relationship for predicting MCI in ring plain streams/rivers was established as:

$$MCI = 131.717 - 25.825 \log_{10} D \quad \text{[where D = distance from source (km)]}$$

This was based upon more than 2400 Council surveys of about 300 ring plain 'control' sites over the period from 1980 to 2008. This generic predictive relationship has a margin of error of ±10 units (Stark and Fowles, 2009).

The second predictive model used data from Leathwick (personal communication, 2009) which developed predictive scores based upon the River Environmental Classification (REC) system for New Zealand rivers and streams (Snelder et al., 2004). REC classifies and maps river and stream environments in a spatial framework for management purposes. It provides a context for inventories of river/stream resources and a spatial framework for effects assessment, policy development, developing monitoring programmes, and interpretations of state of the environment reporting.

In this report, the Council has chosen to not compare the 2022/23 results against these predictive scores directly within the main body of the document, as the primary scope of this report is to present and analyse data to report on state and trends. However, the Council recognises the value of these scores to provide a

more comprehensive understanding of how the current state may compare to these predictive scores, therefore a table of both predictive scores (if applicable) alongside the most recent regionally-derived MCI results from 2022/23 monitoring year can be found in Appendix II.

2.3 Flows

Hydrological flow recorders continuously monitor water levels in the Mangaoraka, Waiongana, Pūnehu, Kapoaiaia, Waiokura Streams, and the Waiwhakaiho, Manganui, Pātea, Mangaehu, Waingongoro, Kaūpokonui, Waitara, and Whenuakura Rivers. The proximity of previous freshes (elevated flows), along with the temperature at the time of sampling for each site surveyed are summarised in Appendix III, with flow assessments extrapolated from nearby catchments for sites where flow recorders did not exist.

For SoE purposes, flow protocols prevent sampling within seven days after a three times median fresh or ten days after a seven times median fresh, as higher flows disturb community composition and abundance. Other environmental data collected included temperature, periphyton, moss, leaves, woody debris, macrophytes, substrate, erosion, and degree of shading.

2.4 Trend analysis

An important use of long-term monitoring is being able to detect the health of streams and whether conditions have deteriorated, improved, or remained the same over time. The MCI index is an appropriate and easily understood measure of stream health, and was deemed as the most appropriate for the assessment of site health over time (Stark and Maxted, 2007).

In previous SoE reports, time trends were analysed using a traditional Null-Hypothesis Significance Testing (NHST) approach which reported p-values and false-discovery rates. In this report, the time trend analysis has been altered to meet best practise, which moves away from this traditional analysis and instead follows the Trends Direction Assessment (TDA) method of McBride (2019). This change provides a small shift in analysis and reporting of results, however favours a continuous measure using confidence in trend direction. This change addresses the null-hypothesis conflict applied in the NHST and instead assumes that data will always either increase or decrease over time (Snelder et al., 2021).

For this report, regionally-derived MCI scores for the full monitoring (01 July 1995 – 30 June 2023) and previous ten year (01 July 2013 – 30 June 2023) periods were analysed for trends. Sites that did not have at least 10 years of data were excluded from this analysis, as anything with less than 10 years of data does not have sufficient data collected to calculate trends effectively.

In this assessment, trend direction was determined using a Mann-Kendall test, a non-parametric method for assessing the monotonic association between the MCI index and time. The results of this assessment yield valuable information such as annual change (expressed as annual percentage of change), and likelihood/confidence levels. These levels are derived from the Kendall statistic and are used to assign trend directions. It is crucial to note that these confidence levels and resultant trend categories do not reflect the rate of change itself. Some sites may exhibit minor changes but with a high confidence in either improvement or degradation.

For this SoE report the categories have been streamlined into five categories to capture the overall trend, aligning with LAWA trend categories (LAWA, 2023). Trends indicating a likelihood of 90% and 100% are classified as ‘very likely improving’. Those showing a 67% to 90% likelihood are categorized as 'likely improving'. 'Very likely degrading' and 'likely degrading' trends cover the same likelihood ranges, with the category determined by the direction of the slope (positive or negative) calculated in the TDA. A likelihood of 50% to 66% results in a categorisation of ‘indeterminate’, indicating no clear upward or downward trend at the site. These confidence categories are summarised in Table 6.

Note: Reported as likelihood of an improving (increasing), degrading (decreasing), or indeterminate trend. Direction symbols received from LAWA (2023).

Table 6 Confidence categories for trend direction results

Confidence Category	Likelihood range in direction range	
Very Likely Improving	90-100%	
Likely Improving	67–90%	
Indeterminate	50-66%	
Likely Degrading	67–90%	
Very Likely Degrading	90-100%	

Regarding the MCI, an upward trend reflects improvement at a site and a downward trend reflects degradation. To analyse the trend analysis results, the trend direction, confidence/likelihood of that direction being true, and the annual percentage of change must all be taken into account.

It's important to note that the trend analysis methods used here focus solely on identifying monotonic trends and do not investigate causation or correlations with underlying factors driving these trends. Trends observed in the analysis may reflect environmental variations such as rainfall, stream flow, and temperature fluctuations over time. Environmental conditions often show non-monotonic behaviour, influenced by events like floods, which can cause abrupt changes at monitoring sites (Graham et al., 2020). The Council's SoE program for freshwater macroinvertebrates conducted biannual monitoring (in spring and summer) until the 2021/22 period. Consequently, these data may exhibit seasonal patterns. Seasonality was not specifically tested in the data analysed for the TDA, but exploring seasonal variations could potentially offer a more detailed understanding of long-term trends. For detailed spring versus summer analyses, refer to previous annual reports.

3. Results

3.1 Regional state of macroinvertebrate communities (Council values and bands)

The following section will report on taxa richness and regionally-derived MCI scores. Results from the 2019/20, 2020/21, 2021/22, and 2022/23 monitoring years can be found in Table 7 below. MCI scores are coloured according to the grading system described in Table 3.

During the 2019/20 monitoring year, taxa richness across the region ranged from 6-31 taxa, while MCI scores ranged from 58-145 units. During the 2020/21 monitoring year, taxa richness across the region ranged from 5-29 taxa, while MCI scores ranged from 56-151 units. During the 2021/22 monitoring year, taxa richness across the region ranged from 4-30 taxa, while MCI scores ranged from 64-150 units. All periods recorded generally similar ranges.

The results from the 2022/23 monitoring year are illustrated in Figure 2. Additionally, a breakdown of the most recent 2022/23 taxa richness and regionally-derived MCI scores alongside the historical ranges and medians for each site for the entire dataset can be found in Appendix IV.

An individual discussion broken down by river/stream can be found below. Individual site graphs reporting on taxa richness and MCI, as well as recent 2022/23 macroinvertebrate community results for each site are reported in Appendix V.

Note: MCI scores are coloured according to their respective band ranging from 'very poor' to 'excellent'. Data for the 2019/20, 2020/21, and 2021/22 periods are broken down by their spring and summer results. The 2022/23 monitoring year was the first year in which the programme was only sampled once during the summer period. Colour key indicates category of MCI health as described by the Council: excellent (dark blue), very good (light blue), good (green), fair (yellow), poor (orange) and very poor (red). "-" indicates that the sample was not taken during that monitoring period

Table 7 Taxa richness and regionally-derived MCI scores for the reporting period (2019/20 to 2022/23)

River	Site	2019/20				2020/21				2021/22				2022/23	
		MCI		Taxa		MCI		Taxa		MCI		Taxa		MCI	Taxa
		Spring	Summer	Spring	Summer	Spring	Summer	Spring	Summer	Spring	Summer	Spring	Summer	Summer	
Herekawe Stream	HRK000085	94	88	17	17	82	93	17	15	95	99	17	19	94	17
Huatoki Stream	HTK000350	104	97	24	22	104	102	22	20	105	101	22	24	101	23
	HTK000425	98	94	22	26	107	104	20	28	108	109	21	20	108	23
	HTK000745	79	66	16	13	91	90	14	20	86	74	14	13	87	17
Kapoaiaia Stream	KPA000250	115	113	24	24	126	110	18	20	119	119	24	19	127	19
	KPA000700	103	100	19	19	92	95	18	23	103	88	18	18	112	18
	KPA000950	90	88	21	16	93	87	15	19	92	96	15	19	95	15
Kaūpokonui River	KPK000250	138	125	24	26	136	127	26	27	140	131	24	22	135	23
	KPK000500	128	115	26	22	126	122	22	26	133	116	21	21	128	21
	KPK000660	117	119	26	14	104	106	18	24	119	104	23	20	109	20
	KPK000880	89	106	13	13	103	91	18	18	101	94	20	14	100	11
	KPK000990	91	89	15	19	102	86	21	21	99	91	19	15	90	12
Kurapete Stream	KRP000300	104	93	17	14	96	96	14	16	92	97	13	13	100	17
	KRP000660	98	94	18	25	94	95	24	22	97	112	21	17	104	20
Katikara Stream	KTK000150	136	134	16	20	151	145	14	19	134	137	17	13	145	20
	KTK000248	98	88	19	16	100	95	22	20	100	105	19	24	94	21
Makara Stream	MAA000900	107	100	11	6	77	106	13	19	91	96	14	15	92	17
Mangorei Stream	MGE000970	105	88	20	18	96	106	22	28	105	97	27	23	93	15
Mangaehu River	MGH000950	97	98	19	10	98	91	17	18	108	90	13	21	104	18
Manganui River	MGN000195	125	134	13	20	121	128	17	24	125	126	16	16	136	16
	MGN000427	107	84	15	18	101	101	25	17	101	96	22	17	110	18
Mangati Stream	MGT000488	85	62	15	12	73	60	17	10	83	72	13	15	84	15

River	Site	2019/20				2020/21				2021/22				2022/23	
		MCI		Taxa		MCI		Taxa		MCI		Taxa		MCI	Taxa
		Spring	Summer	Spring	Summer	Spring	Summer	Spring	Summer	Spring	Summer	Spring	Summer	Summer	
	MGT000520	58	69	8	11	56	75	10	11	80	68	9	10	58	8
Makuri Stream	MKR000495	90	93	12	20	104	94	15	17	104	93	17	15	102	22
Maketawa Stream	MKW000200	131	130	28	23	130	129	25	26	131	136	23	15	133	17
	MKW000300	113	97	21	19	109	109	21	21	110	110	21	21	108	22
Moumahaki Stream	MMK000050	-	85	-	13	73	82	19	18	94	89	17	17	78	11
Mangaoreti Stream	MNT000950	-	-	-	-	82	70	10	10	64	65	5	4	80	8
Mangaoraka Stream	MRK000420	96	87	17	27	80	81	14	19	90	92	23	23	93	24
Mangaroa Stream	MRO000210	-	-	-	-	68	84	10	15	-	74	-	10	78	10
Matau Stream	MTA000068	110	104	18	26	103	106	24	21	102	105	21	30	108	20
Mangawhero Stream	MWH000490	89	92	20	18	97	97	19	23	91	91	21	20	101	21
Pātea River	PAT000200	135	128	31	26	136	137	29	27	150	137	21	27	145	27
	PAT000315	121	107	27	24	114	116	21	20	121	126	22	17	120	20
	PAT000360	101	77	21	15	85	89	16	23	102	100	19	24	103	20
Punehu Stream	PNH000200	139	121	21	28	133	129	23	19	138	123	23	19	124	19
	PNH000900	97	98	24	18	98	90	19	16	108	105	20	17	115	17
Stony River	STY000300	113	114	11	13	107	120	9	8	116	110	11	4	108	10
	STY000400	98	105	11	13	120	125	11	11	100	124	13	5	128	5
Timaru Stream	TMR000150	140	136	28	24	143	132	24	21	138	143	23	22	131	23
	TMR000375	110	82	21	18	114	105	22	27	122	117	19	21	116	24
Tangahoe River	TNH000090	102	90	9	26	95	92	22	15	-	93	-	9	114	7
	TNH000200	104	101	14	18	94	103	16	21	116	102	20	12	109	9
	TNH000515	98	86	18	19	95	93	11	24	101	85	19	12	94	16
Uruti Stream	URU000198	96	91	17	21	88	90	21	20	95	91	22	14	77	15
Waiau Stream	WAI000110	90	86	18	19	91	92	22	17	91	86	15	22	97	12
Waiongana Stream	WGA000260	97	83	18	16	110	91	16	22	90	94	21	25	98	20
	WGA000450	104	78	19	20	95	89	16	24	84	96	21	25	88	18

River	Site	2019/20				2020/21				2021/22				2022/23	
		MCI		Taxa		MCI		Taxa		MCI		Taxa		MCI	Taxa
		Spring	Summer	Spring	Summer	Spring	Summer	Spring	Summer	Spring	Summer	Spring	Summer	Summer	
Waingongoro River	WGG000115	145	137	22	24	143	145	23	22	139	143	21	19	140	26
	WGG000150	122	126	20	25	130	131	21	19	138	139	21	18	127	15
	WGG000500	99	108	20	22	109	104	23	16	106	117	23	18	107	14
	WGG000665	93	101	15	20	96	101	16	22	96	107	20	15	106	16
	WGG000895	95	90	20	22	92	98	22	17	94	95	23	23	98	21
	WGG000995	91	91	26	13	79	94	16	21	83	86	15	27	93	20
Waiau Stream (2)	WIU000700	-	-	-	-	68	70	5	12	71	77	11	12	-	-
Waiwhakaiho River	WKH000100	140	128	22	20	129	140	16	22	138	135	29	19	136	19
	WKH000500	111	102	20	25	80	103	14	19	107	97	23	22	105	19
	WKH000920	105	71	22	13	86	83	21	13	-	103	-	20	98	9
	WKH000950	91	82	18	10	86	78	18	17	99	79	18	19	91	11
Waiokura Stream	WKR000500	108	110	20	18	117	104	21	16	110	108	23	18	117	18
	WKR000700	105	106	16	17	99	98	20	18	109	103	16	15	109	14
Waimoku Stream	WMK000100	124	134	23	16	131	137	27	15	120	131	21	17	133	21
	WMK000298	100	101	19	17	96	94	21	17	115	98	17	11	96	20
Waikaramarama Stream	WMR000100	-	-	-	-	101	100	18	20	95	100	21	27	98	13
Whenuakura River	WNR000450	91	82	19	11	76	91	11	20	86	91	13	14	-	-
Waitara River	WTR000540	100	83	19	8	98	103	12	13	104	95	18	22	-	-
	WTR000850	100	71	13	9	107	87	9	14	80	91	10	17	80	12

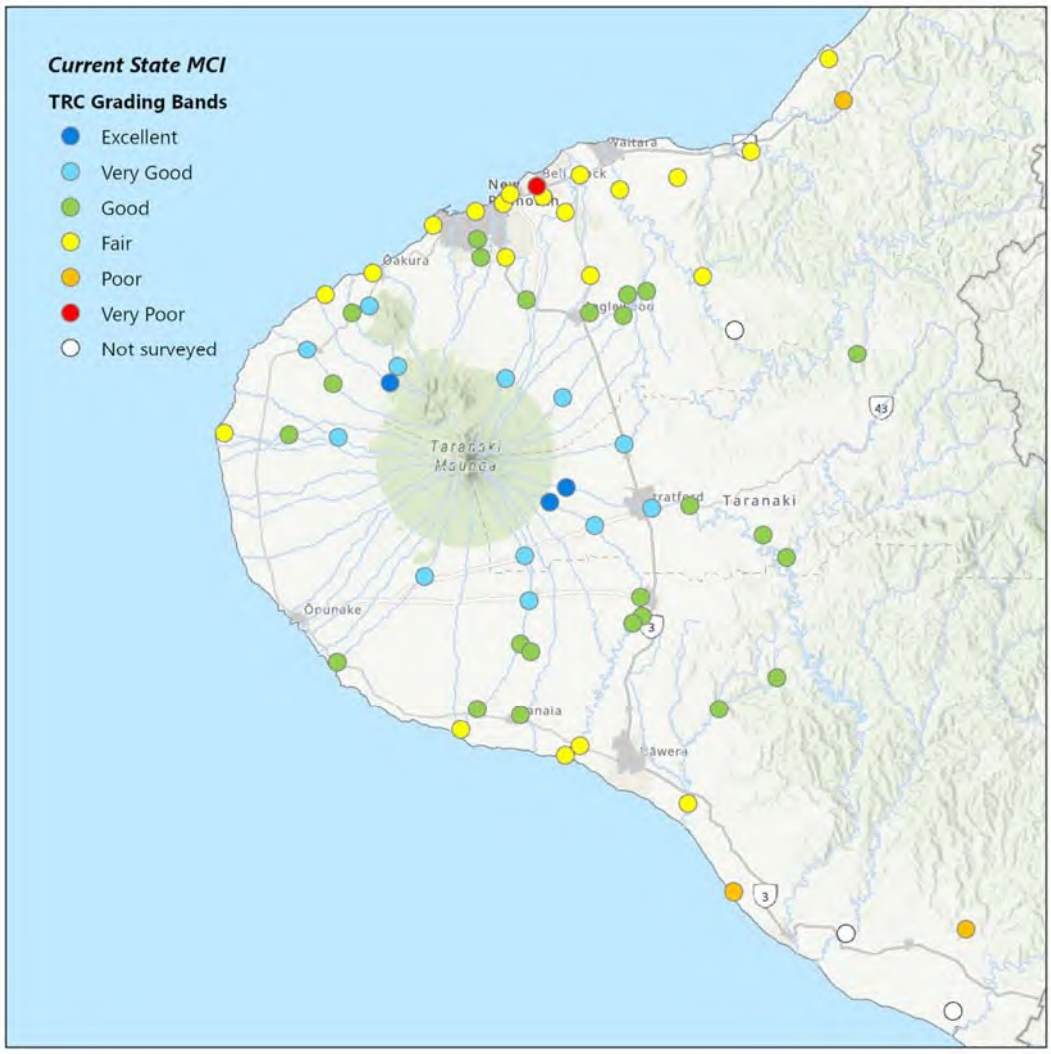

Figure 2 Regionally-derived MCI grades for the 67 macroinvertebrate sites monitored in the Taranaki region during the 2022/23 monitoring year

3.1.1 Individual site results

Herekawe Stream

The Herekawe Stream is a small lowland coastal stream which terminates at Paritūtū Beach on the western perimeter of New Plymouth City. One site is monitored in the lower reaches of the Herekawe Stream. Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 8.

Table 8 Results from SoE surveys performed in the Herekawe Stream together with 2022/23 results

Site	First Sample Date	n	SoE Data 1995-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
HRK000085	31/08/1995	53	13-29	18	68-100	89	17	94	Fair

Since the 2019/20 monitoring period, taxa richness has ranged between 15 and 19 at this site. In the most recent 2023 survey, a moderate taxa richness of 17 was recorded, which is similar to the historical median value and within the range previously recorded throughout all surveys.

Since the 2019/20 monitoring year, MCI scores have ranged between 82 units and 99 units at this site. In the most recent survey, an MCI score of 94 units was recorded at this site. This score categorised this site as having 'fair' macroinvertebrate community health. This score was similar to the historical median.

Huatoki Stream

The Huatoki Stream is a small ringplain stream arising outside Te Papa-Kura-o-Taranaki that flows south to north with the middle and lower parts of the catchment in the New Plymouth city area. There are three SoE sites on this stream. Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 9.

Table 9 Results from SoE surveys performed in the Huatoki Stream together with 2022/23 results

Site	First Sample Date	n	SoE Data 1996-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
HTK000350	24/12/1996	51	19-34	25	79-115	99	23	101	Good
HTK000425	24/12/1996	51	17-32	25	90-117	104	23	108	Good
HTK000745	24/12/1996	51	11-27	20	56-102	86	17	87	Fair

Since the 2019/20 monitoring year, taxa richness ranged between 20 and 24 taxa at site HTK000350, 20 and 28 taxa at site HTK000425, and 13 and 20 taxa at site HTK000745.

In the most recent 2023 survey, a taxa richness of 23, 23, and 17 was recorded at sites HTK000350, HTK000425, and HTK000754 respectively. All sites recorded less than their respective site medians, however still recorded within the ranges of those recorded previously.

Since the 2019/20 monitoring year, MCI scores ranged from 97 and 105 units at site HTK000350, 94 and 108 units at site HTK000425, and 66 and 91 units at site HTK000745. These ranges have indicated there is usually an overall decrease in health between the upper two sites and the most downstream site.

During the most recent survey, MCI scores of 101 units, 108 units, and 87 units were recorded at sites HTK000350, HTK000425, and HTK000745 respectively. These scores categorised HTK000350 and HTK000425 as having 'good' macroinvertebrate community health, while HTK000745 recorded 'fair' health. This showed a decrease in health in a downstream direction, with the two upstream sites scoring similar to each other, but both significantly higher than the downstream HTK000745 site (by 14 and 21 units respectively). This is a typical pattern of the two upstream sites, as seen by the ranges sitting slightly higher than that of the downstream site. All sites recorded slightly higher MCI scores comparative to historical medians however, not significantly. When comparing results, the two upstream sites had three 'highly sensitive' taxa present while the downstream site recorded only one sensitive taxon. Additionally, the downstream site had less EPT taxa present than the two upstream sites leading to a decrease in MCI score. The significant decrease at the lower site can be attributed to increased urbanisation, habitat modification and subsequent deterioration in water quality.

Kapoaiaia Stream

The Kapoaiaia Stream is a small ringplain stream running in a westerly direction with a source situated inside Te Papa-Kura-o-Taranaki. This stream was selected for the purpose of monitoring a western Taranaki ringplain catchment with minimal existing riparian vegetation cover. Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 10.

Table 10 Results from SoE surveys performed in the Kapoaiaia Stream together with 2022/23 results

Site	First Sample Date	n	SoE Data 1996-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
KPA000250	23/03/1998	46	18-31	24	83-131	117	19	127	Very Good
KPA000700	10/12/1996	46	12-30	21	78-118	97	18	112	Good
KPA000950	10/12/1996	46	15-25	19	76-101	87	15	95	Fair

Since the 2019/20 monitoring year, taxa richness ranged between 18 and 24 taxa at site KPA000250, 18 and 23 taxa at site KPA000700, and 15 and 21 taxa at site KPA000950.

In the most recent 2023 survey, a taxa richness of 19, 18, and 15 was recorded at sites KPA000250, KPA000700, and KPA000950 respectively. All sites recorded lower taxa richness than historical medians, and were within the lower ranges of what has previously been recorded, with the downstream site KPA000950 recording a taxa richness equal to the lowest recorded for the site to date.

Since the 2019/20 monitoring year, MCI scores ranged between 110 to 126 units at site KPA000250, 88 to 103 units at site KPA000700, and 87 to 96 units at site KPA000950.

In the most recent 2023 survey, MCI scores of 127 units, 112 units, and 95 units were recorded at sites KPA000250, KPA000700, and KPA000950 respectively. These scores categorised site KPA000250 as having 'very good' macroinvertebrate community health, site KPA000700 as having 'good' health, and site KPA000950 as having 'fair' health. This showed a decrease in health in a downstream direction, with each site being significantly lower than the last. This is reflected by the macroinvertebrate community composition, with the upstream site KPA000250 recording seven 'highly sensitive' taxa, while sites KPA000700 and KPA000950 only had five and two of these taxa present respectively. All sites recorded MCI scores which were higher than their respective medians, with the middle site KPA000700 recording a significant higher score (by 15 units).

The deterioration in macroinvertebrate health in a downstream direction is likely due to impacts associated with agriculture as the mid to lower reaches of the stream are in an agriculture dominated catchment.

Kaūpokonui River

The Kaūpokonui River is a ringplain river with its source inside Te Papa-Kura-o-Taranaki which flows in a southerly direction, terminating at Kaūpokonui Beach. Five sites located along the length of the Kaūpokonui River are included in the SoE programme. Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 11.

Table 11 Results from SoE surveys performed in the Kaūpokonui River together with 2022/23 results

Site	First Sample Date	n	SoE Data 1995-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
KPK000250	24/03/1998	47	20-36	27	124-140	130	23	135	Very Good
KPK000500	16/02/1996	50	20-33	26	98-138	118	21	128	Very Good
KPK000660	12/12/1995	54	14-32	24	71-128	104	20	109	Good
KPK000880	12/12/1995	54	13-31	18	66-110	91	11	100	Good
KPK000990	19/10/1999	46	11-26	19	69-103	91	12	90	Fair

Since the 2019/20 monitoring year, taxa richness ranged between 22 and 27 taxa at site KPK000250, 21 and 26 taxa at site KPK000500, 14 and 26 taxa at site KPK000660, 13 and 20 taxa at site KPK000880, and 15 and 21 taxa at site KPK000990.

In the most recent 2023 survey, macroinvertebrate taxa richness was low to moderate at the five Kaūpokonui sites, ranging from 11-23 taxa. All sites recorded lower than their respective medians, with site KPK000880 recording the lowest taxa richness for the site to date.

Since the 2019/20 monitoring year, MCI scores ranged between 125-140 units at site KPK000250, 115-133 units at site KPK000500, 104-119 units at site KPK000660, 89-106 units at site KPK000880, and 86-102 units at site KPK000990.

In the most recent 2023 survey, MCI scores of 135 units, 128 units, 109 units, 100 units, and 90 units were recorded at sites KPK000250, KPK000500, KPK000660, KPK000880, and KPK000990 respectively. These scores categorised site KPK000250 and KPK000500 as having 'very good' macroinvertebrate community health, sites KPK000660 and KPK000880 as having 'good' health, while downstream KPK000990 had 'fair' health. All sites scored MCI scores that were similar to or higher than their respective site medians.

MCI scores recorded at the five sites monitored indicated a decrease in health in a downstream direction, with upstream sites KPK000250 and KPK000500 scoring significantly higher than the three downstream sites. Both upstream sites recorded more 'highly sensitive' taxa (10 at KPK000250, seven at KPK000500), with the three downstream sites having less of these taxa present (three at KPK000660, one at KPK000880 and one at KPK000990). The most downstream KPK000990 recorded the lowest MCI of the five sites, but was not significantly lower than the KPK000880 site just 5.4km upstream. This decrease is typical, with the downstream KPK000990 scoring 45 MCI units less than the most upstream KPK000250, which is only located 3.3km from the ringplain of Te Papa-Kura-o-Taranaki.

The general deterioration in macroinvertebrate health is likely due to cumulative inputs from point and diffuse sources in a catchment dominated by agriculture, which also has industrial and urban influence.

Kurapete Stream

The Kurapete Stream is a ringplain seepage-sourced stream running in an easterly direction that flows into the Manganui River, which is itself a tributary of the Waitara River. Two sites, one located immediately upstream of the Inglewood Wastewater Treatment Plant (WWTP) and the other nearly six km downstream, are included in the SoE programme for the purposes of long-term monitoring of the impacts of the removal of the treated wastewater discharge from the stream and also, riparian vegetation planting initiatives in the catchment.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 12.

Table 12 Results from SoE surveys performed in Kurapete Stream together with 2022/23 results

Site	First Sample Date	n	SoE Data 1995-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
KRP000300	05/09/1995	53	12-32	21	80-107	95	17	100	Good
KRP000660	05/09/1995	53	17-30	24	74-112	95	20	104	Good

Since the 2019/20 monitoring year, taxa richness ranged between 13 and 17 taxa at site KRP000300, and 17 and 25 taxa at site KRP000660. In the most recent 2023 survey, a taxa richness of 17 and 20 were recorded at sites KRP000300 and KRP000660 respectively. These numbers were on the lower end compared to the range recorded historically, with both sites recording taxa numbers that were lower than their respective

medians. Since the 2019/20 monitoring year, MCI scores ranged between 92-104 units at site KRP000300, and 94-112 units at site KRP000660.

In the most recent 2023 survey, MCI scores of 100 and 104 units were recorded at sites KRP000300 and KRP000660 respectively and were both reflective of 'good' macroinvertebrate community health. These scores were on the moderate end of the range recorded previously. Both sites scored higher than their respective medians, although not significantly.

Katikara Stream

The Katikara Stream is a ringplain stream running in a westerly direction, which arises within Te Papa-Kura-o-Taranaki. Two sites in the Katikara Stream, one located near the headwaters (just inside the Te Papa-Kura-o-Taranaki boundary) and the other near the coast, were first included in the SoE programme for the purpose of long-term monitoring of the progressive impacts of riparian vegetation planting initiatives within this north-western Taranaki catchment.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 13.

Table 13 Results from SoE surveys performed in the Katikara Stream together with 2022/23 results

Site	First Sample Date	n	SoE Data 1999-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
KTK000150	27/09/1999	45	11-38	24	112-151	135	20	145	Excellent
KTK000248	26/10/2000	43	16-31	25	80-118	102	21	94	Fair

Since the 2019/20 monitoring year, taxa richness ranged between 13 and 17 taxa at site KRP000300, and 17 and 25 taxa at site KRP000660. In the most recent 2023 survey, a taxa richness of 20 and 21 were recorded at sites KTK000150 and KTK000248 respectively. These numbers were moderate compared to the range recorded historically. Both sites recorded lower than their respective historical medians, but recorded taxa numbers similar to each other.

Since the 2019/20 monitoring year, MCI scores have ranged between 134-151 units at site KTK000150, and 88-105 units at site KTK000248. In the most recent 2023 survey, MCI scores of 145 and 94 units were recorded at sites KTK000150 and KTK000248 respectively. This categorised the upstream site KTK000150 as having 'excellent' macroinvertebrate community health, while the downstream KTK000248 had 'fair' health. This is typical of these sites, due to the upstream sites proximity to Te Papa-Kura-o-Taranaki. There was a significant decrease in a downstream direction of 51 units, however this was typical of that previously recorded, with both sites recording MCI scores within their respective ranges. Site KTK000150 recorded more than its respective median, but not significantly. While site KTK000248 recorded less than its respective median, but again not significantly.

Despite having similar taxa richness, site KTK000150 recorded an 'excellent' macroinvertebrate community score likely due to having ten 'highly sensitive' taxa present, with the downstream KTK000248 recording only two of these taxa. In contrast, site KTK000248 recorded ten 'tolerant' taxa, while the upstream site KTK000150 only recorded two of these taxa, causing the significant difference in MCI scores.

Makara Stream

The Makara Stream is a small eastern hill country stream and a tributary of the Waitara River. One site was established in the 2019/20 monitoring period for the purpose of monitoring an additional site in the Waitara FMU. This is the first time this site has been reported on.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 14.

Table 14 Results from SoE surveys performed in the Makara Stream together with 2022/23 results

Site	First Sample Date	n	SoE Data 2019-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
MAA000900	29/11/2019	6	6-19	14	77-107	98	17	92	Fair

Since the 2019/20 monitoring year, taxa richness has ranged between 6-19 taxa. In the most recent 2023 survey, this site recorded a moderate taxa richness of 17, which was slightly higher than the historical median.

Since the 2019/20 monitoring year, MCI scores have ranged between 77-107 units. In the most recent 2023 survey, an MCI score of 92 units was recorded for this site. This categorised the site as having 'fair' macroinvertebrate community health.

Mangorei Stream

The Mangorei Stream is a ringplain stream and a tributary of the Waiwhakaiho River. A site was established in the lower reaches of the Mangorei Stream, near the confluence with the Waiwhakaiho River, for the SoE programme in 2002/03. This was in recognition of the importance of this catchment as the only major inflow to the lower reaches of the Waiwhakaiho River below a significant hydroelectric power scheme, and New Plymouth District Council water supply abstractions.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 15.

Table 15 Results from SoE surveys performed in the Mangorei Stream together with 2022/23 results

Site	First Sample Date	n	SoE Data 2002-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
MGE000970	25/11/2002	39	18-33	26	84-113	102	15	93	Fair

Since the 2019/20 monitoring year, taxa richness has ranged between 18-28 taxa at this site. In the most recent 2023 survey, this site recorded a low taxa richness of 15. This result was lower than the median taxa richness of that recorded previously, and was the lowest taxa richness for the site recorded to date.

Since the 2019/20 monitoring year, MCI scores have ranged between 88-106 units. In the most recent 2023 survey, an MCI score of 93 units was recorded, reflecting 'fair' macroinvertebrate community health at the time of the survey. This was on the lower end of that recorded previously, and was lower than the historical median for the site by 9 units.

Mangaehu River

The Mangaehu River is a large eastern hill country river and is a major tributary of the Pātea River. There is one SoE site located on the Mangaehu River not far from its confluence with the Pātea River.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 16.

Table 16 Results from SoE surveys performed in the Mangaehu River together with 2022/23 results

Site	First Sample Date	n	SoE Data 1995-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
MGH000950	20/10/1995	54	10-26	19	77-108	92	18	104	Good

Since the 2019/20 monitoring year, taxa richness has ranged between 10-21 taxa. In the most recent 2023 survey, this site recorded a moderate taxa richness of 18. This was only slightly lower than the historical median for this site and was typical for this site.

Since the 2019/20 monitoring year, MCI scores ranged between 90-108 units. In the most recent 2023 survey, an MCI score of 104 units was recorded. This categorised the site as having 'good' macroinvertebrate community health at the time of the survey. This was on the higher end of the range recorded previously, and was a significant 12 units higher than the historical median for the site.

Long-term improvements in macroinvertebrate health at the site were likely in relation to an apparent reduction in river bed sedimentation possibly related to fewer severe flood events particularly since 2000 with scores tending to plateau between in 2004 and 2008 before improving steadily again since then. Work has also been undertaken encouraging farmers to stabilise erosion prone hill slopes by planting appropriate vegetation such as poplar.

It is recommended that one site is established upstream of this site for the SoE macroinvertebrates programme. This site is located in the Pātea FMU, which is currently underrepresented in the programme. An additional site further into the Eastern Hill Country and closer to the eastern boundary of the Pātea catchment, would provide an ideal reference site for both the Pātea FMU as well as the Northern Hill Country FMU, as it is difficult to establish safe sites in the Northern Hill Country FMU.

Manganui River

The Manganui River is a ringplain river whose source is inside Te Papa-Kura-o-Taranaki and is a significant tributary of the Waitara River. There are two SoE sites located on the Manganui River, one at its mid reaches and another at its lower reaches.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 17.

Table 17 Results from SoE surveys performed in the Manganui River together with 2022/23 results

Site	First Sample Date	n	SoE Data 1995-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
MGN000195	20/09/1995	54	9-26	20	106-143	126	16	136	Very Good
MGN000427	20/09/1995	54	14-26	20	77-117	98	18	110	Good

Since the 2019/20 monitoring year, taxa richness has ranged between 13-24 at site MGN000195 and 15-25 at site MGN000427. In the most recent 2023 survey, taxa richness was moderate with upstream site MGN000195 having a taxa richness of 16, while the downstream site MGN000427 recorded a taxa richness of 18. Both sites recorded slightly lower than their respective historical medians, but fell within range of that previously recorded.

Since the 2019/20 monitoring year, MCI scores have ranged between 121-134 units at site MGN000195 and 84-107 units at site MGN000427. In the most recent 2023 survey, MCI scores of 136 units and 110 units were recorded at sites MGN000195 and MGN000427 respectively. This categorised the upstream site MGN000195 as having 'very good' health, with the downstream site MGN000427 as having 'good' health.

Both sites recorded MCI scores that were higher than their respective site medians, with the downstream site MGN000427 scoring a significant 12 units more than the historical median. This river showed a decrease in macroinvertebrate community health in a downstream direction, with the downstream site recording an MCI score a significant 26 units less than the upstream site. These sites are 29.2km from one another, with the upstream site being only 8.7km away from the ringplain of Te Papa-Kura-o-Taranaki. This decrease in MCI score can be attributed to the upstream site having seven 'highly sensitive' taxa present and only two 'tolerant' taxa present, while the downstream site only had three 'highly sensitive' taxa present, but five 'tolerant' taxa. The deterioration in macroinvertebrate health is likely due to cumulative inputs from point and diffuse sources in a catchment that is dominated by agriculture.

Mangatī Stream

The Mangatī Stream is a small coastal stream, which flows in a northerly direction through a mix of agriculture, industrial and urban areas. Two sites, located above and below an industrial area, are sampled for SoE purposes.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 18.

Table 18 Results from SoE surveys performed in the Mangati Stream together with 2022/23 results

Site	First Sample Date	n	SoE Data 1995-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
MGT000488	21/09/1995	53	9-29	16	56-91	77	15	84	Fair
MGT000520	21/09/1995	53	3-22	10	44-80	68	8	58	Very Poor

Since the 2019/20 monitoring year, taxa richness has ranged between 10-17 taxa at site MGT000488 and 8-11 taxa at site MGT000520. In the most recent 2023 survey, taxa richness between sites was low to moderate with the upstream MGT000488 recording 15 taxa, while the downstream site MGT000520 only recorded eight taxa. Both sites recorded taxa numbers that were slightly lower than their historical medians, but were within range of what has been historically recorded. These results suggested no recent effects of unauthorised discharges, which have historically occurred in this stream.

Since the 2019/20 monitoring year, MCI scores have ranged between 60-85 units at site MGT000488, and 56-80 units at sites MGT000520. In the most recent 2023 survey, MCI scores of 84 units and 58 units were recorded at sites MGT000488 and MGT000520 respectively. This categorised the upstream site as having 'fair' health, while the downstream site had 'very poor' health. Of all sites surveyed during the 2023 monitoring year, site MGT000520 was the only site to have an MCI score reflective of 'very poor' macroinvertebrate community health. The upstream site MGT000488 recorded an MCI score slightly higher than the median, while site MGT000520 recorded slightly lower. Both sites fell into the typical range recorded for these sites. There was a significant decrease in MCI scores of 26 units in a downstream direction. Both sites recorded macroinvertebrate communities of only 'tolerant' and 'moderately sensitive' taxa, with no 'highly sensitive' taxa recorded for this survey. MCI scores were congruent with taxa richness, with both sites having typical scores compared with historical medians.

Makuri Stream

The Makuri Stream is a smaller lowland hill country stream. One site on this stream was added to the SoE programme in the 2019/20 monitoring year for the purpose of monitoring an additional site in the Pātea FMU. This is the first time this site has been reported on.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 19.

Table 19 Results from SoE surveys performed in the Makuri Stream together with 2022/23 results

Site	First Sample Date	n	SoE Data 2019-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
MKR000495	29/11/2019	6	12-20	16	90-104	94	22	102	Good

Since the 2019/20 monitoring year, taxa richness has ranged between 12-20 taxa. In the most recent 2023 survey, a moderate taxa richness of 22 taxa was recorded. This was higher than the median for the site and was the highest taxa richness recorded to date.

Since the 2019/20 monitoring year, MCI scores have ranged between 90-104 units. In the most recent 2023 survey, an MCI score of 102 units was recorded. This categorised the site as having 'good' macroinvertebrate community health. This score was slightly higher than the historical median, and was within the range previously recorded at this site.

Maketawa Stream

The Maketawa Stream is a ringplain stream with its source inside Te Papa-Kura-o-Taranaki. It flows in an easterly direction into the Manganui River. Two sites on the Maketawa Stream were added to the SoE programme in the 2002-2003 monitoring year, in recognition of the fisheries significance of this sub-catchment of the Manganui River catchment.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 20.

Table 20 Results from SoE surveys performed in the Maketawa Stream together with 2022/23 results

Site	First Sample Date	n	SoE Data 2002-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
MKW000200	06/03/1998	44	8-33	23	100-142	129	17	133	Very Good
MKW000300	21/11/2000	43	12-31	21	90-127	109	22	108	Good

Since the 2019/20 monitoring year, taxa richness has ranged between 15-28 taxa at site MKW000200 and 19-21 taxa at site MKW000300. In the most recent survey, taxa richness was moderate with the upstream MKW000200 recording 17 taxa, and the downstream site MKW000300 recording 22 taxa. The upstream MKW000200 site recorded a taxa richness slightly lower than the historical median, while MKW000300 recorded a taxa richness which was slightly higher than the site median. However, both sites recorded taxa richness within the typical range of that previously recorded.

Since the 2019/20 monitoring year, MCI scores have ranged between 129-136 units at site MKW000200 and 97-113 at site MKW000300. In the most recent survey, MCI scores of 133 units and 108 units were recorded at sites MKW000200 and MKW000300 respectively. This categorised the upstream site as having 'very good' health while the downstream site had 'good' health. These scores were similar to their respective site medians, and were typical and within the range that has previously been recorded at these sites. A decrease in macroinvertebrate community health was recorded in a downstream direction, with the downstream site recording an MCI score a significant 25 units less than that recorded at the upstream site. These sites have a distance of 13.2km between locations, with the upstream site only being 2.3km away from the ringplain of Te Papa-Kura-o-Taranaki. Despite the downstream MKW000300 having a higher taxa richness at the time of the survey, a higher number of 'tolerant' taxa were recorded, while the upstream site recorded more 'highly sensitive' taxa. The general deterioration in macroinvertebrate health recorded in the Maketawa Stream is likely due to cumulative inputs from point and diffuse sources in a catchment dominated by agriculture, which also has some industrial and urban influence.

Moumahaki Stream

The Moumahaki Stream is an eastern hill country stream that flows in a southerly direction into the Waitōtara River. One site was established in the 2019/20 monitoring year for the purpose of monitoring an additional site in the Southern Hill country. This is the first time this site has been reported on. Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 21.

Table 21 Results from SoE surveys performed in the Moumahaki Stream together with 2022/23 results

Site	First Sample Date	n	SoE Data 2020-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
MMK000050	20/03/2020	5	13-19	17	73-94	85	11	78	Poor

Since the 2019/20 monitoring year, taxa richness has ranged between 13-19 taxa. In the most recent 2023 survey, taxa richness was low (11 taxa). This was lower than the site median and was the lowest recorded taxa richness to date. Range changes are to be expected while the data set remains limited and with time the data will become more robust.

Since the 2019/20 monitoring year, MCI scores have ranged between 73-94 units at this site. In the most recent 2023 survey, an MCI score of 78 units was recorded. This categorised the site as having 'poor' macroinvertebrate community health. This score was slightly less than the historical median, but was within the range previously recorded. No 'highly sensitive' taxa were recorded at this site during the latest survey, which was reflected by the 'poor' MCI score.

The Moumahaki site is a soft sedimentary site where the substrate composition is largely smaller substrates such as silt and sand. It was noted to have highly unstable bank stability, likely leading to erosion and further sediment deposition, which can negatively impact macroinvertebrate communities.

Mangaoreti Stream

The Mangaoreti is a lowland coastal stream and a tributary of the Urenui River. One site in this river was included in the SoE programme in the 2020/21 monitoring year, for the purpose of monitoring an additional site in the Northern Hill country FMU. This is the first time this site has been reported on.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 22.

Table 22 Results from SoE surveys performed in the Mangaoreti Stream together with 2022/23 results

Site	First Sample Date	n	SoE Data 2021/22				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
MNT000950	18/01/2021	4	4-10	8	64-82	68	8	80	Fair

Since the 2020/21 monitoring year when this site was added, taxa richness has ranged between 4-10 taxa. In the most recent 2023 survey, taxa richness was low, however typical for that recorded previously. A total of eight taxa were recorded in this survey. This taxa richness was equal to the historical median for this site.

Since the 2020/21 monitoring year, MCI scores have ranged between 64-82 units. In the most recent 2023 survey, an MCI score of 80 units was recorded at this site. This categorised this site as having 'fair' macroinvertebrate community health. This score was a significant 12 units higher than the site median, and was on the higher end of the range of that typically recorded at this site.

Mangaoraka Stream

The Mangaoraka Stream is a ringplain stream whose source is outside Te Papa-Kura-o-Taranaki. The stream flows in a northerly direction and is a tributary of the Waiongana Stream where it joins near to the coast.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 23.

Table 23 Results from SoE surveys performed in the Mangaoraka Stream together with 2022/23 results

Site	First Sample Date	n	SoE Data 1995-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
MRK000420	19/09/1995	53	11-30	25	75-105	90	24	93	Fair

Since the 2019/20 monitoring year, taxa richness has ranged between 14-27 taxa. In the most recent 2023 survey, taxa richness was moderate (24 taxa). This was slightly lower than the median for this site, however was typical for what has previously been recorded.

Since the 2019/20 monitoring year, MCI scores have ranged between 80-96 units. In the most recent 2023 survey, an MCI score of 93 units was recorded at this site. This categorised the site as having 'fair' macroinvertebrate community health. This score was slightly more than the historical median, and was within the range of that previously recorded.

Recently, deteriorating water quality (i.e. increased dissolved reactive phosphorus, total phosphorus, faecal coliforms, enterococci and decreased visual clarity as a measure by black disc) has been recorded at the site (Taranaki Regional Council, 2018). The decline in water quality was due to a large increase in land use activity, namely new poultry farms and a deterioration in stock control, resulting in an overall increase in pollution loads within the catchment.

Mangaroa Stream

The Mangaroa Stream is a lowland coastal stream. One site in this river was included in the SoE programme in the 2020/21 monitoring year, for the purpose of monitoring an additional site in the Coastal Terraces FMU. This is the first time this site has been reported on.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 24.

Table 24 Results from SoE surveys performed in the Mangaroa Stream together with 2022/23 results

Site	First Sample Date	n	SoE Data 2021/22				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
MRO000210	13/01/2021	3	10-15	10	68-84	74	10	78	Poor

Since the 2021 monitoring year when this site was added, taxa richness has ranged from 10-15 taxa. Taxa richness was low at the MRO000210 site, recording 10 taxa in the most recent survey. This was the same as the median for this site, however is sitting at the bottom of the previously recorded range for this site. The majority of taxa present were 'tolerant' taxa, with no EPT taxa present.

Since the 2021 monitoring year, MCI scores have range between 68-84 units. In the most recent 2023 survey, an MCI score of 78 units was recorded at this site. This categorised this site as having 'poor' macroinvertebrate community health. This score was slightly more the historical median, but was typical for the range previously recorded at this site. This lower MCI score is likely due to no 'highly sensitive' taxa being recorded at this site during the latest survey.

Matau Stream

The Matau Stream is an eastern hill country stream. One site was established in the 2019/20 monitoring year due to its proximity to forestry zones and its location within the underrepresented Waitara FMU.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 25.

Table 25 Results from SoE surveys performed in the Matau Stream together with 2022/23 results

Site	First Sample Date	n	SoE Data 2019-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
MTA000068	29/11/2019	6	18-30	23	102-110	105	20	108	Good

Since the 2019/20 monitoring year, taxa richness has ranged between 18-30 taxa at site. In the most recent 2023 survey, this site recorded a moderate taxa richness of 20 taxa. This was slightly lower than the site median.

Since the 2019/20 monitoring year, MCI scores have ranged between 102-110 units. In the most recent 2023 survey, an MCI score of 108 units was recorded at this site. This score was reflective of 'good' macroinvertebrate community health. This score was slightly more than the historical median, but within the range previously recorded at this site.

Mangawhero Stream

The Mangawhero Stream is a small stream that arises as a seepage stream draining the Ngaere swamp, with a lower sub-catchment (Mangawharawhara Stream) rising on the ringplain, but outside of Te Papa-Kura-o-Taranaki. Previously two sites on this stream were monitored as part of the SoE programme; however, following recommendations, the upper site MWH000380 was removed as this site has very poor site-specific habitat and is not considered representative of the stream's water quality or catchment. This is the first report in which MWH000380 is not reported on.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 26.

Table 26 Results from SoE surveys performed in the Mangawhero Stream together with 2022/23 results

Site	First Sample Date	n	SoE Data 1995-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
MWH000490	24/10/1995	54	13-30	20	63-102	83	21	101	Good

Since the 2019/20 monitoring year, taxa richness has ranged between 18-23 taxa. In the most recent 2023 survey, a moderate taxa richness of 21 taxa was recorded. This was slightly more than the median for this site, however was typical for what has previously been recorded.

Since the 2019/20 monitoring year, MCI scores have ranged between 89-97 units. In the most recent 2023 survey, an MCI score of 101 units was recorded at this site. This categorised the site as having 'good' macroinvertebrate community health. This score was a significant 18 units more than the median for the site, and sat in the upper range of that previously recorded.

Improvement in the MCI score was consistent with the diversion of the major point source Eltham municipal wastewater discharge out of the Mangawhero Stream which was completed in June 2010.

Pātea River

The Pātea River is a large, ringplain river that originates within Te Papa-Kura-o-Taranaki and flows in a south-easterly direction. Three SoE sites are located in the upper and middle reaches of the river.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 27.

Table 27 Results from SoE surveys performed in the Pātea River together with 2022/23 results

Site	First Sample Date	n	SoE Data 1995-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
PAT000200	11/10/1995	54	21-35	29	127-150	138	27	145	Excellent
PAT000315	11/10/1995	54	17-32	25	99-130	111	20	120	Very Good
PAT000360	11/10/1995	54	15-33	23	77-112	98	20	103	Good

Since the 2019/20 monitoring year, taxa richness has ranged between 21-31 taxa at site PAT000200, 17-27 taxa at site PAT000315, and 15-24 taxa at site PAT000360. In the most recent 2023 survey, a taxa richness of 27, 20, and 20 taxa was recorded at sites PAT000200, PAT000315, and PAT000360 respectively. All sites recorded less than their respective site medians, however were still within the range of that recorded previously.

Since the 2019/20 monitoring year, MCI scores have ranged between 128-150 units at site PAT000200, 107-126 units at site PAT000315, and 77-102 units at site PAT000360. In the most recent 2023 survey, MCI scores of 145 units, 120 units, and 103 units were recorded at sites PAT000200, PAT000315, and PAT000360 respectively. These scores categorised site PAT000200 as having 'excellent' macroinvertebrate community health, site PAT000315 as having 'very good' health, and site PAT000360 as having 'good' health. This showed a decrease in health in a downstream direction, with each site being significantly lower than the last. This can be reflected in community results, with the upstream site PAT000200 having more taxa present, including thirteen 'highly sensitive' taxa, while sites PAT000315 and PAT000360 recorded only five and three 'highly sensitive' taxa respectively. All sites recorded MCI scores that were higher than their respective medians, with the downstream site PAT000360 recording a significantly higher score (by 15 units units). Overall, there was a decrease of 42 MCI units over a 17.3km distance indicating a significant deterioration in macroinvertebrate community health between the upper and lower sites.

Pūnehu Stream

The Pūnehu Stream is a ringplain stream whose source is located within Te Papa-Kura-o-Taranaki and flows in a southerly direction, with its mouth located east of the town of Opunake. There are two SoE sites, one located in the upper middle reaches and the other located in the lower reaches of the Pūnehu Stream.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 28.

Table 28 Results from SoE surveys performed in the Pūnehu Stream together with 2022/23 results

Site	First Sample Date	n	SoE Data 1995-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
PNH000200	11/10/1995	54	18-32	26	104-139	125	19	124	Very Good
PNH000900	11/10/1995	54	10-26	21	70-114	91	17	115	Good

Since the 2019/20 monitoring period, taxa richness ranged between 19-28 taxa at site PNH000200, and 16-24 taxa at site PNH000900. In the most recent 2023 survey, a taxa richness of 19 and 17 were recorded at sites PNH000200 and PNH000900 respectively. Both sites recorded lower than their respective historical medians, but were similar to one another.

Since the 2019/20 monitoring year, MCI scores have ranged between 121-139 units at site PNH000200, and 90-108 units at site PNH000900. In the most recent 2023 survey, MCI scores of 124 units and 115 units were recorded at sites PNH000200 and PNH000900 respectively. This categorised the upstream site PNH000200 as having 'very good' macroinvertebrate community health, while the downstream PNH000900 had 'good' health. There was a decrease in MCI score in a downstream direction, although this was not significant. The upstream site PNH000200 recorded slightly less than the historical median, while the downstream site PNH000900 recorded a significant 24 units more than the historical median, and recorded the highest MCI score to date for this site.

Historically, there have been some compliance issues in regard to consented dairy shed discharges, and the cumulative impacts of such discharges in the Mangatawa Stream sub-catchment in the local vicinity of the lower site (Taranaki Regional Council, 2011 and Fowles, 2014). Changes in macroinvertebrate community structure at the lower site, especially when compared with the upper mid-reach site, reflected issues with nutrient enrichment. However, at least for this survey, there were no significant changes between these sites to suggest nutrient enrichment at this time.

Hangatāhua (Stony) River

The Hangatāhua (Stony) River is a ringplain river whose source is located within Te Papa-Kura-o-Taranaki. The lower part of the river has a very narrow catchment and generally has good water quality. There are two sites monitored for SoE purposes on the Hangatāhua River.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 29.

Table 29 Results from SoE surveys performed in the Hangatāhua (Stony) River together with 2022/23 results

Site	First Sample Date	n	SoE Data 1995-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
STY000300	24/10/1995	54	1-21	10	64-140	112	10	108	Good
STY000400	24/10/1995	52	2-18	10	67-150	108	5	128	Very Good

Since the 2019/20 monitoring year, taxa richness has ranged between 4-13 taxa at site STY000300, and 5-13 taxa at site STY000400. In the most recent 2023 survey, taxa richness was low to moderate at both sites, with 10 and five taxa recorded at sites STY000300 and STY000400 respectively. The upstream site STY000300 recorded the same number of taxa as the site median, while the downstream site STY000400 recorded five less taxa. However, both sites recorded numbers of taxa that were within the range typical for these sites. Macroinvertebrate communities in the Hangatāhua River are likely impacted by erosion events that are ongoing within this catchment.

Since the 2019/20 monitoring year, MCI scores have ranged between 107-120 units at site STY000300, and 98-125 units at site STY000400. In the most recent 2023 survey, MCI scores of 108 units and 128 units were recorded at sites STY000300 and STY000400 respectively. This categorised the upstream site STY000300 as having 'good' macroinvertebrate community health, while the downstream site STY000400 had 'very good' health. When comparing to historical medians, the upstream STY000300 scored slightly lower, while the downstream site STY000400 scored an MCI significantly higher than the median (by 20 units).

While it's typical for most rivers to exhibit a decrease in health in a downstream direction, for this survey the Hangatāhua River was the only river in which the sites showed an increase in health in a downstream direction, with the downstream site STY000400 being a significant 20 units more than the upstream site. When investigating further, the two Hangatāhua River sites had extremely similar environmental and temperature data, however the STY000400 site only had five taxa identified compared to ten at the STY000300 site. All five taxa were EPT taxa, which is likely to have increased the MCI value for this site, causing it to be significantly higher than the upstream STY000300 site. One possibility for is that frequent headwater erosion events in the Hangatāhua River, as noted in previous SoE annual reports and Appendix 1, may significantly impact taxa richness and index calculations in the upper catchment. These erosion events introduce large amounts of suspended solids, which can disrupt the habitat and reduce the diversity of aquatic organisms. However, the lower site is less affected because fewer suspended solids from these events reach that area, leading to less disturbance and a relatively more stable environment for aquatic life.

Timaru Stream

The Timaru Stream is a ringplain stream arising within Te Papa-Kura-o-Taranaki and flows in a westerly direction. There are two SoE sites situated on this stream. Of note, in the 2008-2009 period severe headwater erosion events had impacted upon the macroinvertebrate communities of the upper reaches of this stream (Taranaki Regional Council, 2009). Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 30.

Table 30 Results from SoE surveys performed in the Timaru Stream together with 2022/23 results

Site	First Sample Date	n	SoE Data 1995-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
TMR000150	24/10/1995	53	8-34	25	119-152	138	23	131	Very Good
TMR000375	24/10/1995	53	13-35	26	82-122	105	24	116	Good

Since the 2019/20 monitoring year, taxa richness has ranged between 21-28 taxa at site TMR000150 and 18-27 at site TMR000375. In the most recent 2023 survey, a taxa richness of 23 and 24 were recorded at sites TMR000150 and TMR000375 respectively. Both sites recorded slightly lower than their respective historical medians, but recorded numbers similar to each other.

Since the 2019/20 monitoring year, MCI scores have ranged between 132-143 units at site TMR000150 and 82-122 units at site TMR000375. MCI scores of 131 units and 116 units were recorded at sites TMR000150 and TMR000375 respectively. This categorised the upstream site TMR000150 as having 'very good' macroinvertebrate community health, while the downstream TMR000375 had 'good' health. There was a significant decrease in MCI scores in a downstream direction, with site TMR000375 scoring 15 units less than the upstream site. This is typical for Timaru Stream and is likely due to cumulative agricultural impacts throughout the middle catchment affecting the lower site. The upstream site is expected to have less catchment effects as it sites on the boundary line of Te Papa-Kura-o-Taranaki. The upstream site TMR000150 scored less than the historical median, but not significantly. Meanwhile, the downstream site TMR000375 scored significantly higher than its respective median by 11 units.

Tāngāhoe River

The Tāngāhoe River is an eastern hill country river flowing in a southerly direction with a river mouth located east of Hāwera. Three sites were included in the SoE programme in 2007 for the purpose of monitoring long-term land use changes (afforestation) particularly in the upper-mid catchment.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 31.

Table 31 Results from SoE surveys performed in the Tāngāhoe River together with 2022/23 results

Site	First Sample Date	n	SoE Data 2007-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
TNH000090	04/12/2007	29	9-31	22	90-107	97	7	114	Good
TNH000200	04/12/2007	30	12-35	24	92-116	102	9	109	Good
TNH000515	04/12/2007	30	11-26	20	78-104	94	16	94	Fair

Since the 2019/20 monitoring year, taxa richness has ranged between 9-26 taxa at site TNH000090, 12-21 taxa at site TNH000200, and 11-24 taxa at site TNH000515. In the most recent 2023 survey, a taxa richness of 7, 9, and 16 taxa were recorded at sites TNH000090, TNH000200, and TNH000515 respectively. All sites recorded lower than their respective site medians, with the two upstream sites TNH000090 and TNH000200 both recording the lowest taxa richness recorded for the sites to date. The most downstream TNH000515 scored within what is typical for that site.

Since the 2019/20 monitoring year, MCI scores have ranged between 90-102 units at site TNH000090, 94-116 units at site TNH000200, and 85-101 units at site TNH000515. In the most recent survey, MCI scores of 114 units, 109 units, and 94 units were recorded at sites TNH000090, TNH000200, and TNH000515 respectively. This categorised site TNH000090 and TNH000200 as having 'good' macroinvertebrate community health, while TNH000515 had 'fair' health. There was a significant decrease in MCI scores in a downstream direction, with the most downstream site TNH000515 scoring significantly less than upstream sites TNH000090 and TNH000200 (by 20 units and 15 units respectively). The two upstream sites scored similar to each other. All sites scored either the same or more than their respective site medians, with the upstream site TNH000090 scoring significantly more, by 17 units. This site also scored the highest MCI score to date for that site.

Uruti Stream

The Uruti Stream is a small lowland hill country stream that flows in a northerly direction into the Mimitangiatua River. One site in this river was included in the SoE programme in the 2019/20 monitoring year, for the purpose of monitoring an additional site in the Northern Hill country FMU. This is the first time this site will be reported on.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 32.

Table 32 Results from SoE surveys performed in the Uruti Stream together with 2022/23 results

Site	First Sample Date	n	SoE Data 2019-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
URU000198	29/11/2019	6	14-22	21	88-96	91	15	77	Poor

Since the 2019/20 monitoring year, taxa richness has ranged between 14-22 taxa. In the most recent 2023 survey, a low taxa richness of 15 was recorded, with the majority of taxa being 'tolerant' taxa. This taxa richness was slightly lower than the site median.

Since the 2019/20 monitoring year, MCI scores have ranged between 88-96 units. In the most recent 2023 survey, an MCI score of 77 units was recorded at this site. This categorised the site as having 'poor' macroinvertebrate community health. This score was a significant 14 units less than the site median, and was the lowest recorded MCI score at this site to date, being 11 units lower than the current minimum score recorded.

Due to recent similar comments made by samplers at this site, it is recommended that the appropriateness of future monitoring at this site in the SoE macroinvertebrate programme is reviewed. Being located so close to the confluence with the Mimitangiatua River, this site is likely often inundated by the river during high flows. Additionally, the direct site location is affected by shading of the SH3 Bridge.

Waiau Stream

The Waiau Stream is a small, lowland stream flowing in a northerly direction with the stream mouth situated east of Waitara. One SoE site is located in the mid reaches of this stream.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 33.

Table 33 Results from SoE surveys performed in the Waiau Stream together with 2022/23 results

Site	First Sample Date	n	SoE Data 1998-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
WAI000110	05/02/1998	46	15-30	21	79-101	90	12	97	Fair

Since the 2019/20 monitoring year, taxa richness has ranged between 15-22 taxa. In the most recent 2023 survey, this site recorded a low taxa richness of 12 taxa. This was much lower than the median and was the lowest taxa richness for the site to date.

Since the 2019/20 monitoring year, MCI scores have ranged between 86-92 units. In the most recent 2023 survey, an MCI score of 97 units was recorded at site WAI000110, reflecting 'fair' macroinvertebrate community health. This was within the range of that previously recorded at this site. This MCI score was slightly more than the historical median.

Waiongana Stream

The Waiongana Stream has a source within Te Papa-Kura-o-Taranaki and flows in an easterly direction with the stream mouth just east of Bell Block. There are two SoE sampling sites on the Waiongana Stream.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 34.

Table 34 Results from SoE surveys performed in the Waiongana Stream together with 2022/23 results

Site	First Sample Date	n	SoE Data 1995-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
WGA000260	18/10/1995	53	9-31	24	82-112	96	20	98	Fair
WGA000450	18/10/1995	53	12-29	21	72-104	89	18	88	Fair

Since the 2019/20 monitoring year, taxa richness has ranged between 16-25 taxa at site WGA000260, and 16-25 taxa at site WGA000450. In the most recent 2023 survey, a moderate taxa richness of 20 and 18 were recorded at sites WGA000260 and WGA000450 respectively. Both sites recorded lower than their respective historical medians, but recorded taxa numbers similar to each other.

Since the 2019/20 monitoring year, MCI scores have ranged between 83-110 units at site WGA000260, and 78-104 units at site WGA000450. In the most recent 2023 survey, MCI scores of 98 units and 88 units were recorded at sites WGA000260 and WGA000450 respectively. This categorised both sites as having 'fair' macroinvertebrate community health. There was a decrease in MCI scores in a downstream direction, although this was not significant. The upstream site WGA000260 recorded an MCI score slightly higher than the historical median, while the downstream site WGA000450 recorded slightly less.

Waingongoro River

The Waingongoro River is a large ringplain river with its source inside Te Papa-Kura-o-Taranaki. The river flows in a southerly direction and there are six SoE sites situated along the length of the river.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 35.

Table 35 Results from SoE surveys performed in the Waingongoro River together with 2022/23 results

Site	First Sample Date	n	SoE Data 1995-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
WGG000115	24/10/1995	54	19-40	30	122-145	133	26	140	Excellent
WGG000150	24/10/1995	54	18-39	26	119-139	129	15	127	Very Good
WGG000500	24/10/1995	54	15-29	22	93-125	104	14	107	Good
WGG000665	24/10/1995	54	14-30	20	77-111	96	16	106	Good
WGG000895	24/10/1995	54	13-25	21	73-106	94	21	98	Fair
WGG000995	24/10/1995	54	12-27	18	69-100	90	20	93	Fair

Since the 2019/20 monitoring year, taxa richness has ranged between 19-24 taxa at site WGG000115, 18-25 taxa at site WGG000150, 16-23 taxa at site WGG000500, 15-25 taxa at site WGG000665, 17-23 taxa at site WGG0008995, and 13-27 taxa at site WGG000995. In the most recent 2023 survey, macroinvertebrate taxa richness was low to moderate at the six Waingongoro sites, ranging from 14-26 taxa. The four most upstream sites recorded lower than their respective medians, the fifth site WGG000895 recorded the same as the site median, while the bottom site WGG000995 recorded slightly more than its respective median. Two sites, site WGG000150 and WGG000500 scored the lowest taxa richnesses to date.

Since the 2019/20 monitoring year, MCI scores have ranged between 137-145 units at site WGG000115, 122-139 units at site WGG000150, 99-117 units at site WGG000500, 93-107 units at site WGG000665, 90-98 units at site WGG0008995, and 79-94 units at site WGG000995. In the most recent 2023 survey, MCI scores of 140 units, 127 units, 107 units, 106 units, 98 units, and 93 units were recorded at sites WGG000115, WGG000150, WGG000500, WGG000665, WGG000895, and WGG000995 respectively. These scores categorised site WGG000115 as having 'excellent' macroinvertebrate community health, site WGG000150 as having 'very good' health, sites WGG000500 and WGG000665 as having 'good' health, and sites WGG000895 and WGG000995 as having 'fair' health. MCI scores decreased in a downstream direction. The most upstream sites WGG000115 and WGG000150 scored significantly higher than the downstream sites. The bottom site WGG000995 scored significantly less than all five upstream sites. All sites recorded MCI scores similar to their respective site medians, and were within range of those previously recorded.

Waiau (2) Stream

The Waiau (2) Stream is a lowland coastal stream that flows in a southerly direction into the Waitōtara River. One site in this river was included in the SoE programme in the 2020/21 monitoring year, for the purpose of monitoring an additional site in the Southern Hill country. This is the first time this site has been reported.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 36.

Table 36 Results from SoE surveys performed in the Waiau (2) Stream together with 2022/23 results. *Median value rounded up from 11.5.

Site	First Sample Date	n	SoE Data 2021/22				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
WIU000700	13/01/2021	4	5-12	12*	68-77	70	-		Not surveyed

Since the 2020/21 monitoring year when sampling at this site began, taxa richness has ranged between 5-12 taxa, and MCI scores have ranged between 68-77 units. This site was not sampled during the most recent monitoring year due to weather and unsuitable flow conditions.

Waiwhakaiho River

The Waiwhakaiho River is sourced within Te Papa-Kura-o-Taranaki and flows in an easterly direction with its mouth situated in the city of New Plymouth. An additional site was established in the upper reaches of the Waiwhakaiho River during the 2002/03 monitoring period, to complement the three sites in the central to lower reaches of this large ringplain river, in recognition of its importance as a water resource and particularly its proximity to New Plymouth city.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 37.

Table 37 Results from SoE surveys performed in the Waiwhakaiho River together with 2022/23 results

Site	First Sample Date	n	SoE Data 1995-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
WKH000100	27/11/2002	39	4-33	20	115-147	131	19	136	Very Good
WKH000500	23/11/1995	53	14-32	22	80-125	109	19	105	Good
WKH000920	23/11/1995	52	7-29	20	60-110	94	9	98	Fair
WKH000950	11/11/1996	51	8-30	20	70-111	88	11	91	Fair

Since the 2019/20 monitoring year, taxa richness has ranged between 16-29 taxa at site WKH000100, 14-25 taxa at site WKH000500, 13-22 taxa at site WKH000920, and 10-19 taxa at site WKH000950. In the most recent 2023 survey, taxa richness was low to moderate at the four Waiwhakaiho sites, ranging from 9-19 taxa. All sites recorded lower than their respective medians, but were within the ranges of that previously recorded.

Since the 2019/20 monitoring year, MCI scores have ranged between 128-140 units at site WKH000100, 80-111 units at site WKH000500, 71-105 units at site WKH000920, and 78-99 units at site WKH000950. In the most recent 2023 survey, MCI scores of 136 units, 105 units, 98 units, and 91 units were recorded at sites WKH000100, WKH000500, WKH000920, and WKH000950 respectively. These scores categorised site WKH000100 as having 'very good' macroinvertebrate community health, site WKH000500 as having 'good' health, while the downstream sites WKH000920 and WKH000950 had 'fair' health. All sites scored MCI scores similar to their site medians, and were within the typical range of that recorded for their respective site. The MCI scores recorded at the four sites indicated a decrease in health in a downstream direction, with upstream site WKH000100 scoring significantly more than the three downstream sites. Middle sites WKH000500 and WKH000920 scored similar to each other, however site WKH000950 scored significantly less than all upstream sites.

Waiokura Stream

The Waiokura Stream is a small, southerly flowing ringplain seepage-sourced stream, which has two sites in the SoE programme in recognition of a long-term collaborative study of the effects of best-practice dairy-farming initiatives being evaluated in five dairying catchments throughout the country (Wilcock et al., 2009).

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 38.

Table 38 Results from SoE surveys performed in the Waiokura Stream together with 2022/23 results

Site	First Sample Date	n	SoE Data 2003-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
WKR000500	24/02/2003	35	16-29	23	88-117	102	18	117	Good
WKR000700	24/02/2003	30	15-27	20	92-109	100	14	109	Good

Since the 2019/20 monitoring year, taxa richness has ranged between 16-23 taxa at site WKR000500, and 15-20 taxa at site WKR000700. In the most recent 2023 survey, a low taxa richness of 18 and 14 taxa were recorded at sites WKR000500 and WKR000700 respectively. Both sites recorded lower than their respective historical medians, with downstream site WKR000700 scoring the lowest taxa richness at this site to date.

Since the 2019/20 monitoring year, MCI scores have ranged between 104-117 units at site WKR000500, and 98-109 units at site WKR000700. In the most recent 2023 survey, MCI scores of 117 units and 109 units were recorded at sites WKR000500 and WKR000700 respectively. This categorised both sites as having 'good' macroinvertebrate community health. There was a decrease in MCI scores in a downstream direction, although this was not significant. The upstream site WKR000500 recorded significantly more than the historical median by 15 units, while the downstream site WKR000700 recorded an MCI score higher than the median, although not significantly. Both sites WKR000500 and WKR000700 recorded MCI scores that were equal to the highest scores recorded at these sites to date.

Waimoku Stream

The Waimoku Stream is a small, easterly flowing ringplain stream with a source inside Te Papa-Kura-o-Taranaki in the Kaitake Ranges. There are two SoE sites situated on the stream in the upper and lower reaches.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 39.

Table 39 Results from SoE surveys performed in the Waimoku Stream together with 2022/23 results

Site	First Sample Date	n	SoE Data 1999-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
WMK000100	22/12/1999	45	15-38	30	119-141	131	21	133	Very Good
WMK000298	22/12/1999	45	10-29	20	75-115	94	20	96	Fair

Since the 2019/20 monitoring year, taxa richness has ranged between 15-27 taxa at site WMK000100, and 11-21 taxa at site WKR000700. In the most recent 2023 survey, a moderate taxa richness of 21 and 20 were recorded at sites WMK000100 and WMK000298 respectively. Both sites recorded lower or similar to than their respective historical medians.

Since the 2019/20 monitoring year, MCI scores have ranged between 104-117 units at site WMK000100, and 98-109 units at site WKR000700. In the most recent 2023 survey, MCI scores of 133 units and 96 units were recorded at sites WMK000100 and WMK000298 respectively. This categorised site WMK000100 as

having 'very good' macroinvertebrate community health, while site WMK000298 had 'fair' health. There was a significant decrease in MCI scores in a downstream direction, with the downstream site WMK000298 scoring 37 units less than the upstream site. This is likely due to the upstream site having eight 'highly sensitive' taxa present, while the downstream site only had two of these taxa present. This decrease occurred over a 4km distance from the boundary of Te Papa-Kura-o-Taranaki where the upper site lies. This was a large decrease in condition for a relatively short distance and greater than what would be expected given the relatively intact upper catchment. This was likely due to a combination of factors including poorer habitat quality at this urban stream site, along with poorer water quality.

Waikaramarama Stream

The Waikaramarama Stream is a lowland coastal stream that flows in a northerly direction. One site in this river was included in the SoE programme in the 2020/21 monitoring year, for the purpose of monitoring an additional site in the Northern Hill Country. This is the first time this site has been reported.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 40.

Table 40 Results from SoE surveys performed in the Waikaramarama Stream together with 2022/23 results

Site	First Sample Date	n	SoE Data 2021/22				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
WMR000100	18/01/2021	4	18-27	21	95-101	100	13	98	Fair

Since the 2020/21 monitoring year when sampling at this site began, taxa richness has ranged between 18-27 taxa. In the most recent 2023 survey, a low taxa richness of 13 was recorded. This was less than the site median and was the lowest recorded taxa richness to date. However, range changes are to be expected, given the current limited data set.

Since the 2020/21 monitoring year when sampling at this site began, MCI scores have ranged between 95-101 units. In the most recent 2023 survey, an MCI score of 98 units was recorded at this site. This categorised the site as having 'fair' macroinvertebrate community health. This score was slightly less than the historical median, but was within the range previously recorded at this site.

Whenuakura River

The Whenuakura River has a catchment that is in the eastern hill country, with the lowest portion in the Taranaki southern marine terrace. The river flows in a southerly direction, with a mouth between the townships of Pātea and Waverley. One site in this river was included in the SoE programme in the 2015-2016 monitoring year, for the purpose of monitoring an additional site in the eastern hill country.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 41.

Table 41 Results from SoE surveys performed in the Whenuakura River together with 2022/23 results

Site	First Sample Date	n	SoE Data 2015-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
WNR000450	14/10/2015	14	11-32	18	71-99	87	-		Not surveyed

Since the 2019/20 monitoring year, taxa richness has ranged between 11-20 taxa, and MCI scores have ranged between 76-91 units. This site was not sampled during the most recent monitoring year due to weather and flow conditions preventing sampling.

Waitara River

The Waitara River is Taranaki's largest river with significant catchment areas in both the eastern hill country and on the eastern side of the Taranaki ringplain. Two SoE sites are situated on the Waitara River.

Historical results, together with results from the current 2022/23 monitoring period are summarised in Table 42.

Table 42 Results from SoE surveys performed in the Waitara River together with 2022/23 results

Site	First Sample Date	n	SoE Data 1996-2022				SoE Data 2022/23		
			Taxa No.		MCI		Taxa No.	MCI	Council Grade
			Range	Median	Range	Median			
WTR000540	15/10/2015	14	8-26	20	83-110	99	-		Not surveyed
WTR000850	31/01/1996	53	8-32	17	64-107	86	12	80	Fair

Since the 2019/20 monitoring year, taxa richness has ranged between 8-22 taxa at site WTR000540 and 9-17 at WTR000850. In the most recent survey, a low taxa richness of 12 was recorded for site WTR000850. This was less than the historical median for the site, and on the lower range of that typically recorded. The upstream site WTR000540 was not sampled during the most recent monitoring year due to weather and flow conditions preventing sampling.

Since the 2019/20 monitoring year, MCI scores ranged between 83-104 units at site WTR000540 and 71-107 units at WTR000850. In the most recent survey, an MCI score of 80 units was recorded at site WTR000850. This categorised the site as having 'fair' macroinvertebrate community health. This score was slightly less than the historical median, but was within the range previously recorded at this site.

Overall

A summary of the proportion of sites within each Council grading band can be found in Table 43 below.

Table 43 Proportion of sites within each Council grading band

Council Grading	Council MCI	
	Sites	%
Excellent	3	4%
Very Good	12	18%
Good	24	36%
Fair	21	31%
Poor	3	5%
Very Poor	1	1%
Not sampled	3	4%

Overall, regional MCI scores ranged from 58 units to 145 units. Ten sites scored MCI scores significantly more than their respective site medians, while one site recorded significantly less than its respective site median, although this was unsurprising as this was only the fourth year of monitoring for that site. Two new maxima and one new minimum scores were recorded during this monitoring period.

Taxa richness ranged from five to 27 taxa. One new maximum and nine new minima taxa richness's were recorded during this monitoring period.

3.2 National state of macroinvertebrate communities (NPS values and bands)

This SoE report now includes scores based on nationally-derived macroinvertebrate tolerance values and NOF bands as defined in Stark & Maxted (2007), in accordance with the NPS-FM.

The following section presents results on macroinvertebrate communities using three attributes: MCI, SQMCI and ASPM calculated using nationally-derived tolerance values over the most recent five-year period. These results are presented independently from previous sections and should not be compared directly. This shift in methodology for analysing nationally-derived scores may appear as inconsistencies compared to previous analyses using regionally-derived results, but more reflects a methodological change. In future assessments, it is recommended to complete a comparative study of regionally-derived and nationally-derived tolerance values and MCI scores to evaluate similarities.

All nationally-derived MCI scores and NOF bands for the 67 sites can be found in Table 44.

3.2.1 Five-year median MCI scores

Based on the NPS-FM NOF bands, 52 of the 67 sites (78%) reported a five-year median MCI score above the national bottom line (≥90). There were 15 sites (22%) that recorded MCI medians below the national bottom line (<90), indicative of severe organic pollution or nutrient enrichment. The majority of the sites (29 sites, or 43%) fell within band C, which states that the macroinvertebrate community is indicative of moderate organic pollution or nutrient enrichment. Twelve sites (18%) were recorded in band A, which are sites indicative of pristine conditions with no pollution or enrichment.

The map indicates that in-stream communities tend to be better within or near the boundary of Te Papa-Kura-o-Taranaki, where many of the rivers and streams originate. As the water bodies move away from the park boundary, macroinvertebrate communities tends to decline in health, with more sites falling into the moderate (band C) or poor (band D) categories. The majority of sites in band D are situated in lowland coastal sites or urban areas (Figure 3). This trend is likely due to various factors such as land use, pollution, and other environmental impacts affecting water quality.

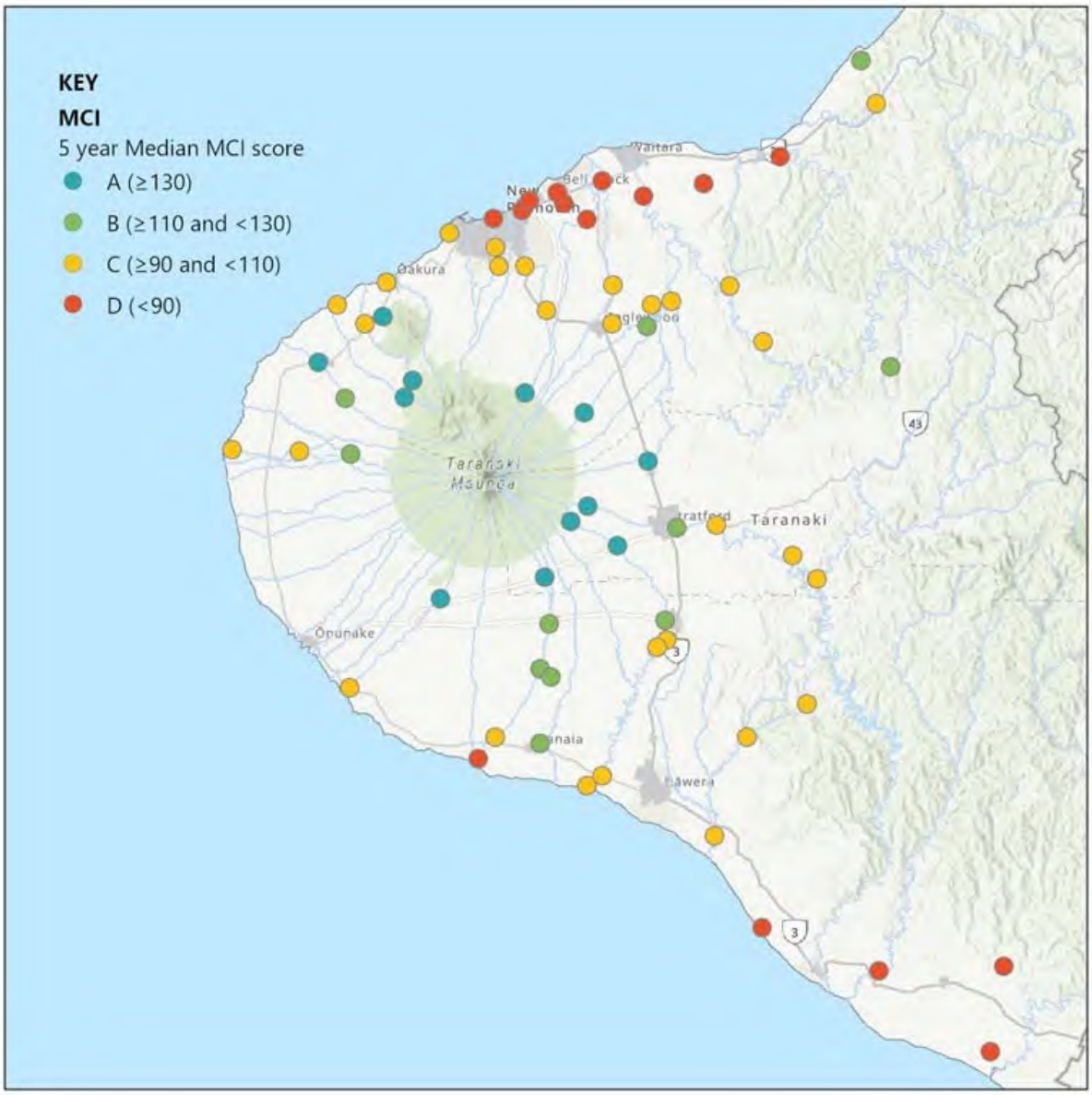

Figure 3 Five-year median MCI scores

3.2.1 Five-year median SQMCI score

Based on the NPS-FM NOF bands, 41 of the 67 sites (61%) reported five-year median SQMCI scores above the national bottom line (a score of 4.5 or higher). There were 26 sites (39%) that recorded SQMCI medians below the national bottom line, indicative of severe organic pollution or nutrient enrichment. There were 18 sites (27%) that fell within band A, which are sites indicative of pristine conditions with no pollution or enrichment. This metric had the highest number of sites in band A out of the three metrics assessed. There were more sites in both bands A and D compared to the MCI scores.

In line with the MCI, but not as pronounced, the SQMCI map also shows that in-stream communities are healthier within or near the boundary of Te Papa-Kura-o-Taranaki. Both maps indicate higher water quality within or near the park boundary, where rivers and streams originate. However, the SQMCI map, which reflects macroinvertebrate abundances not accounted for in the MCI scores, shows a more pronounced decline in water quality as you move away from the park boundary compared to the MCI map. This highlights that the SQMCI scores reveal a greater extent of poor water quality across the region compared to the MCI (Figure 4).

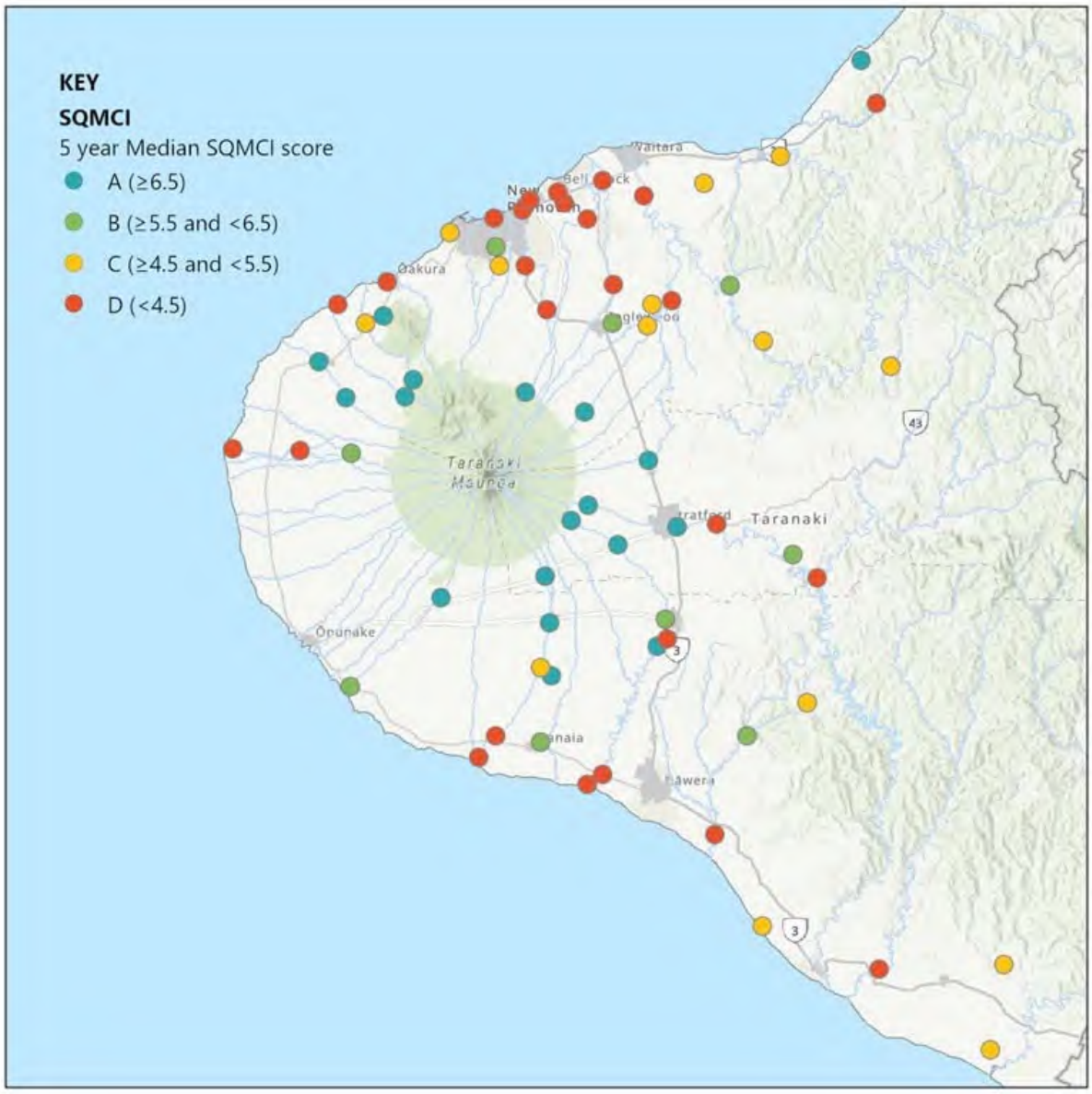

Figure 4 Five-year median SQMCI scores

3.2.1 Five-year median ASPM score

Based on the NPS-FM NOF bands, 59 of the 67 sites (88%) reported five-year median ASPM scores above the national bottom line (a score of 0.3 or higher). Eight sites (12%) recorded ASPM medians below the national bottom line, indicative of severe organic pollution or nutrient enrichment. The majority of the sites (34 sites or 51%) fell within band B, which states that the macroinvertebrate community is indicative of mild organic pollution or nutrient enrichment. Nine sites (13%) were recorded in band A, which are sites indicative of pristine conditions with no pollution or enrichment. This metric had the lowest amount of sites in band A out of the three metrics assessed.

Similarly, like the MCI and SQMCI maps, the ASPM map indicates that in-stream communities are healthier within or near the boundary of Te Papa-Kura-o-Taranaki. The ASPM bands somewhat mirror those of the MCI map, which is unsurprising given that the MCI is used as part of the ASPM calculation, resulting in a certain degree of correlation. The distribution of scores is slightly more balanced however, there are noticeable pockets of poor-quality (band D) scores in the northern and southern parts of the region, particularly in lowland or urban areas (Figure 5).

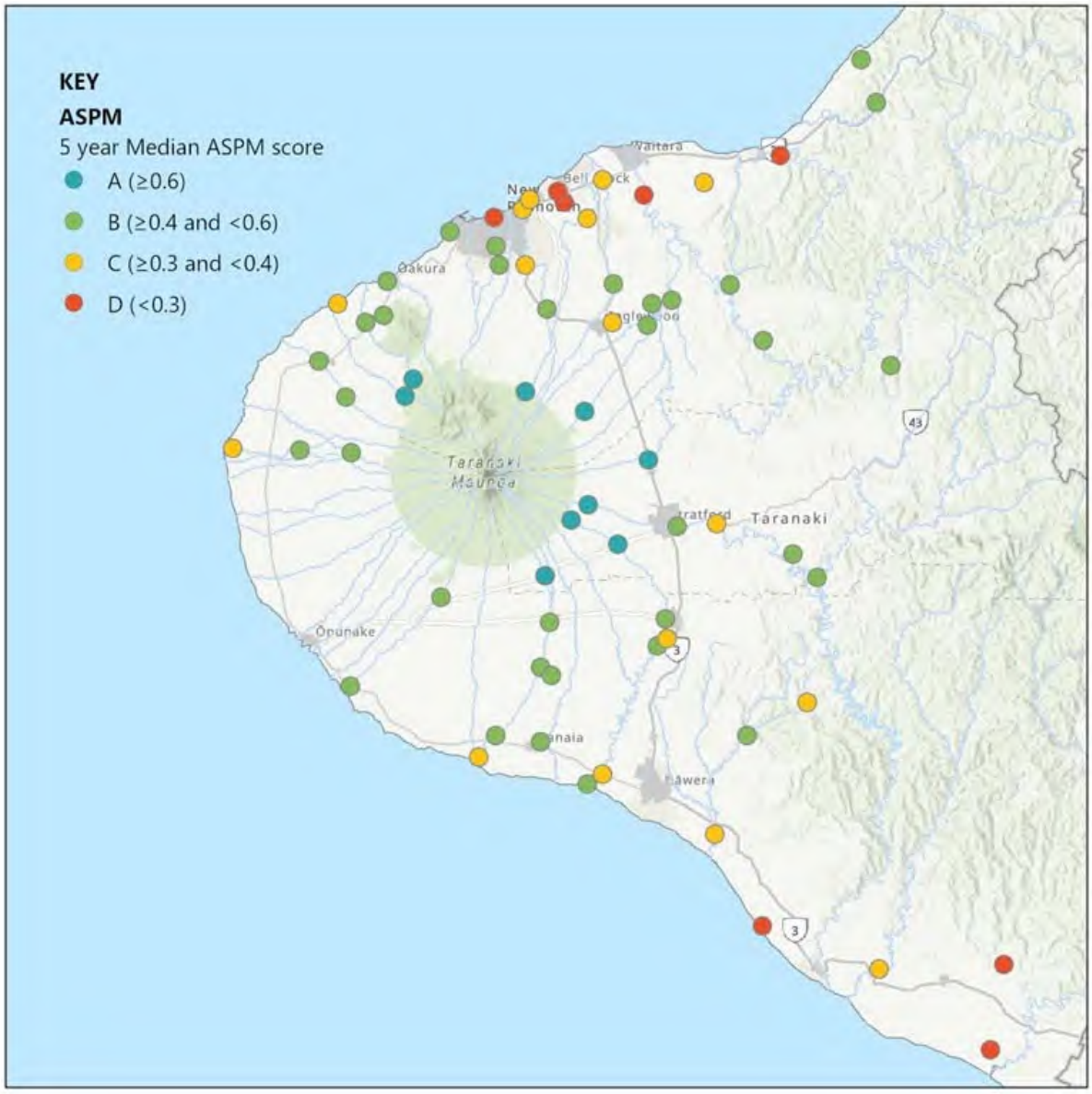

Figure 5 Five-year median ASPM

Note: Site codes with an asterisk (*) indicates new sites with less than five-years of data where partial/incomplete data was used. Table is ordered in alphabetical order by site code, and rivers/streams with multiple sites are listed from upstream to downstream

Table 44 Site-based baseline state for the macroinvertebrate attribute derived from monitored data at 67 monitoring sites in the Taranaki region

River/Stream Name	Site code	5 Year Median MCI	5 Year Median SQMCI	5 Year Median ASPM	MCI	SQMCI	ASPM
Herekawe Stream	HRK000085	98.82	4.63	0.40	C	C	B
Huatoki Stream	HTK000350	102.61	4.61	0.44	C	C	B
	HTK000425	106.43	6.41	0.50	C	B	B
	HTK000745	83.08	3.81	0.26	D	D	D
Kapoaiaia River	KPA000250	118.33	5.55	0.53	B	B	B
	KPA000700	100.00	4.22	0.41	C	D	B
	KPA000950	93.68	4.36	0.38	C	D	C
Kaūpokonui River	KPK000250	134.81	7.77	0.66	A	A	A
	KPK000500	121.90	6.58	0.53	B	A	B
	KPK000660	117.69	5.45	0.50	B	C	B
	KPK000880	102.86	4.04	0.41	C	D	B
	KPK000990	89.47	3.49	0.34	D	D	C
Kurapete Stream	KRP000300	103.08	5.85	0.38	C	B	C
	KRP000660	98.26	5.03	0.46	C	C	B
Katikara Stream	KTK000150	140.00	6.63	0.64	A	A	A
	KTK000248	101.90	3.86	0.38	C	D	C
Makara Stream	MAA000900*	99.41	5.61	0.42	C	B	B
Mangorei Stream	MGE000970	96.00	4.21	0.39	C	D	C
Mangaehu River	MGH000950	98.00	4.46	0.42	C	D	B
Manganui River	MGN000195	136.25	7.64	0.62	A	A	A
	MGN000427	103.53	3.85	0.42	C	D	B
Mangatī Stream	MGT000488	77.33	4.02	0.18	D	D	D
	MGT000520	72.00	3.90	0.19	D	D	D
Makuri Stream	MKR000495*	96.24	5.67	0.40	C	B	B
Maketawa Stream	MKW000200	140.77	7.38	0.67	A	A	A

River/Stream Name	Site code	5 Year Median MCI	5 Year Median SQMCI	5 Year Median ASPM	MCI	SQMCI	ASPM
	MKW000300	111.82	4.53	0.52	B	C	B
Moumahaki Stream	MMK000050*	88.29	4.58	0.29	D	C	D
Mangaoreti Stream	MNT000950*	75.00	4.81	0.14	D	C	D
Mangaoraka Stream	MRK000420	88.89	3.700	0.39	D	D	C
Mangaroa Stream	MRO000210*	78.00	4.66	0.20	D	C	D
Matau Stream	MTA000068*	113.95	4.97	0.50	B	C	B
Mangawhero Stream	MWH000490	95.00	4.37	0.38	C	D	C
Pātea River	PAT000200	148.89	8.02	0.73	A	A	A
	PAT000315	124.00	6.63	0.54	B	A	B
	PAT000360	91.43	3.44	0.32	C	D	C
Pūnehu Stream	PNH000200	132.63	7.55	0.57	A	A	B
	PNH000900	102.22	5.54	0.43	C	B	B
Stony River	STY000300	117.50	7.77	0.49	B	A	B
	STY000400	132.00	7.68	0.51	A	A	B
Timaru Stream	TMR000150	138.26	7.07	0.66	A	A	A
	TMR000375	109.63	5.19	0.52	C	C	B
Tāngāhoe River	TNH000090	97.78	4.67	0.39	C	C	C
	TNH000200	106.67	5.80	0.44	C	B	B
	TNH000515	92.63	4.39	0.37	C	D	C
Uruti Stream	URU000198*	94.14	4.27	0.40	C	D	B
Waiau Stream	WAI000110	86.36	5.04	0.36	D	C	C
Waiongana Stream	WGA000260	94.55	3.94	0.41	C	D	B
	WGA000450	87.78	3.96	0.36	D	D	C
Waingongoro River	WGG000115	147.37	8.20	0.69	A	A	A
	WGG000150	140.00	7.73	0.61	A	A	A
	WGG000500	115.71	6.28	0.48	B	B	B
	WGG000665	109.00	7.12	0.45	C	A	B

River/Stream Name	Site code	5 Year Median MCI	5 Year Median SQMCI	5 Year Median ASPM	MCI	SQMCI	ASPM
	WGG000895	97.65	4.46	0.39	C	D	C
	WGG000995	93.85	4.13	0.41	C	D	B
Waiau Stream (2)	WIU000700*	78.33	4.65	0.19	D	C	D
Waiwhakaiho River	WKH000100	141.05	7.81	0.68	A	A	A
	WKH000500	105.26	3.57	0.44	C	D	B
	WKH000920	86.15	3.56	0.32	D	D	C
	WKH000950	85.26	3.19	0.30	D	D	C
Waiokura Stream	WKR000500	112.22	7.06	0.47	B	A	B
	WKR000700	110.59	6.00	0.46	B	B	B
Waimōku Stream	WMK000100	137.65	7.79	0.57	A	A	B
	WMK000298	103.53	4.09	0.41	C	D	B
Waikaramamara Stream	WMR000100*	110.00	6.78	0.43	B	A	B
Whenuakura Stream	WNR000450*	89.41	4.26	0.31	D	D	C
Waitara River	WTR000540*	98.68	4.62	0.42	C	C	B
	WTR000850	86.67	3.74	0.28	D	D	D

Table 45 below compares the total number of sites within each NOF band for the three macroinvertebrate metrices. For the MCI, the distribution shows fewer sites in band A compared to the SQMCI, but more sites in band C, indicating sites of intermediate quality. In contrast, the SQMCI has the largest number of sites in band A, but slightly fewer sites in bands B and C compared to MCI. Notably, although the SQMCI has the highest number of sites in band A, it also has the highest amount of sites in band D. For ASPM, the number of sites in band B is the largest among the three metrics, while the number of sites in bands A and D are the smallest of the three metrics. To gain a comprehensive understanding of the overall water quality, it is essential to consider these three metrics together rather than in isolation, as each provides different insights into site conditions.

Table 45 Total sites within each NOF band for macroinvertebrate attributes using 5-year medians scores calculated from the latest five summer results

NOF BAND	MCI		SQMCI		ASPM	
	Sites	%	Sites	%	Sites	%
A	12	18%	18	27%	9	13%
B	11	16%	9	13%	34	51%
C	29	43%	14	21%	16	24%
D	15	22%	26	39%	8	12%

The majority of Taranaki's waterways (based on the monitoring sites included in the Freshwater Macroinvertebrate SoE Monitoring Programme) were found to be in better ecological health than the national bottom lines, ranging from 61% (two-thirds) For the SQMCI to 88% for the ASPM, depending on the ecological attribute considered.

The stretches of streams and rivers in Taranaki where all three of the NPS-FM attributes for ecological health are in band A, are Kaūpokonui River (KPK000250), Katikara Stream (KTK000150), Manganui River (MGN000195), Maketawa Stream (MKW000200), Pātea River (PAT000200), Timaru Stream (TMR000150), Waingongoro River (WGG000115 and WGG000150) and Waiwhakaiho River (WKH000100). These sites represent the healthiest aquatic communities found in the region, as shown by this monitoring programme.

The stretches of streams and rivers in Taranaki where all three of the NPS-FM attributes for ecological health were found to be in the poorest health (within band D), are Huatoki Stream (HTK000745), Mangatī Stream (MGT000488 and MGT000520) and Waitara River (WTR000850). These sites host the least healthy aquatic communities in the region and are likely affected by urbanization and industrialization. Additionally, habitat modification and a general decline in water quality, such as the accumulation of diffuse and point source discharges in the lower reaches of the catchments, contribute to their poor condition. Eighteen sites (27% of monitored sites) have at least one NPS attribute of ecological health in the A band. Thirty-one sites (46% of monitored sites) have at least one NPS attribute of ecological health in the D band.

These results are discussed in more detail in Section 4.

3.3 Regional analysis of trends

Trend analyses using regionally-derived MCI scores were completed for 56 sites. The remaining 11 sites did not have sufficient data for a trend analysis. Long-and short-term trends results are illustrated in Figures 6 and 7 and are also summarised in Table 46.

Temporal trends measured for the 56 sites with complete data throughout the full SoE monitoring period (referred to as 'long-term trends') indicated that 42 sites had positive trends (nine 'likely improving' and 33 'very likely improving'), while eight sites exhibited negative trends (five 'likely degrading' and three 'very likely degrading'). The remaining six sites had an 'indeterminate' trend direction. These trends suggest that a majority of sites in the SoE monitoring programme have showed some degree of improvement in the state of the in-stream communities since the beginning of their monitoring in the programme.

In contrast, trends for sites between the monitoring period of 2013 and 2023 (referred to as 'short-term trends') showed a different pattern: only 20 sites displayed positive trends (13 'likely improving' and seven 'very likely improving'), while 18 sites showed negative trends (11 'likely degrading' and seven 'very likely degrading'). The remaining 20 sites had an 'indeterminate' trend direction. Compared to the long-term trends, these results indicated a more balanced distribution of positive and negative trends, with now more than twice the number of sites showing degradation than seen in the long-term trends. Additionally, the proportion of sites showing an 'indeterminate' trend increased, and the overall amount of sites showing a positive trend decreasing by more than half. This indicates that, at least since 2013, that many sites have experienced a short-term decline in the health of their in-stream communities.

The comparison suggests that while the long-term trends might have shown generally positive or mixed outcomes, the reduction in improving trends and the increase in degrading trends over the past decade indicate a more recent change in environmental conditions and/or human activities however, at present it is not clear what has driven this change. This shift highlights the importance of conducting more targeted studies on the factors influencing ecological health so that appropriate measures can be taken to support and mitigate degradation in the region.

A rolling graph comparison of how trend categories have changed over time is illustrated in Figure 8. Throughout the monitoring programme, a shift is evident from predominantly improving trends in 2005 to an increase in degradation trends, particularly from 2017 onwards. Between 2020 and 2023, there has been a noticeable decrease in the number of sites in degrading categories, while the numbers of sites in improving categories have increased significantly. The distribution of trends has become more balanced, with the most recent two years showing an even spread across categories. This transition from mostly positive to negative trends suggests a decline in in-stream community health. However, the decrease in 'degrading' trends after 2020 could indicate recent improvements at sites. In the future, detailed investigation into the drivers of macroinvertebrate health could provide insight into what is driving degradation or improvement at these sites. However, the recent decrease in degrading trends might indicate some improvements. Future investigations into macroinvertebrate health drivers could provide further insights into these trends.

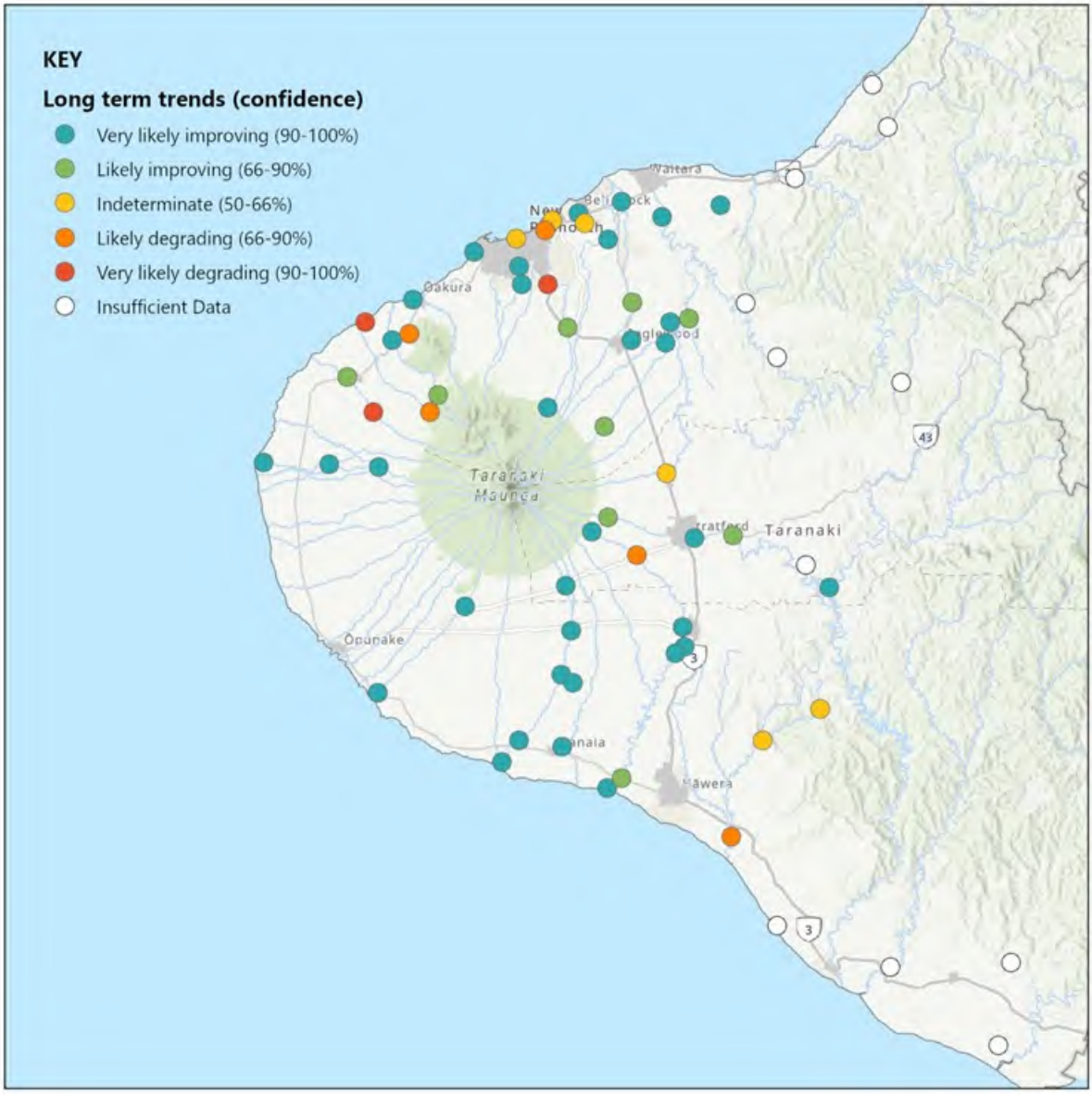

Figure 6 Long-term trends for sites in the SoE macroinvertebrate monitoring programme (01 July 1995 – 30 June 2023)

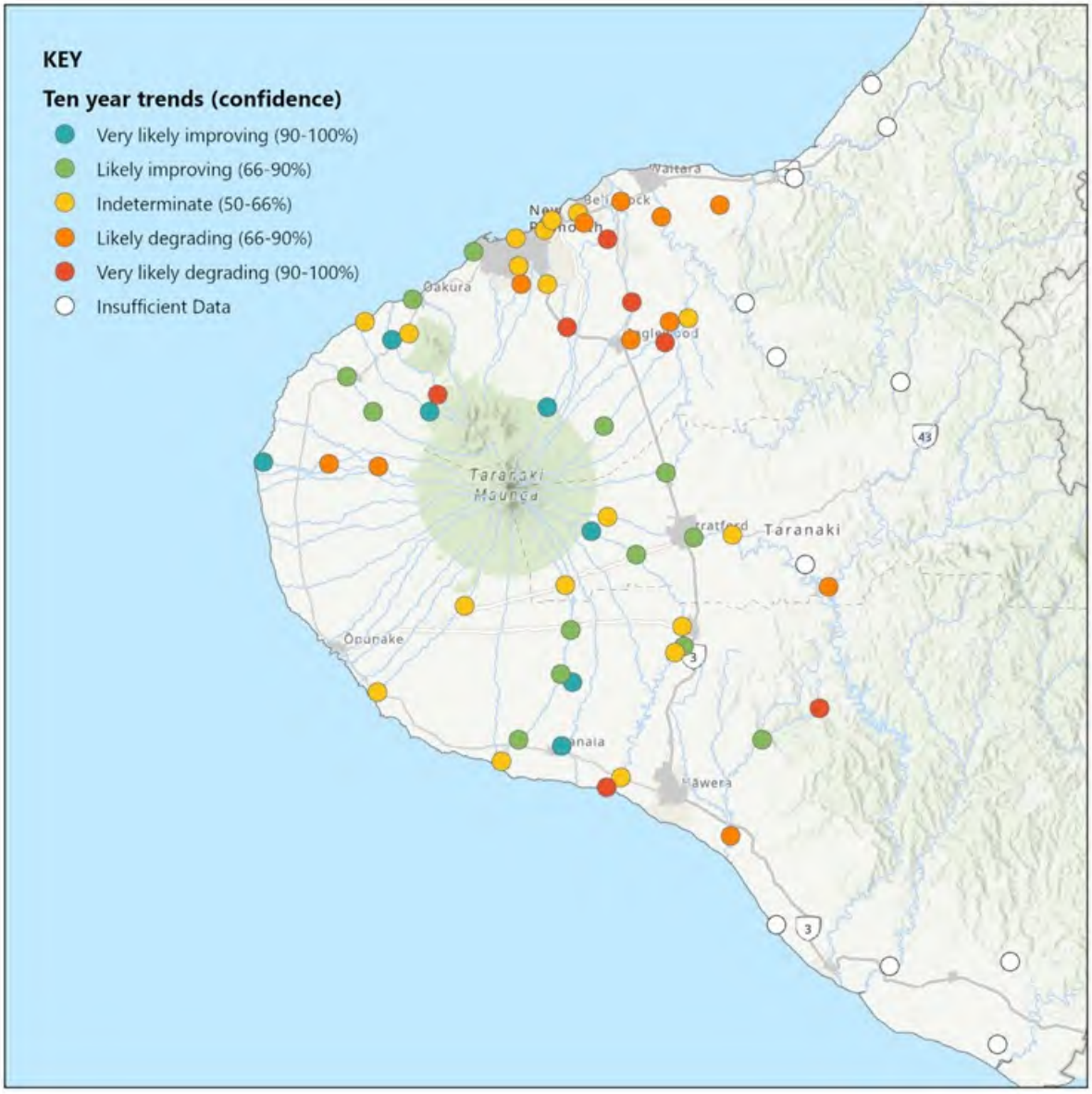

Figure 7 Short-term trends for sites in the SoE macroinvertebrate monitoring programme (01 July 2013 – 30 June 2023)

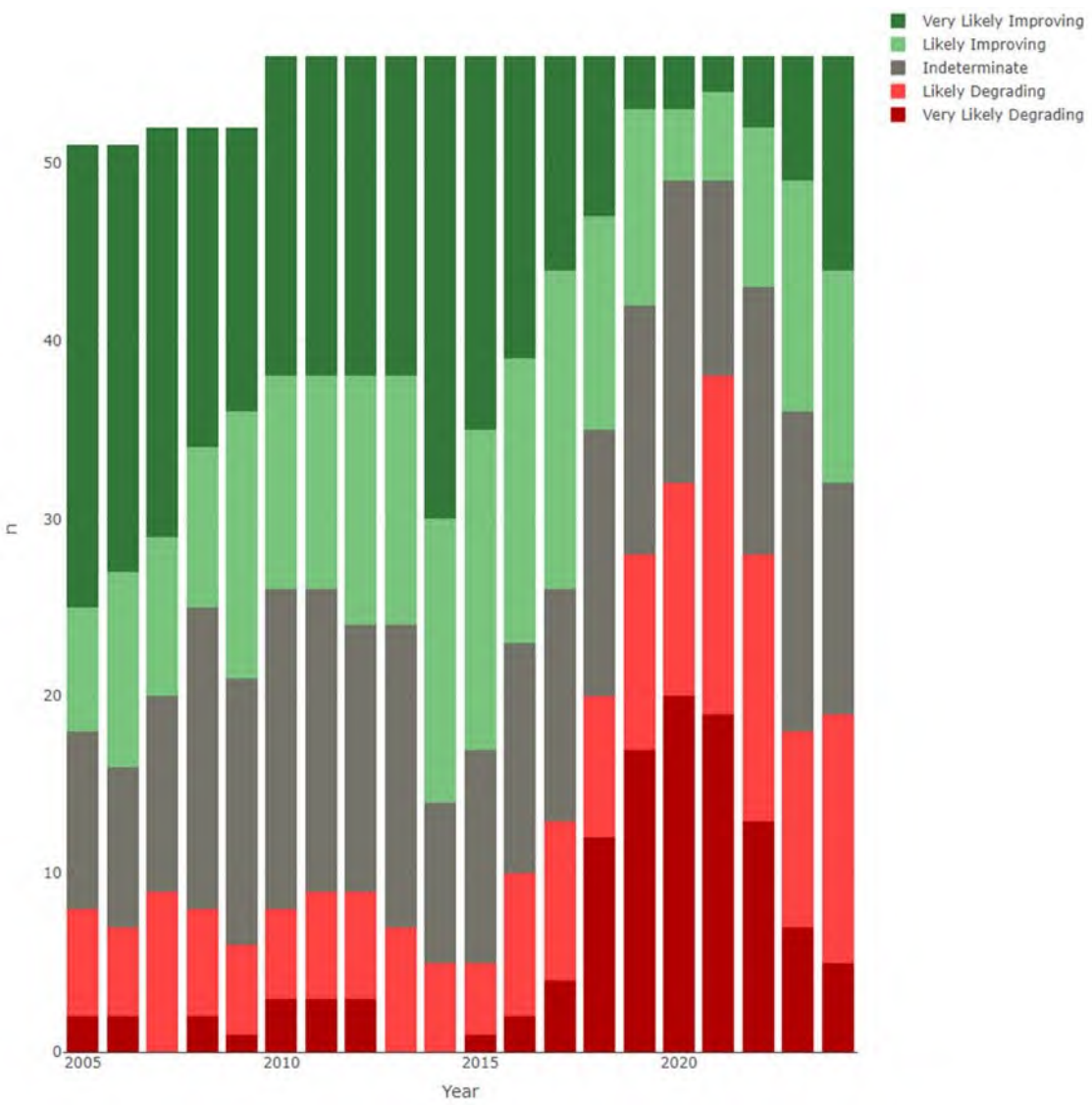

Figure 8 Rolling graph of trend categories of MCI scores over time

Note: Trends analysed using regional tolerance scores for macroinvertebrates. Direction symbols received from LAWA.

Table 46 Trend analysis on long-term and ten-year MCI datasets for each site with >10 years of data

River	Site	Long-term Trends					Ten-year Trends				
		n	Trend	Likelihood	% Change		n	Trend	Likelihood	% Change	
Herekawe Stream	HRK000085	55	Very Likely Improving	1.00	0.42		18	Likely Improving	0.86	0.44	
Huatoki Stream	HTK000350	55	Very Likely Improving	1.00	0.68		18	Likely Degrading	0.68	-0.21	
	HTK000425	55	Very Likely Improving	1.00	0.33		18	Indeterminate	0.55	0.11	
	HTK000745	55	Indeterminate	0.62	-0.06		18	Indeterminate	0.53	-0.19	
Kapoaiaia Stream	KPA000250	55	Very Likely Improving	1.00	0.89		19	Likely Degrading	0.90	-0.60	
	KPA000700	55	Very Likely Improving	1.00	0.74		19	Likely Degrading	0.85	-0.70	
	KPA000950	48	Very Likely Improving	1.00	0.48		19	Very Likely Improving	0.94	0.63	
Kaupokonui River	KPK000250	51	Very Likely Improving	0.99	0.17		19	Indeterminate	0.51	0.07	
	KPK000500	47	Very Likely Improving	1.00	0.57		19	Likely Improving	0.85	0.71	
	KPK000660	47	Very Likely Improving	1.00	0.99		19	Likely Improving	0.69	0.35	
	KPK000880	55	Very Likely Improving	1.00	0.52		19	Likely Improving	0.90	0.97	
	KPK000990	55	Very Likely Improving	0.97	0.39		19	Indeterminate	0.53	0.00	
Kurapete Stream	KRP000300	54	Very Likely Improving	1.00	0.64		18	Likely Degrading	0.86	-0.64	
	KRP000660	54	Very Likely Improving	1.00	0.68		18	Likely Degrading	0.74	-0.23	
Katikara Stream	KTK000150	54	Likely Degrading	0.78	-0.08		18	Very Likely Improving	0.99	0.93	
	KTK000248	54	Very Likely Degrading	0.92	-0.22		18	Indeterminate	0.50	0.00	
Makara Stream	MAA000900	Insufficient data for trends									
Mangorei Stream	MGE000970	55	Very Likely Degrading	0.94	-0.34		18	Indeterminate	0.55	-0.02	
Mangaehu River	MGH000950	54	Very Likely Improving	1.00	0.81		19	Likely Degrading	0.71	-0.27	
Manganui River	MGN000195	54	Indeterminate	0.63	-0.03		19	Likely Improving	0.70	0.14	
	MGN000427	55	Likely Improving	0.77	0.12		19	Indeterminate	0.53	-0.26	
Mangati Stream	MGT000488	53	Indeterminate	0.61	0.05		18	Likely Degrading	0.83	-1.14	
	MGT000520	54	Very Likely Improving	1.00	0.88		18	Indeterminate	0.65	-0.60	
Makuri Stream	MKR000495	Insufficient data for trends									

River	Site	Long-term Trends					Ten-year Trends				
		n	Trend	Likelihood	% Change		n	Trend	Likelihood	% Change	
Maketawa Stream	MKW000200	55	Likely Improving	0.87	0.14		18	Likely Improving	0.89	0.50	
	MKW000300	55	Very Likely Improving	1.00	0.56		18	Very Likely Degrading	0.99	-0.72	
Moumahaki Stream	MMK000050	Insufficient data for trends									
Mangaoreti Stream	MNT000950	Insufficient data for trends									
Mangaoraka Stream	MRK000420	54	Very Likely Improving	0.99	0.42		18	Very Likely Degrading	0.94	-0.67	
Mangaroa Stream	MRO000210	Insufficient data for trends									
Matau Stream	MTA000068	Insufficient data for trends									
Mangawhero Stream	MWH000490	55	Very Likely Improving	1.00	1.05		19	Likely Improving	0.84	0.65	
Pātea River	PAT000200	55	Likely Improving	0.90	0.10		19	Indeterminate	0.64	0.14	
	PAT000315	55	Very Likely Improving	1.00	0.33		19	Likely Improving	0.84	0.48	
	PAT000360	55	Likely Improving	0.72	0.05		19	Indeterminate	0.54	0.02	
Punehu Stream	PNH000200	54	Very Likely Improving	1.00	0.40		19	Indeterminate	0.65	-0.31	
	PNH000900	46	Very Likely Improving	1.00	0.94		19	Indeterminate	0.62	0.38	
Stony River	STY000300	46	Very Likely Degrading	0.96	-0.22		18	Likely Improving	0.69	0.21	
	STY000400	55	Likely Improving	0.70	0.10		18	Likely Improving	0.86	1.52	
Timaru Stream	TMR000150	55	Likely Improving	0.73	0.03		18	Very Likely Degrading	0.94	-0.62	
	TMR000375	54	Very Likely Improving	1.00	0.64		18	Very Likely Improving	0.90	1.26	
Tangahoe River	TNH000090	52	Indeterminate	0.50	0.00		18	Very Likely Degrading	0.94	-0.91	
	TNH000200	53	Indeterminate	0.58	0.09		19	Likely Improving	0.82	0.35	
	TNH000515	54	Likely Degrading	0.68	-0.15		19	Likely Degrading	0.72	-0.19	
Uruti Stream	URU000198	Insufficient data for trends									
Waiau Stream	WAI000110	54	Very Likely Improving	0.99	0.32		18	Likely Degrading	0.84	-0.63	
Waiongana Stream	WGA000260	46	Likely Improving	0.75	0.09		18	Very Likely Degrading	0.91	-0.82	
	WGA000450	44	Very Likely Improving	1.00	0.50		18	Likely Degrading	0.86	-0.55	
Waingongoro River	WGG000115	52	Very Likely Improving	1.00	0.26		19	Very Likely Improving	1.00	0.89	

River	Site	Long-term Trends					Ten-year Trends				
		n	Trend	Likelihood	% Change		n	Trend	Likelihood	% Change	
	WGG000150	52	Likely Degrading	0.68	-0.05		19	Likely Improving	0.80	0.32	
	WGG000500	52	Very Likely Improving	1.00	0.42		19	Indeterminate	0.62	-0.14	
	WGG000665	47	Very Likely Improving	1.00	0.44		19	Indeterminate	0.60	0.07	
	WGG000895	47	Likely Improving	0.78	0.06		19	Indeterminate	0.64	0.13	
	WGG000995	47	Very Likely Improving	0.92	0.19		19	Very Likely Degrading	0.91	-0.68	
Waiau Stream (2)	WIU000700	Insufficient data for trends									
Waiwhakaiho	WKH000100	45	Very Likely Improving	0.98	0.32		18	Very Likely Improving	0.96	0.53	
	WKH000500	44	Likely Improving	0.80	0.15		18	Very Likely Degrading	0.99	-1.67	
	WKH000920	40	Likely Degrading	0.74	-0.13		17	Indeterminate	0.50	-0.10	
	WKH000950	40	Indeterminate	0.64	-0.09		18	Indeterminate	0.58	0.35	
Waiokura Stream	WKR000500	36	Very Likely Improving	1.00	1.00		19	Very Likely Improving	0.98	0.96	
	WKR000700	31	Very Likely Improving	0.99	0.46		19	Very Likely Improving	0.98	0.86	
Waimoku Stream	WMK000100	30	Likely Degrading	0.72	-0.05		18	Indeterminate	0.59	-0.11	
	WMK000298	31	Very Likely Improving	1.00	0.74		18	Likely Improving	0.70	0.26	
Waikaramarama River	WMR000100	Insufficient data for trends									
Whenuakura River	WNR000450	Insufficient data for trends									
Waitara River	WTR000540	Insufficient data for trends									
	WTR000850	31	Very Likely Improving	1.00	0.74		19	Likely Degrading	0.76	-1.07	

For the 56 sites analysed for trends, over the long term 42 (75%) of sites have shown a likely or very likely improvement, and eight (14%) of sites have shown a likely or very likely deterioration. Over the most recent short term, 20 sites (36%) have shown a likely or very likely improvement, and 18 sites (32%) have shown a likely or very likely deterioration.

The stretches of streams and rivers which have shown a very likely improvement over both the long term and the more recent short term are Kapoaiaia Stream (KPA000950), Maketawa Stream (MKW000300), Timaru Stream (TMR000375), Waingongoro River (WGG000115), Waiwhakaiho River (WKH000100), and Waiokura Stream (WKR000500 and WKR000700). In contrast, there are zero stretches of the stretches of streams and rivers which have shown a very likely deterioration over both the long term and the more recent short term. These results are discussed in detail in Section 4.

4. Discussion

This report summarised the 2019/20 to 2022/23 monitoring period. The 2022/23 sampling year was the 28th year of the Council's macroinvertebrate SoE programme. This report describes the macroinvertebrate communities at the 67 sites established in the Taranaki Region.

Results are discussed in terms of macroinvertebrate taxa richness and regionally-derived MCI scores, which are discussed in relation to historical data for each site. Long- and short-term temporal trends using regionally-derived MCI data were identified where possible. Additionally, in compliance with NPS-FM guidelines, five-year medians have been calculated and presented.

Macroinvertebrate community composition and health can be influenced by a wide range of factors. The MCI and SQMCI indices were developed to assess the impact of organic pollution and nutrient enrichment on these communities (Stark, 1985; Stark 1998; and Stark et al., 2001). Stark and Maxted (2007) emphasized that "biotic indices rely on the fact that biological communities are a product of their environment, in that different kinds of organisms have different habitat preferences and pollution tolerances." Consequently macroinvertebrate indices respond to various environmental factors such as water flow, sedimentation, shading, temperature, and dissolved oxygen, to name a few. The resulting states and trends in macroinvertebrate health are influenced by multiple pressures and drivers, as illustrated by the Collier et al., 2014 model (Figure 9).

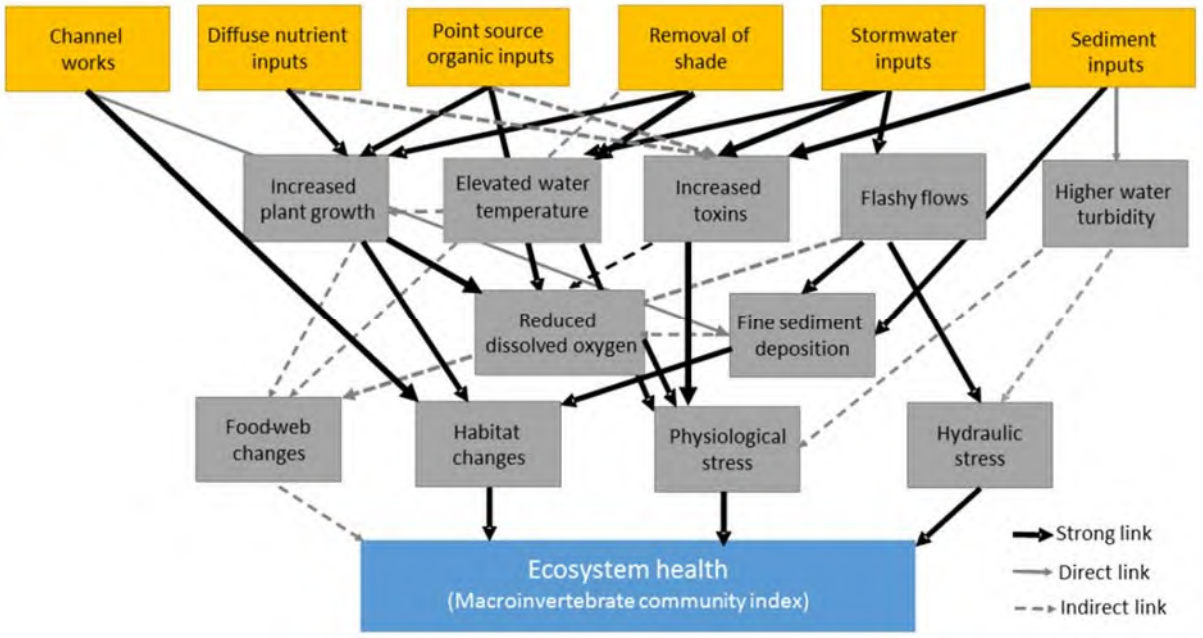

Figure 9 Conceptual causal model identifying the expected causal links between human pressures and Macroinvertebrate Community Index (MCI) from Collier et al., 2014

Ideally, to fully understand the factors influencing macroinvertebrate community composition, a comprehensive grasp of the relevant variables and their interactions is essential. However, our current data on several key variables is limited. While we have an excellent database of historical physicochemical water quality, including metrics such as dissolved inorganic nitrogen and dissolved reactive phosphorus, the number of monitored sites in this database is relatively few compared to the number of sites in the SoE macroinvertebrates programme. This data relates solely to the state of the water at the time of sampling rather than collecting a continuous data record. It is recommended that data analysis is carried out on data held by the Council to explore potential drivers of macroinvertebrate health in the region. Additionally, an analysis of the six REC factors (land cover, climate, valley landform, network position, geology, and flow source) could be undertaken to test whether differences in REC factors could be affecting macroinvertebrate

communities. Further analysis could provide insight onto why trends and results are changing and could assist in site targeting for future programmes and monitoring.

Regional (Taranaki)

When comparing to the entire monitoring period (2019/20 to 2022/23), there were several new minima and maxima MCI scores prior to the 2023 monitoring year:

- In 2020, three sites (PAT000360, TMR000375, and TNH000090) established new minima MCI scores, while three sites (PNH000200, WGA000450, and WGG000115) obtained new maxima MCI scores.
- In 2021, one site (WKH000500) established a new minimum MCI score, while two sites (KTK000150, WKR000500, and WT000850) established new maxima MCI scores.
- In 2022, no sites established a new minimum MCI score, however, ten sites (KPK000250, KRP000660, MGH000950, MGT000520, PAT000200, TMR000375, TNH000200, WGG000150, WKR000700, and WMK000298) established new maxima MCI scores.
- Note: the new minima and maxima MCI scores set during the 2020-2022 monitoring period do not include sites which were established into the programme since the 2020 monitoring period.

The results from the most recent 2023 monitoring year have shown that:

- For regional MCI scores, three sites were categorised as having 'excellent' health, 12 sites were categorised as having 'very good' health, 24 sites were categorised as having 'good' health, 21 sites were categorised as having 'fair' health, three sites were categorised as having 'poor' health, and one site was categorised as having 'very poor' health.
- Regional MCI scores ranged from 58 units to 145 units.
- Ten sites reported MCI scores significantly higher than their respective site medians, while one site recorded an MCI significantly less than its respective site median (noting that this was only the fourth year of monitoring for that site and as such, the data record is currently limited).
- Two new maximum regional MCI scores (PNH000900 and TNH000090) and one new minimum regional MCI score (URU000198) were established during the 2022/23 monitoring period.
- Taxa richness ranged from five to 27 taxa.
- One new maximum taxa richness (MKR000495) and nine new minima taxa richnesses (KPK000880, MGE000970, MMK000050, TNH000090, TNH000200, WGG000150, WGG000500, WKR000700, and WMR000100) were recorded during the 2022/23 monitoring period.

The lower Mangatī Stream site (MGT000520) recorded an MCI score reflective of 'very poor' health and a low taxa richness of eight taxa, seven of which were 'tolerant'. The lower reaches of the Mangatī Stream flow through the Mangatī industrial area, and site MGT000520 is situated downstream of this area, approximately 400m below Devon Road. It is likely that the macroinvertebrate communities at MGT000520 have been impacted by cumulative stormwater and wastewater discharges from this industrial area. In the spring 2021 survey a 'fair' MCI score of 80 units was recorded. Prior to this, MCI scores have consistently reflected 'very poor' to 'poor' macroinvertebrate community health. During the period under review, this site also scored 'very poor' MCI scores in the spring 2020 survey (58 units) and spring 2021 survey (56 units).

The three sites which recorded MCI scores reflective of 'poor' health were all sites which were recent additions to the programme since the last 2018-2019 report (MMK000050, MRO000210, and URU000198). Since these sites were established into the SoE programme, they have only scored MCI scores reflecting either 'fair' or 'poor' health. As monitoring continues for these sites, it would not be surprising to see the MCI ranges for these sites expand in either direction.

In general, data indicated that macroinvertebrate communities at sites in the upper reaches of catchments comprise a greater proportion of taxa that are 'sensitive' to the effects of nutrient enrichment and poor

habitat conditions compared to communities in the mid and lower reaches. These changes in community composition likely result from the impacts of nutrient enrichment, sedimentation, turbidity, increased sunlight (due to less riparian shading and potentially wider rivers), higher temperatures, increased algal and macrophyte growth, lower water levels, and reduced aeration (mixing), leading to lower dissolved oxygen levels. In future, it is recommended that a more comprehensive analysis be conducted, considering these factors to identify the overall drivers of macroinvertebrate health in our region.

The upper reaches of catchments often had a higher taxa richness than the lower reaches. Generally, there is also a greater proportion of taxa sensitive to nutrient enrichment and poor habitat quality in the upper reaches compared to communities in the mid and lower reaches. However, various factors can influence taxa richness, and some upper sites are negatively affected by headwater erosion events. Additionally, mild nutrient enrichment can sometimes increase taxa richness, so care must be taken when interpreting these results. Nonetheless, taxa richness is very useful in determining the presence or effects of pollution events, as toxic discharges invariably reduce richness.

The results from the 2022/23 monitoring period indicate a gradual decline in macroinvertebrate community health downstream (Figure 2). Sites classified as ‘excellent’ are predominantly located near or within the boundaries of Te Papa-Kura-o-Taranaki, whereas sites scoring ‘fair’ or lower are closer to the coast. Enhancing stream health, especially at sites in the lower reaches of ring plain streams, is unlikely to be significant or meaningful without substantial improvements in habitat and water quality upstream. Such improvements involve initiatives like riparian fencing/planting and redirecting discharges from dairy pond treatment systems away from direct surface water disposal to land irrigation.

It's not surprising to observe degradation in in-stream communities in the lower reaches, as indicated by the prevalence of taxa tolerant to organic impacts. However, noticeable temporal improvements may not occur until comprehensive management strategies are implemented across the entire catchment area.

During the monitoring period, sites in the middle and lower reaches generally showed lower summer MCI scores compared to spring MCI scores. This difference can be attributed to the factors mentioned earlier and possibly to lifecycle patterns. Some taxa appear as large nymphs in spring but may not be detected in summer surveys due to their transition to egg or first instar stages, which are challenging to identify at the genus level. Consequently, less sensitive taxa are more prevalent in summer surveys, alongside an increase in 'tolerant' taxa.

For detailed seasonal patterns, previous reports with both spring and summer surveys and seasonal analyses provide further insights. However, seasonal analyses for the 2023 monitoring year were not conducted due to the discontinuation of spring surveys.

The decreasing gradient of in-stream health from ‘very good’ in the upper reaches of ringplain streams to ‘fair’ in the lower reaches reflects a downstream shift in macroinvertebrate communities towards taxa more tolerant of nutrient enrichment and habitat deterioration. These communities have adapted to cumulative impacts from upstream point source discharges and diffuse runoff, making them resilient to further impacts, except those from toxic discharges. Therefore, significant improvements in water quality and habitat are necessary in lower reach communities before statistically and ecologically meaningful changes can be observed.

National (NPS-FM)

In total, 56 sites had the most recent five-year median scores calculated using complete and robust data, while 11 sites used partial/incomplete data.

Overall, all three metrics show a similar trend where water quality is higher within or near the boundary of Te Papa-Kura-o-Taranaki and tends to decrease with increasing distance away from the park. The concentration of high quality sites in band A is evident within or around the park boundary for all three

metrics. MCI and ASPM showed similar patterns of distribution, with ASPM having smaller pockets of poor quality sites that fell within band D. The SQMCI attribute had the most pronounced indication of poor water quality.

In the past, MCI has been considered the best index to assess the state of the environment for macroinvertebrates (Stark and Maxted, 2007) and this shows that 78% of sites were above the NPS-FM national bottom line. MCI and ASPM were highly correlated with all ASPM sites that fell within band D also being sites that fell within band D for MCI. The remaining MCI sites where ASPM was not also in band D were sites in which the ASPM were at the lower band C range.

With the numeric states collated, 30 sites (45%) have at least one numeric state that fails to achieve national bottom line.

There were nine sites throughout eight rivers/streams that had all three numeric attributes within band A, all of which were the most upstream sites for the respective rivers/streams. All sites in which the ASPM band was in band A also had both MCI and SQMCI in band A.

There were four sites throughout three rivers/streams that had all three numeric attributes fall below national bottom line. The Mangatī River was the only river to have both sites with all three attributes in band D.

The SQMCI had the most sites fall within band A, but also had the highest proportion of sites failing to achieve national bottom lines across the three metrics assessed. This could reflect the sensitive nature of the SQMCI metric compared to MCI. MCI is calculated using presence-absence data, while SQMCI takes relative abundances into account, therefore any change in the MCI will reflect a loss or addition of taxa at a site, and will always reflect a decline in relative abundances first before taxa decline (i.e., SQMCI will decrease before MCI will decrease). A change in SQMCI value does not inherently mean a change in taxa numbers.

Overall, it is recommended that in the future a comparison of regionally and nationally-derived tolerance values and MCI scores are analysed together to assess similarities and differences within analysis methods.

Regional trends

For long-term trends, eight sites indicated either 'likely degrading' or 'very likely degrading' trends.

The two Katikara Stream sites (KTK00015 and KTK000248) both indicated a negative trend, with the upper site 'likely degrading' and the lower site 'very likely degrading'. This is likely due to severe headwater erosion events in during 2008/09 which impacted the macroinvertebrate communities in this stream, with subsequent limited recovery in the time following. Other sites, such as STY000300 ('very likely degrading'), and WGG000150 ('likely degrading') also showed negative trends likely impacted by known erosion events in these catchments. The Waiwhakaiho River site (WKH000920, 'likely degrading') has had fluxes of decline and recovery but overall indicating a decline in health over time. This pattern could be attributed to an increase in the permitted take of the Hydro Electric Power Scheme (HEPS), among other factors. The lower Tāngāhoe site (TNH000515) showed a 'likely degrading' trend, however the calculated likelihood was at the lower end of the trend category. This site has showed variability in health over time, with improvements followed by declines in MCI health, attributing to an overall degradation shown over the full dataset.

The upper site on the Waimōku Stream (WMK000100) showed a 'likely degrading' long-term trend. MCI values for this site have had a moderate range with the minimum and maximum scores differing by 20 units, however scores have usually consistently remained in the 'very good' health category. The percent of annual change for this site was only revealing a decrease in MCI scores by 0.05 units annual, which is a small change.

The Mangorei Stream site (MGE000970) showed a 'very likely degrading' trend. MCI values for this site have had a relatively wide range, with the minimum and maximum value differing by 29 units. There have been

small fluctuations in MCI score over the entire dataset, which has overall revealed a negative trend over time. This can be seen when looking at all site results (view Appendix V) where there was a higher proportion of sites categorised as 'good' health at the beginning of the monitoring period, whereas from approximately 2011 onward there was a shift to more MCI scores representative of 'fair' health. However, there is a suggestion that this has plateaued over the recent years, as suggested by the change to an 'indeterminate' trend category in the ten-year trends.

When comparing these sites with a long-term degrading trend, seven out of eight sites had a change in trend category either to 'indeterminate', 'likely improving', or 'very likely improving' in the ten-year trend analysis. The Tāngāhoe River site (TNH000515) site was the only site of these eight to remain as 'likely degrading".

Some of the sites in the ten-year trend analysis have plateaued, with 20 sites now showing an 'indeterminate' trend direction, indicating neither a positive or negative trend. This could be due to many reasons, one such being that in some catchments riparian management initiatives have largely been completed and therefore in-stream communities and MCI scores have stabilised at those sites. Additionally, some sites have shown step change improvements due to the removal of point source discharges such as wastewater treatment plant removals, resulting in a new baseline at those sites. There are also factors which could be counteracting improvements, such as increased agricultural inputs or warmer/drier weather. Waterways of note in the ten-year trend analysis were the Kurapete Stream and the Waiongana Stream, where both sites on each stream have degrading trend categories. This could suggest that events have or are occurring in the upper reaches of the catchment, affecting all sites on the stream.

Ten-year trends have also indicated that the number of sites showing 'improving' trends has decreased, while the number of sites showing 'degrading' trends has increased. Since 2013, 18 sites (32%) have likely or very likely deteriorated, compared to only eight sites (14%) showing similar trends over the long-term. Conversely, since 2013, 20 sites (36%) have likely or very likely improved, whereas long-term trends indicate that three-quarters of the sites (42 sites, 75%) were likely or very likely improving. A comparison of how the proportion of these trend categories have changed over time is presented in Figure 8. Fourteen sites with likely or very likely degrading short-term trends were sites that were shown as likely or very likely improving in the long-term trends, suggesting a recent decline in their macroinvertebrate stream communities. Typically, the sites which had healthy in-stream macroinvertebrate communities at the start of the monitoring programme have not shown large improvements in trend analyses. Following this, it is not surprising that sites with long-term trends showing the highest improvements were in relatively poor health at the start of the monitoring programme.

Several of the sites exhibiting negative ten-year trends (either 'likely degrading' or 'very likely degrading') were also sites which were affected by low summer flows in the latest 2023 survey (Appendix III). For these sites, days since a significant flood, specifically a fresh over 7x median flow were particularly high. Samples taken in summer months have often shown poorer MCI results than spring (refer to previous annual reports for spring and summer analyses). This could be due to factors such as decreased habitat space, a reduction of taxa which prefer fast flowing water, and an increase in taxa which prefer slower flowing water (Suren & Jowett, 2006). An analysis from the previous 2018/19 annual report indicated that MCI scores were negatively correlated with the days between sampling and the last significant fresh (when flows go over 3x or 7x median). It was assumed that this was likely due to periphyton and fine sediment deposition accrual as well as an overall decrease in flows overtime due to less rainfall. Significant freshes mobilise the streambed removing periphyton and deposited sediment, which leaves a habitat better suited to macroinvertebrates. Other factors such as nutrients and temperature can have important interactive and antagonistic effects and therefore the importance of the preceding hydrological regime will vary at the site level. The previous 2018/19 annual report indicated that the time between sampling and the last significant fresh had been increasing, which could have influenced trends at some sites.

In the future, investigations into how macroinvertebrate communities have interacted with other stream factors such as periphyton, deposited sediment, and nutrients could be useful when discussing results and trends.

5. Summary

The 2022/23 period was the 28th year of the macroinvertebrate state of the environment (SoE) monitoring programme. This report incorporated new data from the 2019/20 through to 2022/23 monitoring years, and summarises the macroinvertebrate communities at 67 sites established throughout the Taranaki region.

Results are discussed in terms of macroinvertebrate taxa richness and MCI scores using regionally-derived tolerance values, which is compared with prior SoE data. Additionally, to align with national standards, this report also includes MCI, SQMCI and ASPM scores based on nationally-derived tolerance values over the recent five-year period. In-stream health is also assessed using regionally-derived MCI scores to identify long- and short-term trends where possible.

6. Recommendations from the 2018-2019 report

In the 2018/19 report, it was recommended:

1. THAT the freshwater biological macroinvertebrate fauna component of the SoE programme be maintained in the 2019/20 monitoring year by means of the same programme as that undertaken in 2018/19, with some site changes. These changes are namely that five Eastern Hill Country sites be added to the programme to provide improved representation, and that the upper Mangawhero site is removed, as this site has very poor site-specific habitat and is not considered representative of the stream or catchment;
2. THAT temporal trending of the macroinvertebrate faunal data continues to be updated on an annual basis.

7. Recommendations for 2023/24 monitoring period

1. THAT the freshwater biological macroinvertebrate fauna component of the SoE programme be maintained in the 2023/24 monitoring year by means of the same programme as that undertaken in 2018/19, with some site changes. Changes recommended are the addition of sites to increase representation of currently underrepresented FMUs or catchment types (e.g., spring-fed catchments), as well as the review of one established site on the Uruti Stream for appropriateness in the SoE programme;
2. THAT any potential site changes are discussed with iwi/hapū and/or catchment community groups to explore opportunities to incorporate other data streams and/or align monitoring programmes;
3. THAT temporal trending of the macroinvertebrate data continues to be updated on an annual basis;
4. THAT to inform policy implementation and future SoE reporting, an analysis of drivers of macroinvertebrate health be undertaken;
5. THAT a comparison between regionally- and nationally-derived tolerance values and MCI scores be completed to assess similarities between results.

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Appendix I

History of site selection

Evaluations of the effects of, and recovery from, extensive erosion in the headwaters of the Waiaua River were included in this programme. These surveys commenced in December 1998, with the two sites on the Waiaua River incorporated into the SOE biological monitoring programmes once the initial documentation of the effects and recovery was established. This river has continued to be affected by headwater erosion in more recent years, leading to a review of the programme in 2006, after which the Waiaua River was excluded from the SOE programme. The Kurapete Stream (upstream and 5.5km downstream of the Inglewood oxidation pond system) has been monitored throughout the SOE period, using the appropriate SOE protocols, and thus has been recently included in the programme. Two additional sites in the Waiwhakaiho River catchment were included in 2002-2003 in recognition of the importance of this major catchment. A further two additional eastern hill country sites in the Whenuakura and Waitara Rivers were added to the programme in 2015-2016 to improve the representativeness of the monitoring programme.

Two sites in the Maketawa Stream were also added because of a commitment to continue the documentation of conditions in this catchment following the investigation of baseline water quality conditions during the 2000-2002 period (Stark, 2003). Three sites in the Tangahoe River were established in the 2007-2008 period for the purposes of monitoring land use changes (afforestation) in an eastern hill country catchment. The two sites in the Waiokura Stream were also added in the 2007-2008 period as a long term monitoring commitment to the collaborative best practice dairying catchment project. One site in the Herekawe Stream (a long-term consent monitoring site) was incorporated into the programme in the 2008-2009 period for the purpose of monitoring the local initiatives of walkway establishment and riparian planting of this small catchment on the western outskirts of the New Plymouth urban area.

The Hangatahua (Stony) River was selected for the SOE programme as a waterway of high conservation value. The headwaters of the river are the Ahukawakawa swamp within Te Papakura o Taranaki, and several tributaries that begin above the tree line on the north-west of Mount Taranaki. Once the river leaves the National Park boundary its catchment becomes very narrow so that it receives little water from surrounding farmland before reaching the sea. This factor and the protection order on the catchment maintains good water quality in the river. However, ecological degradation occurs from time to time after headwater erosion events when sedimentation and scouring of the riverbed may be particularly severe. The sites at Mangatete Road and State Highway 45 are approximately seven kilometres and 12km downstream of the National Park boundary respectively.

The Timaru and Mangaoraka Streams were chosen for the SOE programme as examples of streams within primary agricultural catchments. The Timaru Stream arises within the National Park boundary, near the peak of Pouakai, in the Pouakai Range. Upon leaving this range, the stream flows along the edge of the Kaitake Range (also part of the National Park) and receives several tributaries that flow through adjacent agricultural land. From the edge of the Kaitake Range, the stream flows north through agricultural land to the sea. Carrington Road crosses the stream within the National Park boundary and State Highway 45 is six kilometres downstream of the confluence with the first farmland tributary. The Mangaoraka Stream rises below the National Park boundary near Egmont Road and flows north through farmland for its entire length before joining the Waiongana Stream near the coast. Corbett Road is 26km downstream of the source.

The Waiongana Stream was included in the SOE programme as an example of a stream with a major water abstraction. The stream originates within the National Park, near the North Egmont visitor's centre. After crossing the park boundary, it flows northeast through agricultural land to the sea. State Highway 3a crosses the stream fifteen kilometres downstream of the National Park boundary, and the intake for the Waitara industrial water supply is a further five kilometres downstream of that. Devon Road is 30km downstream of the National Park boundary.

The Waiwhakaiho, Manganui, Waitara, and Mangaehu Rivers were selected for the SOE programme as examples of waterways with large catchments and multiple impacts from human land uses including

plantation forestry, rural, urban and industrial activities. They arise either on Mt Taranaki or in the eastern hill country, before flowing across the ring plain.

The Waiwhakaiho River and its headwater tributaries arise above the tree line on the north face of Mount Taranaki. Upon leaving the National Park, the river flows north through agricultural and industrial land for 27km to the sea. The river passes under State Highway 3 near Egmont Village, nine kilometres downstream of the National Park boundary. The sites at Constance Street and adjacent to Lake Rotomanu are included in the lower Waiwhakaiho River industrial discharges monitoring programme. The site adjacent to Lake Rotomanu has replaced the site immediately downstream of the Mangaone Stream that was used in the 1995-1996 State of the Environment monitoring survey. This allows the State of the Environment monitoring programme to better integrate with the industrial monitoring programme. The Mangorei Stream is the principal tributary catchment in the lower reaches, downstream of the major abstraction of water for hydroelectric and community supply purposes. Occasional headwater erosion events have been documented in the upper river with an instance of severe (orange) discolouration in spring 2014 due to release of naturally occurring iron oxide from a small headwater tributary.

The source of the Manganui River is situated above the tree line on the eastern slopes of Mount Taranaki. After leaving the National Park, the river flows east and then north through agricultural land for 44km before joining the Waitara River. State Highway 3 is eight kilometres downstream of the National Park boundary. At Tariki Road, much of the flow of the Manganui River is diverted through the Motukawa hydroelectric power scheme to the Waitara River. Therefore, except when the Tariki weir is overtopping, most of the water in the Manganui River at Bristol Road (14km downstream of the diversion) comes from tributaries such as the Mangamawhete, Waitepuke, Maketawa, and Ngatoro Streams. Like the Manganui River, these streams originate high on the eastern slopes of Mount Taranaki. They flow through agricultural land before joining the river. The Maketawa Stream provides a valued trout and native fish habitat. Sites were included in the upper and lower reaches of the stream.

The small Kurapete Stream, which rises as seepage to the west of Inglewood, was included to monitor trends in relation to the removal of the discharge from the town's Wastewater Treatment Plant from this tributary of the lower Manganui River in 2000. Sites were included upstream and nearly six km downstream of where the discharge was located.

The Waitara River flows south-west and then north-west out of the eastern hill country through a mix of agricultural land and native forest before passing through the town of Waitara and out to sea. It has a different character from the steep ring plain rivers and carries a high silt load. The Autawa Road site is located 46km from the coast. This site was added only during the 2015-2016 reporting period, to increase the number of eastern hill country sites being monitored. The Mamaku Road site is located six kilometres upstream of the coast above any tidal influence. This site is also part of the monitoring programme for the stormwater discharge from the Waitara Valley Methanex plant to the Waitara River.

The Mangaehu River originates in the eastern hill country and flows south-west through agricultural land for most of its length before joining the Patea River, ten kilometres upstream of Lake Rotorangi. Raupuha Road crosses the river less than one kilometre upstream of the confluence with the Patea River.

The Tangahoe River is a smaller eastern hill country catchment which flows through agricultural land, some of which has undergone afforestation in the upper reaches. Fonterra extracts dairy company processing waters in the lower reaches near the coast, south of Hawera township.

The Whenuakura River is an eastern hill country river which primarily flows through agricultural land. It has a high silt load and is consequently highly turbid. The only site located on the Whenuakura River was at Nicholson Road. This was included from 2015-2016 onwards to increase the number of eastern hill country rivers being monitored.

The Mangati Stream was chosen for the SOE programme as an example of a small, degraded stream. Only five kilometres in length, the stream rises in farmland and flows north through the Bell Block industrial area and suburbs to the sea. The site downstream of the railway line is upstream of all industrial discharges to the stream. The site at Te Rima Place is located within a suburban park, downstream of all Bell Block industrial discharges. Both sites are part of the Mangati Stream industrial monitoring programme.

The Waimoku Stream originates in Te Papakura o Taranaki where it flows down Lucy's Gully in the Kaitake Ranges. Once the stream leaves the park it flows through farmland for three and a half kilometres, and through the coastal township of Oakura for about 200m, before entering the sea. It was included in the SOE programme in the 1999-2000 monitoring year to monitor the effects of a riparian planting programme in the catchment. Sampling sites are located in Lucy's Gully under native forest, and in Oakura township, about 100m upstream of the sea.

The Waiau Stream originates in farmland near Tikorangi, and is a small catchment to the north of the Waitara River. It flows for 12.5km to the sea. The stream was included in the SOE programme in the 1999-2000 monitoring year as an example of a northern lowland catchment. The sampling site at Inland North Road is located in a pasture setting.

The Punehu Stream is representative of a south-western Taranaki catchment subject primarily to intensive agricultural land use with water quality affected by diffuse source run-off and point source discharges from dairy shed treatment pond effluents particularly in the Mangatawa Stream, a small lower reach tributary. No industrial discharges to the stream system are known to occur. Both sites were Taranaki ring plain survey sites (TCC, 1984) and the lower site near the coast remains a NIWA hydrological recording station as a representative basin. The upstream site is representative of relatively unimpacted stream water quality although it lies approximately two km below the National Park boundary.

The small seepage fed, ringplain Waiokura Stream drains an intensively dairy-farmed catchment. The Fonterra, Kapuni factory irrigates wastewater within the mid reaches of this catchment. The catchment is the subject of a collaborative long term study of best practice dairying in five New Zealand catchments (Wilcock et al, 2009).

The Patea River rises on the eastern slopes of Mt Taranaki, within the National Park and is a trout fishery of regional significance, particularly upstream of Lake Rotorangi (formed by the Patea dam) in its mid reaches. Site 1 (at Barclay Road) is representative of the upper catchment adjacent to the National Park above agricultural impacts. Site 2 (at Swansea Road), which is integrated with consent compliance monitoring programmes, was also a ring plain survey site, and is representative of developed farmland drainage and is downstream of Stratford township (urban run-off, but upstream of the rubbish tip and oxidation pond discharges and the combined cycle power station discharge). Site 3 (at Skinner Road) is an established hydrological recorder station downstream of these discharges and the partly industrialised Kahouri Stream catchment.

The Waingongoro River rises on the south-eastern slopes of Mount Taranaki within the National Park and is one of the longest of the ring plain rivers, with a meandering 67km of river length from the National Park boundary prior to entering the Tasman Sea at Ohawe Beach. The river is the principal trout fishery in Taranaki, is also utilised for water abstraction purposes, and up until mid-2010, received treated industrial and municipal wastes discharges in mid-catchment at Eltham. Site 1 (near the National Park boundary) is representative of high water quality conditions with minimal agricultural impacts. Site 2, six kilometres further downstream (at Opunake Road) represents agricultural impacts, still in the upper reaches of the river. Site 3, (at Eltham Road) a further 16km downstream remains representative of the impacts of farmland drainage and some water abstraction while upstream of the former major Eltham point source discharges from a meatworks and the municipal wastewater treatment plant. The meatworks wastewaters were diverted to spring and summer land irrigation in the mid-2000s and treated plant wastewater subsequently has been irrigated onto farmland in this manner. The Eltham municipal wastes were permanently diverted

by pipeline to Hawera in June 2010. The Stuart Road site, a further six kilometres downstream is located below these former discharges. A further two sites (SH45 and Ohawe Beach) are located 33km and 37km downstream of Stuart Road in the intensively developed farmland lower reaches of the catchment. River flow recording sites are located at Eltham Road and SH45.

The Mangawhero Stream is a relatively small, swamp-fed catchment rising to the east of Eltham in the Ngaere Swamp and draining developed farmland. The upper site is located in the mid reaches of the stream upstream of the former point source discharge from the Eltham municipal wastewater treatment plant while the lower site is located a further three kilometres downstream, below the Mangawharawhara Stream confluence, near the confluence with the Waingongoro River. Apart from the municipal point source discharge, which was diverted out of the stream in July 2010 (see above), the catchment is predominantly developed farmland.

The Huatoki Stream was sampled as part of the State of the Environment monitoring programme for the first time in the 1997-1998 monitoring year. The stream rises one kilometre outside the National Park boundary on the foothills of the Pouakai Range. It flows through agricultural land for 12.5 kilometres to the outskirts of New Plymouth where it enters native forest reserve. The stream flows for four and a half kilometres alongside walkways and beneath the central business district of New Plymouth before entering the sea next to Puke Ariki Landing. Within New Plymouth it flows through a culvert in a flood retention dam and over a small weir in the Huatoki Reserve prior to the business section of the city. Beautification works adjacent to 'Centre City' near the stream mouth (in 2010) involved the creation of a weir and fish pass immediately upstream of the lowest site which subsequently has altered the flow regime at this site and created a run-like habitat with intermittent flow variability rather than the previous riffle habitat.

The Herekawe Stream is a small seepage stream on the western boundary of New Plymouth. It drains a mainly urban catchment and receives stormwater discharges particularly in its lower reaches. Completion of a walkway and riparian planting community project now warrants the inclusion of the consent monitoring 'control' site at Centennial Drive for monitoring the effectiveness of these initiatives.

The Kaupokonui River rises on the southern slopes of Mt Taranaki within the National Park. It drains an intensively farmed dairy catchment. The principal point source discharges to the river occur in the mid-reaches from the Kaponga oxidation pond system, and cooling water from NZMP (Kapuni) Ltd. The river has patchy riparian vegetation cover and has been targeted for intensive riparian management initiatives. Site 1 is two and a half kilometres downstream of the National Park boundary and has high water quality, with minor agricultural impacts. Toward the mid-reaches, site 2 (six kilometres further downstream) is subject to some agricultural impacts, but is a short distance upstream of the Kaponga oxidation ponds' system discharge. A further six kilometres downstream, site 3 is upstream of wastes irrigation, cooling water discharges and factory abstraction. The Upper Glenn Road (site 4) is a further 10km downstream, below all of the factory's activities and is a river flow hydrological recording site. The final site 5, is located near the mouth of the river, five kilometres below site 4, upstream of any tidal influence at Kaupokonui beach domain camping ground.

Two western catchments, the Katikara Stream and Kapoaiaia Stream, were included in the programme to monitor trends in relation to riparian planting. Such riparian planting initiatives have been concentrated in certain catchments where past riparian vegetation has been sparce. The Katikara Stream rises on the western slopes of Mt Taranaki, passing through primarily agricultural land in the relatively short distance to the sea. The Kapoaiaia Stream also rises from Mt Taranaki on the western side and south of the Katikara Stream. The Kapoaiaia Stream drains agricultural land throughout its entire catchment below the National Park boundary, passing through Pungarehu township at SH45 before entering the sea at Cape Egmont. A hydrological telemetry recorder is located at Cape Egmont

More recently, several sites have been established in the SoE macroinvertebrates programme in response to the NPS-FM 2020, which recommends sufficient sampling within each FMU developed by the Council.

Should monitoring find that the macroinvertebrate communities within an FMU or part of an FMU are degraded or degrading, the Council is required to take action to halt or reverse degradation. These new sites in the SoE programme were added to improve monitoring within underrepresented FMUs.

Appendix II

Predictive MCI scores for REC class, altitude, and distance alongside current 2022/23 regionally-derived MCI results

Predictive MCI scores for REC class, altitude and distance from national park, alongside current 2022/23 regionally-derived MCI results. KM=kilometres from national park

River/stream	Site code	MCI 2023	REC		Distance	
			CLASS	MCI	KM	MCI
Herekawe Stream	HRK000085	94	WW/L/VA/U/MO/MG	89	N/A	N/A
Huatoki Stream	HTK000350	101	WX/L/VA/P/MO/LG	95	N/A	N/A
	HTK000425	108	WW/L/VA/P/MO/LG	92	N/A	N/A
	HTK000745	87	WW/L/VA/U/MO/MG	93	N/A	N/A
Kapoaiaia Stream	KPA000250	127	CX/H/VA/P/MO/MG	111	5.7	112
	KPA000700	112	CX/H/VA/P/MO/MG	105	13.5	103
	KPA000950	95	CX/L/VA/P/MO/LG	99	25.2	96
Kaūpokonui River	KPK000250	135	CX/H/VA/IF/MO/MG	137	3.3	118
	KPK000500	128	CX/H/VA/P/MO/MG	127	9.2	107
	KPK000660	109	CX/H/VA/P/MO/LG	122	15.5	101
	KPK000880	100	CW/H/VA/P/MO/LG	106	25.7	95
	KPK000990	90	CW/L/VA/P/HO/LG	96	31.1	93
Kurapete Stream	KRP000300	100	WX/L/VA/P/LO/LG	92	N/A	N/A
	KRP000660	104	WW/L/VA/P/LO/LG	102	N/A	N/A
Katikara Stream	KTK000150	145	CW/L/VA/P/HO/LG	131	0	132
	KTK000248	94	WX/L/VA/P/MO/LG	96	18.1	99
Makara Stream	MAA000900*	92	WW/L/SS/P/MO/MG	-	N/A	N/A
Mangorei Stream	MGE000970	93	CX/L/VA/P/MO/LG	101	15.6	101
Mangaehu River	MGH000950	104	CW/L/SS/P/HO/LG	117	N/A	N/A
Manganui River	MGN000195	136	CX/H/VA/P/MO/LG	124	8.7	107
	MGN000427	110	CX/L/VA/P/HO/MG	103	37.9	91
Mangati Stream	MGT000488	84	WN/L/VA/P/LO/LG	80	N/A	N/A
	MGT000520	58	WW/L/VA/U/LO/LG	88	N/A	N/A
Makuri Stream	MKR000495*	102	WW/L/SS/P/MO/LG	-	N/A	N/A
Maketawa Stream	MKW000200	133	CX/H/VA/IF/MO/MG	130	2.3	121
	MKW000300	108	CX/H/VA/P/MO/LG	111	15.5	101
Moumahaki Stream	MMK000050*	78	WW/L/SS/P/MO/LG	-	N/A	N/A
Mangaoreti Stream	MNT000950*	80	WW/L/SS/P/LO/LG	-	N/A	N/A
Mangaoraka Stream	MRK000420	93	WW/L/VA/P/MO/LG	92	N/A	N/A
Mangaroa Stream	MRO000210*	78	WD/L/VA/P/MO/LG	-	N/A	N/A
Matau Stream	MTA000068*	108	CW/L/SS/P/LO/MG	-	N/A	N/A
Mangawhero Stream	MWH000490	101	CN/L/VA/P/MO/LG	93	N/A	N/A
Pātea River	PAT000200	145	CX/H/VA/IF/MO/MG	129	1.9	125
	PAT000315	120	CX/H/VA/P/MO/LG	112	12.4	103
	PAT000360	103	CW/L/VA/P/HO/LG	109	19.2	99
Pūnehu Stream	PNH000200	124	CX/H/YA/IF/MO/MG	121	4.4	115
	PNH000900	115	CW/L/VA/P/MO/LG	100	20.9	98
Stony (Hangatahua) River	STY000300	108	CX/H/VA/S/MO/MG	128	7.3	109
	STY000400	128	CX/H/VA/S/MO/MG	115	12.5	103
Timaru Stream	TMR000150	131	CX/H/VA/IF/LO/HG	141	0	132
	TMR000375	116	CX/L/VA/P/MO/MG	117	10.9	105
Tāngāhoe River	TNH000090	114	WW/L/SS/P/MO/LG	110	N/A	N/A
	TNH000200	109	WW/L/SS/P/HO/LG	108	N/A	N/A
	TNH000515	94	WW/L/SS/P/HO/LG	95	N/A	N/A
Uruiti River	URU000198*	77	WW/L/SS/P/MO/LG	-	N/A	N/A

River/stream	Site code	MCI 2023	REC		Distance	
			CLASS	MCI	KM	MCI
Waiau Stream	WAI000110	97	WW/L/VA/P/MO/LG	91	N/A	N/A
Waiau Stream (2)	WIU000700*	-	WD/L/VA/P/MO/LG	-	N/A	N/A
Waiongana Stream	WGA000260	98	CX/L/VA/P/MO/LG	99	16.1	100
	WGA000450	88	WW/L/VA/P/MO/LG	88	31.2	93
Waingongoro River	WGG000115	140	CX/H/VA/IF/LO/MG	131	0.7	132
	WGG000150	127	CX/H/VA/P/LO/MG	124	7.2	110
	WGG000500	107	CW/L/VA/P/MO/LG	110	23	97
	WGG000665	106	CW/L/VA/P/HO/MG	102	29.6	94
	WGG000895	98	CW/L/VA/P/HO/LG	92	63	85
	WGG000995	93	CW/L/VA/P/HO/MG	95	66.6	85
Waiwhakaiho River	WKH000100	136	CX/H/VA/IF/LO/HG	137	0	132
	WKH000500	105	CX/H/VA/P/MO/MG	115	10.6	105
	WKH000920	98	CX/H/VA/P/HO/LG	97	26.6	95
	WKH000950	91	CX/H/VA/P/HO/LG	97	28.4	94
Waiokura Stream	WKR000500	117	WW/L/VA/P/MO/LG	97	N/A	N/A
	WKR000700	109	WW/L/VA/P/MO/LG	95	N/A	N/A
Waimoku Stream	WMK000100	133	WW/L/VA/P/LO/HG	128	0	132
	WMK000298	96	WW/L/VA/P/MO/MG	103	4	116
Whenuakura River	WNR000450	-	WW/L/SS/P/HO/LG	109	N/A	N/A
Waikaramarama Stream	WMR000100*	98	WW/L/SS/P/LO/LG	-	N/A	N/A
Waitara River	WTR000540	-	WX/L/SS/P/HO/LG	110	N/A	N/A
	WTR000850	80	WX/L/SS/P/HO/LG	98	N/A	N/A

Appendix III

Temperatures and duration since freshes at sampling sites in the 2022/23 biomonitoring year

Duration since freshes at sampling sites in the 2023 SoE biomonitoring year using continuous hydrological flow records, with flow assessments extrapolated from nearby catchments for sites where flow recorders did not exist. NB: () = extrapolation from nearby catchment

River/stream	Site	Site code	Temp ˚C	2023 Survey (days after flow above)	
				3 x median	7 x median
Herekawe Stream	Centennial Drive	HRK000085	16.2	(16)	(92)
Huatoki Stream	Hadley Drive	HTK000350	18.3	(16)	(92)
	Huatoki Domain	HTK000425	16.5	(16)	(92)
	Molesworth St	HTK000745	-	(16)	(92)
Kapoaiaia Stream	Wiremu Road	KPA000250	14.2	16	19
	Wataroa Road	KPA000700	14.7	16	19
	Cape Egmont	KPA000950	16.4	16	19
Kaupokonui River	Opunake Road	KPK000250	13.1	9	10
	U/S Kaponga oxi ponds	KPK000500	14.7	9	10
	U/S Lactose Co.	KPK000660	14.6	9	10
	Upper Glenn Road	KPK000880	16.8	9	10
	Near mouth	KPK000990	16.6	9	10
Kurapete Stream	U/S Inglewood WWTP	KRP000300	14.2	(7)	(8)
	D/S Inglewood WWTP	KRP000660	13.7	(7)	(8)
Katikara Stream	Carrington Road	KTK000150	13.4	(14)	(14)
	Beach	KTK000248	21.9	(14)	(14)
Makara Stream	120m U/S confluence with Waitara River	MAA000900*	20.4	(15)	(15)
Mangorei Stream	SH3	MGE000970	15.5	(7)	(29)
Mangaehu River	Raupuha Road	MGH000950	18.9	20	22
Manganui River	SH3	MGN000195	12.4	8	9
	Bristol Road	MGN000427	13.9	6	7
Mangati Stream	D/S Railway line	MGT000488	14.8	(9)	(21)
	Te Rima Place, Bell Block	MGT000520	15.2	(9)	(21)
Makuri Stream	30m D/S Raupuha Road	MKR000495*	16.3	(20)	(22)
Maketawa Stream	Opp Derby Road	MKW000200	12.9	(21)	(22)
	Tarata Road	MKW000300	13.9	(21)	(22)
Moumahaki Stream	Moumahaki at Johnston Road	MMK000050*	19.3	(26)	(28)
Mangaoreti Stream	U/S of Avenue Rd Bridge	MNT000950*	-	(9)	(9)
Mangaoraka Stream	Corbett Road	MRK000420	-	(25)	(81)
Mangaroa Stream	Vanners landfarm, Lower Ball Road	MRO000210*	19.7	(16)	(18)
Matau Stream	U/S confluence with unnamed trib.	MTA000068*	16.2	(15)	(15)
Mangawhero Stream	D/S Mangawharawhara S	MWH000490	13.7	(8)	(97)
Pātea River	Barclay Road	PAT000200	11.7	8	30
	Swansea Road	PAT000315	14.5	8	30
	Skinner Road	PAT000360	16.0	8	30
Punehu Stream	Wiremu Road	PNH000200	14.5	8	19
	SH45	PNH000900	14.9	8	19
Stony (Hangatahua) River	Mangatete Road	STY000300	19.3	(14)	(14)
	SH45	STY000400	19.5	(14)	(14)
Timaru Stream	Carrington Road	TMR000150	14.0	(14)	(14)
	SH45	TMR000375	18.3	(14)	(14)
Tangahoe River	Upper Valley	TNH000090	18.4	(18)	(19)
	Tangahoe Vly Rd bridge	TNH000200	16.4	(18)	(19)
	D/S rail bridge	TNH000515	17.0	(18)	(19)

River/stream	Site	Site code	Temp ˚C	2023 Survey (days after flow above)	
				3 x median	7 x median
Uruti River	SH3 Bridge	URU000198*	-	(9)	(9)
Waiau Stream	Inland North Road	WAI000110	-	(10)	(10)
Waiau Stream (2)	Approx 1.2 km U/S of Hawkin Road	WIU000700*	-	-	-
Waiongana Stream	SH3a	WGA000260	14.3	7	11
	Devon Road	WGA000450	15.7	7	11
Waingongoro River	700m D/S Nat Park	WGG000115	12.2	7	10
	Opunake Road	WGG000150	13.5	7	10
	Eltham Road	WGG000500	15.4	7	10
	Stuart Road	WGG000665	15.8	7	10
	SH45	WGG000895	16.1	10	11
	Ohawe Beach	WGG000995	16.6	9	10
Waiwhakaiho River	National Park	WKH000100	11.2	8	9
	SH3 (Egmont Village)	WKH000500	15.9	26	40
	Constance St (NP)	WKH000920	14.5	7	9
	Adjacent to L Rotomanu	WKH000950	14.2	7	9
Waiokura Stream	Skeet Road	WKR000500	13.9	(13)	(152)
	Manaia Golf Course	WKR000700	15.0	(13)	(152)
Waimoku Stream	Lucy's Gully	WMK000100	14.6	(14)	(14)
	Beach	WMK000298	17.1	(14)	(14)
Whenuakura River	Nicholson Road	WNR000450	-	-	-
Waikaramarama Stream	D/S of first bridge	WMR000100*	-	(9)	(9)
Waitara River	Autawa Road	WTR000540	-	-	-
	Mamaku Road	WTR000850	19.9	20	78

Appendix IV

Current 2022/23 MCI and taxa richness results alongside historic data

Current regionally derived MCI and taxa richness results and regional bands from the 2022-2023 monitoring year, alongside historic taxa richness and MCI data

River	Site	n	SOE Data 1995-2022				SOE Data 2022- 2023		
			Taxa No.		TRC MCI		Taxa No.	TRC MCI	TRC Grade
			Range	Median	Range	Median			
Herekawe Stream	HRK000085	53	13-29	18	68-100	89	17	94	Fair
Huatoki Stream	HTK000350	51	19-34	25	79-115	99	23	101	Good
	HTK000425	51	17-32	25	90-117	104	23	108	Good
	HTK000745	51	11-27	20	56-102	86	17	87	Fair
Kapoaiaia Stream	KPA000250	46	18-31	24	83-131	117	19	127	Very Good
	KPA000700	46	12-30	21	78-118	97	18	112	Good
	KPA000950	46	15-25	19	76-101	87	15	95	Fair
Kaupokonui River	KPK000250	47	20-36	27	124-140	130	23	135	Very Good
	KPK000500	50	20-33	26	98-138	118	21	128	Very Good
	KPK000660	54	14-32	24	71-128	104	20	109	Good
	KPK000880	54	13-31	18	66-110	91	11	100	Good
	KPK000990	46	11-26	19	69-103	91	12	90	Fair
Kurapete Stream	KRP000300	53	12-32	21	80-107	95	17	100	Good
	KRP000660	53	17-30	24	74-112	95	20	104	Good
Katikara Stream	KTK000150	45	11-38	24	112-151	135	20	145	Excellent
	KTK000248	43	16-31	25	80-118	102	21	94	Fair
Makara Stream	MAA000900	6	6-19	14	77-107	98	17	92	Fair
Mangorei Stream	MGE000970	39	18-33	26	84-113	102	15	93	Fair
Mangaehu River	MGH000950	54	10-26	19	77-108	92	18	104	Good
Manganui River	MGN000195	54	9-26	20	106-143	126	16	136	Very Good
	MGN000427	54	14-26	20	77-117	98	18	110	Good
Mangati Stream	MGT000488	53	9-29	16	56-91	77	15	84	Fair
	MGT000520	53	3-22	10	44-80	68	8	58	Very Poor
Makuri Stream	MKR000495	6	12-20	16	90-104	94	22	102	Good
Maketawa Stream	MKW000200	44	8-33	23	100-142	129	17	133	Very Good
	MKW000300	43	12-31	21	90-127	109	22	108	Good
Moumahaki Stream	MMK000050	5	13-19	17	73-94	85	11	78	Poor
Mangaoreti Stream	MNT000950	4	4-10	8	64-82	68	8	80	Fair
Mangaoraka Stream	MRK000420	53	11-30	25	75-105	90	24	93	Fair
Mangaroa Stream	MRO000210	3	10-15	10	68-84	74	10	78	Poor
Matau Stream	MTA000068	6	18-30	23	102-110	105	20	108	Good
Mangawhero Stream	MWH000490	54	13-30	20	63-102	83	21	101	Good
Pātea River	PAT000200	54	21-35	29	127-150	138	27	145	Excellent
	PAT000315	54	17-32	25	99-130	111	20	120	Very Good
	PAT000360	54	15-33	23	77-112	98	20	103	Good
Punehu Stream	PNH000200	54	18-32	26	104-139	125	19	124	Very Good
	PNH000900	54	10-26	21	70-114	91	17	115	Good
Stony River	STY000300	54	1-21	10	64-140	112	10	108	Good
	STY000400	52	2-18	10	67-150	108	5	128	Very Good
Timaru Stream	TMR000150	53	8-34	25	119-152	138	23	131	Very Good
	TMR000375	53	13-35	26	82-122	105	24	116	Good

River	Site	n	SOE Data 1995-2022				SOE Data 2022- 2023		
			Taxa No.		TRC MCI		Taxa No.	TRC MCI	TRC Grade
			Range	Median	Range	Median			
Tangahoe River	TNH000090	29	9-31	22	90-107	97	7	114	Good
	TNH000200	30	12-35	24	92-116	102	9	109	Good
	TNH000515	30	11-26	20	78-104	94	16	94	Fair
Uruti Stream	URU000198	6	14-22	21	88-96	91	15	77	Poor
Waiau Stream	WAI000110	46	15-30	21	79-101	90	12	97	Fair
Waiongana Stream	WGA000260	53	9-31	24	82-112	96	20	98	Fair
	WGA000450	53	12-29	21	72-104	89	18	88	Fair
Waingongoro River	WGG000115	54	19-40	30	122-145	133	26	140	Excellent
	WGG000150	54	18-39	26	119-139	129	15	127	Very Good
	WGG000500	54	15-29	22	93-125	104	14	107	Good
	WGG000665	54	14-30	20	77-111	96	16	106	Good
	WGG000895	54	13-25	21	73-106	94	21	98	Fair
	WGG000995	54	12-27	18	69-100	90	20	93	Fair
Waiau Stream (2)	WIU000700	4	5-12	12	68-77	70	-		Not surveyed
Waiwhakaiho	WKH000100	39	4-33	20	115-147	131	19	136	Very Good
	WKH000500	53	14-32	22	80-125	109	19	105	Good
	WKH000920	52	7-29	20	60-110	94	9	98	Fair
	WKH000950	51	8-30	20	70-111	88	11	91	Fair
Waiokura Stream	WKR000500	35	16-29	23	88-117	102	18	117	Good
	WKR000700	30	15-27	20	92-109	100	14	109	Good
Waimoku Stream	WMK000100	45	15-38	30	119-141	131	21	133	Very Good
	WMK000298	45	10-29	20	75-115	94	20	96	Fair
Waikaramarama Stream	WMR000100	4	18-27	21	95-101	100	13	98	Fair
Whenuakura River	WNR000450	14	11-32	18	71-99	87	-		Not surveyed
Waitara River	WTR000540	14	8-26	20	83-110	99	-		Not surveyed
	WTR000850	53	8-32	17	64-107	86	12	80	Fair

Appendix V

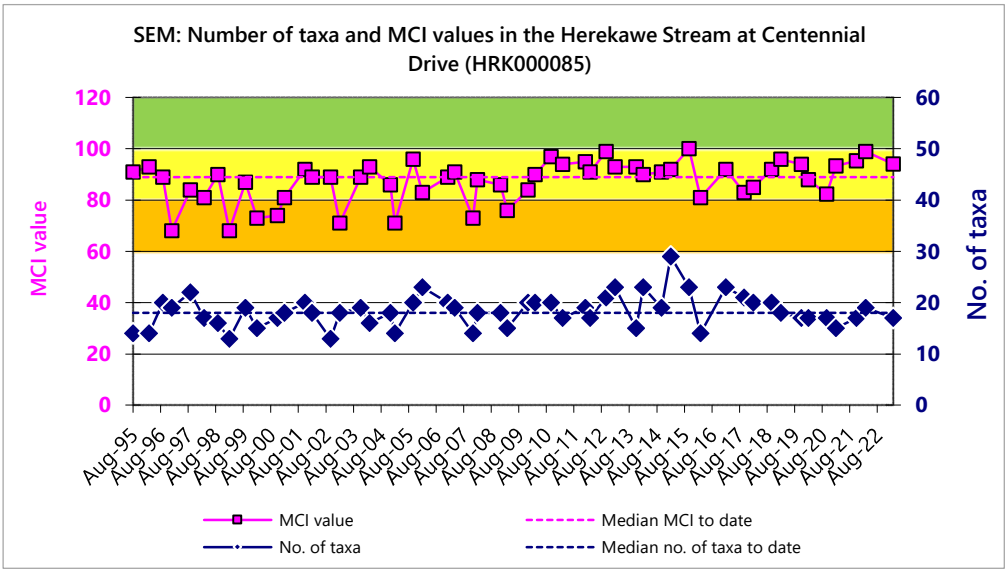
Recent macroinvertebrate community results and taxa and regionally-derived MCI results for the entire programme

Herekawe

Taxa List	Site Code / Sample Number	Taranaki MCI Score	HRK000085 / TRC2310364
Annelida (Worms)	Oligochaeta	1	R
Mollusca	*Potamopyrgus*	4	VA
Crustacea	*Paracalliope*	5	XA
Ephemeroptera (Mayflies)	*Austroclima*	7	C
	Coloburiscus	7	C
Plecoptera (Stoneflies)	*Megaleptoperla*	9	R
Coleoptera (Beetles)	Elmidae	6	A
Trichoptera (Caddisflies)	*Hydropsyche (Aoteapsyche)*	4	A
	Hydrobiosis	5	R
	Neurochorema	6	R
	Oxyethira	2	R
	Triplectides	5	R
Diptera (True Flies)	*Aphrophila*	5	R
	Tanytarsini	3	R
	Ephydridae	4	R
	Austrosimulium	3	R
	Tanyderidae	4	R
		Number of Taxa	17
		Taranaki MCI	94
		Taranaki SQMCI	4.9
		EPT (taxa)	7
		% EPT (taxa)	41

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

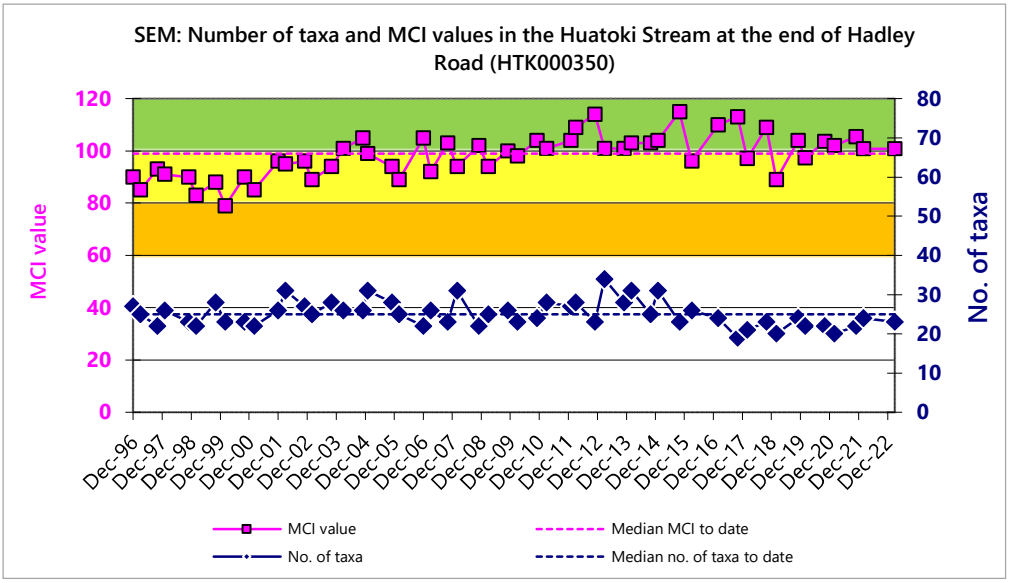


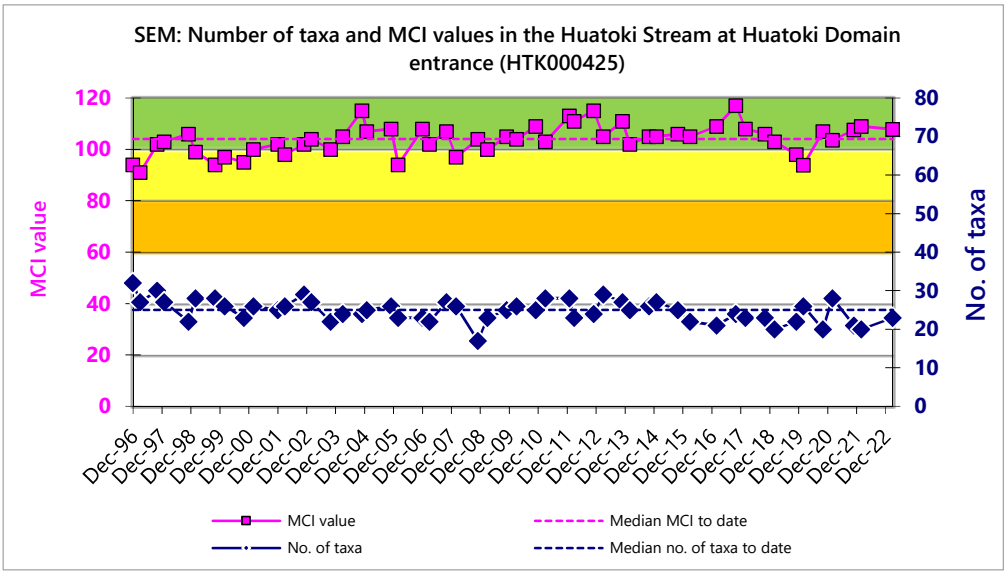
Huatoki

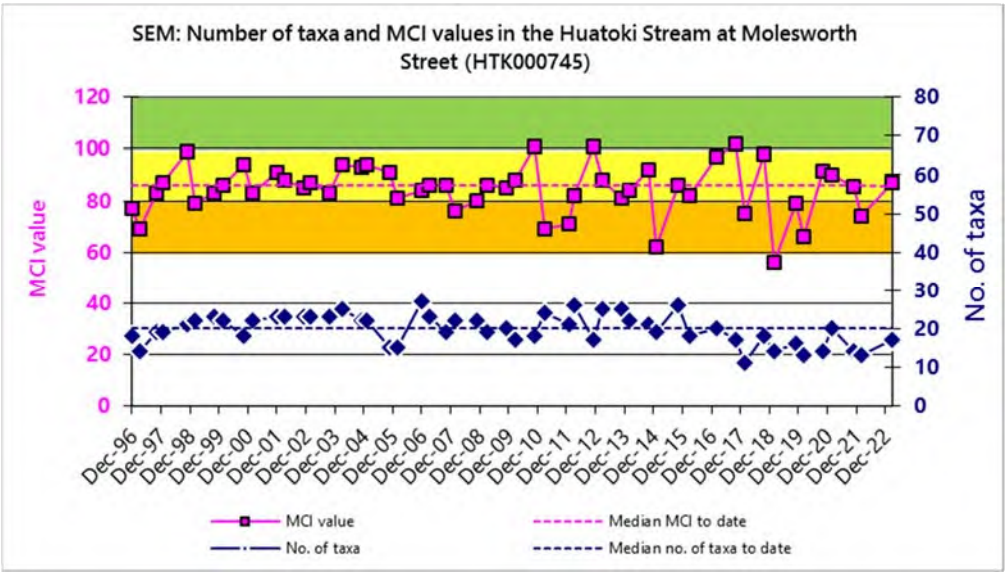
Taxa List	Site Code	Taranaki MCI Score	HTK000350	HTK000425	HTK000745
	Sample Number		TRC2310365	TRC2310366	TRC2310367
Nemertea	Nemertea	3	R	R	-
Annelida (Worms)	Oligochaeta	1	R	R	VA
	Lumbricidae	5	-	-	R
Hirudinea (Leeches)	Hirudinea	3	-	-	R
Mollusca	*Latia*	5	C	C	C
	Potamopyrgus	4	-	C	A
	Sphaeriidae	3	-	-	R
Crustacea	Ostracoda	1	-	-	R
	Paratya	3	-	-	C
	Paranephrops	5	R	-	-
Ephemeroptera (Mayflies)	*Austroclima*	7	C	A	-
	Coloburiscus	7	A	A	-
	Deleatidium	8	VA	VA	R
	Nesameletus	9	A	C	-
	Zephlebia group	7	-	-	R
Plecoptera (Stoneflies)	*Zelandobius*	5	-	R	-
Coleoptera (Beetles)	Elmidae	6	A	VA	A
	Ptilodactylidae	8	R	R	-
Megaloptera (Dobsonflies)	*Archichauliodes*	7	C	A	R
Trichoptera (Caddisflies)	*Hydropsyche (Aoteapsyche)*	4	VA	A	R
	Costachorema	7	C	R	-
	Hydrobiosis	5	C	C	-
	Neurochorema	6	R	R	-
	Pycnocentria	7	-	R	-
	Pycnocentrodes	5	R	C	-
	Triplectides	5	-	-	R
Diptera (True Flies)	*Aphrophila*	5	C	C	-
	Eriopterini	5	-	R	-
	Maoridiamesa	3	C	-	-
	Orthocladiinae	2	C	-	-
	Tanytarsini	3	XA	R	-
	Muscidae	3	R	-	-
	Austrosimulium	3	R	R	R
	Tanyderidae	4	R	R	C
Acarina (Mites)	Acarina	5	-	-	R
		Number of Taxa	23	23	17
		Taranaki MCI	101	108	87
		Taranaki SQMCI	4.2	6.6	2.5
		EPT (taxa)	9	11	4
		% EPT (taxa)	39	48	24

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant


SEM: Number of taxa and MCI values in the Huatoki Stream at the end of Hadley Road (HTK000350)
MCI value
No. of taxa
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date


SEM: Number of taxa and MCI values in the Huatoki Stream at Huatoki Domain entrance (HTK000425)
MCI value
No. of taxa
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date

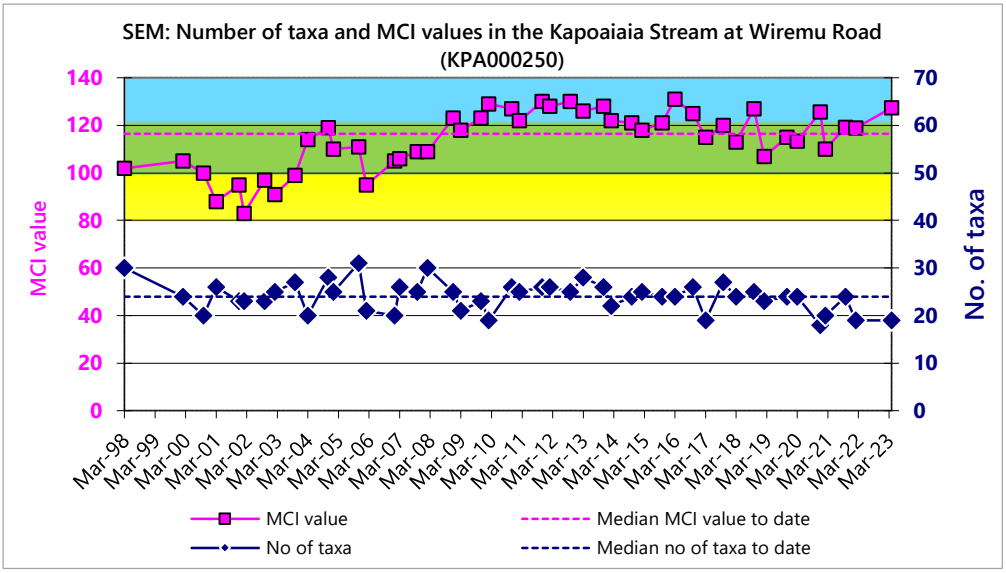

SEM: Number of taxa and MCI values in the Huatoki Stream at Molesworth Street (HTK000745)
MCI value
No. of taxa
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date

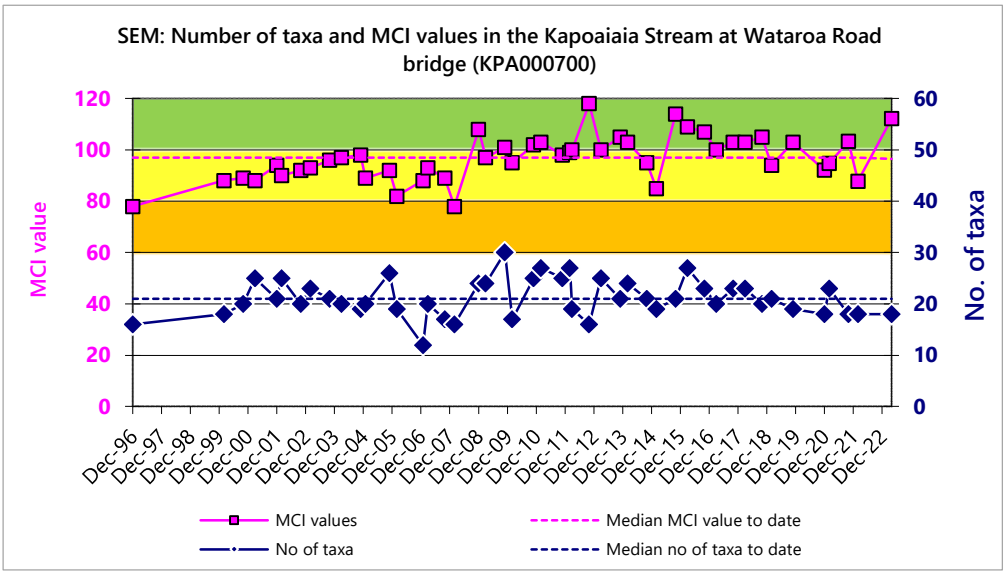
Kapoaiaia

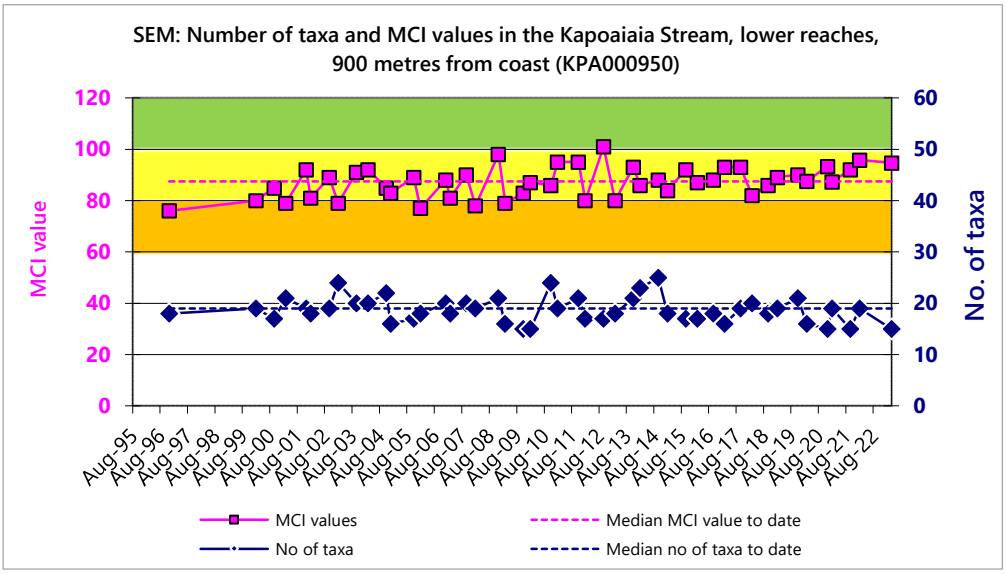
Taxa List	Site Code / Sample Number	Taranaki MCI Score	KPA000250 TRC2310368	KPA000700 TRC2310369	KPA000950 TRC2310370
Annelida (Worms)	Oligochaeta	1	-	-	R
Mollusca	*Potamopyrgus*	4	-	-	C
Ephemeroptera (Mayflies)	*Austroclima*	7	R	R	R
	Coloburiscus	7	VA	C	-
	Deleatidium	8	XA	XA	A
	Nesameletus	9	VA	R	R
Plecoptera (Stoneflies)	*Stenoperla*	10	R	-	-
	Zelandoperla	8	C	R	-
Coleoptera (Beetles)	Elmidae	6	A	C	VA
	Hydraenidae	8	R	R	-
Megaloptera (Dobsonflies)	*Archichauliodes*	7	C	C	C
Trichoptera (Caddisflies)	*Hydropsyche (Aoteapsyche)*	4	A	A	A
	Costachorema	7	C	-	-
	Hydrobiosis	5	C	A	C
	Beraeoptera	8	A	R	-
	Olinga	9	R	-	-
	Oxyethira	2	-	-	R
	Pycnocentrodes	5	R	C	A
Diptera (True Flies)	*Aphrophila*	5	A	A	C
	Maoridiamesa	3	R	A	-
	Orthocladiinae	2	VA	VA	VA
	Tanytarsini	3	-	R	A
	Empididae	3	-	R	-
	Muscidae	3	-	A	-
	Austrosimulium	3	R	-	R
	Number of Taxa		19	18	15
	Taranaki MCI		127	112	95
	Taranaki SQMCI		7.1	6.6	4.4
	EPT (taxa)		12	9	6
	% EPT (taxa)		63	50	40

'Tolerant' taxa | 'Moderately sensitive' taxa | 'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant


SEM: Number of taxa and MCI values in the Kapoaiaia Stream at Wiremu Road (KPA000250)
MCI value
No. of taxa
MCI value
No of taxa
Median MCI value to date
Median no of taxa to date


SEM: Number of taxa and MCI values in the Kapoaiaia Stream at Wataroa Road bridge (KPA000700)
MCI value
No. of taxa
MCI values
No of taxa
Median MCI value to date
Median no of taxa to date

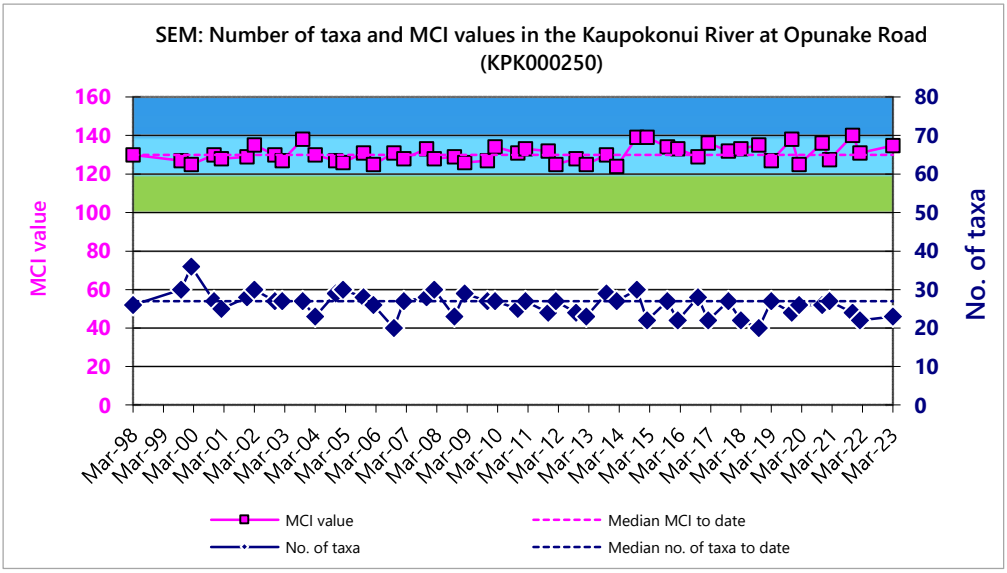

SEM: Number of taxa and MCI values in the Kapoaiaia Stream, lower reaches, 900 metres from coast (KPA000950)
MCI value
No. of taxa
MCI values
No of taxa
Median MCI value to date
Median no of taxa to date

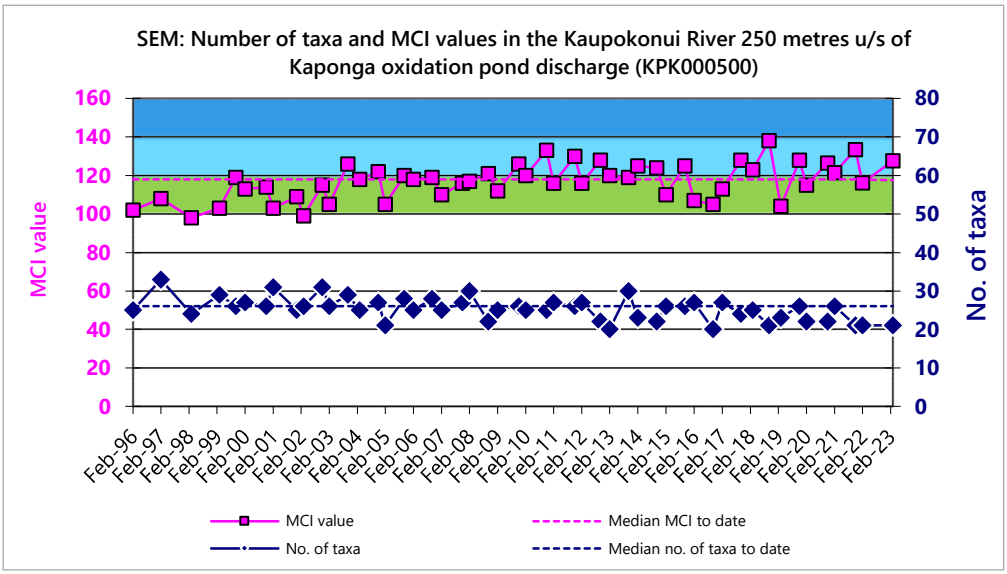
Kaūpokonui

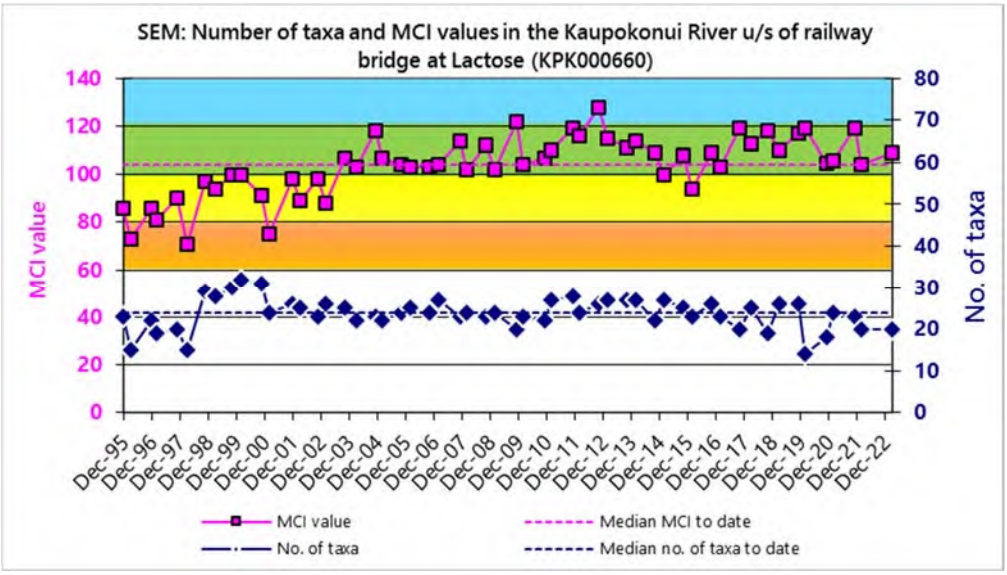
Taxa List	Site Code / Sample Number	Taranaki MCI Score	KPK000250 TRC2310373	KPK000500 TRC2310374	KPK000660 TRC2310375	KPK000880 TRC2310376	KPK000990 TRC2310377
Annelida (Worms)	Oligochaeta	1	-	-	-	R	R
	Lumbricidae	5	-	-	-	R	-
Mollusca	*Potamopyrgus*	4	-	-	XA	-	R
Ephemeroptera (Mayflies)	*Austroclima*	7	C	C	C	C	C
	Coloburiscus	7	A	VA	A	-	-
	Deleatidium	8	VA	XA	-	VA	VA
	Ichthybotus	8	R	-	-	-	-
	Nesameletus	9	A	VA	A	-	-
Plecoptera (Stoneflies)	*Austroperla*	9	R	-	-	-	-
	Megaleptoperla	9	C	R	-	-	-
	Stenoperla	10	R	-	-	-	-
	Zelandoperla	8	C	R	-	-	-
Coleoptera (Beetles)	Elmidae	6	A	A	A	VA	VA
	Hydraenidae	8	R	-	-	-	-
Megaloptera (Dobsonflies)	*Archichauliodes*	7	A	A	A	R	R
Trichoptera (Caddisflies)	*Hydropsyche (Aoteapsyche)*	4	A	VA	VA	VA	XA
	Costachorema	7	R	A	R	R	-
	Hydrobiosis	5	C	C	C	C	A
	Neurochorema	6	-	C	-	-	-
	Polyplectropus	6	-	-	R	-	-
	Psilochorema	6	C	-	-	-	-
	Beraeoptera	8	XA	XA	VA	-	-
	Helicopsyche	10	-	R	-	-	-
	Olinga	9	VA	C	C	-	-
	Pycnocentrodes	5	R	VA	R	-	-
Diptera (True Flies)	*Aphrophila*	5	A	A	C	-	-
	Eriopterini	5	R	R	R	-	-
	Maoridiamesa	3	-	C	R	C	-
	Orthocladiinae	2	R	-	R	A	VA
	Polypedilum	3	R	-	-	-	-
	Tanytarsini	3	-	R	-	-	C
	Muscidae	3	-	R	R	-	R
	Austrosimulium	3	-	-	R	-	-
	Tanyderidae	4	-	-	R	-	R
Number of Taxa			23	21	20	11	12
Taranaki MCI			135	128	109	100	90
Taranaki SQMCI			7.8	7.4	4.9	5.7	4.5
EPT (taxa)			16	14	10	5	4
% EPT (taxa)			70	67	50	45	33

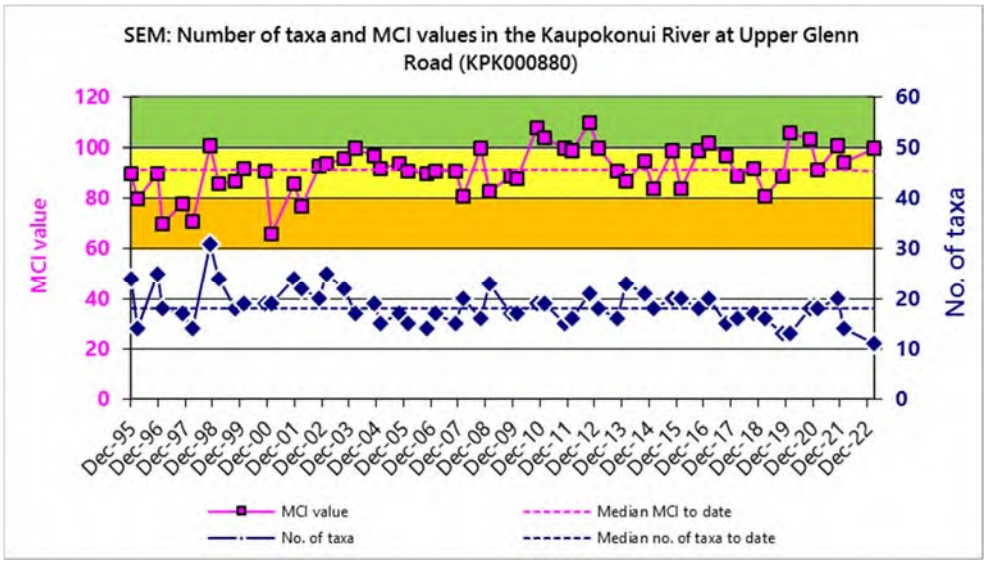
'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

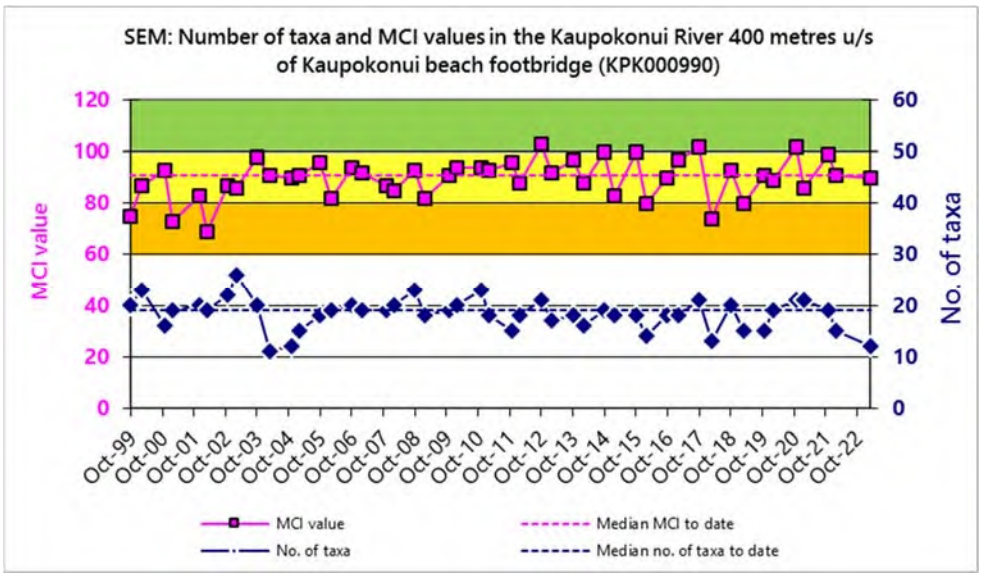
R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant


SEM: Number of taxa and MCI values in the Kaupokonui River at Opunake Road (KPK000250)
MCI value
No. of taxa
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date


SEM: Number of taxa and MCI values in the Kaupokonui River 250 metres u/s of Kaponga oxidation pond discharge (KPK000500)
MCI value
No. of taxa
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date


SEM: Number of taxa and MCI values in the Kaupokonui River u/s of railway bridge at Lactose (KPK000660)
MCI value
No. of taxa
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date


SEM: Number of taxa and MCI values in the Kaupokonui River at Upper Glenn Road (KPK000880)
MCI value
No. of taxa
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date

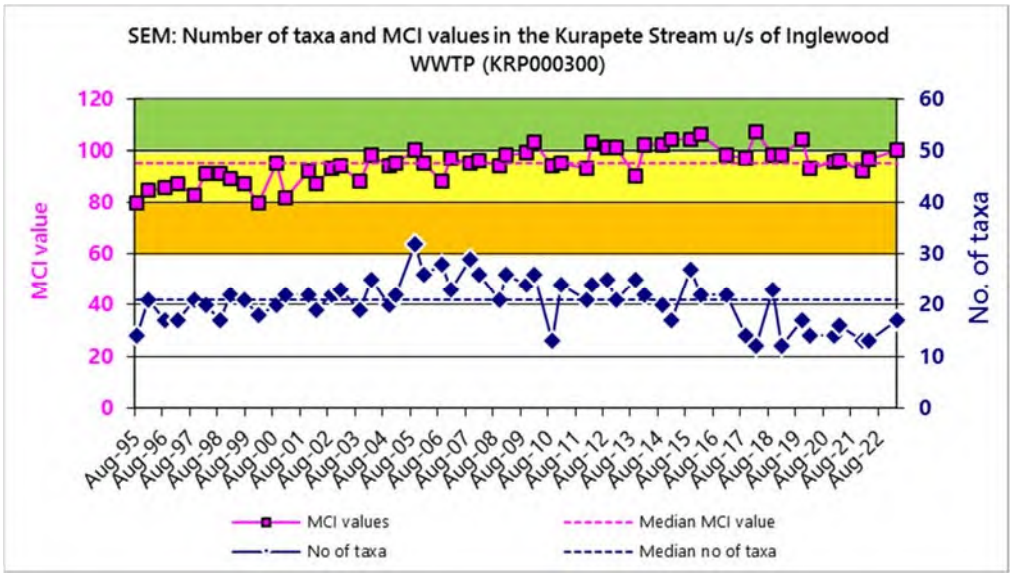

SEM: Number of taxa and MCI values in the Kaupokonui River 400 metres u/s of Kaupokonui beach footbridge (KPK000990)
MCI value
No. of taxa
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date

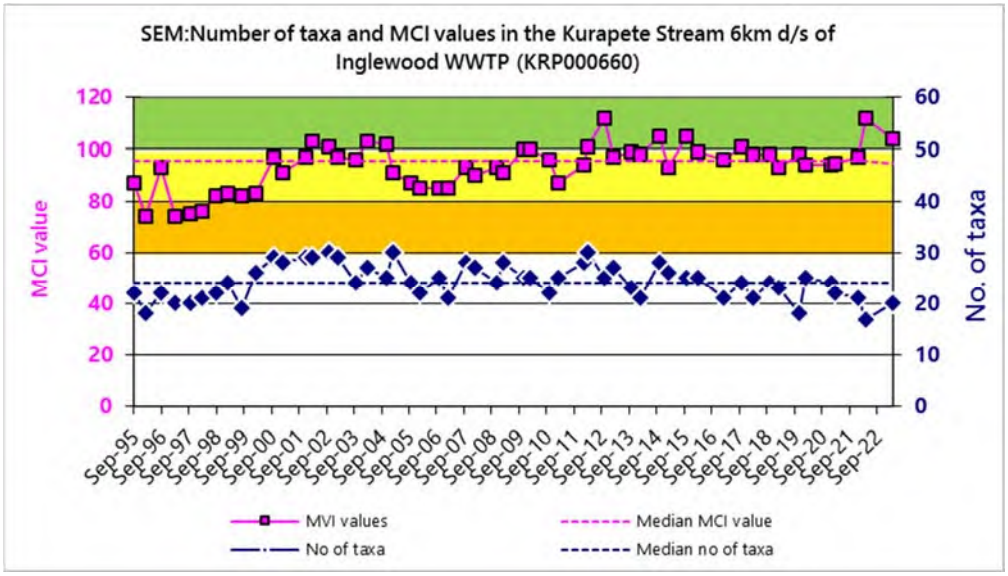
Kurapete

Taxa List	Site Code / Sample Number	Taranaki MCI Score	KRP000300 TRC2310378	KRP000660 TRC2310379
Annelida (Worms)	Oligochaeta	1	C	A
Mollusca	*Latia*	5	R	-
	Potamopyrgus	4	A	A
Ephemeroptera (Mayflies)	*Austroclima*	7	A	VA
	Coloburiscus	7	C	A
	Deleatidium	8	-	R
	Zephlebia group	7	A	R
Plecoptera (Stoneflies)	*Zelandobius*	5	-	C
Coleoptera (Beetles)	Elmidae	6	C	VA
	Ptilodactylidae	8	R	R
Megaloptera (Dobsonflies)	*Archichauliodes*	7	C	A
Trichoptera (Caddisflies)	*Hydropsyche (Aoteapsyche)*	4	A	A
	Hydrobiosis	5	R	C
	Neurochorema	6	-	C
	Pycnocentria	7	R	-
	Pycnocentrodes	5	-	VA
Diptera (True Flies)	*Aphrophila*	5	-	R
	Eriopterini	5	-	R
	Orthocladiinae	2	R	R
	Tanypodinae	5	R	R
	Tanytarsini	3	R	-
	Austrosimulium	3	A	C
	Tanyderidae	4	R	R
		Number of Taxa	17	20
		Taranaki MCI	100	104
		Taranaki SQMCI	5	5.6
		EPT (taxa)	6	9
		% EPT (taxa)	35	45

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant


SEM: Number of taxa and MCI values in the Kurapete Stream u/s of Inglewood WWTP (KRP000300)
MCI value
No. of taxa
120
100
80
60
40
20
0
60
50
40
30
20
10
0
Aug-95
Aug-96
Aug-97
Aug-98
Aug-99
Aug-00
Aug-01
Aug-02
Aug-03
Aug-04
Aug-05
Aug-06
Aug-07
Aug-08
Aug-09
Aug-10
Aug-11
Aug-12
Aug-13
Aug-14
Aug-15
Aug-16
Aug-17
Aug-18
Aug-19
Aug-20
Aug-21
Aug-22
MCI values
Median MCI value
No of taxa
Median no of taxa

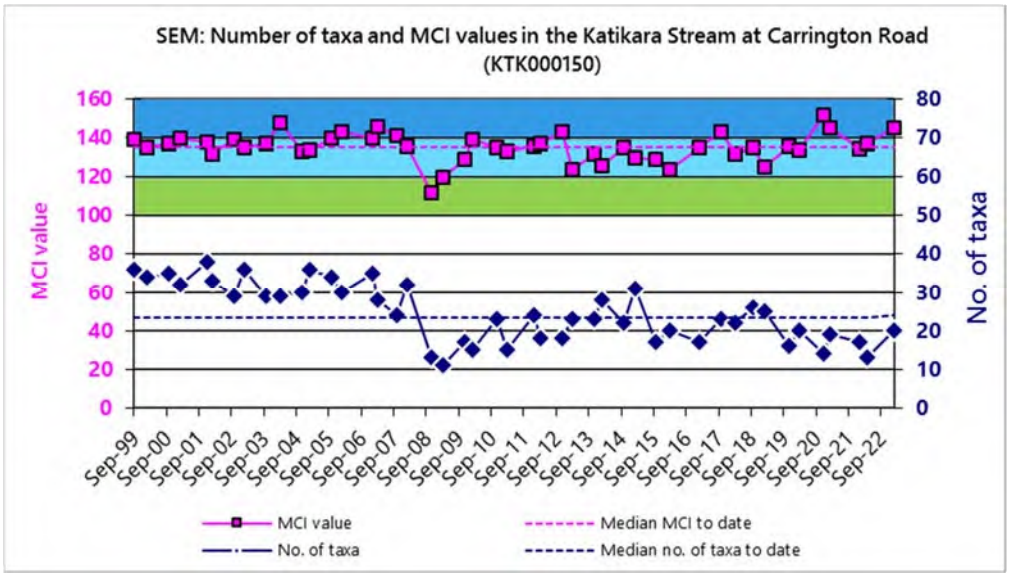

SEM:Number of taxa and MCI values in the Kurapete Stream 6km d/s of Inglewood WWTP (KRP000660)
MCI value
No. of taxa
120
100
80
60
40
20
0
60
50
40
30
20
10
0
Sep-95
Sep-96
Sep-97
Sep-98
Sep-99
Sep-00
Sep-01
Sep-02
Sep-03
Sep-04
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
Sep-20
Sep-21
Sep-22
MVI values
Median MCI value
No of taxa
Median no of taxa

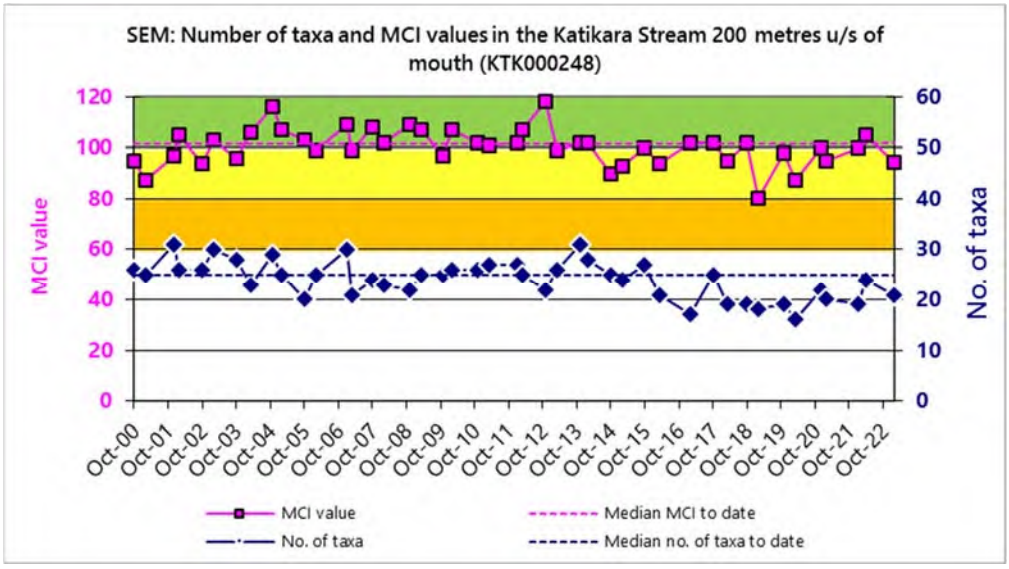
Katikara

Taxa List	Site Code / Sample Number	Taranaki MCI Score	KTK000150 TRC2310371	KTK000248 TRC2310372
Nemertea	Nemertea	3	-	R
Annelida (Worms)	Oligochaeta	1	-	R
Mollusca	*Zemelanopsis*	3	-	R
	Potamopyrgus	4	-	C
Ephemeroptera (Mayflies)	*Ameletopsis*	10	C	-
	Austroclima	7	R	R
	Coloburiscus	7	A	R
	Deleatidium	8	A	A
	Nesameletus	9	A	-
Plecoptera (Stoneflies)	*Austroperla*	9	C	-
	Stenoperla	10	R	-
	Taraperla	10	R	-
	Zelandoperla	8	R	-
Coleoptera (Beetles)	Elmidae	6	-	VA
	Hydraenidae	8	C	-
	Ptilodactylidae	8	-	R
Megaloptera (Dobsonflies)	*Archichauliodes*	7	C	C
Trichoptera (Caddisflies)	*Hydropsyche (Aoteapsyche)*	4	-	A
	Costachorema	7	R	-
	Hydrobiosis	5	C	A
	Hydrobiosella	9	R	-
	Neurochorema	6	-	R
	Hydropsyche (Orthopsyche)	9	C	-
	Polyplectropus	6	R	-
	Psilochorema	6	R	-
	Pycnocentrodes	5	-	C
Diptera (True Flies)	*Aphrophila*	5	-	C
	Eriopterini	5	R	R
	Maoridiamesa	3	-	A
	Orthocladiinae	2	R	A
	Polypedilum	3	C	-
	Tanytarsini	3	-	VA
	Austrosimulium	3	-	R
	Tanyderidae	4	-	R
		Number of Taxa	20	21
		Taranaki MCI	145	94
		Taranaki SQMCI	7.7	4.5
		EPT (taxa)	15	7
		% EPT (taxa)	75	33

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant


SEM: Number of taxa and MCI values in the Katikara Stream at Carrington Road (KTK000150)
MCI value
No. of taxa
160
140
120
100
80
60
40
20
0
80
70
60
50
40
30
20
10
0
Sep-99
Sep-00
Sep-01
Sep-02
Sep-03
Sep-04
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
Sep-20
Sep-21
Sep-22
MCI value
No. of taxa
Median MCI to date
Median no. of taxa to date

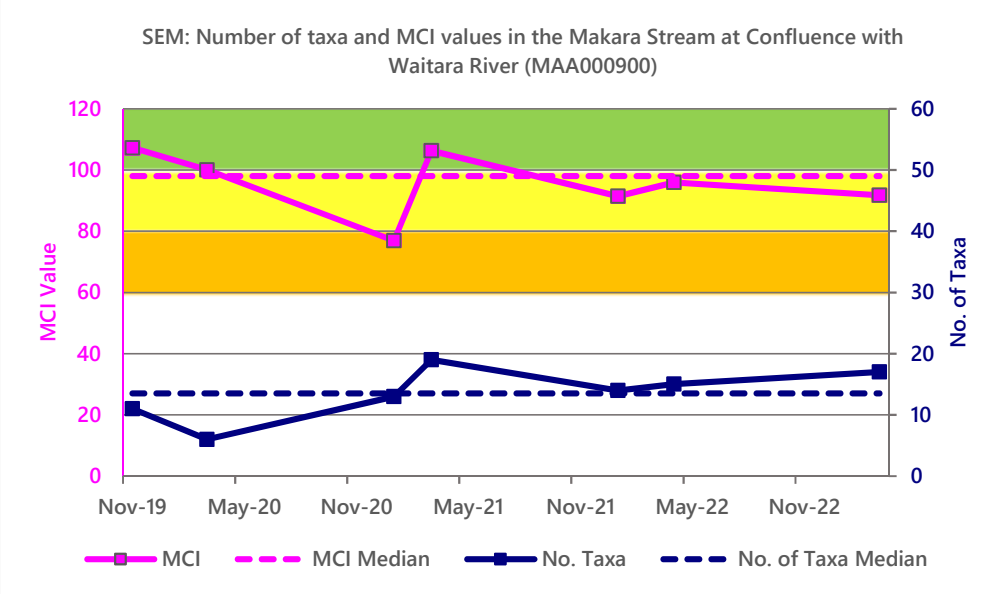

SEM: Number of taxa and MCI values in the Katikara Stream 200 metres u/s of mouth (KTK000248)
MCI value
No. of taxa
120
100
80
60
40
20
0
60
50
40
30
20
10
0
Oct-00
Oct-01
Oct-02
Oct-03
Oct-04
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
Oct-10
Oct-11
Oct-12
Oct-13
Oct-14
Oct-15
Oct-16
Oct-17
Oct-18
Oct-19
Oct-20
Oct-21
Oct-22
MCI value
No. of taxa
Median MCI to date
Median no. of taxa to date

Makara

Taxa List	Site Code / Sample Number	Taranaki MCI Score	MAA000900 / TRC2310380
Annelida (Worms)	Oligochaeta	1	R
Mollusca	*Potamopyrgus*	4	C
Ephemeroptera (Mayflies)	*Deleatidium*	8	VA
	Zephlebia group	7	R
Plecoptera (Stoneflies)	*Zelandobius*	5	R
Coleoptera (Beetles)	Elmidae	6	C
Trichoptera (Caddisflies)	*Costachorema*	7	C
	Hydrobiosis	5	A
	Neurochorema	6	R
	Psilochorema	6	R
	Oxyethira	2	R
	Triplectides	5	R
Diptera (True Flies)	Eriopterini	5	C
	Orthocladiinae	2	R
	Polypedilum	3	A
	Tanytarsini	3	C
	Austrosimulium	3	A
		Number of Taxa	17
		Taranaki MCI	92
		Taranaki SQMCI	6.1
		EPT (taxa)	8
		% EPT (taxa)	47

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

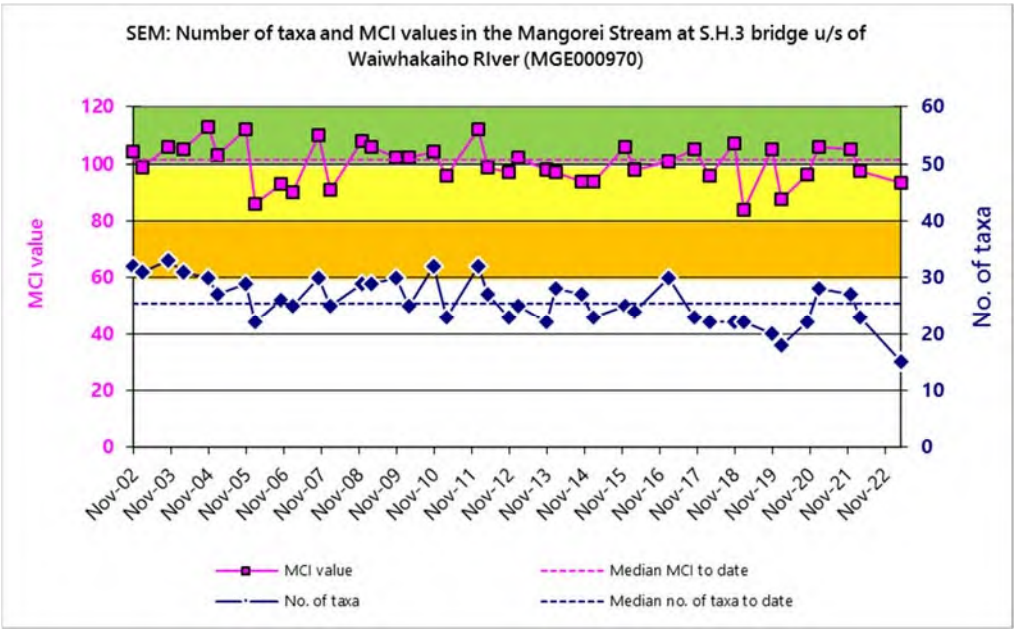


Mangorei

Taxa List	Site Code / Sample Number	Taranaki MCI Score	MGE000970 / TRC2310523
Annelida (Worms)	Lumbricidae	5	R
Mollusca	*Potamopyrgus*	4	C
Ephemeroptera (Mayflies)	*Coloburiscus*	7	R
	Deleatidium	8	R
Coleoptera (Beetles)	Elmidae	6	A
Megaloptera (Dobsonflies)	*Archichauliodes*	7	C
Trichoptera (Caddisflies)	*Hydropsyche (Aoteapsyche)*	4	VA
	Hydrobiosis	5	R
	Neurochorema	6	R
	Oxyethira	2	R
	Pycnocentrodes	5	R
Diptera (True Flies)	Orthocladiinae	2	C
	Tanytarsini	3	A
	Empididae	3	R
	Austrosimulium	3	R
		Number of Taxa	15
		Taranaki MCI	93
		Taranaki SQMCI	4.2
		EPT (taxa)	6
		% EPT (taxa)	40

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

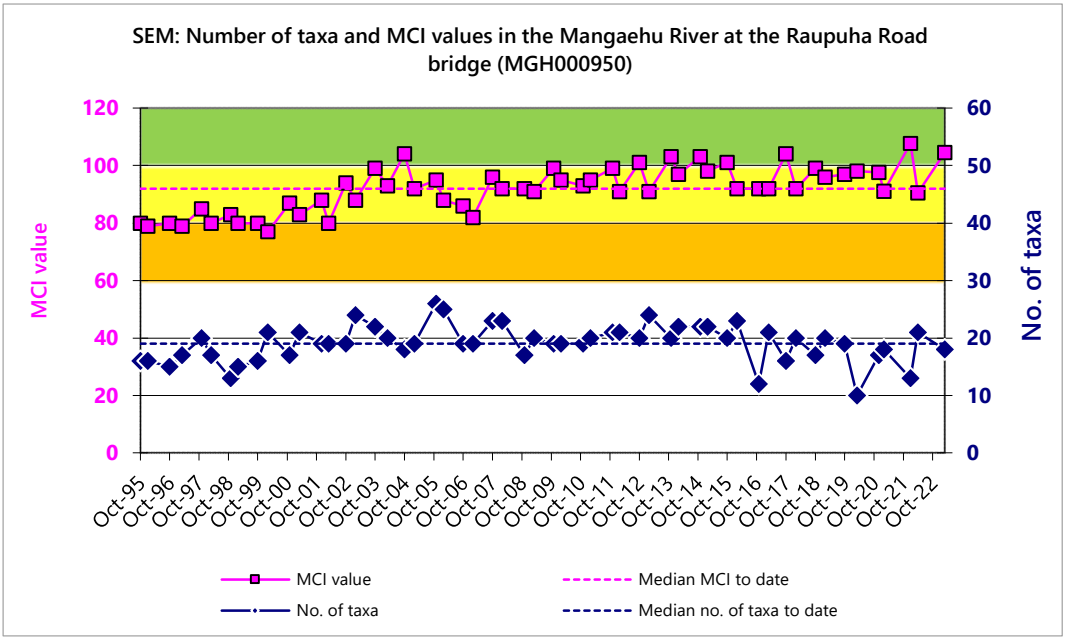


Mangaehu

Taxa List	Site Code / Sample Number	Taranaki MCI Score	MGH000950 / TRC2310999
Mollusca	*Potamopyrgus*	4	A
Ephemeroptera (Mayflies)	*Austroclima*	7	R
	Deleatidium	8	A
	Zephlebia group	7	R
Coleoptera (Beetles)	Elmidae	6	R
Trichoptera (Caddisflies)	*Hydropsyche (Aoteapsyche)*	4	C
	Costachorema	7	R
	Hydrobiosis	5	A
	Neurochorema	6	R
	Hydropsyche (Orthopsyche)	9	R
	Pycnocentria	7	R
	Pycnocentrodes	5	R
Diptera (True Flies)	*Aphrophila*	5	A
	Maoridiamesa	3	R
	Orthocladiinae	2	A
	Polypedilum	3	C
	Tanytarsini	3	C
	Muscidae	3	R
		Number of Taxa	18
		Taranaki MCI	104
		Taranaki SQMCI	4.7
		EPT (taxa)	10
		% EPT (taxa)	56

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

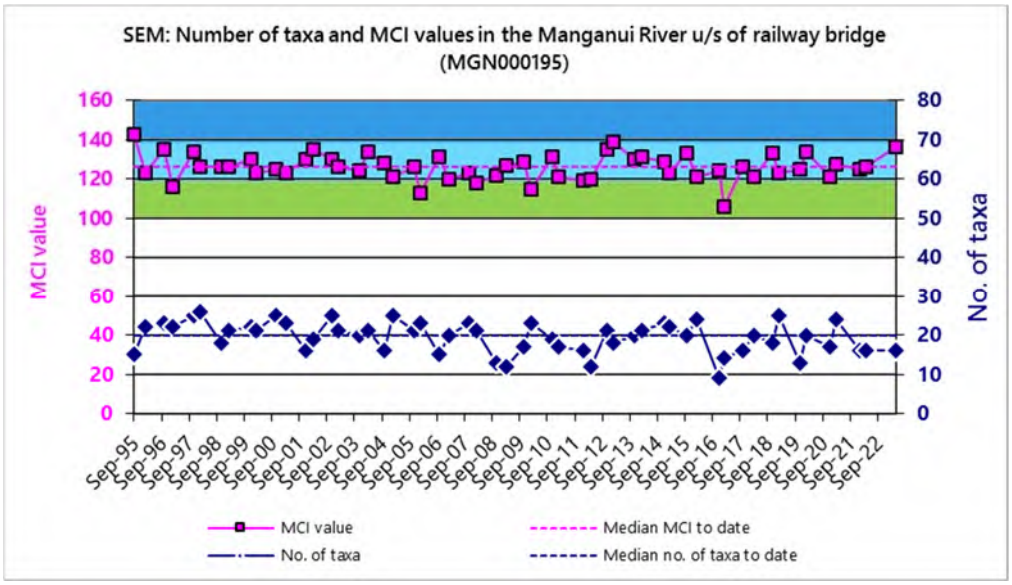


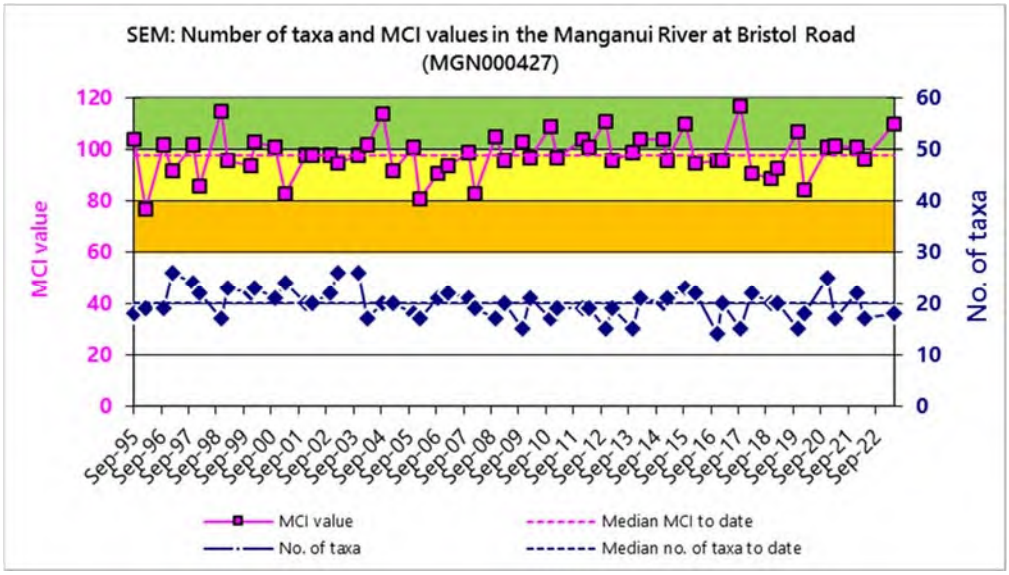
Manganui

Taxa List	Site Code / Sample Number	Taranaki MCI Score	MGN000195 TRC2310993	MGN000427 TRC2310994
Annelida (Worms)	Oligochaeta	1	-	R
Mollusca	*Potamopyrgus*	4	-	A
Ephemeroptera (Mayflies)	*Coloburiscus*	7	A	A
	Deleatidium	8	VA	VA
	Nesameletus	9	C	-
	Zephlebia group	7	-	R
Plecoptera (Stoneflies)	*Taraperla*	10	R	-
	Zelandoperla	8	A	-
Coleoptera (Beetles)	Elmidae	6	R	R
	Hydraenidae	8	R	-
Megaloptera (Dobsonflies)	*Archichauliodes*	7	R	R
Trichoptera (Caddisflies)	*Hydropsyche (Aoteapsyche)*	4	C	A
	Costachorema	7	R	C
	Hydrobiosis	5	R	A
	Neurochorema	6	-	R
	Beraeoptera	8	A	R
	Confluens	5	-	R
	Olinga	9	C	R
	Pycnocentrodes	5	-	R
Diptera (True Flies)	*Aphrophila*	5	A	C
	Eriopterini	5	R	-
	Maoridiamesa	3	-	R
	Orthocladiinae	2	-	R
	Austrosimulium	3	R	-
		Number of Taxa	16	18
		Taranaki MCI	136	110
		Taranaki SQMCI	7.5	6.6
		EPT (taxa)	10	11
		% EPT (taxa)	63	61

'Tolerant' taxa | 'Moderately sensitive' taxa | 'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant


SEM: Number of taxa and MCI values in the Manganui River u/s of railway bridge (MGN000195)
MCI value
No. of taxa
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date

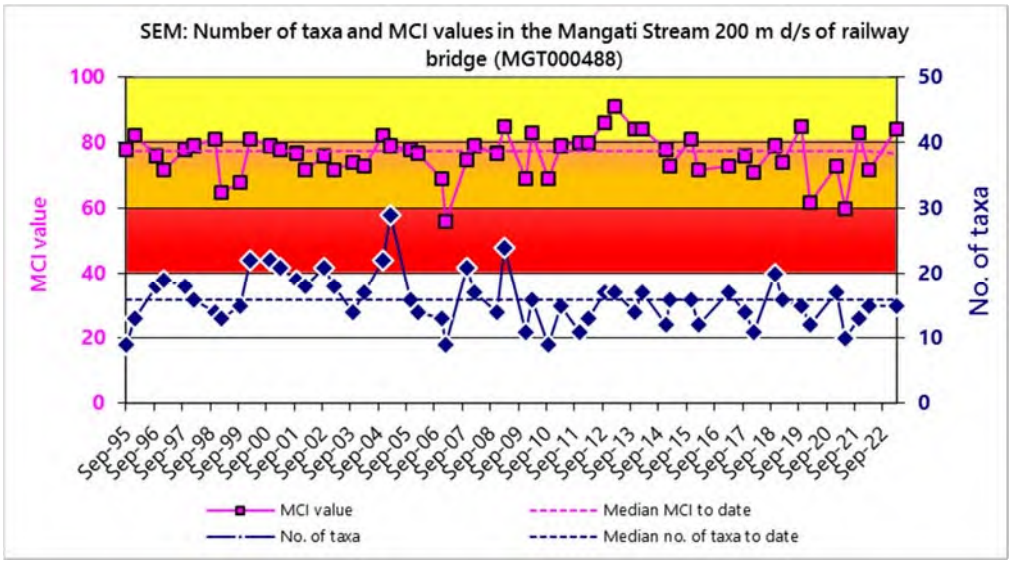

SEM: Number of taxa and MCI values in the Manganui River at Bristol Road (MGN000427)
MCI value
No. of taxa
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date

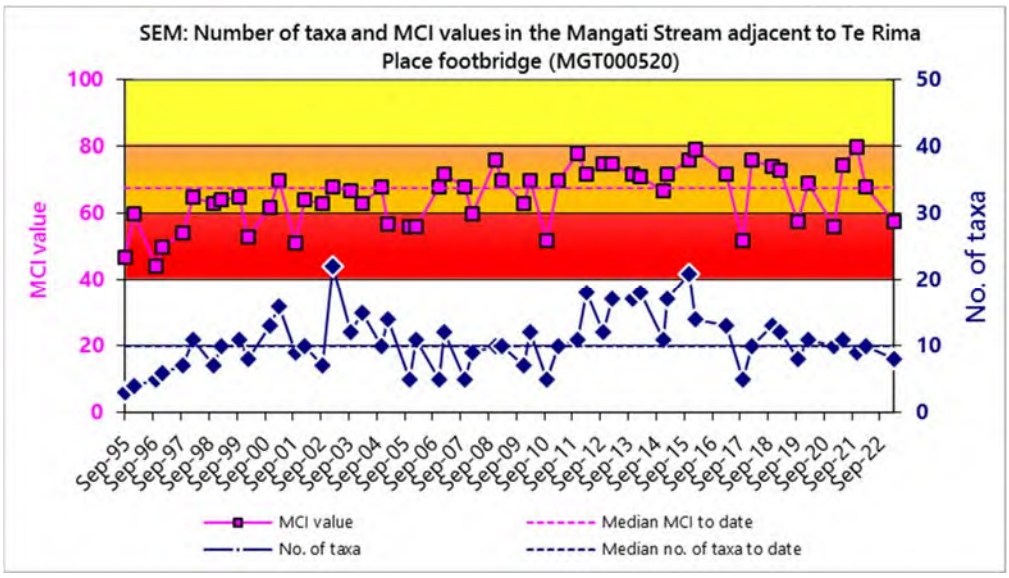
Mangatī

Taxa List	Site Code / Sample Number	Taranaki MCI Score	MGT000488 TRC2311141	MGT000520 TRC2311147
Heterotroph	No dense heterotrophic growths		P	P
Nemertea	Nemertea	3	R	R
Annelida (Worms)	Oligochaeta	1	A	R
Mollusca	*Physella*	3	R	-
	Potamopyrgus	4	VA	XA
Crustacea	*Paracalliope*	5	VA	-
Ephemeroptera (Mayflies)	*Austroclima*	7	C	-
	Zephlebia group	7	R	-
Trichoptera (Caddisflies)	*Hydrobiosis*	5	R	R
	Oxyethira	2	-	C
	Triplectides	5	R	-
Diptera (True Flies)	Orthocladiinae	2	C	A
	Polypedilum	3	-	R
	Tanypodinae	5	R	-
	Paradixa	4	R	-
	Austrosimulium	3	A	R
	Tanyderidae	4	R	-
Acarina (Mites)	Acarina	5	C	-
		Number of Taxa	15	8
		Taranaki MCI	84	58
		Taranaki SQMCI	4.1	3.9
		EPT (taxa)	4	1
		% EPT (taxa)	27	13

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant


SEM: Number of taxa and MCI values in the Mangati Stream 200 m d/s of railway bridge (MGT000488)
MCI value
No. of taxa
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date

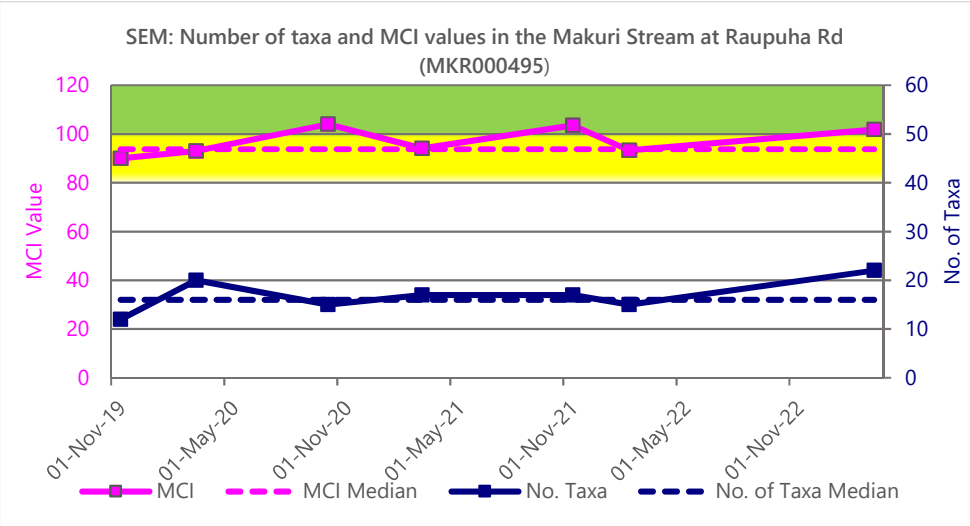

SEM: Number of taxa and MCI values in the Mangati Stream adjacent to Te Rima Place footbridge (MGT000520)
MCI value
No. of taxa
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date

Makuri

Taxa List	Site Code / Sample Number	Taranaki MCI Score	MKR000495 / TRC2310583
Annelida (Worms)	Oligochaeta	1	C
	Lumbricidae	5	R
Mollusca	*Potamopyrgus*	4	A
Crustacea	*Paracalliope*	5	R
Ephemeroptera (Mayflies)	*Austroclima*	7	A
	Coloburiscus	7	C
	Deleatidium	8	VA
	Zephlebia group	7	C
Coleoptera (Beetles)	Elmidae	6	A
	Hydraenidae	8	R
Megaloptera (Dobsonflies)	*Archichauliodes*	7	C
Trichoptera (Caddisflies)	*Hydropsyche (Aoteapsyche)*	4	A
	Costachorema	7	R
	Hydrobiosis	5	C
	Pycnocentria	7	R
	Pycnocentrodes	5	C
Diptera (True Flies)	*Aphrophila*	5	C
	Maoridiamesa	3	R
	Orthocladiinae	2	C
	Polypedilum	3	R
	Tanytarsini	3	R
	Austrosimulium	3	R
		Number of Taxa	22
		Taranaki MCI	102
		Taranaki SQMCI	6.4
		EPT (taxa)	9
		% EPT (taxa)	41

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

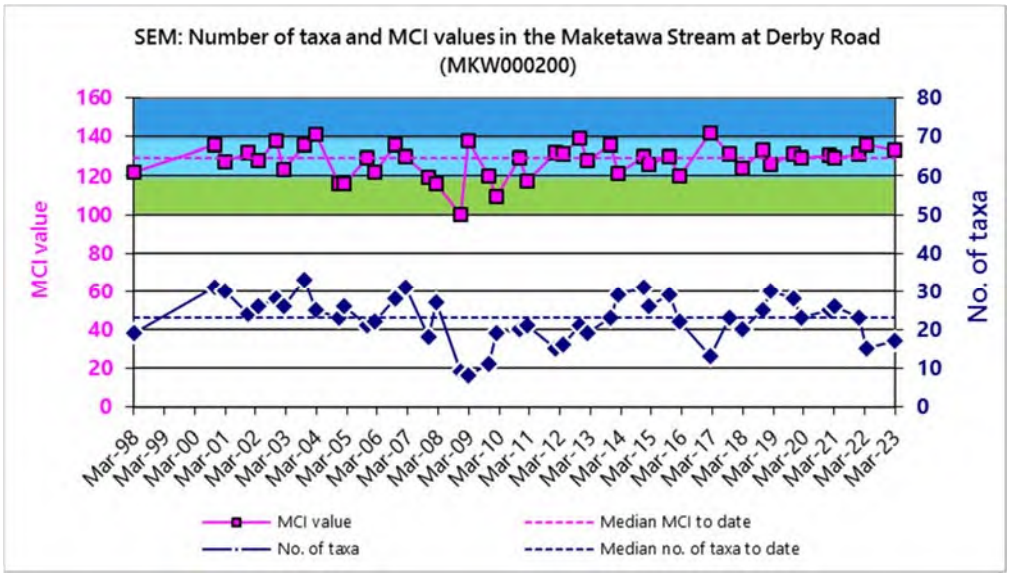


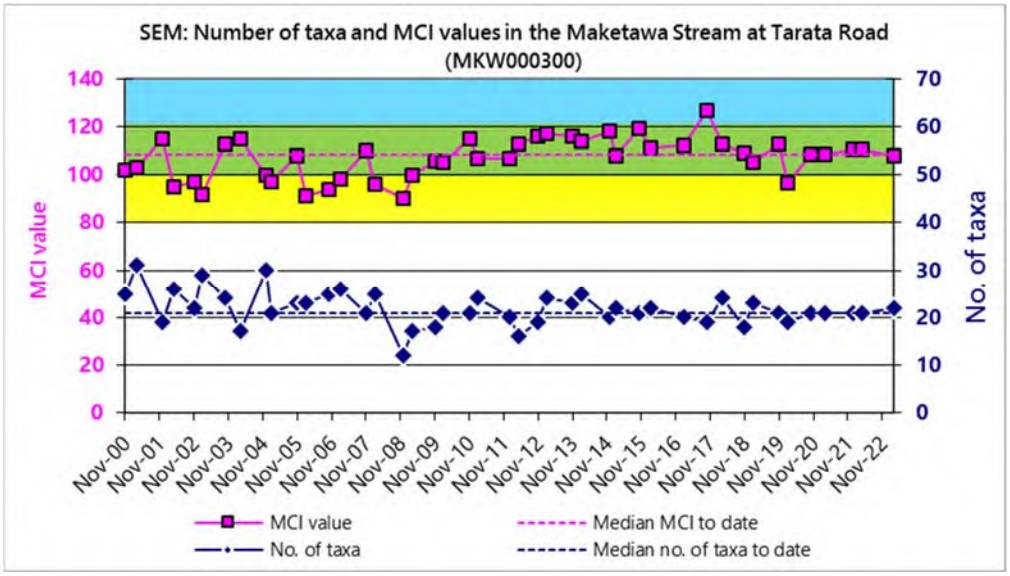
Maketawa

Taxa List	Site Code / Sample Number	Taranaki MCI Score	MKW000200 TRC2310989	MKW000300 TRC2310990
Mollusca	*Potamopyrgus*	4	-	R
Ephemeroptera (Mayflies)	*Austroclima*	7	-	R
	Coloburiscus	7	R	C
	Deleatidium	8	VA	A
	Nesameletus	9	A	C
Plecoptera (Stoneflies)	*Austroperla*	9	R	R
	Megaleptoperla	9	R	-
	Zelandoperla	8	A	-
Hemiptera (Bugs)	*Saldidae*	5	-	R
Coleoptera (Beetles)	Elmidae	6	A	C
Megaloptera (Dobsonflies)	*Archichauliodes*	7	-	C
Trichoptera (Caddisflies)	*Hydropsyche (Aoteapsyche)*	4	A	VA
	Costachorema	7	C	C
	Hydrobiosis	5	R	C
	Neurochorema	6	R	R
	Psilochorema	6	R	-
	Beraeoptera	8	R	-
	Olinga	9	R	R
	Oxyethira	2	-	R
	Pycnocentrodes	5	-	R
Diptera (True Flies)	*Aphrophila*	5	A	A
	Eriopterini	5	R	-
	Maoridiamesa	3	-	A
	Orthocladiinae	2	C	A
	Tanytarsini	3	-	VA
	Muscidae	3	-	R
	Austrosimulium	3	-	R
		Number of Taxa	17	22
		Taranaki MCI	133	108
		Taranaki SQMCI	7.1	4.1
		EPT (taxa)	13	11
		% EPT (taxa)	76	50

'Tolerant' taxa | 'Moderately sensitive' taxa | 'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant


SEM: Number of taxa and MCI values in the Maketawa Stream at Derby Road (MKW000200)
MCI value
No. of taxa
MCI value
No. of taxa
Median MCI to date
Median no. of taxa to date

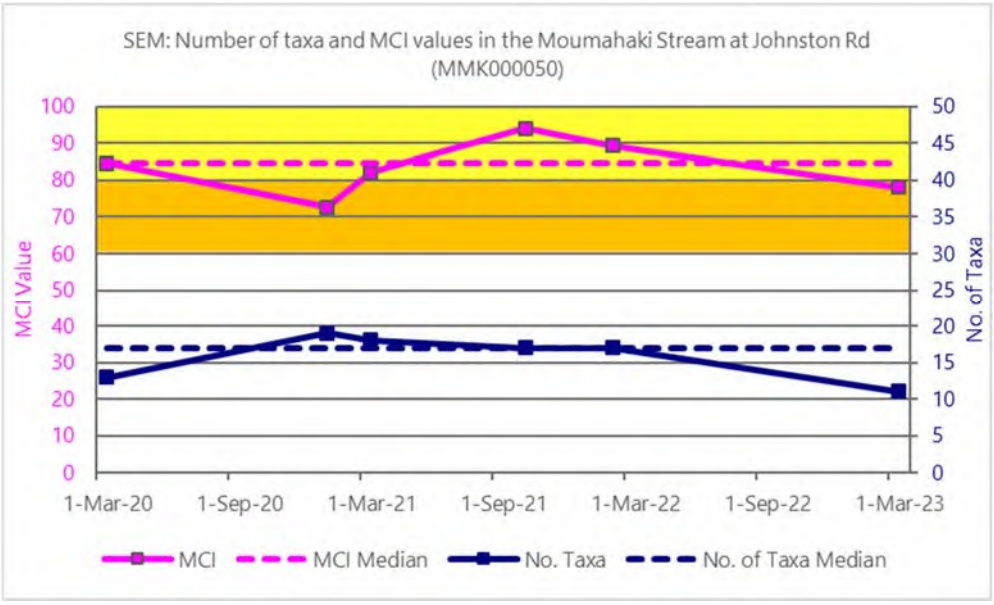

SEM: Number of taxa and MCI values in the Maketawa Stream at Tarata Road (MKW000300)
MCI value
No. of taxa
MCI value
No. of taxa
Median MCI to date
Median no. of taxa to date

Moumahaki

Taxa List	Site Code / Sample Number	Taranaki MCI Score	MMK000050 / TRC2310586
Annelida (Worms)	Oligochaeta	1	R
Mollusca	*Potamopyrgus*	4	R
Crustacea	Ostracoda	1	R
	Paracalliope	5	VA
	Phreatogammarus	5	C
Coleoptera (Beetles)	Elmidae	6	R
Trichoptera (Caddisflies)	*Hydrobiosis*	5	R
	Triplectides	5	R
Diptera (True Flies)	*Paralimnophila*	6	R
	Orthocladiinae	2	C
	Polypedilum	3	C
		Number of Taxa	11
		Taranaki MCI	78
		Taranaki SQMCI	4.7
		EPT (taxa)	2
		% EPT (taxa)	18

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

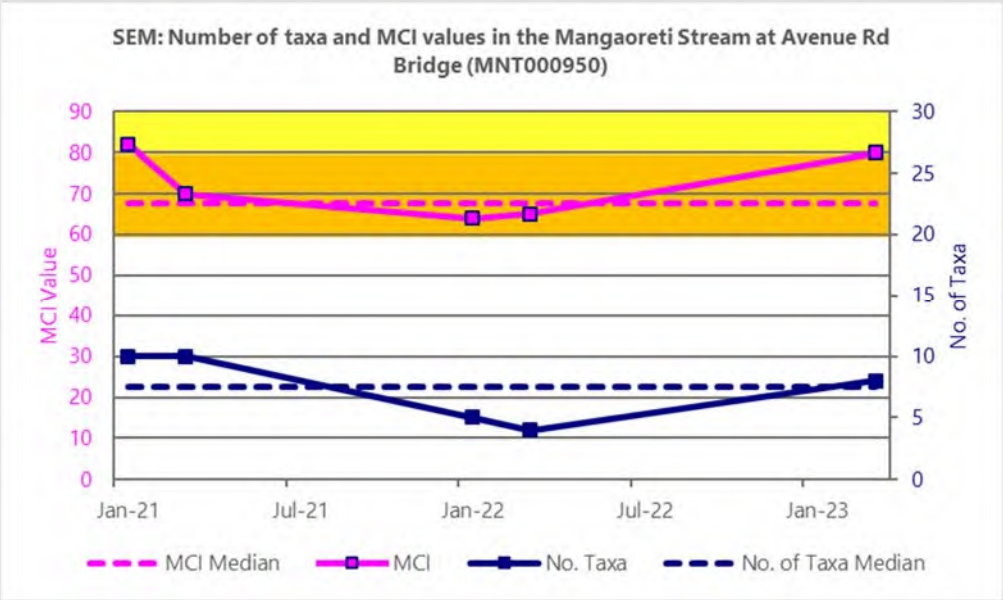


Mangaoreti

Taxa List	Site Code	Taranaki MCI Score	MNT000950
	Sample Number		TRC2310382
Nemertea	Nemertea	3	R
Mollusca	*Zemelanopsis*	3	R
	Potamopyrgus	4	R
Crustacea	*Phreatogammarus*	5	C
	Paratya	3	A
Diptera (True Flies)	Eriopterini	5	R
	Harrisius	6	R
	Austrosimulium	3	R
		Number of Taxa	8
		Taranaki MCI	80
		Taranaki SQMCI	3.5
		EPT (taxa)	0
		% EPT (taxa)	0

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

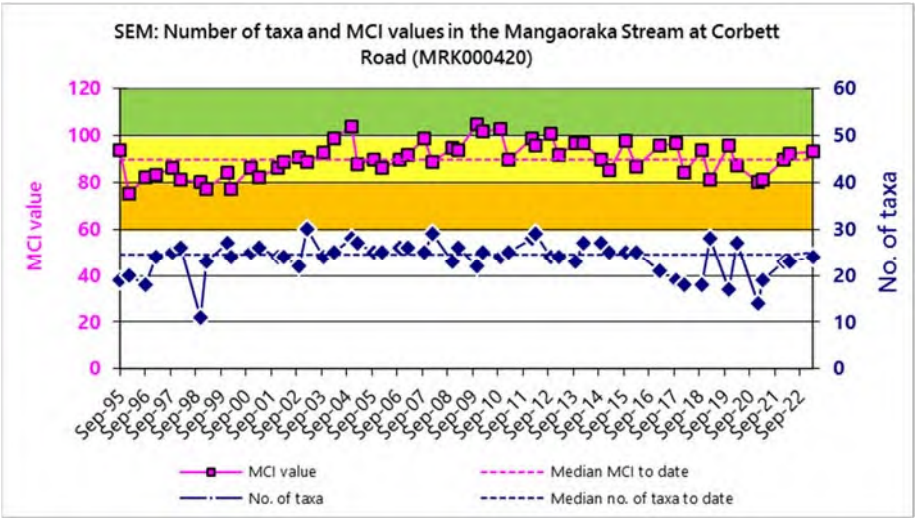


Mangaoraka

Taxa List	Site Code / Sample Number	Taranaki MCI Score	MRK000420 / TRC2310381
Platyhelminthes (Flatworms)	*Cura*	3	R
Annelida (Worms)	Oligochaeta	1	R
	Lumbricidae	5	R
Mollusca	*Latia*	5	C
	Potamopyrgus	4	A
Ephemeroptera (Mayflies)	*Austroclima*	7	VA
	Coloburiscus	7	C
	Deleatidium	8	C
	Zephlebia group	7	R
Coleoptera (Beetles)	Elmidae	6	VA
Megaloptera (Dobsonflies)	*Archichauliodes*	7	C
Trichoptera (Caddisflies)	*Hydropsyche (Aoteapsyche)*	4	VA
	Hydrobiosis	5	C
	Neurochorema	6	R
	Oxyethira	2	R
	Pycnocentria	7	C
	Pycnocentrodes	5	C
Diptera (True Flies)	*Aphrophila*	5	C
	Maoridiamesa	3	R
	Orthocladiinae	2	A
	Tanytarsini	3	VA
	Muscidae	3	R
	Austrosimulium	3	C
	Tanyderidae	4	R
		Number of Taxa	24
		Taranaki MCI	93
		Taranaki SQMCI	4.9
		EPT (taxa)	9
		% EPT (taxa)	38

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

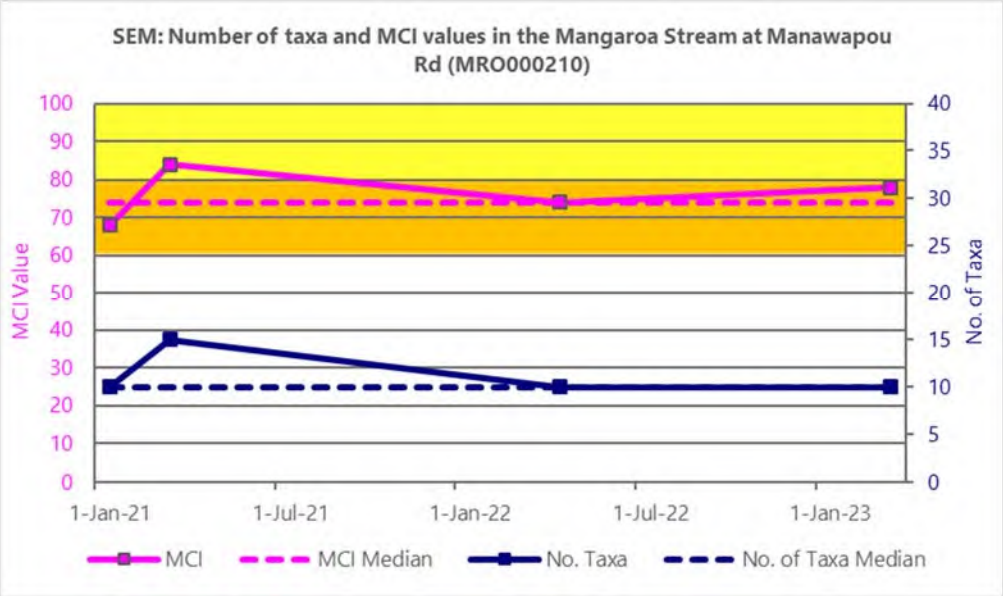


Mangaroa

Taxa List	Site Code / Sample Number	Taranaki MCI Score	MRO000210 / TRC2310383
Mollusca	*Potamopyrgus*	4	VA
Crustacea	*Paracalliope*	5	XA
	Phreatogammarus	5	A
	Talitridae	5	C
Trichoptera (Caddisflies)	*Oxyethira*	2	R
Lepidoptera (Moths)	*Hygraula*	4	R
Diptera (True Flies)	*Polypedilum*	3	R
	Empididae	3	R
	Austrosimulium	3	A
Acarina (Mites)	Acarina	5	R
		Number of Taxa	10
		Taranaki MCI	78
		Taranaki SQMCI	4.8
		EPT (taxa)	0
		% EPT (taxa)	0

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

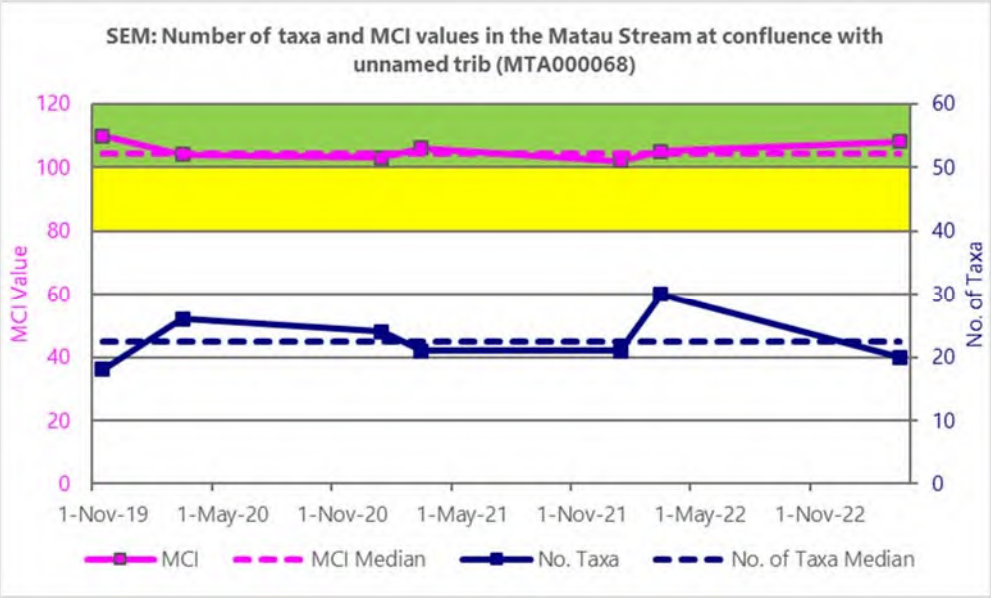


Matau

Taxa List	Site Code / Sample Number	Taranaki MCI Score	MTA000068 / TRC2310386
Mollusca	*Potamopyrgus*	4	R
Ephemeroptera (Mayflies)	*Austroclima*	7	A
	Coloburiscus	7	R
	Deleatidium	8	C
	Nesameletus	9	R
	Rallidens	9	C
	Zephlebia group	7	C
Coleoptera (Beetles)	Elmidae	6	A
	Ptilodactylidae	8	R
Megaloptera (Dobsonflies)	*Archichauliodes*	7	R
Trichoptera (Caddisflies)	*Hydropsyche (Aoteapsyche)*	4	C
	Hydrobiosis	5	C
Diptera (True Flies)	*Aphrophila*	5	A
	Eriopterini	5	R
	Maoridiamesa	3	R
	Orthocladiinae	2	VA
	Polypedilum	3	R
	Tanytarsini	3	C
	Empididae	3	R
	Austrosimulium	3	R
		Number of Taxa	20
		Taranaki MCI	108
		Taranaki SQMCI	4
		EPT (taxa)	8
		% EPT (taxa)	40

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

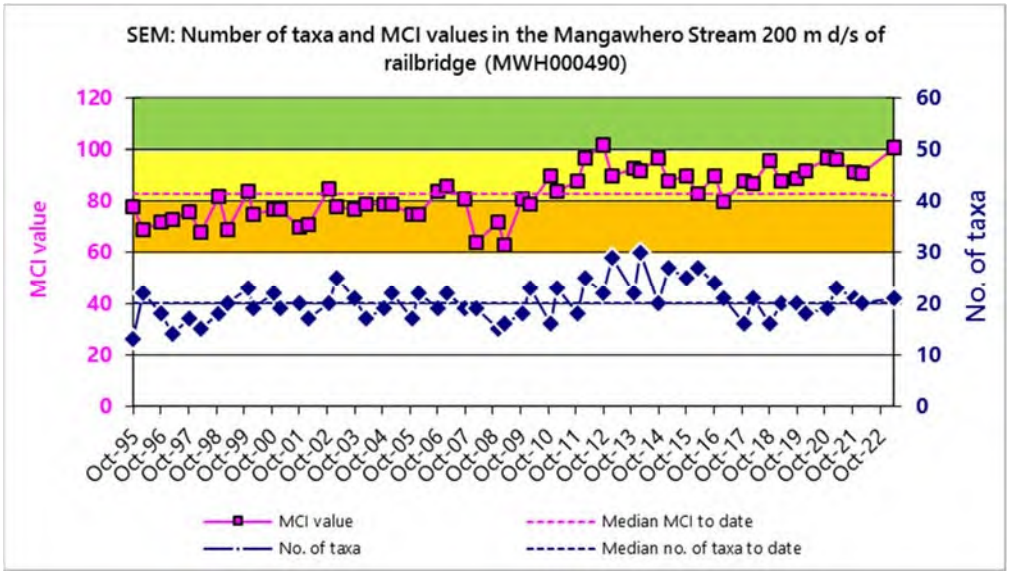


Mangawhero

Taxa List	Site Code / Sample Number	Taranaki MCI Score	MWH000490 / TRC2310385
Annelida (Worms)	Oligochaeta	1	A
Mollusca	*Potamopyrgus*	4	A
Crustacea	*Paracalliope*	5	C
	Phreatogammarus	5	R
Ephemeroptera (Mayflies)	*Austroclima*	7	C
	Coloburiscus	7	C
	Deleatidium	8	C
	Zephlebia group	7	R
Plecoptera (Stoneflies)	*Zelandobius*	5	R
Coleoptera (Beetles)	Elmidae	6	A
Megaloptera (Dobsonflies)	*Archichauliodes*	7	C
Trichoptera (Caddisflies)	*Hydropsyche (Aoteapsyche)*	4	VA
	Costachorema	7	C
	Hydrobiosis	5	C
	Pycnocentria	7	C
	Pycnocentrodes	5	A
Diptera (True Flies)	*Aphrophila*	5	C
	Orthocladiinae	2	C
	Tanytarsini	3	R
	Muscidae	3	R
	Austrosimulium	3	R
		Number of Taxa	21
		Taranaki MCI	101
		Taranaki SQMCI	4.4
		EPT (taxa)	10
		% EPT (taxa)	48

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

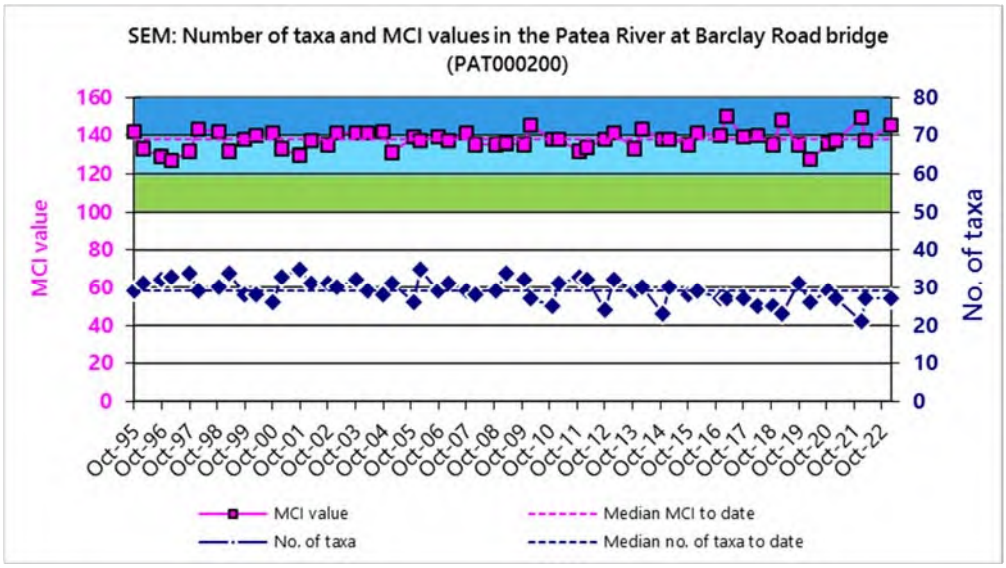


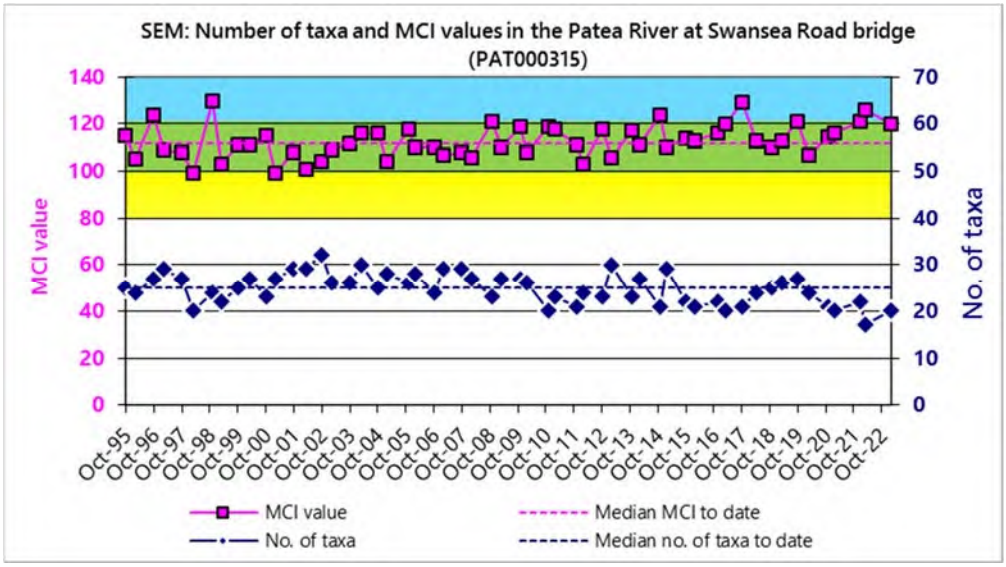
Pātea

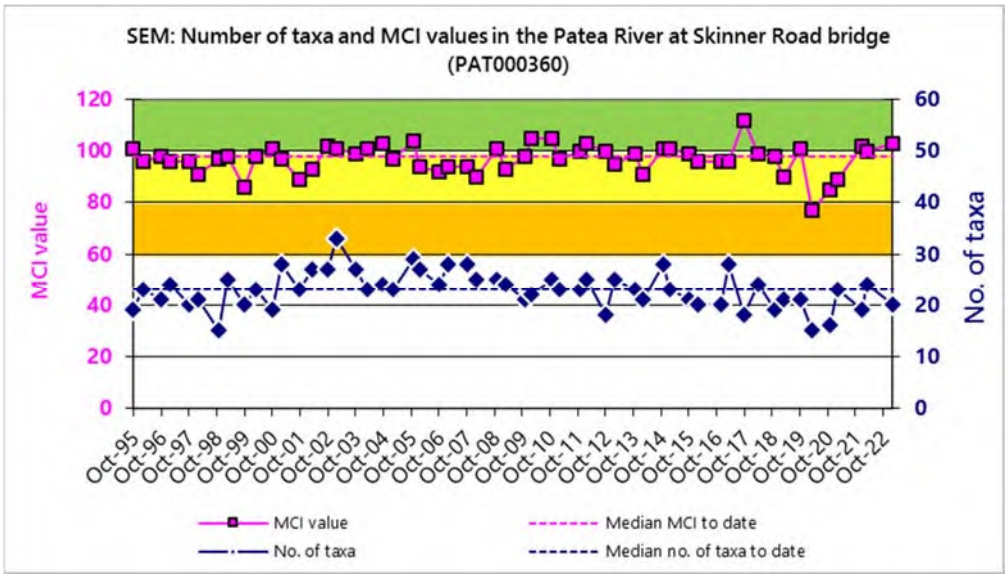
Taxa List	Site Code / Sample Number	Taranaki MCI Score	PAT000200 TRC2310387	PAT000315 TRC2310388	PAT000360 TRC2310389
Annelida (Worms)	Oligochaeta	1	-	R	R
	Lumbricidae	5	R	-	-
Mollusca	*Potamopyrgus*	4	R	C	R
Ephemeroptera (Mayflies)	*Acanthophlebia*	9	R	-	-
	Ameletopsis	10	R	-	-
	Austroclima	7	R	C	-
	Coloburiscus	7	VA	A	C
	Deleatidium	8	XA	VA	VA
	Nesameletus	9	A	A	R
	Zephlebia group	7	-	R	-
Plecoptera (Stoneflies)	*Austroperla*	9	R	-	-
	Megaleptoperla	9	C	-	-
	Stenoperla	10	C	-	-
	Zelandoperla	8	A	R	-
Coleoptera (Beetles)	Elmidae	6	VA	A	VA
	Hydraenidae	8	C	C	-
	Hydrophilidae	5	R	-	-
Megaloptera (Dobsonflies)	*Archichauliodes*	7	A	A	A
Trichoptera (Caddisflies)	*Hydropsyche (Aoteapsyche)*	4	-	A	VA
	Costachorema	7	C	R	R
	Hydrobiosis	5	C	C	A
	Hydrobiosella	9	R	-	-
	Neurochorema	6	R	R	R
	Hydropsyche (Orthopsyche)	9	C	-	-
	Helicopsyche	10	R	-	-
	Olinga	9	VA	R	R
	Pycnocentria	7	R	-	-
	Pycnocentrodes	5	-	R	C
Diptera (True Flies)	*Aphrophila*	5	A	A	VA
	Eriopterini	5	R	R	C
	Maoridiamesa	3	-	-	C
	Orthocladiinae	2	-	C	A
	Polypedilum	3	R	-	-
	Tanytarsini	3	-	-	A
	Muscidae	3	-	-	R
	Tanyderidae	4	-	-	R
		Number of Taxa	27	20	20
		Taranaki MCI	145	120	103
		Taranaki SQMCI	7.7	6.9	5.5
		EPT (taxa)	18	12	9
		% EPT (taxa)	67	60	45

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant


SEM: Number of taxa and MCI values in the Patea River at Barclay Road bridge (PAT000200)
MCI value
No. of taxa
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date


SEM: Number of taxa and MCI values in the Patea River at Swansea Road bridge (PAT000315)
MCI value
No. of taxa
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date

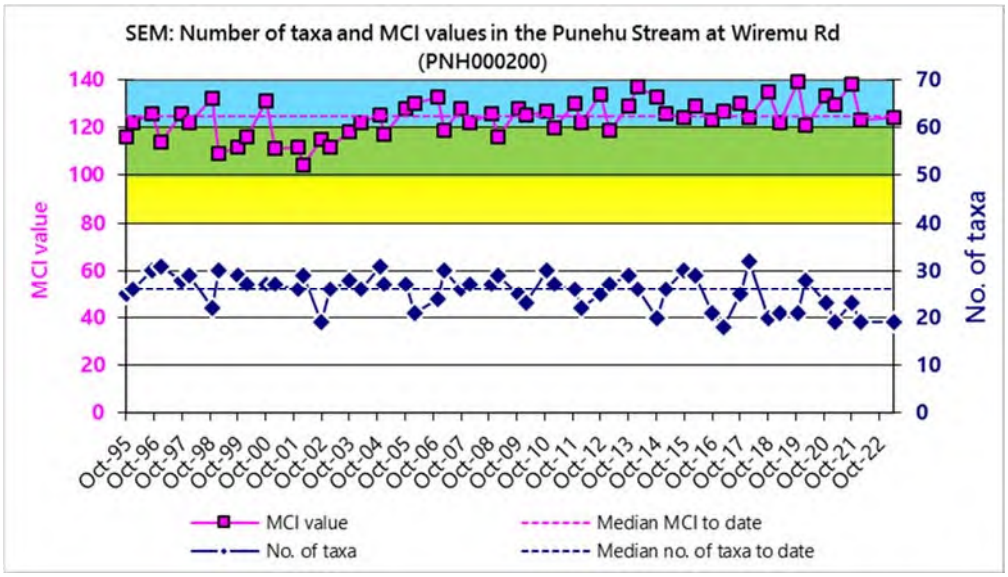

SEM: Number of taxa and MCI values in the Patea River at Skinner Road bridge (PAT000360)
MCI value
No. of taxa
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date

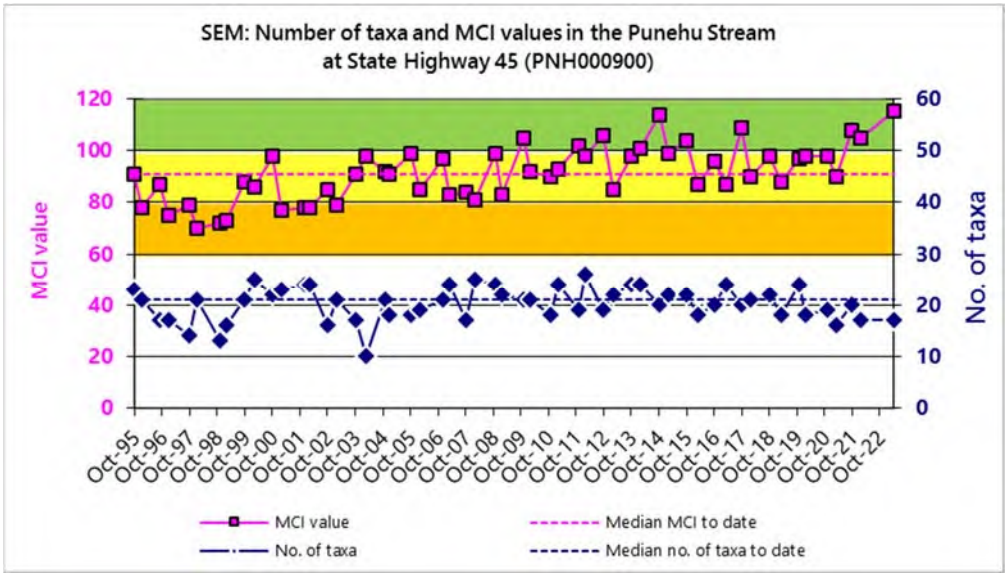
Pūnehu

Taxa List	Site Code / Sample Number	Taranaki MCI Score	PNH000200 TRC2310390	PNH000900 TRC2310391
Mollusca	*Potamopyrgus*	4	-	A
Ephemeroptera (Mayflies)	*Austroclima*	7	-	C
	Coloburiscus	7	C	C
	Deleatidium	8	XA	VA
	Nesameletus	9	VA	C
Plecoptera (Stoneflies)	*Megaleptoperla*	9	R	-
	Zelandoperla	8	C	-
Coleoptera (Beetles)	Elmidae	6	VA	VA
	Hydraenidae	8	R	-
Megaloptera (Dobsonflies)	*Archichauliodes*	7	C	C
Trichoptera (Caddisflies)	*Hydropsyche (Aoteapsyche)*	4	C	C
	Costachorema	7	C	-
	Hydrobiosis	5	R	R
	Beraeoptera	8	A	-
	Hudsonema	6	-	R
	Olinga	9	R	R
	Pycnocentria	7	-	R
	Pycnocentrodes	5	C	VA
Diptera (True Flies)	*Aphrophila*	5	C	R
	Eriopterini	5	C	-
	Maoridiamesa	3	A	-
	Orthocladiinae	2	A	-
	Polypedilum	3	-	R
	Tanytarsini	3	-	R
	Austrosimulium	3	R	R
		Number of Taxa	19	17
		Taranaki MCI	124	115
		Taranaki SQMCI	7.5	6.2
		EPT (taxa)	11	10
		% EPT (taxa)	58	59

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant


SEM: Number of taxa and MCI values in the Punehu Stream at Wiremu Rd (PNH000200)
MCI value
No. of taxa
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date

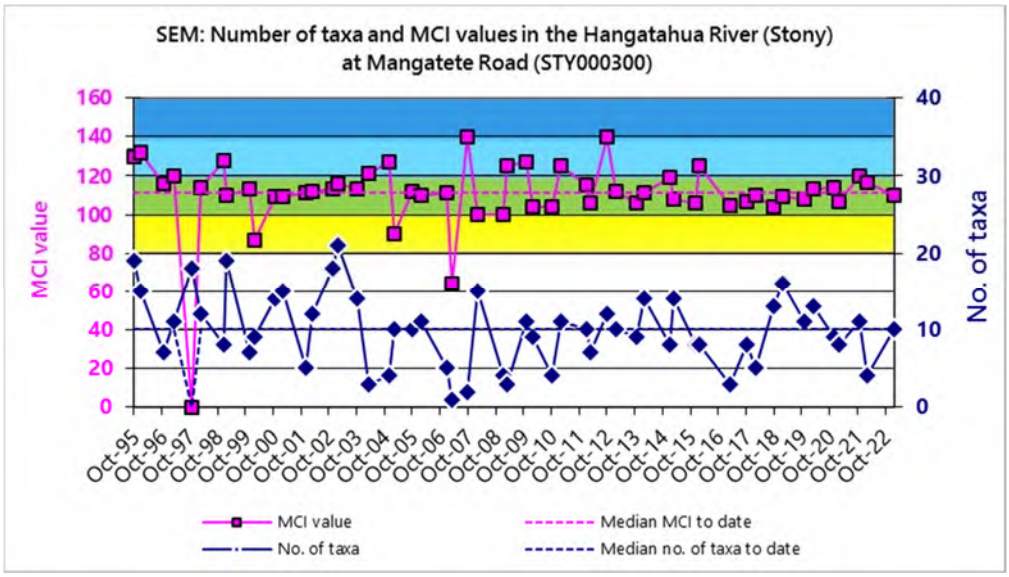

SEM: Number of taxa and MCI values in the Punehu Stream at State Highway 45 (PNH000900)
MCI value
No. of taxa
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date

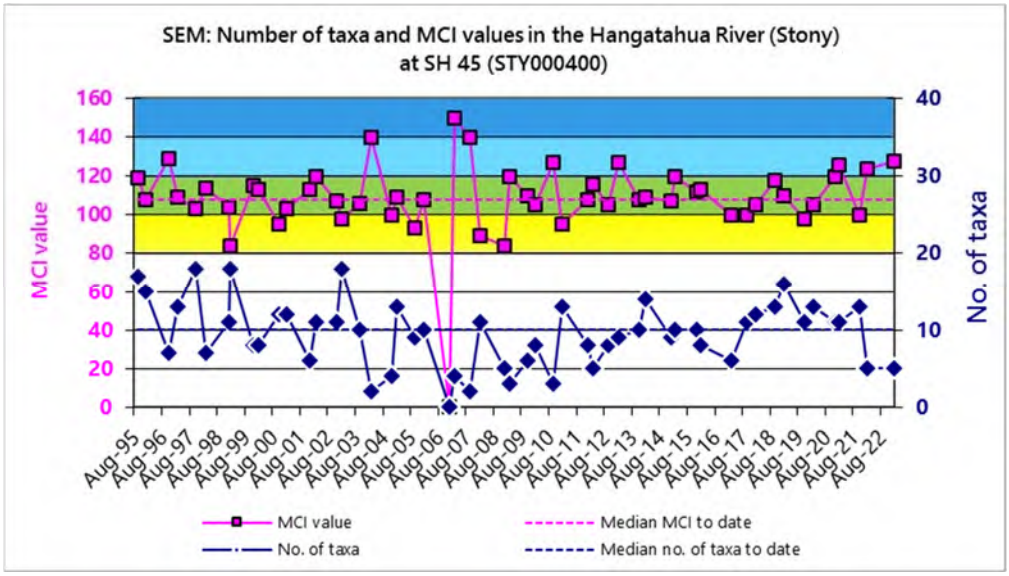
Stony

Taxa List	Site Code / Sample Number	Taranaki MCI Score	STY000300 TRC2310362	STY000400 TRC2310363
Ephemeroptera (Mayflies)	*Deleatidium*	8	XA	VA
Plecoptera (Stoneflies)	*Zelandoperla*	8	VA	A
Trichoptera (Caddisflies)	*Hydropsyche (Aoteapsyche)*	4	R	R
	Costachorema	7	A	C
	Hydrobiosis	5	R	R
	Psilochorema	6	R	-
	Pycnocentrodes	5	R	-
Diptera (True Flies)	*Aphrophila*	5	R	-
	Maoridiamesa	3	R	-
	Polypedilum	3	R	-
		Number of Taxa	10	5
		Taranaki MCI	108	128
		Taranaki SQMCI	7.9	7.9
		EPT (taxa)	7	5
		% EPT (taxa)	70	100

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant


SEM: Number of taxa and MCI values in the Hangatahua River (Stony)
at Mangatete Road (STY000300)
MCI value
No. of taxa
160
140
120
100
80
60
40
20
0
40
30
20
10
0
Oct-95
Oct-96
Oct-97
Oct-98
Oct-99
Oct-00
Oct-01
Oct-02
Oct-03
Oct-04
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
Oct-10
Oct-11
Oct-12
Oct-13
Oct-14
Oct-15
Oct-16
Oct-17
Oct-18
Oct-19
Oct-20
Oct-21
Oct-22
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date

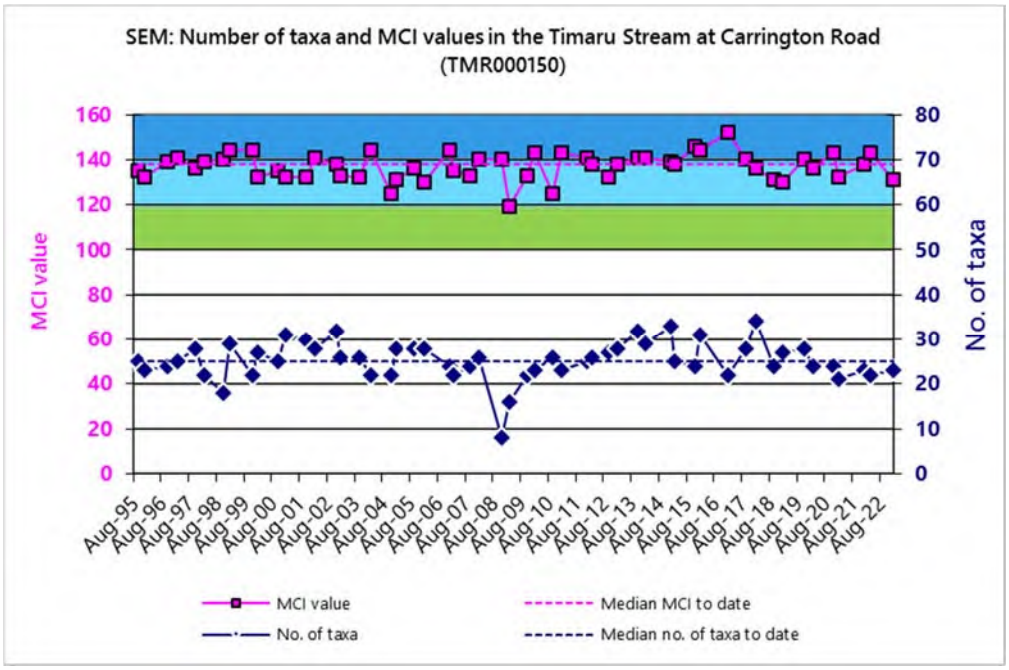

SEM: Number of taxa and MCI values in the Hangatahua River (Stony)
at SH 45 (STY000400)
MCI value
No. of taxa
160
140
120
100
80
60
40
20
0
40
30
20
10
0
Aug-95
Aug-96
Aug-97
Aug-98
Aug-99
Aug-00
Aug-01
Aug-02
Aug-03
Aug-04
Aug-05
Aug-06
Aug-07
Aug-08
Aug-09
Aug-10
Aug-11
Aug-12
Aug-13
Aug-14
Aug-15
Aug-16
Aug-17
Aug-18
Aug-19
Aug-20
Aug-21
Aug-22
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date

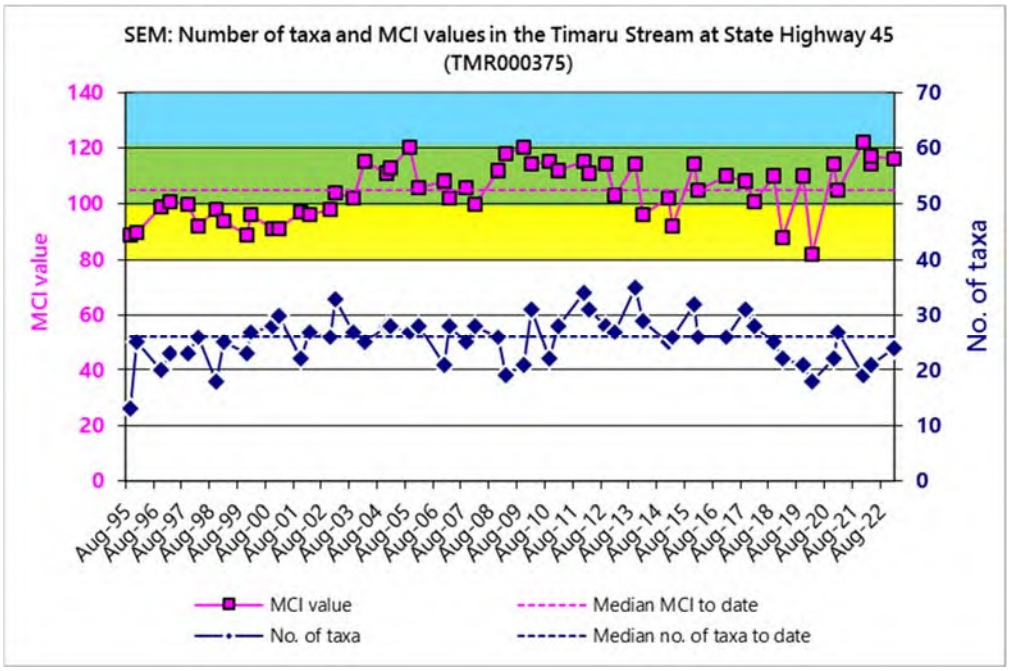
Timaru

Taxa List	Site Code / Sample Number	Taranaki MCI Score	TMR000150 TRC2310395	TMR000375 TRC2310396
Mollusca	*Potamopyrgus*	4	-	R
Ephemeroptera (Mayflies)	*Acanthophlebia*	9	R	-
	Ameletopsis	10	R	-
	Austroclima	7	-	A
	Coloburiscus	7	A	A
	Deleatidium	8	VA	C
	Nesameletus	9	C	-
	Rallidens	9	-	R
Plecoptera (Stoneflies)	*Austroperla*	9	R	-
	Stenoperla	10	C	-
	Zelandobius	5	R	-
	Zelandoperla	8	C	R
Coleoptera (Beetles)	Elmidae	6	C	VA
	Hydraenidae	8	-	R
Megaloptera (Dobsonflies)	*Archichauliodes*	7	C	A
Trichoptera (Caddisflies)	*Hydropsyche (Aoteapsyche)*	4	C	A
	Costachorema	7	R	R
	Hydrobiosis	5	C	C
	Hydrobiosella	9	VA	-
	Neurochorema	6	-	A
	Psilochorema	6	R	-
	Beraeoptera	8	-	R
	Olinga	9	R	R
	Pycnocentria	7	-	R
	Pycnocentrodes	5	-	C
Diptera (True Flies)	*Aphrophila*	5	A	A
	Eriopterini	5	R	-
	Hexatomini	5	R	-
	Maoridiamesa	3	R	R
	Orthocladiinae	2	R	C
	Polypedilum	3	R	-
	Tanytarsini	3	-	A
	Muscidae	3	-	R
	Austrosimulium	3	-	R
Acarina (Mites)	Acarina	5	-	R
		Number of Taxa	23	24
		Taranaki MCI	131	116
		Taranaki SQMCI	7.9	5.7
		EPT (taxa)	15	13
		% EPT (taxa)	65	54

'Tolerant' taxa | 'Moderately sensitive' taxa | 'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant


SEM: Number of taxa and MCI values in the Timaru Stream at Carrington Road
(TMR000150)
MCI value
No. of taxa
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date

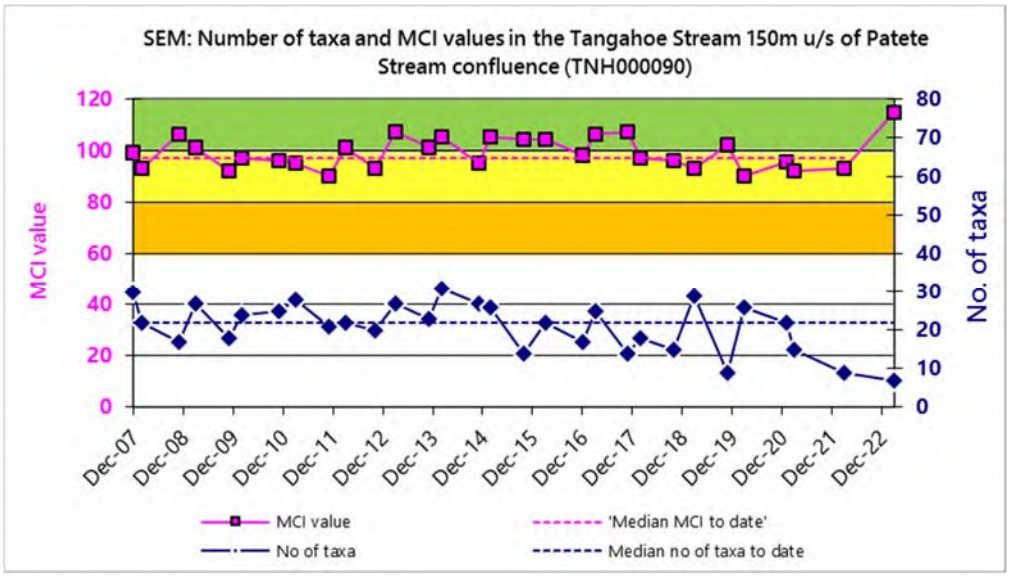

SEM: Number of taxa and MCI values in the Timaru Stream at State Highway 45
(TMR000375)
MCI value
No. of taxa
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date

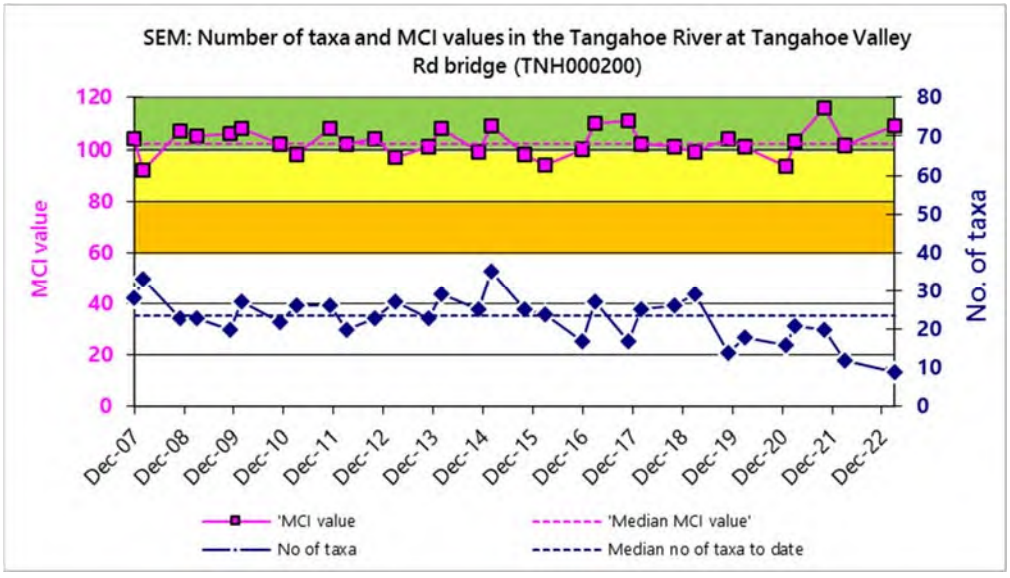
Tāngāhoe

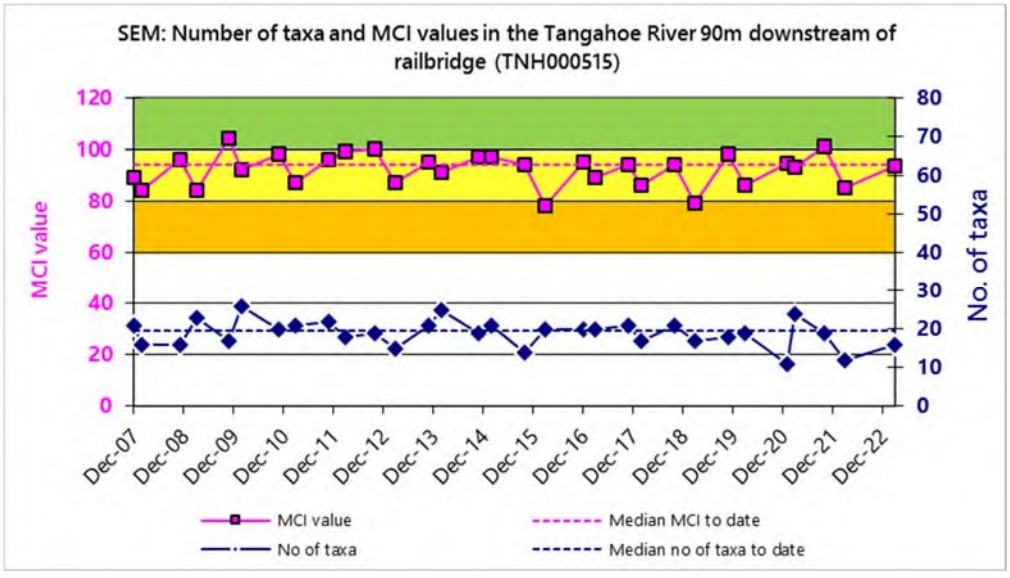
Taxa List	Site Code / Sample Number	Taranaki MCI Score	TNH000090 TRC2310392	TNH000200 TRC2310393	TNH000515 TRC2310394
Annelida (Worms)	Oligochaeta	1	-	-	R
Mollusca	*Potamopyrgus*	4	VA	R	R
Crustacea	*Paracalliope*	5	-	-	R
	Paratya	3	-	-	C
Ephemeroptera (Mayflies)	*Austroclima*	7	C	-	R
	Coloburiscus	7	-	R	R
	Deleatidium	8	A	VA	C
	Zephlebia group	7	R	-	-
Plecoptera (Stoneflies)	*Zelandobius*	5	-	-	R
Coleoptera (Beetles)	Elmidae	6	R	C	R
Megaloptera (Dobsonflies)	*Archichauliodes*	7	-	R	-
Trichoptera (Caddisflies)	*Hydropsyche (Aoteapsyche)*	4	-	R	C
	Costachorema	7	-	-	R
	Hydrobiosis	5	R	R	R
Diptera (True Flies)	*Aphrophila*	5	-	R	-
	Eriopterini	5	-	-	R
	Orthocladiinae	2	-	-	A
	Polypedilum	3	-	-	R
	Tanytarsini	3	-	-	R
	Austrosimulium	3	C	R	-
Number of Taxa			7	9	16
Taranaki MCI			114	109	94
Taranaki SQMCI			4.7	7.7	3.7
EPT (taxa)			4	4	7
% EPT (taxa)			57	44	44

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant


SEM: Number of taxa and MCI values in the Tangahoe Stream 150m u/s of Patete Stream confluence (TNH000090)
MCI value
No. of taxa
120
100
80
60
40
20
0
80
70
60
50
40
30
20
10
0
Dec-07
Dec-08
Dec-09
Dec-10
Dec-11
Dec-12
Dec-13
Dec-14
Dec-15
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
MCI value
'Median MCI to date'
No of taxa
Median no of taxa to date


SEM: Number of taxa and MCI values in the Tangahoe River at Tangahoe Valley Rd bridge (TNH000200)
MCI value
No. of taxa
120
100
80
60
40
20
0
80
70
60
50
40
30
20
10
0
Dec-07
Dec-08
Dec-09
Dec-10
Dec-11
Dec-12
Dec-13
Dec-14
Dec-15
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
'MCI value
'Median MCI value'
No of taxa
Median no of taxa to date

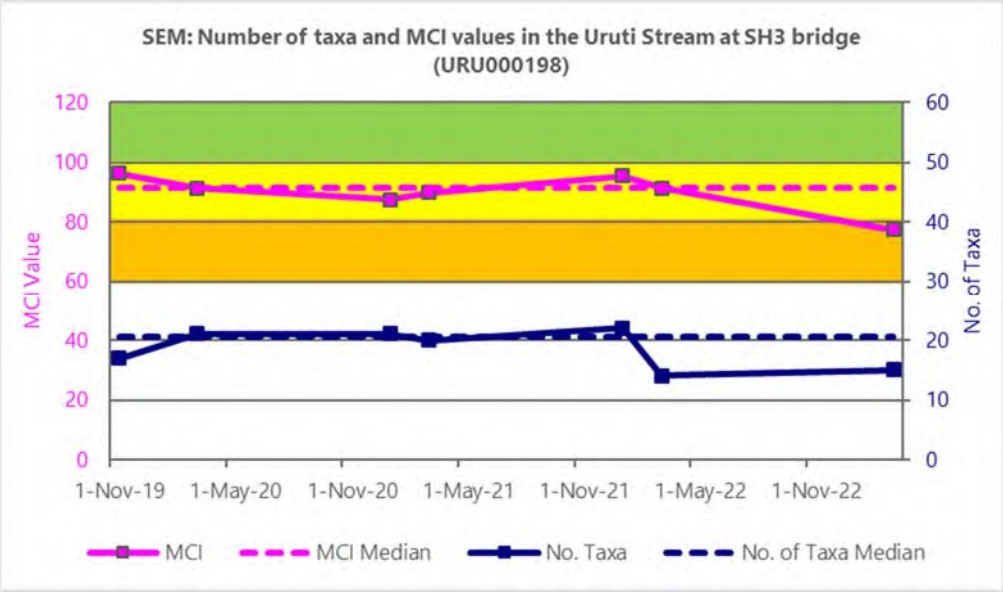

SEM: Number of taxa and MCI values in the Tangahoe River 90m downstream of railbridge (TNH000515)
MCI value
No. of taxa
120
100
80
60
40
20
0
80
70
60
50
40
30
20
10
0
Dec-07
Dec-08
Dec-09
Dec-10
Dec-11
Dec-12
Dec-13
Dec-14
Dec-15
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
MCI value
Median MCI to date
No of taxa
Median no of taxa to date

Uruti

Taxa List	Site Code / Sample Number	Taranaki MCI Score	URU000198 / TRC2310397
Nemertea	Nemertea	3	R
Annelida (Worms)	Oligochaeta	1	R
Mollusca	*Latia*	5	C
	Potamopyrgus	4	A
Crustacea	*Paratya*	3	R
Ephemeroptera (Mayflies)	*Austroclima*	7	C
	Zephlebia group	7	R
Coleoptera (Beetles)	Elmidae	6	C
Trichoptera (Caddisflies)	*Hydropsyche (Aoteapsyche)*	4	R
	Oxyethira	2	R
Diptera (True Flies)	*Aphrophila*	5	C
	Orthocladiinae	2	A
	Polypedilum	3	C
	Empididae	3	R
	Austrosimulium	3	R
		Number of Taxa	15
		Taranaki MCI	77
		Taranaki SQMCI	3.8
		EPT (taxa)	3
		% EPT (taxa)	20

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

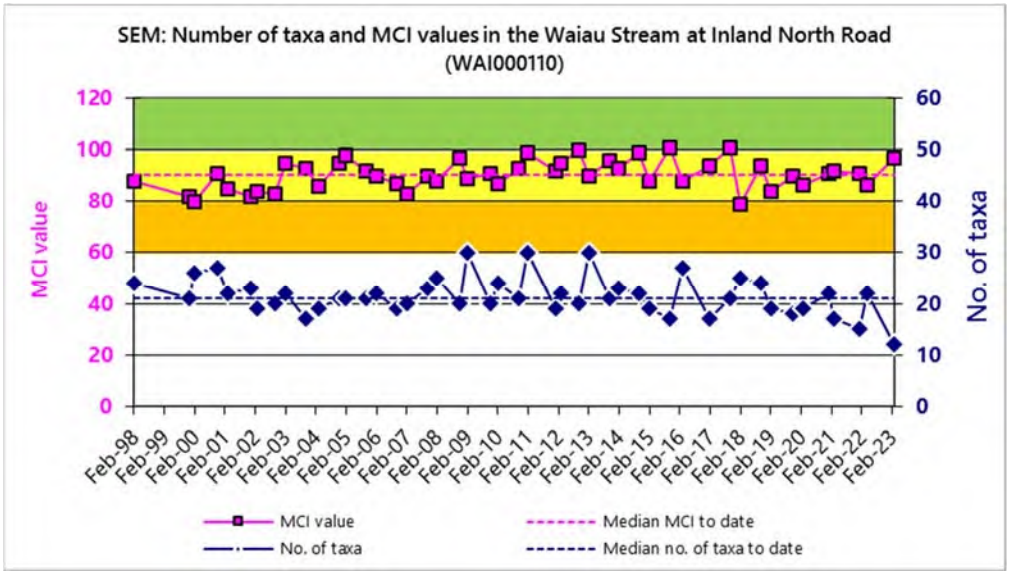


Waiau

Taxa List	Site Code / Sample Number	Taranaki MCI Score	WAI000110 / TRC2310398
Annelida (Worms)	Oligochaeta	1	C
Mollusca	*Latia*	5	R
	Potamopyrgus	4	VA
Crustacea	*Paracalliope*	5	A
Ephemeroptera (Mayflies)	*Austroclima*	7	A
Coleoptera (Beetles)	Elmidae	6	A
Trichoptera (Caddisflies)	*Hydropsyche (Aoteapsyche)*	4	C
	Hydrobiosis	5	R
	Hudsonema	6	C
	Pycnocentria	7	A
	Pycnocentrodes	5	A
Diptera (True Flies)	*Maoridiamesa*	3	R
		Number of Taxa	12
		Taranaki MCI	97
		Taranaki SQMCI	4.9
		EPT (taxa)	6
		% EPT (taxa)	50

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

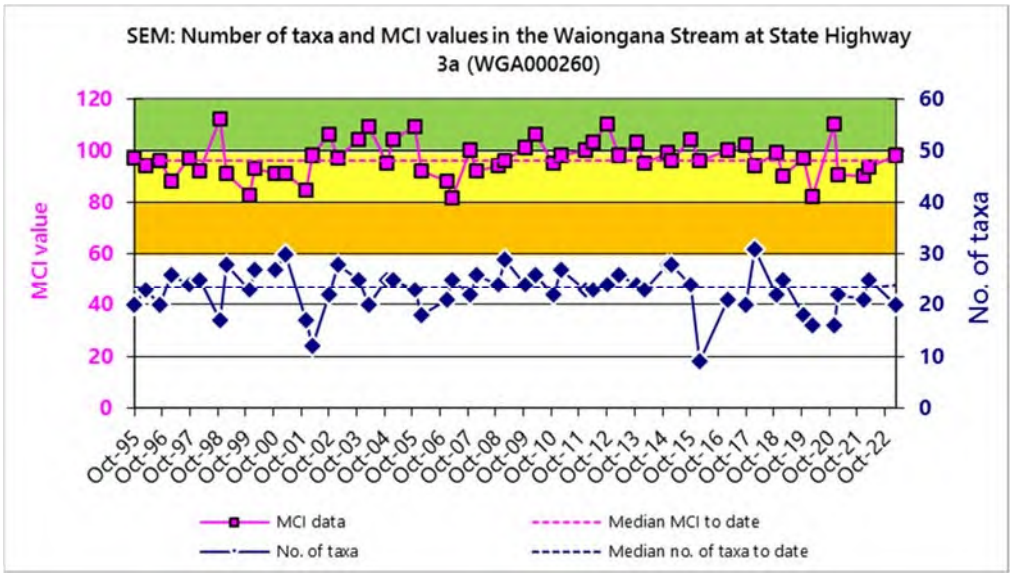


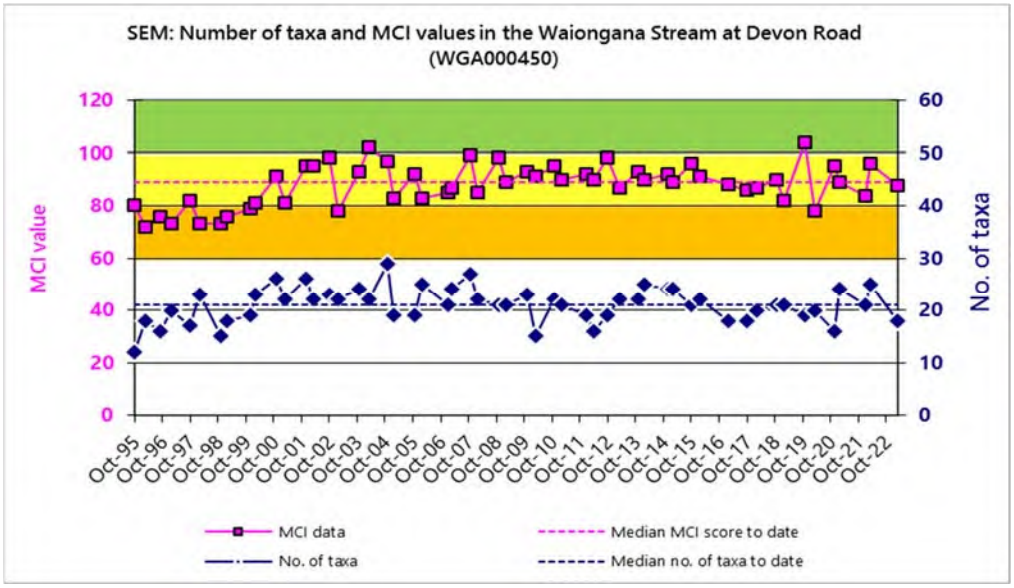
Waiongana

Taxa List	Site Code / Sample Number	Taranaki MCI Score	WGA000260 TRC2310581	WGA000450 TRC2310582
Nemertea	Nemertea	3	R	R
Annelida (Worms)	Oligochaeta	1	C	A
Mollusca	*Latia*	5	-	R
	Potamopyrgus	4	A	VA
Crustacea	Paraleptamphopus	5	R	-
Ephemeroptera (Mayflies)	*Austroclima*	7	C	C
	Coloburiscus	7	R	-
	Deleatidium	8	R	-
	Zephlebia group	7	R	R
Coleoptera (Beetles)	Elmidae	6	A	A
Megaloptera (Dobsonflies)	*Archichauliodes*	7	C	R
Trichoptera (Caddisflies)	*Hydropsyche (Aoteapsyche)*	4	A	A
	Costachorema	7	R	-
	Hydrobiosis	5	C	C
	Neurochorema	6	C	C
	Pycnocentrodes	5	C	C
Diptera (True Flies)	*Aphrophila*	5	A	R
	Maoridiamesa	3	R	R
	Orthocladiinae	2	A	A
	Tanytarsini	3	VA	A
	Muscidae	3	R	R
	Austrosimulium	3	-	C
		Number of Taxa	20	18
		Taranaki MCI	98	88
		Taranaki SQMCI	3.9	3.8
		EPT (taxa)	9	6
		% EPT (taxa)	45	33

'Tolerant' taxa | 'Moderately sensitive' taxa | 'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant


SEM: Number of taxa and MCI values in the Waiongana Stream at State Highway 3a (WGA000260)
MCI value
No. of taxa
120
100
80
60
40
20
0
60
50
40
30
20
10
0
Oct-95
Oct-96
Oct-97
Oct-98
Oct-99
Oct-00
Oct-01
Oct-02
Oct-03
Oct-04
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
Oct-10
Oct-11
Oct-12
Oct-13
Oct-14
Oct-15
Oct-16
Oct-17
Oct-18
Oct-19
Oct-20
Oct-21
Oct-22
MCI data
Median MCI to date
No. of taxa
Median no. of taxa to date


SEM: Number of taxa and MCI values in the Waiongana Stream at Devon Road (WGA000450)
MCI value
No. of taxa
120
100
80
60
40
20
0
60
50
40
30
20
10
0
Oct-95
Oct-96
Oct-97
Oct-98
Oct-99
Oct-00
Oct-01
Oct-02
Oct-03
Oct-04
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
Oct-10
Oct-11
Oct-12
Oct-13
Oct-14
Oct-15
Oct-16
Oct-17
Oct-18
Oct-19
Oct-20
Oct-21
Oct-22
MCI data
Median MCI score to date
No. of taxa
Median no. of taxa to date

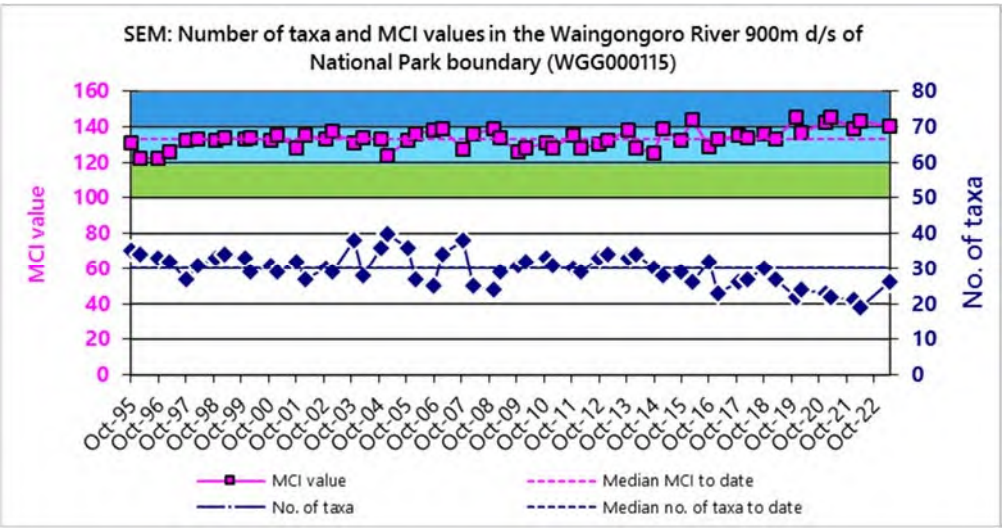
Waingongoro

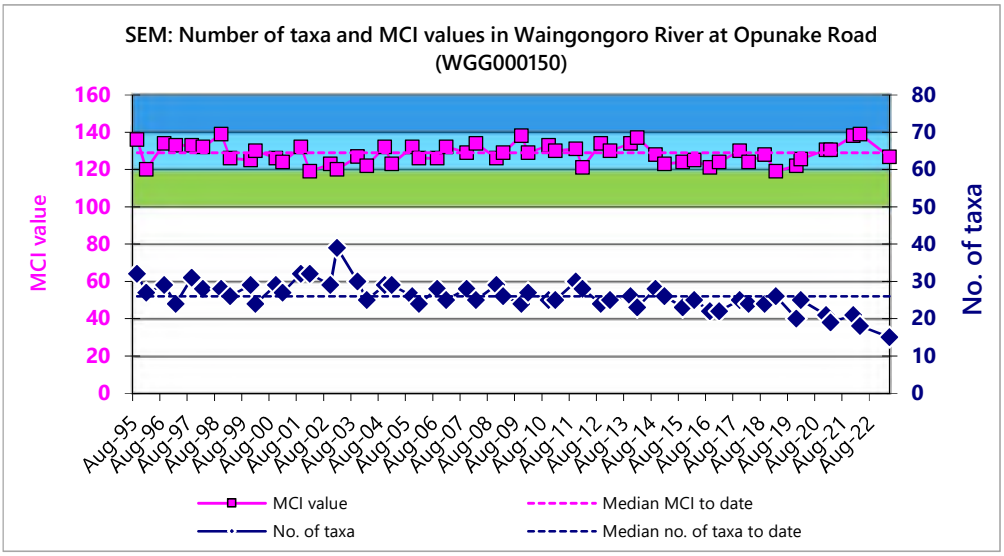
Taxa List	Site Code	Taranaki MCI Score	WGG000115	WGG000150	WGG000500	WGG000665	WGG000895	WGG000995
	Sample Number		TRC2310402	TRC2310403	TRC2310404	TRC2310405	TRC2310406	TRC2310407
Platyhelminthes (Flatworms)	*Cura*	3	-	-	-	-	-	R
Nemertea	Nemertea	3	-	-	-	-	-	R
Annelida (Worms)	Oligochaeta	1	-	-	R	R	C	C
	Lumbricidae	5	-	-	-	R	R	R
Mollusca	*Latia*	5	-	-	-	-	R	-
	Potamopyrgus	4	-	-	-	C	VA	C
Crustacea	*Paracalliope*	5	-	-	-	-	C	-
	Paratya	3	-	-	-	-	-	C
Ephemeroptera (Mayflies)	*Ameletopsis*	10	R	-	-	-	-	-
	Austroclima	7	-	-	-	-	R	-
	Coloburiscus	7	VA	VA	A	A	A	R
	Deleatidium	8	VA	VA	XA	XA	A	C
	Nesameletus	9	A	C	-	-	-	-
	Zephlebia group	7	R	R	-	-	-	R
Plecoptera (Stoneflies)	*Austroperla*	9	R	-	-	-	-	-
	Megaleptoperla	9	C	-	-	-	-	-
	Stenoperla	10	R	-	-	-	-	-
	Zelandobius	5	-	-	-	R	-	R
	Zelandoperla	8	A	C	-	-	-	-
Coleoptera (Beetles)	Elmidae	6	A	A	A	A	VA	A
	Hydraenidae	8	C	C	R	-	-	-
	Ptilodactylidae	8	R	-	-	-	-	-
Megaloptera (Dobsonflies)	*Archichauliodes*	7	A	C	R	R	C	R
Trichoptera (Caddisflies)	*Hydropsyche (Aoteapsyche)*	4	R	C	A	A	XA	VA
	Costachorema	7	-	-	-	R	R	R
	Hydrobiosis	5	C	C	C	C	R	C
	Neurochorema	6	-	-	-	-	C	-
	Hydropsyche (Orthopsyche)	9	C	-	-	-	-	-
	Psilochorema	6	R	R	-	-	-	-
	Beraeoptera	8	VA	VA	C	C	-	-
	Helicopsyche	10	R	-	-	-	-	-
	Olinga	9	A	-	-	-	-	-
	Pycnocentrodes	5	R	-	C	R	A	C
Diptera (True Flies)	*Aphrophila*	5	C	A	R	R	A	R
	Eriopterini	5	R	R	C	C	-	-
	Hexatomini	5	R	-	-	-	-	-
	Maoridiamesa	3	-	-	-	-	C	R
	Orthocladiinae	2	R	R	R	-	A	C
	Polypedilum	3	R	-	-	-	-	-
	Tanypodinae	5	-	-	-	-	R	-
	Tanytarsini	3	-	-	-	-	R	-
	Muscidae	3	-	-	-	-	R	-
	Austrosimulium	3	-	-	-	R	-	R
	Tanyderidae	4	-	-	R	-	-	-

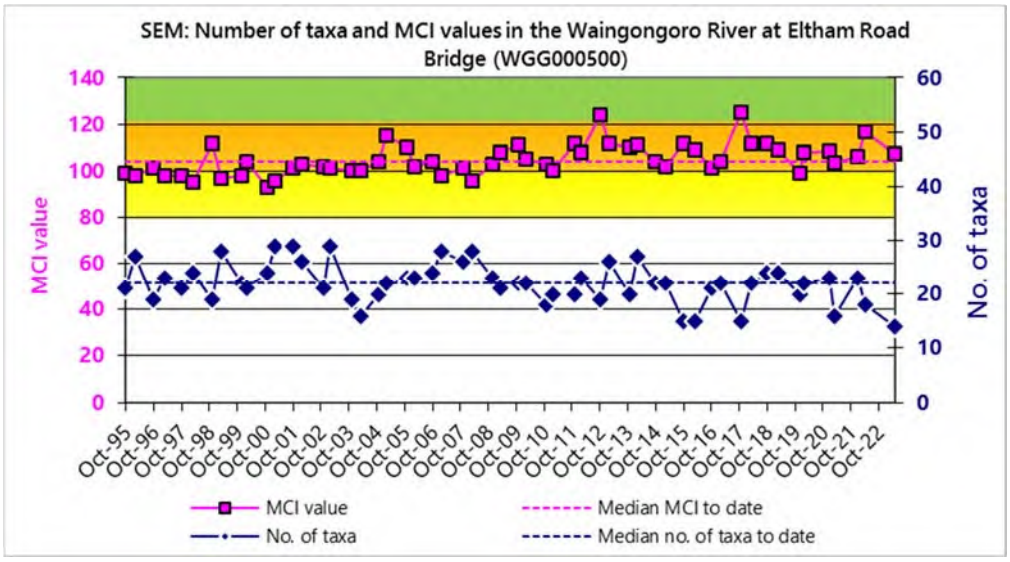
Taxa List	Site Code	Taranaki MCI Score	WGG000115	WGG000150	WGG000500	WGG000665	WGG000895	WGG000995
	Sample Number		TRC2310402	TRC2310403	TRC2310404	TRC2310405	TRC2310406	TRC2310407
Number of Taxa			26	15	14	16	21	20
Taranaki MCI			140	127	107	106	98	93
Taranaki SQMCI			7.6	7.3	7.6	7.6	4.4	4.3
EPT (taxa)			17	9	6	8	8	8
% EPT (taxa)			65	60	43	50	38	40

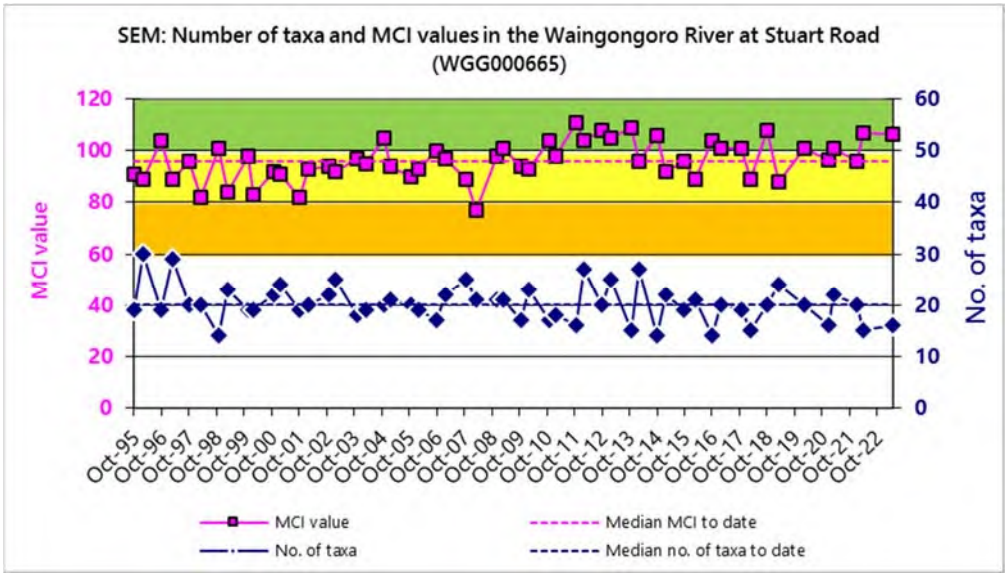
'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

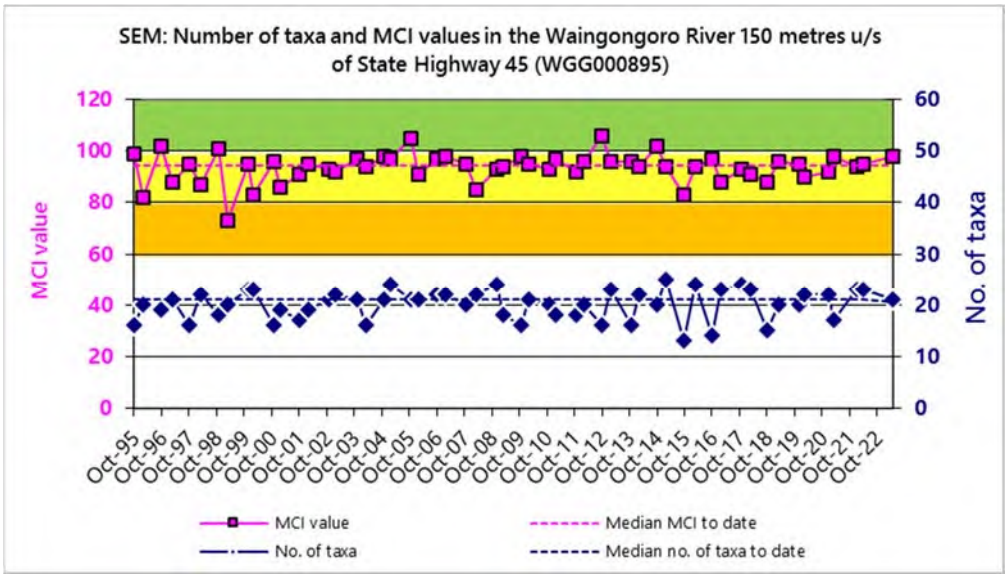
R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

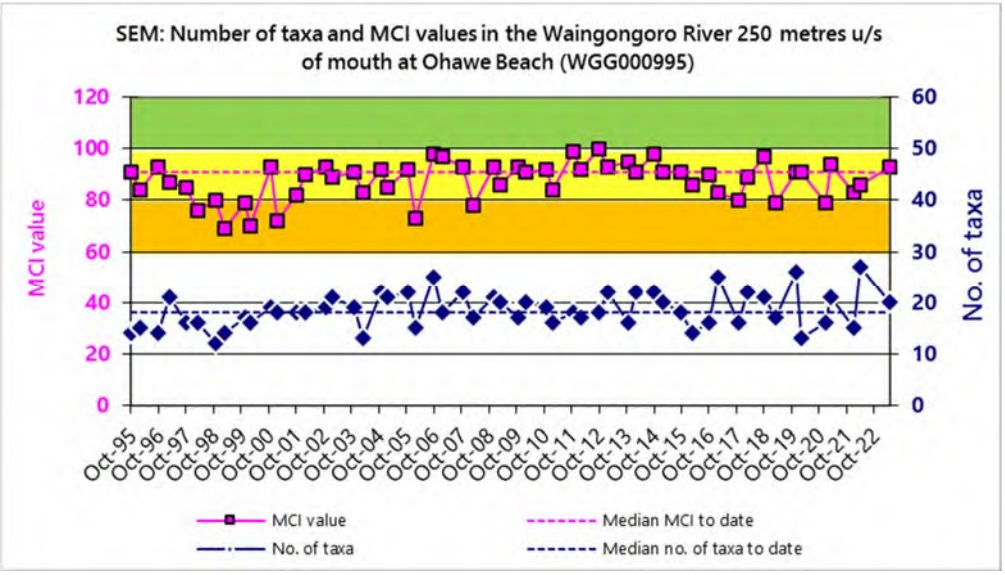




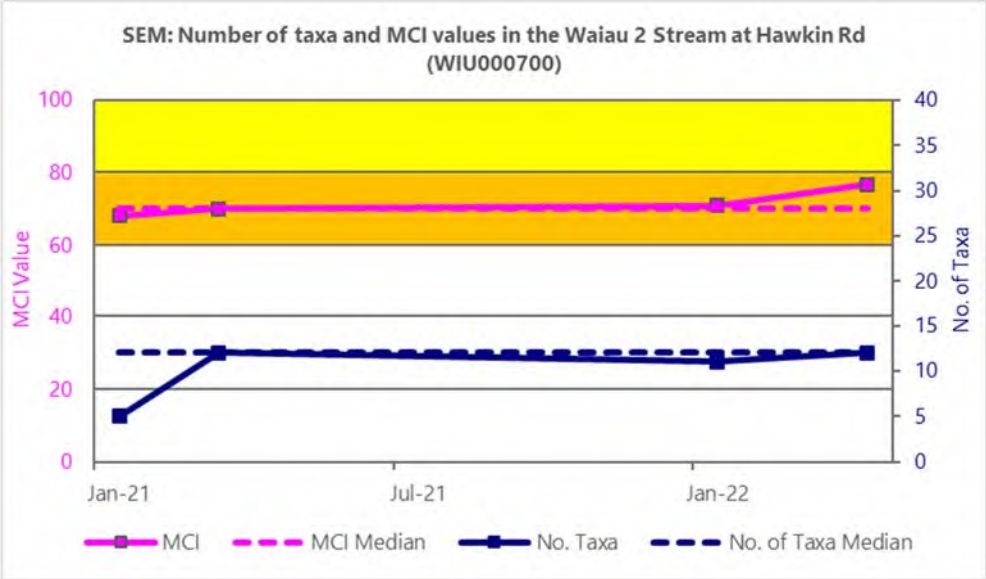

SEM: Number of taxa and MCI values in the Waingongoro River at Eltham Road Bridge (WGG000500)
MCI value
No. of taxa
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date


SEM: Number of taxa and MCI values in the Waingongoro River at Stuart Road (WGG000665)
MCI value
No. of taxa
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date


SEM: Number of taxa and MCI values in the Waingongoro River 150 metres u/s of State Highway 45 (WGG000895)
MCI value
No. of taxa
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date


SEM: Number of taxa and MCI values in the Waingongoro River 250 metres u/s of mouth at Ohawe Beach (WGG000995)
MCI value
No. of taxa
120
100
80
60
40
20
0
60
50
40
30
20
10
0
Oct-95
Oct-96
Oct-97
Oct-98
Oct-99
Oct-00
Oct-01
Oct-02
Oct-03
Oct-04
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
Oct-10
Oct-11
Oct-12
Oct-13
Oct-14
Oct-15
Oct-16
Oct-17
Oct-18
Oct-19
Oct-20
Oct-21
Oct-22
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date

Waiau 2

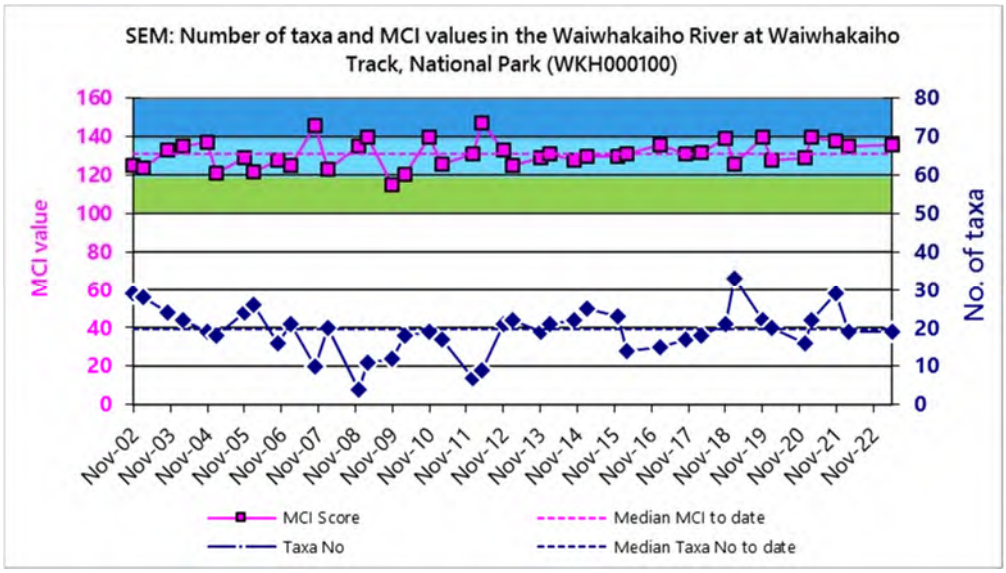

SEM: Number of taxa and MCI values in the Waiau 2 Stream at Hawkin Rd (WIU000700)
MCI Value
No. of Taxa
100
80
60
40
20
0
40
35
30
25
20
15
10
5
0
Jan-21
Jul-21
Jan-22
MCI
MCI Median
No. Taxa
No. of Taxa Median

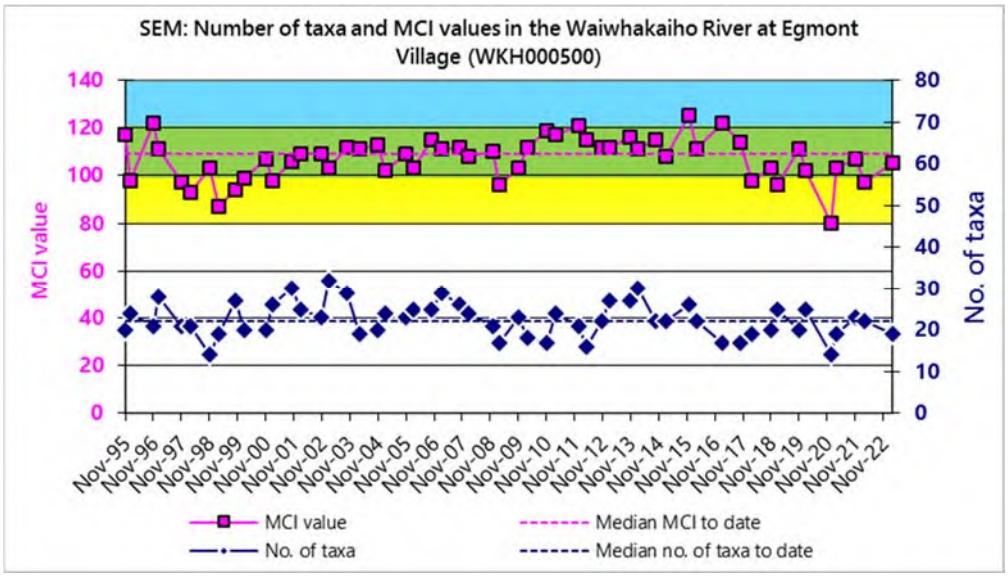
Waiwhakaiho

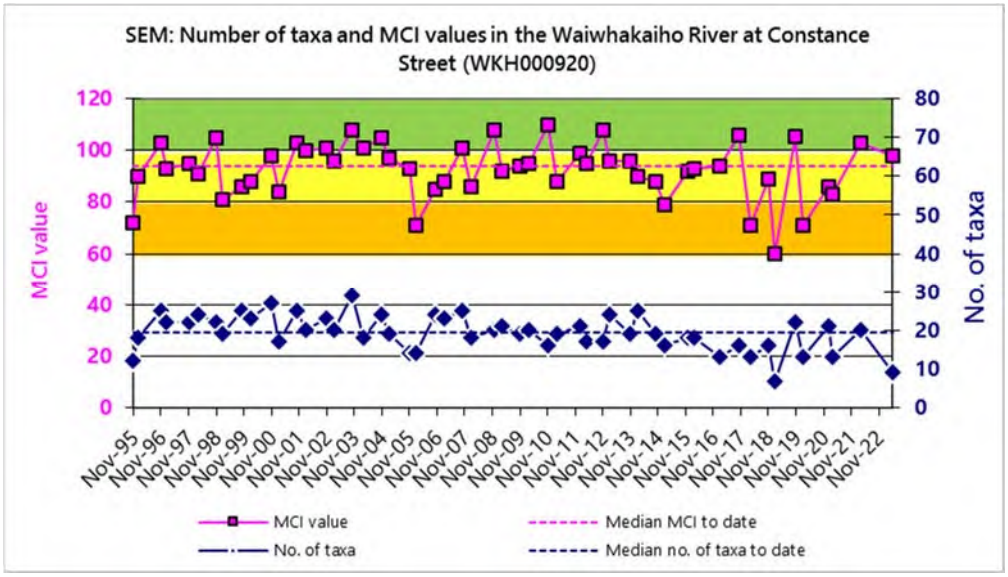
Taxa List	Site Code / Sample Number	Taranaki MCI Score	WKH000500 TRC2310102	WKH000920 TRC2310995	WKH000950 TRC2310996	WKH000100 TRC2310998
Nematomorpha	Nematomorpha	3	-	R	-	-
Annelida (Worms)	Oligochaeta	1	-	-	R	-
Mollusca	*Potamopyrgus*	4	-	R	C	-
Crustacea	*Paratya*	3	-	-	C	-
Ephemeroptera (Mayflies)	*Austroclima*	7	R	-	-	-
	Coloburiscus	7	C	-	R	A
	Deleatidium	8	A	R	C	VA
	Nesameletus	9	A	-	-	C
Plecoptera (Stoneflies)	*Spaniocerca*	8	-	-	-	R
	Zelandoperla	8	-	-	-	A
Hemiptera (Bugs)	*Saldidae*	5	R	-	-	-
Coleoptera (Beetles)	Elmidae	6	A	R	R	A
	Hydraenidae	8	R	-	-	R
Megaloptera (Dobsonflies)	*Archichauliodes*	7	C	-	-	-
Trichoptera (Caddisflies)	*Hydropsyche (Aoteapsyche)*	4	A	A	A	R
	Costachorema	7	C	C	C	R
	Hydrobiosis	5	C	-	R	R
	Hydrochorema	9	-	-	-	R
	Neurochorema	6	C	-	-	-
	Psilochorema	6	-	-	-	R
	Beraeoptera	8	-	-	-	C
	Confluens	5	-	R	-	-
	Helicopsyche	10	-	-	-	C
	Olinga	9	-	-	-	C
	Oxyethira	2	R	-	-	-
	Pycnocentria	7	-	-	-	R
	Pycnocentrodes	5	-	R	-	-
Diptera (True Flies)	*Aphrophila*	5	A	-	-	A
	Maoridiamesa	3	VA	-	-	R
	Orthocladiinae	2	A	A	A	R
	Tanytarsini	3	VA	-	R	-
	Muscidae	3	C	-	-	-
	Austrosimulium	3	R	-	-	-
Number of Taxa			19	9	11	19
Taranaki MCI			105	98	91	136
Taranaki SQMCI			4.2	3.6	3.9	7.4
EPT (taxa)			8	5	5	14
% EPT (taxa)			42	56	45	74

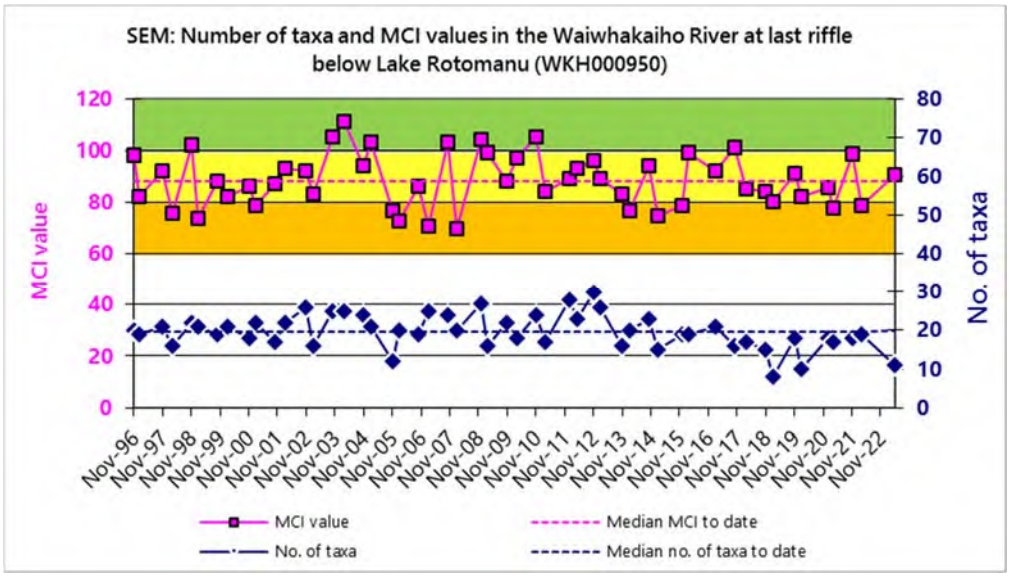
'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant
XA = Extremely Abundant


SEM: Number of taxa and MCI values in the Waiwhakaiho River at Waiwhakaiho Track, National Park (WKH000100)
MCI value
No. of taxa
MCI Score
Taxa No
Median MCI to date
Median Taxa No to date


SEM: Number of taxa and MCI values in the Waiwhakaiho River at Egmont Village (WKH000500)
MCI value
No. of taxa
MCI value
No. of taxa
Median MCI to date
Median no. of taxa to date


SEM: Number of taxa and MCI values in the Waiwhakaiho River at Constance Street (WKH000920)
MCI value
No. of taxa
MCI value
No. of taxa
Median MCI to date
Median no. of taxa to date

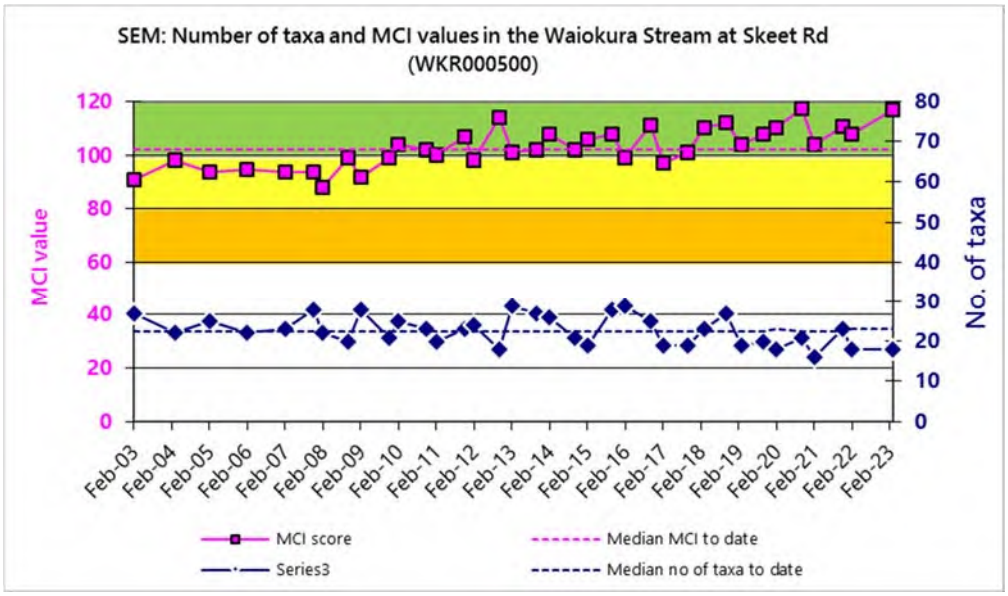

SEM: Number of taxa and MCI values in the Waiwhakaiho River at last riffle below Lake Rotomanu (WKH000950)
MCI value
No. of taxa
120
100
80
60
40
20
0
80
70
60
50
40
30
20
10
0
Nov-96
Nov-97
Nov-98
Nov-99
Nov-00
Nov-01
Nov-02
Nov-03
Nov-04
Nov-05
Nov-06
Nov-07
Nov-08
Nov-09
Nov-10
Nov-11
Nov-12
Nov-13
Nov-14
Nov-15
Nov-16
Nov-17
Nov-18
Nov-19
Nov-20
Nov-21
Nov-22
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date

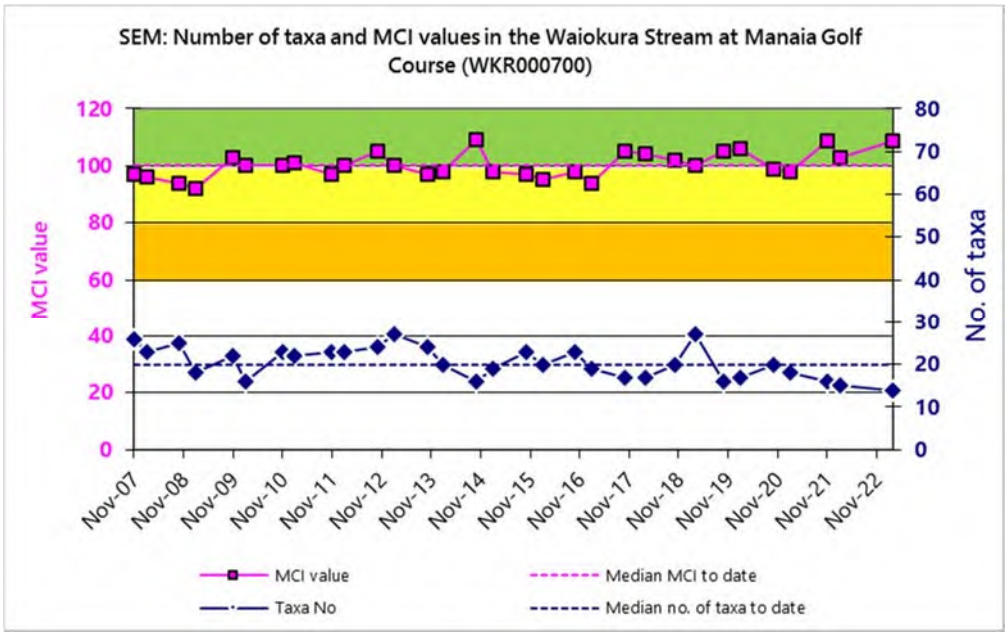
Waiokura

Taxa List	Site Code	Taranaki MCI Score	WKR000500	WKR000700
	Sample Number		TRC2310408	TRC2310409
Annelida (Worms)	Oligochaeta	1	-	R
	Lumbricidae	5	R	-
Mollusca	*Potamopyrgus*	4	C	C
Crustacea	*Paracalliope*	5	-	R
	Paranephrops	5	R	R
Ephemeroptera (Mayflies)	*Austroclima*	7	VA	VA
	Coloburiscus	7	A	A
	Deleatidium	8	R	-
	Zephlebia group	7	C	A
Coleoptera (Beetles)	Elmidae	6	A	A
	Ptilodactylidae	8	R	-
Megaloptera (Dobsonflies)	*Archichauliodes*	7	C	C
Trichoptera (Caddisflies)	*Hydropsyche (Aoteapsyche)*	4	A	A
	Costachorema	7	R	-
	Hydrobiosis	5	R	R
	Confluens	5	R	R
	Olinga	9	-	R
	Pycnocentria	7	C	-
Diptera (True Flies)	*Aphrophila*	5	C	-
	Eriopterini	5	R	-
	Austrosimulium	3	R	-
	Tanyderidae	4	-	C
		Number of Taxa	18	14
		Taranaki MCI	117	109
		Taranaki SQMCI	6.4	6.4
		EPT (taxa)	9	7
		% EPT (taxa)	50	50

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant


SEM: Number of taxa and MCI values in the Waiokura Stream at Skeet Rd (WKR000500)
MCI value
No. of taxa
120
100
80
60
40
20
0
80
70
60
50
40
30
20
10
0
Feb-03
Feb-04
Feb-05
Feb-06
Feb-07
Feb-08
Feb-09
Feb-10
Feb-11
Feb-12
Feb-13
Feb-14
Feb-15
Feb-16
Feb-17
Feb-18
Feb-19
Feb-20
Feb-21
Feb-22
Feb-23
MCI score
Median MCI to date
Series3
Median no of taxa to date

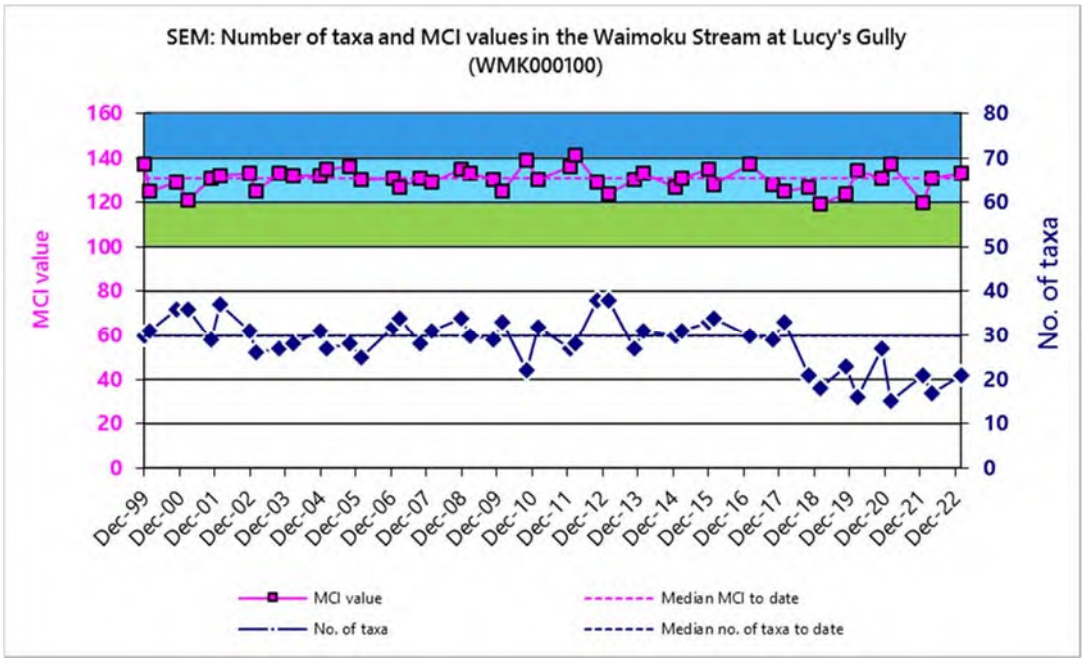

SEM: Number of taxa and MCI values in the Waiokura Stream at Manaia Golf Course (WKR000700)
MCI value
No. of taxa
120
100
80
60
40
20
0
80
70
60
50
40
30
20
10
0
Nov-07
Nov-08
Nov-09
Nov-10
Nov-11
Nov-12
Nov-13
Nov-14
Nov-15
Nov-16
Nov-17
Nov-18
Nov-19
Nov-20
Nov-21
Nov-22
MCI value
Median MCI to date
Taxa No
Median no. of taxa to date

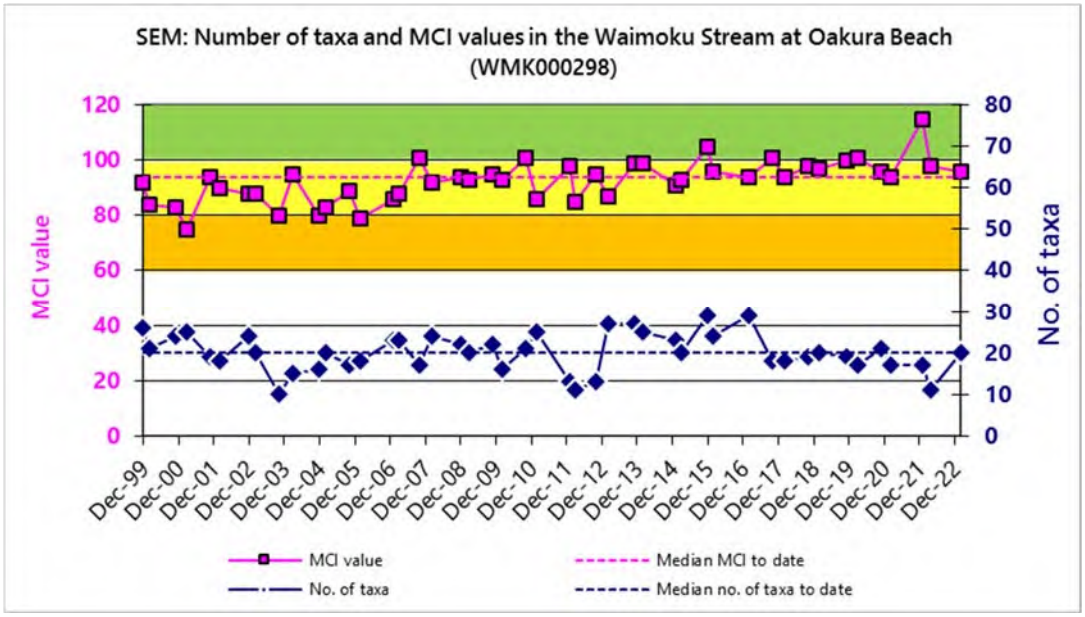
Waimōku

Taxa List	Site Code / Sample Number	Taranaki MCI Score	WMK000100 TRC2310400	WMK000298 TRC2310401
Annelida (Worms)	Oligochaeta	1	-	C
Mollusca	*Potamopyrgus*	4	-	VA
Crustacea	Talitridae	5	C	-
	Paratya	3	-	R
	Paranephrops	5	R	-
Ephemeroptera (Mayflies)	*Austroclima*	7	A	A
	Coloburiscus	7	A	C
	Deleatidium	8	C	C
	Ichthybotus	8	R	-
	Nesameletus	9	C	-
	Zephlebia group	7	A	-
Plecoptera (Stoneflies)	*Austroperla*	9	C	-
	Zelandoperla	8	R	-
Coleoptera (Beetles)	Elmidae	6	R	C
	Hydrophilidae	5	R	-
	Ptilodactylidae	8	R	-
Megaloptera (Dobsonflies)	*Archichauliodes*	7	R	-
Trichoptera (Caddisflies)	*Costachorema*	7	-	R
	Hydrobiosis	5	R	R
	Hydrobiosella	9	C	-
	Neurochorema	6	-	R
	Hydropsyche (Orthopsyche)	9	A	R
	Oxyethira	2	-	R
	Pycnocentrodes	5	-	R
	Triplectides	5	-	R
Diptera (True Flies)	*Aphrophila*	5	R	C
	Eriopterini	5	R	R
	Hexatomini	5	R	-
	Maoridiamesa	3	-	C
	Orthocladiinae	2	-	VA
	Polypedilum	3	C	C
	Austrosimulium	3	-	C
		Number of Taxa	21	20
		Taranaki MCI	133	96
		Taranaki SQMCI	7.3	3.6
		EPT (taxa)	11	9
		% EPT (taxa)	52	45

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant


SEM: Number of taxa and MCI values in the Waimoku Stream at Lucy's Gully (WMK000100)
MCI value
No. of taxa
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date

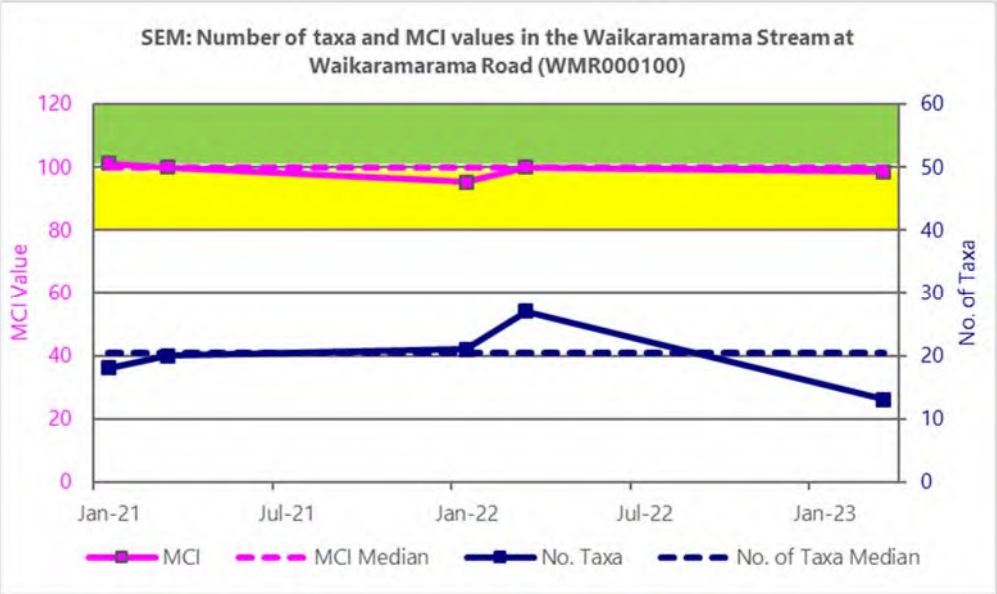

SEM: Number of taxa and MCI values in the Waimoku Stream at Oakura Beach (WMK000298)
MCI value
No. of taxa
MCI value
Median MCI to date
No. of taxa
Median no. of taxa to date

Waikaramarama

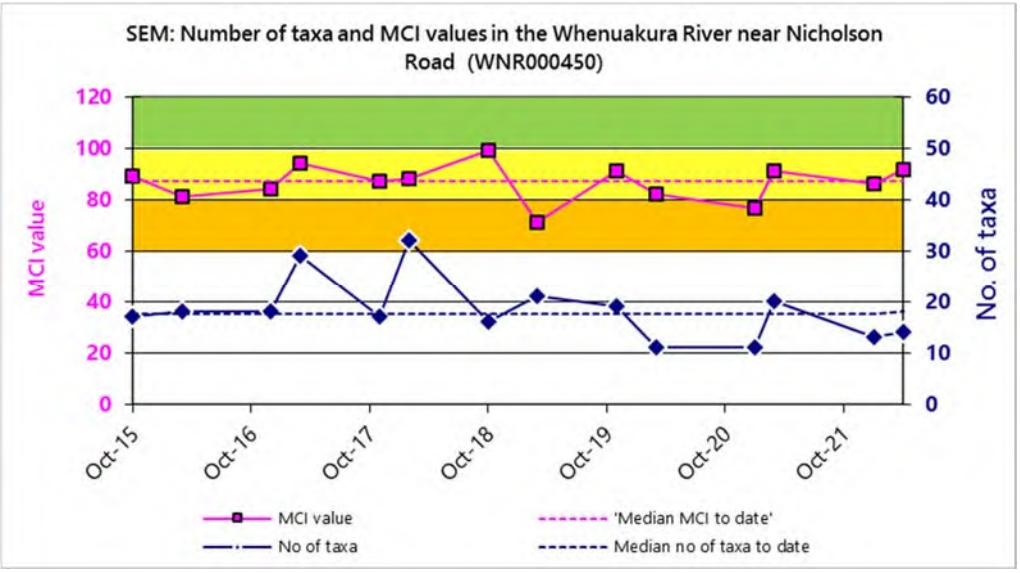
Taxa List	Site Code / Sample Number	Taranaki MCI Score	WMR000100 / TRC2310399
Annelida (Worms)	Oligochaeta	1	R
Mollusca	*Potamopyrgus*	4	A
Ephemeroptera (Mayflies)	*Austroclima*	7	VA
	Coloburiscus	7	C
	Deleatidium	8	A
	Zephlebia group	7	R
Coleoptera (Beetles)	Elmidae	6	A
Trichoptera (Caddisflies)	*Hydrobiosis*	5	C
	Psilochorema	6	R
Diptera (True Flies)	Eriopterini	5	R
	Orthocladiinae	2	A
	Polypedilum	3	R
	Austrosimulium	3	A
		Number of Taxa	13
		Taranaki MCI	98
		Taranaki SQMCI	5.8
		EPT (taxa)	6
		% EPT (taxa)	46

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant



Whenuakura

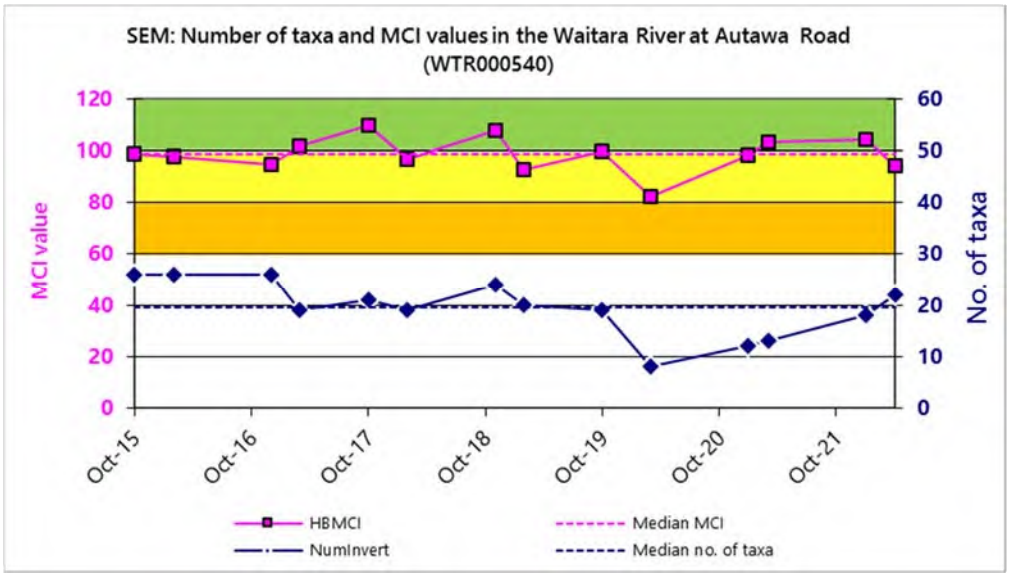

SEM: Number of taxa and MCI values in the Whenuakura River near Nicholson Road (WNR000450)
MCI value
No. of taxa
120
100
80
60
40
20
0
60
50
40
30
20
10
0
Oct-15
Oct-16
Oct-17
Oct-18
Oct-19
Oct-20
Oct-21
MCI value
'Median MCI to date'
No of taxa
Median no of taxa to date

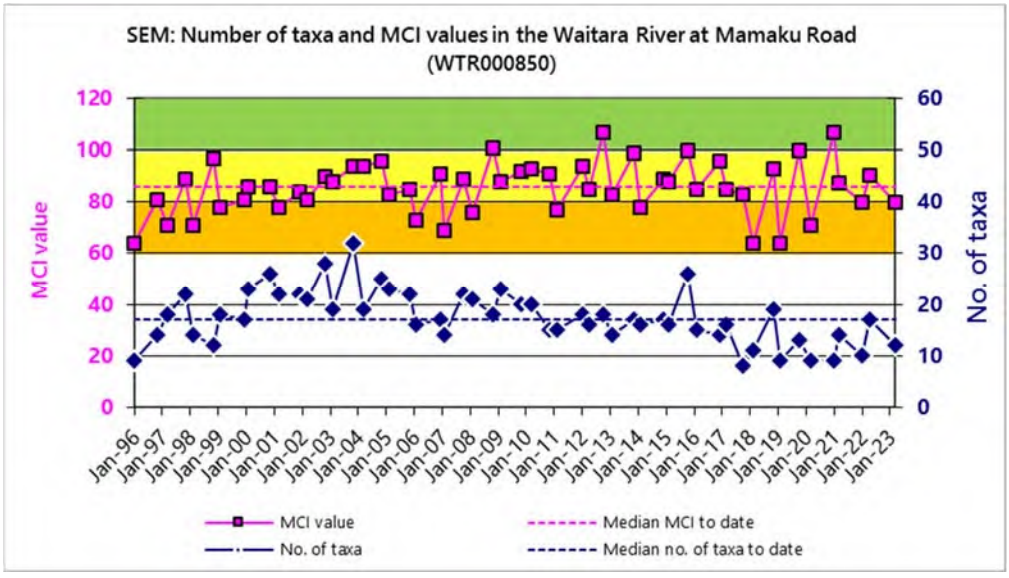
Waitara

Taxa List	Site Code / Sample Number	Taranaki MCI Score	WTR000850 / TRC2310992
Mollusca	*Potamopyrgus*	4	C
Crustacea	*Paratya*	3	R
Ephemeroptera (Mayflies)	*Austroclima*	7	R
Megaloptera (Dobsonflies)	*Archichauliodes*	7	R
Trichoptera (Caddisflies)	*Hydropsyche (Aoteapsyche)*	4	A
	Hydrobiosis	5	R
	Oxyethira	2	R
Diptera (True Flies)	*Aphrophila*	5	R
	Maoridiamesa	3	C
	Orthocladiinae	2	C
	Polypedilum	3	C
	Austrosimulium	3	R
		Number of Taxa	12
		Taranaki MCI	80
		Taranaki SQMCI	3.7
		EPT (taxa)	3
		% EPT (taxa)	25

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant


SEM: Number of taxa and MCI values in the Waitara River at Autawa Road (WTR000540)
MCI value
No. of taxa
120
100
80
60
40
20
0
60
50
40
30
20
10
0
Oct-15
Oct-16
Oct-17
Oct-18
Oct-19
Oct-20
Oct-21
HBMCI
NumInvert
Median MCI
Median no. of taxa


SEM: Number of taxa and MCI values in the Waitara River at Mamaku Road (WTR000850)
MCI value
No. of taxa
120
100
80
60
40
20
0
60
50
40
30
20
10
0
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
MCI value
No. of taxa
Median MCI to date
Median no. of taxa to date