Lower Waiwhakaiho Catchment Monitoring Programme Biennial Report 2012-2014

Technical Report 2014–123

ISSN: 1178-1467 (Online)
Document: 1441640 (Word)
Document: 1536698 (Pdf)

Taranaki Regional Council
Private Bag 713
STRATFORD

September 2015

Executive summary

The Lower Waiwhakaiho River catchment monitoring programme addresses discharges by several consent holders in the Fitzroy area of New Plymouth. The report covers the period July 2012 – June 2014, and is the twenty first report for this combined monitoring programme.

The Waiwhakaiho River catchment is significant for the Taranaki region. It is used for domestic, agricultural and industrial water supply, hydroelectric power generation, recreational purposes, and waste assimilation. It is important to local Maori people. Because of the pressure on the river, the Taranaki Regional Council (the Council) adopted a water management plan for the river in September 1991.

At the end of the 2014 monitoring period a total of 18 consents were held by the 13 industries monitored under this programme that discharge wastewater, stormwater and/or leachate from the industrial area at Fitzroy, New Plymouth to the lower Waiwhakaiho River and Mangaone Stream, or to land in the lower Waiwhakaiho and Mangaone Stream catchments. The activities and impacts of the consent holders upon water quality are discussed, as is the extent of their compliance with their permits, and their overall environmental performance. There is a separate report covering emissions to air within the catchment[1].

The monitoring programme has included site inspections, discussions with site operators over site management, chemical surveys of discharges, groundwater and receiving waters, sediment sampling in the Mangaone Stream, and biomonitoring of the Waiwhakaiho River and Mangaone Stream.

In the lower Waiwhakaiho River and Mangaone Stream, the biomonitoring surveys generally reported results that were similar to or better than long term historical medians. In the 2012-14 period it was found that all Waiwhakaiho River sampling sites generally recorded community richnesses similar to or slightly above long term medians for their respective sites. There was a typical downstream decrease in MCI scores between the sites, but these results did not indicate any significant effects of stormwater or wastewater discharges from the Fitzroy industrial area on the macroinvertebrate communities of the Waiwhakaiho River. Communities in the Waiwhakaiho River downstream of Lake Rotomanu may be inhibited from time-to-time by the variable current speeds caused by tidal flooding, although it is possible that the Mangaone Stream was contributing to the increased algal growth observed downstream of the confluence where there was a small decrease in the number of more 'sensitive' taxa characteristic of the community, and a more marked increase in the proportion of 'tolerant' taxa comprising the community. In the Mangaone Stream, overall, the results from the surveys during the period under review indicated some improvements in comparison with historical results. It appears that in general the degree of sediment contamination in the Mangaone Stream downstream of the Taranaki Sawmills discharge has reduced, although a gradual deterioration in downstream biological health was found by the current survey. Groundwater inputs may have

[1] Waiwhakaiho Airshed Monitoring Programme Annual Report 2012-2013 Technical Report 2013–69 and Waiwhakaiho Airshed Monitoring Programme Annual Report 2013-2014 Technical Report 2014–55

contributed to some of this deterioration recorded immediately downstream of the fertiliser depot in the lower reaches of the stream, particularly the paucity of 'sensitive' taxa.

There continued to be evidence of nutrient enrichment occurring in the lower Mangaone Stream. Chemical monitoring shows that stormwater from the fertiliser distribution depot (and old fertiliser works) presently owned and operated by Ravensdown Fertiliser Co-operative Limited, is still a source of nutrients. This enrichment is likely to be sufficient to encourage the formation of prolific algal growths in the lower Mangaone Stream, which may in turn affect the streambed fauna.

The fish survey indicated that fish communities in the Waiwhakaiho River and Mangaone Stream generally had a moderate species diversity at all sites. The results were considered to reflect a relatively healthy community, that in the Mangaone Stream, was well on its way to recovery following the pollution incident of 2011.

Monitoring of groundwater and leachate in relation to the old landfill area off Bewley Road showed that all of the samples collected from the three monitoring bores complied with consent limits.

There were a total of 44 Unauthorised Incidents (UI's) recorded in the Waiwhakaiho catchment during the period under review, 36 of which were substantiated at the time of investigation. 12 of the incidents were in the area covered by this monitoring programme, with consented industries monitored under the Lower Waiwhakaiho Catchment Monitoring Programme accounting for 9 of these unauthorised discharges.

During the year under review, the companies generally demonstrated a high level of environmental performance and a high level of administrative performance.

During the years under review, an improvement was required in the environmental and administrative performance and compliance with AML Limited's resource consents, as defined in Section 1.1.5. During the period under review there were a number of delays and extensions to the abatement notice issued in June 2012 that required works to be undertaken to ensure compliance with the suspended solids limit on the consent. Although a treatment system was installed part way through the period under review, this had been an identified as required improvement in a management plan produced in the early part of the previous monitoring period. After installation there were issues with the performance of the system, and monitoring results at the end of the period under review found that the system was still not working effectively. Further improvements to the system were made in the 2014-2015 year.

During the years under review, the Downer EDI Works Limited demonstrated a high level of environmental and high level of administrative performance and compliance with the resource consents as defined in Section 1.1.5. Although there were three incidents recorded, these were not related to the Company's activities at the Rifle Range Road site. One of the incidents was unsubstantiated, and corrective actions were undertaken promptly at the other two locations, such that the potential for adverse effects was avoided.

During the years under review, Farmlands Co-operative Society Limited demonstrated a high level of environmental and high level of administrative performance and compliance with the resource consents as defined in Section 1.1.5. Although there was an unauthorised

discharge of hydrocarbons found from the site during the period under review, this was attributed to the actions of Ireland Roading Limited.

During the years under review, Firth Industries Limited (Division of Fletcher Concrete and Infrastructure Limited) demonstrated a good level of environmental and a good level of administrative performance and compliance with resource consents as defined in Section 1.1.5. During the period under review there was one minor exceedance of the suspended solids limit on the consent, with no effect found in the Waiwhakaiho River at the time of sampling. There were calcified deposits, and a white foamy discharge found travelling across the Waiwhakaiho River bed on one occasion, and the Company remediated the area promptly upon request. Council is working with Firth regarding improved stormwater/wastewater management options during the consent renewal process to avoid a reoccurrence.

During the years under review, Fitzroy Engineering Group Limited demonstrated a high level of environmental and high level of administrative performance and compliance with the resource consents as defined in Section 1.1.5. Although there were two incidents recorded, there was no breach of consent found, and no adverse effects were found in the receiving water.

During the years under review, Freight and Bulk Transport Holdings Limited demonstrated a high level of environmental performance and compliance with their resource consent, but overall an improvement was required in their administrative performance as defined in Section 1.1.5. It was identified that activities at the site did not comply with the permitted activity rule for stormwater discharges in the Regional Freshwater Plan. The Company has since applied for a consent.

During the years under review, the Nankervis Family Trust demonstrated a high level of environmental and good level of administrative performance and compliance with the resource consents as defined in Section 1.1.5. During the period under review there was an exceedance of the suspended solids limit in the stormwater permitted activity rule in the Regional Freshwater Plan (which is the same concentration as that imposed on the waste water consent). There were no adverse effects noted, but the requested update to the contingency plan was not received.

During the years under review, New Plymouth District Council demonstrated a high level of environmental and high level of administrative performance and compliance with the resource consents as defined in Section 1.1.5. Although there was one incident recorded, there were no adverse effects found and NPDC's investigations identified that this was as a result of a previously unknown private connection.

During the years under review, New Zealand Decorative Concrete Limited demonstrated a high level of environmental and high level of administrative performance and compliance with the resource consents as defined in Section 1.1.4. During the period under review the Company's contingency plan was accepted as an interim plan, however the Company was informed that additional detail was required for a full plan.

During the years under review, New Zealand Railways Corporation Limited demonstrated a high level of environmental and good level of administrative performance and compliance with the resource consents as defined in Section 1.1.5. During the period under review there were a number of requests for silt fencing around a stormwater drain to be repaired. There were no adverse environment effects found and this was resolved in the 2014-2015 year.

Although, during the years under review, Ravensdown Fertiliser Co-operative Limited demonstrated a high level of environmental and high level of administrative performance and compliance with their resource consents as defined in Section 1.1.5, the overall performances in relation to the Company's activities at the site as a whole as defined in Section 1.1.5 were improvement required in their environmental performance and poor administrative performance. During the period under review there was a continued minor effect on the ammoniacal nitrogen concentration in the Katere Road groundwater bore for which an abatement notice was issued. A subsequent breach of this abatement notice resulted in the issuing of an infringement notice.

During the years under review, Taranaki Sawmills Limited demonstrated a good level of environmental and high level of administrative performance and compliance with the resource consents as defined in Section 1.1.5. During the period under review there were two non-compliances with the suspended solids limit on the consent, however there were no resultant adverse environmental effect due to the conditions prevailing at the time of the discharges. Biomonitoring and sediment sampling indicates that potential effects from historical discharges are starting to decrease.

During the years under review, Technix Group Limited demonstrated a high level of environmental and high level of administrative performance and compliance with the resource consents as defined in Section 1.1.5.

For reference, in the 2012-2013 year, 35% of consent holders in Taranaki monitored through tailored compliance monitoring programmes achieved a high level of environmental performance and compliance with their consents, while another 59% demonstrated a good level of environmental performance and compliance with their consents. In the 2013-2014 year, 60% of consent holders achieved a high level of environmental performance and compliance with their consents, while another 29% demonstrated a good level of environmental performance and compliance.

This report includes recommendations for the 2014-2015 year.

Table of contents

List of tables

List of figures

List of photographs

1. Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is the Biennial Report for the period July 2012-June 2014 by the Council describing the monitoring programme associated with resource consents held by twelve industries in the Lower Waiwhakaiho Catchment. The monitoring covers discharges to water and land in the Fitzroy and Katere Road industrial areas of New Plymouth.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the consents held by these industries that relate to discharges of stormwater, wastewater and leachate to the Lower Waiwhakaiho River and Mangaone Stream, and to land in the Mangaone Stream catchment.

One of the intents of the *Resource Management Act 1991* (RMA) is that environmental management should be integrated across all media, so that a consent holder's use of water, air, and land should be considered from a single comprehensive environmental perspective. Accordingly, the Council generally implements integrated environmental monitoring programmes and reports the results of the programmes jointly. This report discusses the environmental effects of the companies' use of water and land, and is the 21st report by the Council for these Companies.

A separate report covers the results of the Council's monitoring programmes associated with the air discharge permits held by some of these industries[2].

The lower Waiwhakaiho River has been identified by the Council as a resource of regional significance that has demonstrated evidence of adverse impact from catchment-wide point and diffuse source pollution and other river usage. This is apparent particularly during periods of low flow accentuated by abstraction related to operation of the hydroelectric power station at Mangamahoe. The Mangaone Stream has also been identified in Appendix IA of the Regional Freshwater Plan for Taranaki as a stream of high ecological value. This tributary of the Waiwhakaiho River has particularly high native fish diversity, including the presence of threatened species. It is therefore important that monitoring of the Waiwhakaiho River and Mangaone Stream is continued, particularly in relation to any major wastewater or stormwater discharges, in order that these water bodies are safeguarded as resources for the area.

1.1.2 Structure of this report

Section 1 of this report is a background section. It sets out general information about compliance monitoring under the RMA and the Council's obligations and general approach to monitoring sites through annual programmes, lists the resource

2 Waiwhakaiho Airshed Monitoring Programme Annual Report 2012-2013 Technical Report 2013–69 and Waiwhakaiho Airshed Monitoring Programme Annual Report 2013-2014 Technical Report 2014–55

consents held by companies in the Lower Waiwhakaiho catchment, and outlines the nature of the monitoring programme in place for the period under review.

Each company's activity is then discussed in a separate section (Sections 2 to 14).

In each subsection 1 (e.g. Section 2.1) there is a general description of the industrial activity and its discharges, and an aerial photograph or map showing the location of the activity.

Subsection 2 outlines the matters covered by each company's water discharge permit(s).

Subsection 3 presents the results of monitoring of the company's activities during the period under review, including scientific and technical data, and contains a summary of any information on the Council's Register of Incidents relating to the exercise of the consent(s).

Subsection 4 discusses the results, their interpretation, and their significance for the environment in the vicinity of the site under discussion.

Subsection 5 presents recommendations to be implemented in the 2014-2015 monitoring year.

Section 15 presents a summary of the information on file about unauthorised incidents in the Waiwhakaiho and Mangaone catchments that have been logged on the Council's database.

Section 16 discusses the results, their interpretation, and their significance for the environment in the Waiwhakaiho River or Mangaone Stream as a whole.

Section 17 presents a summary of recommendations made in relation to the monitoring of each company's activities.

A glossary of common abbreviations and scientific terms, and a bibliography, are presented at the end of the report.

1.1.3 The Resource Management Act (1991) and monitoring

The *Resource Management Act 1991* (RMA) primarily addresses environmental `effects' which are defined as positive or adverse, temporary or permanent, past, present or future, or cumulative. Effects may arise in relation to:

(a) the neighbourhood or the wider community around an activity, and may include cultural and socio-economic effects;
(b) physical effects on the locality, including landscape, amenity and visual effects;
(c) ecosystems, including effects on plants, animals, or habitats, whether aquatic or terrestrial;
(d) natural and physical resources having special significance (eg, recreational, cultural, or aesthetic);
(e) risks to the neighbourhood or environment.

In drafting and reviewing conditions on discharge permits, and in implementing monitoring programmes, the Council is recognising the comprehensive meaning of `effects' inasmuch as is appropriate for each activity. Monitoring programmes are not only based on existing permit conditions, but also on the obligations of the RMA to assess the effects of the exercise of consents. In accordance with section 35 of the RMA, the Council undertakes compliance monitoring for consents and rules in regional plans, and maintains an overview of the performance of resource users and consent holders. Compliance monitoring, including both activity and impact monitoring, enables the Council to continuously evaluate its approach and that of consent holders to resource management and, ultimately, through the refinement of methods and considered responsible resource utilisation, to move closer to achieving sustainable development of the region's resources.

1.1.4 Investigations, interventions, and incidents

The monitoring programme for the year was based on what was considered to be an appropriate level of monitoring, review of data, and liaison with the consent holder. During the year matters may arise which require additional activity by the Council, for example provision of advice and information, or investigation of potential or actual causes of non-compliance or failure to maintain good practices. A pro-active approach that in the first instance avoids issues occurring is favoured.

The Council operates and maintains a register of all complaints or reported and discovered excursions from acceptable limits and practices, including non-compliance with consents, which may damage the environment. The Unauthorised Incident Register (UIR) includes events where the company concerned has itself notified the Council. The register contains details of any investigation and corrective action taken.

Complaints may be alleged to be associated with a particular site. If there is potentially an issue of legal liability, the Council must be able to prove by investigation that the identified company is indeed the source of the incident (or that the allegation cannot be proven).

1.1.5 Evaluation of environmental performance

Besides discussing the various details of the performance and extent of compliance by the consent holder(s) during the period under review, this report also assigns a rating as to each Company's environmental and administrative performance.

Environmental performance is concerned with actual or likely effects on the receiving environment from the activities during the monitoring year. **Administrative performance** is concerned with the Company's approach to demonstrating consent compliance in site operations and management including the timely provision of information to Council (such as contingency plans and water take data) in accordance with consent conditions.

Events that were beyond the control of the consent holder and unforeseeable (i.e. a defence under the provisions of the *RMA* can be established) may be excluded with regard to the performance rating applied. For example loss of data due to a flood destroying deployed field equipment.

The categories used by the Council for this monitoring period, and their interpretation, are as follows:

Environmental Performance

- **High** No or inconsequential (short-term duration, less than minor in severity) breaches of consent or regional plan parameters resulting from the activity; no adverse effects of significance noted or likely in the receiving environment .The Council did not record any verified unauthorised incidents involving significant environmental impacts and was not obliged to issue any abatement notices or infringement notices in relation to such impacts.

- **Good** Likely or actual adverse effects of activities on the receiving environment were negligible or minor at most. There were some such issues noted during monitoring, from self reports, or in response to unauthorised incident reports, but these items were not critical, and follow-up inspections showed they have been dealt with. These minor issues were resolved positively, co-operatively, and quickly. The Council was not obliged to issue any abatement notices or infringement notices in relation to the minor non-compliant effects; however abatement notices may have been issued to mitigate an identified potential for an environmental effect to occur.

  For example:

  - High suspended solid values recorded in discharge samples, however the discharge was to land or to receiving waters that were in high flow at the time;
  - Strong odour beyond boundary but no residential properties or other recipient nearby.

- **Improvement required** Likely or actual adverse effects of activities on the receiving environment were more than minor, but not substantial. There were some issues noted during monitoring, from self reports, or in response to unauthorised incident reports. Cumulative adverse effects of a persistent minor non-compliant activity could elevate a minor issue to this level. Abatement notices and infringement notices may have been issued in respect of effects.

- **Poor** Likely or actual adverse effects of activities on the receiving environment were significant. There were some items noted during monitoring, from self reports, or in response to unauthorised incident reports. Cumulative adverse effects of a persistent moderate non-compliant activity could elevate an 'improvement required' issue to this level. Typically there were grounds for either a prosecution or an infringement notice in respect of effects.

Administrative compliance

- **High** The administrative requirements of the resource consents were met, or any failure to do this had trivial consequences and were addressed promptly and co-operatively.

- **Good** Perhaps some administrative requirements of the resource consents were not met at a particular time, however this was addressed without repeated interventions from the Council staff. Alternatively adequate reason was provided for matters such as the no or late provision of information, interpretation of 'best practical option' for avoiding potential effects, etc.

- **Improvement required** Repeated interventions to meet the administrative requirements of the resource consents were made by Council staff. These matters took some time to resolve, or remained unresolved at the end of the period under review. The Council may have issued an abatement notice to attain compliance.

- **Poor** Material failings to meet the administrative requirements of the resource consents. Significant intervention by the Council was required. Typically there were grounds for an infringement notice.

For reference, in the 2012-2013 year, 35% of consent holders in Taranaki monitored through tailored compliance monitoring programmes achieved a high level of environmental performance and compliance with their consents, while another 59% demonstrated a good level of environmental performance and compliance with their consents. In the 2013-2014 year, 60% of consent holders achieved a high level of environmental performance and compliance with their consents, while another 29% demonstrated a good level of environmental performance and compliance.

1.2 Resource consents

Section 15(1)(a) of the RMA stipulates that no person may discharge any contaminant into water, unless the activity is expressly allowed for by a resource consent or a rule in a regional plan, or by national regulations.

Sections 15(1)(b) and (d) of the RMA stipulate that no person may discharge any contaminant onto land if it may then enter water, or from any industrial or trade premises onto land under any circumstances, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations.

Each of the consents that pertain to the Lower Waiwhakaiho Catchment Resource Consents Monitoring Programme is listed in Table 1.The locations of the consent holders monitored under this programme and the chemical sampling sites are shown in Figure 1. The locations of the discharges are shown in Figure 2, whilst the biomonitoring sites that pertain to the monitoring programme are shown in Figure 3.

A total of 18 consents were held to discharge wastewater, stormwater and leachate from the industrial area at Fitzroy, New Plymouth to the lower Waiwhakaiho River and Mangaone Stream during the period under review. Each of these permits was

issued by the Council as a resource consent under Section 87(e) of the Resource Management Act.

The discharges to the Waiwhakaiho River of interest in this programme are from industries located within the Fitzroy area; i.e., Ravensdown fertiliser depot, Smart Road railyard, Firth Industries concrete plant, and Technix Group Limited and their tenanted workshops, and Fitzroy Engineering Group's blast and paint site. In addition, the New Plymouth District Council (NPDC) holds permits to discharge stormwater at several points, and for the discharge of leachate from the old Bewley Road rubbish dumpsite.

The discharges to the Mangaone Stream that were monitored were from New Zealand Decorative Concrete's concrete products manufacturing site on Egmont Road, Viterra's feed mill, Taranaki Sawmills' timber preservation plant and Ravensdown's stormwater on Katere Road, AML Limited's concrete plant on Hurlstone Drive, Nankervis Family Trust's truck wash on Dean Place, Technix Group's industrial complex, and Downer EDI Works Limited's asphalt plant on Rifle Range Road. Also monitored was the discharge from Freight and Bulk Transport Limited's Katere Road transport depot to land in the vicinity of the Mangaone Stream

Table 1 Resource consents for discharges to lower Waiwhakaiho River and Mangaone Stream from New Plymouth industrial area

Consent holder	Consent number	Type of discharge	Catchment area/Volume	Review date	Expiry date
Waiwhakaiho River					
Fitzroy Engineering Group Limited	0021-3	Stormwater from industrial site [renewal aplication lodged 20/02/2014]	400 L/s	-	1 June 2014
Fitzroy Engineering Group Limited	9853-1	To discharge stormwater, including treated truckwash water, from an industrial site [partial transfer from Technix consent 0291-2] [renewal aplication lodged 26/02/2014]	426 L/s	-	1 June 2014
Firth Industries	0392-3	Treated concrete truck washings and stormwater [renewal aplication lodged 27/01/2014]	10 L/s; 200 L/s	-	1 June 2014
NPDC	4984-1	Leachate from former Bewley Road Landfill [renewal aplication lodged 28/02/2014]	20 L/s	-	1 June 2014
NPDC	5163-2	Stormwater from Waiwhakaiho industrial area, multiple outlets	-	June 2014	1 June 2026
NZ Railways Corporation	3528-2	Treated wastewater and stormwater from rail yard [renewal application lodged 28/02/2014]	13 m^3/day	-	1 June 2014
Ravensdown Fertiliser	3140-2	Stormwater from fertiliser storage depot [renewal application lodged 19/11/2013]	700 L/s	-	1 June 2014
Technix Group	0291-2	Treated washwater and stormwater from industrial site [renewal application lodged 20/02/2014]	426 L/s	-	1 June 2014

Consent holder	Consent number	Type of discharge	Catchment area/Volume	Review date	Expiry date
Mangaone Stream					
AML Limited [Trading as Allied Concrete]	4539-2	Stormwater and treated waste water from truck washing	5880 m^2	June 2014	1 June 2026
Downer EDI Works	3917-2	Treated washwater and stormwater from asphalt plant [renewal application lodged 30/08/2013]	175 L/s	-	1 June 2014
Freight & Bulk Transport	2041-2	Treated truckwash water and stormwater from transport depot to land [renewal application lodged 28/02/2014]	2.8 m^3/day	-	1 June 2014
Nankervis Family Trust	6965-1	Truckwash water via interceptor	Approx 1 m^3/day	June 2014	1 June 2020
NPDC	1275-3	Stormwater from Katere industrial area, multiple outlets	-	June 2014	1 June 2026
NZ Decorative Concrete	7450-1	Stormwater from a decorative concrete products manufacturing site		June 2014	1 June 2026
NZ Railways Corporation	1735-2	Stormwater from Smart Road rail terminal	11.28 ha	June 2014	1 June 2026
Ravensdown Fertiliser	3865-3	Stormwater from fertiliser storage depot [renewal application lodged 19/11/2013]	700 L/s	-	1 June 2014
Taranaki Sawmills	3491-2	Treated cooling water, wastewater and stormwater	5.3188 ha + 12 m^3/day cooling water	June 2014	1 June 2020
Farmlands Co-operative Society Limited	4548-2	Treated wastewater and stormwater from feed mill [transferred 10 December 2013]	128 L/s	June 2014	1 June 2020

Outlines of the companies' activities and the site specific special conditions on their consents are presented in later sections. Although there is some variation among the conditions of the consents, which were granted over a period of several years, the newest consents include some 'standardised' conditions (with some exceptions). The standardisation is in terms of some general limits on effluent composition, definition of mixing zones, control of receiving water effects (compliance with Section 107 of the Resource Management Act 1991), contingency plans, and review of conditions.

The 'standardised' special conditions are as follows:

1. THAT the following limits shall not be exceeded in the discharge:
   (i) Suspended solids 100 mg/L
   (ii) Oil & grease 15 mg/L
   (iii) pH [range] 6.0 - 8.5 [or 6 - 9 for more recent consents]

2. THAT allowing for a mixing zone extending xx metres below the discharge pipe, the discharge shall not give rise to any of the following effects in the receiving water of the Waiwhakaiho River/Mangaone Stream:
   (i) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
   (ii) any conspicuous change in the colour or visual clarity;
   (iii) any emission of objectionable odour;
   (iv) any rendering of fresh water unsuitable for consumption by farm animals;
   (v) any significant adverse effects on aquatic life, habitats, or ecology.

3. THAT the consent holder, within three months of the granting of this consent, shall provide a contingency plan, to the satisfaction of the Chief Executive, Taranaki Regional Council, for action to be taken in the event of accidental discharge or spillage of contaminants.

4. THAT the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2002 and/or June 2008 and/or June 2014 for the purpose of ensuring that the conditions are adequate to deal with any adverse effects of the discharge on the environment.

A summary of each consent is given in each consent holder's subsection 1, and includes the purpose of the consent, the special conditions, and the duration of the consent. Copies of the full consents are given in alphabetical order in Appendix I.

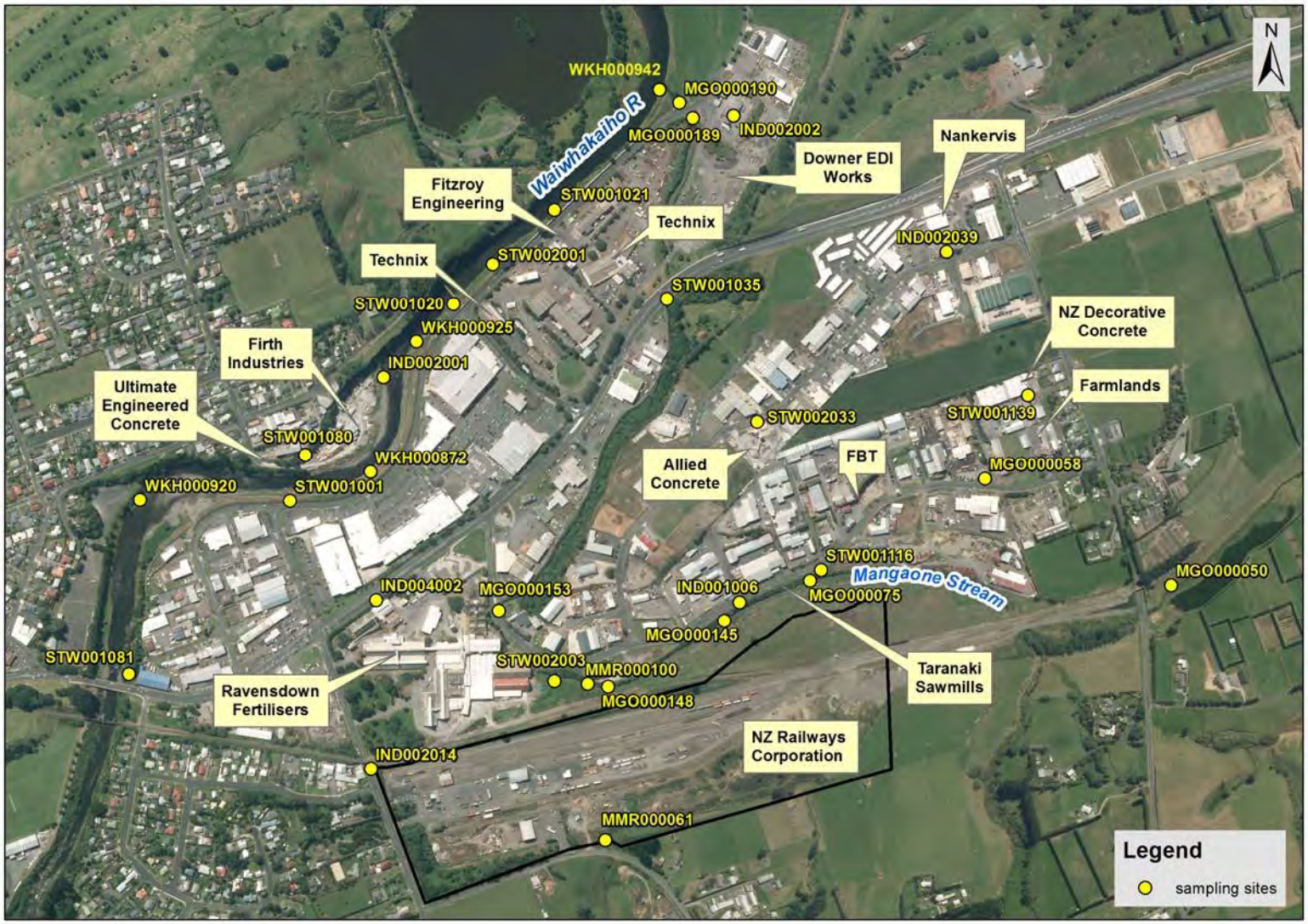


Figure 1 Lower Waiwhakaiho River and Mangaone Stream consent holders and chemical sampling

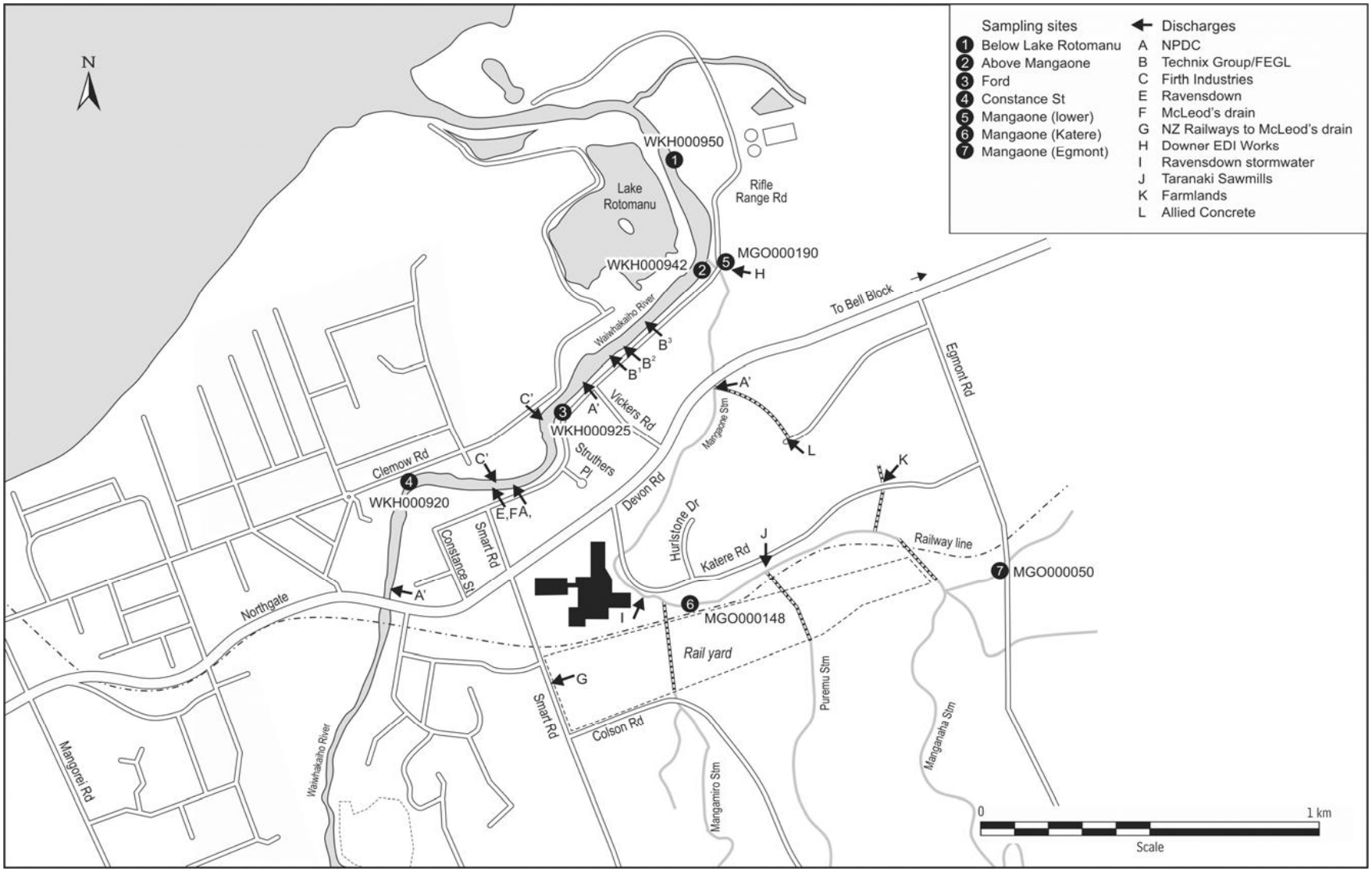


Figure 2 Lower Waiwhakaiho River and Mangaone Stream discharges

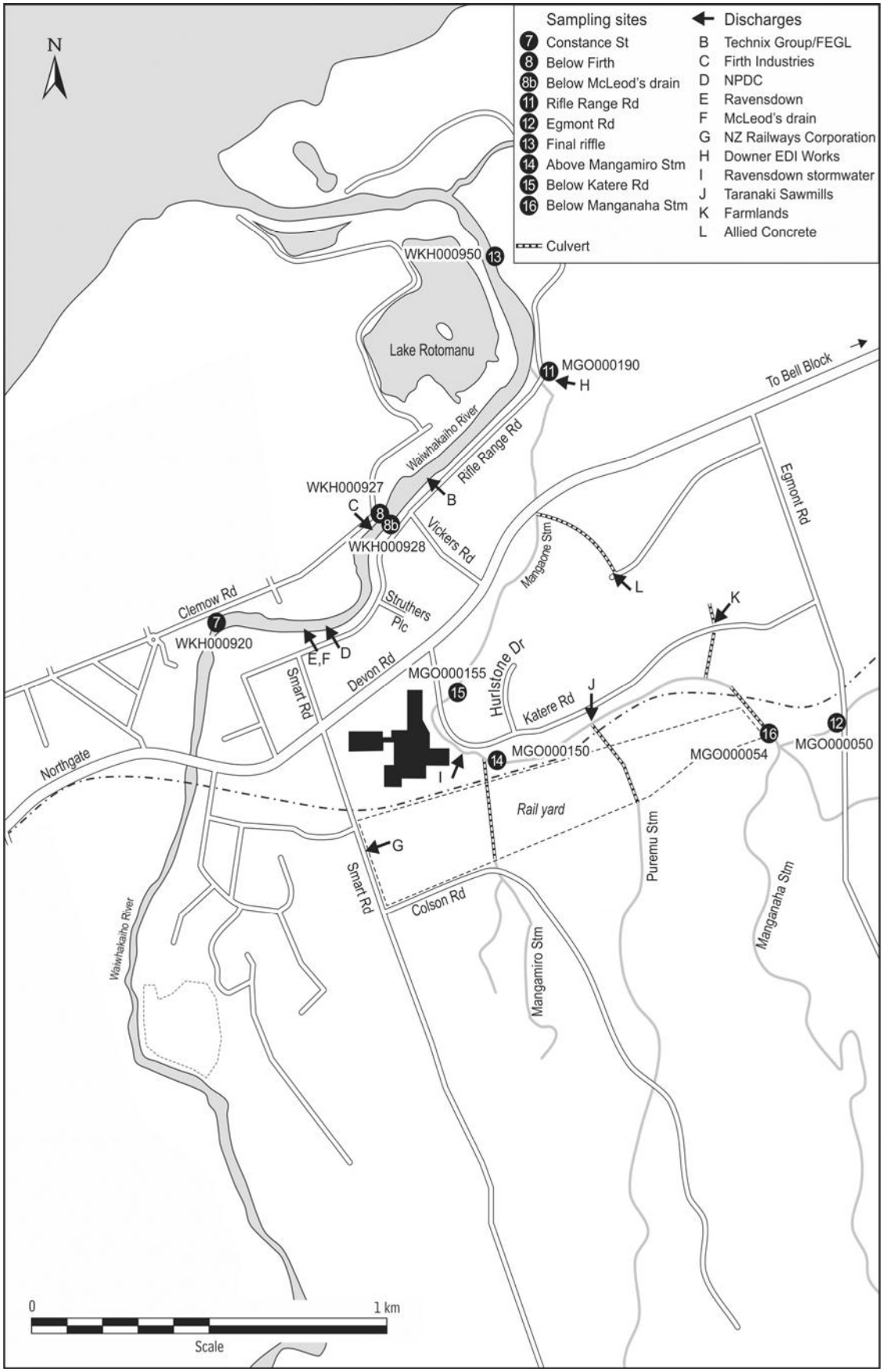


Figure 3 Lower Waiwhakaiho River and Mangaone Stream biological monitoring sites

1.3 Monitoring programme

1.3.1 Introduction

Section 35 of the RMA sets out obligations upon the Council to gather information, monitor, and conduct research on the exercise of resource consents, and the effects arising, within the Taranaki region and report upon these.

The Council may therefore make and record measurements of physical and chemical parameters, take samples for analysis, carry out surveys and inspections, conduct investigations, and seek information from consent holders.

The monitoring programme in the catchment consisted of five primary components. During the 2012-2014 monitoring period inspections of industrial sites, wet weather sampling and analysis of discharge and receiving waters, dry weather sampling and analysis of groundwaters and receiving waters, sediment sampling and macroinvertebrate surveys were undertaken (as outlined in the monitoring programme).

1.3.2 Programme liaison and management

There is generally a significant investment of time and resources by the Taranaki Regional Council in:

- ongoing liaison with resource consent holders over consent conditions and their interpretation and application;
- in discussion over monitoring requirements;
- preparation for any reviews;
- renewals;
- new consents;
- advice on the Council's environmental management strategies and content of regional plans and;
- consultation on associated matters.

1.3.3 Site inspections

Each of the consent holders' properties was scheduled for inspection four times per year during the period under review to assess compliance with any relevant consent conditions, and the potential for unauthorised discharge. With regard to consents for discharge to water, the main points of interest were plant processes with potential or actual discharges to receiving watercourses, including contaminated stormwater and process wastewaters.

Activities on the site are discussed with respect to general housekeeping, effects on stormwater quality and wastewater disposal. Water and waste treatment systems and areas where chemicals or products are stored or transferred are given particular attention. Sources of data being collected by the consent holder were identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. The neighbourhood was also surveyed for environmental effects.

The frequency of inspection varied depending on the type of activity at the site, the outcome of previous inspections, and the stage of any investigation of unsourced discharges of contaminants. Inspection frequency is approximately quarterly, however additional inspections may be carried out where necessary.

During the 2012-2014 monitoring years an officer of the Council carried out inspections approximately quarterly. A written report was provided to the consent holder following each inspection.

1.3.4 Chemical sampling

The Council undertook sampling of both the discharges from the site and the water quality upstream and downstream of the discharge point and mixing zone.

The number and location of sites sampled, the frequency and conditions of sampling, and the range of water quality parameters determined have changed since this combined monitoring programme commenced in 1988. This evolution has occurred as knowledge of the characteristics of the discharges and waters that receive them has been gained, and as the number and composition of licensed discharges has varied.

Routine chemical sampling is now conducted on a biannual basis under wet weather conditions and groundwater monitoring is conducted on a biannual basis in dry weather. In the monitoring period under review, Council monitored 20 discharge points, 13 receiving water sites and 8 groundwater bores, and analysed the samples for a wide range of parameters depending upon the types of activities being conducted at a particular site and/or the sampling site location.

1.3.4.1 Surface water surveys

The discharge and receiving water chemical sampling sites are shown in Figure 1. As there are no samples taken downstream of the confluence of the Mangaone Stream and Waiwhakaiho River, the surface water surveys of these two water bodies, and their discharges, may sometimes be carried out separately.

Wet weather sampling was carried out on 4 February 2013, 16 April 2013, 10 May 2013, 4 December 2013 and 9 June 2014. The timing of sampling is dependent on rainfall, in terms of both incidence and intensity. Too little rain and there is insufficient run-off to be sampled. Too much rain and the river rises above some of the stormwater discharge points, preventing sampling. The results of the discharge monitoring are discussed in the relevant section based on the consent holder responsible for that discharge, and the receiving water results are discussed in Section 16. The results of the full wet weather monitoring conducted during the 2012-2014 years are included in Appendix II.

1.3.4.2 Groundwater surveys

Groundwater sampling in the vicinity of the old Bewley Road landfill took place on 23 January 2013, 6 June 2013, 10 January 2014, and 5 June 2014, and sampling of the groundwater in the vicinity of the Ravensdown Fertiliser Limited site took place on 24 September 2012, 23 January 2013, 10 April 2013, 6 June 2013, 28 January 2014, and

5 June 2014. Groundwater sampling is conducted independently of the wet weather surface water sampling. A discharge drain and three receiving water sites are sampled in conjunction with the Bewley Road groundwater monitoring, and two receiving water sites are sampled in conjunction with the Ravensdown groundwater monitoring. The location of the sites sampled during the groundwater surveys are shown in Figure 4.

Where possible, a summary of previous monitoring data for a particular site is provided for comparative purposes. Unless specifically stated all metals results are from acid soluble analysis.

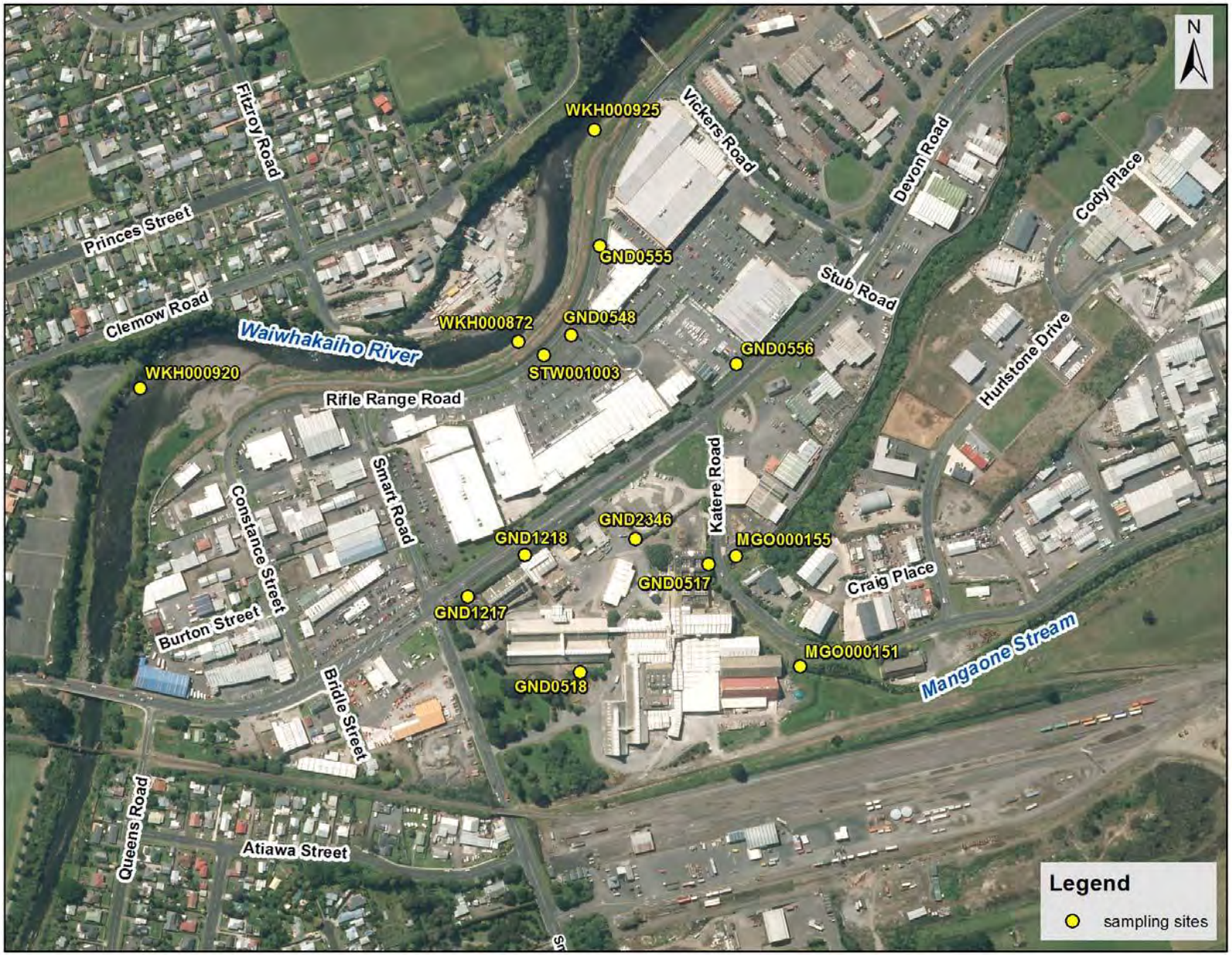


Figure 4 Location of groundwater monitoring bores and associated sampling sites

1.3.4.3 Streambed sediment sampling

Dry weather sampling of the Mangaone Stream sediments was undertaken at three sites on one occasion (5 March 2014). This monitoring is scheduled to be carried out every other year and focuses on the contaminants that may be present in the past and present discharges from the Taranaki Sawmills site, and is reported in Section 13.

1.3.5 Biomonitoring surveys

Biological surveys are used to determine the impacts that discharges may cause over a period of time, as distinct from chemical surveys which give detailed information upon the constituents of a discharge at the time of sampling but cannot give information upon previous discharge characteristics. Biological surveys also directly indicate any significant adverse effects of discharges upon in-stream flora and fauna, so that cause-effect relationships do not have to be established as for critical levels of individual chemical parameters, although variation in habitat must also be taken into consideration.

1.3.5.1 Macroinvertebrate surveys

Samples of streambed macroinvertebrates and algae are collected from three sampling sites in the lower Waiwhakaiho River and five sites in the Mangaone Stream on a biannual basis. During the 2012-2014 years, these surveys were conducted on 28 November 2012, 31 January 2013, 1 Feb 2013, 15 November 2013, 13 February 2014, and 14 February 2014. The locations of the biomonitoring sites are shown in Figure 3. A summary of the findings is discussed in Section 16.2.1 and copies of the full reports are included in Appendix III.

1.3.5.2 Fish survey

Fish surveys in the Waiwhakaiho catchment historically surveyed only two sites in the Mangaone Stream. In the 2004-2005 fish survey report it was proposed that future surveys incorporate more sites in an attempt to compare sites with similar habitats, and to ensure that discharges to the Mangaone Stream are not presenting a barrier to upstream migration. This more comprehensive survey was scheduled to be carried out every three years, the first of which was carried out in the 2009-2010 year.

A further recommendation was subsequently made to also survey two sites in the Waiwhakaiho River.

An electric fishing survey was undertaken on 24 January 2014 incorporating two sites in the Waiwhakaiho River and three sites in the Mangaone Stream, to assess whether stormwater and wastewater discharges to the river or stream had had any adverse effects on fish populations. A summary of the findings is discussed in Section 16.2.2, and a copy of the full report is included in Appendix IV.

The next fish survey is scheduled to be undertaken in the 2015-2016 monitoring year.

2. AML Limited (trading as Allied Concrete)

2.1 Process description

AML Limited's concrete batching plant at 67 Hurlstone Drive is one of four such plants operated by the Company in the Taranaki region. The main activities are loading of ready-mixed concrete into trucks, and the unloading of concrete raw materials including cement and aggregate into silos and bins.

Stormwater from the majority of the site drains directly to the New Plymouth District Council (NPDC) stormwater system and then to the Mangaone Stream.

Figure 5 AML Limited (trading as Allied Concrete) site location and stormwater drainage

The wastewater treatment system consists of a series of settlement ponds and pumps for the recycling of process water. The emptied mixing bowls of up to seven concrete trucks are washed out each day using water and a small amount of detergent. This bowl washwater is discharged into two 36 m^3 bins and allowed to settle for at least 18 hours before treatment through an additional series of six settlement ponds totalling approximately 360 m^3 in volume. Solids from the settlement process are removed from the bins and ponds as required.

Water from the settlement ponds is recycled into the concrete manufacturing process and is also used for bowl washing. The recycled water is supplemented on most days by reticulated supply and no discharge of wastewater occurs to the stormwater drain. However, because the uncovered settlement ponds receive stormwater both directly and as run off from certain areas of the site, an excess of water may enter the system during heavy or sustained rainfall, or if rainfall occurs when the plant is not operating. This excess is discharged via a sand filter prior to entering the NPDC stormwater system, which discharges to the Mangaone Stream immediately upstream of State Highway 3.

Contaminants that may enter the wastewater treatment system include solids and detergents from bowl washing, and cement products and additives used in Allied Concrete's manufacturing process.

The use of settling bins and six settling ponds in series significantly reduces the suspended solids concentration of the discharge. The small amounts of additives in the bowl washwater are likely to bind to suspended sediment in the ponds, the majority of which will settle out during the treatment process. Concentrations of any additives remaining in the discharge will be further reduced by dilution with stormwater from the surrounding area prior to entering the Mangaone Stream.

Storage areas for the concrete additives are bunded with drainage to the wastewater treatment system

During the 2000-2001 monitoring period, it was found that untreated stormwater was exiting the site via a piped drain in the concreted car park area. This flow was channelled to the road where it entered the NPDC stormwater system discharging to the Mangaone Stream. This discharge was not covered by the wastewater discharge consent and so a cattle grid type arrangement was installed on site during the 2002-2003 year that drains to a soak hole to prevent this discharge from occurring.

2.2 Water discharge permit

AML Limited operates a concrete batching plant on Hurlstone Drive. The Company holds discharge permit **4539** to provide for the discharge of stormwater and treated wastewater from truck washing at a concrete batching plant into the Mangaone Stream. The consent was originally granted to Ready Mixed Concrete Limited on 22 June 1994, for a period until 1 June 2008. The consent was transferred to Allied Concrete Limited on 22 December 1997.

Conditions on the original consent addressed effects in the receiving water and effluent treatment, placed limits on effluent composition (maximum suspended solids concentration, 50 g/m^3; pH range 6-9) and provided the option to review the conditions in June 1996 and 2002.

At the time the consent was transferred to Allied Concrete changes of condition were made in relation to pH. The changes were sought at the request of the Regional Council, as monitoring had shown that the upper pH range limit on the discharge was being breached, yet there was no adverse effect in the receiving water. The limit on effluent pH was removed, and two more conditions were inserted. The discharge was not allowed to alter the receiving water pH by more than 0.5 units or cause it to exceed the range 6-9, and a mechanism for controlling discharge rate was required to be put in place.

AML Limited [Trading as Allied Concrete] now holds water discharge permit **4539-2** to cover the discharge stormwater and treated wastewater from truck washing at a concrete batching plant into the Mangaone Stream in the Waiwhakaiho catchment. This permit was issued by the Taranaki Regional Council on 30 July 2008 under Section 87(e) of the RMA. It is due to expire on 1 June 2026.

Special condition 1 requires that the Company adopts the best practicable option.

Special condition 2 limits the area of the stormwater catchment.

Special condition 3 requires bunding or other means of control to be put in place ensuring that the quality of stormwater from hazardous substance storage areas can be managed.

Special condition 4 places component concentration limits on the discharge.

Special condition 5 prohibits specific effects on the receiving water.

Special condition 6 states that the discharge is not allowed to alter the receiving water pH by more than 0.5 units, or cause it to exceed the range 6-8, after reasonable mixing.

Special conditions 7 and 8 require the preparation and maintenance of a contingency plan and an operation and maintenance plan.

Special condition 9 requires written notification of changes at the site that may alter the nature of the discharges at the site, which is to be accompanied by an assessment of the effects those changes may have on the receiving environment.

Special condition 10 contains provisions for review of the conditions of the consent.

The permit is attached to this report in Appendix I.

2.3 Results

2.3.1 Inspections

7 August 2012

A meeting was held on site to discuss the installation of a sand trap. The inspecting officer was informed that Hynds Environmental was designing a sand trap for the site. The abatement notice[3] was extended until 15 October 2012 to allow for the works to be completed. It was noted that temporary measures had been installed to reduce the amount of suspended solids being discharged in the storm water.

26 September 2012

The inspecting officer met with the Site Manager. The sand trap to be installed was discussed and the inspecting officer looked at the designs. The inspecting officer was informed that it would take Hynds 5 weeks to build the treatment system, and then Taranaki Civil would install it. At inspection it was found that the silt ponds looked good. Hay bales were still present in the stone trap to restrict the movement of solids to the stormwater system. It was observed that there was a new 4500L diesel tank on site, situated in a large bund. It was noted that the old diesel tank was to be removed. It was reported that the soak holes looked good. No dust was found beyond the boundary of the property, and a visual check of the manhole found that there was no

3 Abatement Notice No.11837 issued on 6 July 2013 (due to non-compliant discharge that occurred on 5 June 2012) requiring the Company to undertake works to ensure compliance with Special Condition 4 of Resource Consent 4539-2 by 7 August 2012

discharge of stormwater occurring from the site at the time of inspection. It was noted that the workshop area was tidy, with no spills noted. It was considered that the site was tidy.

Following the site visit the abatement notice was extended until 12 November 2012 to allow for construction and installation of the sand trap.

19 November 2012
It was reported that there were no dust or odours found beyond the boundary of the property. The inspecting officer met the Site Manager on site. It was found that the sand trap filter system was on site, but it was still to be installed. The inspecting officer was informed that the trap should be in place by the end of the month. It was noted that there were a lot of trucks on site as the Waitara plant was shut down. It was observed that the silt ponds looked good and it was noted that the water was being recycled. There was no discharge from the site at the time of inspection. It was found that the diesel bunds looked good, and it was noted that the small tank had not yet been removed. It was considered that the site was tidy.

26 February 2013
The inspection was undertaken with the Site Manager. No dust or odours were found beyond the boundary of the property. The silt ponds looked good, with the pond water being circulated through the plant at the time of inspection. The sand trap had been installed, and it was reported that all run off from the site was directed through this system before being discharged to the reticulated stormwater network. It was found that an elbow had also been installed on the small sand trap at the rear of the site. It was noted that the workshop area was tidy and no spills were noted around the site. It was reported that the old diesel tank was still to be removed from the site.

19 April 2013
It was reported that all the storage areas for waste material were due to be cleaned out within the next few days. It was noted that the site was tidy, and activities appeared to be managed in an acceptable manner at the time of inspection.

10 June 2013
No dust or odour were found beyond the boundary of the property. The plant was operating at the time of inspection. The settling ponds looked good, and the soak holes appeared to be working well. It was reported that the new diesel bund looked good, with no spills noted. It was found that the old diesel tank had been removed from the site. The workshop area was tidy, as was the rest of the site. There was no discharge occurring from the site at the time of inspection.

29 August 2013
The site was inspected in wet and windy conditions. No emissions or odours were found beyond the boundary of the site. No trucks were loading out at the time of inspection. It was found that the soak holes around the site were full, and the Company was instructed that the hay bale in the sand trap needed to be replaced. The site was found to be tidy.

10 December 2013
The inspecting officer was met on site by the Site Manager. It was reported that the sand trap still wasn't working to specification, and there were contractors coming

that afternoon investigate. It was found that the site was tidy with no dust or odours discharging beyond the boundary of the property. The diesel bund area was satisfactory, and the soak holes looked good.

18 February 2014
No dust or odour was found to be discharging beyond the boundary of the property. The inspection was undertaken with the Site Manager. It was found that there was no discharge from the site at the time of inspection. The inspecting officer was informed that the wash ponds were to be altered soon. Two of the smaller ponds were to be cleaned out and made into one large pond. The water would then be pumped from there through the plant. The pond that currently contains the pump would be an overflow pond and would discharge to stormwater when required. It was found that the soak holes were dry at the time of inspection. The diesel bund looked good and no spills were noted around the site. The site was found to be tidy at the time of inspection.

28 May 2014
The site was inspected in overcast conditions after recent showers. There were trucks loading out at the time of inspection. The ponds looked to be working well, and the soak holes were reported to be in good order. There was no discharge occurring from the site at the time of inspection. The diesel bund looked good and it was noted that there was a small volume of stormwater retained in the bund. The workshop area was tidy. There were no spills around the site, and there was no dust or odour found beyond the boundary of the site. The sit was reported to be tidy at the time of inspection.

2.3.2 Results of discharge monitoring

Since 1996, the discharge from the concrete plant has been monitored at a manhole outside the plant, before it enters the stormwater drain along Hurlstone Drive. It is also monitored at a second point, together with contributions from the surrounding industrial area, at the point where the combined NPDC reticulated stormwater drain discharges into the Mangaone Stream (TRC site code STW001035).

Results for the 2012-2014 monitoring of the stormwater/wastewater, where it leaves the concrete plant are presented in Table 2. A summary of previous monitoring results is also included for comparative purposes.

The results for the stormwater drain at the Mangaone Stream (TRC site code STW001035) are given in Section 9.3.1.2,
Table **24**, whilst the results of the receiving water (i.e. for the purposes of monitoring compliance with consent conditions) are given in Section 16.1.2, Table 56 (TRC site code MGO000190).

There was a discharge from the sump into the NPDC reticulated system, and hence to the stream, on three of the four monitoring occasions. In contrast to the 2010-2012 period, only one of the samples collected contained more than the permitted concentration of suspended solids, with the two other samples returning result well below the median of historical results. The consent exceedance was logged as an unauthorised incident, and is discussed in Section 2.3.3.

Table 2 Chemical monitoring results for AML Limited's discharge for 2012-2014, with a summary of previous monitoring data from March 1996 to June 2012. TRC site code STW002033

	Cond mS/m	O&G g/m^3	pH	SS g/m^3	Temp ^{O}C	Turby NTU
Consent Limit	-	*15*	-	*100*	-	-
Number	29	25	30	28	29	12
Minimum	6.4	<0.5	8.2	7	8.0	10
Maximum	2740	22	12.8	1000	21.3	350
Median	191	<0.5	12.0	99	13.1	84
04-Feb-13	68.3	b	11.4	13	21.8	20
16-Apr-13[a]	-	-	-	-	-	-
10-May-13[a]	-	-	-	-	-	-
04-Dec-13	219	<0.5	12.1	19	19.0	9.9
09-Jun-14	23.0	<0.5	8.9	320	14.5	520

Key: Results shown in bold within a table indicates that a consent limit for a particular parameter has been exceeded
a flow too low to sample
b parameter not determined, no visible hydrocarbon sheen and no odour

Monitoring has found that the pH of the discharge varies widely depending on the degree and type of activity at the plant, and the amount of rainfall prior to sampling. The pH's of the discharge samples collected during the period under review were within the range of historical results.

The influence of alkaline discharges from the concrete plant was observed at the discharge point (TRC site code STW001035) on 10 May and 4 December 2013. No significant changes in pH were observed in the receiving water between TRC site code MGO000153 (upstream) and MGO000190 (downstream) during the period under review. The consent condition limiting the effect the discharge is permitted to have on the receiving water pH was therefore complied with.

The oil and grease limit of 15 g/m^3 imposed by the Company's consent was complied with on all three monitoring occasions.

2.3.3 Investigations, interventions, and incidents

In the 2012-2014 period, the Council was required to undertake significant additional investigations and interventions, or record incidents, in association with AML Limited (trading as Allied Concrete)'s conditions in resource consents or provisions in Regional Plans.

15 July 2014

During analysis of samples collected on 9 June 2014, it was found that the stormwater discharge was not complying with resource consent conditions at the Hurlstone Drive concrete plant site. A letter of explanation, detailing the additional improvements that would be undertaken at the site, was received and accepted. It was outlined in the letter that:

Allied Concrete took this matter very seriously and after investigation, found the contributing factors that resulted in the breach were:

- Days of heavy rain fall.

- The pump that moves water form the concrete and gravel areas around the plant through the sand filter system had failed, which in turn caused a overflow of water.

Actions taken since the event were:

- Installation of a new higher volume submersible pump capable of handling all weather conditions.
- Ordering of a monitoring device that measures the solids in the discharge water.
- Plans were underway for the installation of a separate water treatment system to be put in place between the primary stone trap and the submersible pump.
- Updating the Allied Concrete water management plan.

2.4 Discussion

2.4.1 Evaluation of plant performance

At inspection the fuel and chemical storage at the AML Limited site was well managed during the years under review.

In recent years the Company has put in place a number of treatment systems aimed at reducing the suspended solids concentration in the stormwater exiting the site.

Although these appear to be effective in relation to managing the stormwater that used to exit the site through the driveway, effective on-going maintenance of the system is necessary. During the period under review, the soak holes and sediment catcher at the site entrance were found to be satisfactory at all but one of the eight monitoring inspections. On one occasion it was noted that the soak holes were full and that the hay bale needed to be replaced.

In relation to the consented stormwater/wastewater discharge via the NPDC reticulated stormwater network, the treatment systems had not proved to be so effective. The suspended solids concentration of the discharge was found to have exceeded the permitted concentration in one of the three samples collected in the 2012-2014 years. The Company first started considering the installation of a filter system to further treat the site stormwater discharge in August 2009, due to earlier suspended solids exceedances. A stormwater filter was marked on the site plan in Appendix 1 of the Company's "Water Management Plan for the New Plymouth Plant Hurlstone Road" dated September 2010. An abatement notice was issued at the end of the 2010-2012 monitoring period, after three of the four discharge samples collected exceeded the permitted concentration of suspended solids. The abatement notice required that the Company to undertake works to ensure compliance with Special Condition 4 of Resource Consent 4539-2 by 7 August 2012. The timeframe for the works in this abatement notice was extended twice to 17 November 2012. At inspection on 19 November 2012, it was found that the treatment device was on site, but was yet to be installed. There is no record on file of a further extension to the abatement notice having been requested. The inspecting officer was informed that the works would be completed by the end of the month and the treatment system was found to have been installed at the February inspection. The inspecting officer

was advised that the device was still not working effectively at inspection on 10 December 2013. The breach of the suspended solids limit found during the period under review occurred on 6 June 2014. This was logged as an unauthorised incident and the Company advised that they were to undertake further works to ensure compliance.

2.4.2 Environmental effects of exercise of consent

Despite the suspended solids consent exceedance, due to the conditions prevailing at the time of sampling, during the period under review there were no adverse effects observed in the Mangaone Stream as a result of discharges from the AML Limited site.

Alkaline discharges from this site have the potential to influence not only the pH of the New Plymouth District Council stormwater discharge at the State Highway 3 bridge and downstream receiving water, but also the unionised ammonia concentration. Unionised ammonia is potentially in the receiving environment at relatively low concentrations (less than 0.025 g/m^3) and the equilibrium that exists between ammoniacal nitrogen and unionised ammonia is affected by pH. In alkaline conditions the equilibrium is shifted towards the more toxic unionised ammonia.

Although there was evidence of the pH of discharges from the site having an impact on the unionised ammonia concentrations in the combined New Plymouth District Council discharge during the years under review, there was little, if any, effect on the pH and unionised ammonia concentration of the Mangaone Stream.

Imposing a pH control limit on the receiving water as opposed to the discharge still appears to be an appropriate control mechanism. Monitoring results during the years under review continued to show that, whilst the pH of the discharge is quite alkaline, this 'effect' appears to be assimilated within the NPDC reticulated stormwater network and/or the receiving water.

2.4.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the years under review is set out in Table 3.

Table 3 Summary of performance for AML Limited's consent 4539-2, discharge of stormwater and treated concrete truck washings

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adoption of best practicable option to minimise effects	Observation and discussion at inspection	1 SS consent exceedance occurred, issues with performance of treatment system
2. Limit on stormwater catchment area	Observation and discussion at inspection	Yes
3. Bunding of above ground hazardous substance storage	Observation at inspection	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
4. Discharge cannot cause specified general adverse effects beyond mixing zone	Sampling and discharge point inspections	Yes
5. Concentration limits upon potential contaminants in discharge	Chemical sampling	Suspended solids exceeded in discharge in 1 of 3 samples
6. pH limits on receiving water as a result of discharge	Chemical sampling	Yes
7. Maintenance of and adherence to contingency plan	Review of documentation received	Yes
8. Preparation and maintenance of operation and management plan. Initially due January 2009	Review of documentation received.	Yes, however plan not adhered to initially with regard to installation of a filter system
9. Written notification of changes	Observation and discussion at inspection found no changes requiring notification	N/A
10. Optional review provision re environmental effects	Next opportunity for review June 2014, unless Council notified of changes.	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		Improvement required
Overall assessment of administrative performance in respect of this consent		Improvement required

N/A = not applicable

During the years under review, an improvement was required in the environmental and administrative performance and compliance with AML Limited's resource consents, as defined in Section 1.1.5. During the period under review there were a number of delays and extensions to the abatement notice issued in June 2012 that required works to be undertaken to ensure compliance with the suspended solids limit on the consent. Although a treatment system was installed part way through the period under review, this had been an identified as required improvement in a management plan produced in the early part of the previous monitoring period. After installation there were issues with the performance of the system, and monitoring results at the end of the period under review found that the system was still not working effectively. Further improvements to the system were made in the 2014-2015 year.

2.4.4 Recommendation from the 2010-2012 Biennial Report

In the 2010-2012 Biennial Report, it was recommended:

THAT monitoring of discharges from AML Limited in the 2012-2013 year continues at the same level as in 2010-2012.

This recommendation was carried out in full.

2.4.5 Alterations to monitoring programmes for 2014-2015

In designing and implementing the monitoring programmes for water discharges in the region, the Council has taken into account the extent of information made available by previous authorities, its relevance under the RMA, the obligations of the Act in terms of monitoring discharges and effects, and subsequently reporting to the regional community. The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki discharging to the environment.

It is proposed that for 2014-2015, the programme remains unchanged. A recommendation to this effect is attached to this report.

2.5 Recommendations

THAT monitoring of discharges from AML Limited in the 2014-2015 year continues at the same level as in 2012-2014.

3. Downer EDI Works Limited

3.1 Process description

Downer EDI Works Limited operates an asphalt manufacturing plant at a site off Rifle Range Road. A depot for maintenance, parking and storage of equipment and materials used in road-making is also on the site.

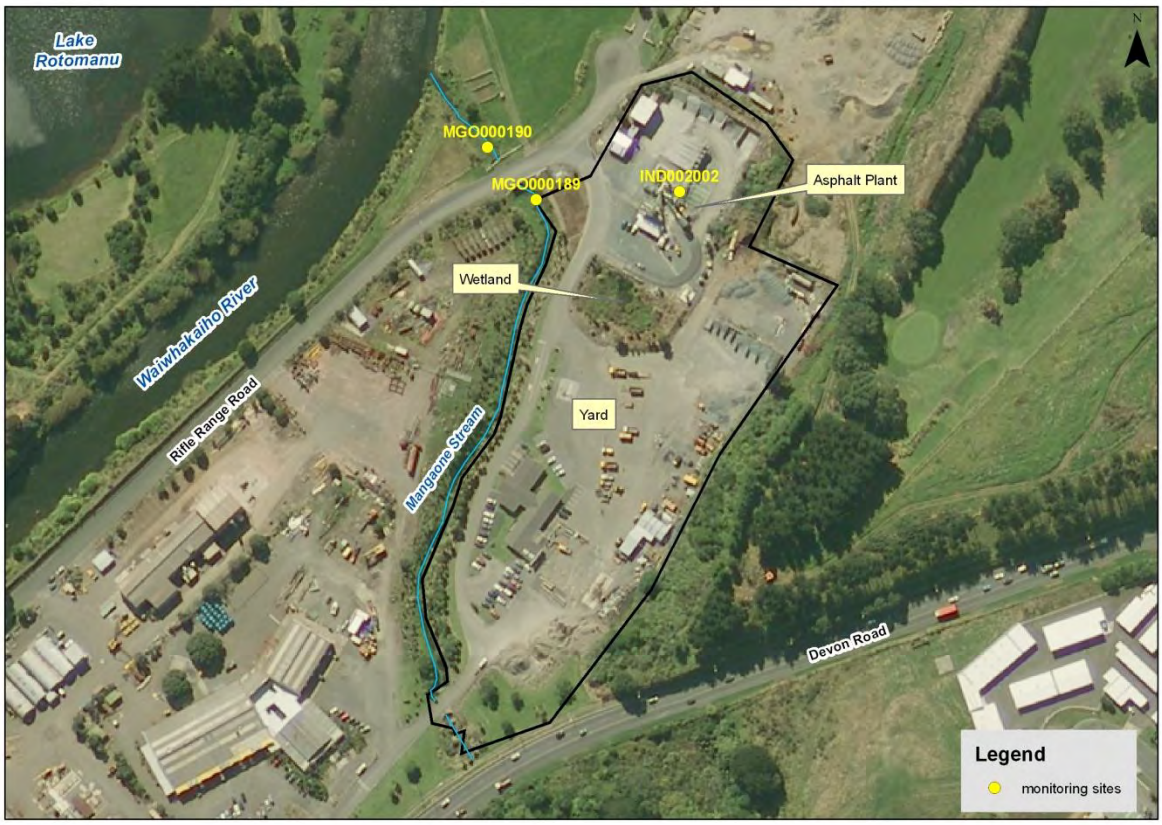


Figure 6 Downer EDI Works Limited's site and sampling point locations

In the manufacturing process, aggregate metal is dried by gas heating and is mixed with heated bitumen to form hot-mix bitumen. Diesel oil and/or kerosene may be added to adjust the consistency of the mix. The product is loaded onto trucks for transport. Dust and gases generated from the process are treated in a wet scrubber. Scrubber effluent is treated in four settling ponds then reused.

The asphalt plant stormwater catchment contains raw materials, comprising various grades of aggregate, static bitumen tanks, bunded emulsion tanks, and stores housing bitumen additives and plant maintenance materials, such as chain oil. There is also short term storage of a small volume of waste asphalt, generally product that is incompletely mixed, from the start or end of the production run. This waste material is disposed of periodically at an approved landfill. The plant and storage areas are graded such that these area drain to the settling ponds prior to discharge to the constructed wetland.

The depot includes an administration building, vehicle and equipment maintenance workshops, aggregate stores, and an area for parking motor vehicles and equipment.

Stormwater from this area drains via a three-stage oil separator to a small constructed wetland that also receives piped water from springs. There is also a truck wash facility in the depot area, the drainage from which is currently diverted to sewer at all times by means of a locked diversion valve.

Drainage from the asphalt plant settling ponds (which have a baffled outlet to contain floatables) and the depot both discharge via the small wetland, to the Mangaone Stream immediately above the Rifle Range Road bridge.

Improvements at the site in recent years have included sealing of areas of the site, upgrades to the asphalt plant settling ponds and improvements in their management, additional silt controls on the truck depot side of the site and construction of new bunds and shed for hazardous substances storage. A stop valve has also been installed in the discharge system from the wetland to the stream, so that the flow can be stopped in the event of a spill.

3.2 Water discharge permit

Downer EDI Works Limited operates an asphalt drum plant that is situated on the right bank of the Mangaone Stream near its confluence with the Waiwhakaiho River, on Rifle Range Road. Ownership of the plant has changed several times, with Works Civil Construction previously taking over the site from Technic Industries Limited in November 1997.

Discharge permit **3917** was granted on 1 May 1996 to discharge up to 175 litres per second of stormwater and washdown water from the site to the Mangaone Stream, with 'standardised' conditions, for a period until 1 June 2014. This was the second consent issued for the discharge since 1991. The consent was transferred to Works Civil Construction on 26 May 1999. The Company changed its name to Works Infrastructure Limited on 20 December 1999, who rebranded to Downer EDI Works Limited during the 2008-2009 year. The consent was transferred on 23 March 2009.

An application to renew this consent was received on 30 August 2013, and therefore under Section 124 of the RMA, the Company can continue to operate under the conditions of the expired consent until a decision is made on the renewal application.

Further information was requested regarding the activities, potential contaminant, drainage and treatment systems and an assessment of environmental effects for the entire site, as the original application was limited to the asphalt plant site area only. A stormwater management plan and updated contingency plan were also requested.

The permit is attached to this report in Appendix I.

3.3 Results

3.3.1 Inspections

30 August 2012

The plant was not operating at the time of inspection. The settling ponds looked good, and the interceptor system appeared satisfactory. There was no discharge into the wetland at the time of inspection. It was noted that the truck wash was not in use. There was a small clear discharge into the Mangaone Stream from the site, and it was

reported that there was no visual impact on the Mangaone Stream. The yard was considered to be clean and tidy.

15 November 2012
The asphalt plant was running at the time of inspection. It was found that the silt ponds looked good with the water being recycled back through the plant. There was no discharge into the wetland from the interceptor. The truck wash was not in use at the time of inspection. No spills were noted around the site. The Mangaone Stream was flowing clean and clear, both above and below the site. The stormwater drains around the site were visually clear of contaminants, and the site was considered to be tidy.

19 March 2013
It was reported that the plant was not operating at the time of inspection, with only cold mix being made on site. It was noted that the interceptor system looked to be working well, and it was observed that there was a small clear discharge into the wetland area. The truck wash was in use at the time of inspection and the workshop area was tidy. It was found that the stormwater drains were visually free of contaminants at the time of inspection. The Mangaone Stream was flowing clean and clear, both above and below the site. No spills were noted around the site, and the site was found to be tidy.

26 June 2013
The site was inspected in overcast conditions after recent showers. The plant was not in use at the time of inspection. The interceptor system looked good, and it was noted that there was no discharge into the wetlands at the time of inspection. Stormwater drains around the site were found to be clear of visible contaminants. The workshop area was tidy and it was noted that the wash bay was in use at the time of inspection. A sample was collected from the settling pond discharge. The wetland looked to be in good condition and it was noted that there was no visual impact on the receiving water from the site stormwater discharge. It was reported that the site was tidy.

29 August 2013
The site was inspected in wet and windy conditions. The plant was not operating at the time of inspection. There was a small clear discharge from the silt ponds. The Mangaone Stream was in flood. There was a small leak from a vehicle and this had left hydrocarbon patches around the site. The wetland had a small hydrocarbon sheen present. The site Health, Safety and Environmental Manager was spoken to and the inspecting officer was informed that staff had organised for the interceptors to be cleaned out and the hydrocarbon patches to be cleaned up. It was noted that there was no visual impact in the receiving waters at the time of inspection.

18 December 2013
The bitumen plant was operating at the time of inspection and trucks were loading out. The interceptor system looked good and the wetland was clear of hydrocarbons. The Mangaone Stream was flowing clean and clear. The truck was area was tidy. It was reported that the silt ponds looked good and were not discharging. The site was in a tidy condition.

6 March 2014
The plant was not operating at the time of inspection, but trucks were loading out. The wetland area looked good, and it was noted that there was no discharge

occurring to the Mangaone Stream at the time of inspection. Stormwater drains around the site were found to be visually clear of contaminants. It was reported that the truck wash area was in good condition, and that the site was tidy.

21 May 2014

The plant was not operating at the time of inspection. It was observed that there was a trickle discharge from the treatment ponds. The discharge looked to be of good quality. The wetland area also looked good, although it was noted that there was a small amount of rubbish around the wetland, near the interceptor. The interceptor looked to be working well. The Mangaone Stream was flowing clean and clear. It was reported that the truck wash sump looked to be quite full. No spills were noted around the site.

3.3.2 Results of discharge monitoring

Chemical monitoring of discharges from the site of Downer EDI Works Limited takes place at two points. The effluent to the wetland from the settling ponds at the asphalt plant is sampled at the ponds' outlet (site code IND002002). The combined flow of stormwater from the depot, which is treated in the oil separator and constructed wetland, and the pond effluent is sampled at the outlet to the Mangaone Stream (TRC site code MGO000189).

The discharge from the settling ponds is often highly turbid, however further "treatment" occurs in the constructed wetland. The discharge to the wetland is usually a grey colour, and contains a high concentration of fine suspended solids.

The results of chemical monitoring of the pond effluent and combined flows for the 2010-2012 periods are given in Table 4 and Table 5, respectively.

Table 4 Chemical monitoring results for Downer EDI Works Limited's settling ponds effluent for 2012-2014, with summary of previous monitoring data from October 1994 to June 2012. TRC site code IND002002

	Cond mS/m	O & G g/m^3	pH	SS g/m^3	Temp ^{O}C	Turby NTU
Number	23	22	23	23	22	9
Minimum	5.2	<0.5	5.9	4	10.5	3.7
Maximum	89.5	2.4	9.6	600	26.7	290
Median	39.2	0.2	7.6	110	19.5	20
04-Feb-13	55.2	<0.5	7.7	6	23.8	6.7
16-April-13[a]	-	-	-	-	-	-
26-Jun-13	38.1	b	7.5	160	37.4	220
04-Dec-13	39.9	b	7.9	86	24.6	100
09-Jun-14[a]	-	-	-	-	-	-

Key: Results shown in bold within a table indicates that a consent limit for a particular parameter has been exceeded
a Insufficient flow
b parameter not determined, no visible hydrocarbon sheen and no odour

During the years under review, the basin was discharging at the time of three of the five sampling surveys.

The suspended solids concentrations were found to be well below the historical maximum, with the concentration measured in the sample collected on 4 February 2013 being close to the lowest value recorded to date.

The median calculated from historical monitoring results indicates that the discharge typically has a low oil and grease concentration. This was also the case for the samples collected in the 2012-2014 years.

The pH result obtained for the samples collected during the years under review were acceptable, and similar to the median calculated from previous results.

Table 5 Chemical monitoring results for discharge from Downer EDI Works Limited's site to the Mangaone Stream for 2012-2014, with summary of previous monitoring data from September 1991 to June 2012. TRC site code MGO000189

	Cond mS/m	O & G g/m^3	pH	SS g/m^3	Temp ^{O}C	Turby NTU
Consent Limit	-	*15*	*6-8.5*	*100*	-	-
Number	40	32	40	40	36	13
Minimum	6.2	<0.5	6.5	<2	10.6	3.6
Maximum	32.2	4.9	8.4	370	19.2	380
Median	19.9	<0.5	6.8	15.5	15.3	50
04-Feb-13	20.3	<0.5	6.7	2	18.7	2.6
16-Apr-13	6.8	<0.5	7.4	11	17.6	18
04-Dec-13	13.5	b	6.6	14	18.2	18
09-Jun-14	13.8	0.6	6.8	34	16.7	43

Key: Results shown in bold within a table indicates that a consent limit for a particular parameter has been exceeded
b parameter not determined, no visible hydrocarbon sheen and no odour

Compliance with consent conditions for pH range (6.0-8.5), oil and grease (15 g/m^3), and suspended solids (100 g/m^3) concentration was observed during the 2012-2014 years.

It is noted that the suspended solids concentrations recorded were generally well below the historical median.

3.3.3 Investigations, interventions, and incidents

In the 2012-2014 period, the Council was required to undertake significant additional investigations and interventions, or record incidents, in association with Downer EDI Works Limited's conditions in resource consents or provisions in Regional Plans. Although these incidents were not related to the Company's operations at their Rifle Range Road site, the three recorded incidents and the results of the Council's investigations are outlined below.

1 November 2012
At 10:15 am a complaint was received about a digger operating in the Tongaporutu River. An investigation of the site found a very small amount of sediment disturbance at the high tide. All works appeared to be in keeping with what was submitted to the Council. The culvert was deemed as being a permitted activity under rule A1.1 of the Regional Coastal Plan for Taranaki. Photos were taken and photos were received from the complainant.

25 July 2013
At 11:00 am a complaint was received regarding roadside spoil being dumped beyond the roadside verge where it was likely to enter a waterbody at Mangaehu Road, Tututawa. A meeting was held on site with a Company representative. The Company was advised that it was not best practicable option to dump roadside spoil where it can reach a waterbody. A meeting was held with the Company and that matter discussed. A letter of explanation was received and accepted.

27 September 2013
At 11:54 am a complaint was received regarding the unauthorised discharge of roadside spoil into an unnamed tributary of the Mangaehu Stream at Mangaehu Road, Makahu. Investigation found that spoil had been placed in an area adjacent to the stream. Spoil had entered a nearby unnamed tributary of the Mangaehu Stream. There was also potential for future unauthorised discharge of roadside spoil into the unnamed tributary. Photographs were taken. A letter of explanation was received and accepted.

Follow-up inspections found that both of these locations were remediated to a satisfactory standard.

3.4 Discussion

3.4.1 Discussion of site performance

Housekeeping at the site was found to be good over the monitoring period.

The site was well managed during the years under review, with only minor issues being noted.

The discharge from the site complied with the conditions of consent on all monitoring occasions.

3.4.2 Environmental effects of exercise of consent

No adverse effects were noted on the water quality in the Mangaone Stream as a result of the exercise of Company's water permit.

3.4.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the years under review is set out in Table 6.

Table 6 Summary of performance for Downer EDI Works Limited consent 3917-2, discharge of stormwater and treated wastewater into the Waiwhakaiho River

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Concentration limits upon potential contaminants in discharge	Chemical sampling	Yes
2. Discharge cannot cause specified adverse effects beyond mixing zone	Visual assessment at inspection and receiving water sampling and biomonitoring	Yes
3. Preparation of contingency plan	Latest version October 2010	Yes
4. Provision for review of consent	Not scheduled for consideration for remainder of consent duration. Consent due to expire 1 June 2014	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

During the years under review, the Downer EDI Works Limited demonstrated a high level of environmental and high level of administrative performance and compliance with the resource consents as defined in Section 1.1.5. Although there were three incidents recorded, these were not related to the Company's activities at the Rifle Range Road site. One of the incidents was unsubstantiated, and corrective actions were undertaken promptly at the other two locations, such that the potential for adverse effects was avoided.

3.4.4 Recommendation from the 2010-2012 Biennial Report

In the 2010-2012 Biennial Report, it was recommended:

THAT monitoring of discharges from Downer EDI Works Limited in the 2012-2013 year continues at the same level as in 2010-2012.

This recommendation was implemented during the years under review.

3.4.5 Alterations to monitoring programmes for 2014-2015

In designing and implementing the monitoring programmes for water discharges in the region, the Council has taken into account the extent of information made available by previous authorities, its relevance under the RMA, the obligations of the Act in terms of monitoring discharges and effects, and subsequently reporting to the regional community. The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki discharging to the environment.

It is proposed that for 2014-2015, the programme remains unchanged. A recommendation to this effect is attached to this report.

3.5 Recommendation

THAT monitoring of discharges from Downer EDI Works Limited in the 2014-2015 year continues at the same level as in 2012-2014.

4. Farmlands Co-operative Society Limited

4.1 Process description

The New Plymouth Feed Mill now owned by Farmlands Co-operative Society Limited (Farmalnds) had been in operation on this 1.03 ha site at the eastern end of Katere Road, New Plymouth from 1966 to 2011. Raw grain and supplements were processed into feed for central North Island divisions of PCL Industries Limited and then Viterra (NZ) Limited.

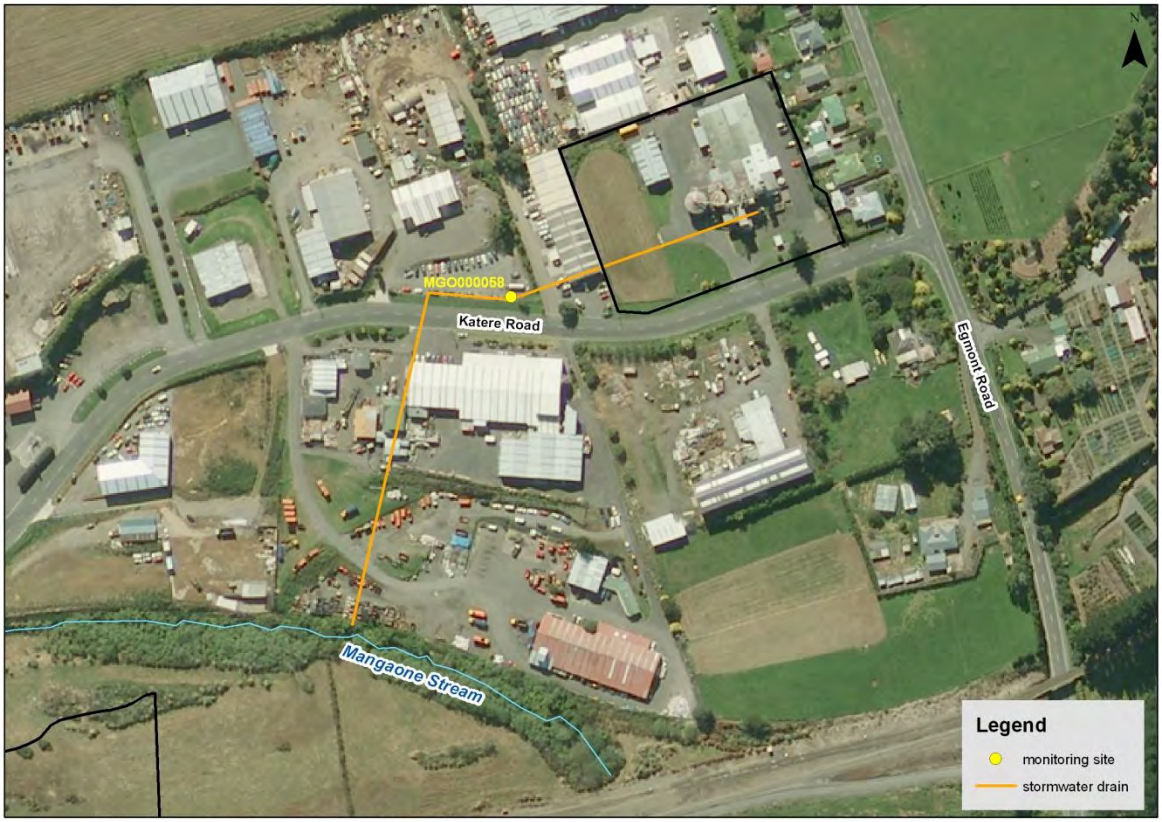


Figure 7 Viterra (NZ) Limited site and sampling point locations

Raw materials were transported to the site by truck in bagged and bulk form, the largest component being various types of grain. Other raw materials were soft goods or feed supplements such as vitamin and mineral premixes, or liquids such as tallow, vegetable oil, and molasses. The grain was ground and the meal was mixed and blended with various supplements and liquids according to requirements. A gas fired boiler [4.62 kW] was used in the cooking of material and drying of the finished product. The feed was then pelletised, bagged or stored in bulk before being loaded onto trucks for dispatch.

Dry materials were stored in silos and were moved around the site by the use of screw conveyers and bucket elevators. Both of these systems were totally enclosed.

Tallow was stored in heated tanks above the load out area. The tallow was kept warm so that it was in liquid form and could be pumped through to the processing area. The tanks are bunded. The bulk molasses was stored in a bunded tank outside

the eastern wall of the plant. The molasses processing area inside the plant is also bunded.

There were small amounts of greases [approximately 40 kg] and oils [approximately 60 L] kept on site to meet servicing requirements.

Trucks were loaded by a gravity fed system in a bay located at the lowest area in the stormwater catchment, almost directly above a solids separator. Tallow was also received into the plant at this point.

Stormwater drainage from the site and surrounding area passes through a small two-chamber solids separator then discharges via an underground drain under Katere Road where it joins the Mangaone Stream behind Waste Management's site at 86 Katere Road. A contractor was utilised by the previous consent holders to empty the solids separator every three months, or after spillage if it is considered necessary.

The industrial wastewater, which consisted predominantly of boiler blowdown, was also discharged via the solids separator into the unnamed tributary of the Mangaone Stream. The discharge rate from this source was 3 L/s for 12 seconds every one and a half hours. This equated to a maximum discharge quantity of 480 L/day through the course of a 20 hour day.

Truck washing was no longer conducted at the site, as the product transportation had been contracted out.

Whilst the mill was in operation, prior to maintenance work, the roofs and yard were sometimes hosed down, with the washings discharged via the solids separator into the unnamed tributary of the Mangaone Stream.

The mill site was purchased by Farmlands after the mill had been closed and the site cleared of feed stocks and hazardous substances.

The site is currently used by FBT for vehicle storage.

4.2 Water discharge permit

Farmlands holds consent for activities relating to a stockfeed mill at the eastern end of Katere Road (formerly operated by PCL Feeds Limited). Discharge Permit 4548 was originally granted on 27 July 1994 to provide for the discharge of up to 128 litres per second of stormwater and minor volumes of wastewater to a Mangaone Stream tributary for a period to 1 June 2002. The consent was transferred to the new company name of 'PCL Industries Limited' in July 1999. The consent was transferred on 21 January 2010 to PCL Feeds Limited, to Viterra (NZ) Limited on 13 August 2010 and then to Farmlands Co-operative Society Limited on 10 Dec 2013.

An application to renew the consent was received by the Taranaki Regional Council on 28 November 2001, and consent **4548-2** was granted on 11 January 2002. It expires on 1 June 2020, with provision for review of conditions in June 2003, June 2005, June 2008, and June 2014.

The consent places conditions on pH range (6-9), and maximum concentrations of oil and grease (15 g/m^3), biochemical oxygen demand (25 g/m^3), and suspended solids (100 g/m^3) in the discharge effluent. There are also conditions that must be met relating to the receiving water in the Mangaone Stream. A contingency plan in case of accidental spillage is required. It is also a requirement of the consent that the Company prepares, maintains and adheres to an operation and management plan.

4.3 Results

4.3.1 Inspections

22 August 2012

It was found that the site was unmanned at the time of inspection. Trucks and cars were parked onsite. It was noted that the feedmill was not in operation and no dust or odours were found beyond the boundary of the property. The storm water drains were found to be visually clear of contaminants, and the site was considered to be tidy.

9 November 2012

It was noted that the site was unmanned at the time of inspection. Truck and other vehicles were found to be parked on site. No dust or odours were found beyond the boundary of the property, and the stormwater drains were observed to be clean and clear. The site was reported to be tidy

25 February 2013

The site was unmanned at the time of inspection. No dust or odours were found beyond the boundary of the property. It was reported that the stormwater drains were dry. It was noted that there were vehicles parked on site, and the site was found to be tidy.

26 June 2013

It was found that the site was unmanned at the time of inspection. Trucks were parked on site. No odours or dust were found beyond the boundary of the property, and there was no stormwater discharge from the site at the time of inspection.

21 August 2013

The site was inspected in overcast conditions after recent heavy rain. The site was unmanned. No dust or odours were found beyond the boundary of the property. I was reported that the stormwater drains around the site were visually clear of contaminants, and the site was tidy.

7 October 2013

The site was inspected in response to a complaint received regarding the Mangaone stream being contaminated with hydrocarbons. It was found that the stream had a visible surface sheen. The discharge was traced through the storm water system to the feed mill, and it was found that there was the oil in the sump below the load-out area. FBT were contacted who outlined that Ireland Roading had undertaken a weigh-bridge hydro-test earlier in the day using water from a bitumen tank/truck. The sump under the weigh-bridge contained residual oil, which drained to the sump under the load-out area. A sucker truck was arranged and the sump was cleaned.

Although the consent holder (Viterra (NZ) Limited) was instructed to ensure the site discharges are compliant with resource consent conditions. The unauthorised discharge was attributed to Ireland Roading as the responsible party, and the incident is discussed further in Section 15.

6 November 2013

It was reported that the site was unmanned at the time of inspection. It was found that some of the sheds were open, and there was product present, stored on pallets. No dust or odours were found beyond the boundary of the property. The stormwater drains around the site were clean and clear. There were a number a vehicles and trucks parked on site. It was noted that the site was tidy.

12 February 2014

It was noted that the site was unmanned. At the time of inspection it was found that the stormwater drains were visually clear of contaminants, and the site was tidy.

1 May 2014

The site inspection was undertaken in fine weather conditions. There was no odour or dust found beyond the boundary of the property. The stormwater drains were visually clear of contaminants at the time of inspection, and it was noted that the site was unmanned. There were a few vehicles parked on site, and it was reported that the site was tidy.

4.3.2 Results of discharge monitoring

There was a discharge occurring from the site on three of the four sampling occasions. The results are presented in Table 7.

Table 7 Chemical monitoring results for Farmlands Co-operative Society Limited stormwater discharge for 2012-2014, with summary of previous monitoring data from November 1992 to June 2012 TRC site code MGO000058

	BOD g/m^3	Cond mS/m	DRP g/m^3P	NH_3 g/m^3N	NH_4 g/m^3N	O & G g/m^3	pH	SS g/m^3	Temp ^oC	Turby NTU
Consent limit	*25*	-	-	-	-	*15*	*6-9*	*100*	-	-
Number	35	40	18	37	37	32	40	38	39	13
Minimum	1.5	2.7	0.01	0.00002	0.038	<0.5	5.9	<2	10.1	5.2
Maximum	690	50.3	0.637	0.01003	11.4	13	7.4	530	20.5	96
Median	12	11.7	0.179	0.00056	0.259	0.6	6.5	34	16.1	42
16-Apr-13	-	-	-	-	-	-	-	-	-	-
4-Feb-13	2.4	13.2	0.060	0.00011	0.104	b	6.4	3	18.3	2.7
4-Dec-13	3.8	4.0	0.283	0.00079	0.192	0.6	7.0	28	18.0	26
9-Jun-14	5.7	5.4	0.036	0.00046	0.177	<0.5	6.9	34	15.0	36

Key: Results shown in bold within a table indicates that a consent limit for a particular parameter has been exceeded

a No discharge at time of sampling

b parameter not determined, no visible hydrocarbon sheen and no odour

Compliance was achieved with the consent limits for pH, suspended solids and oil and grease on all monitoring occasions.

BOD is limited within the consent conditions primarily because of the potential for growth of sewage fungus in the Mangaone Stream, and to a lesser extent because of the potential for de-oxygenation of the stream as the oxygen demand of the contaminants is exerted in the receiving environment. During the years under review, compliance was also achieved with the BOD limit on the Company's consent, and sewage fungus was not noted as being present in the stormwater drain on any of the sampling occasions.

4.4 Investigations, interventions, and incidents

In the 2012-2014 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with Farmlands Co-operative Society Limited's (and previously Viterra (NZ) Limited's) conditions in resource consents or provisions in Regional Plans.

There was unauthorised discharge found from the site during the period under review, however this was attributed to the activities of Ireland Roading Limited and is discussed in Section 7.3.2 and Section 15.

4.5 Discussion

4.5.1 Discussion of site performance

Housekeeping at the site over the monitoring period was good.

Routine sampling of the stormwater found that consent limits on component concentrations were complied with during the period under review.

In the past, whilst the mill was operating, there had on occasion been a sufficient source of nutrients to cause a growth of sewage fungus in the tributary and later in the stormwater pipe from the site. During the period under review, no sewage fungus was noted as being present in the stormwater drains at the time of the sampling runs, or at inspection.

4.5.2 Environmental effects of exercise of consent

The Company's consent requires that the discharge from the feedmill does not result in the unionised ammonia being increased above 0.025g/m^3 or the filtered carbonaceous BOD of the stream being raised above 2 g/m^3. The stream is monitored upstream at Egmont Road (TRC site code MGO000050) and approximately 200m downstream (TRC site code MGO000075). The New Plymouth District Council mid Katere Road drain also discharges between these two sites. The results of the receiving environment monitoring (Mangaone Stream) are given in Table 56, section 16.1.2.

During all surveys, the unionised ammonia was well below 0.025 g/m^3 at the time of sampling and there was only a small change between the upstream and downstream monitoring sites.

Although there were measurable increases observed in the filtered carbonaceous BOD downstream of the Farmlands discharge point at the time of all of the sampling

surveys, the filtered carbonaceous BOD of the stream remained below the 2 g/m^3 limit.

It is noted that on all sampling occasions, the BOD of the Mid Katere Road stormwater drain was higher than that of the Farmlands discharge.

During the period under review there were no observations reported relating to sewage fungus in the stormwater pipe or the Mangaone Stream.

4.5.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the years under review is set out in Table 8.

Table 8 Summary of performance for Farmlands Co-operative Society Limited consent 4548-2, discharge of treated stormwater and minor quantities of wastewater into the Mangaone Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Consent to be exercised as per application information	Inspections	Yes
2. Council to be informed prior to changes at site affecting discharge	Mill remained non-operational	Yes
3. Stormwater system to be maintained to Council's satisfaction	Inspection	Yes
4. Concentration limits on potential contaminants in discharge	Discharge sampling	Yes
5. Discharge cannot cause specified adverse effects beyond mixing zone	Visual assessment at inspection and receiving water sampling and biomonitoring	Yes
6. Limit on filtered carbonaceous BOD in stream	Receiving water sampling	Yes
7. Limit on unionised ammonia in stream	Receiving water sampling	Yes
8. Prepare and maintain contingency plan	Review of documentation received. Latest version 2002. Request from Council to review plan on 21 April 2009	Contingency plan in need of review if plant restarts
9. Prepare and maintain operation and management plan	Review of documentation received. Latest version 2002. Request from Council to review plan on 21 April 2009	Management plan in need of review if plant restarts or stormwater quality issues found
10. Consent to be exercised in accordance with management plan	Inspection and discussion with consent holder	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
11. Provisions for review of management plan	No request for plan review during the 2012-2014 period	N/A
12. Provision for review of consent	No further opportunities for review	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A not applicable of not assessed

During the years under review, Farmlands Co-operative Society Limited demonstrated a high level of environmental and high level of administrative performance and compliance with the resource consents as defined in Section 1.1.5. Although there was an unauthorised discharge of hydrocarbons found from the site during the period under review, this was attributed to the actions of Ireland Roading Limited.

4.5.4 Recommendation from the 2010-2012 Biennial Report

In the 2010-2012 Biennial Report, it was recommended:

THAT monitoring of discharges from Viterra (NZ) Limited in the 2012-2013 year continues at the same level as in 2010-2012.

This recommendation was implemented.

4.5.5 Alterations to monitoring programmes for 2014-2015

In designing and implementing the monitoring programmes for water discharges in the region, the Council has taken into account the extent of information made available by previous authorities, its relevance under the RMA the obligations of the Act in terms of monitoring discharges and their effects, and subsequently reporting to the regional community. The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki discharging to the environment.

It is proposed that for 2014-2015 the programme remains unchanged. A recommendation to this effect is attached to this report.

4.6 Recommendation

THAT monitoring of discharges from Farmlands Co-operative Society Limited in the 2014-2015 year continues at the same level as in 2012-2014.

5. Firth Industries Limited (Division of Fletcher Concrete and Infrastructure Limited)

5.1 Process description

Firth Industries Limited (Division of Fletcher Concrete and Infrastructure Limited) operates a concrete batching plant on a 1.19 ha site off Clemow Road, on the true left bank of the Waiwhakaiho River. The plant is situated partly on the flood plain and partly above the escarpment formed by the river. A concrete precast factory operated by Ultimate Engineered Concrete Limited is on the site. This includes a bedding plant, which operates from an area above the escarpment.

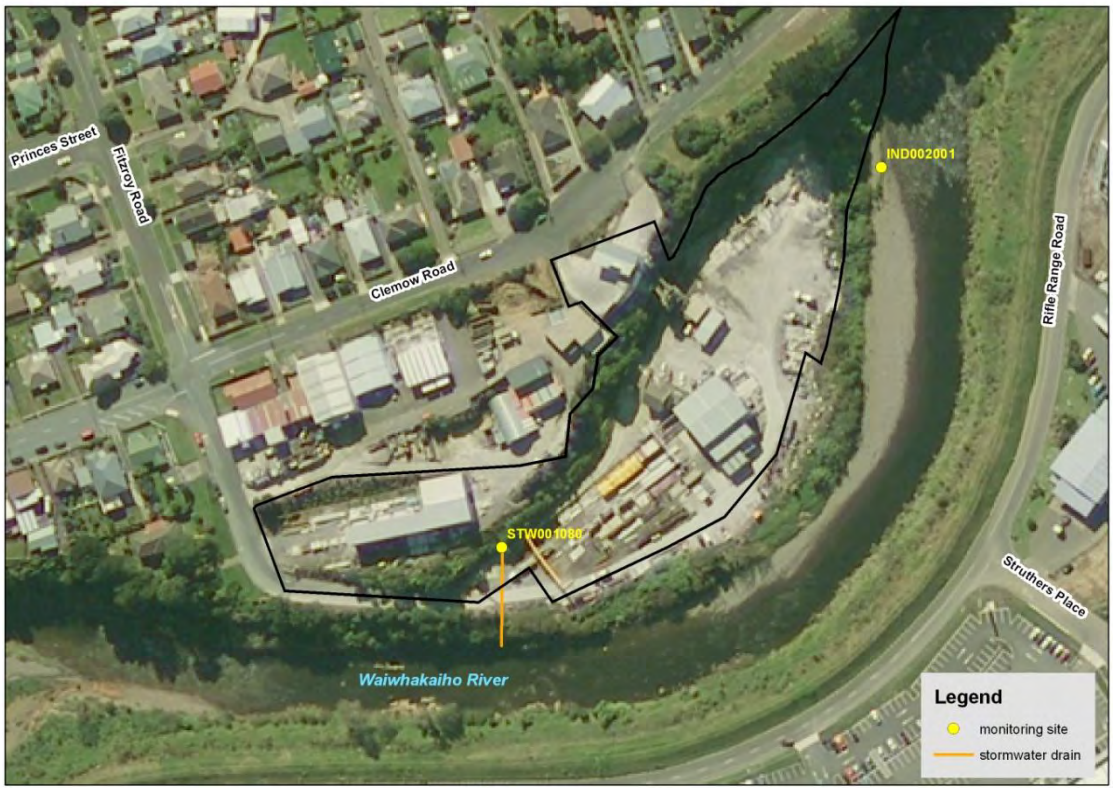


Figure 8 Firth Industries site location and discharge points

Stormwater from the lower part of the site is treated in a four-pond settling system before being pumped to the Waiwhakaiho River via an old watercourse. Wastewater from the washing of plant and concrete delivery trucks is discharged to the settling system. Where possible, this is then recycled for reuse as wash water. Seepage from the escarpment also flows to the settling ponds. Under heavy or prolonged rainfall conditions, the settled washings are discharged to the Waiwhakaiho River with stormwater. There is a back-flow prevention valve on the discharge line to prevent the Waiwhakaiho River from flooding the site.

Stormwater from the upper part of the site, where the bedding plant is situated, discharges via two small settling pits to the Waiwhakaiho River at a separate point.

A range of chemicals used in the readymix and precast operations are held in the catchment of the main settling system. On the whole, they are either stored indoors or within bunded areas.

Off-specification and surplus concrete, and solids from the settling ponds are deposited along the riverbank. This forms part of the flood protection works for the site. Excess solids are removed from the site periodically.

5.2 Water discharge permit

Firth Industries Limited (Firth) has a concrete batching plant on the left bank of the Waiwhakaiho River off Smart Road (north). Consent was first granted for discharges from the plant to the river in 1987. The third consecutive consent (**0392**) to discharge from the site was granted on 1 May 1996, to provide for up to 10 litres per second of truck washing effluent and up to 200 litres per second of stormwater, for a period until 1 June 2014. This consent was transferred to Firth Industries Limited (Division of Fletcher Concrete and Infrastructure Limited) on 17 February 2006 after an amalgamation of these Companies.

A change to consent conditions was granted on 29 May 2000. This change resulted in the controls being applied to the effects on pH in the receiving water, rather than the pH of the discharge per se.

Seven special conditions are appended to the consent. These include requirements that the discharge must not be allowed to alter the receiving water pH by more than 0.5 units, or cause it to exceed the range 6-9, limits on effluent composition (maximum oil and grease limit 15g/m^3 and suspended solids concentration 100 g/m^3), effluent treatment, requirements to maintain a contingency plan and control the discharge rate, and provision for a review of conditions in June 2002 and 2008. The consent expired on 1 June 2014.

The permit is attached to this report in Appendix I.

An application to renew this consent was received on 27 January 2014, and, the Council has exercised it's discretion under Section 124 of the RMA allowing the Company to continue to operate under the conditions of the expired consent until a decision is made on the renewal.

To enable continuation of the processing of the consent application, further information was requested that included:

- A consideration of alternatives and a review of on site practices to better identify the best practicable option
- Clarification around the stormwater/waste water discharge volumes, rates, potential contaminant and their potential effects
- Solid waste handling and storage practices

5.3 Results

5.3.1 Inspections

17 August 2012

The site was inspected in showery conditions after recent heavy rain. At the time of inspection the truck wash was not in use. The silt ponds looked good, and it was considered that the site was tidy. The discharge into the Waiwhakaiho River was clean and clear and was having no visual impact. There was a very small discharge of stormwater from the driveway from the upper level, and this was also reported to be clean and clear. The plant was operating during the inspection. The bunded areas under the plant were clean and dry. No spills were noted around the site. The aggregate/cement drop-off zones on Clemow Road were tidy. No dust was found to be discharging beyond the boundary at the time of inspection.

15 November 2012

No dust or odours were found beyond the boundary of the property. It was noted that the stormwater drain under the driveway from the upper level was not discharging. The truckwash was in use at the time of inspection. The silt ponds looked good. It was reported that the discharge into the receiving waters was clean and clear, and was having no visual impact. The site was found to be tidy.

26 February 2013

It was noted that the plant was not operating at the time of inspection, but a truck was being washed in the wash bay. The silt ponds looked good, and it was noted that there was a small clear discharge occurring to the Waiwhakaiho River. No visual impact was observed on the receiving waters. It was reported that the river flow was very low at the time of inspection. It was noted that the stormwater drains around the site were dry. No dust or odours were found beyond the boundary of the property. The site was tidy at the time of inspection.

5 June 2013

The site was inspected in overcast conditions after recent showers. It was found that the wash bay was in use at the time of inspection. It was noted that the settling ponds looked good, with a clear discharge occurring to the receiving water. There was no visual impact from the discharge. There was no odour or dust found beyond the boundary of the property. The site was considered to be tidy.

21 August 2013

The site was inspected in overcast conditions after recent heavy rain. The plant was not operating at the time of inspection, but the truckwash was in use. It was noted that the silt ponds appeared to be working well. There was a clear discharge into the Waiwhakaiho River, and there was no visual impact on the receiving water. No dust or odours were found beyond the boundary of the site. The site was tidy at the time of inspection.

3 December 2013

The site was inspected in fine weather conditions with light winds. Trucks were being washed and loaded out at the time of inspection. The silt ponds looked to be working well, with a clear discharge occurring to the Waiwhakaiho River. There was no visual impact noted on the receiving water. No dust was discharging beyond the boundary of the property. The site was found to be tidy.

18 February 2014

No dust or odours were discharging beyond the boundary of the property. A truck was being washed at the time of inspection. The silt ponds were discharging. It was noted that there was a white sludge visible on the bottom of the receiving waters and there was a slight foaming where the discharge entered the Waiwhakaiho River. The Company was advised that the silt ponds needed to be cleaned out regularly to ensure they operate efficiently, and within resource consent conditions. It was also reported that access to the river from the site was difficult.

At the end of the inspection the Company was instructed to ensure that the silt ponds were cleaned out regularly.

28 May 2014

The site was inspected in overcast conditions after recent showers. It was reported that the wash bay was not in use at the time of inspection. It was found that a concrete truck was loading out. It was noted that the ponds appeared to be working well, with a trickle discharge occurring to the Waiwhakaiho River. It was noted that there was a white sludge present on the sand on the river bed, but the liquid discharge was clean and clear. There was no visual impact on the receiving waters. No spills were noted around the site, and there was no dust or odour from the site. The site was considered to be tidy at the time of inspection.

5.3.2 Results of discharge monitoring

Effluent from Firth's site is monitored where it enters the Waiwhakaiho River below the main settling system. A second sampling site from the Ultimate Engineered Concrete facility on the upper level was also added to the monitoring programme (TRC site code STW001080) during the 1999-2000 monitoring period. This site receives wastewater from the settling pond from the bedding plant, located above the escarpment to the south west of the main plant, and stormwater runoff from the adjacently property (which is not owned by Firth, but is within the area covered by their resource consent).

Firth was granted a change to the conditions of consent 0392 on 29 May 2000. The pH range limit now relates to pH limits for the receiving water rather than the discharge itself. These limits are that the receiving water shall not alter by more than 0.5 of a pH unit, and that the pH of the receiving water shall not fall outside the range of 6.0-9.0, beyond a mixing zone extending 50 metres downstream of the discharge point.

The results for the stormwater drain at the Waiwhakaiho River (TRC site code IND002001) are given in Table 9. The results of the sampling from where the effluent and stormwater leaves the upper part of the site (i.e. pre-casting facility, TRC site code STW001080) are shown in Table 10, whilst the results of the receiving water (i.e. for the purposes of monitoring compliance with consent conditions) are given in Section 16.1.1.1, Table 54.

Table 9 Chemical monitoring results for Firth Industries discharge for 2012-2014, with summary of previous monitoring data from September 1990 to June 2012. TRC site code IND002001

	Cond mS/m	O & G g/m^3	pH	SS g/m^3	Temp ^{O}C	Turby NTU
Consent Limit	-	*15*	-	*100*	-	-
Number	55	43	55	55	53	14
Minimum	6.7	<0.5	9.9	<2	7.9	20
Maximum	321	1.9	12.3	610	25.7	420
Median	63.3	<0.5	11.5	39	15.0	120
04-Feb-13	36.5	b	11.0	88	20.6	110
16-Apr-13[a]	-	-	-	-	-	-
10-May-13	45.9	0.6	11.5	72	12.6	82
04-Dec-13	32.9	b	11.0	**150**	18.3	160
09-Jun-14	138	b	12.0	53	15.6	65

Key: Results shown in bold within a table indicates that a consent limit for a particular parameter has been exceeded
a No discharge at time of sampling
b parameter not determined, no visible hydrocarbon sheen and no odour

The suspended solid concentration of three of the four samples collected during the period under review complied with the consent limit, with the limit was exceeded in the sample collected on 4 December 2013.

The contaminant limit prescribed on the consent for the oil and grease concentration (15 g/m^3) was complied with on all sampling occasions during the years under review.

The pH of the discharge varies depending on the degree and type of activity at the plant and the amount of rainfall prior to sampling, the effects of which are limited in the receiving water, rather than in the discharge itself. The pH's of the samples collected during the 2012-2014 years were typical for this site, as they were generally similar to the median calculated from previous monitoring results.

Table 10 Chemical monitoring results for Firth Industries discharge for 2012-2014, with summary of previous monitoring data from June 2000 to June 2012. TRC site code STW001080

	Cond mS/m	O & G g/m^3	pH	SS g/m^3	Temp ^{O}C	Turby NTU
Consent Limit	-	*15*	-	*100*	-	-
Number	20	17	20	19	20	13
Minimum	4.1	0.5	7.8	7	10.1	11
Maximum	40.5	13.5	10	560	20.2	66
Median	12	1.8	8.2	27	16	30
04-Feb-13	11.2	<0.5	7.7	17	20.7	16
16-Apr-13[a]	-	-	-	-	-	-
10-May-13	11.4	1.6	8.0	49	12.8	34
04-Dec-13	55.4	b	8.5	13	18.6	12
09-Jun-14	9.4	b	8.1	20	15.6	29

Key: Results shown in bold within a table indicates that a consent limit for a particular parameter has been exceeded
a No discharge at time of sampling
b parameter not determined, no visible hydrocarbon sheen and no odour

The effluent and stormwater discharges sampled from the pre-casting plant were in compliance with the consent condition limits for all parameters on all occasions.

Compliance was achieved with the pH limit on the receiving water on three of the four monitoring occasions (refer Table 54, Section 16.1.1.1). Despite the stormwater being relatively alkaline at the discharge points there was little effect on the pH of the Waiwhakaiho River itself as a result of the discharges.

5.3.3 Investigations, interventions, and incidents

In the 2012-2014 period, the Council was required to undertake significant additional investigations and interventions, or record incidents, in association with Firth Industries Limited (Division of Fletcher Concrete and Infrastructure Limited)'s conditions in resource consents or provisions in Regional Plans.

2 April 2013

At 10:00 am a complaint was received concerning a white liquid discharging from the Firth cement property at Fitzroy, New Plymouth. An inspection of the Firth Industries Limited site found that all stormwater/washdown water flowed via a series of settling ponds into the Waiwhakaiho River from a point source. At the time of inspection the discharge was clear. A white substance (possibly calcium) had settled out of solution at the point of discharge and had created a hard, rock-like coating over the river bank. No adverse effects were observed and special condition 2 (constituents in discharge) of consent 0392-3 were being complied with at the time of investigation.

5 March 2014

At 12:00 am a complaint was received regarding a discoloured river in Waiwhakaiho, New Plymouth. An inspection was undertaken with the Site Manager. It was found that there was white material on the river bank and slight foaming. There was no visual impact on the receiving waters (Photo 1). The Site Manager said they would remove the sludge from the sand and clean out the area that had pooled before the river. A re-inspection was undertaken on 18 March 2014 to follow up on the complaint. It was found that the sludge had been cleaned up, and there was no foam visible at the time of inspection. The pooled area of discoloured liquid had also been removed, and this was clear during the inspection.

Photo 1 Firth discharge to the Waiwhakaiho River 3 March 2014

5.4 Discussion

5.4.1 Discussion of site performance

In terms of housekeeping practices, the Firth facilities were generally well managed during the years under review.

The settling pits were generally found to be well managed at inspection, however after a white sludge and foamy discharge were found below the discharge point at inspection on 18 February 2014, the Company was instructed ensure that the ponds were cleaned out regularly. Sampling of the discharge prior to this inspection (4 December 2013), found that the suspended solids concentration imposed by the consent had been exceeded. The discharge was found to comply with the limits on the consent during the other three sampling surveys.

Two complaints were received regarding discolouration in the discharge from this site, or in the Waiwhakaiho River below the site. Upon investigation it was found that on one occasion visible effects were present, but it was deemed that there was no breach of consent occurring. On the other occasion it was found that although there were no adverse effects in the Waiwhakaiho River, there was calcification and a white sludge present on the river bed. It was agreed that the Company would remediate the affected area of river bed, and this was done promptly.

5.4.2 Environmental effects of exercise of consent

The Company generally demonstrated compliance with the consent conditions imposed on consent 0392 during the 2012-2014 monitoring periods. Although the

was one exceedance of suspended solids concentration found during sampling, there was little, if any, effect on the suspended solids concentration of the river at the time of sampling.

Imposing a pH control limit on the receiving water as opposed to the discharge still appears to be an appropriate control mechanism. Whilst the pH level of the discharges is quite alkaline, this was assimilated within the receiving water with little, if any, effect observed in the Waiwhakaiho River.

Historically, some white staining of the riverbed with calcium deposits has occurred for a distance of up to about 15 metres from the lower discharge point. However, this is within the 50-metre mixing zone and no adverse biological effects have been observed as a result. During the years under review it was found that due to the Waiwhakaiho River altering course away from the site, there was calcified sediment in a pooled area on one occasion, and that there was a sludge and discoloured foamy discharge extending along the river bed from the discharge point to the edge of the flow of the Waiwhakaiho River. No effects were found in the receiving water itself, and the Company remediated the area.

It is noted that the Company remediation calcified deposits on the Waiwhakaiho River bed on one occasion during the previous monitoring period. The Council is therefore the working with the Company during the consent renewal process to decrease the frequency of discharges from the site, and to improve the discharge quality in order to avoid or minimise these actual or potential visible effects on the banks and/or bed of the Waiwhakaiho River.

5.4.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the years under review is set out in Table 11.

Table 11 Summary of performance for Firth Industries consent 0392-3, discharge of treated concrete truck washings

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Discharge cannot cause specified general adverse effects beyond mixing zone	Sampling and discharge point inspections	Yes
2. Concentration limits upon potential contaminants in the discharge (suspended solids and O&G)	Chemical sampling	SS limit exceeded in 1 of 4 samples
3. pH limits on receiving water as a result of discharge	Chemical sampling	Yes
4. Rate of discharge to be controlled	Observation and discussion at inspection	Yes
5. Efficient maintenance and operation of ponds	Observation and discussion at inspection	Instructed to improve pond maintenance on 1 of 8 routine monitoring inspections
6. Provision and maintenance of a contingency plan	Review of plans provided.	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
7. Optional review provision re environmental effects	Scheduled for consideration June 2008	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		Good
Overall assessment of administrative performance in respect of this consent		Good

N/A = not applicable

During the years under review, Firth Industries Limited (Division of Fletcher Concrete and Infrastructure Limited) demonstrated a good level of environmental and a good level of administrative performance and compliance with resource consents as defined in Section 1.1.5. During the period under review there was one minor exceedance of the suspended solids limit on the consent, with no effect found in the Waiwhakaiho River at the time of sampling. There were calcified deposits, and a white foamy discharge found travelling across the Waiwhakaiho River bed on one occasion, and the Company remediated the area promptly upon request. Council is working with Firth regarding improved stormwater/wastewater management options during the consent renewal process to avoid a reoccurrence.

5.4.4 Recommendation from the 2010-2012 Biennial Report

In the 2010-2012 Biennial Report, it was recommended:

THAT monitoring of discharges from Firth Industries Limited (Division of Fletcher Concrete and Infrastructure Limited) in the 2012-2013 year continues at the same level as in 2010-2012.

This recommendation was implemented in full.

5.4.5 Alterations to monitoring programmes for 2014-2015

In designing and implementing the monitoring programmes for water discharges in the region, the Council has taken into account the extent of information made available by previous authorities, its relevance under the RMA, the obligations of the Act in terms of monitoring discharges and effects, and subsequently reporting to the regional community. The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki discharging to the environment.

It is proposed that for 2014-2015, the programme remains unchanged. A recommendation to this effect is attached to this report.

5.5 Recommendation

THAT monitoring of discharges from Firth Industries Limited (Division of Fletcher Concrete and Infrastructure Limited) in the 2014-2015 year continues at the same level as in 2012-2014.

6. Fitzroy Engineering Group Limited

6.1 Process description

Fitzroy Engineering Group Limited (FEGL) operates an engineering business which involves the manufacturing of heavy engineering components and structures, and activities at the site also include abrasive blasting and painting.

The site was previously leased by FEGL from Technix Group Limited (Technix), and the stormwater discharges from FEGL's activities were covered under consents held by TGL. In 2013 FEGL purchased the part of the property they operate on from Technix (Figure 9). After the purchase of the property resource consent 0021-3 was transferred from Technix to FEGL. Resource consent 0291-3 was split into two consents as the northern area covered by this consent was now owned by FEGL. The consent number assigned to this catchment area was consent number 9853.

Figure 9 Technix Group Limited and Fitzroy Engineering Group Limited subdivided site

The stormwater area for consent 0021 covers the south-west section of FEGL's property. The stormwater drainage system runs from the south and east boundary towards the east boundary, the drainage then runs north towards the Waiwhakaiho River and discharges into the river via a stormwater drain (STW002001, Figure 10). There are multiple sumps along this system to collect stormwater.

The buildings/land use within this area includes:

- Staff offices and facilities,
- Workshops (Machining, plate and general),
- Dangerous goods storage,
- Liquid oxygen tanks, and
- Blast and Paint storage.

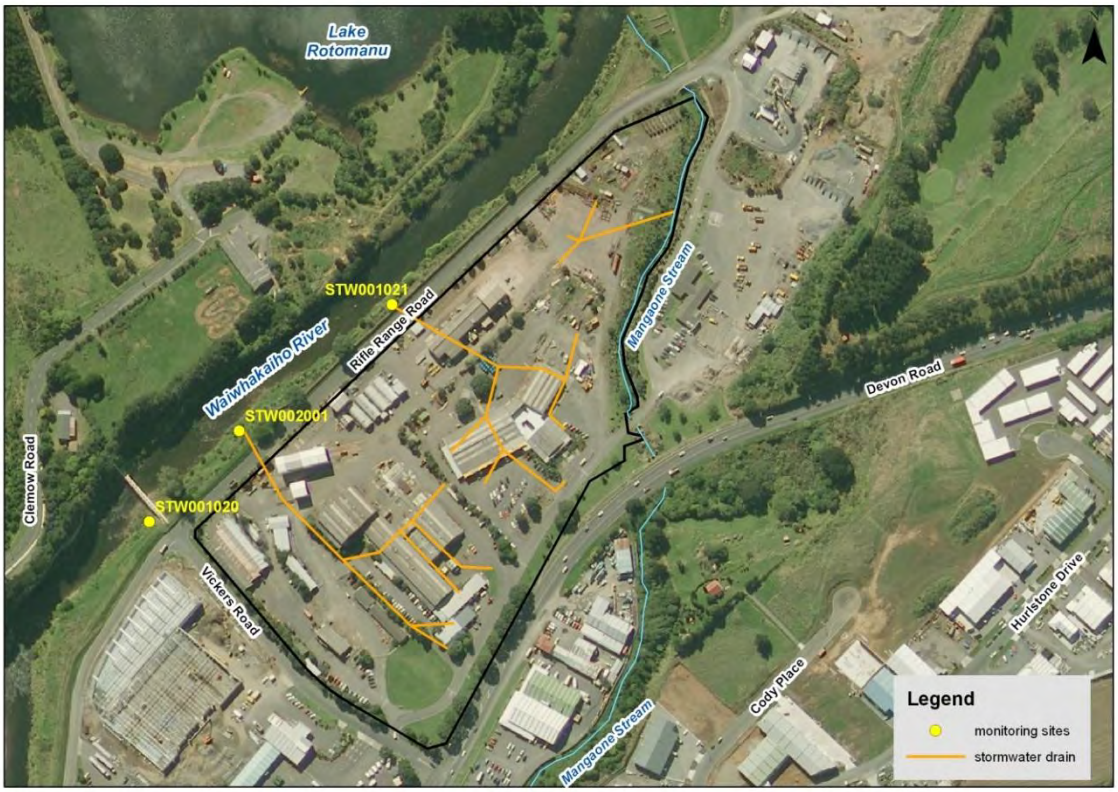


Figure 10 Fitzroy Engineering Group limited site and stormwater discharge points

The drainage system for the 9853 discharge begins in the adjacent Technix property, continues north through FEGL's section, and discharges into the Waiwhakaiho River via a stormwater drain (STW001021). The system has a sump on the southern boundary and another attached to the blast and paint shop. A dangerous goods storage shed is also in this catchment area.

FEGL undertakes infrequent hydrotesting processes on large fabrications, and also operations involving the passivating of stainless steel. These activities produce wastewater that may contain contaminants such as penetrant dye and rust inhibitor, and also can be acidic. These activities sometimes occur outside. FEGL has advised that the wastewater from these processes will be bunded using tarpaulin sheets, and any drains will be blocked with sandbags. Once that activity is finished the waste will be removed by a waste management specialist.

FEGL has provided a stormwater management plan and spill contingency plan.

6.2 Water discharge permits

During the last four months of the period under review FEGL held two resource consents in respect of discharges from an industrial engineering complex situated immediately upstream of the confluence of the Waiwhakaiho River and Mangaone Stream. The consents related to discharges of stormwater to the Waiwhakaiho River, which had initially been covered by consents held by Technix.

Consent **0021** provides for the discharge to the river opposite Fitzroy Engineering Group's plate shop. In addition to the main building of Fitzroy Engineering Group,

and a dangerous goods store, the catchment includes Technix's engineering services, mechanic and stores. This consent was transferred to FEGL on 20 February 2014.

Discharge permit **0021-3** was granted on 1 May 1996 to discharge stormwater off a Vickers Road site into the Waiwhakaiho River, with the 'standardised' conditions, for a period until 1 June 2014. This permit is the fourth consent issued for the discharge since 1970. The discharge rate allowed is 400 litres per second. There was a provision for a review of consent conditions in the month of June 2008.

Consent **9853** provides for the discharge of stormwater to the river opposite Fitzroy Engineering Group's blast and paint shop. This is a combined discharge point as the catchment includes FEGL's blast and paint operation, another building complex (which has been occupied by about five tenants, but from 1 January 2008 the only occupants were Fitzroy Engineering, Technix Group Limited and Steelfab), a truck washing area, and a dangerous goods store. The discharges from this whole area were previously covered by one consent, held by Technix (**0291**). A partial transfer of this consent took place on 20 February 2014, with the catchment area now covered by consent 9853 shown **Figure 9** (area 1).

Discharge permit **9853** was granted on 20 February 2014 to discharge stormwater, including treated truckwash water, from an industrial site into the Waiwhakaiho River for a period until 1 June 2014. The consent contained the 'standardised' conditions, and a condition prohibiting the discharge of wastes containing cleaning solvents. The consent is the second issued for the discharge since 1976. There was a provision for a review of consent conditions in the month of June 2008.

Applications to renew these consents were received on 26 February 2014, and therefore under Section 124 of the RMA, the Council exercised its discretion and allowed the activity to continue under the conditions of the expired consents until a decision was made on the renewal applications.

6.3 Results

6.3.1 Inspections

24 March 2014

This site inspection was undertaken in fine weather conditions. The stormwater drains around the site were visually clear of contaminants. The diesel bund area was tidy with no spills noted. There was no blasting or painting occurring at the time of inspection. No dust or odours were found beyond the boundary of the property, and the site was considered to be tidy.

10 June 2014

An inspection was undertaken in response to a complaint received regarding hydrocarbons discharging to a road side drain. It was found that the stormwater run-off into the road side drain along Rifle Range Road, adjacent to the diesel tank and bund, had a hydrocarbon surface sheen. The Waiwhakaiho River was inspected and found to be turbid and in high flow. The discharge of hydrocarbons was not found to be affecting the river at the time of inspection. The issue was reported to the FEGL HSE manager who agreed to address the source of the hydrocarbons.

The Company was instructed that the following action was to be taken: Ensure all storm water run-off complies with the Regional Freshwater Plan.

6.3.2 Results of discharge monitoring

There are two routine sampling points for monitoring of stormwater discharges from FEGL site stormwater discharges to the Waiwhakaiho River. They were the storm drain opposite Fitzroy Engineering Group's plate shop (consent 0021, TRC site code STW002001), and opposite Fitzroy Engineering Group's blast and paint shop (consent 9853, TRC site code STW001021). The latter discharge point also contains stormwater, and potentially truckwash wastewater from the area covered by Technix's consent 0291.

Opposite Fitzroy Engineering Group's plate shop (Consent 0021)

The results reported in Table 50 are for those samples collected prior to the transfer of this consent to FEGL.

The values for pH, suspended solids, and oil and grease are all within the limits set in the "standardised" conditions for consent 0021.

Table 12 Monitoring results for FEGL stormwater discharge for 20 February 2014- 30 June 2014, with summary of previous monitoring data from September 1990 to June 2012. TRC site code STW002001

	Cond mS/m	O & G g/m^3	pH	SS g/m^3	Temp ^oC	Turby g/m^3
Consent limits	-	*15*	*6-8.5*	*100*	-	-
Number	39	37	39	39	37	14
Minimum	2.8	<0.5	7	5	10.3	5.6
Maximum	234	25	9.7	790	20.4	160
Median	7.4	1.4	7.4	57	15.4	72
9-Jun-14	2.8	b	7.3	7	15.3	9.6

Key: Results shown in bold within a table indicates that a consent limit for a particular parameter has been exceeded

b parameter not determined, no visible hydrocarbon sheen and no odour

Opposite Fitzroy Engineering Group's Blast & Paint (Consent 0291)

As discussed, this discharge contains stormwater from both the Technix and FEGL sites. Up until 20 February 2014, this combined discharge was covered solely by consent 0291 held by Technix. The partial transfer of consent to FEGL resulted in the FEGL stormwater being covered by their own consent (9853).

The conditions on stormwater composition on consent 0291 and 9853 for pH range, suspended solids and oil and grease were complied with on each monitoring occasion.

Table 13 Chemical monitoring results for FEGL/Technix combined stormwater discharge for 2012-2014, with summary of previous monitoring data from September 1990 to June 2012. TRC site code STW001021

	Cond mS/m	O & G g/m^3	pH	SS g/m^3	Temp ^{O}C	Turby NTU
Consent limits	-	*15*	*6-9*	*100*	-	-
Number	34	32	34	34	33	14
Minimum	2.2	<0.5	6	<2	10.6	6.7
Maximum	24.4	35	7.7	530	20.8	200
Median	6.6	1.3	7.3	41	14.7	42
4-Feb-13	6.3	<0.5	6.6	18	23.4	41
16-Apr-13	4.6	2.2	7.3	50	18.8	97
4-Dec-13	3.4	b	7.1	14	19.9	18
9-Jun-14	2.8	b	7.3	7	15.3	9.6

Key: Results shown in bold within a table indicates that a consent limit for a particular parameter has been exceeded

b parameter not determined, no visible hydrocarbon sheen and no odour

6.4 Investigations, interventions, and incidents

In the 2012-2014 period, the Council was required to undertake significant additional investigations and interventions, or record incidents, in association with FEGL's conditions in resource consents or provisions in Regional Plans.

13 July 2012

Self-notification was received concerning an oil spill in an industrial yard at Rifle Range Road, New Plymouth. Investigation found that oil had spilled from a process unit, in a bunded area, on the yard of FEGL. Council was informed that the incident occurred when Archers were preparing the units to go off-shore. The oil had been contained before it reached stormwater. Sawdust and sand had been applied to soak up the oil. Trans Pacific were contacted to remove any remaining oil from within the unit.

10 June 2014

During routine stormwater sampling it was discovered that a site used for engineering purposes was not operating within resource consent conditions with regard to stormwater discharges. Hydrocarbons were found in a roadside drain that was discharging to stormwater. No evidence of any hydrcarbons were found in the Waiwhakaiho River. The issue of the (very minor) hydrocarbon contamination was outlined to the HSE Manager. The Company undertook to address the source of the hydrocarbons. Less than one hour later a reinspection found the site discharges were free of hydrocarbon sheen.

6.5 Discussion

6.5.1 Discussion of site performance

Housekeeping at the site over the monitoring period was generally good, and inspection found that the bunds had been well managed. Although during a sampling survey, a hydrocarbon sheen was observed to be entering a roadside

stormwater drain from the area around the bund, this was resolved promptly and there were no effects observed in the receiving water.

In previous years it has been found that further improvements in Fitzroy Engineering Group Limited's cleaning up of spent blasting media was desirable, as tracking of spent blasting media towards the stormwater drains has previously been observed on occasion. During the years under review the stormwater drains were found to be visually clear of contaminants at all site inspections.

The stormwater discharges from the site were found to be compliant with consent conditions on all monitoring occasions

6.5.2 Environmental effects of exercise of consents

There were no adverse environmental effects noted in the receiving environment as a result of FEGL discharges.

6.5.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the years under review is set out in Table 14 and Table 15.

Table 14 Summary of performance for FEGL consent 0021-3, discharge of stormwater into the Waiwhakaiho River

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Concentration limits upon potential contaminants in discharge	Chemical sampling	Yes
2. Discharge cannot cause specified adverse effects beyond mixing zone	Visual assessment at inspection and receiving water sampling and biomonitoring	Yes
3. Prepare and maintain contingency plan	Review of documentation received. Latest version received Mat 2014	Yes
4. Provision for review of consent	No further opportunities for review	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 15 Summary of performance for FEGL consent 9853-1, discharge of stormwater and treated truckwash water into the Waiwhakaiho River

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Concentration limits upon potential contaminants in discharge	Chemical sampling	Yes
2. Discharge cannot cause specified adverse effects beyond mixing zone	Visual assessment at inspection and receiving water sampling and biomonitoring	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
3. Prohibits discharge of cleaning solvents	Visual assessment at inspection and receiving water sampling and biomonitoring	Yes
4. Prepare and maintain contingency plan	Review of documentation received Latest version received May 2014	Yes
5. Provision for review of consent	No further opportunities for review	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

During the years under review, Fitzroy Engineering Group Limited demonstrated a high level of environmental and high level of administrative performance and compliance with the resource consents as defined in Section 1.1.5. Although there were two incidents recorded, there was no breach of consent found, and no adverse effects were found in the receiving water.

6.5.4 Alterations to monitoring programmes for 2014-2015

In designing and implementing the monitoring programmes for water discharges in the region, the Council has taken into account the extent of information made available by previous authorities, its relevance under the RMA the obligations of the Act in terms of monitoring discharges and effects, and subsequently reporting to the regional community. The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki discharging to the environment.

It is proposed that for 2014-2015, the programme remains unchanged. A recommendation to this effect is attached to this report.

6.6 Recommendation

THAT monitoring of discharges from Fitzroy Engineering Group Limited in the 2014-2015 year continues at the same level as in 2012-2014.

7. Freight and Bulk Transport Holdings Limited

7.1 Process description

Freight and Bulk Transport Holdings Limited operate a truck depot that services the rural sector from this 1.77 ha site on Katere Road.

This site was previously monitored under the annual inspection round of truck washes, and was incorporated into the Lower Waiwhakaiho Catchment Monitoring Programme at the start of the 2009-2010 year.

Figure 11 Location of Freight and Bulk Transport Holdings site

The Company stores, blends and distributes dry stock feeds such as crushed meal, palm kernel and grains. Lime, fertiliser and gravel used for farm races are also stored at the site. The lime, stock feeds and fertilisers are stored in the sheds at the northern end of the site; only the gravel is stored outside in the stormwater catchment. Stock trucks are no longer operated through this site.

There is a workshop at the site for servicing the vehicle fleet. Scrap metals from vehicle repair workshop are stored in a bin to contain any oily runoff, and the waste oil storage vessel is contained within a bund. There is a refuelling facility near the site offices.

In the middle of the upper level there is an uncovered wash bay, this contains two wash areas; the fleet wash area and the main wash area. A biodegradable detergent (XT88) is used at the truckwash. There is a 4 metre by 15 metre retaining pit under the wash bay, which drains to six 1 m x 10.5 m deep soak holes.

The majority of the stormwater from the site is collected by three stormwater sumps, which discharge to the Mangaone Stream via the mid Katere Road drain. However, stormwater from the catchment area around the workshop drains into the wash bay sump and soak holes.

Some stormwater is retained on site, and is used in the truckwash.

A workshop is located on the lower level.

As with most of the other consents in the Waiwhakaiho catchment, consent 2041 requires that the consent holder provided a satisfactory contingency plan to Council. In this case, the relevant special condition required that the plan be submitted to Council within three months of the granting of the consent, i.e. by 1 August 1996. There is a satisfactory contingency plan on file, dated 1 December 2010.

7.2 Water discharge permit

Freight and Bulk Transport Holdings Limited (FBT) operates a transport depot on Katere Road, New Plymouth on the northern side of the Mangaone Stream. The site is used for the storage of stock feed and aggregate, and contains a truck wash facility. Consent was first granted to Farmers Bulk Topdressers Limited for the discharge of treated truck washdown wastewater and stormwater through a settling pond and to soak holes into groundwater in the Mangaone catchment in November in 1986. The consent was transferred to FBT on 25 February 1991. The consent (**2041-2**) to discharge from the site was granted on 1 May 1996, to provide for the discharge of up to 2.8 cubic metres per day of treated truck washdown water and stormwater onto and into land in the vicinity of the Mangaone Stream, for a period until 1 June 2014.

Three special conditions are appended to the consent, which include provisions for review of the consent, requirements to provide a contingency plan and the prohibition of specific effects in the Mangaone Stream.

The permit is attached to this report in Appendix I.

On 10 September 2013 the Council advised FBT that the site was also likely to require consent for the stormwater discharges from the site. An application to renew this consent, solely for the discharge of treated waste water onto and into land, was received on 28 February 2014, and therefore according to Section 124 of the RMA, the Council has exercised it's discretion and is allowing the Company to continue to operate under the conditions of the expired consent until a decision is made on the renewal.

7.3 Results

7.3.1 Inspections

30 August 2012

No objectionable or offensive odours, or emissions, were found beyond the boundary of the property. The truck wash was in use at the time of inspection. The contaminated wash water was being directed to the wash water pit. The level in the

pit was low. It was noted that the drain warden in the stormwater sump near the exit from the load out tunnel was working well. The stormwater drains around the site were visually free of contaminants. It was reported that the new workshop area was tidy, and that the site as a whole was considered to be tidy.

15 November 2012

It was reported that no odours or emissions were found beyond the boundary of the property. A truck was being washed at the time of inspection. The wash pit was full and it was noted that the pump to the soak holes was not running. No spills were noted around the site. The stormwater drains looked good and were visually clear of contaminants. The workshop area, and site in general, were tidy.

28 February 2013

No dust or odours were found beyond the boundary of the property. The diesel tank area was reported as being tidy. The wash pit was full but not overflowing. The pump was not running at the time of inspection. No spills were noted around the site. All stormwater drains around the site were clean and clear. The drain warden outside the truck load out area was working well. No tracking of product was noted. Minor earthworks were occurring on site to allow the boundary fence to be repaired. The site was tidy.

19 April 2013

The site inspection was undertaken with the site owner. It was reported that the truck wash was not working as efficiently as it could do, but that it was being well maintained. The inspecting officer was informed that a contractor was due that day to drill new soak holes, and that the solids were going to be removed from the settling pit within the next day or two. It was reported that works were to be undertaken within the next few days to bund a hard stand storage area to minimise stormwater run off to the truck wash, and that the Company was looking to upgrade the system in the near future, but they were waiting on the outcome of some possible building works for a new shed.

24 June 2013

The site was inspected in overcast conditions after recent showers. The diesel bund looked satisfactory and no spills were noted in this area. It was found that the wash pit was full at the time of inspection, but it was not in use. It was noted that the pump was not operating. It was found that the stormwater drains around the site were visually clear of contaminants. No odours or dust were found beyond the boundary of the property. No spills were noted around the site, and the workshop area was tidy. It was observed that there was a pile of topsoil at the top of the driveway. The Company was asked to watch the runoff from this, and to ensure that no sediment enters the stormwater network.

2 September 2013

The site was inspected in fine weather conditions. No dust or odours were found beyond the boundary of the property. The stormwater drains around the site were found to be visually clear of contaminants. A truck was loading at the time of inspection. The workshop area was tidy and no spills were noted around the site. The wash bay was in use at the time of inspection and it was observed that the wash pit was full. It was considered that the site was tidy at the time of inspection.

3 December 2013
The site was inspected in fine weather conditions with light winds. It was noted that the diesel tank and bund area looked good. The wash pit was full and the pump was not operating at the time of inspection. No trucks were being washed, no trucks were loading out, and no spills were noted around the site at time of inspection. The stormwater drains were found to be dry. The workshop area was tidy, as was the rest of the site. It was reported that no dust or odours were discharging beyond the boundary.

19 February 2014
Stormwater drains around the site were found to be visually clear of contaminants at the time of inspection. The truck wash was not in use and it was reported that the wash pit level was low. No odours were found beyond the boundary of the property. The site was tidy at the time of inspection.

12 June 2014
The inspection was undertaken in wet weather conditions. No trucks were loading out at the time of inspection. There was no dust or odour discharging beyond the boundary of the site. The Company was advised that the drain warden needed a clean out as there was stormwater backed in up in the drain. The other stormwater drains were visually clean and clear. There was a truck being washed out at the time of inspection and it was noted that the wash pit was almost full. The workshop area was tidy, and no spills were noted around the site.

7.3.2 Investigations, interventions, and incidents

In the 2012-2014 period, the Council was required to undertake significant additional investigations and interventions, or record incidents, in association with Freight and Bulk Holdings Limited's conditions in resource consents or provisions in Regional Plans in relation to this Katere Road site. However, one incident was recorded in relation to a nearby site being leased by the Company.

7 October 2013
At 6:15 pm an inspection was undertaken in response to a complaint received regarding the Mangaone Stream being contaminated with hydrocarbons. It was found that the stream had a visible surface sheen. The discharge was traced through the stormwater system to the closed feed mill site leased by FBT. Oil was found to be present in the sump below the load-out area. FBT were contacted and the Company outlined that Ireland Roading had undertaken a weigh-bridge hydro-test earlier in the day using water from a bitumen tank/truck. The sump under the weigh-bridge contained residual oil and this drained to the sump under the load-out area. A sucker truck was arranged and the sump was to be cleaned.

Although investigation found that FBT were not the party responsible for this unauthorised discharge, as the lease of the site, the Company was instructed to ensure the site discharges were compliant with resource consent conditions.

7.4 Discussion

7.4.1 Discussion of site performance

Housekeeping at the site was generally found to be good over the monitoring period, and the site was generally well managed. There was no tracking noted during the years under review, and the drain filter was found to be in need of a clean out on only one of the nine inspections undertaken during the year under review.

There is no stormwater discharge consent in place for the site, as activities had previously been thought to comply with the standards/terms/conditions of the permitted activity rule (Rule 23) in the Regional Freshwater Plan for Taranaki (Appendix V). Inspection during the years under review continued to indicate that this may not necessarily be the case, and the Company was advised that they should apply for a stormwater discharge consent. An application was received in the 2014-2015 year.

7.4.2 Environmental effects of exercise of consent

No adverse effects were noted on the water quality in the Mangaone Stream as a result of the exercise of Company's water permit.

7.4.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the years under review is set out in Table 16.

Table 16 Summary of performance for Freight and Bulk Transport Holdings Limited consent 2041-2, discharge of treated truck wash wastewater and stormwater onto and into land in the vicinity of the Mangaone Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Provision for review of consent	Not scheduled for consideration for remainder of consent duration. Consent due to expire 1 June 2014	N/A
2. Preparation of satisfactory contingency plan by 1 August 1996	Review of Council records. Plan on file dated 1 December 2010	Yes
3. Discharge cannot cause specified adverse effects beyond mixing zone	Visual assessment at inspection and receiving water sampling and biomonitoring	Yes
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

During the years under review, Freight and Bulk Transport Holdings Limited demonstrated a high level of environmental performance and compliance with their resource consent, but overall an improvement was required in their administrative performance as defined in Section 1.1.5. It was identified that activities at the site did not comply with the permitted activity rule for stormwater discharges in the Regional Freshwater Plan. The Company has since applied for a consent.

7.4.4 Recommendation from the 2010-2012 Biennial Report

In the 2010-2012 Biennial Report, it was recommended:

THAT monitoring of discharges from Freight and Bulk Transport Holdings Limited in the 2012-2013 year continues at the same level as in 2010-2012.

This recommendation was carried out in full.

7.4.5 Alterations to monitoring programmes for 2014-2015

In designing and implementing the monitoring programmes for water discharges in the region, the Council has taken into account the extent of information made available by previous authorities, its relevance under the RMA, the obligations of the Act in terms of monitoring discharges and effects, and subsequently reporting to the regional community. The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki discharging to the environment.

It is proposed that for 2014-2015, the programme remains unchanged. A recommendation to this effect is attached to this report.

7.5 Recommendation

THAT monitoring of discharges from Freight and Bulk Transport Holdings Limited in the 2014-2015 year continues at the same level as in 2012-2014.

8. Nankervis Family Trust

8.1 Process description

Activities at the site are undertaken by City Care. This Company operates out of the site owned by the Nankervis Family Trust, who hold the discharge consent for the site. City Care is an underground services company that carries out activities such as: reticulated drainage and sewage system maintenance, and minor earthworks.

The site is located in the Fitzroy industrial area, in the defined urban catchment of New Plymouth, approximately 380 metres from the closest water body, the Mangaone Stream.

Figure 12 Nankervis Family Trust site location and discharge point

The consented discharge is of truck washwater via an interceptor system into the Mangaone Stream. The stormwater discharge from the site complies with the standards/terms/conditions of Rule 23 of the Regional Freshwater Plan for Taranaki (see Appendix V), and is therefore a permitted activity.

Wash down water from the truck wash bay discharges to a drain, which is directed to an inceptor system. This then discharges into the New Plymouth District Council's stormwater system (IND002039) and then into the Mangaone Stream (STW001035).

It was stated at the time of the application that up to approximately 1.0 m^3 of washwater would be discharged per day.

The interceptor system is a Humes precast 2,800 litre concrete oil and grit interceptor tank which is designed to retain the light oily fluid and the heavier grits and solids within the unit chambers.

The trucks being washed include earthmoving trucks and general drainage and sewage maintenance trucks.

City Care also has a concrete mixer, which the Company stated would not be washed in the truck wash bay, but would be washed down in a separate fully bunded area of the site, with no drains leading to the stormwater system. The waste was then to be taken to a local landfill.

A number of issues can arise when using interceptor systems mainly due to sediment build up and the use of detergents, and it was recommended that a sediment trap be put in place to reduce the amount of sediment entering and potentially blocking the system. The Company was also advised that the interceptor system should not be used for large spill containment, which Council did not envisage to be a problem, as the Company does not fuel up on site, and no other hazardous substances are directed to the system.

The Company provided Council with a protocol that would be followed for the washing of all trucks. It stated that no degreasing of any plant would occur in the wash down bay, that there would be no use of detergents, and that the washing of concrete from concrete trucks and general washing of concrete items was prohibited in the wash down bay. The Company has also stated that a sign would be erected listing the items that are prohibited in the wash down area and that they would be using their own suck trucks to clean the interceptor system out.

8.2 Water discharge permit

Although the site is operated and managed by City Care, the landowners, Nankervis Family Trust obtained consent **6965-1** to cover the discharge of truck wash water via an interceptor system into the Mangaone Stream.

The permit was issued by the Taranaki Regional Council on 20 October 2006 under Section 87(e) of the RMA. It is due to expire on 1 June 2020.

Ten special conditions are appended to the consent. These include requirements for the consent holder to adopt the best practicable option and undertake activities in line with the information submitted in the consent application. The consent places limits on the pH range (6-9), and maximum concentrations of oil and grease (15 g/m^3), and suspended solids (100 g/m^3) in the discharge effluent. There are also conditions that must be met relating to the receiving water of the Mangaone Stream. A contingency plan in case of accidental spillage, and a management plan for the site stormwater and washwater are required. Degreasers, detergents and concrete wash waters are prohibited in the discharge, as are any direct discharges of untreated wash waters to the stream.

There was provision for the consent to lapse if it was not exercised, and provision for a review of the conditions of the consent in June 2008 and June 2014.

The permit is attached to this report in Appendix I.

8.3 Results

8.3.1 Inspections

10 September 2012
The site was inspected in showery weather conditions with light winds. No odours or emissions were found beyond the boundary of the property. The wash pad was not in use at the time of inspection. The workshop area was tidy and the stormwater drains around the site were visually free of contaminants.

29 November 2012
No dust or emissions found beyond the boundary of the property. The wash bay was not in use at the time of inspection and it was noted that the stormwater drains were dry. The inspecting officer was informed that the interceptor system was cleaned out about a month prior to this inspection. The workshop area was tidy and no spills were noted around the site. The site was considered to be tidy.

26 February 2013
No dust or odours were found beyond the boundary of the property. The site was in the process of being graded, and it was observed that new stormwater drains had been installed. It was noted that the interceptor system looked good, and there was no discharge at the time of inspection. The wash bay was not in use, and the workshop area was tidy. The dangerous goods shed was closed and there was no evidence of any spills around the site.

22 April 2013
It was found that the City Care site had recently been sealed with all stormwater directed to an interceptor system. The inspecting officer was informed that the Company was planning to construct a truck wash, just for the City Care vehicles. The plans also included a bin area to store clean fill during transit to a dump site. It was reported that the site was tidy, and the Company was informed that the site looked to be satisfactory at the time of inspection.

5 June 2013
The site was inspected in overcast conditions after recent showers. It was noted that the new stormwater drains actually flow directly to the stormwater network, bypassing the interceptor. It was reported that there was a spill kit on site. The inspecting officer was informed that the wash bay sump and interceptor were due to be cleaned that month. It was noted that the wash bay was not in use at the time of inspection and the stormwater drains were visually clear of contaminants. There was a low flow clear discharge occurring from the site at the time of inspection. The site was considered to be tidy.

29 August 2013
The site was inspected in wet and windy weather conditions. It was found that the stormwater drains around the site were visually clear of contaminants. No spills were noted around the site. The workshop area was tidy and it was noted that the

wash bay was in use at the time of inspection. It was found that the dangerous goods shed was closed and the site was tidy.

3 December 2013
It was found that the truck wash was not in use at the time of inspection. It was noted that the interceptor was cleaned out in September and it was due to be cleaned out again this month. The stormwater drains around the site were visually clear of contaminants, but it was observed that there were a few small oil patches around the site. The dangerous goods store area was found to be tide, as was the rest of the site.

26 February 2014
The inspecting officer met on site with the Site Manager, and the recent sample results (non-compliant suspended solids) were discussed. The Site Manager undertook to send through the stormwater drain layout, and to update the contingency plan. At inspection it was found that the wash bay was not in use. It was again noted that there were a few oil spill patches on the ground around the site that appeared to have had sand placed on them in order to contain the spills. It was observed that there was a very low flow discharge from the site, and the inspecting officer was informed that the interceptor was cleaned out in January. It was noted that no dust was found to be discharging beyond the boundary of the property.

12 June 2014
An inspection was undertaken after recent heavy rain. It was found that the wash bay was not in use at the time of inspection and the area was tidy. The inspecting officer was informed that the interceptor system is booked in to be cleaned out. It was observed that there was a small clear discharge occurring from the site. It was noted that there was a small hydrocarbon sheen present on some of the pooled water on site, however the stormwater drains looked to be visually clear of contaminants. No dust or odour was found to be discharging beyond the boundary of the site.

8.3.2 Results of discharge monitoring

As the consent is for the discharge of treated washwater, if possible, sampling at this site is carried out at inspection if a discharge is occurring, and is independent of the stormwater monitoring surveys. A the time of the consent application, the stormwater discharged from the site was considered to be a permitted activity, but due the fact that stormwater from the site contributes to the New Plymouth District Council discharge at the Devon Road bridge (STW001035), it is visually inspected periodically during the wet weather sample runs, and sampled if considered necessary.

Results for the 2010-2012 monitoring of the washwater and/or stormwater, downstream of the interceptor (site IND002039), are presented in Table 17.

Table 17 Chemical monitoring results for Nankervis Family Trust's discharge for 2012-2014. TRC site code IND002039

	Cond mS/m	O&G g/m^3	pH	SS g/m^3	Temp ^{O}C	Turby NTU
Consent Limit	-	*15*	*6-9*	*100*	-	-
Guideline	-	*15*	*6-9*	*100*	-	-
Number	7	4	7	7	7	7
Minimum	5.5	<0.5	6.3	<2	11.6	6.1
Maximum	15.3	3.7	8.8	120	19.7	100
Median	11.1	0.6	7.5	16	13.1	13
04-Feb-13	6.5	1.0	7.7	99	20.7	110
16-Apr-13	8.3	b	8.2	29	17.9	48
04-Dec-13	3.7	1.0	7.4	200	18.2	130
09-Jun-14	4.8	<0.5	7.6	92	14.7	82

Key: Results shown in bold within a table indicates that a consent limit for a particular parameter has been exceeded
a Insufficient flow
b parameter not determined, no visible hydrocarbon sheen and no odour

The samples collected complied with the oil and grease limit (15 g/m^3), and had a pH within the specified range (6-9) on all monitoring occasions. On 4 December 2013 it was noted that the washpad was not in use at the time of sampling, and it was found that the suspended solids concentration of the stormwater exceeded the standard in the Regional Freshwater Plan for a permitted stormwater discharge (100 g/m^3).

8.3.3 Investigations, interventions, and incidents

In the 2012-2014 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with Nankervis Family Trust's conditions in resource consents or provisions in Regional Plans.

Although there was one stormwater discharge from the site that exceeded the permitted activity Rule in the Regional Freshwater Plan, this was dealt with by asking that the stormwater management plan for the site be updated.

8.4 Discussion

8.4.1 Discussion of site performance

The washpad was found to be in use at the time the inspections were undertaken on only one occasion during the period under review. Inspection of the pad, treatment system and receiving drain indicated that the facility was well managed.

Although there were small patches of hydrocarbon sheen observed on the site surface at three of the eight monitoring inspections, sampling showed that the discharge was compliant with the oils and grease limit on the consent.

The suspended solids concentration was found to be twice the permitted concentration during one of the four sampling surveys. On this sampling occasion, it

was noted that the wash pad was not in use, and the non-compliant discharge was of stormwater rather than treated waste water.

The consent held for this site is for treated wastewater only, and the suspended solids concentration recorded on this occasion was noted to be in excess of the standards/terms/conditions of the permitted stormwater rule in the Regional Freshwater Plan. City Care was asked to update the site stormwater management plan and contingency plan. This is only the second time since monitoring began at this site that the stormwater discharge has contained suspended solids at a concentration above the permitted level. Should these observations continue, and further or more significant breaches be found in future monitoring, the Company will be required to reduce the concentration of suspended solids in the discharge, or obtain a stormwater consent.

8.4.2 Environmental effects of exercise of consent

There were no adverse effects found during the years under review that were attributable to activities at the Nankervis Family Trust site.

8.4.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the years under review is set out in Table 18.

Table 18 Summary of performance for Nankervis Family Trust's consent 6965-1, discharge of truckwash water via interceptor into the Mangaone Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt best practicable option to avoid, remedy or mitigate effects	Inspection and consultation with site operators	Yes
2. To be exercised in accordance with application information	Inspection and consultation with site operators	Yes
3. Stormwater contingency plan and washwater management plan to be submitted prior to exercising consent	Review of Council records. Updated contingency and stormwater management plans requested during the period under review	Updated plans not received
4. Discharge cannot cause specified adverse effects beyond mixing zone	Observation of river during sampling runs	Yes
5. No direct discharge of untreated washwater to Mangaone Stream	Inspection and observations during sampling runs	Yes
6. Limits on chemical composition of discharge	Observation during inspection and discharge sampling	1 of 4 samples exceeded suspended solids concentration
7. No degreasers to be used and no washwaters containing concrete products to be discharged	Inspection and consultation with site operators	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
8. No adverse effects permitted on surface water or groundwater	Inspection and observations during sampling runs. No groundwater sampling scheduled	Yes
9. Consent to lapse after 5 years if not exercised	Consent has been exercised	N/A
10. Provision for review of consent	Next review opportunity June 2014	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		Good

N/A = not applicable

During the years under review, the Nankervis Family Trust demonstrated a high level of environmental and good level of administrative performance and compliance with the resource consents as defined in Section 1.1.5. During the period under review there was an exceedance of the suspended solids limit in the stormwater permitted activity rule in the Regional Freshwater Plan (which is the same concentration as that imposed on the waste water consent). There were no adverse effects noted, but the requested update to the contingency plan was not received.

8.4.4 Recommendation from the 2010-2012 Biennial Report

In the 2010-2012 Biennial Report, it was recommended:

THAT monitoring of discharges from Nankervis Family Trust in the 2012-2013 year continues at the same level as in 2010-2012.

This recommendation was implemented in full.

8.4.5 Alterations to monitoring programmes for 2014-2015

In designing and implementing the monitoring programmes for water discharges in the region, the Council has taken into account the extent of information made available by previous authorities, its relevance under the RMA, the obligations of the Act in terms of monitoring discharges and effects, and subsequently reporting to the regional community. The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki discharging to the environment.

It is proposed that for 2014-2015, the programme remains unchanged. A recommendation to this effect is attached to this report.

8.5 Recommendation

THAT monitoring of discharges from Nankervis Family Trust in the 2014-2015 year continues at the same level as in 2012-2014.

9. New Plymouth District Council

9.1 Process description

New Plymouth District Council (NPDC) holds consents to discharge stormwater to the lower Waiwhakaiho River and Mangaone Stream, and to discharge rubbish dump leachate to groundwater and the Waiwhakaiho River from an industrial development off Bewley Road. The catchment areas and discharge points associated with the stormwater consents are shown in Figure 13 and Figure 14. The results for the stormwater and leachate discharge monitoring are reported on separately.

NPDC holds two resource consents in relation to discharges to the Lower Waiwhakaiho River below State Highway 3, and one consent in relation to discharges to the Mangaone Stream.

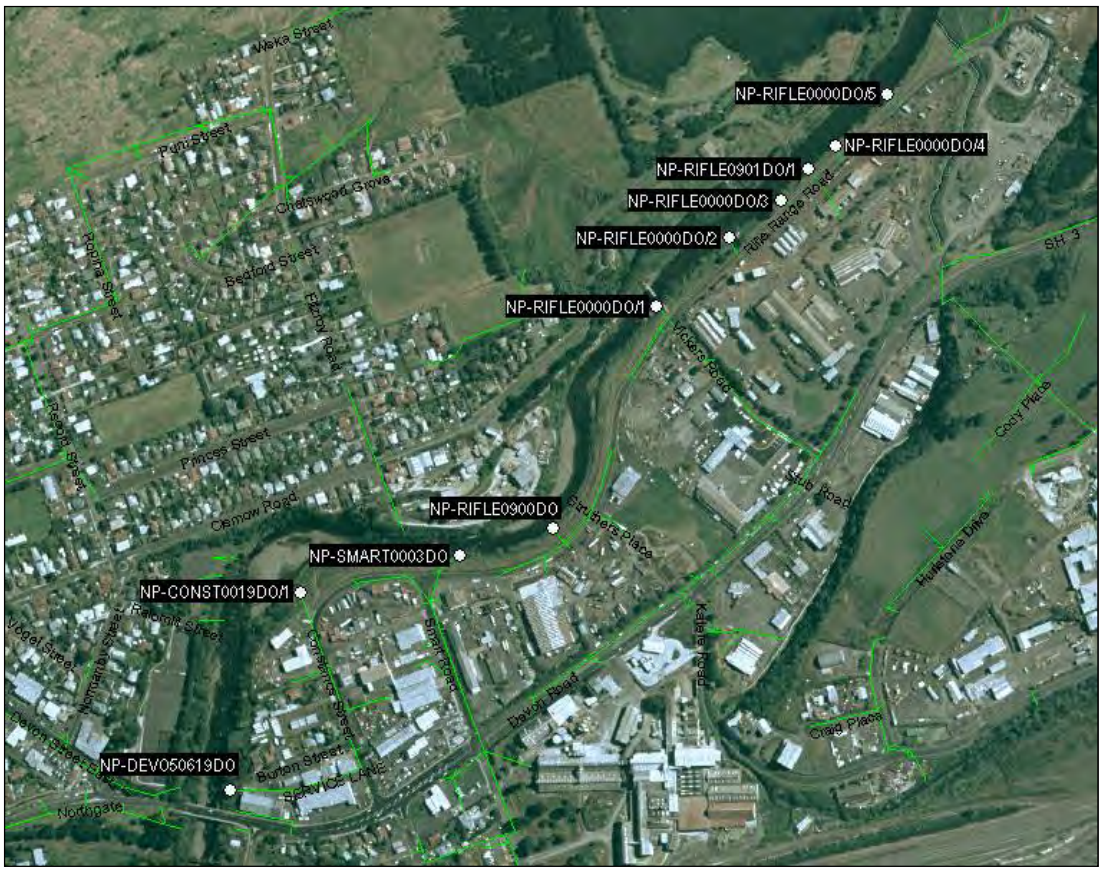


Figure 13 NPDC stormwater drainage and consented discharge points to the Waiwhakaiho River

9.1.1 Stormwater discharges

It has been acknowledged that the NPDC has no direct control over the quality of discharges from sites in the catchment. However, road run-off and surface flooding due to poorly maintained drains may contribute to the contamination of stormwater entering the Waiwhakaiho River and Mangaone Stream.

All stormwater screen inlets and outlets in the system are inspected and cleaned regularly by NPDC to ensure that debris is not accumulated in any way that may affect

the network capacity. Outfalls with flap gates are serviced every two months. These inspections are usually undertaken following a heavy rainfall event.

During periods of high rainfall, one of the key features of the performance of the stormwater drainage system is its susceptibility to inlet and outlet blockages. The NPDC maintenance plan aims to reduce reactive maintenance and improve the operation and reliability of the system through preventative maintenance. This includes pipeline condition assessment using video inspection.

Figure 14 NPDC stormwater drainage and consented discharge points to the Mangaone Stream

9.1.2 Bewley Road closed landfill

The old Taranaki County Council (TCC) depot site was quarried at the end of its life, and was then infilled, becoming the Bewley Road Landfill. The former Bewley Road landfill extended for about 740m along the Waiwhakaiho River bank between Constance Street and Vickers Road, and back to Devon Road. In 2006 the closed landfill area was developed and is now the site of the Valley Mega Centre retail outlet and car park. Leachate from the site discharges to groundwater which seeps into both the stormwater network, and the Waiwhakaiho River, along the river bank between Constance Street and Vickers Road. There is no treatment of the leachate generated from this closed landfill. Leachate is discharged continuously to the river at very low levels and low volumes.

9.2 Water discharge permits

Waiwhakaiho River

NPDC holds two consents, one that provides for stormwater discharges to the lower Waiwhakaiho River below the State Highway 3 bridge and one for leachate discharged from under the industrial/commercial subdivision developed on the site of the old Bewley Road rubbish dump.

Discharge permit **4984** was granted on 22 August 1996 for a period until 1 June 2014 to authorise the discharge of leachate to groundwater and to the Waiwhakaiho River. Conditions on the consent address limits on discharge component concentrations (ammonia, dissolved phosphorus and pH), effects on the receiving water, and require that the groundwater monitoring bores are maintained. There was a provision for a review of consent conditions in the month of June 2008.

An application to renew this consent was received on 28 February 2014, and therefore under Section 124 of the RMA, the Council has exercised its discretion and has allowed the activity to continue under the conditions of the expired consent until a decision is made on the renewal application.

Discharge permit **5163** was originally granted on 11 July 1997 for a period until 1 June 2008, to authorise the discharge of up to 1800 litres per second of stormwater from the Bewley Road industrial area [now the commercial area between Constance Street and Vickers Road] to the Waiwhakaiho River. The standardised conditions were imposed with the exception that a contingency plan was not required.

A renewed consent was issued on 10 June 2008 to authorise the discharge of stormwater from the Waiwhakaiho industrial area into the Waiwhakaiho River via multiple outfalls between the State Highway 3 bridge and the confluence with the Mangaone Stream. This consent incorporates discharges previously permitted by consents 1126 and 3138, which were both surrendered on 16 July 2008.

Conditions on the consent require the consent holder to adopt the best practicable option to prevent or minimise any adverse effects, address erosion, and prohibit some specific effects. There are provisions to review the conditions of the consent in June 2010, June 2014, and June 2020. The consent is due to expire on 1 June 2026.

The permit is attached to this report in Appendix I.

Katere Road industrial area

Discharge permit **1275** authorised the discharge of up to 2000 litres per second of stormwater to the Mangaone Stream from a 3 ha catchment in the Katere Road industrial area. The conditions addressed limits on pH range (6-9) and suspended solids (50 g/m^3) and oil and grease (15 g/m^3) concentrations, erosion prevention measures, and review of conditions. Consent 1275 was granted on 14 September 1993 for a period until 1 June 2008. It is the second consent issued for the discharge since 1984.

This consent was renewed on 10 June 2008 to provide for the discharge of stormwater from the Katere and Waiwhakaiho industrial areas into the Mangaone Stream via

multiple outfalls between Egmont Road and the confluence with the Waiwhakaiho River.

Conditions on the consent require the consent holder to adopt the best practicable option to prevent or minimise any adverse effects, address erosion, and prohibit some specific effects. There are provisions to review the conditions of the consent in June 2010, June 2014, and June 2020. The consent is due to expire on 1 June 2026.

The permit is attached to this report in Appendix I.

9.3 Results

9.3.1 Stormwater discharges

9.3.1.1 Inspections

10 September 2012
An inspection was undertaken in showery conditions with light winds, after recent heavy rain. It was found that there were small discharges from all the stormwater networks. There were no visual impacts on the receiving waters from any of the discharges.

19 December 2012
It was found that there were low flow discharges from all the stormwater networks. The discharges were clean and clear, and there were no visual impacts on the receiving waters.

27 March 2013
The stormwater outfalls were inspected in dry weather. There were no discharges from the stormwater networks. The receiving waters were clean and clear at the time of inspection.

24 June 2013
It was found that all the stormwater outlets had a small clear discharge occurring. There were no visual impacts in the receiving waters.

6 November 2013
It was found that there were very low flow discharges from all the stormwater outlets. The discharges were all clean and clear, and no visual impacts were observed in the receiving waters. The waterbodies were at a low flow and were clear.

21 August 2013
The stormwater outlets were inspected in overcast conditions after recent heavy rain. There were low flow discharges from all the outlet points. There were no visual impacts on the receiving waters. The Waiwhakaiho River and Mangaone Stream were flowing clean and clear at the time of inspection.

26 February 2014
The stormwater drains inspected all had a very low flow discharge. There were no visual impacts on the receiving waters. The Waiwhakaiho River and The Mangaone Stream were flowing clean and clear.

21 May 2014
The stormwater outlets were inspected after recent showers. The outlet opposite Vickers Road had a slight hydrocarbon sheen present. This cleared up at the confluence of the stormwater flow and the main flow of the Waiwhakaiho River. The discharges from the other stormwater outlets were of a low flow and were clear. The Waiwhakaiho River and Mangaone Stream were flowing clean and clear at the time of inspection.

9.3.1.2 Chemical monitoring

Chemical monitoring is carried out at six public stormwater drain outlets, three of which also discharge wastewater or stormwater from licensed industrial sites. These are McLeod's Drain at the bottom of Smart Road, the "mid Katere Road" storm drain to the Mangaone Stream and the storm drain to the Mangaone Stream that services the Hurlstone Drive area.

The results of this chemical monitoring are presented in Table 20, Table 23, and Table 24 (respectively), with the results for the three outlets that do not contain additional licensed discharges reported in Table 19, Table 21 and Table 22.

No contaminant concentration limits have been incorporated into the NPDC consents as it is acknowledged that, for the most part, the district council has no direct control over the quality of the discharges from the industrial and commercial sites. However, the quality of the discharges is still monitored as road run-off and surface flooding due to poorly maintained drains may contribute to the contamination of stormwater entering the receiving waters.

Discharge to Waiwhakaiho River from Burton Street

The sampling site that monitors the discharge of stormwater from the Burton Street area as it enters the Waiwhakaiho River was introduced during the 1999-2000 monitoring period. The drain carries stormwater from a number of small commercial sites that are located along Burton Street. The discharge is monitored to determine influences on water quality occurring upstream of other larger discharge sources (such as Firths or McLeod's Drain).

The results of routine chemical monitoring for 2012-2014 are presented in Table 19, together with a summary of previous results for comparison.

Table 19 Chemical monitoring results for Burton Street stormwater for 2012-2014, with summary of previous monitoring data from June 2000 to June 2012. TRC site code STW001081

	Cond mS/m	O & G g/m^3	pH	SS g/m^3	Temp ^{O}C	Turby NTU
Guideline	-	*15*	*6-9*	*100*	-	-
Number	23	19	23	23	22	23
Minimum	1.2	<0.5	6.9	2	10.4	0.6
Maximum	18.6	2.4	7.9	170	20.0	130
Median	5.4	1.3	7.3	16	16.2	14
4-Feb-13	5.6	0.5	7.0	13	21.5	10
16-Apr-13	4.0	<0.5	7.2	4	17.8	6.3

	Cond mS/m	O & G g/m³	pH	SS g/m³	Temp °C	Turby NTU
4-Dec-13	1.7	b	7.1	20	18.4	16
9-Jun-14	2.4	1.2	7.3	7	14.3	8.7

Key: Results shown in bold within a table indicates that a guideline for a particular parameter (derived from Rule 23 of the Regional Freshwater Plan) has been exceeded
b parameter not determined, no visible hydrocarbon sheen and no odour

The pH, suspended solids and oil and grease concentrations were determined to be within the standards expected for the permitted activities within this stormwater catchment.

Discharge to Waiwhakaiho River from McLeod's drain

The discharge from McLeod's Drain enters the Waiwhakaiho River about 50 metres downstream of the lower end of Smart Road. The drain carries stormwater from the site of Ravensdown Fertiliser's depot on Devon Road (consent 3140), other industrial sites including Smart Road railyard (consent 3258), the residential area of Glen Avon, and a rural area to the south. The discharge is monitored to determine influences on water quality in addition to those of the fertiliser storage depot and railyard. There is likely to be slightly elevated background phosphorus and ammonia concentrations, mainly due to dissolution of fertiliser particles carried by wind or water into storm drains at and around Ravensdown's fertiliser depot, or from spillages during cartage of the fertiliser to and from the site. Ravensdown have policies in place requiring that spills during cartage on site and on public roads are cleaned up by the drivers. The results of routine chemical monitoring for 2010-2012 are presented in Table 20, together with a summary of previous results for comparison.

Table 20 Chemical monitoring results for McLeod's Drain discharge for 2012-2014, with summary of previous monitoring data from September 1990 to June 2012. TRC site code STW001001

	Cond mS/m	DRP g/m³	F g/m³	NH3 g/m³N	NH4 g/m³N	O & G g/m³	pH	SS g/m³	Temp °C	Turby NTU
Guideline	-	-		*0.025*		*15*	*6-9*	*100*	-	-
Number	68	42	62	28	33	44	69	54	58	14
Minimum	9.8	0.012	0.17	0.00002	0.011	<0.5	4.0	2	10.3	13
Maximum	3450	82.6	14.8	6.38894	115	9.0	9.0	420	32.1	150
Median	30.6	0.87	0.50	0.02817	5.27	0.8	7.2	25	16.0	56
4-Feb-13	25.5	0.638	0.21	0.03237	3.29	<0.5	7.3	8	20.5	13
16-Apr-13	21.5	0.700	0.24	0.03032	4.66	<0.5	7.2	18	18.0	26
4-Dec-13	10.0	2.96	0.30	0.03339	3.32	b	7.4	69	17.8	59
9-Jun-14	14.3	1.67	0.34	0.05111	4.90	<0.5	7.5	42	15.1	50

Key: Results shown in bold within a table indicates that a guideline for a particular parameter (derived from Rule 23 of the Regional Freshwater Plan) has been exceeded
b parameter not determined, no visible hydrocarbon sheen and no odour

The pH, suspended solids, and oil and grease concentrations were all determined to be well within the standards expected for a permitted activity and within the prescribed "standardised" limits for consent holders. The unionised ammonia exceeded the standard for this parameter on all four monitoring occasions.

The maximum unionised ammonia concentration during the years under review was twice the permitted concentration on 9 June 2014. On 4 February 2013 and 16 April 2013 the main contributor of these contaminants was identified as being Ravensdown Fertilisers Co-operative Limited (site code IND004002, Table 39). On 4 December 2013 and 9 June 2014 it was not possible to obtain a sample of the Ravensdown discharge due to access issues. The other consented discharge to McLeod's drain, from the New Zealand Railways Corporation railyard, was found to have been below the guideline values during each of the sampling surveys (site code IND0002014, Table 35).

The dissolved reactive phosphorus concentration, whilst much lower than the historical maximum, was above median on 4 December 2013 and 9 June 2014. The fluoride concentrations in the samples collected during the period under review were all below the median calculated from previous results.

The influence of the Ravensdown stormwater discharge was clearly evident in the ammoniacal nitrogen and dissolved reactive phosphorus concentrations of the McLeod's drain samples. In the 2010-2012 period, the influence of the Ravensdown discharge was also evident in the pH of the McLeod's drain samples. This was not the case during the period under review, with the pH's in the 2012-2014 years found to be similar to the historical median for this monitoring location.

Discharge to Waiwhakaiho River from Rifle Range Road and Struthers Place

This was an open drain/tributary that was piped when the Bewley Road area was developed and the Waiwhakaiho stopbank put in. Stormwater from the retail area between Struthers Place and Constance Street, the commercial area of Struthers Place, and part of Rifle Range Road are piped to the Waiwhakaiho via this discharge point.

Table 21 Wet weather chemical monitoring results for Struthers Place discharge for 2012-2014, with summary of previous monitoring data from September 1990 to June 2012. TRC site code WKH000872

	Cond mS/m	NH_3 g/m^3-N	NH_4 g/m^3-N	O & G g/m^3	pH	SS g/m^3	Temp ^oC
Guideline	-	*0.025*	-	*15*	*6-9*	*100*	-
Number	14	3	3	12	14	12	14
Minimum	5.9	0.00087	0.326	0.25	7.0	12	12.2
Maximum	126	0.00571	1.53	2.3	8.8	2400	20.2
Median	11.4	0.00185	0.464	0.8	7.1	34	14.9
4-Feb-13	20.4	-	-	<0.5	7.2	17	21.6
16-Apr-13	21.5	-	-	<0.5	7.2	8	19.2
4-Dec-13	2.5	0.02321	3.54	<0.5	7.2	14	18.1
9-Jun-14	3.9	0.00332	0.783	<0.5	7.1	6	15.3

Key: Results shown in bold within a table indicates that a guideline for a particular parameter (derived from Rule 23 of the Regional Freshwater Plan) has been exceeded

b parameter not determined, no visible hydrocarbon sheen and no odour

The pH, suspended solids and oil and grease concentrations were determined to be similar to or below the median value for this site, and were well within the standards expected for the permitted activities within this stormwater catchment.

Discharge to Waiwhakaiho River from Vickers Road

This catchment drains the area on both sides of Vickers Road along with a section of Devon Road, to the west of the Katere Road junction. Monitoring of this discharge point was previously reported in the Technix section, as part of Technix's site discharges via this drain. However, as this outlet has now been incorporated into NPDC's consent 5163, monitoring results for this discharge point have now been moved into this section covering NPDC's discharges (Table 22).

Table 22 Chemical monitoring results for Vickers Road discharge for 2012-2014, with summary of previous monitoring data from September 1990 to June 2012. TRC site code STW001020

	Cond mS/m	E. *coli* nos/100ml	O & G g/m^3	pH	SS g/m^3	Temp ^{O}C	Turby NTU
Guideline	-	-	*15*	*6-9*	*100*	-	-
Number	45	26	43	45	44	47	15
Minimum	2.9	<23	<0.5	6.7	<2	10.4	16
Maximum	68.1	140,000	549	9.3	510	20.7	160
Median	12.0	6,500	2.0	7.3	64	15.6	55
4-Feb-13	10.9	35,000	<0.5	7.4	24	21.2	36
16-Apr-13	20.5	17,000	<0.5	6.7	2	18.6	2.7
4-Dec-13	2.3	8,600	b	7.5	17	18.1	13
9-Jun-14	3.8	41,000	<0.5	7.7	25	15.1	22

Key: Results shown in bold within a table indicates that a guideline for a particular parameter (derived from Rule 23 of the Regional Freshwater Plan) has been exceeded

b parameter not determined, no visible hydrocarbon sheen and no odour

Sampling showed that the pH, suspended solids and oil and grease concentrations were well within the standards expected for the permitted activities within this stormwater catchment on all monitoring occasions. The oil and grease and suspended solids concentrations were found to be below median on all monitoring occasions during the period under review.

Discharge to Mangaone Stream from mid Katere Road

Stormwater from the mid section of Katere Road discharges to the Mangaone Stream in between the discharges from Farmland's (formerly Viterra's) feedmill and Taranaki Sawmill's timber treatment plant site, and carries stormwater from a number of permitted activities on the Northern side of Katere Road, and from the Freight and Bulk Transport site.

Monitoring of this discharge commenced in 2007. The results for the 2012-2014 monitoring periods are presented in Table 23.

Table 23 Chemical monitoring results for stormwater drain from mid Katere Road to the Mangaone Stream for 2012-2014, with summary of previous monitoring data from July 2007 to June 2012. TRC site code STW001116

	BOD g/m^3	Cond mS/m	DRP g/m^3P	NH_3 g/m^3N	NH_4 g/m^3N	O & G g/m^3	pH	SS g/m^3	Temp ^oC	Turby NTU
Guideline	*5*	-	-	*0.025*	-	*15*	*6-9*	*100*	-	-
Number	10	10	10	10	10	9	10	10	10	10
Minimum	5.0	7.6	0.048	0.00057	0.05	0.6	7.6	62	10.8	82
Maximum	24	19.3	0.731	0.01256	0.659	6.2	8.4	280	20.1	300
Median	8.4	11.9	0.382	0.00794	0.276	3.6	7.8	170	14.1	145
4-Feb-13	22	13.6	0.542	0.04023	3.16	0.8	7.4	40	20.9	46
16-Apr-13	17	13.8	1.49	0.02316	1.78	<0.5	7.5	120	18.1	150
4-Dec-13	12	7.2	2.95	0.04149	2.54	0.7	7.6	160	18.1	160
9-Jun-14	7.4	7.5	0.486	0.01060	0.821	1.3	7.6	110	14.9	115

Key: Results shown in bold within a table indicates that a guideline for a particular parameter (derived from Rule 23 of the Regional Freshwater Plan) has been exceeded

The consent held by NPDC for discharges into the Mangaone Stream has no conditions relating to the quality of the discharge.

The biochemical oxygen demand of this discharge exceeded the concentration given in the Regional Freshwater Plan for Taranaki for permitted activities (Rule 23), on all monitoring occasions and the suspended solids content exceeded guidelines on 16 April 2013, 4 December 2013 and 9 June 2014. There were no stormwater consents issued to industries discharging via this point, and the results therefore show that there were discharges occurring that are neither permitted nor consented. On these monitoring occasions, the source of the non-complying discharge could not be identified, although it was identified during the period under review that the stormwater discharges from Freight and Bulk Transport Limited did not comply with the standards/terms/conditions of the RFWP. The Company was advised to apply for a resource consent, and an application was subsequently received. This is discussed further in Section 7.4. Council will continue to monitor activities in the area, and the quality of the discharge, to ensure that the discharge quality from this outlet is of an acceptable standard, and is not resulting in any significant adverse effects.

The DRP's were all found to be above the historical median, with the concentrations on 16 April 2013 and 4 December 2013 being new maximums for this monitoring location.

The ammoniacal nitrogen and unionised ammonia concentration were found to be similar to or above the historical maximum, with the discharges on 4 February 2013 and 4 December 2013 containing unionised ammonia level above the permitted activity standard. However, due to the conditions prevailing at the time of sampling, only minor effects were found on the instream concentrations of these parameters, and the unionised ammonia concentration remained well below that considered to be potentially toxic.

Discharge to Mangaone Stream from Hurlstone Drive

Stormwater from the industrial area along Hurlstone Drive discharges to the Mangaone Stream immediately upstream of the State Highway 3 bridge, stormwater and wastewater from the batching plant of Allied Concrete (consent 4539) and stormwater and washwater from Nankervis Family Trust (consent 6965) contribute to this discharge.

The results of routine chemical monitoring for 2012-2014 are presented in Table 24, together with a summary of previous results for comparison.

The renewed consent does not contain conditions controlling the quality of the stormwater discharged from the Council's stormwater system, however with the exception of unionised ammonia and pH on 13 May 2013 and 4 December 2013, at the time of sampling the discharge complied with the pH, suspended solids and oil and grease standards expected for a permitted activity, and were within the prescribed limits for consent holders discharging via this outlet.

It is noted that the influence of the discharge from Allied Concrete was evident in the pH recorded at this site during the surveys on 13 May 2013 and 4 December 2013, and this in turn increased the concentration of unionised ammonia in the discharge. Due to the conditions prevailing at the time of sampling, and the pH of the receiving water, no significant adverse effects were found as a result of these high unionised ammonia and pH discharges. Council will continue to monitor the effects of the elevated pH on the ammoniacal nitrogen/unionised ammonia equilibrium to confirm that the current approach of regulating the pH of the Allied Concrete discharge in the receiving water rather than at the point of discharge from the site is appropriate.

Table 24 Chemical monitoring results for stormwater drain from Hurlstone Drive to Mangaone Stream at SH3 for 2012-2014, with summary of previous monitoring data from November 1992 to June 2012. TRC site code STW001035

	Condy mS/m	NH_3 g/m^{3}N	NH_4 g/m^{3}N	O & G g/m^3	pH	SS g/m^3	Temp ^{O}C	Turby NTU
Guideline	-	*0.025*	-	*15*	*6-9*	*100*	-	-
Number	48	33	34	36	47	47	48	15
Minimum	3.3	0.00001	0.006	<0.5	6.5	2	10.0	8.1
Maximum	225	0.38935	0.344	8.8	12.1	390	19.5	750
Median	13	0.01298	0.056	0.8	8.9	26	15.0	27
4-Feb-13	4.0	0.00141	0.068	1.2	7.6	39	21.4	31
10-May-13	10.2	0.04384	0.064	b	9.7	16	14.3	17
4-Dec-13	5.9	0.07604	0.076	2.1	10.1	17	19.2	17
9-Jun-14	2.8	0.00071	0.087	<0.5	7.4	19	14.8	18

Key: Results shown in bold within a table indicates that a guideline for a particular parameter (derived from Rule 23 of the Regional Freshwater Plan) has been exceeded

b parameter not determined, no visible hydrocarbon sheen and no odour

9.3.2 Bewley Road industrial development

An area between the right bank of the Waiwhakaiho River and Devon Road was once used as a rubbish dump. The reach of river adjacent to the old dump runs for about

740 metres, from a point between the Devon Road bridge and Constance Street downstream to a point near Vickers Road. The area has been substantially developed and now contains a retail park and a number of commercial operators.

In 1994-95, the Council carried out a survey of groundwater in the vicinity of the new site development. Ground and surface water samples were taken to assess potential effects of leachate from the dump on the river. The site was found to be highly permeable, down to more than 9 metres, with drainage to the river. Leachate discharge rate was estimated at between 2 and 20 litres/second. Ground and surface water monitoring results, together with the results of previous chemical and biological monitoring of the river, demonstrated that, apart from some visual effects caused by iron oxides, the discharge of leachate from the dump site was having no significant adverse effect on the river.

There are three groundwater monitoring bores located around the periphery of the area, which NPDC is required by their consent to maintain for groundwater monitoring. There is a discharge monitoring point, at the outlet of the main drain which carries the groundwater to the river. The locations of the four sites are shown on Figure 4 as GND0548, GND0555, GND0556, and WKH000872. Stormwater from the retail area between Struthers Place and Constance Street, the commercial area of Struthers Place and part of Rifle Range Road and a small unnamed tributary that once discharged at this location are also piped to the Waiwhakaiho via this discharge point.

The Council issued consent 4984 to provide for the discharge of leachate from the area, and instituted a programme of six-monthly ground and surface water sampling to monitor for changes in groundwater quality that might lead to adverse impact on the river. The consent places limits on discharge components (total ammonia, dissolved reactive phosphorus, and pH) based on the results of past monitoring and which, if exceeded, may trigger a review of conditions on the consent. The prescribed limits for pH, total ammonia and dissolved reactive phosphorus are 7.5, 15 g/m^3 and 0.065 g/m^3, respectively.

Groundwater bore #1 (the south bore, GND0548) is located near the corner of Struthers Place and Rifle Range Road. This is a replacement bore as the first bore sunk in this area was destroyed during stop-bank construction in 1997. The replacement bore was itself destroyed during landscaping in front of what was then the Hookers site, and a new bore was installed prior to the sampling survey undertaken in October 2002. These facts need to be considered when interpreting the results, and in particular the median values for parameters. The results for GND0548 are shown in Table 25.

Table 25 Chemical monitoring results for Bewley Road landfill monitoring bore #1 (TRC site code GND0548) for 2012-2014, with summary of previous monitoring results from November 1994 to June 2012

Parameter	Unit	*Consent limit*	N	Min	Max	Med	23-Jan-13	6-Jun-13	10-Jan-14	5-Jun-14
Time	NZST						12:05	09:47	11:20	08:15
Total alkalinity	g/m^3	-	37	78	409	308	362	372	359	366
Chemical oxygen	g/m^3	-	37	11	40	25	38	41	36	39
Conductivity @ 20^{0}C	mS/m	-	42	60.4	133	79.2	82.6	82.5	70.1	70.3

Parameter	Unit	*Consent limit*	N	Min	Max	Med	23-Jan-13	6-Jun-13	10-Jan-14	5-Jun-14
Dissolved reactive phosphorus	g/m^3-P	*0.065*	36	0.003	0.238	0.006	<0.003	0.012	0.004	0.008
Bicarbonate	g/m3	-	31	95.16	498.98	398.94	441.6	453.8	438.0	446.5
Potassium	g/m^3	-	36	10.5	25.4	19.6	23.3	24.0	21.3	22.6
Unionised ammonia	g/m^3-N	-	35	0.00509	0.0314	0.01671	0.02474	0.02525	0.02808	0.01951
Ammoniacal nitrogen	g/m^3-N	*15*	42	1.02	11.3	7.19	11.8	12.5	13.2	8.97
Nitrate	g/m^3-N	-	33	<0.01	0.7	<0.01	<0.01	0.01	0.013	0.03
pH	pH	*7.5*	42	6.5	7.1	6.8	6.7	6.7	6.7	6.7
Sulphate	g/m^3	-	34	<1	430	49.2	<1	<1	<1	1.8
Temperature	Deg.C	-	35	15.9	19.5	17.1	18.2	17.7	18.4	18.7
Total phosphorus	g/m^3-P	-	15	0.147	2.13	0.331	-	-	-	-
Dissolved zinc	g/m^3	-	36	<0.005	0.165	0.008	0.007	<0.005	0.009	<0.005

Key: Results shown in bold within a table indicates that a consent limit for a particular parameter has been exceeded

The groundwater complied with the consent limits for ammoniacal nitrogen, dissolved reactive phosphorus, and pH.

The results obtained for ammoniacal nitrogen at this piezometer during the year under review, although above median, were lower than the maximum value, which was recorded in June 2008. Elevated levels of ammoniacal nitrogen have been found in the groundwater in the vicinity of the Ravensdown Fertiliser storage depot, and the overall trend of slightly increasing ammoniacal nitrogen concentrations observed at GND0548 (shown in Figure 21) is potentially from that source rather than from the Bewley Road landfill.

Groundwater monitoring bore #2 (north bore, GND0555) is on Rifle Range Road between Struthers Place and Vickers Road. This bore was also affected by stop-bank construction in a previous review period and had to be redrilled. During the 2001-2002 monitoring period it was found that this bore had collapsed internally and the NPDC was requested to clear the bore or re-drill as necessary. The bore has subsequently been redrilled (prior to the sampling run undertaken in June 2002) and a bore log was provided to the Council. During the 2007-2008 monitoring period the bore had again been destroyed by development activities in the area. NPDC replaced the bore at the request of the Council. The fact that this bore has been redrilled a number of times needs to be considered in interpreting the results and in particular median values for parameters. The results for GND0555 are shown in Table 26.

Table 26 Chemical monitoring results for Bewley Road landfill monitoring borer #2 (TRC site code GND0555) for 2012-2014, with summary of previous monitoring results from November 1994 to June 2012

Parameter	Unit	*Consent limit*	N	Min	Max	Med	23-Jan-13	6-Jun-13	28-Jan-14	5-Jun-14
Time	NZST						11:55	9:34	11:30	10:25
Total alkalinity	g/m^3	-	31	36	630	293	263	262	250	291
Chemical oxygen	g/m^3	-	31	11	75	32	16	19	8	32
Conductivity @ 20^{0}C	mS/m	-	31	31.1	106	53.8	57.5	57.3	52.6	54.5
Dissolved reactive phosphorus	g/m^3-P	*0.065*	27	<0.003	0.017	0.005	0.003	<0.003	0.028	0.011
Bicarbonate	g/m3	-	25	43.92	614.88	315.98	320.9	319.6	305.0	355.0

Parameter	Unit	*Consent limit*	N	Min	Max	Med	23-Jan-13	6-Jun-13	28-Jan-14	5-Jun-14
Potassium	g/m^3	-	31	2.8	18.7	8.6	12.2	10.6	5.5	10.7
Unionised ammonia	g/m^3-N	-	22	0.00002	0.01885	0.00793	0.02222	0.01835	0.01602	0.00792
Ammoniacal nitrogen	g/m^3-N	*15*	31	0.132	14.8	5.21	7.82	7.55	6.94	5.39
Nitrate	g/m^3-N	-	23	0.01	2.02	0.02	0.08	0.01	0.02	0.04
pH	pH	*7.5*	31	5.6	7.0	6.6	6.8	6.8	6.7	6.5
Sulphate	g/m^3	-	31	<1	270	9.7	2.8	<1	3.7	1.8
Temperature	Deg.C	-	22	16.1	21.0	17.9	19.2	17.1	19.5	19.6
Dissolved zinc	g/m^3	-	31	0.005	0.353	0.026	0.015	<0.005	0.006	<0.005

Key: Results shown in bold within a table indicates that a consent limit for a particular parameter has been exceeded

The consent limits for ammoniacal nitrogen, dissolved reactive phosphorus, and pH were complied with.

With the exception of unionised ammonia on 23 January 2013, the rest of the parameters were all within the range of previously recorded results. During the years under review, the ammoniacal nitrogen concentrations at this bore were found to be above median, but were slightly lower than the concentration found in the groundwater at GND00548.

Groundwater monitoring bore #3 (the control bore, GND0556) is drilled into natural alluvial deposits beside Devon Road. This bore was affected by the raising of the ground surface around it by approximately 0.5 metres. The results for GND0556 are shown in Table 27.

Table 27 Chemical monitoring results for Bewley Road landfill monitoring bore #3 – Control bore (TRC site code GND0556) for 2012-2014, with summary of previous monitoring results from November 1994 to June 2012

Parameter	Unit	*Consent limit*	N	Min	Max	Med	23-Jan-13	06-Jun-13	10-Jan-14	05-Jun-14
Time	NZST						11:40	14:10	11:40	8:35
Total alkalinity	g/m^3	-	38	18	224	180	100	160	120	151
Chemical oxygen demand (filtered)	g/m^3	-	38	5	14	9	<5	<5	5	12
Conductivity @ 20^{0}C	mS/m	-	39	9.1	119	95.1	118	113	128	130
Dissolved reactive phosphorus	g/m^3-P	*0.065*	33	0.003	0.072	0.032	<0.003	0.016	0.011	0.008
Bicarbonate	g/m^3	-	32	111.02	273.28	215.8	122.0	195.2	146.4	184.2
Potassium	g/m^3	-	38	12	31.8	22.2	31.5	34.1	34.5	35.9
Unionised ammonia	g/m^3-N	-	31	0.00009	0.0064	0.00131	0.00172	0.00305	0.00373	0.00634
Ammoniacal nitrogen	g/m^3-N	*15*	39	0.084	2.39	0.619	1.65	2.94	2.84	3.92
Nitrate	g/m^3-N	-	31	0.008	0.3	0.008	0.01	0.02	0.06	0.06
pH	pH	*7.5*	39	5.5	6.9	6.7	6.4	6.4	6.5	6.6
Sulphate	g/m^3	-	37	20.6	560	288	500	430	526	438
Temperature	Deg.C	-	31	15.5	18.7	17.2	18.1	18.0	18.1	17.8
Dissolved zinc	g/m^3	-	38	0.005	0.216	0.008	0.009	0.014	0.014	0.014

Key: Results shown in bold within a table indicates that a consent limit for a particular parameter has been exceeded

At bore #3, the levels recorded for each of the parameters analysed were similar to those values previously observed, although it is noted that the ammoniacal nitrogen and potassium concentrations have been increasing since the 2004-2005 monitoring

year. The ammoniacal nitrogen concentration was still significantly lower than in the other two bores, and is not at a concentration that causes concern.

The potassium concentration has been increasing in all three bores, but it is most pronounced in this bore

Overall the leachate component concentrations reported are relatively low in comparison to most municipal landfill leachates. There were fluctuations in parameters analysed, but these may also be consistent with the flushing effects of rainfall.

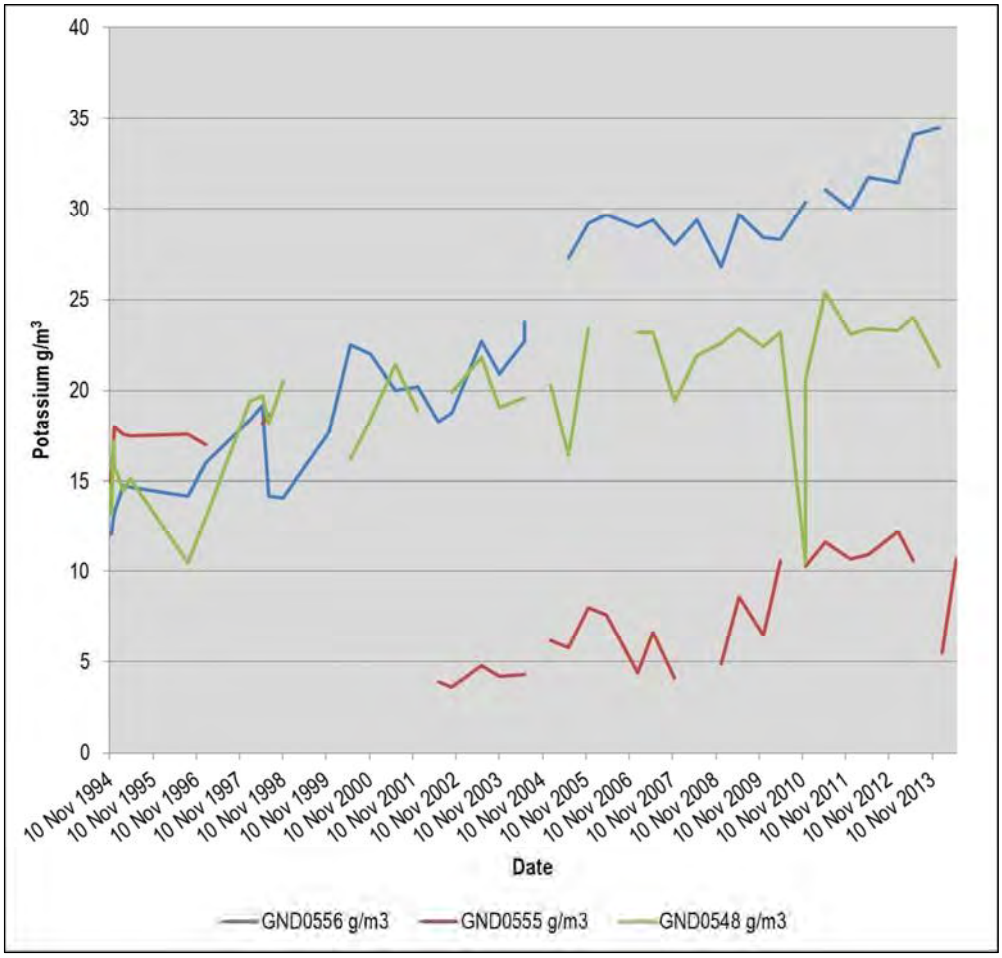


Figure 15 Potassium concentration in the Bewley Road ground water monitoring bores, November 1994 to date

The results for the associated surface water and receiving water sampling are shown in Table 28 and Table 29 respectively.

Table 28 Chemical monitoring results for Bewley Road landfill surface water discharge monitoring (TRC site code WKH000872) for 2012-2014, with summary of previous monitoring results from March 1991 to June 2012

Parameter	Unit	*Consent limit*	N	Min	Max	Med	23-Jan-13	6-Jun-13	10-Jan-14	5-Jun-14
Time	NZST						10:15	8:58	9:00	10:45
Total alkalinity	g/m³ $CaCO_3$	-	42	28	220	147	215	209	214	246
Chemical oxygen demand (filtered)	g/m³	-	40	<5	700	19.5	10	8	7	65

Parameter	Unit	*Consent limit*	N	Min	Max	Med	23-Jan-13	6-Jun-13	10-Jan-14	5-Jun-14
Conductivity @ 20^{0}C	mS/m	-	47	53	230	87.1	77.3	80.8	72.6	91.4
Dissolved reactive phosphorus	g/m^3-P	*0.065*	32	<0.003	3.14	0.005	0.006	<0.003	0.012	0.179
Potassium	g/m^3-N	-	38	2.4	43	27.4	23.9	22.6	22.3	27.3
Unionised ammonia	g/m^3-N	-	32	0.00004	0.15159	0.01269	0.18231	0.17783	0.136	0.37177
Ammoniacal nitrogen	g/m^3-N	*15*	44	0.008	14.8	3.1	10.6	**19.9**	11.5	**29**
Nitrate	g/m^3		28	<0.01	7.18	0.605	4.24	8.05	4.10	7.76
pH	pH	*7.5*	47	4.6	7.5	6.8	7.5	7.4	7.4	7.5
Sulphate	g/m^3	-	38	78	880	209.5	139	140	117	138
Temperature	Deg.C	-	36	14.3	19.5	17.5	21.9	16.1	19.9	17.9
Turbidity	NTU	-	4	16	300	39.5	21	13	300	16
Dissolved zinc	g/m^3	-	41	<0.005	0.345	0.017	0.017	0.008	0.006	0.012

Key: Results shown in bold within a table indicates that a consent limit for a particular parameter has been exceeded.

The discharge complied with the condition of the resource consent with the exception of ammoniacal nitrogen on 6 June 2013 and 5 June 2014. This was logged as an unauthorised discharge, and NPDC's investigations found that the source of contamination was coming from a private site in the Waiwhakaiho valley, and was not related to the landfill.

The values obtained during the years under review were within the range of the historical results, with the exception of unionised ammonia and nitrate/nitrite nitrogen in the 6 June 2013 and 5 June 2014 samples.

It is noted that the potassium, sulphate and dissolved zinc concentrations were all similar to or below their respective historical medians at this discharge point.

To assist in the interpretation of 'effects' of the discharge, the biannual groundwater sampling runs were carried out at times of low river flow and the three river sites above (WKH000920), alongside (WKH000925), and below (WKH000942) the dump site were also sampled. The results of this monitoring are given in Table 29.

Table 29 Chemical monitoring results for Bewley Road landfill, dry weather receiving water chemical monitoring 2012-2014

Parameter		Waiwhakaiho		
		Constance Street (WKH000920)	Opposite Firth's (Ford) (WKH000925)	Above Mangaone Confluence (WKH000942)
23-Jan-2013				
Time	NZST	10:05	10:20	10:45
Cond @20^{o}C	mS/m	12.1	12.4	12.4
DRP	g/m^3 P	0.009	0.010	0.004
NH_3	g/m^3	0.00037	0.00128	0.00072
NH_4	g/m^3 N	<0.003	0.013	0.011
pH	pH	8.4	8.3	8.1
Temp	Deg.C	21.6	21.5	21.9
Turby	NTU	9.2	0.83	2.1
6-Jun-2013				

Parameter		Waiwhakaiho		
		Constance Street (WKH000920)	Opposite Firth's (Ford) (WKH000925)	Above Mangaone Confluence (WKH000942)
Time	NZST	8:49	9:06	9:15
Cond @20°C	mS/m	8.9	9.1	9.1
DRP	g/m^3 P	0.010	0.012	0.015
NH_3	g/m^3	0.00003	0.00014	0.00005
NH_4	g/m^3 N	0.003	0.017	0.008
pH	pH	7.7	7.6	7.5
Temp	Deg.C	8.4	8.5	8.4
Turby	NTU	0.76	0.78	1.3
10-Jan-14				
Time	NZST	8:50	9:15	9:30
Cond @20°C	mS/m	9.5	9.5	17.9
DRP	g/m^3 P	0.012	0.011	0.036
NH_3	g/m^3	0.00043	0.00813	0.00062
NH_4	g/m^3 N	0.013	0.244	0.044
pH	pH	8.0	8.0	7.6
Temp	Deg.C	15.3	15.5	16.1
Turby	NTU	0.68	0.84	1.7
5-Jun-2014				
Time	NZST	10:50	10:35	11:10-
Cond @20°C	mS/m	11.6	11.9	12.0
DRP	g/m^3 P	0.009	0.009	0.010
NH_3	g/m^3	0.00032	0.00012	0.0003
NH_4	g/m^3 N	0.007	0.004	0.008
pH	pH	8.3	8.1	8.2
Temp	Deg.C	10.7	10.5	11.0
Turby	NTU	0.58	0.94	1.5

The analyses showed that in January 2013, the dissolved reactive phosphorus and ammoniacal nitrogen increased between WKH000920 and WKH000925, then decreased at WKH000942. The pH decreased in a downstream direction. There would have been little, if any environmental effect associated with these changes.

In June 2013 there was only a slight increase in the dissolved reactive phosphorus in a downstream direction. During this survey the ammoniacal nitrogen concentration of the receiving water, again increased between WKH000920 and WKH000925, and decreased at site WKH000942. Again, the pH decreased slightly in a downstream direction.

The largest change in ammoniacal nitrogen was during the January 2014 survey, with an 18 fold increase observed between sites WKH000920 and WKH000925. The ammoniacal nitrogen concentration reduced to close to the level of the uppermost site at WKH000942. There was little, if any, change in the dissolved reactive phosphorous or pH between sites WKH000920 and WKH000925, but the dissolved reactive phosphorous increased and the pH decreased between sites WKH000925 and WKH000942. It is noted that there was a noticeable increase in the conductivity between sites WKH000925 and WKH000942.

At the time of the June 2014 survey there was little, if any, change found for any of the parameters monitored.

9.3.3 Investigations, interventions, and incidents

In the 2012-2014 period, the Council was required to undertake significant additional investigations and interventions, or record incidents, in association with the New Plymouth District Council's conditions in resource consents or provisions in Regional Plans that are monitored under this programme.

It is noted that there are occasional sewage overflows that can occur to the Waiwhakaiho River due to events such as blockages, power outages, heavy rainfall and pump failures. NPDC has an approved contingency plan to follow in the event of an overflow to ensure that any necessary remediation and clean-up is undertaken promptly, and that the public is warned of any potential health hazards.. These and any other incidents that may have been recorded in relation to NPDC's activities in this catchment that are monitored under other programmes (e.g. New Plymouth Waste Water Treatment Plant and Colson Road Regional Landfill) would be included in the relevant Annual Report.

9 September 2013

During analysis of samples it was found that consent conditions were being breached on 6 June 2013. The samples showed that there was an exceedance in the permitted total ammonia concentration. Abatement Notice 12068 was issued requiring the source of the contamination to be investigated and for remediation works to be undertaken. A letter of explanation was received, which explained that the source of contamination was coming from a private site in the Waiwhakaiho valley, and was not related to the consented site. The Council was advised that NPDC staff were in the process of making the site compliant. The abatement notice was withdrawn.

9.4 Discussion

9.4.1 Environmental effects of exercise of consents

During the years under review no significant adverse effects were observed in the receiving environment as a result of the exercise of the New Plymouth District Council stormwater or leachate consents.

No issues were noted associated with the maintenance of the reticulated stormwater systems or outlet structures. At one inspection a sheen was observed in the discharge from the Vickers Road outlet, however no visible effects were noted in the Waiwhakaiho River.

The wet weather surveys found that the unionised ammonia concentration from McLeod's Drain was above the guideline value on all monitoring occasions, with the maximum value obtained being twice the guideline concentration. This was attributed to the discharge from Ravensdown, and did not constitute a n exceedance of their consent as due to the conditions prevailing at the time of sampling there was little, if any, effect in the Waiwhakaiho River.

A new maximum ammoniacal nitrogen concentration was found in the Struthers Place stormwater discharge during one of the wet weather surveys. The unionised ammonia concentration of the discharge remained acceptable, and there were no resultant significant adverse effects, as only a slight increase was observed in the ammoniacal concentration of the river.

Elevated BOD, unionised ammonia and suspended solids were observed in discharge samples collected from the mid Katere Road drain. No significant adverse effects were noted in the Mangaone Stream at the time of sampling. The on-going discharge quality matters associated with these findings are being addressed with Freight and Bulk Transport, who discharge via this outlet.

Although the pH and unionised ammonia concentration of the discharge from the Hurlstone Drive area to the Mangaone Stream at State Highway 3 were elevated on occasion, the ammoniacal nitrogen concentration was relatively low and these effects were due to the influence of the Allied Concrete discharge. There were no adverse effects found on the receiving water, and no non-compliance with Allied Concretes or NPDC's consents.

Groundwater samples obtained during the years under review were in compliance with consent 4984.

Overall, with the exception of bicarbonate, the leachate component concentrations reported were relatively low in comparison to most municipal landfill leachates. There continues to be fluctuations in parameters analysed but this is generally consistent with the flushing effects of rainfall. It is noted that the ammoniacal nitrogen and potassium concentrations in the samples collected from bore 3, the control bore up gradient of the dump area, and bore 1, the south bore on the corner of Struthers Place and Rifle Range Road were above median. The concentrations are not so high as to be of immediate concern, and little, if any effect was observed in the receiving water. Council will continue to monitor any changes.

9.4.2 Evaluation of performance

A tabular summary of the consent holder's compliance record for the years under review is set out in Table 30, Table 31, and Table 32.

Table 30 Summary of performance for New Plymouth District Council consent 1275-3, stormwater discharge from the Katere Industrial area into the Mangaone Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adoption of best practicable option to minimise adverse effects	Inspection and receiving water monitoring	Yes
2. Prevention of erosion	Visual assessment at inspection and receiving water sampling	Yes
3. Discharge can not cause specified adverse effects in Mangaone Stream	Inspection and receiving water monitoring	Yes
4. Optional review provision re environmental effects	Next opportunity to review in June 2020	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 31 Summary of performance for New Plymouth District Council consent 5163-2, stormwater discharge from an Industrial Subdivision into the Waiwhakaiho River

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adoption of best practicable option to minimise adverse effects	Inspection and receiving water monitoring	Yes
2. Prevention of erosion	Visual assessment at inspection and receiving water sampling	Yes
3. Discharge can not cause specified adverse effects in Mangaone Stream	Inspection and receiving water monitoring	Yes
4. Optional review provision re environmental effects	Next opportunity to review in June 2020	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 32 Summary of performance for New Plymouth District Council consent 4984-1, leachate discharge from a former landfill into the Waiwhakaiho River

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Limits on chemical composition of discharge	Inspection and sampling of discharge	Ammoniacal nitrogen exceedance due to private connection to reticulated system
2. Discharge cannot cause specified adverse effects beyond mixing zone	Visual assessment at inspection and receiving water sampling	Yes
3. Maintenance of monitoring bores	Inspection and accessibility at sampling	Yes
4. Option for review re chemical sampling finding significant adverse effects	Chemical sampling did not find significant adverse effects	N/A

Condition requirement	Means of monitoring during period under review	Compliance achieved?
5. Optional review provision re environmental effects	Consent expires 2014. No further opportunities for review	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

During the years under review, NPDC demonstrated a high level of environmental and high level of administrative performance and compliance with the resource consents as defined in Section 1.1.5. Although there was one incident recorded, there were no adverse effects found and NPDC's investigations identified that this was as a result of a previously unknown private connection.

9.4.3 Recommendation from the 2010-2012 Biennial Report

In the 2010-2012 Biennial Report, it was recommended:

THAT monitoring of discharges from New Plymouth District Council in the 2012-2013 year continues at the same level as in 2010-2012.

This recommendation was carried out in full.

9.4.4 Alterations to monitoring programmes for 2014-2015

In designing and implementing the monitoring programmes for water discharges in the region, the Council has taken into account the extent of information made available by previous authorities, its relevance under the RMA the obligations of the Act in terms of monitoring discharges and their effects, and subsequently reporting to the regional community. The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki discharging to the environment.

It is proposed that for 2014-2015, the programme remains unchanged. A recommendation to this effect is attached to this report.

9.5 Recommendation

THAT monitoring of discharges from NPDC in the 2014-2015 year continues at the same level as in 2012-2014.

10. New Zealand Decorative Concrete Limited

10.1 Process description

New Zealand Decorative Concrete manufactures products for sealing and colouring concrete using cement, silica sands, plain sands, iron oxides and titanium dioxide. Organic solvents, acrylic resins, thinners and hydrochloric acid are also used at the site. The bulk of the hazardous substances were originally stored in a shipping container in the stormwater catchment, however a new hazardous goods store and a manufacturing building have been constructed. Stormwater from the site runs via a shallow concrete channel round the front of the office and into a stormwater grate connected to the New Plymouth District Council's stormwater drainage system. The stormwater combines with that from a number of other small industrial sites, including that of Farmlands Co-operative Society Limited, before discharging into the Mangaone Stream about 350 metres [m] downstream of Egmont Road.

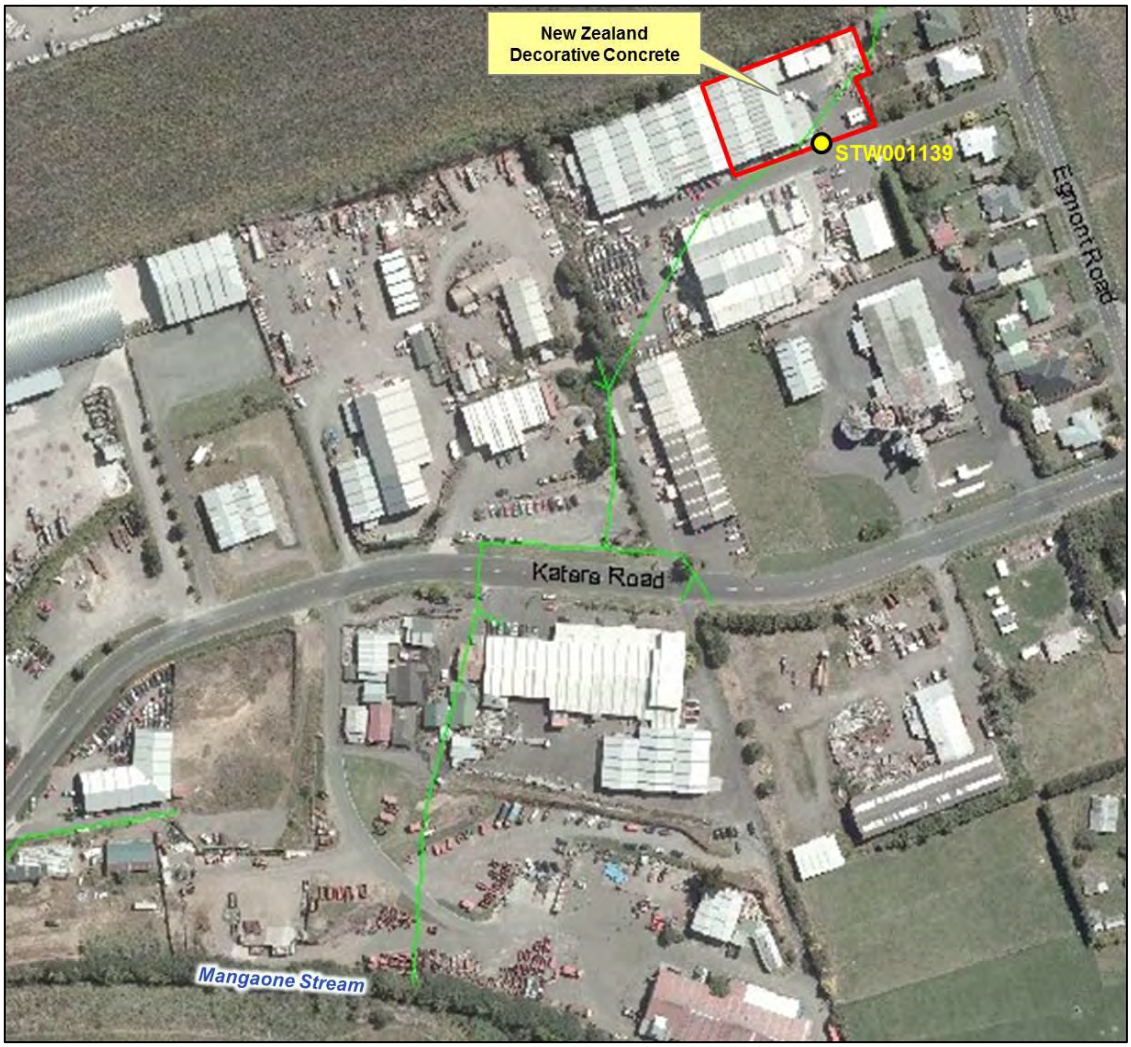


Figure 16 New Zealand Decorative Concrete site and discharge point

All manufacturing activities occur within the rear bay of the building, with the dry products stored in the front bay. Any liquid wastes generated are directed to a sump within the manufacturing area and are removed on an as required basis by a waste contractor.

The dry products are dusty therefore to minimise the potential for effects on air quality, and the potential for the dust to impact on stormwater quality, the floor of the storage bay is vacuumed daily.

A small amount of waterblasting of concrete sample moulds is undertaken at the site to remove any dry concrete residues. This is currently undertaken in the stormwater catchment, but no detergents are used.

The delivery of hazardous substances occurs in the stormwater catchment, and the transport of the substances from storage to the manufacturing area is also through the stormwater catchment.

At the time of the consent application Council was informed that the Company was in the process of developing and testing a contingency plan as part of the applicant's HSNO emergency plan requirements. However, at the time of writing this report, a copy of a completed plan had not been submitted for Council approval.

10.2 Water discharge permits

New Zealand Decorative Concrete Limited holds consent **7450-1** to cover the discharge of stormwater from a decorative concrete products manufacturing site into the Mangaone Stream in the Waiwhakaiho catchment.

This permit was issued by Taranaki Regional Council on 22 December 2009 under Section 87(e) of the RMA. It is due to expire on 1 June 2026.

Ten special conditions are appended to the consent, which include a requirement for the consent holder to adopt the best practicable option. The 'standardised' condition limiting the pH range (6-9), and maximum concentrations of oil and grease (15 g/m^3), and suspended solids (100 g/m^3) are imposed. The stormwater catchment area is limited. There are requirements on the consent relating to the treatment of stormwater from the site, and hazardous substances storage.

There are also conditions that must be met relating to the receiving water of the Mangaone Stream. A contingency plan must be prepared in case of accidental spillage, and Council must be notified if there are any changes in activities at the site, as these would not have been considered at the time the consent application was processed. There was provision for the consent to lapse if it was not exercised, and there is provision for a review of the conditions of the consent in June 2014, June 2020 and/or if Council is advised of any changes to the activities undertaken at the site

The permit is attached to this report in Appendix I.

10.3 Results

10.3.1 Inspections

22 August 2012

The storm water drain was found to be visually free of contaminants. The yard area was tidy, as was the dangerous goods shed. No spills were noted in the vicinity of the dangerous goods shed, and the site was considered to be tidy.

9 November 2012
No dust or odours were found beyond the boundary of the property. The stormwater drain was clean at the time of inspection.

25 February 2013
No dust or odours were found beyond the boundary of the property. The stormwater drain was dry, and the site was tidy.

26 June 2013
No odours or dust were found beyond the boundary of the property. There was no discharge of stormwater from the site at the time of inspection. It was reported that the site was tidy.

26 August 2013
No odours or dust were found beyond the boundary of the site. The stormwater drain was visually clear of contaminants at the time of inspection. It was noted that an isolation valve was still to be installed in the sump. No spills were noted during the inspection, and the site was considered to be tidy.

3 December 2013
There was no discharge occurring from the site at the time of inspection and it was observed that the stormwater drain was dry. No spills were noted around the site, and no dust or odours were found beyond the boundary of the property. It was reported that the site was tidy.

12 February 2014
It was found that the stormwater drain was visually clear of contaminants, and it was noted that the site was tidy at the time of inspection.

1 May 2014
This site inspection was undertaken in fine weather conditions. It was found that the stormwater drain was dry at the time of inspection. No spills were observed on site, and it was noted that the site was tidy.

10.3.2 Results of discharge monitoring

Stormwater from New Zealand Decorative Concrete's site is monitored where the overland flow enters the roadside drain at the entrance to the yard (STW001139). The results for the 2012-2014 years are given in Table 33.

Table 33 Chemical monitoring results of New Zealand Decorative Concrete Limited's stormwater discharge for 2012-2014. TRC site code STW001139

	Cond mS/m	O & G g/m^3	pH	SS g/m^3	Temp ^{O}C	Turby NTU
Consent Limit	-	*15*	*6-9*	*100*	-	-
4-Feb-13	11.6	1.6	8.1	32	22.6	23
16-Apr-13[a]	-	-	-	-	-	-
4-Dec-13	3.9	<0.5	8.0	13	18.7	5.0
9-Jun-14	6.0	<0.5	7.9	8	14.8	6.3

Key: Results shown in bold within a table indicates that a consent limit for a particular parameter has been exceeded
a Insufficient flow

The discharge complied with the discharge limits for pH, suspended solids and oil and grease on all monitoring occasions.

10.3.3 Investigations, interventions, and incidents

In the 2012-2014 period, the Council was required to undertake significant additional investigations and interventions, or record incidents, in association with New Zealand Decorative Concrete's conditions in resource consents or provisions in Regional Plans.

10.4 Discussion

10.4.1 Discussion of site performance

The site was well managed during the years under review. There were no operational practices found at the site that needed addressing, and when sampled, the site discharge complied with the component concentration limits given by the consent.

A contingency plan has submitted to Council for the site. This was accepted as an interim plan in December 2013, as it was lacking some information. The Company was provided with a copy of the contingency plan guidelines, and asked to update the plan to include the required details.

An effective contingency plan for the site is important as it is noted that the chemicals used at the site are unloaded and transported through the stormwater catchment, and with this now having been concreted, any spills would drain to the stormwater sumps much more rapidly.

10.4.2 Environmental effects of exercise of consent

There were no adverse effects found during the years under review that were attributable to activities at the New Zealand Decorative Concrete site.

10.4.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the years under review is set out in Table 34.

Table 34 Summary of performance for New Zealand Decorative Concrete's consent 7450-1, discharge of stormwater into the Mangaone Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt best practicable option to avoid, remedy or mitigate effects	Inspection and consultation with site operators	Yes
2. Stormwater catchment area limited to 0.26 ha	Inspection	Yes
3. Stormwater to be treated by March 2010, system to be maintained to Council's satisfaction	Inspection	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
4. Hazardous substance storage to be bunded or otherwise contained	Inspection	Yes
5. Limits on chemical composition of discharge	Observation during inspection and discharge sampling	Yes
6. Discharge cannot cause specified adverse effects beyond mixing zone	Visual assessment at inspection and receiving water sampling and biomonitoring	Yes
7. Preparation of contingency plan by 22 March 2010. Plan to be maintained thereafter	Review of Council records, and consultation with site operator at inspection. Plan accepted as an interim plan, but Company advised that additional details required	Yes
8. Notification of changes to activities at the site	Inspection and consultation with site operators	N/A
9. Consent to lapse on 31 December 2014 if not exercised	Consent has been exercised	N/A
10. Provision for review of consent	Next review opportunity June 2014	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

During the years under review, New Zealand Decorative Concrete Limited demonstrated a high level of environmental and high level of administrative performance and compliance with the resource consents as defined in Section 1.1.4. During the period under review the Company's contingency plan was accepted as an interim plan, however the Company was informed that additional detail was required for a full plan.

10.4.4 Recommendation from the 2010-2012 Biennial Report

In the 2010-2012 Biennial Report, it was recommended:

THAT monitoring of discharges from New Zealand Decorative Concrete Limited in the 2012-2013 year continues at the same level as in 2010-2012.

This recommendation was carried out in full

10.4.5 Alterations to monitoring programmes for 2014-2015

In designing and implementing the monitoring programmes for water discharges in the region, the Council has taken into account the extent of information made available by previous authorities, its relevance under the RMA the obligations of the Act in terms of monitoring discharges and effects, and subsequently reporting to the regional community. The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki discharging to the environment.

It is proposed that for 2014-2015, the programme remains unchanged. A recommendation to this effect is attached to this report.

10.5 Recommendation

THAT monitoring of discharges from New Zealand Decorative Concrete Limited in the 2014-2015 year continues at the same level as in 2012-2014.

11. New Zealand Railways Corporation

11.1 Process description

New Zealand Railways Corporation owns a rail terminal on a site off Smart Road. In addition to transportation of freight, the terminal is utilised as a maintenance depot. The freight receipt and dispatch area and the refuelling and maintenance depots are situated at the Smart Road end of the site. The various activities undertaken at the site are carried out by the subsidiaries: Ontrack, Kiwi Rail, United Group Rail, and Toll Tranzlink, and Transfield Services.

Figure 17 New Zealand Railways Corporation's rail yard and sampling point locations

Drainage from the area to the west and north of the offices (i.e. the refuelling area and maintenance area) flows to the Waiwhakaiho River via McLeod's Drain, an underground pipe that also receives stormwater from Ravensdown's fertiliser depot, other industrial sites, a residential area, and a rural area. Wastewater from washing of wagons, containers and locomotives is treated in a three-stage oil separator before discharge to the river. Liquids from the repair depot and locomotive fuelling point are discharged to an underground holding tank that is emptied by a waste disposal company at two-monthly intervals. The holding tank is also connected to the oil separator via an automatic pump in case of overfilling.

Drainage from the (sealed) freight area and the unsealed areas of the eastern end of the site is to the Mangaone Stream and its tributaries. The consent for this area of the site remained under the name of Tranz Rail Limited until March 2008.

Railway wagons carrying containers of hazardous substances and the bulk products including urea, resins, fertilisers, di-ammonium phosphate (DAP), lime, oils, bitumen and carbon dioxide are held temporarily on the tracks in this area. No loading or unloading of freight takes place in the stormwater catchment that drains to the Mangaone Stream.

11.2 Water discharge permits

New Zealand Railways Corporation holds two consents for the Smart Road railway yard. One consent relates to the discharge of treated wastewater and stormwater to the Waiwhakaiho River, and the other to the discharge of stormwater to the Mangaone Stream. Both consents were previously held by Tranz Rail Limited.

Discharge permit **3528** was granted on 24 July 1996 to Tranz Rail Limited to provide for the discharge up to 13 cubic metres per day of stormwater, including treated wastewater from cleaning of railway wagons, containers and locomotive maintenance, into the Waiwhakaiho River. The consent was transferred to Toll NZ Consolidated Ltd on 9 March 2006, and to New Zealand Railways Corporation on 1 June 2009. The 'standardised' conditions are imposed, with additional conditions that place limits on maximum concentrations on ammonia and dissolved phosphorus (both 20 g/m^3), and restrict the type of cleaning operations. The consent is the second issued for the discharge since 1990. This consent expired on 1 June 2014.

An application to renew this consent (under the name of KiwiRail Holdings Limited) was received by Council on 28 February 2014, and therefore under Section 124 of the RMA, the Council has exercised its discretion and has allowed the activity to continue under the conditions of the expired consent until a decision is made on the renewal application.

The permit is attached to this report in Appendix I.

Discharge permit **1735** was granted on 13 November 1985 to provide for the discharge of up to 980 litres per second of stormwater from the Smart Road rail terminal into the Mangaone Stream. It was renewed by Tranz Rail Limited on 23 September 1991, was transferred to Toll NZ Consolidated on 11 March 2008, and then was transferred to New Zealand Railways Corporation on 2 June 2009. The consent was renewed again on 31 July 2009 to provide for the discharge of stormwater from the Smart Road Rail Terminal into an unnamed tributary of the Mangaone Stream, and into the Mangaone Stream for a period until 1 June 2026.

In addition to the 'standardised conditions' (4, 5, and 6), the consent requires the consent holder to adopt the best practicable option (1), limits the catchment area covered by the consent (2), requires the bunding of longer term storage of liquid hazardous substances (3), and requires that a stormwater management plan be prepared and maintained (7). The consent includes provisions for the consent to lapse if it is not exercised (8), and for review of the conditions of the consent (9).

The permit is attached to this report in Appendix I.

11.3 Results

11.3.1 Inspections

10 September 2012

The site was inspected in showery conditions with a light wind. The diesel bund looked good and it was noted that there was a small amount of clean water in the bottom. The last stage of the interceptor system was inspected and found to be satisfactory. The stormwater drains around the site appeared to be visually free of contaminants. Silt fences had been installed around the stormwater drain at the rear of the site. It was observed that there were holes on two sides of the silt fence and it was noted that any material building up against them needed to be removed to ensure the silt fences are not damaged. It was noted that the liquid petroleum gas (LPG) loading area was in use, and it was noted that trucks were also being loaded at the front of the site.

The Company was instructed that the following action was to be taken: Ensure that any material building up against the silt fences is removed to ensure they are not damaged.

29 November 2012

No odours or emissions were found beyond the boundary of the property at the time of inspection, and no spills were noted around the site. The interceptor system was found to be satisfactory as was the diesel bund. There was a small amount of clean stormwater in the bottom of the bund, indicating that the draining of stormwater from the bund was being well managed. The storm water drains around the site were visually clear of contaminants at the time of inspection. The Company was instructed that the silt fence around the stormwater drain at the rear of the site needed fixing. The LPG area was in use and the area was tidy. There was no stormwater discharge from the site at the time of inspection, and it was noted that the site was tidy at the time of inspection.

2 April 2013

No odours or dust were found beyond the boundary of the property. There was a small amount of clean water in the diesel bund. The outlet from the bund was locked closed. The final stage of the interceptor looked satisfactory, however, there was a slight hydrocarbon odour present. All the stormwater drains around the site were clean and clear. There was no discharge from the site at the time of inspection. No spills were noted around the site. The LPG area was in use at the time of inspection. It was noted that the silt fence around the rear stormwater drain still needed repairing. It was observed that there was a small amount of rubbish around on the site.

24 June 2013

The site was inspected in overcast conditions after recent showers. No odours or dust were found beyond the boundary of the property. The diesel bund looked satisfactory, and it was again noted that there was a small volume of clean water in the bottom of the bund. The outlet from the bund was found to be closed at the time of inspection. The interceptor system looked to be working well, and it was noted that there did not appear to be a discharge occurring at the time of inspection. The stormwater drains around the site were visually clear of contaminants. It was reported that the LPG area was not in use at the time of inspection.

The Company was instructed that the following action was to be taken: The silt control measures around the rear stormwater drain (in the unsealed area of the site) needed to be repaired or replaced as soon as possible.

2 September 2013
The site was inspected in fine weather conditions. No dust or odours were found beyond the boundary of the property. The interceptor system looked satisfactory at the time of inspection, however it was noted that it may be due for a clean out soon. The stormwater drains in the sealed are visually clear of contaminants. The silt control measures around the stormwater drain at the rear of site (unsealed area) had still not been repaired. It was noted that this would be followed up further to this inspection notice.

12 December 2013
No dust or odours were found beyond the boundary of the property. There was a small volume of clean water in the diesel tank bund. The interceptor system looked satisfactory. Stormwater drains around the site were visually clear of contaminants. The silt control at the rear stormwater drain still had not been fixed, and the Company was advised that this must be done as soon as possible. The LPG area was not in use at the time of inspection.

19 February 2014
The diesel tank was being filled at the time of inspection. The bund was dry and clear of contaminants. The stormwater drains around the site were dry. It was found that there were mainly pallets and containers stockpiled on the yard. The LPG area was not in use at the time of inspection, and it was reported that the site was tidy.

17 June 2014
It was reported that the site was inspected as part of the Lower Waiwhakaiho catchment area, which includes the Mangaone stream running adjacent to this yard. The site was inspected following several days of steady rainfall. No effects were noted from the stormwater discharges. It was noted that the API separators contained and treated any hydrocarbon runoff from locomotive refuelling areas, and that the site was compacted, and little or no disturbance of aggregate helped prevent any suspended solid run off.

The Company was instructed that the following action was to be taken: Ensure the silt cloth is replaced around stormwater entrance risers to prevent any off site effects (As discussed with the Kiwi Rail Gating Manager)

11.3.2 Chemical analysis

11.3.2.1 Results of discharge monitoring

The discharge of stormwater from the freight and fuel handling and storage areas is monitored where the stormwater enters the Smart Road stormwater drain, south of the railway overbridge (site code IND002014). The results for the 2012-2014 period are given in Table 35, with a summary of previous results for comparison. A new site (site code STW001117) had been established during the 2006-2007 year for sampling of the site discharge from the eastern end of the site into the Mangaone Stream, via the Mangamiro Stream. As the discharge sampled was only one of approximately eight New Zealand Railways Corporation discharges that enter the Mangamiro

Stream (which is culverted for the entire stretch flowing under their site) it was subsequently decided that this was not truly representative of the overall quality of the Company's discharges to this receiving water, which exits the culvert immediately upstream of its confluence with the Mangaone stream. From the start of the 2010-2012 period, a different approach was taken, with the Mangamiro Stream being sampled upstream and downstream of the New Zealand Railway site, with any change in the stream being attributable to the consent holder. The result of this monitoring are reported in 11.3.2.2.

Table 35 Chemical monitoring results for Smart Road rail yard stormwater discharge to the Waiwhakaiho River for 2012-2014, with summary of previous monitoring data from July 1994 to June 2012. TRC site code IND002014

	BOD g/m^3	Cond mS/m	DRP g/m^3P	NH_3 g/m^3N	NH_4 g/m^3N	O & G g/m^3	pH	SS g/m^3	Temp ^oC	Turby NTU
Consent limit	-	-	*20*	-	*20*	*15*	*6-9*	*100*	-	-
Number	34	43	35	37	37	43	43	43	43	14
Minimum	<0.5	2.3	0.021	0.00004	0.004	<0.5	5.7	<2	10.3	8
Maximum	37	62	3.24	0.12254	12	22.7	8.4	160	20.8	64
Median	3.7	15.6	0.184	0.00114	0.178	0.9	7.2	16	15.7	27
4-Feb-14	3.8	15.2	0.092	0.00564	0.252	<0.5	7.7	8	19.3	12
16-Apr-13	5.1	22.3	0.160	0.00355	0.356	b	7.4	35	17.5	43
4-Dec-13	6.2	11.5	0.190	0.00223	0.259	<0.5	7.3	19	18.7	20
9-Jun-14	3.3	9.8	0.096	0.00052	0.103	<0.5	7.2	20	14.7	24

Key: Results shown in bold within a table indicates that a consent limit for a particular parameter has been exceeded

b parameter not determined, no visible hydrocarbon sheen and no odour

Compliance with the limits imposed on consent 3528 was achieved for all parameters during the 2012-2014 monitoring period.

The biochemical oxygen demand of the samples collected on 16 April 2013 and 4 December 2013, although slightly higher than the concentration given in the Regional Freshwater Plan for permitted stormwaters from industrial sites, after dilution with other stormwaters is unlikely to result in the presence of undesirable growths like sewage fungus. This parameter is not limited by the Company's consent.

11.3.2.2 Results of receiving environment monitoring

The Mangamiro Stream is culverted under the Smart Road rail terminal and emerges immediately upstream of the confluence of the Mangamiro Stream and Mangaone Stream. The stormwater from the eastern area of the terminal is discharged into the Mangamiro Stream at about eight different points.

This part of the yard is predominantly unsealed, although there is a small proportion of this subcatchment that is sealed and contains the railyard's freight handling activities.

The Mangamiro Stream is monitored at the point of entry into the culvert (site code MMR000060) and at the culverts outlet to the Mangaone Stream (site code MMR000100). The result of the monitoring undertaken during the 2012-2014 years is given in Table 36.

Table 36 Receiving environment chemical monitoring results for Smart Road rail yard stormwater discharge to the Mangamiro Stream in the Mangaone Stream catchment for 2012-2014.

		04-Feb-13		16-Apr-13		04-Dec-13		09-Jun-14	
		MMR000061 U/s Railyard	MMR000100 D/s Railyard	MMR000061 U/s Railyard	MMR000100 D/s Railyard	MMR000061 U/s Railyard	MMR000100 D/s Railyard	MMR000061 U/s Railyard	MMR000100 D/s Railyard
Cond @20°C	mS/m	21.2	20.7	22.7	21.8	17.9	16.5	-	15.9
DRP	g/m³P	0.006	0.062	0.005	0.024	0.008	0.058	-	0.016
NH_3	g/m³N	0.00105	0.00484	0.00150	0.00916	0.00050	0.00112	-	0.00066
NH_4	g/m³N	0.368	0.691	0.517	1.01	0.170	0.181	-	0.172
O&G	g/m³	b	0.9	b	b	b	<0.5	-	<0.5
pH		6.8	7.2	6.9	7.4	6.9	7.2	-	7.1
SS	g/m³	5	12	9	10	12	9	-	6
Temp	°C	19.2	19.0	16.4	16.3	16.7	17.3	-	14
Turb	NTU	5.2	20	14	17	11	6.9	-	7.5

Key: Results shown in bold within a table indicates that a consent limit for a particular parameter has been exceeded

b parameter not determined, no visible hydrocarbon sheen and no odour

It can be inferred from these results that the consent limits for pH, suspended solids and oil and grease were complied with on all four monitoring occasions. It is noted that on all monitoring occasions, there was very little change in the suspended solids concentration of the Mangamiro Stream downstream of the railyard's stormwater inputs.

On all monitoring occasions where upstream/downstream monitoring data is available, it was found that the pH of the Mangamiro Stream had increased below the railyard, with the maximum increase observed being 0.5 pH units on 16 April 2013. It is only pH changes of more than 0.5 pH units that are considered to present a barrier to fish passage, and all results also showed that the receiving water pH was within the desirable range of 6-9.

Previous monitoring of the discharge from the unsealed area down gradient of the freight handling area (monitoring site STW001117) had found that there was low level contamination of the stormwater with ammoniacal nitrogen and dissolved reactive phosphorus. Increases in the unionised ammonia concentrations of the stream were observed on 4 February 2013 and 16 April 2014, and to a lesser extent on 4 December 2013. The highest unionised ammonia concentration recorded was 0.009 g/m³, which is just over one third of the concentration of 0.025 g/m³ that is considered to be toxic in an aquatic environment. Slight increases in dissolved reactive phosphorus were also observed.

This continues to indicate low level contamination of the stormwater discharge from the site to this stream, possibly with a fertiliser product. This level of contamination would have had little, if any effect on the Mangaone Stream though, especially when compared to the discharge from Ravensdown Fertilisers, which enters the Mangaone Stream approximately 60 metres downstream of the Mangamiro Stream.

11.4 Investigations, interventions, and incidents

In the 2012-2014 period, the Council was required to undertake significant additional investigations and interventions, or record incidents, in association with New

Zealand Railway Corporation's conditions in resource consents or provisions in Regional Plans.

30 January 2013

At 2:05 pm notification was received from the New Zealand Fire Service of a chemical spill at the KiwiRail Depot on Smart Road, New Plymouth. A Council representative attended the spill and liaised with the Fire Service's Officer In Charge. It was determined that the dimethyl amine (a raw ingredient for making a salt) was leaking from a shipping container in very low quantities. The container and its consents were doused with water at a rate of 100 L/s to dilute the chemical to below a level that would be harmful to the environment. The leaking container could not be identified on site, and was transport to Dow-Agro Science where further investigation could take place. The cause of the leak was unknown. An inspection of the Mangaone Stream the following day found no visible effects as a result of the spill.

11.5 Discussion

11.5.1 Discussion of site performance

The bulk diesel bund and interceptors were well managed during the years under review. Dangerous goods storage were generally well managed, however there was one spill of dimethyl amine that occurred on the site. This was managed by the New Zealand Fire Service, and no visible effects were found in the Mangaone Stream the following day.

No other spills were noted in the refuelling area or freight handling area during the years under review.

The Company was repeatedly instructed to undertake maintenance or repairs on the silt control measures that the Company had been instructed to at the stormwater drain in the unsealed area at the rear of the site at each of the last three inspections of the previous monitoring period. Although the Company did not take action on these requests during the year under review, however it was found to have been repaired at the first inspection in the 2014-2015 year, and the matter has now been resolved with the installation of a new stormwater drain at the rear of the site.

Discharge and receiving environment monitoring found that the stormwater discharges were compliant with consent conditions at the time of sampling. Although it was noted that there was low level contamination, potentially from a fertiliser product, in the Mangamiro Stream, the effects of this were found to be less than minor under the conditions prevailing at the time of the surveys. Changes in pH were observed, but these were at, or below the upper limit of those considered acceptable from the point of view of not hampering fish passage.

11.5.2 Environmental effects of exercise of consent

The concentrations of contaminants in the discharge to the Waiwhakaiho River for the years under review (Table 35) were well within the limits imposed by the conditions of the resource consent. The discharge from this site had no effect on the stormwater discharge from McLeod's drain (Table 20) or on the receiving water.

Although the biochemical oxygen demand of the stormwater exiting the site to McLeod's drain was slightly higher than the standard given in the Regional Freshwater Plan for industrial stormwaters, this is not limited by the Company's consent and no undesirable biological growths were reported as being present in the stormwater sump where the sample was collected.

Physicochemical monitoring found some measurable changes in some of the parameters monitored. Although a number of requests were made to repair silt fencing around a stormwater drain at the site, the changes in turbidity and suspended solids found in the Mangamiro Stream during the wet weather surveys were less than minor, and no significant adverse effects were found in the Mangaone Stream as a result of the discharges from the site.

11.5.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the years under review is set out in Table 37 and Table 38.

Table 37 Summary of performance for New Zealand Railways Corporation consent 1735-3, discharge of stormwater into the Mangaone Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adoption of best practicable option to prevent or minimise adverse effects	Inspection and receiving water monitoring	Requests to repair install silt controls not actioned until 2014-2015 year. No adverse environmental effects
2. Limits stormwater catchment to 11.28 ha	Inspection	Yes
3. Bunding of hazardous substances if on site for more than 3 days	Inspection	N/A
4. Concentration limits upon potential contaminants in discharge	By inference from chemical sampling of receiving water	Yes
5. Discharge cannot cause specified adverse effects beyond mixing zone	Visual assessment at inspection and receiving water sampling and biomonitoring	Yes
6. Prepare and maintain contingency plan	Review of documentation received. Latest version May 2011	Yes
7. Prepare and maintain management plan	Review of documentation received. Latest version May 2011	Yes
8. Provision for lapsing of consent	Consent exercised	N/A
9. Provision for review of conditions	Next opportunity for review June 2014	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		Good

N/A = not applicable

Table 38 Summary of performance for New Zealand Railways Corporation consent 3528-2, discharge of stormwater and treated wastewater into the Waiwhakaiho River

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Concentration limits upon potential contaminants in discharge	Chemical sampling	Yes
2. Prepare and maintain contingency plan	Review of documentation received. Latest version May 2011	Yes
3. Restriction on products that can be washed from containers	Observations during inspection	Yes
4. Discharge cannot cause specified adverse effects beyond mixing zone	Visual assessment at inspection and receiving water sampling and biomonitoring	Yes
5. Provision for review of consent	No further opportunities for review	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

During the years under review, New Zealand Railways Corporation Limited demonstrated a high level of environmental and good level of administrative performance and compliance with the resource consents as defined in Section 1.1.5. During the period under review there were a number of requests for silt fencing around a stormwater drain to be repaired. There were no adverse environment effects found and this was resolved in the 2014-2015 year.

11.5.4 Recommendation from the 2010-2012 Biennial Report

In the 2010-2012 Biennial Report, it was recommended:

THAT monitoring of discharges from New Zealand Railways Corporation in the 2012-2013 year continues at the same level as in 2010-2012.

This recommendation was implemented in full.

11.5.5 Alterations to monitoring programmes for 2014-2015

In designing and implementing the monitoring programmes for water discharges in the region, the Council has taken into account the extent of information made available by previous authorities, its relevance under the RMA the obligations of the Act in terms of monitoring discharges and their effects, and subsequently reporting to the regional community. The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki discharging to the environment.

It is proposed that for 2014-2015, the programme remains unchanged. A recommendation to this effect is attached to this report.

11.6 Recommendation

THAT monitoring of discharges from New Zealand Railways Corporation in the 2014-2015 year continues at the same level as in 2012-2014.

12. Ravensdown Fertiliser Co-operative Limited

12.1 Process description

The New Plymouth depot of Ravensdown Fertiliser Co-operative Limited occupies an area of about 7 ha bounded by Devon, Smart and Katere Roads, and the Smart Road rail yard (Figure 18). The Mangaone Stream touches the eastern boundary. The depot receives, bags, blends and distributes fertilisers in various forms, namely superphosphate, lime, dolomite and imported high analysis products such as ammonium sulphate, urea, triple super, potassium chloride (potash) and monoammonium and diammonium phosphates (MAP & DAP). Small volumes of trace element fertilisers such as zinc sulphate are also handled through the store. Approximately 250,000 tonnes of fertiliser are distributed per annum.

A total of 7 permanent staff are employed at the site, who are supplemented by 2 full time equivalent contract employees for bagging and maintenance. Three sales staff are also based on site.

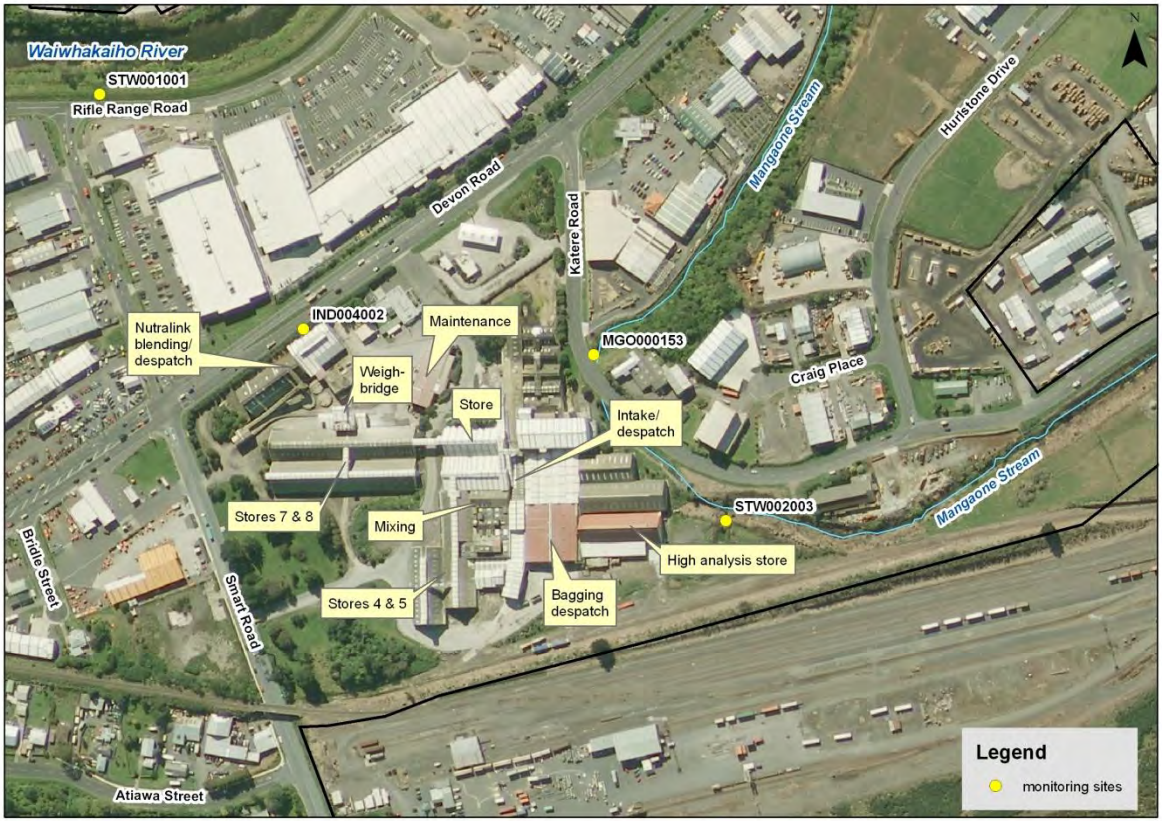


Figure 18 Ravensdown Fertiliser Co-operative Limited site and sampling point locations

Until 1 July 1997, Farmers Fertiliser Limited manufactured super phosphate on the site by acidulation of phosphate rock. Sulphuric acid was manufactured from elemental sulphur. A chrome sulphate plant was run in conjunction with the sulphuric acid plant. Hydrofluorosilicic acid was produced as a by-product of the rock acidulation process. The manufacturing plants were all decommissioned and subsequently removed from site, with the acid plant being the last plant to be removed, which was completed during the 2002-2003 year. After decommissioning,

the acid tank was retained for storage of liquid wastes containing high levels of fertiliser.

Stormwater from the site discharges to both the Waiwhakaiho River and its tributary the Mangaone Stream.

Drainage from western and northern parts of the site flows to the Waiwhakaiho River (Consent 3140), via an underground drain that runs beside Devon Road to Smart Road intersection, where it meets a piped tributary of the river. The piped tributary, known as McLeod's Drain, originates in the Queens Road area and runs beneath lower Smart Road for about 600 metres from the railway, to join the river about 50 metres downstream of Smart Road. The mean flow of the tributary is about 10 L/s. All of the manufacturing plants were in this catchment.

Drainage from southern and eastern parts of the site flows to the Mangaone Stream at several points (Consent 3865). The catchment area of about 2.8 ha includes the (road and rail) transfer area for fertilisers. Part of the fertiliser transfer area is on land owned by New Zealand Railways Corporation (formerly TranzRail). The main discharge is via a short ditch that meets the Mangaone Stream about 150 metres above the Katere Road bridge. The Mangamiro Stream, which is a small piped tributary of the Mangaone Stream, exits just upstream of the Ravensdown stormwater drain. The other discharge points are mainly roof drain outlets.

Ravensdown, when seeking new consents for the stormwater discharges in 1997, stated that its activities would be limited to receipt of fertilisers by road from Port Taranaki and by rail from Napier, and the despatch of fertilisers by both road and rail. The Company intended to use only that (south-eastern) part of the site occupied by the old acidulation plant and fertiliser load out areas, and planned to dispose of the remainder by either sale or lease. At that time Council was informed that, to minimise contamination of stormwater, all loading and unloading of fertilisers would be under cover, and vehicles would travel only on sealed surfaces. Ravensdown are continuing to progress towards the sealing of metal areas subject to heavy traffic flow, although occasional loading and unloading of trucks occurs outside the high analysis store in the south east area of the site.

Challenge Petroleum Limited purchased a parcel (0.65 ha) of the property at the intersection of Devon and Katere Roads for use as a road service station in 1998. This was the location of the old chrome plant building, which was removed completely. The service station has subsequently been redeveloped into an office block, which included the removal of the underground storage tanks.

The old acid plant site was previously occupied by Nutralink for blending of fertilisers, followed by Freight and Bulk Transport Limited for storage and dispatch of grain and similar products.

12.2 Water discharge permits

Ravensdown Fertiliser Co-op Limited blends, stores and distributes fertiliser at a depot situated between Devon, Katere and Smart Roads. Ravensdown was granted two resource consents on 26 November 1997, to discharge stormwater from the depot to the Waiwhakaiho River and to the Mangaone Stream for a period until 1 June

2014. Previously, discharges from the site were provided for by consents held by Farmers Fertiliser Limited, which manufactured phosphate fertiliser on the site until 1 July 1997, when Ravensdown purchased the site and closed the plant.

Discharge permit **3140** provides for the discharge of up to 700 litres per second of stormwater to the Waiwhakaiho River via McLeod's Drain, with 'standardised' conditions. The mixing zone boundary in the Waiwhakaiho River extends 150 metres downstream from the point of discharge of McLeod's Drain. The concentration of un-ionised ammonia in the river may not exceed 0.025 g/m^3. Review of conditions may take place in the month of June 1999, 2002 or 2008.

Discharge permit **3865** provides for the discharge of up to 700 litres per second of stormwater to the Mangaone Stream, with 'standardised' conditions. The mixing zone boundary is defined as Katere Road bridge, about 150 metres below the discharge point. The concentration of un-ionised ammonia in the stream may not exceed 0.025 g/m^3. The discharge of phosphorus is to be minimised. Review of conditions may take place in the month of June 1999, 2002 or 2008.

Applications to renew these consents were received by Council on 19 November 2013, and therefore under Section 124 of the RMA, the activity can continue under the conditions of the expired consent until a decision is made on the renewal applications.

Ravensdown exercised two other resource consents in relation to the fertiliser depot. Discharge permit **4024** provides for emissions to air, mainly dust. Monitoring of this permit is addressed in a separate report (Technical Reports 2013-69 and 2014-55). Land use permit **4332,** which was surrendered in November 2007**,** allowed the installation of groundwater monitoring bores.

12.3 Results

12.3.1 Inspections

24 September 2012

Prior to inspection, groundwater bore GND0517 was sampled in follow-up to previous high ammoniacal nitrogen results obtained for this bore.

The sample was light brown and had a strong ammonia odour and also a slightly sweet rotting cabbage type odour. The sample was shown to Ravensdown staff at the end of the site inspection undertaken on the same day.

The Company was informed that, judging by the odour of the sample, it was thought possible that the ammonia concentration may still have been high in this bore. The Company was advised that if the results confirm this, the matter would be reported to the Compliance Manager.

The Company was instructed that the following action was to be taken:
Continue to investigate the potential sources and flow paths for this contaminant to be entering the groundwater.

24 September 2012
A meeting was held on site regarding the progress on the Company's stormwater drains project. This was followed by a site inspection.

The process, by which the blocked drains underneath the urea store and under the yard in the direction of the Rock Store, was discussed.

It was outlined that the contractor was looking at using a water blaster to wash the sediment from the drains into the two stage interceptor by the workshop. The dimensions of the interceptor are approximately 4m x 2m x 1.9 m deep. The outlet from the interceptor would be blocked. The intention was to trap the solids in the interceptor and then suck out the liquid. This liquid was likely to be recycled through the washing process. The initial proposal was to remove the liquid from the site in one or two 7,000 litre truck loads for spreading onto land as a fertiliser on a 6 acre farmlet on Waitara Road owned by the contractor. The total estimated volume involved would be 70,000 - 100,000 litres.

The Company had approached NPDC and had been advised that the solid material could not be disposed of at the Colson Road landfill due to the zinc concentration. The Company had been redirected to either Marton, Hampton Downs or Red Vale, but no approach had been made to any of these facilities as yet.

Analytical results were provided to Council for samples of the combined sediment/water collected after an initial trial looked at the material present in the three drains in question. The highest levels of contaminants were present in the southern most of the two drains running under the urea store. The results showed ammonia concentrations of 380 g/m^3, biochemical oxygen demand of 101 g/m^3, along with detectable levels of arsenic, copper, chromium, lead, nickel; cadmium and zinc. It was estimated that the material collected was about 20% solids, and the solids were gravelly in nature.

It was recommended that rather than disposing of the material as it was generated, it would be better to store the liquid on site, test it, and then Council would be able to make an informed discussion as to whether the liquid was appropriate for use as a fertiliser for application onto the 6 acre farmlet. It was stated that the Company had two tanks on site of a combined volume of about 25,000 litres that could be used for temporary on site storage.

The location for the on site storage of the solids had not been finalised. The inspecting officers were shown a loading are that Ravensdown was considering using. It was observed that there were some holes in the floor of the concrete pad, and there were large areas of the pad that were not visible to assess the condition of it. It was observed that if this option was chosen, the integrity of the concrete would have to be assured, and the area would need to be bunded and covered to prevent potential stormwater and/or groundwater issues. It was recommended to that Company consider the use of intermediate bulk containers (IBC's) for the temporary storage of the solids.

It was stated that this drain cleaning exercise was only the start of the process, and that the Company was planning on investigating/cleaning all stormwater drains and service channels throughout the site over a period of time. Ravensdown confirmed

that staff had observed stormwater flowing through the service channels recently. It was requested that the Company provide Council with a plan for the overall project, identifying the drains that would be investigated, the order in which the investigations would occur, and approximate timeframes for each phase of the project.

The stormwater plan being put together by SKM was discussed, and it was outlined that the Company expected that the draft report would be completed by the end of the week. The inspecting officer requested that this be forward to the Council for review and comments once it became available.

Staff outlined that the budget for demolishing Rock Stores 1 and 2 had been approved. The process by which this would be undertaken was discussed. The Rock Store 2 was to be emptied, with the lime being moved to another site. The soil inside the stores was to be tested and remediated as necessary prior to removing the store roof to minimize the potential for ground and surface water contamination.

The site was inspected in a gentle north westerly breeze. At inspection it was found that there was no evidence of significant amounts of stored material to be escaping through the walls of the stores, with the exception of the material on the concrete area between Rock Store 1 and the Mangaone Stream. The north western wall of the Southern Star building looked to have been damaged recently, possibly by being hit with the loaders used inside the store. There was only a minor amount of widely dispersed product observed in a few areas of the stormwater catchment. It was outlined that a sweeper had been contracted to sweep the entire site the previous week. The inspecting officer was informed that this is always done after a product shipment arrived, if the intake was undertaken during wet weather and there had been tracking from the stores. Otherwise the Company's own sweeper was used on an as required basis to address minor spills.

It was noted that most of the pallets in front of the high analysis store were clean, and that some of the rubbish had been removed from behind this store, although there was still a small amount of rubbish to be removed.

Rapid doors had been fitted to the door into No 2 store. Staff stated that this had made a huge difference in reducing the wind tunnel effect that could result in discharges from the store in windy conditions. No air discharges were observed from any of the stores at the time of inspection.

Localised intermittent odours were noted on the northern side of the Rock Store building, and it was noted that there was a small amount of ponded dark coloured liquid in this area.

At the end of the inspection the Company was advised that the following action was to be taken:
Please provide copy of draft SKM Stormwater Management Plan report when available.
Please provide details of stormwater/service pipe investigation and cleaning programme identifying the pipes to be investigated/cleaned, along with the timelines involved.

7 February 2013
The inspecting officer was met on site by the Site Manager. It was reported that no dust or odours were found beyond the boundary of the property. The wastewater from cleaning the stormwater drains was being stored on site in tanks until the contracting Company received consent to discharge the liquid onto land. It was noted that there were a couple of small spills on site. These were reported to be urea and palm kernel, and the inspecting officer was informed that these would be cleaned up that day. It was found that there was a new double skinned diesel tank on site. The inspecting officer was informed that a new wheat silo was going to be installed at the rear of the site. It was found that the lime store (Rock Store) had been emptied and the Company advised that the building would be demolished in the near future. The rear of this store was going to be built up to match the level of the front half of the store. It was noted that there was still lime on the concrete pad behind the store (on the Katere Road side), and the inspecting officer was informed that this would be removed by the end of the month. It was observed that the Mangaone Stream was flowing clean and clear at the time of inspection, and that the stormwater drains on site were dry.

9 May 2013
The inspecting officer met on site with the Site Manager. Inspection found that the majority of the stormwater drains were clean and clear. The rear stormwater drain was slightly discoloured due to run off from the unsealed area, but there was no visual impact on the receiving waters. It was noted that the stormwater drains were to be cleaned out by a contractor when the weather allowed. It was found that the wheat silo had been installed. The diesel tank area was reported to be clear of spills.

27 June 2013
The site was inspected in overcast conditions after recent showers. No odours or dust were found beyond the boundary of the property. It was reported that the stormwater drains around the site were visually clear of contaminants at the time of inspection. The wetland area was clear and clean and it was noted that there was no discharge to the Mangaone Stream. There was a small amount of tracking occurring from the stores. The workshop area was found to be tidy.

9 September 2013
The site was inspected in overcast conditions after recent rain. The inspecting officer met on site with the Site Manager. No dust or odours were noted beyond the boundary of the property. The stormwater drains around the site were found to be visually clear of contaminants. The inspecting officer was informed that the Rock Store was be demolished in November. The floor was going to be pulled up and any material underneath would be removed and disposed of. The Company also advised that the contractor was due to be on site shortly to finish cleaning out the drains around the site. The drain that runs under the Rock Store was to be cleaned out as a part of the demolition project. It was noted that the Mangaone Stream was flowing clean and clear below the site.

13 September 2013
The Site Manager emailed to inform the Council that the demolition of the Rock Store would be beginning the week of 16 September 2013, not November, as stated in the inspection notice from the last inspection.

23 October 2013

An inspection was undertaken of the South Star store after self notification of a burst water pipe during the night. It was found that the water was contained within the store and no contaminated water entered the stormwater system. Approximately 16,000 litres of contaminated waster was removed and stored in IBC's. The inspecting officer was informed that the water would be processed back through the system so no wastage of product would occur.

26 November 2013

An on site meeting and site visit were undertaken as part of a consent investigation relating to the Company's two consent renewal applications. The purpose of this visit was to have a look at site activities in order to aid in the understanding of the information submitted in support of the applications for the renewal of consents 3865 and 3140.

It was found that there were a number of trucks loading out, although it was indicated that the site was relatively quiet at the time of the site visit.

The site buildings, activities, drainage etc were viewed and discussed. Possible improvements to structural and procedural controls at the site were also discussed, with the aim of reducing the amount of spillage to ground, tracking from buildings and/or preventing contact between relatively clean stormwater and contaminants on the ground or in drains. Council suggestions included:

- The installation of a sloped batter board on the wall inside the South Star building to prevent spillage fertiliser over the back side of the trucks when loading out.
- Installation of a "sock" on the boarding under the conveyor to the hopper at the weigh bridge to direct the spillage back onto the load out conveyor or into the truck, and batter boards from under the platforms to the front base of the RSJs to direct spillage from the load out conveyor into the truck.
- Culverting the stormwater flow at the southern entrance to the urea store to prevent tracking and spillage from truck leaving the building dropping/washing into the open stormwater drain.
- In all stores, keeping the toe of the product piles further away from the areas that trucks drive through, and trying to keep the piles of products further back from the store entrances so that the tracking remains within the store.
- Piping the roof stormwater that runs through the drain covered by metal plates at the entrance to the intake building. In general the idea would be to minimise the potential for contaminants to be deposited or washed into the stormwater drains, and to pipe stormwater where appropriate to minimise the contact between relatively clean stormwater off the roofs in drains that have the potential to contain sediment build-ups.
- Installation of a sock on the load out in the intake building.

It was noted that the demolition of the rock store was progressing.

It was found that there was a grain silo, and grinder at the site now, and that palm kernel was being stored on site. It was noted that there were potential air related issues related to these activities, which have been introduced onto the site since the air discharge consent was issued. The Company was advised that these changes should be notified to Council as per special condition 8 of consent 4024-3, including

the required assessment of environmental effects identifying potential effects and mitigation measures in place. It was also noted that the special condition requires that Council be notified of changes prior to them occurring.

The following action is to be taken:
Please provide notification to Council (can be emailed to worksnotification@trc.govt.nz) regarding the scale and nature of the new activities relating to the grain storage and grinding and storage and distribution of palm kernel as required by consent, and an assessment of the potential environmental effects of these changes to the site activities and the mitigation measures in place.

18 December 2013
The inspecting officer met on site with the Site Manager. The stormwater drains around the site looked to be satisfactory, although it was noted that there was one drain outside the South Star building that needed to be cleaned out. The inspecting officer noted that there appeared to be a build up of white/grey material present. It was noted that there were a few small spills around the site and the Company was advised that these needed to be cleaned up. It was observed that the lime store (Rock Store) was half way through being pulled down, and the inspecting officer was informed that the material under the plastic (on the floor of the store) was to be removed shortly. The contractor would then be on site soon after to clean out the drains under the store. It was noted that the site was tidy at the time of inspection.

6 March 2014
This site inspection was undertaken in fine, windy weather. The stormwater drains around the site were visually clear of contaminants. There was some tracking of product noted around the site. The diesel tank area was tidy with no spills noted. The wetland area appeared to be healthy. It was reported that stage one of the demolition of the lime store had been completed, and stage two was to begin soon. Photos were taken of this area. The Mangaone Stream was found to be flowing clean and clear at the time of inspection, and the site was tidy.

17 June 2014
It was reported that the site was inspected as part of the Lower Waiwhakaiho Monitoring Programme, which also includes an assessment of all stormwater discharges to the Mangaone Stream that runs adjacent to this plant.

The site was inspected following recent heavy rainfall, which it was noted, allowed a comprehensive study of flow and water quality characteristics to be made. It was reported that, in the main, no problems were found that would lead to water quality degradation in this catchment. The Company was reminded that this was a very large site, and staff were reminded to be mindful of clearing out silt traps, drains etc and taking all contingencies to prevent any off site effects.

12.3.2 Chemical analysis

12.3.2.1 Results of discharge monitoring

Waiwhakaiho River (Consent 3140)
The discharge to the Waiwhakaiho River is sampled at a manhole on the old effluent line to McLeod's Drain (Site Code IND004002). The results of monitoring for 2012-

2014 are presented in Table 39. A summary of previous monitoring data is included for comparison.

The oil and grease concentration limit given in consent 3140 was assessed as having been complied with on both monitoring occasions during the years under review. The pH and suspended solids limits were complied with on 4 February 2013, but were both of these parameter limits were exceeded on 16 April 2013. On this sampling occasion the suspended solids concentration found in the discharge was 14 times higher than that permitted by the consent, however at the time of sampling it was noted that the discharge was at a very low flow, and that some of the sediment in the drain may have been disturbed during sampling.

Table 39 Chemical monitoring results for Ravensdown process effluent discharge for 2012-2014, with summary of previous monitoring data from 1 January 1990 to June 2012. TRC site code IND004002

	Cond mS/m	DRP g/m^3	F g/m^3	NH_3 g/m^{3}N	NH_4 g/m^{3}N	O & G g/m^3	pH	SS g/m^3	Temp ºC	TP g/m^{3}P	Turby NTU	Urea g/m^{3}N
Consent limit	-	-	-	-	-	*15*	*6-8.5*	*100*	-	-	-	-
Number	53	53	52	25	29	31	55	54	52	32	14	3
Minimum	19.2	0.014	0.30	0.00002	0.020	<0.5	3.3	2	10.4	0.043	16	10.7
Maximum	4240	85.9	118	41.0177	143	13	9.0	590	34.5	72.6	350	958
Median	100	1.96	2.02	0.22136	30.4	0.4	7.6	38	17.9	11.1	85	148
4-Feb-13	62.4	3.82	1.16	0.76999	25.0	b	7.8	46	20.6	5.03	31	-
16-Apr-13	235	2.31	2.98	93.38	317	b	9.0	1400	17.2	14.8	400	10.5
4-Dec-13 [c]	-	-	-	-	-	-	-	-	-	-	-	-
9-Jun-14[c]	-	-	-	-	-	-	-	-	-	-	-	-

Key: Results shown in bold within a table indicates that a consent limit for a particular parameter has been exceeded

b parameter not determined, no visible hydrocarbon sheen and no odour

c access issues prevented sampling

Results show that the composition of the discharge has changed considerably since manufacturing stopped at the site. The turbidity, pH, and the concentration of suspended solids, and the nutrients ammonia and phosphorus have all increased markedly, while the temperature, fluoride concentration and conductivity have, for the most part, reduced. These changes owe largely to the cessation of the discharge of brackish cooling water from the Waiwhakaiho estuary following the closure of the fertiliser works. The large cooling water flow tended to mask any effects of stormwater, resulting in a discharge of relatively low turbidity, suspended solids and nutrient values that had a high conductivity. The elevated ammonia and phosphorus concentrations now typically observed owe to the dissolution of fertiliser particles carried by wind or water into the stormwater drains.

With the exception of ammoniacal nitrogen and total phosphorus in the sample collected on 4 February 2013, the samples taken during the years under review both contained above median dissolved reactive phosphorus, ammoniacal nitrogen, pH, suspended solids and total phosphorus. Although new maximums were recorded for unionised ammonia, ammoniacal nitrogen, suspended solids and turbidity in the sample collected on 16 April 2013, it must be borne in mind that some of the sediment settled in the drain may have become entrained in the sample during sample collection. It is also noted that due to the conditions prevailing at the time of

sampling, these elevated levels of contaminants had been assimilated in the Waiwhakaiho River (WKH000925, Table 54) with little, if any, effect at this monitoring location.

The urea concentration of the discharge has not been routinely monitored, but is determined on occasion due to the increase seen in the typical pH. The urea concentration found on 16 April 2013 again confirms that this readily soluble fertiliser is occasionally becoming entrained in the stormwater discharged from the northern area of the site.

Although the discharge from the site could not be sampled on 4 December 2013 and 9 June 2014, as with previous years, the influence of the stormwater from Ravensdown appeared to be clearly evident in the discharge samples collected from McLeod's drain on all monitoring occasions during the period under review (STW001001, Table 20).

The fluoride concentrations found in the discharges similar to the median of the historical results. To put the values of 1.16 and 2.98 g/m^3 in context, the maximum acceptable value for drinking water is 1.5 g/m^3, but there is no limit on fluoride in surface water for the protection of aquatic ecosystems.

Mangaone Stream (Consent 3865)

The main discharge to the Mangaone Stream, comprising stormwater and/or groundwater seepage, is sampled from a ditch in the south-eastern corner of the site, outside the high analysis store (site code STW002003). This stormwater catchment includes the railway lines to the depot, and part of the dispatch building. Some of the catchment is owned by New Zealand Railways Corporation (formerly Ontrack and before that, TranzRail). The results of monitoring for 2012-2014 are presented in Table 40. A summary of previous monitoring data is included for comparison.

Table 40 Chemical monitoring results for Ravensdown main stormwater discharge to the Mangaone Stream for 2012-2014, with summary of previous monitoring data from January 1990 to June 2012. TRC site code STW002003

	Cond mS/m	DRP g/m^{3}P	F g/m^3	NH_3 g/m^{3}N	NH_4 g/m^{3}N	NNN g/m^{3}N	O & G g/m^3	pH	SS g/m^3	Temp ^{o}C	TP g/m^{3}P	Turby NTU
Consent limit	-	-	-	-	-	-	*15*	*6-8.5*	*100*	-	-	-
Number	59	59	54	44	52	27	27	58	56	55	36	15
Minimum	41.2	3.4	0.12	0.00009	8.3	3.6	<0.5	3.3	3	10.3	4.2	2.2
Maximum	1300	697	100	5.67691	1210	151	360	8.2	1600	23.2	707	150
Median	194	28.2	2.43	0.17763	61.1	31.3	<0.5	6.9	28	15.1	19.6	35
4-Feb-13	95.0	5.59	1.10	0.07748	13.4	16.6	b	7.1	26	19.5	6.1	21
10-May-13	123	22.6	1.70	0.84166	58.4	9.32	b	7.7	37	13.2	32.2	170
4-Dec-13	142	28.0	1.24	0.19761	59.1	64.0	b	6.9	32	17.8	30.1	27
9-Jun-14	86.6	12.1	1.37	0.08424	33.4	26.6	b	6.9	41	14.5	14.1	20

Key: Results shown in bold within a table indicates that a consent limit for a particular parameter has been exceeded

b parameter not determined, no visible hydrocarbon sheen and no odour

Compliance was observed with the pH, oil and grease limits, and suspended solids on all four monitoring occasions.

In line with the results obtained during the 2008-2012 years, the majority of the samples collected during the years under review indicated that on the whole, there had been some improvement in the ammoniacal nitrogen concentration of the stormwater discharged from the site to the Mangaone Stream. The highest concentrations found during the period under review were similar to the historical median, with two of the samples returning results that were about one quarter to one half of the historical median. It is noted however that that the nitrate/nitrite nitrogen in the sample collected on 4 December 2013 was about twice the historical median, indicating that the discharge contained fertiliser that had been released some time before sampling as it had oxidised from the ammoniacal nitrogen to the nitrate/nitrite form.

The dissolved reactive and fluoride concentrations were all similar to or below median at this sampling point on all four monitoring occasions, however the total phosphorus was found to be above median during two of the sampling surveys.

12.3.2.2 Results of receiving water monitoring

Monitoring sites have been identified, at which sampling is undertaken during the wet weather runs, in order to assess compliance with the unionised ammonia limits (0.025 g/m^3) on the Company's consents. The mix zone provided for in the Waiwhakaiho River is 150 metres downstream of the McLeod's drain discharge, and in the Mangaone Stream the mix zone extends to the Katere Road bridge. The results of the Waiwhakaiho sampling are given in Table 41 and the results of the Mangaone Stream sampling are given in Table 42. The tables also include the discharge results to aid in the interpretation of any effects in the receiving water.

Waiwhakaiho River

Samples of the discharge from the site to the Waiwhakaiho River at monitoring site IND004002 could not be obtained during the sampling surveys on 4 December 2013 and 9 June 2014. For these surveys the results for the discharge from McLeod's drain have been included, to provide some indication of the quality of the discharge from the Ravensdown site.

Table 41 Receiving water nutrient monitoring in relation to Ravensdown's discharge to the Waiwhakaiho River

		04-Feb-13			
		Waiwhakaiho U/S (WKH000920)	Ravensdown discharge (IND004002)	Waiwhakaiho approx 300m D/S McLeod's drain (WKH000925)	Waiwhakaiho approx 1 km D/S McLeod's drain (WKH000942)
Cond @20^{o}C	mS/m	13.8	62.4	14.3	14.2
DRP	g/m^{3}P	0.012	3.82	0.024	0.035
Fluoride	g/m^3	0.06	1.16	0.07	0.06
NH_3	g/m^{3}N	0.0004	0.76999	0.00235	0.00197
NH_4	g/m^{3}N	0.009	25.0	0.067	0.088
NNN	g/m^{3}N	0.02	-	-	0.10
pH		7.9	7.8	7.8	7.6
SS	g/m^3	<2	46	2	3
Temp	^{o}C	22.5	20.6	22.4	22.4
Turby	NTU	0.67	31	1.2	2.7

	16-Apr-13			
	Waiwhakaiho U/S (WKH000920)	Ravensdown discharge (IND004002)	Waiwhakaiho approx 300m D/S McLeod's drain (WKH000925)	Waiwhakaiho approx 1 km D/S McLeod's drain (WKH000942)
Cond @20°C mS/m	13.1	235	13.2	13.2
DRP g/m³P	0.017	2.31	0.017	0.017
Fluoride g/m³	0.08	2.98	0.07	0.07
NH_3 g/m³N	0.0002	93.383	0.00044	0.00038
NH_4 g/m³N	<0.003	317	0.0100	0.007
NNN g/m³N	0.02	-	-	0.01
pH	8.3	9.0	8.1	8.2
SS g/m³	<2	1400	4	4
Temp °C	15.7	17.2	16.2	16.2
Turby NTU	0.46	400	1.7	1.2
Urea g/m³N	-	10.5	-	-
	4-Dec-13			
	Waiwhakaiho U/S (WKH000920)	McLeod's Drain (STW001001)	Waiwhakaiho approx 300m D/S McLeod's drain (WKH000925)	Waiwhakaiho approx 1 km D/S McLeod's drain (WKH000942)
Cond @20°C mS/m	10.9	10.0	10.8	10.4
DRP g/m³P	0.016	2.96	0.206	0.132
Fluoride g/m³	0.05	0.30	0.06	0.06
NH_3 g/m³N	0.0003	0.03339	0.00581	0.00284
NH_4 g/m³N	0.015	3.32	0.233	0.175
NNN g/m³N	0.06	-	-	0.15
pH	7.7	7.4	7.8	7.6
SS g/m³	<2	69	4	6
Temp °C	17.7	17.7	17.7	18
Turby NTU	1.0	59	3.2	4.4
	09-Jun-14			
	Waiwhakaiho U/S (WKH000920)	McLeod's Drain (STW001001)	Waiwhakaiho approx 300m D/S McLeod's drain (WKH000925)	Waiwhakaiho approx 1 km D/S McLeod's drain (WKH000942)
Cond @20°C mS/m	9.8	14.3	9.9	10.4
DRP g/m³P	0.009	1.67	0.025	0.017
Fluoride g/m³	0.04	0.34	0.04	0.04
NH_3 g/m³N	0.00006	0.0511	0.00076	0.00073
NH_4 g/m³N	<0.003	4.9	0.045	0.022
NNN g/m³N	0.2	-	-	0.19
pH	7.9	7.5	7.8	8.0
SS g/m³	<2	42	<2	<2
Temp °C	12.2	15.0	12.3	15.5
Turby NTU	0.8	50	1.2	1.3

Key: Results shown in bold within a table indicates that a consent limit for a particular parameter has been exceeded

During the period under review there were generally small changes in the dissolved reactive phosphorus, unionised ammonia, ammoniacal nitrogen, suspended solids and turbidity concentrations of the Waiwhakaiho River 300 metres downstream of where the Ravensdown stormwater discharges (via McLeod's drain). There was little, if any, change in the fluoride concentration of the receiving water.

Mangaone Stream

During the sampling survey undertaken on 16 April 2013 it was noted that there was only a trickle flow occurring from the rear drain that was too low flowing to allow a sample to be obtained.

On all monitoring occasions increases were observed in the ammoniacal nitrogen and unionised ammonia concentrations at the Katere Road bridge monitoring site, including the survey when the discharge flow rate from the Ravensdown site was too low to sample.

The highest unionised ammonia concentration found downstream of Ravensdown's rear drain during the year under review was 0.008 g/m^3, found at MGO000153 on 4 December 2013. This is much less than the 0.025 g/m^3 considered to be toxic in an aquatic environment.

Table 42 Receiving water nutrient monitoring in relation to Ravensdown's discharge to the Mangaone Stream

		04-Feb-13			
		Mangaone upstream (MGO000148)	Ravensdown discharge (STW002003)	Mangaone at Katere Rd bridge (MGO000153)	Mangaone at Rifle Range Rd bridge (MGO000190)
Time	NZST	12:05	11:50	11:20	09:25
Cond @20^{o}C	mS/m	20.4	95.0	19.4	13.6
DRP	g/m^{3}P	0.014	5.59	0.062	0.068
NH_3	g/m^{3}N	0.00157	0.07748	0.00393	0.00258
NH_4	g/m^{3}N	0.221	13.4	0.347	0.426
NNN	g/m^{3}N	0.71	16.6	0.96	-
pH		7.2	7.1	7.4	7.1
SS	g/m^3	6	26	6	8
Temp	^{o}C	19.2	19.5	19.3	20.1
Turby	NTU	8.6	21	-	10
		16-Apr-13			
		Mangaone upstream (MGO000148)	Ravensdown discharge (STW002003)	Mangaone at Katere Rd bridge (MGO000153)	Mangaone at Rifle Range Rd bridge (MGO000190)
Time	NZST	12:12	12:10	11:58	12:05
Cond @20^{o}C	mS/m	21.1	-	22.1	21.4
DRP	g/m^{3}P	0.041	-	0.055	0.035
NH_3	g/m^{3}N	0.00096	-	0.00298	0.00111
NH_4	g/m^{3}N	0.169	-	0.356	0.119
NNN	g/m^{3}N	0.86	-	0.97	-
pH		7.2	-	7.4	7.4
SS	g/m^3	4	-	3	<2

Temp	°C	16.1	-	15.2	16.7
Turb	NTU	7.1	-	-	2.8
		10-May-13			
		Mangaone upstream (MGO000148)	Ravensdown discharge (STW002003)	Mangaone at Katere Rd bridge (MGO000153)	Mangaone at Rifle Range Rd bridge (MGO000190)
Time	NZST	12:50	12:50	12:40	13:30
Cond @20°C	mS/m	15.9	123	17.7	14.9
DRP	g/m³P	0.020	22.6	0.040	0.126
NH_3	g/m³N	0.00034	0.84166	0.00136	0.00114
NH_4	g/m³N	0.144	58.4	0.294	0.248
NNN	g/m³N	0.80	9.32	1.00	-
pH		6.9	7.7	7.2	7.2
SS	g/m³	19	37	7	23
Temp	°C	13.8	13.2	13.4	13.3
Turby	NTU	18	170	-	21
		4-Dec-13			
		Mangaone upstream (MGO000148)	Ravensdown discharge (STW002003)	Mangaone at Katere Rd bridge (MGO000153)	Mangaone at Rifle Range Rd bridge (MGO000190)
Time	NZST	12:30	12:10	11:00	10:10
Cond @20°C	mS/m	16.6	142	13.7	12.7
DRP	g/m³P	0.061	28.0	0.337	0.395
NH_3	g/m³N	0.00113	0.19761	0.00766	0.00617
NH_4	g/m³N	0.183	59.1	0.494	0.632
NNN	g/m³N	0.85	64	0.84	-
pH		7.2	6.9	7.6	7.4
SS	g/m³	6	32	14	14
Temp	°C	17.3	17.8	17.4	17.3
Turby	NTU	6.8	27	-	14
		9-Jun-14			
		Mangaone upstream (MGO000148)	Ravensdown discharge (STW002003)	Mangaone at Katere Rd bridge (MGO000153)	Mangaone at Rifle Range Rd bridge (MGO000190)
Time	NZST	13:30	15:15	14:20	14:45
Cond @20°C	mS/m	16	86.6	14.6	14.7
DRP	g/m³P	0.016	12.1	0.105	0.138
NH_3	g/m³N	0.00085	0.08424	0.00194	0.00284
NH_4	g/m³N	0.175	33.4	0.396	0.421
NNN	g/m³N	0.84	26.6	0.99	-
pH		7.2	6.9	7.2	7.3
SS	g/m³	5	41	15	13
Temp	°C	14.0	14.5	14.2	15.4
Turby	NTU	8	20	-	16

Key: Results shown in bold within a table indicates that a consent limit for a particular parameter has been exceeded

During the year under review changes in the dissolved reactive phosphorus concentration of the Mangaone Stream observed below Ravensdown's discharge ranged from a 6 fold increase on 9 June 2014 to little, if any, effect on 16 April 2013.

12.3.2.3 Results of groundwater monitoring

From the 2002-2003 year, the routine compliance monitoring programme allowed for a full survey of the groundwater in the immediate vicinity of the Ravensdown site to be undertaken at five sites on one occasion during each monitoring year, along with associated receiving water monitoring. The location of the monitoring bores is shown in Figure 4 and the results for the year under review are given in Table 44. The associated receiving water monitoring is presented in Section 16.1.1.2.

In 2003-2004 this monitoring found elevated levels of nutrients in the vicinity of the site, particularly ammoniacal nitrogen at site GND0517. Although, at that time, the source of this was quickly identified and remediated, subsequent changes in management practices at the site have resulted in elevated ammoniacal nitrogen concentrations being present once again in this bore. As a result, the 2012-2014 programmes again provided for three bores, and associated receiving water sites, to be monitored at 6 monthly intervals with a focus on nutrients. The results of this nutrient focused monitoring for the years under review are given in Table 43. The relevant results for site GND0548 have been included in this table as, although the site is monitored in relation to New Plymouth District Council's Bewley Road landfill, this site is also down gradient of the Ravensdown Fertiliser store.

It is noted that the monitoring bores in the Caltex forecourt were lost when the underground storage tanks were removed. A remaining bore located on the old service station site, approximately 10 metres down gradient of the Ravensdown store's boundary that was monitored during the 2010-2012 years, was destroyed during the period under review when new commercial units were built on the site. At Councils request, Ravensdown installed a new monitoring bore on their property boundary (GND2346). This new bore was first sampled in April 2013.

Sampling of GND0517, and associated receiving water sampling was undertaken on 24 September 2013. This was carried out in follow-up to elevated ammoniacal nitrogen concentrations observed in a sample collected from this bore in May 2012. The results of this sampling are also included in Table 43.

Table 43 Chemical monitoring results for nutrients in the groundwater and Mangaone Stream in the vicinity of Ravensdown Fertilisers for 2012-2014

Site		MGO000151	GND0517	MGO000155	GND1218	GND2346	GND0548
24-Sep-12		*TRC122973*	*TRC122972*	*TRC122974*	-	-	-
Cond	mS/m	17.5	1390	17.8	-	-	-
DRP	g/m^3 P	<0.003	19.6	0.016	-	-	-
NH_3	g/m^3	0.00095	99.733	0.00086	-	-	-
NH_4	g/m^3 N	0.145	1330	0.165	-	-	-
pH		7.3	8.4	7.2	-	-	-
Temp	^{o}C	15.0	14.5	15.0	-	-	-
TP	g/m^3 P	0.028	22.2	0.024	-	-	-

Site		MGO000151	GND0517	MGO000155	GND1218	GND2346	GND0548
23-Jan-13		*TRC134484*	*TRC134482*	*TRC134485*	*TRC134481*	-	*TRC134473*
Cond	mS/m	19.8	872	20.3	133	-	82.6
DRP	g/m^3 P	0.010	8.37	0.005	0.016	-	<0.003
NH_3	g/m^3	0.00238	55.401	0.00440	0.00030	-	0.02474
NH_4	g/m^3 N	0.038	832	0.074	31.6	-	11.8
pH		8.1	8.3	8.1	4.4	-	6.7
Temp	^{o}C	21.2	15.9	20.5	16.6	-	18.2
TP	g/m^3 P	0.026	11.2	0.022	0.590	-	-
10 April 2013		-	-	-	-	*TRC135623*	-
Cond	mS/m	-	-	-	-	69.0	-
DRP	g/m^3 P	-	-	-	-	0.086	-
NH_3	g/m^3	-	-	-	-	0.01606	-
NH_4	g/m^3 N	-	-	-	-	2.58	-
pH		-	-	-	-	7.2	-
Temp	^{o}C	-	-	-	-	17.4	-
6-Jun-13		*TRC136152*	*TRC136151*	*TRC136144*	*TRC136150*	-	*TRC136143*
Cond	mS/m	17.1	1080	16.6	114	-	82.5
DRP	g/m^3 P	0.008	1.36	0.01	0.010	-	0.012
NH_3	g/m^3	0.00092	15.199	0.00135	0.00013	-	0.02525
NH_4	g/m^3 N	0.242	1110	0.228	19.1	-	12.5
pH		7.2	7.6	7.4	4.3	-	6.7
Temp	^{o}C	10.8	15.7	10.5	15.8	-	17.7
TP	g/m^3 P	0.045	3.07	0.076	0.208	-	-
28-Jan-14		*TRC148662*	*TRC148660*	*TRC148663*	*TRC148658*	*TRC148659*	*TRC148310*-*
Cond	mS/m	18.7	801	18.8	177	65.0	70.1
DRP	g/m3 P	0.008	3.34	0.012	0.014	0.118	0.004
NH_3	g/m^3	0.00078	199.54	0.00075	0.00141	0.01419	0.02808
NH_4	g/m^3 N	0.09	1060	0.085	76.3	2.23	13.2
pH		7.4	8.8	7.4	4.7	7.2	6.7
Temp	^{o}C	15.7	15.9	16	16.5	17.7	18.4
TP	g/m3 P	0.048	3.67	0.025	0.068	0.220	-
5-Jun-14		*TRC1410165*	*TRC1410159*	*TRC1410166*	*TRC1410163*	*TRC1410164*	*TRC1410160*
Cond	mS/m	17.5	790	17.8	164	58.2	70.3
DRP	g/m^3 P	0.008	4.63	0.008	0.010	0.120	0.008
NH_3	g/m^3	0.00097	271.44	0.00131	0.00113	0.01541	0.01951
NH_4	g/m^3 N	0.121	1170	0.158	75.5	1.51	8.97
pH		7.5	8.9	7.5	4.6	7.4	6.7
Temp	^{o}C	11.5	16.2	12.0	16.8	17.9	18.7
TP	g/m^3 P	0.011	4.98	0.011	0.037	0.126	-

Key *Sample collected on 10 January 2014

The data presented in Table 43 shows that there is a slight elevation in the total and dissolved phosphorus in the groundwater bores in the vicinity of the Ravensdown site.

The ammoniacal nitrogen concentration of the groundwater is also elevated at all three bores in the immediate vicinity of the site, with the concentrations found at GND0517, adjacent to Katere Road, continuing to be significantly above background during the years under review.

Although affected to a much lesser extent, the ammoniacal nitrogen concentration at GND1218, on the northern boundary of the site approximately 70m from the urea store, was found to have more than doubled during the 2012-2014 years. Historical results for this site show that the ammoniacal nitrogen concentration had previously varied between 6.5 and 26.2 g/m^3 (Figure 19).

Samples taken from the new bore (GND2346) used in place of GND1342 returned results significantly lower than the range of results previously reported for GND1342.

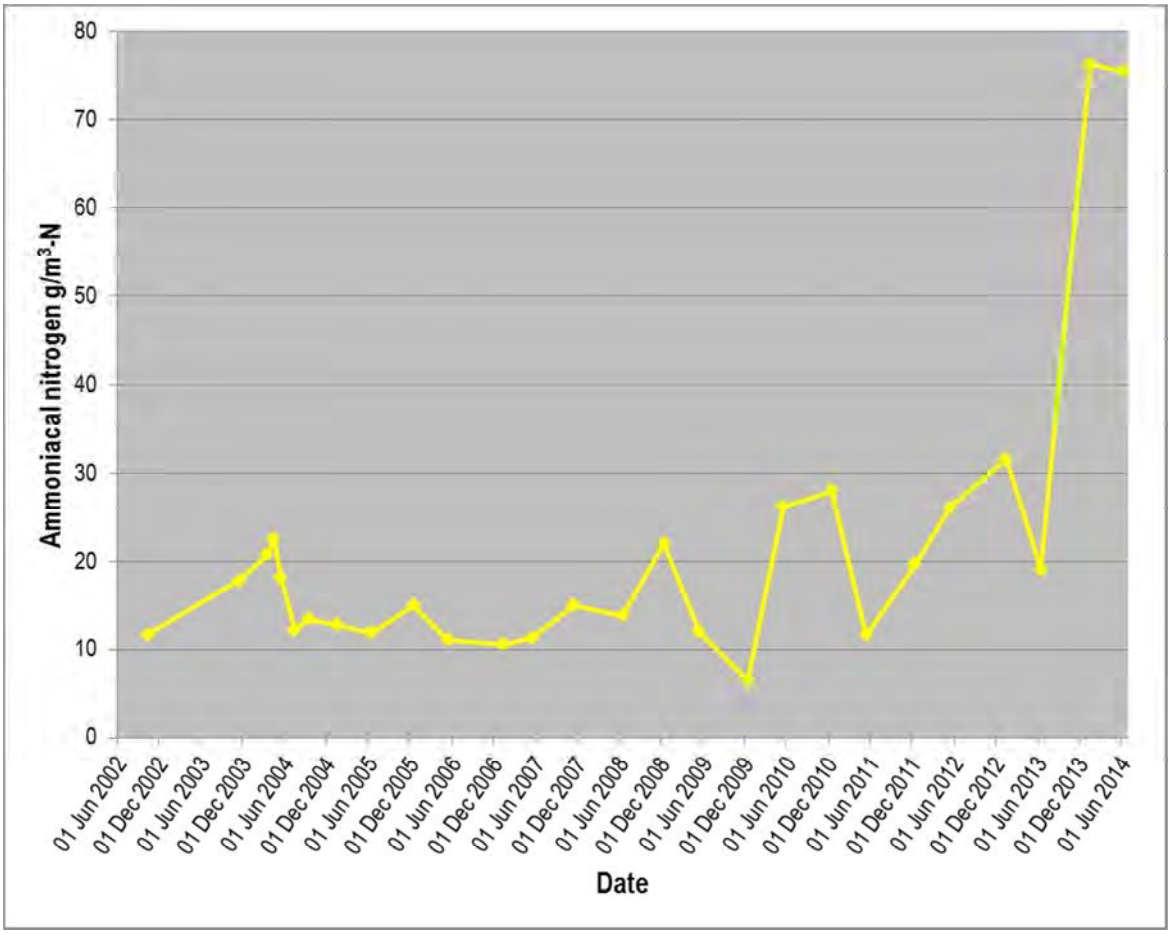


Figure 19 Ammoniacal nitrogen concentration at site GND1218, 2002 to date

The historical ammoniacal nitrogen results for site GND0517, on the eastern boundary, are illustrated in Figure 20.

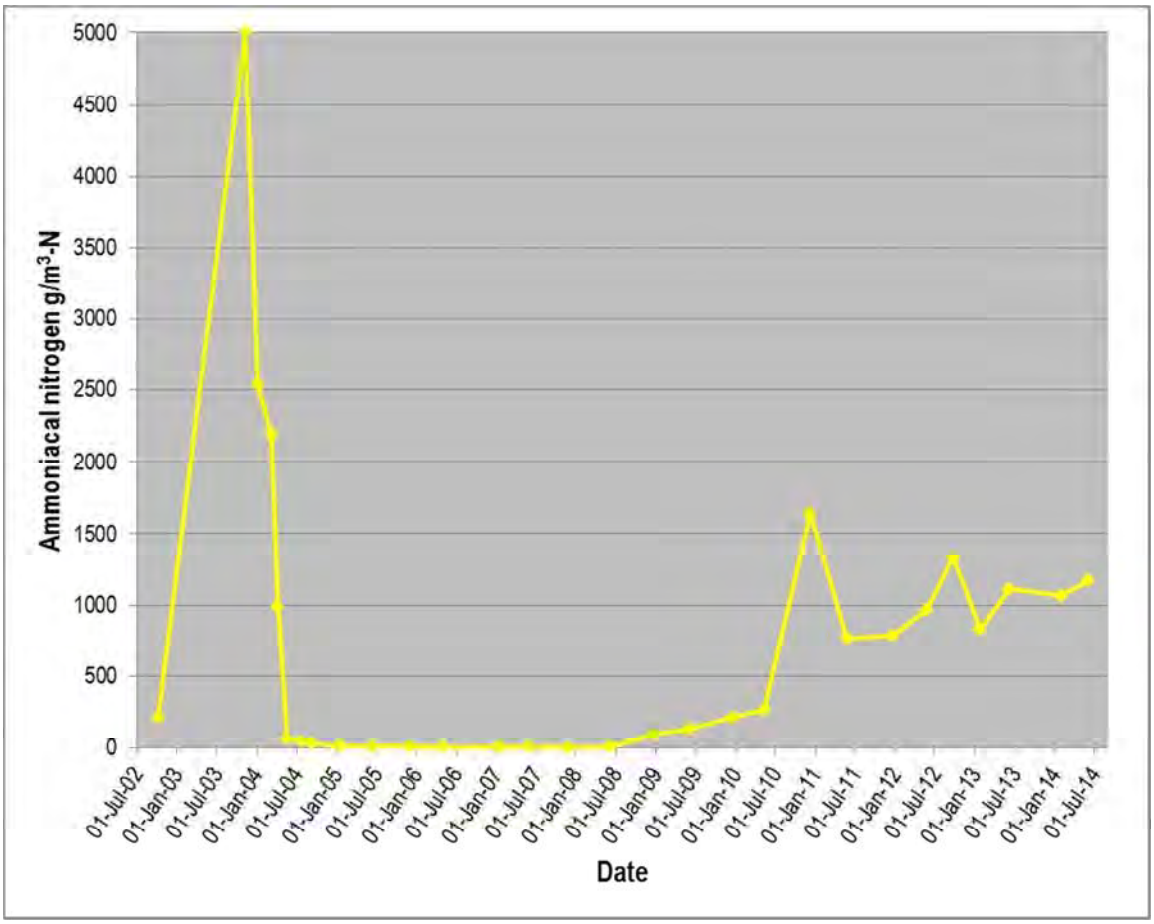


Figure 20 Trend in ammoniacal nitrogen concentration at site GND0517, 2002 to date

In 2003, soon after regular monitoring of this bore commenced, the ammoniacal nitrogen concentration found in this bore was 5000 g/m^3. It was identified that the phosphate rock store (Rock Store) was the likely source of contaminants due to a leaking roof and broken concrete floor. The ammoniacal nitrogen concentration dropped markedly after the store was emptied in December 2003. The ammoniacal nitrogen concentration bottomed out at approximately 3 g/m^3 during the 2007-2008 monitoring year before beginning to increase once again. It was subsequently found by Council that this store had been put back into use. The recoverable material was removed from the store in the middle of the 2010-2011 year, and a plastic liner was placed over the remaining material to prevent contact with stormwater entering through the leaks in the roof. Although this reduced the amount of ammoniacal nitrogen in the ground water at this monitoring location, results to the end of the 2010-2012 years showed an underlying trend of increasing ammoniacal nitrogen concentration. Towards the end of that monitoring period this was logged as an unauthorised incident on the Council's Unauthorised Incidents Register, and as a result the Company contracted a consultant to investigate the stormwater and groundwater issues at the site.

Follow-up sampling on 24 September 2012 confirmed that the ammoniacal nitrogen concentration was continuing to increase. This was logged as an unauthorised incident, and an abatement notice was issued requiring works to be undertaken to ensure that no further contamination of groundwater occurs. Although a decrease was observed in the following sample (December 2012), this was not sustained and

therefore a further unauthorised incident was registered, which subsequently lead to an infringement fine being s issued for the breach of the abatement notice. The incidents occurring during the period under review are discussed further in Section 0.

The other bore for which there has been a trend of increasing ammoniacal nitrogen concentration evident is at GND0548. This bore is off site and down gradient of both the Ravensdown site and the Bewley Road landfill. Historically there appeared to be steady increases in ammoniacal nitrogen concentration at this bore, which are illustrated in Figure 21. However, it is noted that there was a notable decrease in the ammoniacal nitrogen concentration found in the sample collected in June 2014. At this stage it is too early to comment on the significance of this result in relation to the previous trend.

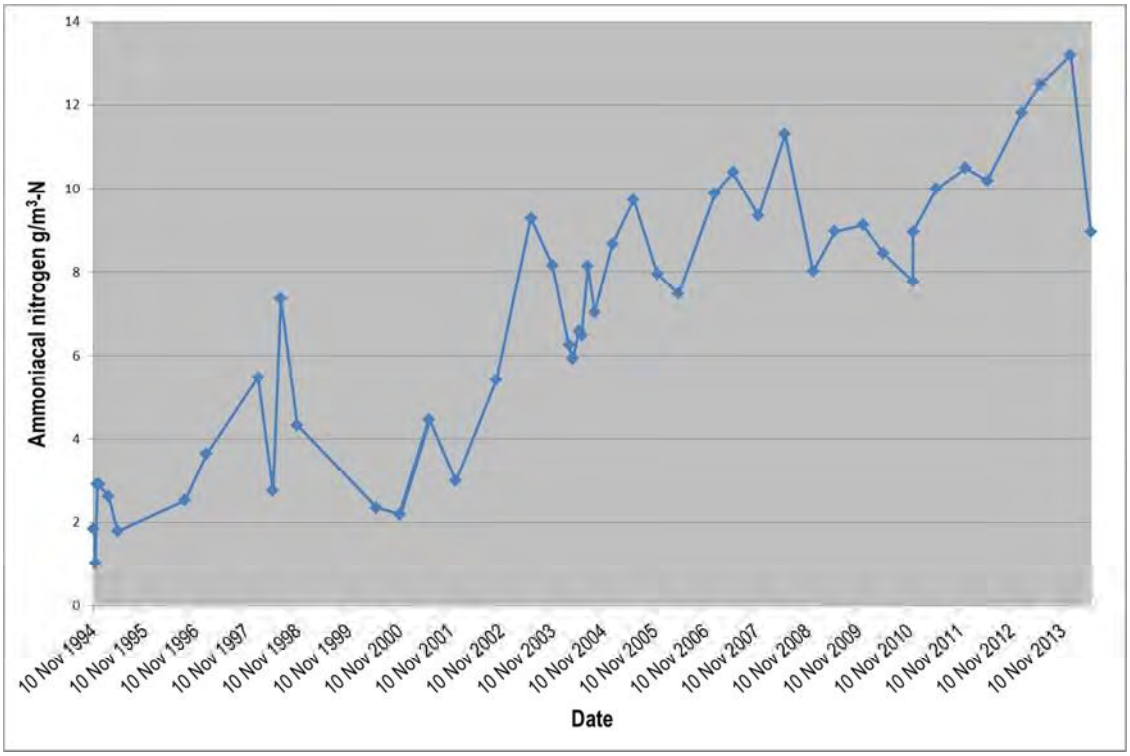


Figure 21 Trend in ammoniacal nitrogen concentration at site GND0548, 1996 to date

Despite the elevated ammoniacal nitrogen in the vicinity of the Ravensdown site, dry weather in-stream monitoring (Section 16.1.2.2) showed that during the years under review, there were only slight increases in the ammoniacal nitrogen concentration in the Mangaone Stream as it flowed past the Ravensdown site. It is also noted that the ammoniacal nitrogen concentrations found in the Mangaone Stream are above the ANZECC trigger value of 0.021 g/m^3 above, as well as below, bore GND0517. The dissolved reactive phosphorous concentration was found to be slightly in excess of the ANZECC trigger value of 0.010 g/m^3 below the site on two of the four monitoring occasions.

At this stage no significant adverse effects are being noted in the Waiwhakaiho River during dry weather (Section 16.1.1.2). The Council is continuing to monitor the situation.

Table 44 Monitoring results for Ravensdown groundwater bores for 2012-2014

Parameter		*Drinking water MAV's*	MW1 GND1217	MW2 GND1218	MW5 GND0517	MW6 GND0518	GND2346
23-Jan-2013			TRC134480	TRC134481	TRC134482	TRC134483	TRC135623*
CdAs	g/m^3	*0.004*	<0.005	<0.005	<0.005	0.005	<0.005
Cond	mS/m	-	106	133	872	79.4	65.0
CrAs	g/m^3	*0.05*	<0.03	<0.03	<0.03	<0.03	<0.03
CuAs	g/m^3	*2*	0.06	0.05	0.02	0.03	<0.01
DRP	g/m^3P	-	<0.003	0.016	8.37	0.014	0.118
F	g/m^3	*1.5*	1.36	1.56	0.51	0.88	0.46
NH_3	g/m^3	-	0.00005	0.00030	55.401	0.00549	0.01419
NH_4	g/m^3N	-	1.64	31.6	832	2.78	2.23
NiAs	g/m^3	*0.08*	0.08	0.03	<0.02	<0.02	<0.02
PbAs	g/m^3	*0.01*	<0.05	<0.05	<0.05	<0.05	<0.05
pH	pH	*7-8.5*	4.9	4.4	8.3	6.7	7.2
SO_4	g/m^3	*250*	480	550	1050	240	-
SS	g/m^3	-	140	92	220	180	75
Temp	^oC	-	17.0	16.6	15.9	17.4	17.7
TP	g/m^3P	-	0.504	0.590	11.2	8.15	0.220
Vand	g/m^3	*0.006*[c]	<0.001	<0.001	0.024	<0.001	<0.001
ZnAs	g/m^3	-	0.207	0.134	0.019	0.131	0.010
28-Jan-2014			TRC148657	TRC148658	TRC148660	TRC148661	TRC148659
CdAs	g/m3	*0.004*	<0.005	<0.005	<0.005	<0.005	<0.005
Cond	mS/m	-	121	177	801	84.9	69.0
CrAs	g/m3	*0.05*	<0.03	<0.03	<0.03	<0.03	<0.03
CuAs	g/m3	*2*	0.06	0.04	0.01	0.02	<0.01
DRP	g/m3P	-	0.016	0.014	3.34	0.367	0.086
F	g/m3	*1.5*	1.04	0.92	0.54	1.06	0.61
NH_3	g/m^3	-	0.00092	0.00141	199.54	0.00234	0.1606
NH4	g/m3N	-	2.02	76.3	1060	1.86	2.58
NiAs	g/m3	*0.08*	0.08	0.03	<0.02	<0.02	<0.02
PbAs	g/m3	*0.01*	<0.05	<0.05	<0.05	<0.05	<0.05
pH		*7-8.5*	6.1	4.7	8.8	6.5	7.2
SS	g/m3	-	310	27	4	64	37
Temp	oC	-	16.3	16.5	15.9	17.5	17.4
TP	g/m3P	-	1.09	0.068	3.67	4.23	0.104
Vand	g/m3	*0.006*[c]	<0.001	<0.001	0.039	<0.001	0.002
ZnAs	g/m3	-	0.164	0.116	0.015	0.115	<0.005

Key: Results shown in bold within a table indicates that the maximum acceptable value given in the Drinking-Water Standards for New Zealand 2005 (Revised 2008) has been exceeded

* New bore, sampled on 10 April 2013

c ANZECC. (2000). Australian water quality guidelines for fresh and marine waters. Australian and New Zealand Environment and Conservation Council guideline value used here as there is no drinking water MAV for this parameter

Although the results obtained for the concentrations of metals, fluoride and the pH's observed in the groundwater are generally of the same order of magnitude as found in monitoring undertaken in previous years, on review of the 2012-2014 results, there are some emerging trends.

At GND1217, the fluoride concentration has decreased to below the MAV during the period under review, and although still below the MAV, the groundwater has become less acidic.

At GND1218, the fluoride and nickel concentrations have decreased to below their respective MAV's, the cadmium concentration has decreased to below the detection limit, and there are emerging trends of decreasing copper and zinc concentrations.

At GND0518, the cadmium and nickel concentrations have decreased to below the detection limit, the fluoride concentration has decreased to below the MAV, and there is trend of decreasing zinc concentration. It as also noted, that although the pH was found to be outside the MAV range during the period under review, the groundwater in this bore is becoming less acidic.

In contrast to previous years, all the cadmium concentrations were found to be below the detection limit of the test method employed, which puts them at, or below, the MAV. Only one fluoride result was found to be marginally above the MAV (GND1218), this is in contrast to the previous period, when all bores except GND0517 were found to contain fluoride concentrations above the MAV.

Although the concentrations of fluoride, pH and/or sulphate are outside the maximum acceptable values given in the Drinking-Water Standards for New Zealand 2005 (Revised 2008) in a number of the bores, there are no domestic bores on the Council's database in the vicinity of the site.

12.3.3 Receiving environment monitoring

The programmed receiving environment monitoring undertaken to monitoring the condition of the receiving waters of the catchment as a whole is reported in Section 16.

12.3.3.1 Periphyton surveys

In addition to the scheduled compliance monitoring programme, as part of the Ravensdown consent renewal process, a periphyton surveys were conducted. During these surveys both chlorophyll *a* samples and data for periphyton index scores (TRC PI) were collected from each of four monitoring sites in the vicinity of Ravensdown's rear drain. The sites monitored are shown in Figure 22.

Figure 22 Periphyton index and chlorophyll *a* monitoring sites in the Mangaone Stream

During the initial survey, undertaken on 04 April 2014 periphytometers were deployed and algal cover estimated. During the following three surveys (02 May 2014, 15 May 2014 and 09 June), chlorophyll *a* samples were collected in addition to algae cover estimates.

During this series of surveys visual estimates of algal cover showed nuisance periphyton was present at all sites, with nuisance mats generally dominating at Site 1 and Site 3 and nuisance filaments generally dominating Site 2 and Site 4. Filamentous algal species are more likely to dominate over mat forming species in nutrient enriched waters. Recreational and aesthetic guidelines were exceeded at three sites on the first sampling occasion. During the subsequent three surveys, coverage of nuisance periphyton was much lower, a likely result of higher flows and lower water temperatures, both of which limit periphyton growth.

The TRC PI scores showed the sites ranged between 'moderate' 'good' and 'very good'. Higher TRC PI scores were recorded during survey two and survey three, possibly a result of the higher flows that preceded these surveys, or perhaps due to the subjectivity involved when gathering qualitative data.

Chlorophyll *a* analysis showed an increase in periphyton biomass accrual over an eight week period. Site 1 and Site 3 recorded the lowest chlorophyll *a* concentrations, followed by Site 2 and then Site 4. It was predicted that the Mangamiro Stream was a possible source of nutrients that affected periphyton growth at Site 2. However, this increase in periphyton biomass at Site 2 did not continue to Site 3, suggesting that the nutrient enrichment from the Mangamiro Stream was quickly absorbed. Periphyton biomass accrual indicated that the main stormwater discharge from the Ravensdown Fertiliser depot was not affecting growth at Site 3. However, chlorophyll *a* concentrations at Site 4 were much higher than the upstream sites, suggesting nutrient enrichment is occurring between Site 3 and Site 4.

It was concluded that periphyton biomass and accrual was greater at Site 4, downstream of the Ravensdown Fertiliser depot in comparison to the three upstream sites. The main discharge point was unlikely to be the foremost source of nutrients contributing to periphyton growth as lower chlorophyll *a* concentrations were recorded at Site 3 compared with Site 2 and Site 4. It is possible there was another source/s of nutrients entering the Mangaone Stream between Site 3 and 4. Further investigation, including nutrient analysis could be used to determine this.

12.3.4 Investigations, interventions, and incidents

In the 2012-2014 period, the Council was required to undertake significant additional investigations and interventions, or record incidents, in association with Ravensdown Fertilisers Co-operative Limited's conditions in resource consents or provisions in Regional Plans.

8 October 2012

During analysis of groundwater samples taken on 24 September 2012 it was found that the ammoniacal nitrogen concentration of the groundwater was elevated at the groundwater bore on Katere Road, New Plymouth. Abatement Notice 11882 was issued requiring works to be undertaken to ensure that no further contamination of groundwater occurs. Sampling will be undertaken again after 7 January 2013.

Subsequent monitoring found that there had been a decrease in the ammoniacal nitrogen concentration in the Katere Road bore, the Rock store had been emptied, and plans were being made to get the store demolished.

However, it was later found that the reduction in ammoniacal nitrogen in the bore was not sustained.

4 September 2013
Analysis of samples taken on 6 June 2013, during routine groundwater sampling, found that the ammoniacal nitrogen concentration of the groundwater was elevated at the groundwater bore on Katere Road, New Plymouth. The Company was advised that this was in non-compliance with Abatement Notice 11882 issued in October 2012. A letter of explanation was requested.

The response received outlined that following the abatement notice, the planned remedial actions were:
1) To remove all the Aglime in the southern end of the Rock Store
2) To remove all product under the plastic in the northern end of the Rock Store
3) To demolish the Rock Store
4) To clean out the 900mm stormwater pipe going under the northern end of the Rock Store

Although removing the lime from the Rock Store was completed in the first week of January 2013, safety constraints and financial pressures on the Company were the reasons given for the remaining work being delayed, with the demolition of the rock store commencing on 25 September 2013.

An infringement fine was subsequently issued to Ravensdown for failing to comply with the abatement notice.

23 October 2013
At 9:35 am self notification was received regarding a burst water pipe in the South Star building at Ravensdown Fertiliser, New Plymouth. Investigation found that a water pipe had burst during the night and had flooded the store. No water had discharged into the stormwater drains. The contaminated water was cleaned up and stored in IBC's. Photographs were taken.

12.4 Discussion

12.4.1 Discussion of site performance

In general, inspection found that housekeeping at the site was good. However, tracking and minor spills continued to be observed on a number of occasions.

During the period under review the discharge to the Waiwhakaiho River via McLeod's drain the pH was found to be outside the permitted range on one occasion, and also contained higher than permitted concentrations of suspended solids. However, it was noted that some sediment may have been disturbed from the bed of the stormwater pipe during sampling, and Ravensdown has in place a programme whereby the underground stormwater drains on site are being progressively cleaned of accumulated sediment.

Consent 3865 covering the discharge of stormwater to the Mangaone Stream contains a requirement that the Company manages the stormwater disposal system to minimise the discharge of free phosphate. During the years under review, the dissolved reactive phosphorous concentrations were found to be similar to, or below median, showing that the Company is continuing to manage activities at the site that might impact on the discharge of free phosphorous.

Receiving water monitoring found that there were no significant adverse effects in the Waiwhakaiho River or in the Mangaone Stream.

Groundwater monitoring indicated that the ammoniacal nitrogen concentration in the groundwater on Katere Road, adjacent to the site, continued to be elevated and this resulted in two of the three entries recorded in Council's Unauthorised Incidents Register. The first of these incidents resulted in the issuing of an abatement notice, and the second resulted in an infringement notice being issued for breach of the abatement notice.

Although some remedial actions were carried out during the year under review, the progress of the project was delayed and further improvements are desirable.

12.4.2 Environmental effects of exercise of consents

The high ammonia and phosphorus concentrations measured at both discharge points are attributed to the dissolution of fertiliser particles carried by wind or water into the stormwater drains. A measurable increase in concentration of these nutrients below the discharge points was observed during the year under review in both receiving waters (i.e. the Mangaone and Waiwhakaiho). However, the changes were compliant with the conditions of the resource consents and were not expected to have resulted in any significant adverse effects.

There continues to be evidence of nutrient enrichment occurring during dry weather in the lower Mangaone Stream. This enrichment could be encouraging the formation of prolific algal growth observed in the stream, which in turn may affect the streambed fauna. Refer to Section 12.3.3.1 and Section 13 for further discussion. Dissolved reactive phosphorus concentrations of above 0.015 - 0.03 g/m^3 are considered to promote nuisance algal and plant growth. During dry weather monitoring the in-stream dry weather concentrations in the Mangaone Stream were found to be above 0.015 g/m^3 on only one occasions, however prolific growths of filamentous green algae were observed at times, downstream of the Katere Road bridge.

During the years under review the biomonitoring reports suggested that the increase in biomass (algal cover and in stream vegetation) may be indicative of nutrient enriched groundwater inputs from this fertiliser depot. It was also noted at the last survey during the period under review that this may be exerting some influence on the biomass at the Waiwhakaiho River biomonitoring site downstream of the Mangaone Stream confluence. At the biomonitoring site 100 m downstream of the depot, it appears that the effects on the macroinvertebrate index (MCI) may be lessening very slightly. There will be sufficient data to undertake a statistical trend analysis at the end of the 2014-2015 year.

Groundwater analysis results have shown that the ammoniacal nitrogen concentrations in the groundwater in the Katere Road area of the site continued to be elevated. However, remedial works are underway at the site.

12.4.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the year under review is set out in Table 45 and Table 46.

Table 45 Summary of performance for Ravensdown's consent 3865-3, discharge of stormwater into the Mangaone Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Concentration limits upon potential contaminants in discharge	Discharge sampling	Yes
2. Minimisation of free phosphate	Discharge sampling	Yes
3. Discharge cannot cause specified adverse effects beyond mixing zone	Visual assessment at inspection and receiving water sampling and biomonitoring	Yes
4. Prepare and maintain contingency plan	Review of documentation received. Latest version 2011	Yes
5. Provision for review of consent	No further opportunities for Review	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		Good
Overall assessment of administrative performance in respect of this consent		High

N/A not applicable

Table 46 Summary of performance for Ravensdown's consent 3140-2 discharge of stormwater into the Waiwhakaiho River

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Concentration limits upon potential contaminants in discharge	Discharge sampling	One sample with elevated SS and pH, but may have been due to disturbance of settled material during sampling
2. Discharge cannot cause specified adverse effects beyond mixing zone	Visual assessment at inspection and receiving water sampling and biomonitoring	Yes
3. Prepare and maintain contingency plan	Review of documentation received. Latest version 2011	Yes
4. Provision for review of consent	No further opportunities for review	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A not applicable

Although, during the years under review, Ravensdown Fertiliser Co-operative Limited demonstrated a high level of environmental and high level of administrative performance and compliance with their resource consents as defined in Section 1.1.5, the overall performances in relation to the Company's activities at the site as a whole

as defined in Section 1.1.5 were improvement required in their environmental performance and poor administrative performance. During the period under review there was a continued minor effect on the ammoniacal nitrogen concentration in the Katere Road groundwater bore for which an abatement notice was issued. A subsequent breach of this abatement notice resulted in the issuing of an infringement notice.

12.4.4 Recommendation from the 2010-2012 Biennial Report

In the 2010-2012 Biennial Report, it was recommended:

THAT monitoring of discharges from Ravensdown Fertiliser Co-operative Limited in the 2012-2013 year be amended to include an additional sample of the Katere Road groundwater bore along with associated receiving water monitoring.

This recommendation was implemented, with the additional sample being made provisional during the 2013-2014 year.

12.4.5 Alterations to monitoring programmes for 2014-2015

In designing and implementing the monitoring programmes for water discharges in the region, the Council has taken into account the extent of information made available by previous authorities, its relevance under the RMA the obligations of the Act in terms of monitoring discharges and their effects, and subsequently reporting to the regional community. The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki discharging to the environment.

It is proposed that for 2014-2015, the programme remains unchanged. A recommendation to this effect is attached to this report.

12.5 Recommendation

THAT monitoring of discharges from Ravensdown Fertiliser Co-operative Limited in the 2014-2015 year continues at the same level as in 2012-2014.

13. Taranaki Sawmills Limited

13.1 Process description

Taranaki Sawmills Limited has operated a timber treatment plant on Katere Road since 1956. In 1997, an adjoining site was purchased and developed for painting and packaging, packaging componentry, and a domestic despatch yard, some of which has now been on-sold. About 30 persons are employed at the site.

Timber is treated at two plants. At one plant, timber is treated with copper, chromium and arsenic (CCA), and with boron. At the other plant, light organic solvent preservative (LOSP) is used.

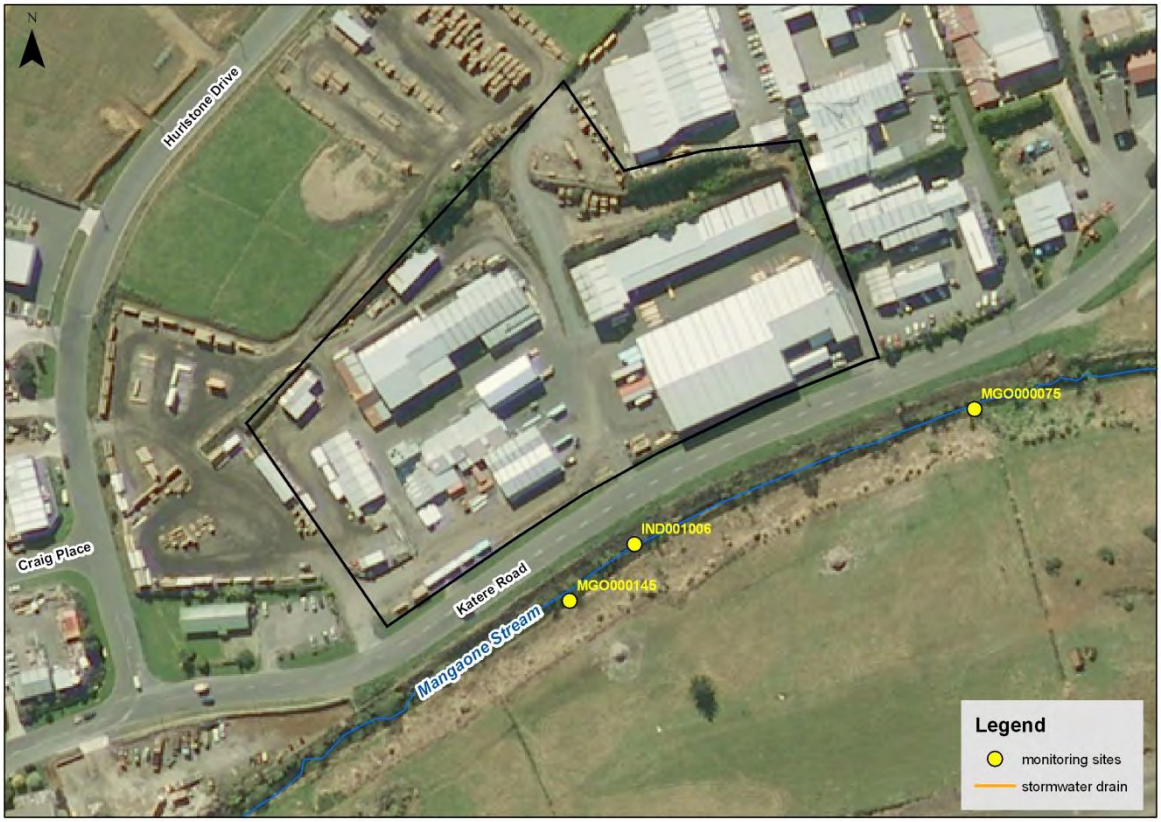


Figure 23 Taranaki Sawmills site and sampling point locations

At the CCA and boron treatment plant, all chemical storage tanks and treatment vessels were once situated in the open, within areas that were sealed and bunded for containment of spillage, and contaminated stormwater from bunded and drip pad areas was collected in sumps and recycled back through the treatment process. The CCA process was changed in February 1999 by the addition of a steam fixation step after CCA treatment, known as the CCA Dry process. This resulted in the elimination of drippage after treatment. Previously, CCA treated timber had to be left on the drip pad for seven days, now the timber only needs to be left on the drip pad for 24 hours to ensure that there is no drippage. There is no discharge to water as a result of the CCA dry process, as blowdown from this process is recycled. During the 2002-2003 year, a roof was constructed over the drip pad, treatment vessels and chemical

storage area, thus eliminating the potential for contaminants to be entrained in the stormwater from these areas.

Some timber is pre-treated by steaming to improve the penetration of the CCA solution. After each steam cycle, the vessel is cooled via an external water heat exchanger to reduce turnaround time. The sludge generated in the steamer vessel, and blowdown from the boiler, was discharged to a settling pit at a rate of about 1,000 litres per day. The settled wastewater, and about 15,000 litres per day of cooling water, was discharged to the Mangaone Stream via a stormwater drain. Sludge that accumulated in the pit was disposed of by a local contractor. During the 2005-2006 year, the condensate from this "steam cracking" of the timber was diverted to sewer. The discharge of cooling water to the Mangaone Stream continued until the 2008-2009 year, during which the cooling water was also diverted to trade waste.

In boron treatment, a vacuum is applied to improve chemical diffusion. The boron treated timber was left under tarpaulins on the drip pad for 14 days for diffusion to complete. An improvement in the boron treatment process was introduced in March 2007. Taranaki Sawmills now employ a dry treatment process using "Framepro". The process for "Framepro" is that the timber is kiln dried before it is sent to the treatment plant. After treatment it dries in a shed on a drip pad until being shipped out.

A new LOSP plant was commissioned in February 1999. The treatment chemicals used in the LOSP process are a range of blends containing one or more of the following, in a white spirit solvent; permethrin, propiconazole, tebuconazole, iodocarb, and/or tributyltin oxide, depending on end use of the timber. At the old LOSP plant, chemical storage tanks were located outside at the northern end of the site in an area that was bunded. The drippage area, which drained to a recycle sump, was also outside. At the new plant, the process is carried out entirely within a building with internal bunds, under computer control to optimise treatment and minimise chemical use. There is no wastewater discharge.

The use of tributyltin oxide at the site ceased in April 2010. Residual tributyltin and CCA have been found in the site surfaces from historical practices. This has been mapped and managed by progressively concreting the affected areas, as discussed in previous Annual/Biennial Reports.

Uncontaminated stormwater, from outside of bunded areas and from roofs, is channelled into two drains that join prior to exiting the site at Katere Road and discharging to the Mangaone Stream.

13.2 Water discharge permit

Taranaki Sawmills Limited holds discharge permit **3491** for the discharge of treated stormwater and wastewater from its plant on Katere Road. This permit, covering the discharge of up to 1,000 cubic metres per day of treated wastewater from a timber drying plant into the Mangaone Stream, was originally issued on 7 March 1990 under section 21 (3) of the Water and Soil Conservation Act and was due to expire on 1 June 2006.

The consent was varied on 5 August 1992 to allow for the discharge of treated stormwater as well as the treated wastewater, and again on 14 February 2002 to allow for an increase in the stormwater discharge volume to take into account of additional stormwater from a newly roofed area.

Taranaki Sawmills Limited applied to renew the permit on 21 November 2005 and permit **3491-2** to cover the discharge of cooling water and wastewater from a timber drying plant and stormwater from a timber treatment site into the Mangaone Stream in the Waiwhakaiho catchment was issued by the Taranaki Regional Council on 17 October 2006 under Section 87(e) of the RMA. It is due to expire on 1 June 2020.

The special conditions on the consent require that the consent holder: (1) adopts the best practicable option to minimise effects, (2) exercises the consent in a manner consistent with the description in the application, (3) adheres to the New Zealand Timber Preservation Council's best practice guideline, (4) ensures that the bunding meets HSNO requirements after a certain date, (5) limits the stormwater catchment area, (6) limits the daily discharge volume of cooling water and wastewater, (7) limits the concentration of particular contaminants known to be used in the industry, (8) limits general (RMA, Section 107) receiving water effects beyond a 30m mix zone, (9) limits the pH range and change in pH permitted in the receiving water, (10) limits temperature effects and changes in filtered carbonaceous biochemical oxygen demand in the receiving water, (11) requires the investigation of pesticide presence in the receiving water and stream sediment, (12) requires the investigation of copper in the receiving water, (13) sets the deadline by which the results of the investigations be provided to Council, (14) maintains a contingency plan, (15) provision for lapse of the consent if not exercised, (16) provision for review based on effects, and (17) provision for review based on changes in the New Zealand Timber Preservation Council's best practice guideline or specific Hazardous Substances regulations.

13.3 Results

13.3.1 Inspections

10 September 2012

The site was inspected in showery weather with light winds. Noticeable (but not objectionable) chemical odours were found at the boundary of the property. No dust was discharging beyond the boundary. The inspection was undertaken with the Site Manager. Timber was being treated with LOSP at the time of inspection and it was reported that no spills were noted in this area. The stormwater drains around the site were found to be visually free of contaminants, and it was noted that the diesel bunds looked good. The CCA area was clean and tidy.

29 November 2012

No dust or emissions were found beyond the boundary of the property. It was noted that the stormwater drains around the site were visually clear of contaminants, however it was noted that the drain wardens were due a cleanout. No tracking of chemicals were observed around the site, and all the bunded areas around the site were found to be in good order. The site was reported as being tidy.

19 March 2013

This site inspection was undertaken with the Site Manager. No dust or odours were found beyond the boundary of the property. The inspecting officer was informed that

a small area of gravel was to be sealed the following week. It was reported that the diesel bunds looked good. The big diesel bund was being drained of clean stormwater at the time of inspection. It was observed that the ring drains at the rear of the site were full of clean stormwater. No tracking of chemicals was found around the site. It was found that all stormwater drains at the site were visually free of contaminants at the time of inspection. The site was again reported as being tidy.

24 June 2013

The site was inspected in overcast conditions after recent showers. No odours or dust were found beyond the boundary of the property. The inspection was undertaken with the Site Manager. It was found that the stormwater drains around the site were visually clear of contaminants, although it was noted that the drain filters were due a clean out. It was reported that the front drain was blocked, and a contractor had been booked to come and unblock it. It was observed that there was a small area where LOSP had spilled onto the sealed area, which needed to be cleaned up. The diesel bunds were found to be in satisfactory condition, although it was noted that there was no water stored within the bunds. The site was again reported as being tidy.

At the end of the inspection the Company was instructed that the following action was to be taken:

- Clean up the area where LOSP had dripped.
- Clean out the drain filters.

2 September 2013

The site inspection was undertaken with the Site Manager, in fine weather and a light breeze. No dust or odours were found beyond the boundary of the property, and no spills were noted around the site. The stormwater drains were reported to be visually clear of contaminants at the time of inspection. It was noted that the front drain had been unblocked. The diesel bund was drained during the inspection and it was observed that the discharge from this was clean and clear. The site was again reported as being tidy.

10 December 2013

This site inspection was undertaken with the Site Manager. The inspecting officer was informed that this member of staff was leaving so there would be a new point of contact for the site. At inspection it was found that the stormwater drains around the site were visually clear of contaminants and it was observed that the drain filters had recently been cleaned out. There was no tracking of materials found at the site, and there was no dust or odour found beyond the boundary of the property. It was reported that the cooling water treatment area was clean and tidy, and the site in general was again reported as being tidy.

6 March 2014

It was reported that no odours or dust were found beyond the boundary of the property. The stormwater drains around the site were visually clear of contaminants. The diesel bund areas were tidy, with no spills observed. The Company was notified that the drain filters were due a clean out. The cooling area was reported to be satisfactory. It was noted that although there was a small leak this was being contained within the bund at the time of inspection.

17 June 2014
An inspection of the site undertaken as part of the Lower Waiwhakaiho monitoring programme, and also as part of the annual inspection round, which includes industries adjacent to the Mangaone stream. This inspection was undertaken during showery weather, following a period of heavy rainfall.

It was found that all stormwater discharging from this site was clear of all visible contaminants. It was noted that silt and suspended solids were reduced owing to, in the main, a sealed and/or compacted yard. It was reported that no discharge of processing or cooling water was evident and, at the discharge point into the Mangaone stream, no visual effects were evident. The yard was reported to be neat and tidy.

Although strong solvent odours were noted in the yard, these were not detected off site.

13.3.2 Surface water chemical analysis

The wet weather discharge from Taranaki Sawmills was sampled on four occasions from the outlet of the storm drain to the Mangaone Stream, immediately across Katere Road (this sampling location represents the entire yard). The two individual flows from the east and west areas of the site near gate number 2 were not sampled individually during the years under review. The results are presented in Table 47 along with the upstream and downstream sampling results. A summary of previous monitoring at this site is included for comparative purposes.

It was found that the concentrations of the effluent components monitored were generally within the ranges of previously reported results, and with the exception of the run undertaken on 4 February 2013, with most of the parameters were similar to or below the median values.

The component limits on the consent for the general parameters of pH, oil and grease, and for the site specific components arsenic, boron, chromium, copper, tributyltin and zinc were complied with at the time of all surveys. The suspended solids limit was exceeded on 4 February 2013 and 16 April 2013.

The tributyltin concentration found in the discharge was below or close to the detection limit of the test during the years under review. Its degradation product, dibutyltin, was found in the discharge at a low concentration during one of the surveys. The tributyltin concentration of the Mangaone Stream was found to be less than the detection limit.

The discharge samples collected during the year under review contained dissolved and total zinc above the respective historical medians. The total zinc concentration recorded for the sample collected on 4 December 2013 was a new maximum for this monitoring location. It is noted however, that there is relatively limited data set for these parameters, with only 13 historical results, and the dissolved zinc concentration complied with the limit imposed on the consent.

The biochemical oxygen demand of the discharge was above median on two of the four monitoring occasions. The concentration of this contaminant in the discharge is

not limited by the Company's consent, but the in stream effects are. This discharge, in combination with other discharges, is not permitted to raise the filtered carbonaceous biochemical oxygen demand of the stream to above 2 g/m^3. The filtered carbonaceous biochemical oxygen demand of the stream remained below 2 g/m^3 on all monitoring occasions, and the discharge had little, if any, discernible effect on the in-stream biochemical oxygen demand.

The trend of decreasing chemical oxygen demand has also continued during the 2012-2014 years. With the exception of the sample collected on 16 April 2013, the chemical oxygen demands found during the years under review were between five eights and half the median of historical results.

Monitoring of the treatment chemicals 3-Iodo-2-propynyl-n-butylcarbamate (IPBC), permethrin, propiconazole and tebuconazole was initiated in the 2010-2011 year after the Company changed to using these chemicals rather than tributyltin. The IPBC concentration was found to be below the detection limit of the test method in both the discharge and the receiving water in all surveys. Permethrin was found to be present in the discharge on two monitoring occasions, with propiconazole and tebuconazole present on the three monitoring occasions that these parameters were determined. Permethrin was found in the Mangaone Stream on only one of the surveys, and then at a very low concentration, only just above the detection limit of the test method. Propiconazole and tebuconazole were found to be present in all three receiving water samples for which these determinations were carried out.

It is noted that, during the years under review, the highest concentrations of the CCA and LOSP timber treatment chemicals and total zinc were found during the February 2013 survey. The fact that the discharge also contained elevated suspended solids indicates that these contaminants tend to adhere to the solid particles in the site surface that are then mobilised as suspended solids during rainfall. There were no significant adverse effects noted during the period under review, however this does point to the potential for adverse effects from a possible accumulation of settled sediment in the stream, if the suspended solids concentration of the discharge is not managed effectively.

Table 47 Chemical monitoring results for Taranaki Sawmills stormwater discharge and receiving water monitoring for 2012-2014, with summary of previous discharge monitoring data from December 1990 to June 2012. TRC site code IND001006

		Discharge					4-Feb-13			16-Apr-13		
Parameter	Unit	N	Min	Max	Median	*discharge limit*	u/s MGO000075	Discharge IND001006	d/s MGO000145	u/s MGO000075	Discharge IND001006	d/s MGO000145
Time	NZST						10:40	10:50	11:10	11:15	11:24	11:29
Total As (RJH)	g/m³	25	0.0173	0.21	0.067	*0.24*	<0.0011	0.059	0.0013	-	-	-
Boron	g/m³	39	0.01	7.0	0.24	*3.7*	0.07	1.31	0.06	0.04	0.11	0.05
BOD[d]	g/m³	21	2.4	890	10	-	1.5	16	1.7	0.7	20	0.6
COD	g/m³	36	6	4000	80	-	-	50	-	-	98	-
Conductivity	g/m³	54	2.5	112	12.3	-	20.5	4.7	20.8	20.3	16.2	21.1
Total Cr (RJH)	g/m³	16	0.023	0.210	0.0555	*0.4*	<0.00053	0.071	0.0024	-	-	-
Dissolved Cu (TRC)	g/m³	14	<0.01	0.070	0.020	*0.088*	0.001	0.02	0.002	0.001	0.02	<0.001
Total Cu (RJH)	g/m³	16	0.022	0.0759	0.03585	-	0.0028	0.064	0.0038	-	-	-
Dibutyltin (as Sn, RJH)	g/m³	11	<0.00005	0.00217	0.00048	-	-	0.00027	-	-	-	-
Iodocarb (IPBC)	g/m³	4	<0.002	<0.002	<0.002	-	-	<0.002	<0.0002	-	-	-
Oil & grease	pH	37	<0.5	24	2.5	*15*	-	5.4	-	-	b	-
Permethrin	g/m³	4	0.0003	0.0022	0.0011	-	-	0.0052	0.00003	-	-	-
pH	g/m³	56	4.4	7.6	5.9	-	7.1	7.2	7.1	7.2	7.2	7.2
Propiconazole	g/m³	4	0.0080	0.0198	0.0098	-	-	0.031	0.0006	-	-	-
Total tin (RJH)	g/m³	9	0.00193	0.019	0.0042	-	-	0.0106	-	-	-	-
Suspended solids	g/m³	49	11	760	64	*100*	5	140	17	4	150	7
Tributyltin (as Sn, RJH)	g/m³	11	<0.00004	0.00360	0.00054	*0.0046*	-	0.00015	<0.000002	-	-	-
Tebuconazole	g/m³	4	0.0064	0.0196	0.0127	-	-	0.022	0.00041	-	-	-
Temperature	g/m³	52	9.5	37.8	17.8	-	19.0	22.3	18.9	15.7	17.7	15.8
Triphenyltin (as Sn, RJH)	Deg.C	11	<0.00003	<0.00007	<0.00003	-	-	<0.00004	<0.000005	-	-	-
Turbidity	NTU	17	19	120	67	-	4.1	130	10	5.4	210	9.2
Dissolved Zn (TRC)	g/m³	13	0.145	0.537	0.280	*0.64*	0.007	0.429	0.028	0.012	0.468	0.026
Total Zn (RJH)	g/m³	13	0.21	0.710	0.420	-	0.0128	1.01	0.038	-	-	-

Key: Results shown in bold within a table indicates that a consent limit for a particular parameter has been exceeded

b parameter not determined, no visible hydrocarbon sheen and no odour

d Total BOD for the discharge samples and filtered carbonaceous BOD for the Mangaone Stream samples

Parameter	Unit	Discharge				discharge limit	4-Dec-13			9-Jun-14		
		N	Min	Max	Median		u/s MGO000075	Discharge IND001006	d/s MGO000145	u/s MGO000075	Discharge IND001006	d/s MGO000145
Time	NZST						10:30	10:40	10:55	14:40	13:15	14:30
Total As (RJH)	g/m³	25	0.0173	0.21	0.067	*0.24*	0.0040	0.044	0.0035	<0.0011	0.043	0.0012
Boron	g/m³	39	0.01	7.0	0.24	*3.7*	0.09	0.1	0.08	0.09	0.07	0.09
BOD[d]	g/m³	21	2.4	890	10	-	1.9	4.9	1.6	0.6	7.5	0.8
COD	g/m³	36	6	4000	80	-	-	37	-	-	35	-
Conductivity	g/m³	54	2.5	112	12.3	-	14.0	2.3	14.5	15.2	3.6	15.4
Total Cr (RJH)	g/m³	16	0.023	0.210	0.0555	*0.4*	0.0032	0.039	0.0032	0.00125	0.04	0.00168
Dissolved Cu (TRC)	g/m³	14	<0.01	0.070	0.020	*0.088*	0.003	0.010	0.004	0.002	<0.01	0.001
Total Cu (RJH)	g/m³	16	0.022	0.0759	0.03585	-	0.0093	0.029	0.0062	0.0035	0.029	0.0032
Dibutyltin (as Sn, RJH)	g/m³	11	<0.00005	0.00217	0.00048	-	-	<0.0003	<0.00006	-	<0.00011	<0.00006
Iodocarb (IPBC)	g/m³	4	<0.002	<0.002	<0.002	-	-	<0.002	<0.0002	-	<0.002	<0.0002
Oil & grease	pH	37	<0.5	24	2.5	*15*	-	0.6	-	-	<0.5	-
Permethrin	g/m³	4	0.0003	0.0022	0.0011	-	-	<0.0002	<0.00002	-	0.0004	<0.00002
pH	g/m³	56	4.4	7.6	5.9	-	7.5	7.2	7.5	7.1	7.2	7.2
Propiconazole	g/m³	4	0.0080	0.0198	0.0098	-	-	<0.0120	0.00044	-	0.0153	0.00022
Total tin (RJH)	g/m³	9	0.00193	0.019	0.0042	-	-	0.0042	-	-	0.00119	-
Suspended solids	g/m³	49	11	760	64	*100*	27	57	16	10	66	8
Tributyltin (as Sn, RJH)	g/m³	11	<0.00004	0.00360	0.00054	*0.0046*	-	<0.00017	<0.00005	-	<0.00009	<0.00005
Tebuconazole	g/m³	4	0.0064	0.0196	0.0127	-	-	0.0162	0.00064	-	0.0184	0.00025
Temperature	g/m³	52	9.5	37.8	17.8	-	17.1	18.9	17.5	14.1	14.5	14.1
Triphenyltin (as Sn, RJH)	Deg.C	11	<0.00003	<0.00007	<0.00003	-		<0.0014	<0.00004	-	<0.00007	<0.00004
Turbidity	NTU	17	19	120	67	-	17	72	14	8.8	70	7.8
Dissolved Zn (TRC)	g/m³	13	0.145	0.537	0.280	*0.64*	0.040	0.291	0.034	0.016	0.316	0.023
Total Zn (RJH)	g/m³	13	0.21	0.710	0.420	-	0.103	0.47	0.067	0.031	0.52	0.028

Key: Results shown in bold within a table indicates that a consent limit for a particular parameter has been exceeded

b parameter not determined, no visible hydrocarbon sheen and no odour

d Total BOD of the discharge samples and filtered carbonaceous BOD of the Mangaone Stream samples

13.3.3 In-stream sediment sampling

Sediment sampling was first carried out in the 2008-2009 year, following on from recommendations in the biomonitoring reports. This recommendation was made in order to gain more of an understanding as to whether or not discharges of contaminants from the sawmill, particularly of tributyltin, could explain some of the differences in the macroinvertebrate communities seen between the upstream and downstream biomonitoring sites. Sampling in April 2009 found a maximum tributyltin concentration of 1.3 mg/kg dry weight at the sampling site approximately 30m downstream of the Taranaki Sawmills discharge. The Company subsequently stopped using tributyltin in the treatment process and embarked on remedial works to address on site areas affected by historical activities.

In-stream sediment sampling was undertaken at three sites in the Mangaone Stream on 5 March 2014 and the results are presented in Table 48.

Table 48 Results of Mangaone Stream sediment sampling 5 March 2014

Parameter (unit mg/kg dry wt)	U/S Taranaki Sawmills	30m D/S Taranaki Sawmills	300m D/S T. Sawmills discharge	Interim ANZECC sediment quality guidelines	
	MGO000054	MGO000145	MGO000150	Low trigger*	High trigger*
Metals					
Arsenic	6	12	5	20	70
Chromium	17	24	35	80	370
Copper	74	54	39	65	270
Zinc	200	200	170	200	410
TBT derivatives					
Tributyltin	<0.004	0.044	0.011	0.005	0.07
Dibutyltin	<0.005	0.043	0.011	-	-
Monobutyltin	<0.007	0.011	<0.007	-	-
Triphenyltin	<0.003	<0.003	<0.003	-	-
Other LOSP					
IPBC	<1.3	<0.9	<0.4	-	-
Permethrin	<0.07	<0.05	<0.03	-	-
Propiconazole	<0.18	<0.12	<0.05	-	-
Tebuconazole	<0.3	<0.117	<0.07	-	-

* Low and high trigger values correspond to the effects range-low and –median used in the NOAA (National Oceanographic and Atmospheric Administration) listing. ANZECC's Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000) state that the low trigger is to be used in slightly modified systems, while the high and low trigger values to be used in highly modified systems

With the exception of copper at the control site MGO000054 and tributyltin at sites MGO000145 and MGO000150, the concentrations of the timber treatment chemicals were below the low trigger value at all three monitoring sites.

In contrast to the two previous sediment surveys undertaken, this survey found that all results were below the high trigger value.

In particular, there has been a substantial reduction in the tributyltin concentration at the site 30 m downstream f the sawmill site since the first determination April 2009 (tributyltin 1.5 mg/kg dry weight). This is as a result of the elimination of any

current potential sources of this contaminant and remediation of the areas of the site affected by historical activities. It is expected that the tributyltin concentrations will continue to decline with effective control of the suspended solids concentration of the stormwater discharge.

13.3.4 Investigations, interventions, and incidents

In the 2012-2014 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with Taranaki Sawmills Limited's conditions in resource consents or provisions in Regional Plans.

13.4 Discussion

13.4.1 Discussion of site performance

Although housekeeping at the site was considered to be good during the period under review, at three of the eight inspections the Company was asked to clean out the drain filters.

The discharge quality during the years under review was compliant with the exception of the suspended solids concentration on two of the four monitoring occasions. The exceedances were not excessive, and there was little, if any, effect on the receiving water quality due to the conditions prevailing at the time of the survey. Therefore this was actioned by instructing that the drain filters be cleaned out.

Although compliance was achieved with the timber treatment chemical component concentrations was achieved, it is for the most part, the dissolved fraction of these chemicals that is limited to prevent acute effects during the stormwater discharge events. The elevated levels of the total fraction of these contaminants found when the suspended solids concentration of the discharge was elevated highlights the importance of the control of the discharge of solids from the site to avoid the potential for contaminants from the timber treatment processes to accumulate in the stream sediments.

Monitoring found that the remediation previously undertaken at the site to control the discharge of tributyltin from historical activities at the site continued to be effective.

13.4.2 Environmental effects of exercise of consent

Council sampling surveys showed that, during the years under review, compliance was achieved with the conditions imposed on consent 3491 relating to receiving water quality.

Concentrations of tributyltin in the receiving water and sediment in the Mangaone Stream have in previous years been found above the guideline values given in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (October 2000), which may have accounted for some of the changes seen in the macroinvertebrate communities during biomonitoring surveys.

Sediment sampling during the years under review found that, although the tributyltin concentrations in the sediment downstream of the site were still elevated, the concentrations had decreased significantly since the previous survey carried out in the 2008-2009 and 2011-2012 years, with the concentrations now being well below the ANZECC high trigger value.

Biomonitoring indicates that there are improvements in biological health starting to occur downstream of the discharge from this site, although at this stage, it is too early to comment on whether this is a sustained improvement.

13.4.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the years under review is set out in Table 49.

Table 49 Summary of performance for Taranaki Sawmills consent 3491-2, discharge of cooling water, wastewater and stormwater into the Mangaone Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adoption of best practicable option	Inspection and discussion with consent holder	Yes
2. Exercise of consent in accordance with application information	Inspection and discussion with consent holder	Yes
3. Adherence to Timber Treatment Best Practice Guideline	Inspection and discussion with consent holder	Yes
4. Bunding to meet HSNO requirements by 31 March 2007	Inspection and discussion with consent holder	No HSNO stationary container certification yet, but compliance plan with ERMA
5. Limits stormwater catchment area	Site inspections	Yes
6. Limit on daily wastewater discharge volume of 12,000 L/day	Discussion at inspection. Discharge directed to sewer	Yes
7. Concentration limits upon potential contaminants in discharge	Chemical sampling	SS limit exceeded in 2 of 4 samples
8. Discharge cannot cause specified adverse effects beyond mixing zone	Visual assessment at inspection and receiving water sampling, and biomonitoring	Biomonitoring and previous sediment sampling indicates effects of historical discharges may be decreasing
9. Limit on pH effects beyond the mix zone	Chemical sampling of the discharge and receiving water	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
10. Limits on temperature effects and filtered carbonaceous biochemical oxygen demand (FCBOD) beyond mix zone	Chemical sampling of the discharge and receiving water, and recording the temperatures at the time of sampling	Yes
11. Investigation into specific biocide levels in discharge and receiving environment	Condition met previously	N/A
12. Investigation into dissolved copper levels in discharge and receiving environment	Condition met previously	N/A
13. Report on investigations to be received by 30 August 2007	Report received 30 August 2007	N/A
14. Maintain and prepare contingency plan	Reviewed plan received January 2013	Yes
15. Provision for consent to lapse if not exercised	Consent exercised	N/A
16. Provision for review re effects	No further opportunities for review	N/A
17. Provision for review if amendments to HSNO regulations or Timber Treatment Guidelines	N/A	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		Good
Overall assessment of administrative performance in respect of this consent		High

N/A not applicable

During the years under review, Taranaki Sawmills Limited demonstrated a good level of environmental and high level of administrative performance and compliance with the resource consents as defined in Section 1.1.5. During the period under review there were two non-compliances with the suspended solids limit on the consent, however there were no resultant adverse environmental effect due to the conditions prevailing at the time of the discharges. Biomonitoring and sediment sampling indicates that potential effects from historical discharges are starting to decrease.

13.4.4 Recommendation from the 2010-2012 Biennial Report

In the 2010-2012 Biennial Report it was recommended

THAT monitoring programme for discharges from Taranaki Sawmills Limited in the 2012-2013 year continues at the same level as in 2010-2012.

This recommendation was implemented in the 2012-2014 monitoring years.

13.4.5 Alterations to monitoring programmes for 2014-2015

In designing and implementing the monitoring programmes for water discharges in the region, the Council has taken into account the extent of information made available by previous authorities, its relevance under the RMA the obligations of the Act in terms of monitoring discharges and their effects, and subsequently reporting to the regional community. The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki discharging to the environment.

It is proposed that for 2014-2015, the programme remains unchanged. A recommendation to this effect is attached to this report.

13.5 Recommendation

THAT monitoring programme for discharges from Taranaki Sawmills Limited in the 2014-2015 year continues at the same level as in 2012-2014.

14. Technix Group Limited

14.1 Process description

The engineering complex of Technix Group Limited is the largest industrial site along the lower Waiwhakaiho River. Situated on the true right bank of the river immediately above its confluence with the Mangaone Stream, the 8.4 ha area of land is bounded by Rifle Range Road, Vickers Road, State Highway 3, and the Mangaone Stream. The development comprises several building complexes, roading and drainage systems.

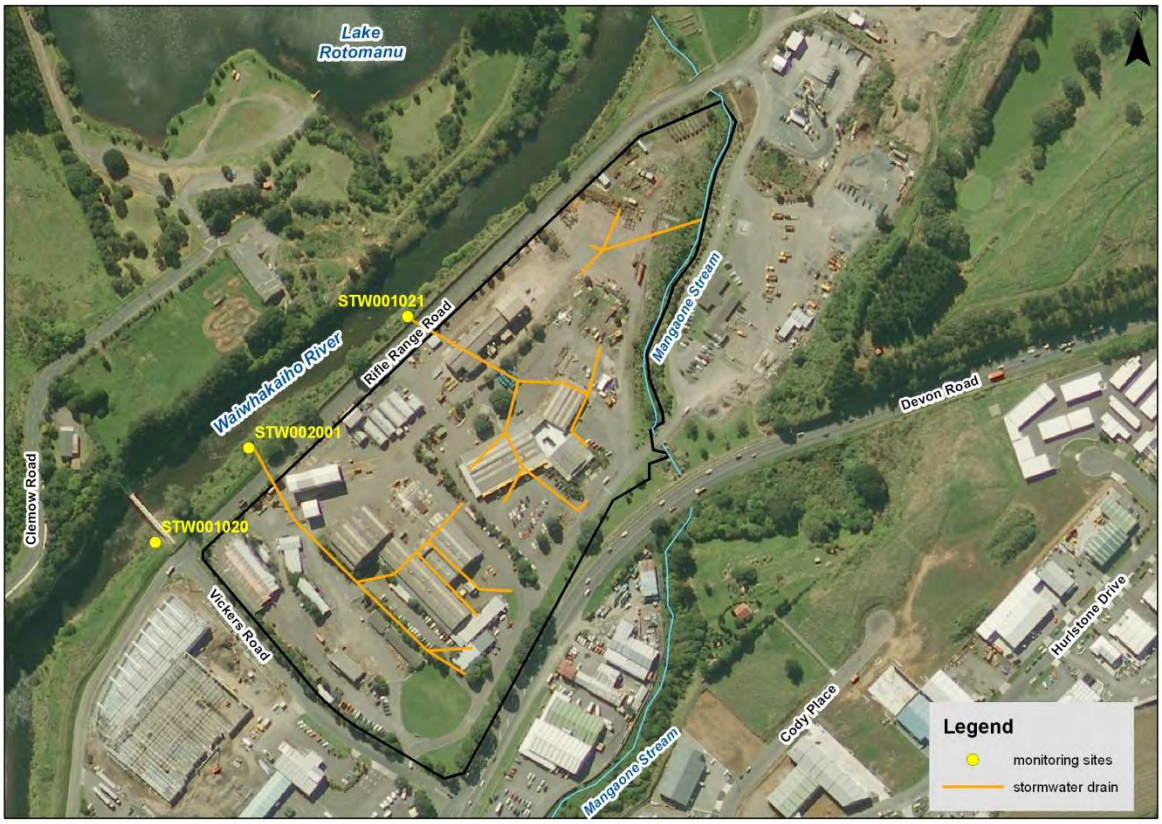


Figure 24 Technix site, drainage system and sampling point locations

Technix Group leases buildings on the site to several tenant companies carrying out a range of activities.

The largest tenant, Fitzroy Engineering Group (FEGL), operates heavy machinery workshops and a blast and paint workshop, with associated services. During the period under review, FEGL purchased the leased area containing the majority of their operations. Consent transfers followed the purchase, and these are discussed further in Sections 4 and 14.2. The other tenants during the year under review included Steelfab, and Kadine Stamps.

The ground surface cover varies from bitumen seal to gravel to grass. There is a large sealed bitumen area in the northern part of the site that was once used as a truck stop.

Stormwater discharges from the site at four main points, three to the Waiwhakaiho River and one to the Mangaone Stream. Three of the discharges were licensed to Technix Group for the majority of the period under review, with FEGL becoming responsible for the discharges from their activities in February 2014.

The original consented discharges were; the two discharges to the Waiwhakaiho River from the central areas of the site, and the one to the Mangaone Stream from the eastern area of the site. The other, previously unlicensed, discharge occurs from the western area of the site to the Waiwhakaiho River down Vickers Road, which also serves commercial properties on the opposite side of the road. This discharge point was included in the New Plymouth District Council's consent 5163-2 when it was renewed on 20 November 2007. Also during the 2007-2008 year, prior to the expiry of the consent held for the discharges to the Mangaone Stream (2230), Council concluded that the activity in this area had become a permitted activity under rule 23 of the Regional Fresh Water Plan for Taranaki [RFWP] (which became operative in 2001) provided the conditions of rule 23 continued to be adhered to by Technix. Council therefore did not require that this consent was renewed.

In terms of activities with the potential for environmental effects is concerned, contaminants may be discharged to land during the day-to-day activities on the sites. These contaminants may enter water, as at some point in time (i.e. when it rains), the contaminants become entrained in stormwater along with contaminants that may be washed off equipment stored in the yard, and the stormwater is then discharged to the Waiwhakaiho River or Mangaone Stream.

The buildings/land use in the areas owned by Technix include:

- Staff offices and facilities,
- Workshops (Machining, plate and general),
- Dangerous goods storage,
- Liquid oxygen tanks, and
- Blast and Paint storage;
- Blasting and Painting sheds (until February 2014).

Contaminants that may be present on the site include;

- Grease and oils (e.g., diesel, petrols, lubricants & hydraulic oils);
- Metals (Ferrous and non-ferrous);
- Paint;
- General workshop contaminants (e.g. welding, cuttings and grinding);
- Garnet and blasting debris (until February 2014)

The stormwater area for consent 0291 covers the centre section of the site. The stormwater networks run around the perimeter of the building before running under FEGL property and into Waiwhakaiho River via a stormwater drain (STW001021). There are multiple sumps along this system to collect any stormwater. The feed pipes have an internal diameter of 150 mm and the discharge pipe has an internal diameter of 225 mm.

This site also has a truck wash bay, currently if the truck wash is used the valve joining the truck wash and stormwater network is closed. Once the cleaning is finished the user must clean the truck wash, including emptying the separator pits,

before opening the valve to allow stormwater to enter the network from the truck wash.

The western area of the site collects the stormwater in a series of pipes ranging between 100 mm and 200 mm in diameter. These pipes discharge onto either Vickers or Rifle Range Road and enter the New Plymouth District Council stormwater network (which discharges into the Waiwhakaiho River).

The northern area of the site is primarily used as a storage yard, with any stormwater collected discharges via a 375 mm concrete stormwater pipe into the Mangaone Stream.

As Technix leases sections within the multiple areas, the specific type of contaminants can change depending on which business leases the section. Technix makes all tenants aware of the stormwater resource consent, the conditions of the consent, and the spill contingency plan.

14.2 Water discharge permits

During the period under review Technix Group Limited initially held two resource consents in respect of discharges from an industrial engineering complex situated immediately upstream of the confluence of the Waiwhakaiho River and Mangaone Stream. The consents related to the discharge of stormwater and wastewater to the Waiwhakaiho River.

Over the years, there have been several changes of name of the companies that have held the consents. The company name (previously Technic Group Limited) was changed to Pyrotechnic Group in December 1998. The consents themselves were transferred to the new company name on 26 May 1999. The Company changed its name to Technix Group Limited on 19 June 2001, and the consents were transferred to the new name on 3 May 2004.

In 2013 FEGL purchased the centre part of the property, which they leased and operated their engineering, blasting and painting activities on. The areas owned by Technix at the start of the 2012-2014 period, indicating the changes that occurred during the period under review are shown in Figure 25.

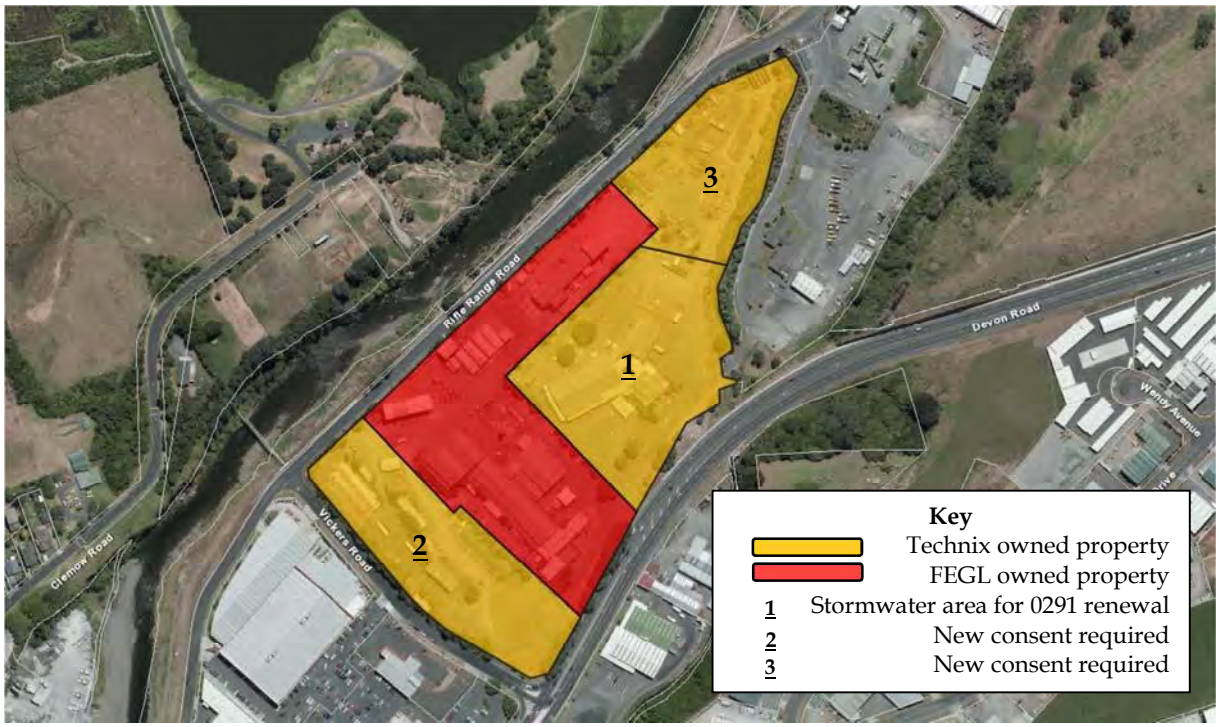


Figure 25 Technix site, changes to consented areas

Consent **0021** provides for the discharge to the river opposite Fitzroy Engineering Group's plate shop. The catchment includes Technix Group Limited's engineering services, mechanic and stores, the main building of Fitzroy Engineering Group, and a dangerous goods store. This consent was transferred to FEGL on 20 February 2014.

Discharge permit **0021** was granted on 1 May 1996 to discharge stormwater off a Vickers Road site into the Waiwhakaiho River, with 'standardised' conditions, for a period until 1 June 2014. This permit is the fourth consent issued for the discharge since 1970. The discharge rate allowed is 400 litres per second. There was a provision for a review of consent conditions in the month of June 2008.

Consent **0291** provides for the discharge to the river opposite Fitzroy Engineering Group's blast and paint shop. It also allows the discharge of treated truck washings. The catchment includes the blast and paint operation, another building complex (which has been occupied by about five tenants, but from 1 January 2008 the only occupants were Fitzroy Engineering, Technix Group Limited and Steelfab), a truck washing area, and a dangerous goods store. The truck wash, which is now leased by Fitzroy Engineering Group Limited, was used during the years under review. A partial transfer of this consent took place on 20 February 2014, with the truckwash and general stormwater from the area retained by Technix (area 1, Figure 25) remaining with Technix under consent **0291**.

Discharge permit **0291** was granted on 1 May 1996 to discharge up to 426 litres per second of stormwater, including treated truckwash water, from a Rifle Range Road site into the Waiwhakaiho River for a period until 1 June 2014. The consent contains the 'standardised' conditions, and a condition prohibiting the discharge of wastes containing cleaning solvents. The consent is the second issued for the discharge since 1976. There was a provision for a review of consent conditions in the month of June 2008.

An application to renew this consent was received on 20 February 2014, and therefore under Section 124 of the RMA, the Council exercised its discretion and allowed the activity to continue under the conditions of the expired consent until a decision was made on the renewal application.

In April 2014 Technix was advised that additional consent were required for the areas marked 1 and 2 on Figure 25, and that the processing of the application to renew consent 0291 would be deferred so that all three applications could be processed together.

14.3 Results

14.3.1 Inspections

3 October 2012

The site was inspected in fine and windy weather. It was noted that no odours or emissions were found beyond the boundary of the property. The diesel bund area was clean with no spills noted. The stormwater drains around the site were visually free of contaminants. The site was considered to be tidy.

20 December 2012

No dust or emissions were found beyond the boundary of the property. All stormwater drains around the site were visually clear of contaminants. The area around the diesel bund was tidy, with no spills were noted. The site was reported to be tidy.

5 April 2013

It was found that the stormwater drains around the site were visually free of contaminants. The wash bay was in use at the time of inspection, and no issues were noted. It was reported that no spills were found around the site, and that the site was tidy. No dust or emissions were found beyond the boundary of the property.

25 June 2013

It was found that the wash bay was not in use at the time of inspection. The stormwater drains around the site were found to be visually clear of contaminants. No dust or odours were found beyond the boundary of the property. The site was reported to be tidy at the time of inspection.

13 September 2013

The site was inspected with the Technix Senior Executive. It was found that the stormwater drains around the site were visually clear of contaminants. The diesel bund area was tidy with no spills noted. The truck wash was not in use at the time of inspection. The workshop area was tidy, and was not being used at the time of inspection. No dust or odours were found beyond the boundary of the property.

20 December 2013

No dust or odours were found beyond the boundary of the property. The truck wash was not in use at the time of inspection. It was observed that the stormwater drains around the site were visually clear of contaminants. The site was considered to be tidy.

4 April 2014

The stormwater drains around the site were found to be visually clear of contaminants. It was observed that the yard areas were free of spills. The dangerous goods store was closed and locked. It was reported that the wash bay had been in use earlier that day and it was noted that only clean water had been used. The workshop area was tidy. There was evidence that there had been a small spill, but this had been contained and cleaned up. The site was reported to be tidy.

17 June 2014

It was reported that this site inspection was undertaken as part of the Lower Waiwhakaiho catchment (including Mangaone Stream) monitoring programme. Heavy rainfall had fallen over the previous few days. The weather at the time of inspection was showery. It was reported that the stormwater runoff occurring at the time of inspection was visually clear, with no silt, suspended solids or hydrocarbon sheen evident. No vehicles or construction equipment were being washed at time of inspection. No odours or other air emissions were noted. It was found that the Mangaone Stream was in fresh, and no visual impacts were found to be occurring due to discharges from this site.

14.3.2 Results of discharge monitoring

There were three routine sampling points for monitoring of stormwater discharges from Technix Group's site, all in relation to the Waiwhakaiho River. They were the storm drain outlets at the bottom of Vickers Road where the discharge has combined with a (previously unlicensed) New Plymouth District Council discharge, opposite Fitzroy Engineering Group's plate shop (consent 0021), and opposite Fitzroy Engineering Group's blast and paint shop (consent 0291). The discharge to the Mangaone Stream (previously consent 2230, permitted during the period under review) is not sampled routinely owing to inactivity in the catchment and difficulty in access to the outlet. However, due to increased activity in this area, the Company was advised during the later part of the period under review, that this discharge point should once again be covered by a consent.

As the Vickers Road outlet has now been incorporated into New Plymouth District Council's consent 5163, monitoring results for this discharge point, previously reported in Technix section, have been moved to the section covering New Plymouth District Council's discharges. Technix was also advised during the later part of the period under review, that this discharge point should be covered by a consent.

Opposite Fitzroy Engineering Group's plate shop (Consent 0021)

The results reported in Table 50 are for those samples collected prior to the transfer of this consent to FEGL.

The values for pH, suspended solids, and oil and grease are all within the limits set in the "standardised" conditions for consent 0021.

Table 50 Monitoring results for Technix stormwater discharge for 1 July 2012- 20 February 2014, with summary of previous monitoring data from September 1990 to June 2012. TRC site code STW002001

	Cond mS/m	O & G g/m^3	pH	SS g/m^3	Temp ^{O}C	Turby g/m^3
Consent limits	-	*15*	*6-8.5*	*100*	-	-
Number	39	37	39	39	37	14
Minimum	2.8	<0.5	7	5	10.3	5.6
Maximum	234	25	9.7	790	20.4	160
Median	7.4	1.4	7.4	57	15.4	72
4-Feb-13	8.0	<0.5	7.2	14	21.4	28
16-Apr-13	6.5	<0.5	7.6	23	18.9	11
4-Dec-13	2.7	b	7.4	41	18.4	47

Key: Results shown in bold within a table indicates that a consent limit for a particular parameter has been exceeded

b parameter not determined, no visible hydrocarbon sheen and no odour

Opposite Fitzroy Engineering Group's Blast & Paint (Consent 0291)

This discharge contains stormwater from both the Technix and FEGL sites. Up until 20 February 2014, this combined discharge was covered solely by consent 0291 held by Technix. The partial transfer of consent to FEGL resulted in the FEGL stormwater being covered by their own consent (9853).

The conditions on stormwater composition on consent 0291 and 9853 for pH range, suspended solids and oil and grease were complied with on each monitoring occasion.

Table 51 Chemical monitoring results for Technix stormwater discharge for 2012-2014, with summary of previous monitoring data from September 1990 to June 2012. TRC site code STW001021

	Cond mS/m	O & G g/m^3	pH	SS g/m^3	Temp ^{O}C	Turby NTU
Consent limits	-	*15*	*6-9*	*100*	-	-
Number	34	32	34	34	33	14
Minimum	2.2	<0.5	6	<2	10.6	6.7
Maximum	24.4	35	7.7	530	20.8	200
Median	6.6	1.3	7.3	41	14.7	42
4-Feb-13	6.3	<0.5	6.6	18	23.4	41
16-Apr-13	4.6	2.2	7.3	50	18.8	97
4-Dec-13	3.4	b	7.1	14	19.9	18
9-Jun-14	2.8	b	7.3	7	15.3	9.6

Key: Results shown in bold within a table indicates that a consent limit for a particular parameter has been exceeded

b parameter not determined, no visible hydrocarbon sheen and no odour

14.4 Investigations, interventions, and incidents

In the 2012-2014 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with Technix Group Limited's conditions in resource consents or provisions in Regional Plans.

14.5 Discussion

14.5.1 Discussion of site performance

Housekeeping at the site over the monitoring period was generally good, and the bunds were well managed. There were no issues noted with regard to the use of the wash pad. Only one minor spill to land was observed at the site during inspection. It was reported that that this had been localised, and had already been contained and cleaned up appropriately

In previous years it had been found that further improvements in Fitzroy Engineering Group Limited's cleaning up of spent blasting media was desirable, as tracking of spent blasting media towards the stormwater drains was observed on occasion. During the years under review the stormwater drains were found to be visually clear of contaminants at all site inspections.

The stormwater discharges from the site were found to be compliant with consent conditions on all monitoring occasions

14.5.2 Environmental effects of exercise of consents

There were no adverse environmental effects noted in the receiving environment as a result of Technix discharges.

14.5.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the years under review is set out in Table 52 and Table 53.

Table 52 Summary of performance for Technix consent 0021-3, discharge of stormwater into the Waiwhakaiho River

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Concentration limits upon potential contaminants in discharge	Chemical sampling	Yes
2. Discharge cannot cause specified adverse effects beyond mixing zone	Visual assessment at inspection and receiving water sampling and biomonitoring	Yes
3. Prepare and maintain contingency plan	Review of documentation received. Latest version approved by Council October 2010	Yes
4. Provision for review of consent	No further opportunities for review	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 53 Summary of performance for Technix consent 0291-2, discharge of stormwater into the Waiwhakaiho River

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Concentration limits upon potential contaminants in discharge	Chemical sampling	Yes
2. Discharge cannot cause specified adverse effects beyond mixing zone	Visual assessment at inspection and receiving water sampling and biomonitoring	Yes
3. Prohibits discharge of cleaning solvents	Visual assessment at inspection and receiving water sampling and biomonitoring	Yes
4. Prepare and maintain contingency plan	Review of documentation received Latest version approved by Council June 2008	Yes
5. Provision for review of consent	No further opportunities for review	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

During the years under review, Technix Group Limited demonstrated a high level of environmental and high level of administrative performance and compliance with the resource consents as defined in Section 1.1.5.

14.5.4 Recommendation from the 2010-2012 Biennial Report

In the 2010-2012 Biennial Report, it was recommended:

THAT monitoring of discharges from Technix Group Limited in the 2012-2013 year continues at the same level as in 2010-2012.

This recommendation was implemented in the 2012-2014 monitoring years.

14.5.5 Alterations to monitoring programmes for 2014-2015

In designing and implementing the monitoring programmes for water discharges in the region, the Council has taken into account the extent of information made available by previous authorities, its relevance under the RMA the obligations of the Act in terms of monitoring discharges and effects, and subsequently reporting to the regional community. The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki discharging to the environment.

It is proposed that for 2014-2015, the programme remains unchanged. A recommendation to this effect is attached to this report.

14.6 Recommendation

THAT monitoring of discharges from Technix Group Limited in the 2014-2015 year continues at the same level as in 2012-2014.

15. Investigations, interventions, and incidents

There were 44 unauthorised incidents recorded on the Council's database for the Waiwhakaiho catchment during the 2012-2014 years that related to land and/or water issues. In 36 of these cases, investigation found that incident was substantiated, i.e. there was a contravention of the Resource Management Act, consent, or Regonal Plan rule occurring.

Nine of the incidents related to industries monitored under the Lower Waiwhakaiho Catchment Monitoring Programme, and during the period under review, these were logged as a result of self-notification or complaint to Council, or were found as a result of routine monitoring. The Companies involved were Firth Industries Ltd [Division of Fletcher Concrete & Infrastructure Ltd] (2), Fitzroy Engineering Group Limited (2), New Plymouth District Council (1), Ravensdown Fertilisers Co-operative Limited (3), and NZ Railways Corporation subsidiary Kiwi Rail (1). The details are discussed in the preceding sections of the report where the monitoring outcomes of the industries in question are described.

11 of the incidents related to other non-agricultural consent holders in the catchment that are monitored under their own tailored compliance monitoring programme. The consent holders involved were McKechnie Aluminium Solutions (1), NPDC – Colson Road landfill (5), NPDC - New Plymouth Wastewater Treatment Plant (3), New Plymouth Golf Club Inc (2). The details surrounding these incidents are discussed in the relevant Annual Report.

All the remaining incidents are summarised below, although it is noted that 21 of the remaining 24 incidents were in the catchment above that monitored under the Lower Waiwhakaiho Catchment Monitoring Programme. Seven of these incidents related to dairy discharges and were found during the dairy inspection round and three related to dead stock being found in waterways.

Baker The Trust

On 28 September 2012 during the annual dairy inspection round it was found that an oxidation system was found not operating within its resource consent conditions at Alfred Road, Egmont Village. The consent holder has requested resampling at their cost. This was to be undertaken during an early consent renewal process.

Bishop The Bruce Family Trust

On 15 January 2013 at 11:08 AM during the annual dairy inspection round it was found that the oxidation pond system was not operating within resource consent conditions. . Abatement Notice No.11928 was issued requiring the first and second pond to be cleaned out to ensure compliance with resource consent conditions. The consent holder was advised that a reinspection would be undertaken after 1 March 2013. The timeframe given in the abatement notice was extended due to the weather conditions. A reinspection undertaken on 9 April 2013 found that the ponds were in the process of being cleaned out.

BJ & VO Bolton Family Trust

On 11 October 2012 at 8:30 AM during the annual dairy inspection round it was found that the oxidation pond system was not complying with resource consent conditions. . Abatement Notice 11881 was issued requiring all effluent to be directed

to the oxidation pond system. The consent holder was advised that a reinspection would be undertaken after 12 November 2012. A reinspection found that there had been a sand trap installed at the junction of the old yard and the new concrete extension. All hosed down effluent was piped to the first pond. Staff would only be washing the yard to this point, at this time as a nib wall was to be constructed along the new concrete area before any hosing off of this area. Scraping will be the only means of cleaning on this area. It was reported that abatement notice No.11881 was being complied with at the time of inspection.

Cowley Farms 2000 Limited/Cliff Erb

On 20 February 2014 a complaint was received regarding a dead cattle beast in the Waiwhakaiho River at the Meeting of the Waters. Photographs were taken. The ID numbers were obtained from the ear tags allowing the owner to be traced. Reinspection found that carcass had been removed. The responsible party was given the opportunity to explain the circumstances leading to the unauthorised discharge. An explanation was received and accepted, with no further enforcement action being undertaken.

Colin & Mary Lines

On 31 August 2012 notification was received from the NPDC about a slip on the Mangaone Stream at Katere Road, New Plymouth. Investigation found that a slip had occurred in the stream. It was considered that works would be required to be undertaken to prevent further erosion and likely impact on Council's flood protection. The Council's Rivers Engineer carried out a further inspection. The owner was advised the works would be required, and that a resource consent would also be required. The Council's Rivers Engineer continued to work with the property owner to ensure that no adverse effects occurred.

Ireland Roading & Construction Ltd

On 7 October 2013 a complaint was received regarding the Mangaone Stream being contaminated with hydrocarbons at Katere Road, Bell Block. It was found that the stream had a visible surface sheen. The contamination was traced through the stormwater system to a sump below a load-out area of a feed mill along Katere Road. The company that was currently occupying the site was contacted and the transport manager responded. He outlined that a hydro-test of the weigh-bridge was undertaken by Ireland Roading & Construction Ltd earlier in the day, suggesting that the oil must have come from the bitumen tank that was being used to store and drain the water during the test. A sucker truck was arranged to clean out the sump. Ireland Roading & Construction Ltd outlined that to prevent possible future discharge of contaminated water the Company would change its procedure, and hire a specialised vacuum truck to take the water directly from the spraying unit at the weighbridge, rather than dump through the stormwater treatment system. This would then be removed to a certified dump after declaring the possible contaminants. An infringement notice was subsequently issued.

JF & IP Stanway

On 25 January 2013 a complaint was received concerning an illegal dump site on Dorset Road, New Plymouth. An inspection of the site found the earth, concrete and tarseal from directional drilling operations were being used to fill in the head of a gully on Dorset Road, New Plymouth. An earth bund had been constructed to capture and treat silt/sediment runoff from the fill area. A meeting was held with

the landowner and it was reported that a resource consent was in the process of being applied for. No adverse effects were observed at the time of inspection. A consent was obtained for this discharge, and the cleanfill was added to the relevant monitoring programme.

Korito Farms Limited
On 6 December 2012 at 11:07 AM during the annual dairy inspection round it was found that the oxidation pond system was not operating with resource consent conditions. Abatement notice number 11920 was issued requiring the ponds to comply with resource consent conditions. The consent holder was advised that a reinspection was to be undertaken after 4 February 2013. Reinspection found that the pond had been pumped out, the irrigated area looked good, and the abatement notice had been complied with.

Margaret Green
On 15 November 2013 a complaint was received concerning rubbish being dumped in a stream on a property near Egmont Village. An inspection of the property found that a small amount of rubbish had been placed near a waterway. The occupier of the land removed the rubbish.

Mr Laurie Bolton
On 19 December 2013 an internal complaint was received concerning cows having access to a stream. The complainant was advised that no cows were observed along stream bank at the time of inspection, and that photos should be taken next time.

Mr Mitchell Rowe
On 8 July 2013 a complaint was received concerning silt and sediment in an unnamed tributary of the Mangaone Stream on Henwood Road. An inspection was undertaken and only historical sediment was in the unnamed tributary. No evidence of any recent discharges were found. The landowner had been attempting to keep sediment from discharging from the site. Advice and information was given to the landowner on how better to do this.

Natural Event
On 7 November 2013 notification was received concerning the Waiwhakaiho River running orange at the Peters Road Bridge, Egmont Village. Investigation found the river to be bright orange and turbid. Extensive inspection of the river was undertaken by foot and by helicopter. It was found that the discharge was occurring within the national park, at the base of the Boomerang Slip.

Groundwater/springwater containing high levels of iron oxide was discharging into the Kokowai Stream, which discharged into the Waiwhakaiho River in the national park. The river was discoloured for approximately 15 kilometres and then diluted by the inflow from another stream. NPDC, Fish & Game and DoC were advised of the discharge. NPDC shut off the water intake at Lake Mangamahoe. Reinspection the following morning found the river to be slightly turbid.

Peter & Celia May Hall
On 13 December during the annual dairy round (sampling) it was found that the oxidation pond system was not operating within resource consent conditions. Abatement notice No 11923 was issued requiring works to be undertaken to ensure compliance with resource consent conditions. The consent holder was advised that a

reinspection would be undertaken after 12 March 2013. Reinspection found that the pond had been pumped out by contractors. It was reported that the irrigated area looked good. There was no discharge at the time of inspection, and the abatement notice was being complied with.

Peter Norman John & Patricia Jean Bellringer

On 15 January 2013 during the annual dairy inspection round it was found that the oxidation pond system was not operating within resource consent conditions. Abatement Notice No.11927 was issued requiring works be undertaken to ensure compliance with resource conditions. The consent holder was advised that a reinspection would be undertaken after 1 March 2013. Reinspection found that the first pond had been recently pumped out, and was not discharging into the second pond. It was noted that there had been recent rain and there was a lot more flow in the receiving waterbody. It was reported that there was nowhere to install stormwater diversion from the system at the shed. The consent holder was informed that the abatement notice had been complied with.

Ross David & Suzanne Maree Bolton

On 25 October 2012 a complaint was received regarding periodic discolouration of the Araheke Stream at Egmont Road, Egmont Village. Investigation found that the periodic discolouration of the Araheke Stream was due to a milking herd of about 250 cows crossing the stream approximately every thirty days. This was within guidelines. At the time of inspection no discolouration was occurring.

Taramoa Farms Limited

On 7 October 2013 during the annual dairy round it was found that the oxidation pond system was not operating within resource consent conditions. Abatement Notice 12093 was issued requiring the oxidation pond system to be cleaned out to ensure compliance with resource consent conditions. The consent holder was advised that a reinspection would be undertaken after 21 November 2013. Reinspection found that the first pond had been lowered and the second pond was empty. The inspecting officer was informed that a stormwater diversion and sandtrap would be installed shortly. It was reported that the abatement notice was being complied with at the time of inspection.

Taranaki Civil Construction Limited - Inglewood

On 13 May 2014 a complaint was received regarding a sediment discharge into an unnamed tributary of the Mangorei River. Investigation found silt and sediment was likely to have discharged to the waterbody during bridge cleaning operations, and it was found that sediment had been placed on the stream bank where it was likely to discharge to the waterbody. A letter of explanation was received and accepted. The land occupier removed the sediment from the stream bank. No evidence of a subsequent discharge was found.

Unsourced

25 August 2012

A complaint was received regarding a dead cow on Fitzroy Beach, New Plymouth. There were no ear tags on the carcass, so NPDC were contacted and they buried the carcass.

12 April 2013
A complaint was received regarding fish being dumped in the Waiwhakaiho River at Burton Street, Fitzroy. An inspection of the river found approximately 20 snapper carcasses and fillets, as well as some other fish types, had been dumped in the water adjacent to the bank in a discrete area. No responsible party could be found, and it was reported that there would be no adverse environmental effects from the discharge.

15 November 2013
A complaint was received regarding a dairy effluent in an unnamed tributary of the Mangorei Stream, Mangorei Road, New Plymouth. Inspections were undertaken at two upstream farms to locate the source of the dairy effluent. An inspection of the effluent system at dairy number 43080 found that the irrigator was set up approximately 25 metres from a surface water body. Although it was likely that this was the source of the pollution, there was no discharge at the time of inspection and the ground around the irrigator was dry. The complaint could not be substantiated at the time of investigation.

20 March 2014
An anonymous complaint was received concerning cows entering the Waiwhakaiho River in New Plymouth. An inspection of the river bank below the Audrey Gale Reserve failed to find a cow in the river.

24 April 2014
A complaint was received regarding rat bait being placed at the Fitzroy Seaside Park causing the death of a family dog. The complainant was informed of the conversation with the contractor during which it was identified that no bait had been laid in that area yet. Blood work of the animal had been taken by the vet and toxicology was awaited. Autopsy results found that the dog did not die as a result of rat bait.

29 May 2014
A complaint was received regarding a dead cow in the Waiwhakaiho River at Riverside Drive, New Plymouth. At the time of inspection it was found that the ear tags had been removed from the carcass, so the owner could not be traced. New Plymouth District Council undertook to remove the carcass. However, it was found that the cow washed away before it could be retrieved.

16. Surface receiving water quality

16.1 Chemical analyses

The results of chemical analysis of the receiving water in 2012-2014 are given in Table 54, Table 55, Table 56, and Table 57. Refer to Section 1.3.4 for the sampling strategy. Monitoring locations are shown in Figure 1 and the full set of chemical monitoring results is given in Appendix II.

16.1.1 Waiwhakaiho River

The lower Waiwhakaiho River was sampled at four points under wet weather (discharge monitoring) and three points under dry weather (groundwater monitoring) conditions:

- **Merrilands Domain (site code WKH000800)**: At the riffle just upstream of the swimming area in the Waiwhakaiho River at the Merrilands Domain, about 5.4 km from the coast. This is the upstream, or control site with respect to New Plymouth District Council's Burton Street stormwater discharge.

- **Constance Street (site code WKH000920)**: At the first bend below Devon Road bridge, about 2.6 km from the river mouth. This is the upstream, or control site, with respect to monitoring discharges to the lower Waiwhakaiho River from New Plymouth industrial area including the groundwater discharge from the Bewley Road landfill.

- **Opposite Firth's (site code WKH000925)**: On the eastern side, upstream of the site of the old concrete ford opposite Firth Industries, about 540 metres below Constance Street and 280 metres below the confluence with McLeod's Drain. This was effectively the lower mixing zone boundary for the discharge from McLeod's Drain (consent 3138), which serves the largest catchment in the Fitzroy area, including the fertiliser depot (consent 3140) and rail yard (consent 1735). The ford was removed in April 1997 as part of flood protection works.

- **Above Mangaone (site code WKH000942)**: Immediately above the confluence with the Mangaone Stream and any tidal saline influence, beside the eastern bank opposite Lake Rotomanu, about 1300 metres from the river mouth. This is the downstream monitoring site for discharges from Firth Industries (consent 0392), Fitzroy Engineering Group Limited (consent 0021 and 9853), and the Technix Group operations along Rifle Range Road (consent 0291).

The results are shown in Table 54 and Table 55.

16.1.1.1 Wet weather Surveys

On the whole, during the wet weather surveys in the year under review, there were only small changes in the concentrations of dissolved reactive phosphorus or nitrates throughout the stretch of the river monitored from the Merrilands Domain site above the industrial area to the Above Mangaone site downstream of the industrial area.

The largest increase in nitrates was observed on 4 February 2013, when a five fold increase was found between the Constance Street site and the site upstream of the Mangaone Stream confluence.

The largest increases in DRP and ammoniacal nitrogen were observed on 4 December 2014 when a factor of 12 increase was found in the DRP, and a factor of 15 increase was found in the ammoniacal nitrogen between the Constance Street site and the site opposite Firths.

In contrast to the 2010-2012 monitoring periods, it is noted that the unionised ammonia concentration remained well below the concentration considered to be toxic in the aquatic environment at all sites on all monitoring occasions.

Table 54 Results of wet weather chemical monitoring of lower Waiwhakaiho River for 2012-2014

Parameter		Waiwhakaiho			
		Merrilands Domain	Constance Street	Opposite Firth's (Ford)	Above Mangaone Confluence
4-Feb-13		WKH000920	WKH000925	WKH000942	WKH000920
Time	NZST	8:05	8:20	8:45	9:20
Cond @20°C	mS/m	13.8	13.8	14.3	14.2
DRP	g/m³ P	0.014	0.012	0.024	0.035
F	g/m³	-	0.06	0.07	0.06
NH_3	g/m³	0.00145	0.0004	0.00235	0.00197
NH_4	g/m³ N	0.033	0.009	0.067	0.088
N-N-N	g/m³ N	-	0.02	-	0.10
pH	pH	7.9	7.9	7.8	7.6
SS	g/m³	<2	<2	2	3
Temp	Deg.C	22.4	22.5	22.4	22.4
Turby	NTU	0.66	0.67	1.2	2.7
16-Apr-13		WKH000920	WKH000925	WKH000942	WKH000920
Time	NZST	9:20	10:50	11:20	11:55
Cond @20°C	mS/m	12.5	13.1	13.2	13.2
DRP	g/m³ P	0.016	0.017	0.017	0.017
F	g/m³	-	0.08	0.07	0.07
NH_3	g/m³	0.00013	0.0002	0.00044	0.00038
NH_4	g/m³ N	<0.003	<0.003	0.010	0.007
N-N-N	g/m³ N	-	0.02	-	0.01
pH	pH	8.1	8.3	8.1	8.2
SS	g/m³	<2	<2	4	4
Temp	Deg.C	15.6	15.7	16.2	16.2
Turby	NTU	0.54	0.46	1.7	1.2
4-Dec-13		WKH000920	WKH000925	WKH000942	WKH000920
Time	NZST	8:10	8:30	9:05	10:00
Cond @20°C	mS/m	10.8	10.9	10.8	10.4
DRP	g/m³ P	0.015	0.016	0.206	0.132
F	g/m³	-	0.05	0.06	0.06
NH_3	g/m³	0.00016	0.0003	0.00581	0.00284
NH_4	g/m³ N	0.008	0.015	0.233	0.175
N-N-N	g/m³ N	-	0.06	-	0.15
pH	pH	7.7	7.7	7.8	7.6

Parameter		Waiwhakaiho			
		Merrilands Domain	Constance Street	Opposite Firth's (Ford)	Above Mangaone Confluence
SS	g/m³	4	<2	4	6
Temp	Deg.C	17.5	17.7	17.7	18.0
Turby	NTU	2.5	1.0	3.2	4.4
09-Jun-14		WKH000800	WKH000920	WKH000925	WKH000942
Time	NZST	12:05	12:30	13:00	14:30
Cond @20°C	mS/m	10.5	9.8	9.9	10.4
DRP	g/m³ P	0.016	0.009	0.025	0.017
F	g/m³	-	0.04	0.04	0.04
NH_3	g/m³	0.00006	0.00006	0.00076	0.00073
NH_4	g/m³ N	0.003	<0.003	0.045	0.022
N-N-N	g/m³ N	-	0.2	-	0.19
pH	pH	7.9	7.9	7.8	8.0
SS	g/m³	<2	<2	<2	<2
Temp	Deg.C	12.1	12.2	12.3	15.5
Turby	NTU	0.81	0.81	1.2	1.3

There are two main potential sources of dissolved reactive phosphorus and ammonia discharging into this stretch of the river. These are the Ravensdown and New Zealand Railway Corporation sites which discharge via McLeod's drain, along with stormwater from the Smart Road residential area.

During the December 2014 survey, the New Zealand Railway Corporation discharge contained only 0.190 g/m³ of dissolved reactive phosphorus and 0.259 g/m³ of ammoniacal nitrogen, significantly less than the 28.0 g/m³ dissolved reactive phosphorus and 59.1 g/m³ of ammoniacal nitrogen found in the discharge from the Ravensdown site. The ammoniacal nitrogen concentration of the Ravensdown discharge on this occasion resulted in an ammoniacal nitrogen concentration of 3.30 g/m³ in the grab sample from the combined discharge from McLeod's drain (STW001001).

There were only minor changes in pH observed between the samples taken along the stretch of the river monitored during the surveys in the period under review.

Only very small changes in suspended solids and turbidity were recorded along the monitored stretch of the river during the sampling runs.

16.1.1.2 Dry weather surveys

The sample results for the dry weather surveys (given in Table 55) show that the conductivity, dissolved reactive phosphorus concentration, pH and turbidity were all generally relatively stable through the stretch of the river monitored.

It is noted that the conductivity almost doubled between Firths ford and the site upstream of the confluence with the Mangaone Stream on 10 Jan 2014. This was accompanied by an increase in dissolved reactive phosphorus, a 0.4 unit drop in pH and drop in ammoniacal nitrogen concentration. Although the low flow discharge from the NPDC drain WKH000872 had elevated conductivity, it would be expected that any changes as a result of this discharge would be observed at the Firths ford

site rather than at the most downstream site. There are a number of stormwater drains between these two sites, which are not routinely monitored during these dry weather surveys, and that were therefore not checked for flow on this sampling occasion. These changes are expected to have had had little, if any, effect on instream life.

Table 55 Results of dry weather chemical monitoring of lower Waiwhakaiho River for 2012-2014

Parameter		Waiwhakaiho		
		Constance Street	Opposite Firth's (Ford)	Above Mangaone Confluence
23-Jan-2013		WKH000920	WKH000925	WKH000942
Time	NZST	10:05	10:20	10:45
Cond @20°C	mS/m	12.1	12.4	12.4
DRP	g/m^3 P	0.009	0.010	0.004
NH_3	g/m^3	0.00037	0.00128	0.00072
NH_4	g/m^3 N	<0.003	0.013	0.011
pH	pH	8.4	8.3	8.1
Temp	Deg.C	21.6	21.5	21.9
Turby	NTU	9.2	0.83	2.1
06-Jun-13		WKH000920	WKH000925	WKH000942
Time	NZST	8:50	9:06	9:15
Cond @20°C	mS/m	8.9	9.1	9.1
DRP	g/m^3 P	0.010	0.012	0.015
NH_3	g/m^3	0.00003	0.00014	0.00005
NH_4	g/m^3 N	0.003	0.017	0.008
pH	pH	7.7	7.6	7.5
Temp	Deg.C	8.4	8.5	8.4
Turby	NTU	0.76	0.78	1.3
10-Jan-14		WKH000920	WKH000925	WKH000942
Time	NZST	8:50	9:15	9:30
Cond @20°C	mS/m	9.5	9.5	17.9
DRP	g/m^3 P	0.012	0.011	0.036
NH_3	g/m^3	0.00043	0.00813	0.00062
NH_4	g/m^3 N	0.013	0.244	0.044
pH	pH	8.0	8.0	7.6
Temp	Deg.C	15.3	15.5	16.1
Turby	NTU	0.68	0.84	1.7
05-Jun-14		WKH000920	WKH000925	WKH000942
Time	NZST	10:50	10:35	11:10
Cond @20°C	mS/m	11.6	11.9	12.0
DRP	g/m^3 P	0.009	0.009	0.010
NH_3	g/m^3	0.00032	0.00012	0.0003
NH_4	g/m^3 N	0.007	0.004	0.008
pH	pH	8.3	8.1	8.2
Temp	Deg.C	10.7	10.5	11.0
Turby	NTU	0.58	0.94	1.5

Ammoniacal nitrogen concentration was also relatively stable with the exception of the10 January 2014 survey. On this occasion there was an 18 fold increase between Constance Street and Opposite Firth's. During this survey the ammoniacal nitrogen concentration of the discharge from the NPDC drain (WKH000872) was 11.5 g/m^3, just over three times the historical median.

The maximum ammoniacal nitrogen concentration observed in the NPDC drain discharge was 29 g/m^3 (approximately ten times the median value) on 5 June 2014. There was no observed impact in the river on this occasion.

The concentrations of dissolved reactive phosphorus and ammoniacal nitrogen that may result in prolific algal growths in the Waiwhakaiho River are 0.010 g/m^3 and 0.021g/m^3 respectively.

At the Constance Street site there was only one marginal exceedance of these values, with the dissolved reactive phosphorus found to be 0.012 g/m^3 on 10 January 2014.

Opposite Firth's there were two marginal exceedances of the dissolved reactive phosphorus guideline (6 June 2013, 0.012 g/m^3; 10 January 2014, 0.011 g/m^3) and one exceedance of the ammoniacal nitrogen guideline (10 January 2014, 0.244 g/m^3).

Above the Mangaone Stream confluence there were two exceedances of the dissolved reactive phosphorus guideline (6 June 2013, 0.015 g/m^3; 10 January 2014, 0.036 g/m^3) and one exceedance of the ammoniacal nitrogen guideline (10 January 2014, 0.044 g/m^3)

Observations made during the biomonitoring reports regarding the general condition of the water bodies are contained in the biomonitoring reports (Appendix III). It was noted that during the November 2012 survey, periphyton mats were patchy at all sites, while growths of filamentous algae were patchy to widespread. In the February 2013 survey periphyton mats were patchy at two sites and widespread at the lowest site (downstream of Lake Rotomanu), while growths of filamentous algae were patchy at the sites below Firth and below Lake Rotomanu. At the November 2013 survey periphyton mats were patchy at the site below Firth and widespread at the other two sites (Constance Street and below Lake Rotomanu), while growths of filamentous algae were patchy at all sites. At the February 2014 survey periphyton mats and filamentous algae were patchy at all sites.

16.1.2 Mangaone Stream

The Mangaone Stream was sampled at up to six points during wet weather and at two points during dry weather.

16.1.2.1 Wet weather surveys

The wet weather sites are as follows:

Egmont Road (site code MGO000050): the uppermost site at Egmont Road bridge.

Downstream of Farmlands and NPDC (site code MGO000075): a site established in 2007 approximately 10m downstream of the NPDC mid Katere Road stormwater

discharge. This site acts as the downstream site for Farmland's feedmill and the District Council's stormwater discharge, and as an upstream "control site" for Taranaki Sawmill's timber treatment site.

30m downstream of Taranaki Sawmills (site code MGO000145): also established in 2007, this site is at the end of the mix zone specified in Taranaki Sawmill's resource consent.

Above Ravensdown (site code MGO000148): a site established in 1996 immediately above the main stormwater drain of Ravensdown Fertiliser's depot (and also above the confluence of the Mangamiro Stream) to enable differentiation of the influence of major tributaries below Egmont Road, particularly the Puremu and Manganaha Streams which flow through Colson Road landfill, from that of discharges from Ravensdown's site.

Katere Road bridge (site code MGO000153): below the discharge from Ravensdown Fertiliser's depot. This site is at the end of the mixing zone specified in the Company's consent 3865.

Rifle Range Road (site code MGO000190): the bottom site at the Rifle Range Road bridge, immediately above the Waiwhakaiho confluence and about 50 metres below the discharge point of Downer EDI Works Limited.

The results of this monitoring are given in Table 56.

Table 56 Results of wet weather chemical monitoring of Mangaone Stream for 2012-2014

Parameter		Mangaone Stream					
		Egmont Road	D/S Viterra and NPDC	D/S Taranaki Sawmills	Above Ravensdown	Katere Road bridge	Rifle Range Road
04-Feb-13		MGO000050	MGO000075	MGO000145	MGO000148	MGO000153	MGO000190
Time	NZST	9:45	10:40	11:10	12:05	11:20	9:25
AsT*	g/m^3	-	<0.0011	0.0013	-	-	-
B	g/m^3	-	0.07	0.06	0.05	-	-
BODFC	g/m^3	2.2	1.5	1.7	-	-	-
Cond@20^{o}C	mS/m	20.5	20.5	20.8	20.4	19.4	13.6
CrT*	g/m3	-	<0.00053	0.0024	-	-	-
CuAs	g/m^3	0.002	-	-	-	-	0.006
CuD	g/m^3	0.001	0.001	0.002	0.002	-	0.004
CuT*	g/m^3	-	0.0028	0.0038	-	-	-
DRP	g/m^3 P	0.018	-	-	0.014	0.062	0.068
IPBC	g/m^3	-	-	<0.0002	-	-	-
NH_3	g/m^3	0.00025	0.0003	0.00097	0.00157	0.00393	0.00258
NH_4	g/m^3 N	0.047	0.053	0.176	0.221	0.347	0.426
NNN	g/m^3 N	-	-	-	0.71	0.96	-
Permethrin	g/m^3	-	-	0.00003	-	-	-
pH	pH	7.1	7.1	7.1	7.2	7.4	7.1
Propiconazole	g/m^3	-	-	0.0006	-	-	-
SS	g/m^3	18	5	17	6	6	8
Triphenyltin	g/m^3	-	-	<0.00005	-	-	-
Tebuconazole	g/m^3	-	-	0.00041	-	-	-

Parameter		Mangaone Stream					
		Egmont Road	D/S Viterra and NPDC	D/S Taranaki Sawmills	Above Ravensdown	Katere Road bridge	Rifle Range Road
Temp	Deg.C	18.4	19.0	18.9	19.2	19.3	20.1
Tributyltin	g/m³ Sn	-	-	<0.000002	-	-	-
Triphenyltin	g/m³ Sn	-	-	<0.00004	-	-	-
Turby	NTU	6.0	4.1	10	8.6	-	10
ZnAs	g/m³	<0.005	-	-	-	-	0.021
ZnD	g/m³	<0.005	0.007	0.028	0.022	-	0.014
ZnT*	g/m³	-	0.0128	0.038	-	-	-
16-Apr-13		MGO000050	MGO000075	MGO000145	MGO000148	MGO000153	MGO000190
Time	NZST	10:55	11:15	11:29	12:10	11:58	12:05
B	g/m³	-	0.04	0.05	0.05	-	-
BODFC	g/m³	<0.5	0.7	0.6	-	-	-
Cond@20°C	mS/m	21.6	20.3	21.1	21.1	22.1	21.4
CuAs	g/m³	0.001	-	-	-	-	0.001
CuD	g/m³	<0.001	0.001	<0.001	0.001	-	0.001
DRP	g/m³ P	0.009	-	-	0.014	0.055	0.035
NH_3	g/m³	0.0002	0.00048	0.00086	0.00096	0.00298	0.00111
NH_4	g/m³ N	0.046	0.088	0.156	0.169	0.356	0.119
NNN	g/m³ N	-	-	-	0.86	0.97	-
pH	pH	7.1	7.2	7.2	7.2	7.4	7.4
SS	g/m³	10	4	7	4	3	<2
Temp	Deg.C	15.7	15.7	15.8	16.1	15.2	16.7
Turby	NTU	6.5	5.4	9.2	7.1	-	2.8
ZnAs	g/m³	<0.005	-	-	-	-	0.010
ZnD	g/m³	<0.005	0.012	0.026	0.018	-	0.010
10 May 2013		MGO000050	MGO000075	MGO000145	MGO000148	MGO000153	MGO000190
Time	NZST	-	-	-	12:50	12:40	13:30
B	g/m³		-		0.05	-	-
Cond@20°C	mS/m	-	-	-	15.9	17.7	14.9
CuAs	g/m³	-	-	-	-	-	0.004
CuD	g/m³	-	-	-	0.004	-	0.002
DRP	g/m³ P	-	-	-	0.020	0.040	0.126
NH_3	g/m³	-	-	-	0.00034	0.00136	0.00114
NH_4	g/m³ N	-	-	-	0.144	0.294	0.248
NNN	g/m³ N	-	-	-	0.8	1.0	-
pH	pH	-	-	-	6.9	7.2	7.2
SS	g/m³	-	-	-	19	7	23
Temp	Deg.C	-	-	-	13.8	13.4	13.3
Turby	NTU	-	-	-	18	-	21
ZnAs	g/m³	-	-	-	-	-	0.051
ZnD	g/m³	-	-	-	0.029	-	0.020
04-Dec-13		MGO000050	MGO000075	MGO000145	MGO000148	MGO000153	MGO000190
Time	NZST	9:12	10:30	10:55	12:30	11:00	10:10
AsT*	g/m³	-	0.004	0.0035	-	-	-
B	g/m³	-	0.09	0.08	0.07	-	-
BODFC	g/m³	<0.5	1.9	1.6	-	-	-
Cond@20°C	mS/m	18.8	14	14.5	16.6	13.7	12.7
CrT*	g/m3	-	0.0032	0.0032	-	-	-
CuAs	g/m³	0.002	-	-	-	-	0.008
CuD	g/m³	<0.001	0.003	0.004	0.002	-	0.003
CuT*	g/m³	-	0.0093	0.0062	-	-	-

Parameter		Mangaone Stream					
		Egmont Road	D/S Viterra and NPDC	D/S Taranaki Sawmills	Above Ravensdown	Katere Road bridge	Rifle Range Road
DRP	g/m³ P	0.013	-	-	0.061	0.337	0.395
IPBC	g/m³	-	-	<0.0002	-	-	-
NH_3	g/m³	0.00029	0.00428	0.00354	0.00113	0.00766	0.00617
NH_4	g/m³ N	0.050	0.354	0.284	0.183	0.494	0.632
NNN	g/m³ N	-	-	-	0.85	0.84	-
Permethrin	g/m³	-	-	<0.00002	-	-	-
pH	pH	7.2	7.5	7.5	7.2	7.6	7.4
Propiconazole	g/m³	-	-	0.00044	-	-	-
SS	g/m³	16	27	16	6	14	14
TBAZ	g/m³	-	-	-	-	-	-
Tebuconazole	g/m³	-	-	0.00064	-	-	-
Temp	Deg.C	16.4	17.1	17.5	17.3	17.4	17.3
Triphenyltin	g/m³	-	-	<0.00004			
Tributyltin	g/m³ Sn	-	-	<0.00005	-	-	-
Turby	NTU	8.9	17	14	6.8	-	-
Urea	g/m³	-	-	-	-	-	14
ZnAs	g/m³	0.008	-	-	-	-	0.033
ZnD	g/m³	0.005	0.040	0.034	0.016	-	0.016
ZnT*	g/m³	-	0.103	0.067	-	-	-
09-Jun-14		MGO000050	MGO000075	MGO000145	MGO000148	MGO000153	MGO000190
Time	NZST	12:10	14:40	14:30	13:30	14:20	14:45
AsT*	g/m³	-	<0.0011	0.0012	-	-	-
B	g/m³	-	0.09	0.09	0.06	-	-
BODFC	g/m³	<0.5	0.6	0.8	-	-	-
Cond@20°C	mS/m	17.9	15.2	15.4	16.0	14.6	14.7
CrT*	g/m3	-	0.00125	0.00168	-	-	-
CuAs	g/m³	0.002	-	-	-	-	0.010
CuD	g/m³	<0.001	0.002	0.001	0.002	-	0.003
CuT*	g/m³	-	0.0035	0.0032	-	-	-
DRP	g/m³ P	0.006	-	-	0.016	0.105	0.138
IPBC	g/m³	-	-	<0.0002	-	-	-
NH_3	g/m³	0.00017	0.00027	0.00071	0.00085	0.00194	0.00284
NH_4	g/m³ N	0.041	0.069	0.146	0.175	0.396	0.421
NNN	g/m³ N	-	-	-	0.84	0.99	-
Permethrin	g/m³	-	-	<0.00002	-	-	-
pH	pH	7.1	7.1	7.2	7.2	7.2	7.3
Propiconazole	g/m³	-	-	0.00022	-	-	-
SS	g/m³	4	10	8	5	15	13
TBAZ	g/m³	-	-	-	-	-	-
Tebuconazole	g/m³	-	-	0.00025	-	-	-
Temp	Deg.C	14.8	14.1	14.1	14.0	14.2	15.4
Triphenyltin	g/m³	-	-	<0.00004			
Tributyltin	g/m³ Sn	-	-	<0.00005	-	-	-
Turby	NTU	3.6	8.8	7.8	8.0	-	16
Urea	g/m³	-	-	-	-	-	-
ZnAs	g/m³	<0.005	-	-	-	-	0.043
ZnD	g/m³	<0.005	0.016	0.023	0.023	-	0.021
ZnT*	g/m³	-	0.031	0.028	0.028	-	-

* Total metals after nitric acid digestion as determined by ICP-MS at RJ Hill Laboratories

The results show that there were downstream increases in the ammonia and dissolved reactive phosphorus concentrations along the stretch of the Mangaone Stream monitored. The historical trends in ammoniacal nitrogen in the stream are shown in Figure 26. It is clearly illustrated that, as with previous years, the highest ammoniacal nitrogen concentrations generally occurred downstream of Ravensdown's rear drain, although, possibly due to the timing of the grab samples in relation to the progression of the rain fall events, the highest concentration is sometimes recorded at the Rifle Range Road site. The most significant changes in the ammoniacal nitrogen concentration were observed on 4 December 2013, although in contrast to previous monitoring periods, a progressive downstream increase was observed on this occasion. During this survey, all sites except MGO000153 were slightly above their respective historical medians. In common with the previous reporting period, the maximum ammoniacal nitrogen concentration found downstream of the Ravensdown site during the period under review was at site MGO000190 downstream of the Rifle Range Road bridge. However, the result obtained, 0.632 g/m^3 was a lot lower than the highest concentration of 3.86 g/m^3 found at this site during the previous reporting period (for comparison, the site historical median is 0.451 g/m^3).

It is noted that there was also an observable increase in ammoniacal nitrogen recorded at site MGO000075, downstream of the feedmill and mid Katere Road drain on 4 December 2013. It is noted that of these two discharges, the primary contributor was the NPDC Mid Katere Road drain, which had an ammoniacal nitrogen concentration of 2.95 g/m^3 (compared to Farmlands discharge, 0.283 g/m^3).

Changes in the biochemical oxygen demand of the stream were found during three of the four full surveys, with the increases remaining below that permitted by the Viterra/Farmlands consent on all occasions.

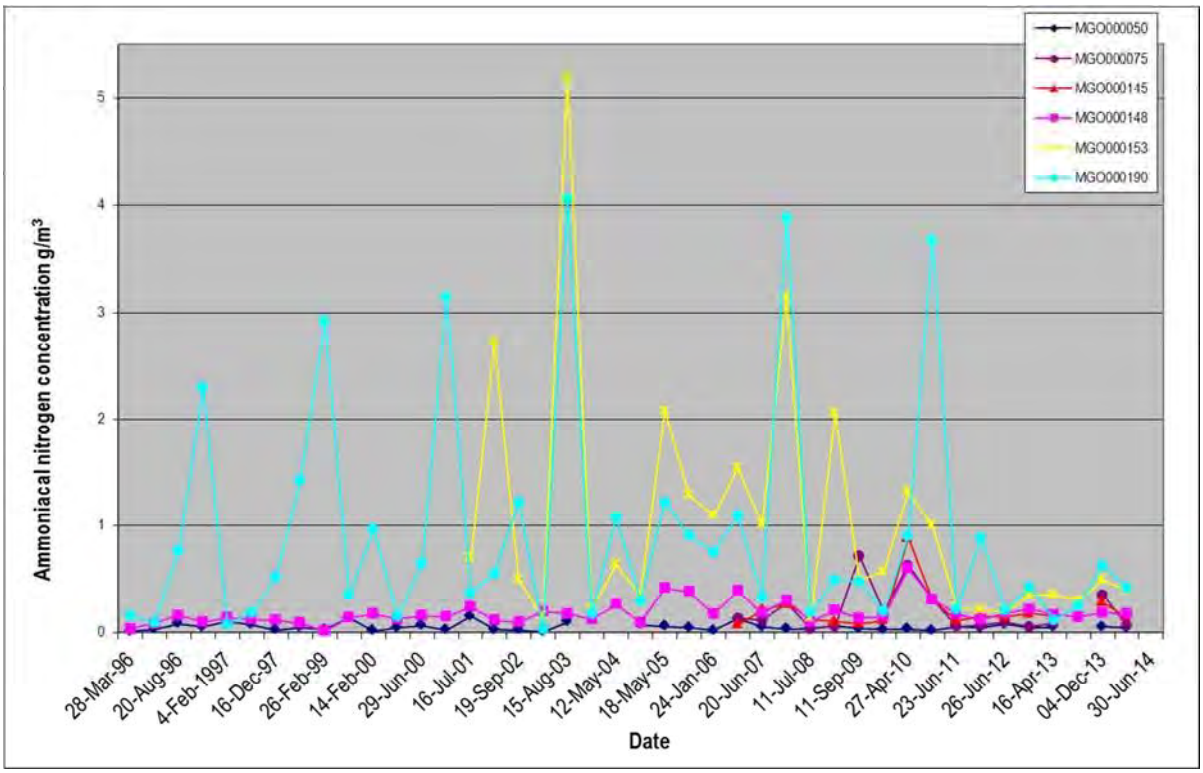


Figure 26 Trends in Mangaone Stream ammoniacal nitrogen concentration

Metal and metalloid concentrations are monitored in the Mangaone Stream to determine what, if any, effects may be occurring due to the discharges from Taranaki Sawmills and other industrial discharges. Sources of these contaminants include (to varying extents), the industrial sites and other non-point sources such as run-off from roads. During the four full surveys it was found that, on the whole, there was little, if any, change in the concentration of arsenic, dissolved copper, chromium, zinc, or boron in the receiving water of the Mangaone Stream below Taranaki Sawmills.

A slight increase in boron concentration was observed below the sawmill only on 14 April 2013.The other slight increases observed downstream of the sawmill were total arsenic on 4 December 2013, total chromium on 4 February 2013, and dissolved zinc on 4 February 2013, 16 April 2013 and (to a lesser extent) 9 June 2014.

Tributyltin was not detected in the water column downstream of the sawmill's discharge during the years under review, although some of the replacement treatment chemicals were found to be present in the stream at low concentrations. Propiconazole and tebuconazole were detected on all three monitoring occasions, and permethrin was detected on one occasion. Iodocarb (IPBC) was not detected.

In common with one of the surveys in each of the previous three monitoring periods, during the period under review it was found that the dissolved copper and zinc increased at the sampling site downstream of the Viterra/Farmlands feedmill and NPDC mid Katere stormwater drain (MGO000075) on occasion. Dissolved copper was found to have increase at this site on 4 December 2013 and 9 June 2014, and the dissolved zinc was found to have increased on 16 April 2013, 4 December 2013, and 9 June 2014.

There are several guidelines for zinc and copper for assessing water quality in terms of suitability for sustaining aquatic life. The United States Environmental Protection Agency (USEPA), in defining metals criteria for protection of freshwater aquatic life, has adopted the use of dissolved metals as most closely approximating the bio available fraction of these metals in the water column. Previously, water quality criteria were based on total recoverable metal concentration.

The water quality criteria for dissolved copper and zinc, for water of hardness 50 g/m^3 CaCO, are 0.005 g/m^3 for Cu and 0.058 g/m^3 for Zn respectively as a 4 day average, for chronic (long term) exposure. The corresponding criteria for acute (4-hour) exposure are 0.007 g/m^3 for Cu and 0.064 g/m^3 for Zn. Acute criteria only are applicable to wet weather sampling results, whereas both chronic and acute exposure criteria are applicable to dry weather sampling results.

In contrast to the previous reporting period, both the dissolved copper and dissolved zinc levels in the Mangaone Stream were found to be at or below the acute and chronic toxicity concentration given by the USEPA at all sites at the time of all of the surveys during the period under review.

Low level analyses for zinc and copper were also performed on samples taken at the Egmont Road site to monitor the effects of stormwater discharged upstream of the industries monitored under this programme, from McKechnie Aluminium Solutions Limited as part of their compliance monitoring programme (Table 57). It is noted that historically, copper and brass were also processed at this site.

Table 57 Results of chemical monitoring of the Mangaone Stream at Egmont Road for McKechnie Aluminium Solutions Limited compliance monitoring programme 2012-2014

Parameter		Mangaone at Egmont Road - MGO000050		
		19-May-2014 (dry run)	17-Jun-2013 (wet run)	9-Jun-2014 (wet run)
Sample number		TRC1410025	TRC136296	TRC149882
Time	NZST	13:40	12:20	14:05
Cond @20°C	mS/m	18.8	15.5	17.6
CuAs	g/m³	<0.01	<0.01	<0.01
CuD	g/m³	0.002	0.001	<0.001
pH		7.1	7.0	7.0
SS	g/m³	3	9	8
Temp	°C	13.5	14.3	15.4
ZnAs	g/m³	<0.005	<0.005	0.008
ZnD	g/m³	<0.005	<0.005	<0.005

On these monitoring occasions, the copper and zinc concentrations in the receiving water were low upstream of the industries monitored in the Lower Waiwhakaiho Catchment Monitoring Programme.

16.1.2.2 Dry weather surveys

During the years under review dry weather monitoring was undertaken in the Mangaone Stream in conjunction with monitoring of the groundwater in the vicinity of the Ravensdown site (Section 12.3.2.3). The two sites monitored were MGO000151, approximately 20m downstream of the Ravensdown rear drain, and MGO000155, approximately 15m downstream of the Katere Road bridge. As this monitoring is predominantly carried out to assess potential effects from the Ravensdown store, the full results of these surveys are reported in Section 12.3.2.3, Table 43. Due to elevations in the ammoniacal nitrogen concentration observed in a Ravensdown bore on Katere Road, this is the parameter of primary interest here. Figure 27 shows the trends in ammoniacal nitrogen concentrations at the upstream and downstream sites.

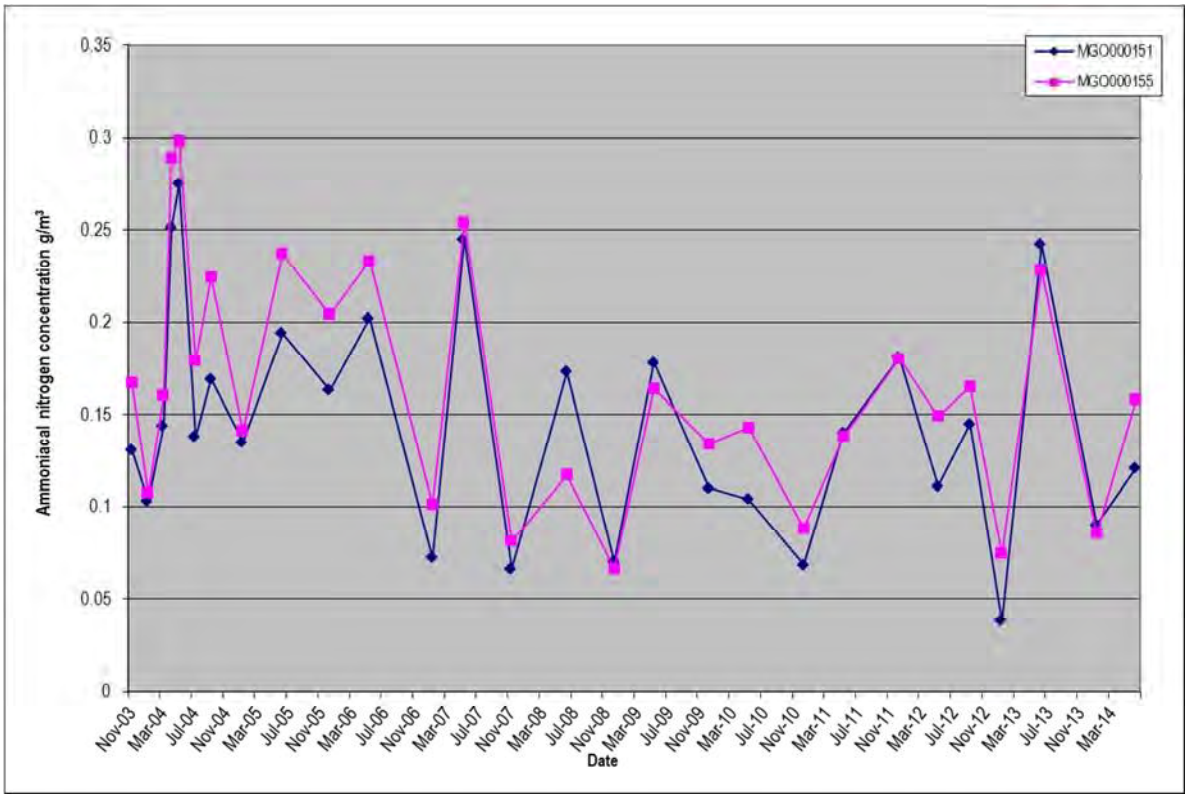


Figure 27 Mangaone Stream ammoniacal nitrogen concentrations in the vicinity of the Ravensdown site under dry weather conditions

Dry weather monitoring shows that, for the most part, the ammoniacal nitrogen of the downstream site was higher than the upstream site to varying degrees, although two of the samples collected during the period under review found that the ammoniacal nitrogen concentration below the Ravensdown site was similar to or lower than the upstream site downstream.

The increases observed during these dry weather conditions are not considered to be sufficient to cause significant adverse environmental effects during dry weather, however biomonitoring inspections have found that periphyton cover in the Mangaone Stream generally increases downstream of the Ravensdown site.

The November 2012 survey found that periphyton cover, which was absent at Egmont Road, increased in a downstream direction, with slippery films and patchy filaments present at the sites downstream of the Manganaha and Puremu Stream confluences, patchy mats and widespread filaments at the site below Ravensdown, and at Rifle Range.

The January 2013 survey found that periphyton cover, which was absent at Egmont Road, increased in a downstream direction, with patchy mats and widespread filaments present at sites downstream of the Manganaha and Puremu Stream confluences and Ravensdown, and then decreased slightly with patchy filaments and mats present at Rifle Range Road.

The November 2013 survey found that periphyton cover, which presented as thin films at Egmont Road, increased in a downstream direction, with a slippery film and patchy filaments present at the site downstream of the Manganaha Stream

confluence, and patchy mats and widespread filaments at the remaining three sites. Aquatic macrophytes were common in the stream at Egmont Road, below Ravensdown and at Rifle Range Road, and at the stream margins at the site below the Puremu Stream confluence.

The February 2014 survey found that periphyton cover, which was confined to thin mats at Egmont Road, increased in a downstream direction, with a slippery film and patchy filaments present downstream of the Manganaha Stream confluence, and patchy mats and filaments at the sites below the Puremu stream confluence and the Ravensdown site, while the Rifle Range Road site had patchy mats and widespread filaments present (refer Appendix III, Report Number CF621, Photos 1 and 2). Aquatic macrophytes were common at the stream margins at the top and bottom sites and in the stream at the three middle sites.

In some of the biomonitoring reports on the surveys undertaken during the period under review it was stated that the prolific periphyton cover may have contributed to impacts on the macroinvertebrate communities at some of the sites in the Mangaone Stream (see section 16.2.1, below).

16.2 Freshwater biomonitoring programme

16.2.1 Macroinvertebrate surveys

Surveys of benthic macroinvertebrates and microflora in the lower Waiwhakaiho River and/or Mangaone Stream were carried out on 28 November 2012, 31 January 2013, 1 Feb 2013, 15 November 2013, 13 February 2014, and 14 February 2014. Three sites in the Waiwhakaiho River and five sites in the Mangaone Stream were sampled. The sites monitored are shown in Figure 3, and described in Table 58.

Table 58 Biomonitoring sites in the Lower Waiwhakaiho River and the Mangaone Stream

Site No	Site Code	Location
7	WKH000920	Waiwhakaiho River, Constance Street
8	WKH000927	Waiwhakaiho River, below Firth industries, west (left) bank
13	WKH000950	Waiwhakaiho River, final riffle downstream of Lake Rotomanu
12	MGO000050	Mangaone Stream, Egmont Road
16	MGO000054	Mangaone Stream, 20m d/s of Manganaha Stream confluence
14	MGO000150	Mangaone Stream, 300m d/s confluence with Puremu Stream
15	MGO000155	Mangaone Stream, 100m d/s fertiliser works
11	MGO000190	Mangaone Stream, Rifle Range Road

The Council's standard 'kick-net' and 'sweep-net' sampling techniques were used to collect streambed macroinvertebrates at three established sites in the Waiwhakaiho River, and five established sites in the Mangaone Stream in order to assess whether discharges from the Lower Waiwhakaiho Industrial area had had any adverse effects on the macroinvertebrate communities of these streams. Samples were processed to provide number of taxa (richness), MCI and $SQMCI_S$ scores for each site.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental

conditions. The $SQMCI_S$ takes into account taxa abundances as well as sensitivity to pollution. It may indicate subtle changes in communities, and therefore be the more relevant index if non-organic impacts are occurring. Significant differences in either the MCI or the $SQMCI_S$ between sites indicate the degree of adverse effects (if any) of the discharges being monitored.

A summary of the findings from each survey is given below and the full reports are attached in Appendix III.

November 2012

This survey found that all Waiwhakaiho River sampling sites recorded community richnesses similar to or higher than long term medians for their respective sites. There was a marked increase in richness in a downstream direction, (from 17 to 30 taxa) and there was a typical downstream decrease in MCI scores between the sites. In addition, all sites recorded MCI scores well above their respective medians, and $SQMCI_S$ scores significantly higher than their medians. Communities in the Waiwhakaiho River downstream of Lake Rotomanu may be inhibited from time-to-time by the variable current speeds caused by tidal flooding. These results did not indicate any significant effects of stormwater or wastewater discharges from the Fitzroy industrial area on the macroinvertebrate communities of the Waiwhakaiho River, although it is possible that the Mangaone Stream was contributing to the increased algal growth observed downstream of the confluence where there was an increase in the number of more 'tolerant' taxa characteristic of the community.

It is apparent that the macroinvertebrate communities in the Mangaone Stream were of mainly 'fair' health. Most sites had moderate taxa richnesses, while MCI scores and $SQMCI_S$ scores were above medians at all sites, significantly so for sites 16 and 11 for MCI scores (Figure 28). However, the five sampling sites in the Mangaone Stream showed a marked decline in $SQMCI_S$ values between Egmont Road (site 12) and Rifle Range Road (site 11), with a marked decline of both $SQMCI_S$ and MCI scores between the sites below the Manganaha stream confluence (site 16) and below the Puremu Stream confluence (site 14). Viterra, the mid Katere Road stormwater drain and Taranaki Sawmills discharge stormwater to the Mangaone Stream between sites 16 and 14. Sediment sampling undertaken in early 2009 had recorded significant concentrations of not only tributyltin in the stream sediments around Taranaki Sawmills, but also elevated concentrations of arsenic, chromium, copper and zinc, all potentially toxic to aquatic biota (see BJ192). The taxa richness at site 14 in the current survey was fewer than the long term median and nine taxa less than at site 16. However, there was increased sedimentation between sites 16 and 14 and sediment sampling undertaken in April 2012, showed less contamination than that recorded in 2009; more indicative of physical habitat induced effects rather than a recently preceding toxic discharge. There was a significant increase in MCI score between the site below the Puremu Stream confluence (site 14) and the site below Ravensdown (site 15), which was maintained in the lower reaches, most likely due to habitat improvements. Some reduction in downstream algal biomass may have been indicative of reduced groundwater inputs from the fertiliser depot.

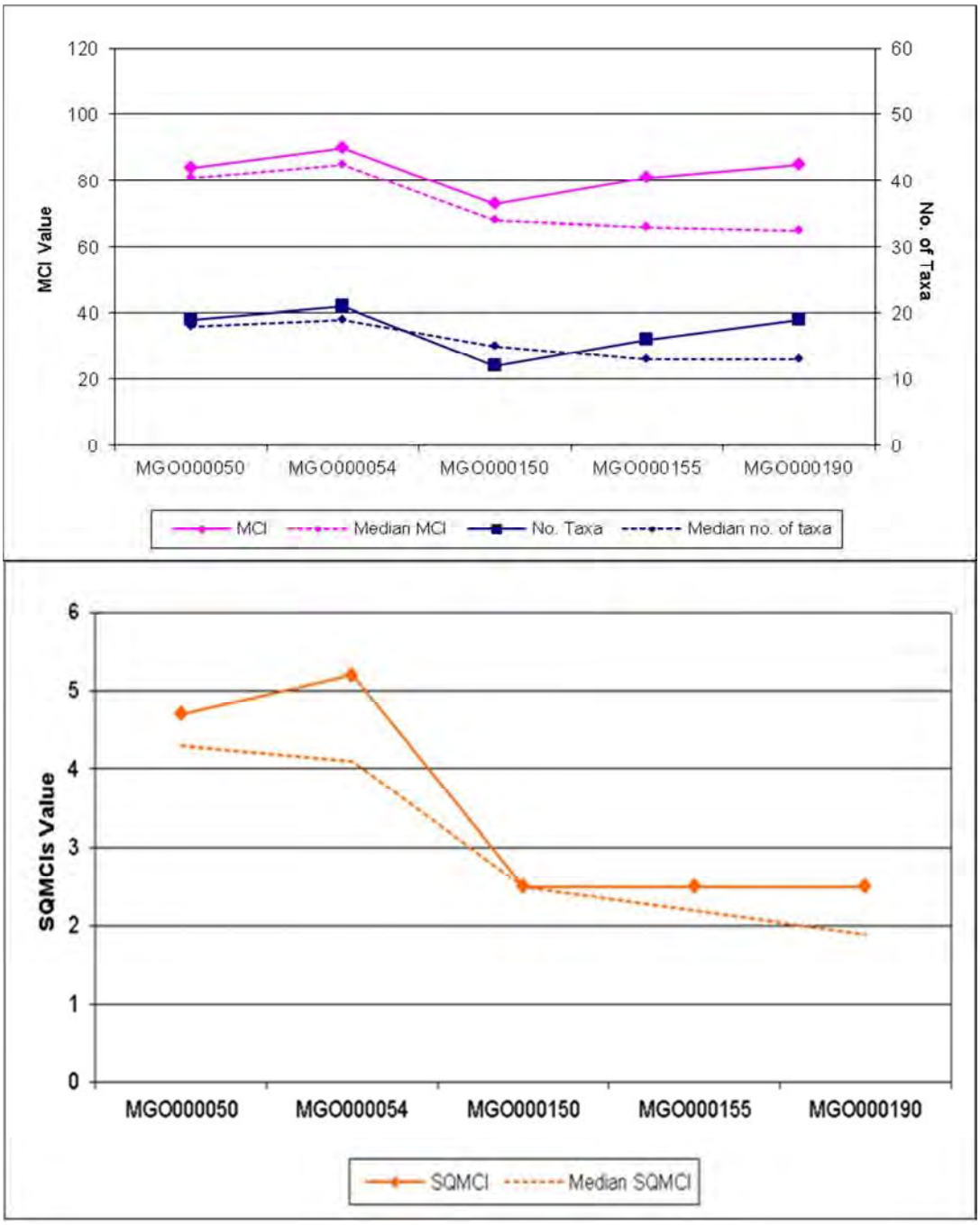


Figure 28 Longitudinal trend in number of taxa, MCI and $SQMCI_S$ values in the Mangaone Stream for the survey of 28 November 2012

The degree of decline in $SQMCI_S$ values was relatively typical for this stream although all sites recorded values in excess of their respective medians, with the greatest historical MCI improvement recorded at site 15, downstream of the fertiliser depot. This improvement was a direct result of the reduced algal biomass and increased, more stable hard substrate observed at site 15.

Overall, the results from the current survey indicate improvement from historical results. It appears that in general the degree of sediment contamination in the Mangaone Stream downstream of the Taranaki Sawmills discharge has been reducing, which may have contributed to the improved downstream biological

health found by the current survey. In addition, reduced groundwater inputs may have contributed to some of the recovery recorded immediately downstream of the fertiliser depot.

January/February 2013

This January/February 2013 survey found that all Waiwhakaiho River sampling sites recorded community richnesses higher than long term medians for their respective sites. There was a small increase in richness in a downstream direction (from 24 to 26 taxa), and there was a typical downstream decrease in MCI scores between the sites, but not as pronounced as that found by the previous spring survey. In addition, all sites recorded MCI scores equivalent to, or above, their respective medians, and $SQMCI_S$ scores significantly higher than their medians. Communities in the Waiwhakaiho River downstream of Lake Rotomanu may be inhibited from time-to-time by the variable current speeds caused by tidal flooding. These results did not indicate any significant effects of stormwater or wastewater discharges from the Fitzroy industrial area on the macroinvertebrate communities of the Waiwhakaiho River, although it is possible that the Mangaone Stream was contributing to the increased algal growth observed downstream of the confluence, where there was a decrease in the number of more 'sensitive' taxa characteristic of the community.

The longitudinal trends in the number of taxa, MCI and $SQMCI_s$ values along the reach of the Mangaone Stream surveyed in January 2013 are illustrated in Figure 29.

The number of taxa tended to decrease in a downstream direction (with the exception of site 15, below the fertlitiser depot), which is a more typical result for this stream. The highest richnesses usually have been found at the two sites in the upper reaches of the stream but atypically the site downstream of the Manganaha Stream confluence (site 16) recorded the lowest taxa richness on this current survey occasion. The MCI was also variable, but generally showed a decreasing trend, in the mid reaches with some recovery in the lower reaches. All sites showed scores lower than, or very similar to, historical median scores; more typical of poorer biological communities found under summer, lower flow conditions.

When considering changes in community structure, the $SQMCI_S$ (which takes into account changes in the abundance of taxa, as well as their sensitivity to pollution) was found to follow a similar pattern to the MCI score in the upper reaches, with a less pronounced decrease in mid reaches, and no recovery through the lower reaches. All sites recorded $SQMCI_S$ scores higher than or equal with their historical medians, with sites 15 and 11 recording the greatest improvement.

The marked deterioration in biological 'health' at the site below the Puremu Stream confluence (site 14),was coincident with extensive periphyton substrate cover, and is therefore unlikely to have been related to a preceding toxic discharge, as the presence of large numbers of snails and oligochaete worms was more indicative of algal smothering effects.

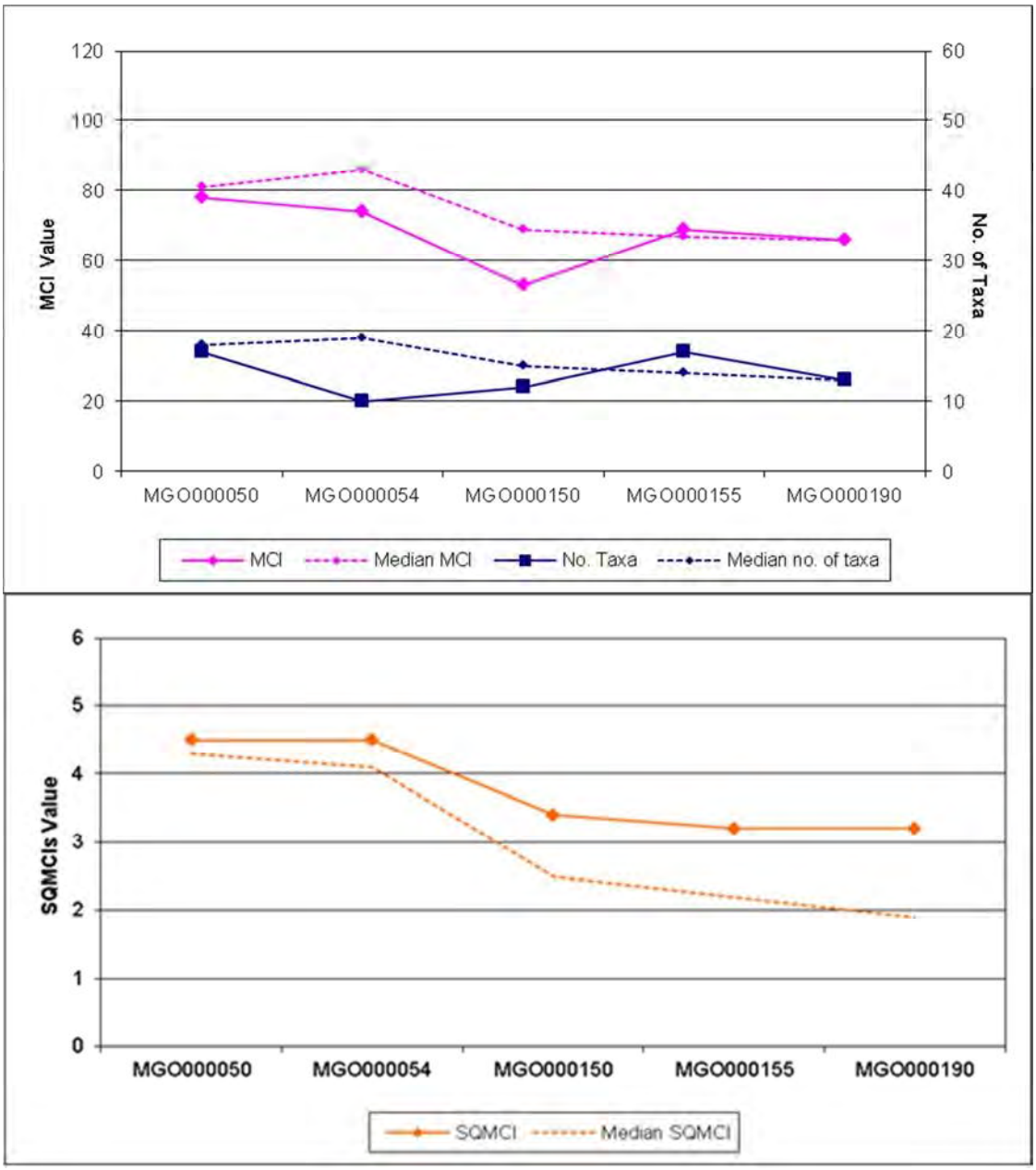


Figure 29 Longitudinal trend in number of taxa, MCI and SQMCI$_S$ values in the Mangaone Stream for the survey of 31 January 2013

In conclusion, it is apparent that the macroinvertebrate communities in the Mangaone Stream were of mainly 'poor' health. Most sites had moderate to poorer taxa richnesses, while MCI scores were near to medians at three sites, and significantly below medians for the sites below the Manganaha Stream confluence and at Rifle Range Road (sites 16 and 11).

SQMCI$_S$ scores ranged from 0.2 to 1.3 units above sites' medians, principally due to the extremely abundant snail populations (associated with extensive periphyton substrate cover and/or aquatic vegetation) present at all sites. However, the five sampling sites in the Mangaone Stream showed a significant decline in MCI and SQMCI$_S$ values between Egmont Road (site 12) and Rifle Range Road (site 11), with a marked decline of MCI scores in particular between the sites below the Manganaha stream confluence (site 16) and below the Puremu Stream confluence (site 14).

Viterra, the mid Katere Road stormwater drain and Taranaki Sawmills discharge stormwater to the Mangaone Stream between sites 16 and 14, and sediment sampling undertaken in early 2009 had recorded significant concentrations of not only tributyltin in the stream sediments around Taranaki Sawmills, but also elevated concentrations of arsenic, chromium, copper and zinc, all potentially toxic to aquatic biota (see BJ192). Although the taxa richness recorded at site 14 by the current survey was fewer than the long term median, it was two taxa more than found upstream at site 16 (below the Manganha Stream confluence) which had a poor richness, much lower than the historical median. Previously, there had been increased sedimentation between sites 16 and 14 and sediment sampling undertaken in April 2012, showed less contamination than that recorded in 2009; suggesting that these changes are more indicative of physical habitat induced effects, rather than a recently preceding toxic discharge. There was a significant increase in MCI score between sites 14 and 15 (below the fertiliser depot), which was maintained in the lower reaches, most likely due to some habitat improvement, although increased downstream algal biomass may have been indicative of impacts from greater groundwater inputs from the fertiliser depot under summer low flow conditions.

The decline in $SQMCI_S$ values was relatively typical for this stream although all sites recorded values in excess of their respective medians and the rate of decline was not as marked as that found by the previous spring survey.

Overall, the results from the current survey indicated typical summer, low flow poorer biological health in the communities of the middle and lower reaches of the Mangaone Stream, coincident with extensive periphyton substrate cover. The extensive periphyton cover and sedimentation of the stream bed are likely to be the primary drivers behind the poor community health, as it appears that the sediment contamination in the Mangaone Stream downstream of the Taranaki Sawmills discharge may be reducing. Groundwater inputs may have contributed to more extensive algal substrate cover immediately downstream of the fertiliser depot.

November 2013

This survey found that all Waiwhakaiho River sampling sites recorded community richnesses similar to or within four taxa of long term medians for their respective sites. There was no trend in richness in a downstream direction, but there was a typical downstream decrease in MCI scores between the sites. In addition, all sites recorded MCI scores insignificant different from their respective medians, and $SQMCI_S$ scores similar to their medians with the exception of a much lower value at the furthest downstream site. Communities in the Waiwhakaiho River downstream of Lake Rotomanu may be inhibited from time-to-time by the variable current speeds caused by tidal flooding. These results did not indicate any significant effects of stormwater or wastewater discharges from the Fitzroy industrial area on the macroinvertebrate communities of the Waiwhakaiho River, although it is possible that the Mangaone Stream was contributing to the increased algal growth observed downstream of the confluence where there was a decrease in the number of more 'sensitive' taxa characteristic of the community.

The longitudinal trends in the number of taxa, MCI and $SQMCI_s$ values along the reach of the Mangaone Stream surveyed in November 2013 are illustrated in Figure 30.

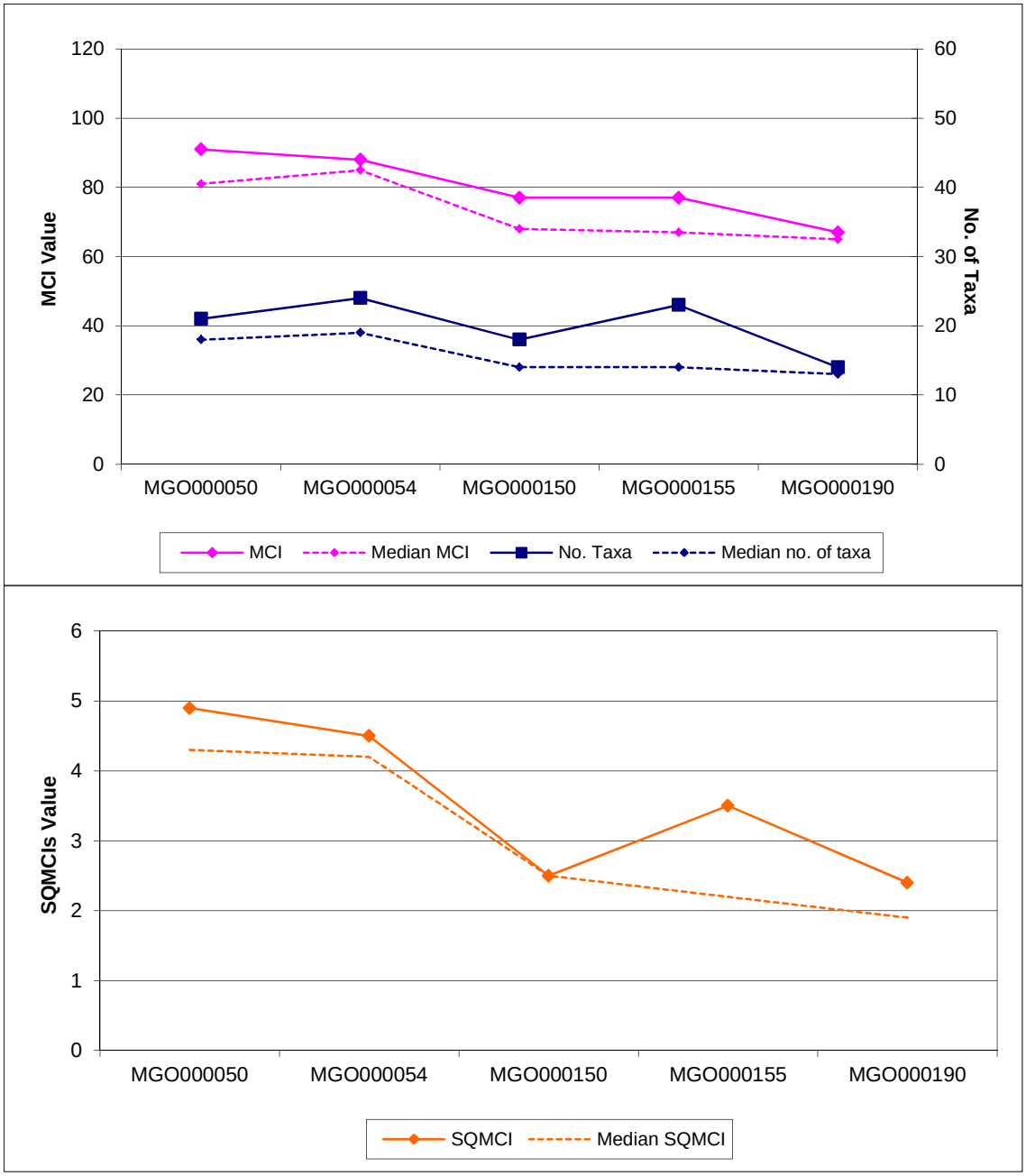


Figure 30 Longitudinal trend in number of taxa, MCI and SQMCI$_S$ values in the Mangaone Stream for the survey of 15 November 2013

The number of taxa tended to decrease in a downstream direction (with the exception of site 15, below the Puremu Stream confluence), which is a more typical result for this stream. The highest richnesses usually have been found at the two sites in the upper reaches of the stream with site 16, at Egmont Road, recording the highest taxa richness of the current survey. The MCI was also variable, but generally showed a decreasing trend through the mid reaches, without the recovery more recently found in the lower reaches. All sites showed scores higher than historical median scores, more typical of biological communities found under moderate, cooler flow conditions in spring.

When considering changes in community structure, the SQMCI$_S$ (which takes into account changes in the abundance of taxa, as well as their sensitivity to pollution)

was found to follow a relatively similar pattern to the MCI score in the upper reaches with a more pronounced decrease in mid reaches, and minimal recovery through the lower reaches. All sites recorded $SQMCI_S$ scores slightly higher than or equal to their historical medians, with the site downstream of the fertiliser depot (site15) recording the greatest improvement due to an extreme abundance of snails amongst the extensive periphyton substrate cover at this site.

In conclusion, it is apparent that the macroinvertebrate communities in the Mangaone Stream were of 'fair' health in the upper reaches deteriorating to 'poor' health in a downstream direction. Most sites had moderate taxa richnesses, while MCI scores and $SQMCI_S$ scores were above or near to medians at all sites. These were significantly above median for the sites at Egmont Road and below the fertiliser depot (sites 12 and 15). However, the five sampling sites in the Mangaone Stream showed a marked decline in MCI and $SQMCI_S$ values between Egmont Road (site 12) and Rifle Range Road (site 11), with a particularly marked decline in both $SQMCI_S$ and MCI scores between the site below the Manganaha Stream confluence and below the Puremu Stream confluence (sites 16 and 14). Viterra, the mid Katere Road stormwater drain and Taranaki Sawmills discharge stormwater to the Mangaone Stream between sites 16 and 14, and sediment sampling undertaken in early 2009 had recorded significant concentrations of not only tributyltin in the stream sediments around Taranaki Sawmills, but also elevated concentrations of arsenic, chromium, copper and zinc, all potentially toxic to aquatic biota (see BJ192). Previously there had been increased sedimentation between sites 16 and 14 and sediment sampling undertaken in April 2012, showed less contamination than that recorded in the 2009; suggesting that these changes are more indicative of physical habitat induced effects, rather than a recently preceding toxic discharge. There was no change in MCI score between the sites below the Puremu Stream confluence and below the fertiliser depot (sites 14 and 15), but there was further deterioration in the lower reaches, most likely due to poorer habitat. Increased downstream algal biomass and aquatic vegetation within the stream may have been indicative of impacts from groundwater inputs from the fertiliser depot.

The degree of decline in $SQMCI_S$ values was relatively typical for this stream although most sites recorded values slightly in excess of their respective medians. The greatest historical MCI improvement was recorded at sites 12 (Egmont Road) and 15, downstream of the fertiliser depot. The latter improvement was coincident with increased, more stable hard substrate observed at site 15.

Overall, the results from the current survey indicated some improvements in comparison with historical results. It appears that in general the degree of sediment contamination in the Mangaone Stream downstream of the Taranaki Sawmills discharge has been reducing, although poorer downstream biological health was found by the current survey. Groundwater inputs may have contributed to some of this deterioration recorded immediately downstream of the fertiliser depot in the lower reaches of the stream, particularly the paucity of 'sensitive' taxa.

February 2014

This survey found that all Waiwhakaiho River sampling sites recorded community richnesses similar to or slightly above long term medians for their respective sites. There was no trend in richness in a downstream direction, but there was a typical downstream decrease in MCI scores between the sites. In addition, all sites recorded

MCI scores insignificantly different from their respective medians (although site 13, downstream of the Mangaone Stream confluence, had a score 10 units lower), and $SQMCI_S$ scores similar to their medians, with the lowest value at the furthest downstream site. Communities in the Waiwhakaiho River downstream of Lake Rotomanu may be inhibited from time-to-time by the variable current speeds caused by tidal flooding. These results did not indicate any significant effects of stormwater or wastewater discharges from the Fitzroy industrial area on the macroinvertebrate communities of the Waiwhakaiho River, although it is possible that the Mangaone Stream was contributing to the increased algal growth observed downstream of the confluence where there was a small decrease in the number of more 'sensitive' taxa characteristic of the community and a more marked increase in the proportion of 'tolerant' taxa comprising the community.

The longitudinal trends in the number of taxa, MCI and $SQMCI_s$ values along the reach of the Mangaone Stream surveyed in February 2014 are illustrated in Figure 10.

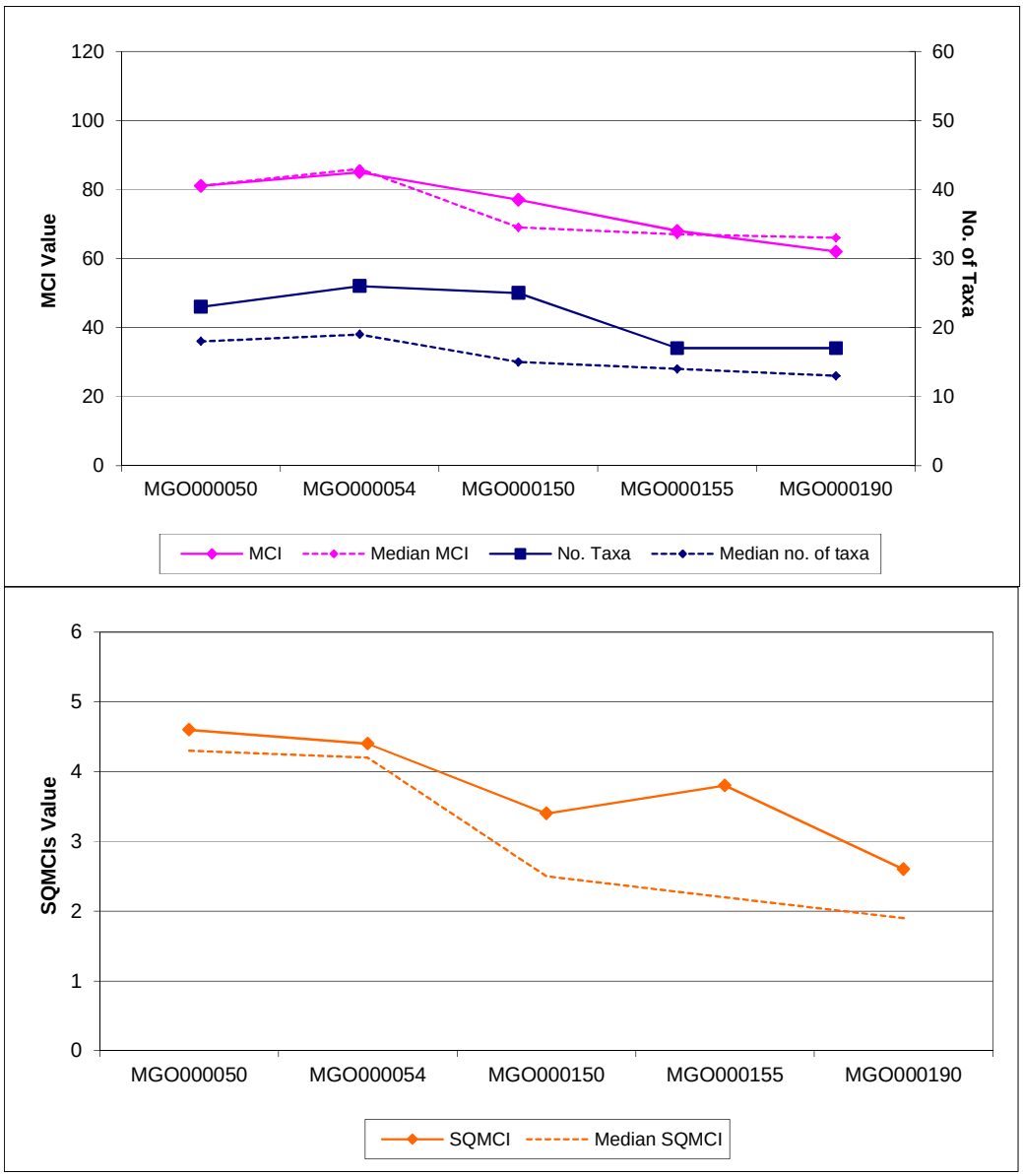


Figure 31 Longitudinal trend in number of taxa, MCI and $SQMCI_s$ values in the Mangaone Stream for the survey of 13 February 2014

The number of taxa tended to decrease in a downstream direction, a more typical result for this stream. The highest richnesses usually have been found at the two sites in the upper reaches of the stream with the site below the Manganaha Stream (site 16) recording the highest taxa richness of the current survey. The MCI was also variable, but showed a decreasing trend through the mid reaches, without the recovery more recently found in the lower reaches. All sites showed scores insignificantly different from historical median scores, and more typical of biological communities found under lower, warmer flow conditions in late summer.

When considering changes in community structure, the $SQMCI_S$ scores (which take into account abundances within taxa, as well as their sensitivity to pollution) was found to follow a relatively similar pattern to the MCI scores in the upper reaches with a slightly more pronounced decrease in mid reaches and minimal recovery through the lower reaches. All sites recorded $SQMCI_S$ scores slightly higher than or equal with their historical medians, with the site downstream of the fertiliser depot (site 15) recording the greatest improvement mainly due to the extreme abundance of snails amongst the extensive periphyton substrate cover and vegetation at this site.

In conclusion, it is apparent that the macroinvertebrate communities in the Mangaone Stream were of 'fair' health in the upper reaches deteriorating to 'poor' health in a downstream direction. Most sites had moderate taxa richnesses decreasing in a downstream direction, while MCI scores and $SQMCI_S$ scores were above or near to medians at all sites, with the site downstream of the Puremu Stream (site 14) showing the highest above median score. However, the five sampling sites in the Mangaone Stream showed a marked decline in MCI and $SQMCI_S$ values between Egmont Road (site 12) and Rifle Range Road (site 11), with a particularly marked decline in both $SQMCI_S$ and MCI scores between the sites below the Manganaha confluence and below the Puremu Stream confluence (sites 16 and 14). Farmlands, the mid Katere Road stormwater drain and Taranaki sawmills discharge stormwater to the Mangaone Stream between sites 16 and 14, and sediment sampling undertaken in early 2009 had recorded significant concentrations of not only tributyltin in the stream sediments around Taranaki Sawmills, but also elevated concentrations of arsenic, chromium, copper and zinc, all potentially toxic to aquatic biota (see BJ192). Previously there had been increased sedimentation between sites 16 and 14. Further sediment sampling undertaken in April 2012 and early March 2014, showed less contamination than that recorded in 2009; continuing to suggest that these changes are more indicative of physical habitat induced effects contributing to the smaller degree of biological health deterioration found more recently. There was a further decrease in MCI score between sites downstream of the Puremu Stream confluence and downstream of the fertiliser depot (site 14 and 15) and some further deterioration in the lower reaches, most likely due to poorer habitat (refer Appendix III, Report Number CF621, Photos 1 and 2). Increased downstream algal biomass and aquatic vegetation within the stream may have been indicative of impacts from groundwater inputs from the fertiliser depot particularly under summer lower flow conditions.

The degree of decline in $SQMCI_S$ values was relatively typical for this stream although most sites recorded values up to one unit in excess of their respective medians. The highest MCI improvement in terms of historical data, was recorded at site 14 (downstream of the Puremu Stream). This improvement was coincident with

increased, more stable hard substrate despite the extensive periphyton substrate cover.

Overall, the results from the current survey indicated some improvements in comparison with historical results. It appears that in general the degree of sediment contamination in the Mangaone Stream downstream of the Taranaki Sawmills discharge has reduced, although a gradual deterioration in downstream biological health was found by the current survey. Groundwater inputs may have contributed to some of this deterioration recorded immediately downstream of the fertiliser depot in the lower reaches of the stream, particularly the paucity of 'sensitive' taxa under these late summer warmer, lower flow conditions.

16.2.2 Fish survey

An electric fishing survey was performed on 24 January 2014 in the Mangaone Stream and the Waiwhakaiho River, to assess whether stormwater and wastewater discharges to the river or stream had had any adverse effects on fish populations.

A pollution incident in February 2011 resulted in a significant fish kill in the Mangaone Stream, affecting all three sites monitored in the Mangaone Stream in the current survey. It was anticipated that the current survey will document what recovery had occurred with regards to the fish communities at these three sites.

In this survey, three sites were surveyed in the Mangaone Stream, and two sites were surveyed in the Waiwhakaiho River. The sites were surveyed using the electric fishing method, which employed a Kainga EFM machine. Those fish captured were identified and counted, where possible. Inevitably some fish eluded capture, although some were identified before reaching cover. The length of each fish was estimated, following which they were released. The fish species found during this survey, together with their abundance, are presented in Appendix IV Table 2 and Table 3.

The area surveyed at each site ranged from 60 to 90 m^2 in the Waiwhakaiho River and 30 to 45 m^2 in the Mangaone Stream. Details of the sites surveyed are given in Table 59 and the location of sites surveyed in relation to the industrial area and discharges are shown in Figure 32.

Table 59 Sites surveyed for fish in the Mangaone Stream and Waiwhakaiho River in January 2014

River	Site No	Site Code	Location
Waiwhakaiho River	7	WKH000920	Constance Street
	13	WKH000950	Final riffle downstream of Lake Rotomanu
Mangaone Stream	12	MGO000050	Egmont Road
	15	MGO000155	100m downstream of fertiliser depot
	11	MGO000190	Rifle Range Road

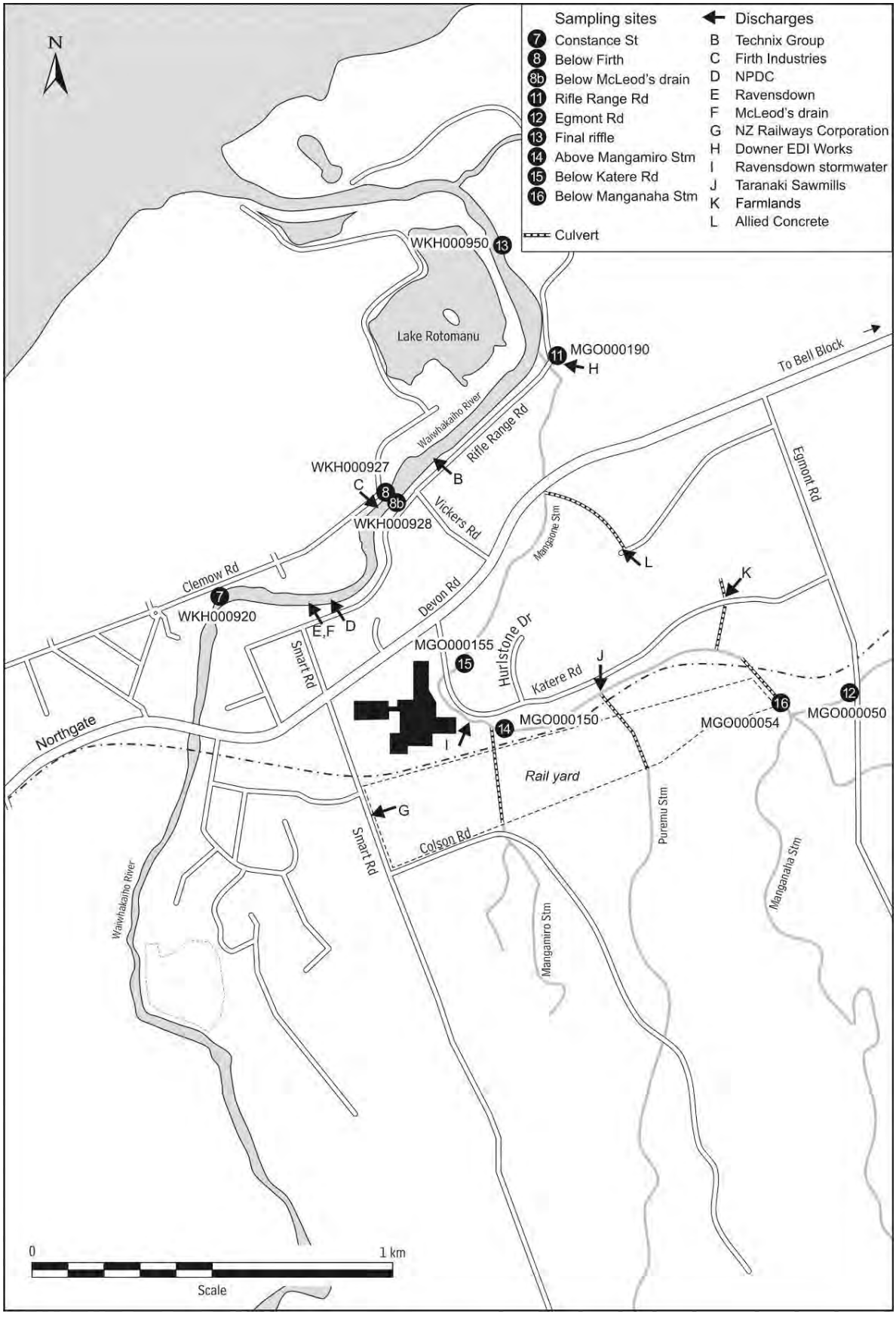


Figure 32 Monitoring sites in the Mangaone Stream including fish survey sites

This January 2014 survey indicated that fish communities in the Waiwhakaiho River and Mangaone Stream generally had a moderate species diversity at all sites. Observations made following the 2011 pollution incident indicated that the Mangaone Stream is capable of supporting a relatively rich fish community, with high numbers of eel, and the first record of lamprey of all surveys conducted. Fish surveys undertaken in streams with good fish cover, such as that present in the Mangaone Stream, can provide an underrepresentation due to those fish taking refuge not being recorded. This is likely to be the case in the current survey, and as such, the current results are considered to reflect a relatively health community, that is well on its way to recovery following the pollution incident of 2011. The communities at previously monitored sites (Egmont Road and Rifle Range Road) had an improved richness when compared to the previous survey, and it is considered that this is a reflection of the variation in sampling technique. There was no indication that industrial discharges to the Mangaone Stream had had a detrimental effect upon the fish communities of the waterway prior to this survey. The difference in diversity and species composition between the sites in the current, and also past surveys, can be attributed to very different habitats at the sites.

With regards to the Waiwhakaiho River results, surveying this river was hindered by the variation in flow caused by the operation of the hydroelectric power scheme located upstream. The area of river surveyed had only been inundated by water a few hours prior to the survey being performed, and as such the relatively low species richness recorded is a reflection of the fact that fish had not yet moved into this area, rather than a reflection of any water quality issues.

The current level of monitoring is appropriate, and it is recommended that future monitoring repeats that undertaken in the current survey, being a three site electric fishing survey in the Mangaone Stream and two site electric fishing survey in the Waiwhakaiho River, undertaken every three years. Although spotlighting has the potential to record different species to that recorded through electric fishing, it is considered that electric fishing is the most appropriate method for these sites. It should be noted that there are plans to improve flood protection in this catchment, and this may impact on fish communities, either by the creation of barriers to fish passage, or disturbance of habitat.

The next fish survey is due in the 2015-2016 year.

17. Summary of recommendations

1. THAT monitoring of discharges from AML Limited in the 2014-2015 year continues at the same level as in 2012-2014.

2. THAT monitoring of discharges from Downer EDI Works Limited in the 2014-2015 year continues at the same level as in 2012-2014.

3. THAT monitoring of discharges from Farmlands Co-operative Society Limited in the 2014-2015 year continues at the same level as in 2012-2014.

4. THAT monitoring of discharges from Firth Industries Limited (Division of Fletcher Concrete and Infrastructure Limited) in the 2014-2015 year continues at the same level as in 2012-2014.

5. THAT monitoring of discharges from Fitzroy Engineering Group Limited in the 2014-2015 year continues at the same level as in 2012-2014.

6. THAT monitoring of discharges from Freight and Bulk Transport Holdings Limited in the 2014-2015 year continues at the same level as in 2012-2014.

7. THAT monitoring of discharges from Nankervis Family Trust in the 2014-2015 year continues at the same level as in 2012-2014.

8. THAT monitoring of discharges from NPDC in the 2014-2015 year continues at the same level as in 2012-2014.

9. THAT monitoring of discharges from New Zealand Decorative Concrete Limited in the 2014-2015 year continues at the same level as in 2012-2014.

10. THAT monitoring of discharges from New Zealand Railways Corporation in the 2014-2015 year continues at the same level as in 2012-2014.

11. THAT monitoring of discharges from Ravensdown Fertiliser Co-operative Limited in the 2014-2015 year continues at the same level as in 2012-2014.

12. THAT monitoring programme for discharges from Taranaki Sawmills Limited in the 2014-2015 year continues at the same level as in 2012-2014.

13. THAT monitoring of discharges from Technix Group Limited in the 2014-2015 year continues at the same level as in 2012-2014.

14. That electric fishing surveys continue to be undertaken at two sites in the Waiwhakaiho River and three sites in the Mangaone Stream at three yearly intervals, noting that the next survey is due to be undertaken in the 2015-2016 year.

Glossary of common terms and abbreviations

The following abbreviations and terms are used within this report:

Al*	aluminium
As*	arsenic
Biomonitoring	assessing the health of the environment using aquatic organisms
BOD	biochemical oxygen demand. A measure of the presence of degradable organic matter, taking into account the biological conversion of ammonia to nitrate
BODF	biochemical oxygen demand of a filtered sample
bund	a wall around a tank to contain its contents in the case of a leak
FCBOD	filtered carbonaceous biochemical oxygen demand. A measure of the presence of degradable organic matter in the filtered sample, excluding the biological conversion of ammonia to nitrate
cfu	colony forming units. A measure of the concentration of bacteria usually expressed as per 100 millilitre sample
COD	chemical oxygen demand. A measure of the oxygen required to oxidise all matter in a sample by chemical reaction
Condy	conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m
Cu*	copper
DO	dissolved oxygen
DRP	dissolved reactive phosphorus
E.coli	*escherichia coli,* an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample
Ent	enterococci, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre of sample
F	fluoride
FC	faecal coliforms, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample
fresh	elevated flow in a stream, such as after heavy rainfall
g/m^3	grams per cubic metre, and equivalent to milligrams per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures
IBC	intermediate bulk container, a square 1000L plastic tank, generally encased in a steel cage.
incident	an event that is alleged or is found to have occurred that may have actual or potential environmental consequences or may involve non-compliance with a consent or rule in a regional plan. Registration of an incident by the Council does not automatically mean such an outcome had actually occurred
intervention	action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring

investigation	action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident
L/s	litres per second
MCI	macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats
mS/m	millisiemens per metre
mixing zone	the zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to 7 times the width of the stream at the discharge point
NH_4	ammonium, normally expressed in terms of the mass of nitrogen (N)
NH_3	unionised ammonia, normally expressed in terms of the mass of nitrogen (N)
NO_3	nitrate, normally expressed in terms of the mass of nitrogen (N)
NTU	Nephelometric Turbidity Unit, a measure of the turbidity of water
O&G	oil and grease, defined as anything that will dissolve into a particular organic solvent (e.g. hexane). May include both animal material (fats) and mineral matter (hydrocarbons)
pH	a numerical system for measuring acidity in solutions, with 7 as neutral. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5
Physicochemical	measurement of both physical properties (e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment
PM_{10}	relatively fine airborne particles (less than 10 micrometre diameter)
resource consent	refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15)
RMA	Resource Management Act 1991 and including all subsequent amendments
SS	suspended solids
SQMCI	semi quantitative macroinvertebrate community index;
Temp	temperature, measured in °C (degrees Celsius)
Turb	turbidity, expressed in NTU
UIR	Unauthorised Incident Register entry- an event recorded by the Council on the basis that it had potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan
Zn*	zinc

*an abbreviation for a metal or other analyte may be followed by the letters 'As', to denote the amount of metal recoverable in acidic conditions. This is taken as indicating the total amount of metal that might be solubilised under extreme environmental conditions. The abbreviation may alternatively be followed by the letter 'D', denoting the amount of the metal present in dissolved form rather than in particulate or solid form.

For further information on analytical methods, contact the Council's laboratory.

Bibliography and references

Taranaki Regional Council: `Waiwhakaiho River Catchment: Draft Water Management Plan'. August 1990.

Taranaki Regional Council: `Lower Waiwhakaiho Monitoring Programme Report for 1988-90'. Technical Report 90-34, September 1990.

Taranaki Regional Council: `Lower Waiwhakaiho Monitoring Programme Report for 1990-91'. Technical Report 91-28, 1991. (Technical Report 91-18)

Taranaki Regional Council: `Joint Lower Waiwhakaiho Monitoring Programme Annual Report 1991/92'. Technical Report 92-36, December 1992. (Technical Report 92-36)

Taranaki Regional Council: `Lower Waiwhakaiho and Mangaone Monitoring Programme Annual Report 1992-93'. (Technical Report 93-14)

Taranaki Regional Council, (1994): `Lower Waiwhakaiho and Mangaone Monitoring Programme Annual Report 1993-94 (Technical Report 94-15).

Taranaki Regional Council, (1995a): Freshwater Macroinvertebrate Community Data - A review of the results of over 600 biomonitoring surveys undertaken between 1980 and 1995.

Taranaki Regional Council, (1995b): 'Lower Waiwhakaiho and Mangaone Monitoring Programme Annual Report 1994-95' (Technical Report 95-5).

Taranaki Regional Council, (1996): 'Lower Waiwhakaiho and Mangaone Monitoring Programme Annual Report 1995-96' (Technical Report 96-52).

Taranaki Regional Council, (1997): 'Lower Waiwhakaiho and Mangaone Monitoring Programme Annual Report 1996-97' (Technical Report 97-95).

Taranaki Regional Council, (1999): 'Lower Waiwhakaiho and Mangaone Monitoring Programme Annual Report 1997-99' (Technical Report 99-68).

Taranaki Regional Council, (2000): 'Lower Waiwhakaiho and Mangaone Monitoring Programme Annual Report 1999-2000' (Technical Report 00-59).

Taranaki Regional Council, (2001): 'Lower Waiwhakaiho Catchment Monitoring Programme Annual Report 2000-2001' (Technical Report 01-63).

Taranaki Regional Council, (2002): 'Lower Waiwhakaiho Catchment Monitoring Programme Annual Report 2001-2002' (Technical Report 02-55).

Taranaki Regional Council, (2003): 'Lower Waiwhakaiho Catchment Monitoring Programme Annual Report 2002-2003' (Technical Report 03-71).

Taranaki Regional Council, (2004): 'Lower Waiwhakaiho Catchment Monitoring Programme Annual Report 2003-2004' (Technical Report 04-77).

Taranaki Regional Council, (2006): 'Lower Waiwhakaiho Catchment Monitoring Programme Annual Report 2004-2005' (Technical Report 05-88).

Taranaki Regional Council, (2007): 'Lower Waiwhakaiho Catchment Monitoring Programme Annual Report 2005-2006' (Technical Report 06-116).

Taranaki Regional Council, (2008): 'Lower Waiwhakaiho Catchment Monitoring Programme Biennial Report 2006-2008' (Technical Report 08-32).

Taranaki Regional Council, (2010): 'Lower Waiwhakaiho Catchment Monitoring Programme Biennial Report 2008-2009' (Technical Report 09-101).

Taranaki Regional Council, (2011): 'Lower Waiwhakaiho Catchment Monitoring Programme Annual Report 2009-2010' (Technical Report 10-107).

Taranaki Regional Council, (2013): 'Lower Waiwhakaiho Catchment Monitoring Programme Annual Report 2010-2012' (Technical Report 12-99).

Appendix I

Resource consents to discharge into the lower Waiwhakaiho River and Mangaone Stream catchments (alphabetical order)

Discharge Permit

Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of Consent Holder:	AML Limited [Trading as Allied Concrete] P O Box 3318 NEW PLYMOUTH
Consent Granted Date:	30 July 2008

Conditions of Consent

Consent Granted:	To discharge stormwater and treated wastewater from truck washing at a concrete batching plant into the Mangaone Stream in the Waiwhakaiho catchment at or about (NZTM) 1696910E-5677375N
Expiry Date:	1 June 2026
Review Date(s):	June 2014, June 2020 and/or within 3 months of receiving a notification under special condition 9
Site Location:	67 Hurlstone Drive, Bell Block
Legal Description:	Lot 1 DP 17583 Blk II Paritutu SD
Catchment:	Waiwhakaiho
Tributary:	Mangaone

For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document

General conditions

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. Notwithstanding any conditions within this consent, the consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.

2. The maximum stormwater catchment area shall be no more than 5880 m^2.

3. Any above ground hazardous substances storage areas shall be bunded with drainage to the wastewater treatment system, and not directly to the stormwater catchment.

4. Concentrations of the following components shall not be exceeded in the discharge:

Component	**Concentration**
suspended solids	100 g/m^3
oil and grease	15 g/m^3

This condition shall apply prior to the entry of the stormwater and wastewater into the receiving waters, at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

5. After allowing for reasonable mixing, within a mixing zone extending 50 metres downstream of the discharge point, the discharge shall not, either by itself or in combination with other discharges, give rise to any or all of the following effects in the Mangaone Stream:

a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
b) any conspicuous change in the colour or visual clarity;
c) any emission of objectionable odour;
d) the rendering of fresh water unsuitable for consumption by farm animals;
e) any significant adverse effects on aquatic life.

6. After allowing for reasonable mixing, within a mixing zone extending 50 metres downstream of the discharge point, the discharge shall not, either by itself or in combination with other discharges, give rise to an increase in pH of greater than 0.5, or a pH outside the range of 6.0 to 8.0 within the receiving waters of the Mangaone Stream.

7. The consent holder shall maintain, and adhere to, a contingency plan detailing measures and procedures to be undertaken to prevent spillage or accidental discharge of contaminants not licensed by this consent, and measures to avoid, remedy or mitigate the environmental effects of such a spillage or discharge.

8. Within three months of the granting of this consent, the consent holder shall prepare and maintain an operation and management plan. This plan shall be adhered to at all times and shall, to the satisfaction of the Chief Executive, Taranaki Regional Council, document how the site is to be managed in order to minimise the contaminants that become entrained in the stormwater. The plan shall include but not necessarily be limited to:

    a) the loading, unloading and storage of materials;
    b) maintenance of conveyance systems;
    c) general housekeeping; and
    d) management of the wastewater treatment system.

9. The consent holder shall notify the Chief Executive, Taranaki Regional Council, prior to making any changes in the processes undertaken at the site, or the chemicals used or stored on site, which could alter the nature of the discharge. Notification shall include the consent number, a brief description of the activity consented and an assessment of the environmental effects of any changes, and be emailed to worknotification@trc.govt.nz. Notification by fax or post is acceptable if the consent holder does not have access to email.

10. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review:

    a) during the month of June 2014 and/or June 2020; and/or
    b) within 3 months of receiving a notification under special condition 9 above,

    for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 30 July 2008

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

Discharge Permit

Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of Consent Holder:	Downer EDI Works Limited P O Box 272 NEW PLYMOUTH
Consent Granted Date:	1 May 1996

Conditions of Consent

Consent Granted:	To discharge up to 175 litres/second of stormwater and washdown water from an asphalt manufacturing plant into the Mangaone Stream in the Waiwhakaiho catchment at or about (NZTM) 1696712E-5677949N
Expiry Date:	1 June 2014
Review Date(s):	June 2002, June 2008
Site Location:	Rifle Range Road Fitzroy New Plymouth
Legal Description:	Sec 224 Hua Dist Blk II Paritutu SD
Catchment:	Waiwhakaiho
Tributary:	Mangaone

For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document

General conditions

(a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

(b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

(c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

(i) the administration, monitoring and supervision of this consent;
(ii) charges for the carrying out of the Council's functions under section 35 in relation to this consent; and
(iii) charges authorised by regulations.

Special conditions

1. That the following limits shall not be exceeded in the discharge:

Suspended solids	100 mg/L
Oil & grease	15 mg/L
pH [range]	6.0 - 8.5

2. That allowing for a mixing zone of 50 metres extending downstream of the discharge pipe, the discharge shall not give rise to any of the following effects in the receiving water of the Mangaone Stream:

(i) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
(ii) any conspicuous change in the colour or visual clarity;
(iii) any emission of objectionable odour;
(iv) the rendering of fresh water unsuitable for consumption by farm animals;
(v) any significant adverse effects on aquatic life, habitats, or ecology.

3. That the consent holder, within three months of the granting of this consent, shall provide a contingency plan, to the satisfaction of the Chief Executive, Taranaki Regional Council, for action to be taken in the event of accidental discharge or spillage of contaminants.

4. That the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2002 and/or June 2008 for the purpose of ensuring that the conditions are adequate to deal with any adverse effects of the discharge on the environment.

Transferred at Stratford on 23 March 2009

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

TRK962041

TARANAKI REGIONAL COUNCIL

PRIVATE BAG 713
47 CLOTON ROAD
STRATFORD
NEW ZEALAND
PHONE 0-6-765 7127
FAX 0-6-765 5097

DISCHARGE PERMIT

Pursuant to the RESOURCE MANAGEMENT ACT 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	FREIGHT & BULK TRANSPORT HOLDINGS LIMITED PO BOX 472 NEW PLYMOUTH
Renewal Granted Date:	1 May 1996

COPY

CONDITIONS OF CONSENT

Consent Granted:	TO DISCHARGE UP TO 2.8 CUBIC METRES/DAY OF TREATED TRUCK WASHDOWN WATER AND STORMWATER ONTO AND INTO LAND IN THE VICINITY OF THE MANGAONE STREAM IN THE WAIWHAKAIHO CATCHMENT AT OR ABOUT GR: P19:067-391
Expiry Date:	1 June 2014
Review Date[s]:	June 2002 and June 2008
Site Location:	KATERE ROAD, FITZROY, NEW PLYMOUTH
Legal Description:	LOT 1 DP13577 LOT 2 DP17884 SEC 184 HUA DIST BLK VI PARITUTU SD

Catchment:	WAIWHAKAIHO	392.000
Tributary:	MANGAONE	392.010

For General, Standard and Special Conditions pertaining to this consent please see reverse side of this document.

TRK962041

GENERAL CONDITIONS

(a) That on receipt of a requirement from the General Manager, Taranaki Regional Council (hereinafter the General Manager), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

(b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

(c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

- (i) the administration, monitoring and supervision of this consent;
- (ii) charges for the carrying out of the Council's functions under section 35 in relation to this consent; and
- (iii) charges authorised by regulations.

SPECIAL CONDITIONS

1) THAT the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2002 and/or June 2008 for the purpose of ensuring that the conditions are adequate to deal with any adverse effects of the discharge on the environment.

2) THAT the consent holder, within three months of the granting of this consent, shall provide a contingency plan, to the satisfaction of the General Manager, Taranaki Regional Council, for action to be taken in the event of accidental discharge or spillage of contaminants.

3) THAT allowing for reasonable mixing, the discharge shall not give rise to any of the following effects in the receiving water:

- (i) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
- (ii) any conspicuous change in the colour or visual clarity;
- (iii) any emission of objectionable odour;
- (iv) the rendering of fresh water unsuitable for consumption by farm animals;
- (v) any significant adverse effects on aquatic life, habitats, or ecology.

Signed at Stratford on 1 May 1996

For and on behalf of
TARANAKI REGIONAL COUNCIL

GENERAL MANAGER

Discharge Permit

Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of Consent Holder:	Nankervis Family Trust 165 Lower Flag Range Road R D 9 HASTINGS 4179
Consent Granted Date:	20 October 2006

Conditions of Consent

Consent Granted:	To discharge truck washwater via an interceptor system into the Mangaone Stream in the Waiwhakaiho catchment at or about GR: P19:073-394
Expiry Date:	1 June 2020
Review Date(s):	June 2008, June 2014
Site Location:	1 Dean Place, New Plymouth
Legal Description:	Lot 2 DP 350826
Catchment:	Waiwhakaiho
Tributary:	Mangaone

For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document

General conditions

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. The consent holder shall adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to avoid or minimise the discharge of silt or other contaminants into water or onto the riverbed and to avoid or minimise the disturbance of the riverbed and any adverse effects on water quality.

2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of application 4368. In the case of any contradiction between the documentation submitted in support of application 4368 and the conditions of this consent, the conditions of this consent shall prevail.

3. Prior to the exercise of this consent, the consent holder shall provide for the written approval of the Chief Executive, Taranaki Regional Council, a management plan relating to contingency planning and management of stormwater and washwater for the site.

4. After reasonable mixing, the contaminant whether by itself or in combination with other contaminants, shall not cause any of the following effects:

a) the production of conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
b) any conspicuous change in the colour or visual clarity;
c) any emissions of objectionable odour;
d) the rendering of fresh water unsuitable for consumption by farm animals; and
e) any significant adverse effects on aquatic life.

5. There shall be no direct discharge of untreated washwater into the Mangaone Stream, as a result of the exercise of this consent.

6. The following concentrations shall not be exceeded in the discharge:

Component	**Concentration**
pH [range]	6-9
Suspended solids	100 gm^{-3}
Oil and Grease	15 gm^{-3}

This condition shall apply prior to the entry of the washwater discharge into the Mangaone Stream at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

7. The consent holder shall not discharge any product used to degrease plant or equipment or discharge any detergent used for truck washing in terms of this consent. The consent holder shall not discharge any water containing concrete, cement or water used to remove concrete and/or cement products from either trucks or equipment.

8. The consent holder shall ensure that no adverse effects shall occur to surface water or groundwater as a result of the exercise of this consent.

9. This consent shall lapse on the expiry of five years after the date of issue of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

10. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2008 and/or June 2014 for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 20 October 2006

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

Discharge Permit

Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of Consent Holder:	New Plymouth District Council Private Bag 2025 NEW PLYMOUTH 4342
Consent Granted Date:	10 June 2008

Conditions of Consent

Consent Granted:	To discharge stormwater from the Katere and Waiwhakaiho industrial areas into the Mangaone Stream via multiple outfalls between Egmont Road and the confluence with the Waiwhakaiho River at or about (NZTM) 1697233E-5677145N, 1697032E-5677145N, 1696882E-5677087N, 1696734E-5676990N, 1696545E-5677175N, 1696755E-5677622N, 1696757E-5677671N, 1696771E-5677957N, and 1696777E-5677965N
Expiry Date:	1 June 2026
Review Date(s):	June 2010, June 2014, June 2020
Site Location:	Katere Road, New Plymouth
Legal Description:	Various
Catchment:	Waiwhakaiho
Tributary:	Mangaone

For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document

General conditions

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.

2. The consent holder shall prevent, where possible, or mitigate any erosion occurring as a result of the exercise of this consent.

3. After allowing for reasonable mixing, within a mixing zone extending 25 metres downstream of the discharge point, the discharge shall not, either by itself or in combination with other discharges, give rise to any or all of the following effects in the Mangaone Stream:

a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
b) any conspicuous change in the colour or visual clarity;
c) any emission of objectionable odour;
d) the rendering of fresh water unsuitable for consumption by farm animals;
e) any significant adverse effects on aquatic life.

4. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2010 and/or June 2014 and/or June 2020, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 10 June 2008

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

Discharge Permit

Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of Consent Holder:	New Zealand Decorative Concrete Limited P O Box 7022 NEW PLYMOUTH 4341
Consent Granted Date:	22 December 2009

Conditions of Consent

Consent Granted:	To discharge stormwater from a decorative concrete products manufacturing site into the Mangaone Stream in the Waiwhakaiho catchment at or about (NZTM) 1697381E-5677456N
Expiry Date:	1 June 2026
Review Date(s):	June 2014, June 2020
Site Location:	42A Egmont Road, New Plymouth
Legal Description:	Lot 1 DP 12763
Catchment:	Waiwhakaiho
Tributary:	Mangaone

For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document

General conditions

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.

2. The stormwater discharged shall be from a catchment area not exceeding 0.26ha.

3. By 22 March 2010, all stormwater shall be directed for treatment through a drain warden or equivalent stormwater treatment system, to be installed and maintained to the satisfaction of the Chief Executive, Taranaki Regional Council, for discharge in accordance with the special conditions of this permit.

4. Any above ground hazardous substances storage areas shall be bunded with drainage to sumps, or other appropriate recovery systems, and not directly to the stormwater catchment.

5. Constituents of the discharge shall meet the standards shown in the following table.

Constituent	**Standard**
pH	Within the range 6.0 to 9.0
suspended solids	Concentration not greater than 100 gm^{-3}
oil and grease	Concentration not greater than 15 gm^{-3}

This condition shall apply before entry of the treated stormwater into the receiving waters at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

6. After allowing for reasonable mixing, within a mixing zone extending 30 metres downstream of the discharge point, the discharge shall not, either by itself or in combination with other discharges, give rise to any or all of the following effects in the receiving water:

   a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
   b) any conspicuous change in the colour or visual clarity;
   c) any emission of objectionable odour;
   d) the rendering of fresh water unsuitable for consumption by farm animals;
   e) any significant adverse effects on aquatic life.

7. By 22 March 2010, the consent holder shall prepare and maintain a contingency plan. The contingency plan shall be adhered to in the event of a spill or emergency and shall, to the satisfaction of the Chief Executive, Taranaki Regional Council, detail measures and procedures to be undertaken to prevent spillage or accidental discharge of contaminants not authorised by this consent and measures to avoid, remedy or mitigate the environmental effects of such a spillage or discharge.

8. The consent holder shall notify the Chief Executive, Taranaki Regional Council, prior to making any changes to the processes or operations undertaken at the site, or the chemicals used or stored on site that could alter the nature of the discharge. Any such change shall then only occur following receipt of any necessary approval under the Resource Management Act. Notification shall include the consent number, a brief description of the activity consented and an assessment of the environmental effects of any changes, and be emailed to worknotification@trc.govt.nz. Notification by fax or post is acceptable if the consent holder does not have access to email.

9. This consent shall lapse on 31 December 2014, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

10. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review:

    a) during the month of June 2014 and/or June 2020; and/or
    b) within 3 months of receiving a notification under special condition 8 above;

    for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 22 December 2009

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

Discharge Permit

Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of Consent Holder:	New Zealand Railways Corporation P O Box 593 WELLINGTON 6140
Consent Granted Date:	31 July 2009

Conditions of Consent

Consent Granted:	To discharge stormwater from the Smart Road Rail Terminal into an unnamed tributary of the Mangaone Stream, and into the Mangaone Stream in the Waiwhakaiho catchment at or about (NZTM) 1696529E-5676921N
Expiry Date:	1 June 2026
Review Date(s):	June 2014, June 2020
Site Location:	Smart Road, New Plymouth
Legal Description:	Pt Sec 144 & 145 Hua Dist, Pt Lot 1 DP 2210 & Pt Lot 2 DP 8654
Catchment:	Waiwhakaiho
Tributary:	Mangaone

For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document

General conditions

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. Notwithstanding any other condition of this consent, the consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.

2. The stormwater discharged shall be from a catchment area not exceeding 11.28ha.

3. By 30 September 2009, where goods are on site in excess of 3 days, any above ground hazardous substances storage areas shall be bunded with drainage to sumps, or discharged via a three stage interceptor and stop valve such that the flow can be isolated in the event of a spill.

4. Constituents of the discharge shall meet the standards shown in the following table.

Constituent	Standard
pH	Within the range 6.0 to 9.0
suspended solids	Concentration not greater than 100 gm^{-3}
Oil and Grease	Concentration not greater than 15 gm^{-3}

This condition shall apply before entry of the treated stormwater into the receiving waters at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

5. After allowing for reasonable mixing, within a mixing zone extending to the Katere Road Bridge (NZTM 1696444E-5676696N) downstream of the discharge point, the discharge shall not, either by itself or in combination with other discharges, give rise to any or all of the following effects in the receiving water:

a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
b) any conspicuous change in the colour or visual clarity;
c) any emission of objectionable odour;
d) the rendering of fresh water unsuitable for consumption by farm animals;
e) any significant adverse effects on aquatic life.

6. The consent holder shall maintain a contingency plan, which shall be reviewed at not more than 2 yearly intervals. The contingency plan shall be adhered to in the event of a spill or emergency and shall, to the satisfaction of the Chief Executive, Taranaki Regional Council, detail measures and procedures to be undertaken to prevent spillage or accidental discharge of contaminants not authorised by this consent and measures to avoid, remedy or mitigate the environmental effects of such a spillage or discharge.

7. By 30 September 2009, the consent holder shall prepare and maintain a stormwater management plan. This plan shall be adhered to at all times and shall, to the satisfaction of the Chief Executive, Taranaki Regional Council document how the site is to be managed in order to minimise the contaminants that become entrained in the stormwater. The plan shall include but not necessarily be limited to:

   a) the loading and unloading of materials;
   b) maintenance of conveyance systems;
   c) general housekeeping; and
   d) management of the interceptor system;

   and shall be reviewed at not more than 2 yearly intervals.

8. This consent shall lapse on 30 September 2014, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

9. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2014 and/or June 2020, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 31 July 2009

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

TRK973865

TARANAKI REGIONAL COUNCIL
PRIVATE BAG 713
47 CLOTON ROAD
STRATFORD
NEW ZEALAND
PHONE 0-6-765 7127
FAX 0-6-765 5097

DISCHARGE PERMIT

Pursuant to the RESOURCE MANAGEMENT ACT 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	RAVENSDOWN FERTILISER CO-OPERATIVE LIMITED P O BOX 452 DUNEDIN
Renewal Granted Date:	26 November 1997

new address:
PO Box 1049
CHRISTCHURCH

CONDITIONS OF CONSENT

Consent Granted:	TO DISCHARGE UP TO 700 LITRES/SECOND OF STORMWATER FROM A FERTILISER STORAGE DEPOT INTO THE MANGAONE STREAM IN THE WAIWHAKAIHO CATCHMENT AT OR ABOUT GR: P19:066-388
Expiry Date:	1 June 2014
Review Date[s]:	June 1999, June 2002 and June 2008
Site Location:	KATERE ROAD NEW PLYMOUTH
Legal Description:	18166 175 PT SUB 5 17WC 3UR SEC 1, 2 & 143 BLK VI PARITUTU SD
Catchment:	WAIWHAKAIHO 392.000
Tributary:	MANGAONE 392.010

For General, Standard and Special Conditions pertaining to this consent please see reverse side of this document.

TRK973865

General conditions

a) That on receipt of a requirement from the General Manager, Taranaki Regional Council (hereinafter the General Manager), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. THAT the following limits shall not be exceeded in the discharge:

pH [range]	6.0-8.5
Suspended solids	100 gm^{-3}
Oil and grease	15 gm^{-3}

2. THAT the consent holder shall manage the stormwater disposal system in such a manner as to minimise the discharge of free phosphate to the Mangaone Stream.

3. THAT allowing for a mixing zone extending downstream to the Katere Road bridge, the discharge shall not give rise to any of the following effects in the receiving water of the Mangaone Stream:

i) an un-ionised ammonia concentration of greater than 0.025 gm^{-3};
ii) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
iii) any conspicuous change in the colour or visual clarity;
iv) any significant adverse effects on aquatic life, habitats, or ecology.

4. THAT the consent holder shall maintain a contingency plan, outlining measures and procedures undertaken to prevent spillage or accidental discharge of contaminants in the stormwater catchment and measures to avoid, remedy or mitigate the environmental effects of such a spillage or discharge. The consent holder shall annually review and maintain the plan.

5. THAT the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 1999 and/or June 2002 and/or June 2008, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects of the discharge on the environment arising from the exercise of this consent, which were not foreseen at the time the application was considered and which it was not appropriate to deal with at that time.

Signed at Stratford on 26 November 1997

For and on behalf of
TARANAKI REGIONAL COUNCIL

GENERAL MANAGER

Discharge Permit

Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of Consent Holder:	Taranaki Sawmills Limited P O Box 7145 Fitzroy NEW PLYMOUTH
Consent Granted Date:	17 October 2006

Conditions of Consent

Consent Granted:	To discharge cooling water and wastewater from a timber drying plant and stormwater from a timber treatment site into the Mangaone Stream in the Waiwhakaiho catchment at or about GR: P19:069-388
Expiry Date:	1 June 2020
Review Date(s):	June 2008, June 2009, June 2010, June 2014
Site Location:	45 & 53 Katere Road, Fitzroy, New Plymouth
Legal Description:	Lot 1 DP 20347 Lot 2 DP 12871 Sec 177 Hua Dist Blk VI Paritutu SD
Catchment:	Waiwhakaiho
Tributary:	Mangaone

For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document

General conditions

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.

2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of application 4046. In the case of any contradiction between the documentation submitted in support of application 4046 and the conditions of this consent, the conditions of this consent shall prevail.

3. The consent holder shall adhere to the New Zealand Timber Preservation Council "Best Practice Guideline for the Safe Use of Timber Preservatives and Antisapstain Chemicals" September 2005 in so far as these guidelines address any matter relevant to the activity authorised by this consent. Where there is a conflict between the requirements of this guideline and the conditions of this consent, then the conditions of this consent shall prevail.

4. From the 31 March 2007 the consent holder shall ensure that all bunding (secondary containment) and any internal bunding, including but not limited to the internal LOSP bunding, meet the requirements of regulations 35 to 41 of the Hazardous Substances (Emergency Management) Regulations 2001 as amended by the Hazardous Substances (Classes 1 to 5 Controls) Amendment Regulations 2004 .

5. The maximum stormwater catchment area shall be no more than 5.3188 ha.

6. The wastewater/cooling water discharge shall be no more than 12 cubic metres per day.

7. The following concentrations shall not be exceeded in the discharge:

Component	**Concentration**
oil and grease	15 g/m^3
suspended solids	100 g/m^3
Arsenic	0.24 g/m^3
Boron	3.7 g/m^3
Copper (dissolved)	0.088 g/m^3
Chromium	0.4 g/m^3
Tributyltin	0.0046 g/m^3
Zinc (dissolved)	0.64 g/m^3

This condition shall apply prior to the discharge of the stormwater into the receiving environment, at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

8. After allowing for reasonable mixing, within a mixing zone extending 30 metres downstream of the discharge point, the discharge shall not either by itself, or in combination with other discharges, give rise to any or all of the following effects in the receiving waters of the Mangaone Stream:

a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
b) any conspicuous change in the colour or visual clarity;
c) any emission of objectionable odour;
d) the rendering of fresh water unsuitable for consumption by farm animals;
e) any significant adverse effects on aquatic life.

9. After allowing for reasonable mixing within a mixing zone extending 30 metres downstream of the discharge point, the discharge shall not, either by itself or in combination with other discharges, give rise to an increase of greater than 0.5 pH increment, or a pH outside the range of 6.0 to 9.0 within the receiving waters of the Mangaone Stream.

10. After allowing for reasonable mixing, within a mixing zone extending 30 metres downstream of the discharge point, the discharge shall not either by itself or in combination with other discharges give rise to any or all of the following effects in the receiving waters of the Mangaone Stream:

a) an increase in temperature of more than 3 degrees Celsius;
b) the natural temperature of the water to exceed 25 degrees Celcius;
c) a filtered carbonaceous 5 day biochemical oxygen demand of more than 2 g/m^3.

11. The consent holder shall investigate the permethrin, iodocarb, propiconazole and tebuconazole levels in site discharge, receiving water and Mangaone Stream sediment and to satisfaction of Chief Executive, Taranaki Regional Council

12. The consent holder shall investigate to satisfaction of Chief Executive, Taranaki Regional Council:

    (a) The assimilative capacity of the Mangaone Stream under wet weather conditions, in relation to the dissolved copper concentration of the site discharge, the Mangaone Stream and the critical maximum concentration as per the United States Environmental Protection Agency National Recommended Water Quality Criteria 2006.

    (b) What, if any remedial action is required at the site to ensure that the discharge from the site does not result in the water quality criteria, described in 12(a), from being exceeded.

13. The consent holder shall report on the investigations required by conditions 11 and 12 to the satisfaction of the Chief Executive, Taranaki Regional Council by 30 August 2007.

14. The consent holder shall provide and maintain a contingency plan, to the satisfaction of the Chief Executive, Taranaki Regional Council, for action to be taken in the event of accidental discharge or spillage of contaminants.

15. This consent shall lapse on the expiry of five years after the date of issue of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

16. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2008, and/or June 2009, and/or June 2010, and/or June 2014, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

17. Conditions 3 and 4 of this resource consent may be reviewed at any time, consequent to any amendment or revision of the New Zealand Timber Preservation Council "Best Practice Guideline for the Safe Use of Timber Preservatives and Antisapstain Chemicals" September 2005, or regulations 35 to 41 of the Hazardous Substances (Emergency Management) Regulations 2001 as amended in the Hazardous Substances (Classes 1 to 5 Controls) Amendment Regulations 2004

Signed at Stratford on 17 October 2006

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

Discharge Permit

Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of Consent Holder:	Farmlands Co-operative Society Limited 23 Sir William Pickering Society Drive CHRISTCHURCH 8053
Decision Date:	11 January 2002
Commencement Date:	11 January 2002

Conditions of Consent

Consent Granted:	To discharge minor volumes of treated industrial wastewater and up to 128 litres/second of treated stormwater from a stockfeed milling plant into an unnamed tributary of the Mangaone Stream in the Waiwhakaiho catchment at or about (NZTM) 1697412E-5677349N
Expiry Date:	1 June 2020
Review Date(s):	June 2003, June 2005, June 2008, June 2014
Site Location:	99 Katere Road, New Plymouth
Legal Description:	Lot 2 DP 15406 Blk VI Paritutu SD
Catchment:	Waiwhakaiho
Tributary:	Mangaone

For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document

General conditions

a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. This consent shall be exercised generally in accordance with the information submitted in support of application 1669 and to ensure the conditions of this consent are maintained.

2. The consent holder shall advise the Chief Executive, Taranaki Regional Council, prior to making any change in the processes undertaken at the site, or the materials used on site, which could alter the quantity or nature of the discharge.

3. The stormwater treatment system shall be maintained to the satisfaction of the Chief Executive, Taranaki Regional Council.

4. The following concentrations shall not be exceeded within the discharge effluent:

Component	**Concentration**
pH (range)	6.0-9.0
suspended solids	100 gm^{-3}
oil and grease	15 gm^{-3}
biochemical oxygen demand	25 gm^{-3}

This condition shall apply prior to the entry of the treated stormwater and wastewater into the Katere Road stormwater system, at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

5. The discharge shall not give rise to any of the following effects in the receiving waters of the Mangaone Stream:

a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
b) any conspicuous change in the colour or visual clarity;
c) any emission of objectionable odour;
d) the rendering of fresh water unsuitable for consumption by farm animals;
e) any significant adverse effects on aquatic life.

6. The discharge shall not cause the concentration of filtered carbonaceous biochemical oxygen demand to exceed 2.00 gm^{-3} in the Mangaone Stream.

7. The discharge shall not cause the concentration of unionised ammonia to exceed 0.025 gm^{-3} in the Mangaone Stream.

8. The consent holder shall prepare and maintain a contingency plan to the satisfaction of the Chief Executive, Taranaki Regional Council, outlining measures and procedures undertaken to prevent spillage or accidental discharge of contaminants, and procedures to be carried out should such a spillage or discharge occur.

9. That within three months of the granting of this consent, the consent holder shall prepare and maintain an operation and management plan to the satisfaction of the Chief Executive, Taranaki Regional Council including but not limited to:

    a) The loading and unloading of materials;
    b) maintenance of conveyance systems;
    c) general housekeeping;
    d) management of the interceptor system.

10. The consent will be exercised in accordance with the procedures set out in the operation and management plan, and the consent holder shall subsequently adhere to and comply with the procedures, requirements, obligations and all other matters specified in the operation and management plan, except by specific agreement of the Chief Executive, Taranaki Regional Council. In the case of contradiction between the operation and management plan and the conditions of this resource consent, the conditions of the resource consent shall prevail.

11. The consent holder shall advise the Taranaki Regional Council one month prior to any changes being made to the operation and management plan. Should the Taranaki Regional Council wish to review the operation and management plan, one month's notice shall be provided to the consent holder.

12. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2003 and/or June 2005 and/or June 2008 and/or June 2014, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 10 December 2013

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

Consent 0021-3

TARANAKI REGIONAL COUNCIL

CHIEF EXECUTIVE
PRIVATE BAG 713
47 CLOTEN ROAD
STRATFORD
NEW ZEALAND
PHONE 06-765 7127
FAX 06-765 5097

Please quote our file number on all correspondence

Discharge Permit

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	Technix Group Limited Private Bag 2222 NEW PLYMOUTH
Consent Granted Date:	1 May 1996

Conditions of Consent

Consent Granted:	To discharge up to 400 litres/second of stormwater from an industrial site into the Waiwhakaiho River at or about GR: P19:064-393
Expiry Date:	1 June 2014
Review Date(s):	June 2002, June 2008
Site Location:	Rifle Range Road, Fitzroy, New Plymouth
Legal Description:	Sec 138 Hua Dist Blk II Paritutu SD
Catchment:	Waiwhakaiho

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General conditions

(a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

(b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

(c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

(i) the administration, monitoring and supervision of this consent;
(ii) charges for the carrying out of the Council's functions under section 35 in relation to this consent; and
(iii) charges authorised by regulations.

Special Conditions

1) That the following limits shall not be exceeded in the discharge:

Suspended solids	100 mg/L
Oil & grease	15 mg/L
pH [range]	6.0 - 8.5

2) That allowing for a mixing zone of 150 metres extending downstream of the discharge pipe, the discharge shall not give rise to any of the following effects in the receiving water of the Waiwhakaiho River:

(i) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
(ii) any conspicuous change in the colour or visual clarity;
(iii) any emission of objectionable odour;
(iv) the rendering of fresh water unsuitable for consumption by farm animals;
(v) any significant adverse effects on aquatic life, habitats, or ecology.

3) That the consent holder, within three months of the granting of this consent, shall provide a contingency plan, to the satisfaction of the Chief Executive, Taranaki Regional Council, for action to be taken in the event of accidental discharge or spillage of contaminants.

4) That the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2002 and/or June 2008 for the purpose of ensuring that the conditions are adequate to deal with any adverse effects of the discharge on the environment.

Transferred at Stratford on 3 May 2004

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Discharge Permit

Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of Consent Holder:	Fitzroy Engineering Group Limited Private Bag 2053 NEW PLYMOUTH 4342
Consent Granted Date:	1 May 1996

Conditions of Consent

Consent Granted:	To discharge up to 426 litres/second of stormwater, including treated truckwash water, from an industrial site into the Waiwhakaiho River
Expiry Date:	1 June 2014
Review Date(s):	June 2002, June 2008
Site Location:	Rifle Range Road, Fitzroy, New Plymouth
Legal Description:	Lot 2 Pt Sec 199 Hua Dist City of New Plymouth Blks II & VI Paritutu SD
Grid Reference (NZTM)	1696554E-5677780N
Catchment:	Waiwhakaiho

For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document

General conditions

a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

(i) the administration, monitoring and supervision of this consent;
(ii) charges for the carrying out of the Council's functions under section 35 in relation to this consent; and
(iii charges authorised by regulations.

Special Conditions

1) That the following limits shall not be exceeded in the discharge:

Suspended solids	100 mg/L
Oil & grease	15 mg/L
pH [range]	6.0 - 8.5

2) That allowing for a mixing zone of 80 metres extending downstream of the discharge pipe, the discharge shall not give rise to any of the following effects in the receiving water of the Waiwhakaiho River:

(i) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
(ii) any conspicuous change in the colour or visual clarity;
(iii) any emission of objectionable odour;
(iv) the rendering of fresh water unsuitable for consumption by farm animals;
(v) any significant adverse effects on aquatic life, habitats, or ecology.

3) That there shall be no discharge of wastes containing cleaning solvents.

4) That the consent holder, within three months of the granting of this consent, shall provide a contingency plan, to the satisfaction of the Chief Executive, Taranaki Regional Council, for action to be taken in the event of accidental discharge or spillage of contaminants.

5) That the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2002 and/or June 2008 for the purpose of ensuring that the conditions are adequate to deal with any adverse effects of the discharge on the environment.

Transferred at Stratford on 20 February 2014

For and on behalf of
Taranaki Regional Council

_____

A D McLay
Director-Resource Management

Consent 0392-3

TARANAKI REGIONAL COUNCIL

CHIEF EXECUTIVE
PRIVATE BAG 713
47 CLOTEN ROAD
STRATFORD
NEW ZEALAND
PHONE: 06-765 7127
FAX: 06-765 5097
www.trc.govt.nz

Please quote our file number on all correspondence

Discharge Permit

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	Firth Industries Ltd (Division of Fletcher Concrete & Infrastructure Ltd) P O Box 3122 Fitzroy NEW PLYMOUTH
Change To Conditions Date:	29 May 2000 [Granted: 1 May 1996]

Conditions of Consent

Consent Granted:	To discharge up to 200 litres/second of stormwater and up to 10 litres/second [2 cubic metres/day] of treated washdown water into the Waiwhakaiho River at or about GR: P19:067-397
Expiry Date:	1 June 2014
Review Date(s):	June 2002, June 2008
Site Location:	Fitzroy Road / Clemow Road, Fitzroy
Legal Description:	DP 10146 New Plymouth City
Catchment:	Waiwhakaiho

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General conditions

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. After allowing for reasonable mixing, within a mixing zone extending 50 metres downstream of the discharge point, the discharge shall not give rise to any or all of the following effects in the receiving waters of the Waiwhakaiho River:

a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
b) any conspicuous change in the colour or visual clarity;
c) any emission of objectionable odour;
d) the rendering of fresh water unsuitable for consumption by farm animals;
e) any significant adverse effects on aquatic life.

2. The following limits shall not be exceeded in the discharge effluent:

Suspended solids	100	mg/L
Oil & grease	15	mg/L

This condition shall apply prior to the entry of the discharge into the receiving waters of the Waiwhakaiho River at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

3. After allowing for reasonable mixing within a mixing zone extending 50 metres downstream of the discharge point, the discharge shall not give rise to an increase of greater than 0.5 pH increment, or a pH outside the range of 6.0 to 9.0 within the receiving waters of the Waiwhakaiho River.

4. The consent holder shall ensure that the rate of the discharge can be controlled at all times, and ceased if required, to ensure compliance with the special conditions of this consent.

5. The consent holder shall properly and efficiently maintain and operate the ponds system in such a manner that any discharge which may occur shall not breach the required standards, and any corrective measures shall be designed and constructed to a standard to the satisfaction of the Chief Executive, Taranaki Regional Council.

6. The consent holder shall provide and maintain a contingency plan, to the satisfaction of the Chief Executive, Taranaki Regional Council, for action to be taken in the event of accidental discharge or spillage of contaminants.

7. The Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during the month of June 2002 and/or June 2008, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects of the discharge on the receiving environment arising from the exercise of this consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 17 February 2006

For and on behalf of
Taranaki Regional Council

Director-Resource Management

TRK964984

TARANAKI REGIONAL COUNCIL

PRIVATE BAG 713
47 CLOTON ROAD
STRATFORD
NEW ZEALAND
PHONE 0-6-765 7127
FAX 0-6-765 5097

DISCHARGE PERMIT

Pursuant to the RESOURCE MANAGEMENT ACT 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder: NEW PLYMOUTH DISTRICT COUNCIL PRIVATE BAG 2025 NEW PLYMOUTH

Consent Granted Date: 23 August 1996

CONDITIONS OF CONSENT

Consent Granted: TO DISCHARGE UP TO 20 LITRES/SECOND OF LEACHATE FROM THE FORMER LANDFILL SITE AT BEWLEY ROAD BETWEEN CONSTANCE STREET AND VICKERS ROAD, NEW PLYMOUTH, INTO GROUNDWATER, AND INTO THE WAIWHAKAIHO RIVER VIA THE FLOW OF CONTAMINATED GROUNDWATER AT OR ABOUT GR: P19:064-393

Expiry Date: 1 June 2014

Review Date[s]: June 2002 and June 2008

Site Location: LAND BETWEEN STATE HIGHWAY 3 [DEVON ROAD] AND THE WAIWHAKAIHO RIVER AND FROM CONSTANCE STREET TO VICKERS ROAD, FITZROY

Legal Description: PT 2 DP17437, DP10423 SEC 1 DP1102 SEC 2 DP10423 PT 1 & SEC 2 DP9932 SEC 1 DP15861 BEING RESERVE ALSO SEC 201 BEING RESERVE BLK V PARITUTU SD

Catchment: WAIWHAKAIHO 392.000

For General, Standard and Special Conditions pertaining to this consent please see reverse side of this document.

TRK964984

GENERAL CONDITIONS

(a) That on receipt of a requirement from the General Manager, Taranaki Regional Council (hereinafter the General Manager), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

(b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

(c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

(i) the administration, monitoring and supervision of this consent;
(ii) charges for the carrying out of the Council's functions under section 35 in relation to this consent; and
(iii) charges authorised by regulations.

SPECIAL CONDITIONS

1. THAT the following limits shall not be exceeded in the discharge:

Total Ammonia [as N]	15 mg/L
Dissolved Reactive Phosphorus	0.065 mg/L
pH	7.5

2. THAT the discharge shall not give rise to any of the following effects in the receiving water:

a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
b) any conspicuous change in the colour or visual clarity;
c) any emission of objectionable odour;
d) the rendering of fresh water unsuitable for consumption by farm animals;
e) any significant adverse effects on aquatic life, habitats, or ecology.

3. THAT the consent holder shall ensure that the three piezometers situated at the Bewley Road site are maintained for monitoring purposes.

4. THAT the Taranaki Regional Council may review any or all of the conditions of this consent by giving written notice, should further chemical sampling reveal levels of contamination resulting in significant adverse environmental effects.

5. THAT the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2002 and/or June 2008 for the purpose of ensuring that the conditions are adequate to deal with any adverse effects of the discharge on the environment.

Signed at Stratford on 23 August 1996

For and on behalf of
TARANAKI REGIONAL COUNCIL

OPERATIONS MANAGER

Discharge Permit

Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of Consent Holder:	New Plymouth District Council Private Bag 2025 NEW PLYMOUTH 4342
Consent Granted Date:	10 June 2008

Conditions of Consent

Consent Granted:	To discharge stormwater from the Waiwhakaiho industrial area into the Waiwhakaiho River via multiple outfalls between the State Highway 3 bridge and the confluence with the Mangaone Stream at or about (NZTM) 1695807E-5676977N, 1695902E-5677235N, 1696113E-5677288N, 1696233E-5677323N, 1696377E-5677616N, 1696472E-5677706N, 1696539E-5677767N, 1696573E-5677800N, 1696611E-5677837N, and 1696683E-5677904N
Expiry Date:	1 June 2026
Review Date(s):	June 2010, June 2014, June 2020
Site Location:	Rifle Range Road, New Plymouth
Legal Description:	Various
Catchment:	Waiwhakaiho

For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document

General conditions

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.

2. The consent holder shall prevent, where possible, or mitigate any erosion occurring as a result of the exercise of this consent.

3. After allowing for reasonable mixing, within a mixing zone extending 50 metres downstream of the discharge point, the discharge shall not, either by itself or in combination with other discharges, give rise to any or all of the following effects in the Waiwhakaiho River:

a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
b) any conspicuous change in the colour or visual clarity;
c) any emission of objectionable odour;
d) the rendering of fresh water unsuitable for consumption by farm animals;
e) any significant adverse effects on aquatic life.

4. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2010 and/or June 2014 and/or June 2020, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 10 June 2008

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

Discharge Permit

Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of Consent Holder:	New Zealand Railways Corporation P O Box 593 WELLINGTON 6140
Consent Granted Date:	24 July 1996

Conditions of Consent

Consent Granted:	To discharge up to 13 cubic metres/day of stormwater, including treated wastewater from washing and maintenance of wagons, containers and locomotives, into the Waiwhakaiho River at or about (NZTM) 1696313E-5676749N
Expiry Date:	1 June 2014
Review Date(s):	June 2002, June 2008
Site Location:	Rail Terminal, Smart Road, New Plymouth
Legal Description:	Pt Lot 1 DP 3582 Pt CT F1/350 Pt Sec 144 Hua Dist SO 11437 Blk VI Paritutu SD
Catchment:	Waiwhakaiho

For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document

General conditions

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. That components of the discharge shall not exceed the following concentrations:

pH [range]	6 - 9	
Oil and grease	15	gm^{-3}
Suspended solids	100	gm^{-3}
Ammonia	20	gm^{-3}
Reactive dissolved phosphate	20	gm^{-3}

This condition shall apply prior to the entry of the discharge into the Waiwhakaiho River, at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

2. That the consent holder shall maintain a contingency plan, to the satisfaction of the Chief Executive, Taranaki Regional Council, outlining measures and procedures to be undertaken to prevent spillage or accidental discharge of contaminants, and the procedures to be carried out should such a spillage occur.

3. That wastewater from cleaning operations shall be restricted to the cleaning of railway wagons and containers used for freighting the following substances: meat; dairy products; fertiliser; resin; tallow; urea and woodchips.

4. That after allowing for reasonable mixing the discharge shall not give rise to any of the following effects in the receiving waters:

a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
b) any conspicuous change in the colour or visual clarity;
c) any emission of objectionable odour;
d) the rendering of fresh water unsuitable for consumption by farm animals;
e) any significant adverse effects on aquatic life, habitats or ecology.

5. That the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2002 and/or June 2008 for the purpose of ensuring That the conditions are adequate to deal with any adverse effects of the discharge on the receiving waters.

Transferred at Stratford on 1 June 2009

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

TRK973140

TARANAKI REGIONAL COUNCIL
PRIVATE BAG 713
47 CLOTON ROAD
STRATFORD
NEW ZEALAND
PHONE 0-6-765 7127
FAX 0-6-765 5097

DISCHARGE PERMIT

Pursuant to the RESOURCE MANAGEMENT ACT 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	RAVENSDOWN FERTILISER CO-OPERATIVE LIMITED P O BOX 452 DUNEDIN
Renewal Granted Date:	26 November 1997

new address.
PO Box 1049
CHRISTCHURCH

CONDITIONS OF CONSENT

Consent Granted:	TO DISCHARGE UP TO 700 LITRES/SECOND OF STORMWATER FROM A FERTILISER STORAGE DEPOT VIA MCLEODS DRAIN INTO THE WAIWHAKAHIO RIVER AT OR ABOUT GR: P19:062-390
Expiry Date:	1 June 2014
Review Date[s]:	June 1999, June 2002 and June 2008
Site Location:	SMART ROAD NEW PLYMOUTH
Legal Description:	WAIWHAKAIHO RIVER RESERVE BLK VI PARITUTU SD
Catchment:	WAIWHAKAIHO 392.000
Tributary:	MCLEODS DRAIN

For General, Standard and Special Conditions pertaining to this consent please see reverse side of this document.

TRK973140

General conditions

a) That on receipt of a requirement from the General Manager, Taranaki Regional Council (hereinafter the General Manager), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. THAT the following limits shall not be exceeded in the discharge:

pH [range]	6.0-8.5
Suspended solids	100 gm^{-3}
Oil and grease	15 gm^{-3}

This conditions shall apply prior to the entry of the discharge into the receiving water at a designated sampling point.

2. THAT allowing for a mixing zone of 150 metres extending downstream of the discharge from McLeods Drain, the discharge shall not give rise to any of the following effects in the receiving water of the Waiwhakaiho River:

i) an un-ionised ammonia concentration of greater than 0.025 gm^{-3};
ii) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
iii) any conspicuous change in the colour or visual clarity;
iv) any significant adverse effects on aquatic life, habitats, or ecology.

3. THAT the consent holder shall maintain a contingency plan, outlining measures and procedures undertaken to prevent spillage or accidental discharge of contaminants in the stormwater catchment and measures to avoid, remedy or mitigate the environmental effects of such a spillage or discharge. The consent holder shall annually review and maintain the plan.

4. THAT the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 1999, June 2002 and/or June 2008, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects of the discharge on the environment arising from the exercise of this consent, which were not foreseen at the time the application was considered and which it was not appropriate to deal with at that time.

Signed at Stratford on 26 November 1997

For and on behalf of
TARANAKI REGIONAL COUNCIL

GENERAL MANAGER

Consent 0291-2

TARANAKI REGIONAL COUNCIL

CHIEF EXECUTIVE
PRIVATE BAG 713
47 CLOTEN ROAD
STRATFORD
NEW ZEALAND
PHONE 06-765 7127
FAX 06-765 5097

Please quote our file number on all correspondence

Discharge Permit

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	Technix Group Limited Private Bag 2222 NEW PLYMOUTH
Consent Granted Date:	1 May 1996

Conditions of Consent

Consent Granted:	To discharge up to 426 litres/second of stormwater, including treated truckwash water, from an industrial site into the Waiwhakaiho River at or about GR: P19:068-393
Expiry Date:	1 June 2014
Review Date(s):	June 2002, June 2008
Site Location:	Rifle Range Road, Fitzroy, New Plymouth
Legal Description:	Lot 2 Pt Sec 199 Hua Dist City of New Plymouth Blks II & VI Paritutu SD
Catchment:	Waiwhakaiho

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General conditions

a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

(i) the administration, monitoring and supervision of this consent;
(ii) charges for the carrying out of the Council's functions under section 35 in relation to this consent; and
(iii charges authorised by regulations.

Special Conditions

1) That the following limits shall not be exceeded in the discharge:

Suspended solids	100 mg/L
Oil & grease	15 mg/L
pH [range]	6.0 - 8.5

2) That allowing for a mixing zone of 80 metres extending downstream of the discharge pipe, the discharge shall not give rise to any of the following effects in the receiving water of the Waiwhakaiho River:

(i) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
(ii) any conspicuous change in the colour or visual clarity;
(iii) any emission of objectionable odour;
(iv) the rendering of fresh water unsuitable for consumption by farm animals;
(v) any significant adverse effects on aquatic life, habitats, or ecology.

3) That there shall be no discharge of wastes containing cleaning solvents.

4) That the consent holder, within three months of the granting of this consent, shall provide a contingency plan, to the satisfaction of the Chief Executive, Taranaki Regional Council, for action to be taken in the event of accidental discharge or spillage of contaminants.

5) That the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2002 and/or June 2008 for the purpose of ensuring that the conditions are adequate to deal with any adverse effects of the discharge on the environment.

Transferred at Stratford on 3 May 2004

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Appendix II

Chemical water quality monitoring data

Table:Results of chemical analyses for the Lower Waiwhakaiho River, Mangaone Stream and industrial drainage system Date: 4 February 2013

Site descriptiom	Site	Sample	Time	AsT	B	BOD	FC BOD	COD	Cond	CrT	CuAs	CuD	CuT	DBT	DRP	Coli	Ent	F	FC	IPBC	NH_3	NH_4	NNN	O&G	PERM	PH	PRCA	SNT	SS	TBT	TEBA	Temp	TP	TBT	Turb	ZnAs	ZnD	ZNT
Waiwhak. @ Merrilands	WKH000800	TRC134613	08:05						13.8						0.014						0.00145	0.033				7.9			<2			22.4			0.66			
NPDC @ Burton St	STW001081	TRC134614	08:15						5.6															0.5		7.0			13			21.5			10			
Waiwhak. @ Constance St	WKH000920	TRC134615	08:20						13.8						0.012			0.06			0.00040	0.009	0.02			7.9			<2			22.5			0.67			
NZ Railways Corporation	IND002014	TRC134644	13:15			3.8			15.2						0.092	120	1900		120		0.00564	0.252		<0.5		7.7			8			19.3			12			
Ravensdown	IND004002	TRC134643	12:40						62.4						3.82			1.16			0.76999	25.0		b		7.8			46			20.6	5.03		31			
McLeods Drain	STW001001	TRC134616	08:30						25.5						0.638	130000		0.21	140000		0.03237	3.29		<0.5		7.3			8			20.5			13			
NPDC stormdrain	WKH000872	TRC134617	08:40						20.4															<0.5		7.2			17			21.6						
Firths (Stresscrete)	STW001080	TRC134619	09:50						11.2															<0.5		7.7			17			20.7			16			
Waiwhakaiho @ ford	WKH000925	TRC134620	08:45						14.3						0.024			0.07	6900		0.00235	0.067				7.8			2			22.4			1.2			
Firth pond discharge	IND002001	TRC134618	09:55						36.5															b		11			88			20.6			110			
NPDC/Technix (Vickers Rd)	STW001020	TRC134621	08:55						10.9							35000			36000					<0.5		7.4			24			21.2			36			
Technix (ACL garage)	STW002001	TRC134622	09:05						8.0															<0.5		7.2			14			21.4			28			
Technix (Fitzroy)	STW001021	TRC134623	09:15						6.3															<0.5		6.6			18			23.4			41			
Wai. Above Mangaone	WKH000942	TRC134624	09:20						14.2						0.035			0.06			0.00197	0.088	0.10			7.6			3			22.4			2.7			
Mangaone @ Egmont Rd	MGO000050	TRC134628	09:45				2.2		20.5		0.002	0.001			0.018				46000		0.00025	0.047				7.1			18			18.4			6.0	<0.005	<0.005	
NZ Decorative Concrete	STW001139	TRC134637	13:55						11.6															1.6		8.1			32			22.6			23			
Viterra (NZ) Limited	MGO000058	TRC134629	10:20			2.4			13.2						0.060	15000	10000		16000		0.00011	0.104		b		6.4			3			18.3			2.7			
NPDC mid Katere Rd	STW001116	TRC134630	10:30			22			13.6						0.542						0.04023	3.16		0.8		7.4			40			20.9			46			
Mangaone d/s PCL and NPDC	MGO000075	TRC134631	10:40	<0.0011	0.07		1.5		20.5	<0.00053		0.001	0.0028							<0.002	0.00030	0.053				7.1			5			19.0			4.1		0.007	0.0128
Taranaki Sawmills	IND001006	TRC134632	10:50	0.059	1.31	16		50	4.7	0.071		0.02	0.064	0.00027						<0.0002				5.4	0.0052	7.2	0.031	0.0106	140	0.00015	0.022	22.3		<0.00004	130		0.429	1.01
Mang. 30m d/s Taranaki Saw.	MGO000145	TRC134635	11:10	0.013	0.06		1.7		20.8	0.0024		0.002	0.038								0.00097	0.176			0.00003	7.1	0.0006		17	<0.000002	0.00041	18.9		<0.000005	10		0.028	
Mangaone u/s Ravensdown	MGO000148	TRC134636	12:05		0.05				20.4						0.014						0.00157	0.221	0.71	b		7.2			6			19.2			8.6		0.022	
MMR u/s NZ Railways Corp	MMR000061	TRC134633	13:25						21.2						0.006						0.00105	0.368		b		6.8			5			19.2			5.2			
MMR d/s NZ Railways Corp	MMR000100	TRC134634	12:20						20.7						0.062						0.00484	0.691		0.9		7.2			12			19.0			20			
Ravensdown	STW002003	TRC134642	11:50						95.0						5.59			1.10			0.07748	13.4	16.6	b		7.1			26			19.5	6.1		21			
Mangaone d/s Ravensdown	MGO000153	TRC134640	11:20						19.4						0.062						0.00393	0.347	0.96			7.4			6			19.3						
Nankervis Family Trust	IND002039	TRC134638	14:25						6.5							770			930					1.0		7.7			99			20.7			110			
Allied Concrete	STW002033	TRC134639	10:05						68.3															b		11.4			13			21.8			20			
NPDC @ SH3	STW001035	TRC134641	14:10						4.0							4700			5100		0.00141	0.068		1.2		7.6			39			21.4			31			
Works settling ponds	IND002002	TRC134626	09:40						55.2															<0.5		7.7			6			23.8			6.7			
Works settling pond discharge	MGO000189	TRC134627	09:35						20.3															<0.5		6.7			2			18.7			2.6			
Mangaone @ Rifle Range Rd	MGO000190	TRC134625	09:25						13.6		0.006	0.004			0.068	31000	36000		35000		0.00258	0.426				7.1			8			20.1			10	0.021	0.014	

Key: AsT = Arsenic, total, g/m^3; B=Boron, g/m^3; BOD = biochemical oxygen demand, g/m^3; FCBOD = filtered carbonaceous biochemical oxygen demand, g/m^3; COD = chemical oxygen demand, g/m^3; Cond = conductivity at 20 C, mS/m; CrT = Chromium, Total, g/m^3; CuAs, CuD, CuT = Copper, acid soluble, dissolved and total, g/m^3; DBT = dibutyltin, g/m^3; DRP = dissolved reactive phosphorus, g/m^{3}P; Coli = *E coli*, n/100ml; Ent = *Enterococcus*, n/100ml; F =fluoride g/m^3; FC = faecal coliform, n/100ml; IPBC = iodopropynyl butylcarbomate (iodocarb), g/m^3: NH_3 = unionised ammonia, g/m^{3}N; NH_4 = ammoniacal nitrogen, g/m^{3}N; NNN = nitrate/nitrite nitrogen, g/m^{3}N; O&G = oil and grease, g/m^3; PERM = permethrin, g/m^3; PRCA = propiconazole, g/m^3; SnT = tin, total, g/m^3; SS = suspended solids, g/m^3; TBT = tributyltin, g/m^3; TEBA = tebuconazole, g/m^3; Temp = temperature, ^{o}C; TP = total phosphorus, g/m^{3}P;TPT = triphenyltin, g/m^3; Turb = turbidity, NTU, ZnAs, ZnD, ZnT = Zinc, acid soluble, dissolved and total, g/m^3 b = parameter not determined, no visible hydrocarbon sheen and no odour

Table:Results of chemical analyses for the Lower Waiwhakaiho River, Mangaone Stream and industrial drainage system Date: 16 April 2013

Site descriptiom	Site	Sample	Time	B	BOD	FC BOD	COD	Cond	CuAs	CuD	DRP	Coli	Ent	F	FC	NH_3	NH_4	NNN	O&G	PH	SS	Temp	TP	Turb	ZnAs	ZnD
Waiwhak. @ Merrilands	WKH000800	TRC135640	09:20					12.5			0.016					0.00013	<0.003			8.1	<2	15.6		0.54		
NPDC @ Burton St	STW001081	TRC135641	10:45					4.0											<0.5	7.2	4	17.8		6.3		
Waiwhak. @ Constance St	WKH000920	TRC135642	10:50					13.1			0.017			0.08		0.00020	<0.003	0.02		8.3	<2	15.7		0.46		
NZ Railways Corporation	IND002014	TRC135663	12:45		5.1			22.3			0.160	9700	48000		10000	0.00355	0.356		b	7.4	35	17.5		43		
Ravensdown	IND004002	TRC135662	12:25					235			2.31			2.98		93.383	317		b	9.0	1400	17.2	14.8	400		
McLeods Drain	STW001001	TRC135643	11:00					21.5			0.700	85000		0.24	88000	0.03032	4.66		<0.5	7.2	18	18.0		26		
NPDC stormdrain	WKH000872	TRC135644	11:10					21.5											<0.5	7.2	8	19.2				
Firths (Stresscrete)	STW001080	-	-																							
Waiwhakaiho @ ford	WKH000925	TRC135645	11:20					13.2			0.017			0.07	1800	0.00044	0.010			8.1	4	16.2		1.7		
Firth pond discharge	IND002001	-	-																							
NPDC/Technix (Vickers Rd)	STW001020	TRC135646	11:25					20.5				17000			19000				<0.5	6.7	2	18.6		2.7		
Technix (ACL garage)	STW002001	TRC135647	11:40					6.5											<0.5	7.6	23	18.9		11		
Technix (Fitzroy)	STW001021	TRC135648	11:45					4.6											2.2	7.3	50	18.8		97		
Wai. Above Mangaone	WKH000942	TRC135649	11:55					13.2			0.017			0.07		0.00038	0.007	0.01		8.2	4	16.2		1.2		
Mangaone @ Egmont Rd	MGO000050	TRC135652	10:55			<0.5		21.6	0.001	<0.001	0.009				1400	0.00020	0.046			7.1	10	15.7		6.5	<0.005	<0.005
NZ Decorative Concrete	STW001139	-	-																							
Viterra (NZ) Limited	MGO000058	-	-																							
NPDC mid Katere Rd	STW001116	TRC135653	11:05		17			13.8			1.49					0.02316	1.78		<0.5	7.5	120	18.1		150		
Mangaone d/s PCL and NPDC	MGO000075	TRC135654	11:15	0.04		0.7		20.3		0.001						0.00048	0.088			7.2	4	15.7		5.4		0.012
Taranaki Sawmills	IND001006	TRC135655	11:25	0.11	20		98	16.2		0.02									b	7.2	150	17.7		210		0.468
Mang. 30m d/s Taranaki Saw.	MGO000145	TRC135658	11:30	0.05		0.6		21.1		<0.001						0.00086	0.156			7.2	7	15.8		9.2		0.026
Mangaone u/s Ravensdown	MGO000148	TRC135659	12:10	0.05				21.1		0.001	0.041					0.00096	0.169	0.86		7.2	4	16.1		7.1		0.018
MMR u/s NZ Railways Corp	MMR000061	TRC135656	12:50					22.7			0.005					0.00150	0.517		b	6.9	9	16.4		14		
MMR d/s NZ Railways Corp	MMR000100	TRC135657	12:20					21.8			0.024					0.00916	1.01		b	7.4	10	16.3		17		
Ravensdown	STW002003	-	-																							
Mangaone d/s Ravensdown	MGO000153	TRC135661	12:00					22.1			0.055					0.00298	0.356	0.97		7.4	3	15.2				
Nankervis Family Trust	IND002039	TRC135660	11:45					8.3				3800			4200				b	8.2	29	17.9		48		
Allied Concrete	STW002033	-	-																							
NPDC @ SH3	STW001035	-	-																							
Works settling ponds	IND002002	-	-																							
Works settling pond discharge	MGO000189	TRC135651	12:10					6.8											<0.5	7.4	11	17.6		18		
Mangaone @ Rifle Range Rd	MGO000190	TRC135650	12:05					21.4	0.001	0.001	0.035	7300	32000		7700	0.00111	0.119			7.4	<2	16.7		2.8	0.010	0.010

Key: B=Boron, g/m^3; BOD = biochemical oxygen demand, g/m^3; FCBOD = filtered carbonaceous biochemical oxygen demand, g/m^3; COD = chemical oxygen demand, g/m^3; Cond = conductivity at 20 C, mS/m;
CuAs, CuD = Copper, acid soluble and dissolved, g/m^3; DRP = dissolved reactive phosphorus, g/m^3P; Coli = *E coli*, n/100ml; Ent = *Enterococcus*, n/100ml; F =fluoride g/m^3; FC = faecal coliform, n/100ml; NH_3 = unionised ammonia, g/m^3N;
NH_4 = ammoniacal nitrogen, g/m^3N; NNN = nitrate/nitrite nitrogen, g/m^3N; O&G = oil and grease, g/m^3; SS = suspended solids, g/m^3; Temp = temperature, ^oC; TP = total phosphorus, g/m^3P; Turb = turbidity, NTU; ZnAs, ZnD = Zinc, acid soluble and dissolved, g/m^3
b = parameter not determined, no visible hydrocarbon sheen and no odour

Table: Results of chemical analyses for the Waiwhakaiho River, Mangaone Stream, and industrial drainage system Date: 10 May 2013

Site description	Site	Sample	Time	B	Cond	CuAs	CuD	DRP	Coli	Ent	F	FC	NH_3	NH_4	NNN	O&G	PH	SS	Temp	TP	Turb	ZnAs	ZnD
Waiwhak. @ Constance St	WKH000920	TRC135926	12:15		10.2			0.017			0.04		0.00010	0.004	0.35		8.0	<2	12.2		0.69		
Firths (Stresscrete)	STW001080	TRC135928	12:40		11.4											1.6	8.0	49	12.8		34		
Waiwhakaiho @ ford	WKH000925	TRC135929	12:50		10.1			0.022			0.04	1500	0.00082	0.039			7.9	2	12.3		1.5		
Firth pond discharge	IND002001	TRC135927	12:25		45.9											0.6	11.5	72	12.6		82		
Wai. Above Mangaone	WKH000942	TRC135930	13:20		10.1			0.014			0.04		0.00023	0.011	0.36		7.9	<2	12.3		1.2		
Mangaone u/s Ravensdown	MGO000148	TRC135922	12:50	0.05	15.9		0.004	0.020					0.00034	0.144	0.80		6.9	19	13.8		18		0.029
Ravensdown	STW0002003	TRC135925	12:50		123			22.6			1.70		0.84166	58.4	9.32	b	7.7	37	13.2	32.2	170		
Mangaone u/s Ravensdown	MGO000153	TRC135923	12:40		17.7			0.040					0.00136	0.294	1.00		7.2	7	13.4				
NPDC @ SH3	STW001035	TRC135924	12:25		10.2				4100			4100	0.04398	0.064		b	9.7	16	14.3		17		
Mangaone @ Rifle Range Rd	MGO000190	TRC135931	13:30		14.9	0.004	0.002	0.126	2800	4500		2800	0.00114	0.248			7.2	23	13.3		21	0.051	0.020

Key: B=Boron, g/m^3; Cond = conductivity at 20 C, mS/m; CuAs, CuD = Copper, acid soluble and dissolved, g/m^3; DRP = dissolved reactive phosphorus, g/m^{3}P; Coli = *E coli*, n/100ml; Ent = *Enterococcus*, n/100ml; F =fluoride g/m^3; FC = faecal coliform, n/100ml; NH_3 = unionised ammonia, g/m^{3}N; NH_4 = ammoniacal nitrogen, g/m^{3}N; NNN = nitrate/nitrite nitrogen, g/m^{3}N; O&G = oil and grease, g/m^3; SS = suspended solids, g/m^3; Temp = temperature, ^{o}C; TP = total phosphorus, g/m^{3}P; Turb = turbidity, NTU; ZnAs, ZnD = Zinc, acid soluble and dissolved, g/m^3;

Table: Results of chemical analyses for the Lower Waiwhakaiho River, Mangaone Stream and industrial drainage system Date: 4 December 2013

Site description	Site	Sample	Time	AsT	B	BOD	FC BOD	COD	Cond	CrT	CuAs	CuD	CuT	DBT	DRP	Coli	Ent	F	FC	IPBC	NH_3	NH_4	NNN	O&G	PERM	PH	PRCA	SNT	SS	TBT	TEBA	Temp	TP	TBT	Turb	ZnAs	ZnD	ZNT
Waiwhakaiho @ Merrilands	WKH000800	TRC137994	08:10						10.8						0.015						0.00016	0.008				7.7			4			17.5			2.5			
NPDC @ Burton St	STW001081	TRC137995	09:30						1.7															b		7.1			20			18.4			16			
Waiwhakaiho. @ Constance St	WKH000920	TRC137996	08:30						10.9						0.016			0.05			0.00030	0.015	0.06			7.7			<2			17.7			1.0			
NZ Railways Corporation	IND002014	TRC138024	11:25			6.2			11.5						0.190	150000	120000		170000		0.00223	0.259		<0.5		7.3			19			18.7			20			
McLeods Drain	STW001001	TRC137997	08:50						10.0						2.96	35000		0.30	35000		0.03339	3.32		b		7.4			69			17.8			59			
NPDC stormdrain	WKH000872	TRC137998	09:00						2.5												0.02331	3.54		<0.5		7.2			14			18.1						
Firths (Stresscrete)	STW001080	TRC138000	10:40						55.4															b		8.5			13			18.6			12			
Waiwhakaiho @ ford	WKH000925	TRC138001	09:05						10.8						0.206			0.06	2100		0.00581	0.233				7.8			4			17.7			3.2			
Firth pond discharge	IND002001	TRC137999	10:40						32.9															b		11.0			150			18.3			160			
NPDC/Technix (Vickers Rd)	STW001020	TRC138002	09:10						2.3							8600			8600					b		7.5			17			18.1			13			
Technix (ACL garage)	STW002001	TRC138003	09:30						2.7															b		7.4			41			18.4			47			
Technix (Fitzroy)	STW001021	TRC138004	09:40						3.4															b		7.1			14			19.9			18			
Wai. Above Mangaone	WKH000942	TRC138005	10:00						10.4						0.132			0.06			0.00284	0.175	0.15			7.6			6			18.0			4.4			
Mangaone @ Egmont Rd	MGO000050	TRC138009	09:10				<0.5		18.8		0.002	<0.001			0.013				7400		0.00029	0.050				7.2			16			16.4			8.9	0.008	0.005	
NZ Decorative Concrete	STW001139	TRC138018	09:25						3.9															<0.5		8.0			13			18.7			5.0			
Viterra (NZ) Limited	MGO000058	TRC138010	10:00			3.8			4.0						0.283	23000	23000		24000		0.00079	0.192		0.6		7.0			28			18.0			26			
NPDC mid Katere Rd	STW001116	TRC138011	10:25			12			7.2						2.95						0.04149	2.54		0.7		7.6			160			18.1			160			
Mangaone d/s PCL and NPDC	MGO000075	TRC138012	10:30	0.0040	0.09		1.9		14.0	0.0032		0.003	0.0093								0.00428	0.354				7.5			27			17.1			17		0.040	0.103
Taranaki Sawmills	IND001006	TRC138013	10:40	0.044	0.10	4.9		37	2.3	0.039		0.01	0.029	<0.0003						<0.002				0.6	<0.0002	7.2	<0.0120	0.0042	57	<0.00017	0.0162	18.9		<0.0014	72		0.291	0.47
Mang. 30m d/s Taranaki Saw.	MGO000145	TRC138016	10:55	0.0035	0.08		1.6		14.5	0.0032		0.004	0.0062	<0.00006						<0.0002	0.00354	0.284			<0.00002	7.5	0.00044		16	<0.00005	0.00064	17.5		<0.00004	14		0.034	0.067
Mangaone u/s Ravensdown	MGO000148	TRC138017	12:30		0.07				16.6			0.002			0.061						0.00113	0.183	0.85			7.2			6			17.3			6.8		0.016	
MMR u/s NZ Railways Corp	MMR000061	TRC138014	11:35						17.9						0.008						0.00050	0.170		b		6.9			12			16.7			11			
MMR d/s NZ Railways Corp	MMR000100	TRC138015	12:20						16.5						0.058						0.00112	0.181		<0.5		7.2			9			17.3			6.9			
Ravensdown	STW002003	TRC138023	12:10						142						28.0			1.24			0.19761	59.1	64.0	b		6.9			32			17.8	30.1		27			
Mangaone d/s Ravensdown	MGO000153	TRC138021	11:00						13.7						0.337						0.00766	0.494	0.84			7.6			14			17.4						
Nankervis Family Trust	IND002039	TRC138019	09:35						3.7							28000			28000					1.0		7.4			200			18.2			130			
Allied Concrete	STW002033	TRC138020	09:45						219															<0.5		12.1			19			19.0			9.9			
NPDC @ SH3	STW001035	TRC138022	11:55						5.9							1800			1800		0.07604	0.076		2.1		10.1			17			19.2			17			
Works settling ponds	IND002002	TRC138007	10:15						39.9															b		7.9			86			24.6			100			
Works settling ponds discharge	MGO000189	TRC138008	10:20						13.5															b		6.6			14			18.2			18			
Mangaone @ Rifle Range Rd	MGO000190	TRC138006	10:10						12.7		0.008	0.003			0.395	16000	18000		18000		0.00617	0.632				7.4			14			17.3			14	0.033	0.016	

Key: AsT = Arsenic, total, g/m³; B=Boron, g/m³; BOD = biochemical oxygen demand, g/m³; FCBOD = filtered carbonaceous biochemical oxygen demand, g/m³; COD = chemical oxygen demand, g/m³; Cond = conductivity at 20 C, mS/m; CrT = Chromium, Total, g/m³; CuAs, CuD, CuT = Copper, acid soluble, dissolved and total, g/m³; DBT = dibutyltin, g/m³; DRP = dissolved reactive phosphorus, g/m³P; Coli = *E coli*, n/100ml; Ent = *Enterococcus*, n/100ml; F =fluoride g/m³; FC = faecal coliform, n/100ml; IPBC = iodopropynyl butylcarbomate (iodocarb), g/m³: NH_3 = unionised ammonia, g/m³N; NH_4 = ammoniacal nitrogen, g/m³N; NNN = nitrate/nitrite nitrogen, g/m³N; O&G = oil and grease, g/m³; PERM = permethrin, g/m³; PRCA = propiconazole, g/m³; SnT = tin, total, g/m³; SS = suspended solids, g/m³; TBT = tributyltin, g/m³; TEBA = tebuconazole, g/m³; Temp = temperature, °C; TP = total phosphorus, g/m³P;TPT = triphenyltin, g/m³; Turb = turbidity, NTU; ZnAs, ZnD, ZnT = Zinc, acid soluble, dissolved and total, g/m³

Table: Results of chemical analyses for the Mangaone Stream and industrial drainage system Date: 9 June 2014

Site descriptiom	Site	Sample	Time	AsT	B	BOD	FC BOD	COD	Cond	CrT	CuAs	CuD	CuT	DBT	DRP	Coli	Ent	F	FC	IPBC	NH_3	NH_4	NNN	O&G	PERM	PH	PRCA	SNT	SS	TBT	TEBA	Temp	TP	TBT	Turb	ZnAs	ZnD	ZNT
Waiwhak. @ Merrilands	WKH000800	TRC1410210	12:05						10.5						0.016						0.00006	0.003				7.9			<2			12.1			0.81			
NPDC @ Burton St	STW001081	TRC1410211	12:20						2.4															1.2		7.3			7			14.3			8.7			
Waiwhak. @ Constance St	WKH000920	TRC1410212	12:30						9.8						0.009			0.04			0.00006	<0.003	0.20			7.9			<2			12.2			0.8			
NZ Railways Corporation	IND002014	TRC1410209	13:35			3.3			9.8						0.096	20000	31000		20000		0.00052	0.103		<0.5		7.2			20			14.7			24			
McLeods Drain	STW001001	TRC1410213	12:40						14.3						1.67	24000		0.34	25000		0.05111	4.90		<0.5		7.5			42			15.1			50			
NPDC stormdrain	WKH000872	TRC1410214	12:50						3.9												0.00332	0.783		<0.5		7.1			6			15.3						
Firths (Stresscrete)	STW001080	TRC1410216	13:05						9.4															b		8.1			20			15.6			29			
Waiwhakaiho @ ford	WKH000925	TRC1410217	13:00						9.9						0.025			0.04	800		0.00076	0.045				7.8			<2			12.3			1.2			
Firth pond discharge	IND002001	TRC1410215	15:20						138															b		12.0			53			15.6			65			
NPDC/Technix (Vickers Rd)	STW001020	TRC1410218	13:10						3.8							41000			41000					<0.5		7.7			25			15.1			22			
Technix (ACL garage)	STW002001	TRC1410219	14:05						3.1															b		7.5			6			16.1			8.7			
Technix (Fitzroy)	STW001021	TRC1410220	13:30						2.8															b		7.3			7			15.3			9.6			
Wai. Above Mangaone	WKH000942	TRC1410221	14:30						10.4						0.017			0.04			0.00073	0.022	0.19			8.0			<2			15.5			1.3			
Mangaone @ Egmont Rd	MGO000050	TRC1410195	12:10				<0.5		17.9		0.002	<0.001			0.006				2400		0.00017	0.041				7.1			4			14.8			3.6	<0.005	<0.005	
NZ Decorative Concrete	STW001139	TRC1410203	12:15						6.0															<0.5		7.9			8			14.8			6.3			
Viterra (NZ) Limited	MGO000058	TRC1410196	14:50			5.7			5.4						0.036	15000	60000		16000		0.00046	0.177		<0.5		6.9			34			15.0			36			
NPDC mid Katere Rd	STW001116	TRC1410197	14:45			7.4			7.5						0.486						0.01060	0.821		1.3		7.6			110			14.9			115			
Mangaone d/s PCL and NPDC	MGO000075	TRC1410198	14:40	<0.0011	0.09		0.6		15.2	0.00125		0.002	0.0035								0.00027	0.069				7.1			10			14.1			8.8		0.016	0.031
Taranaki Sawmills	IND001006	TRC1410199	13;15	0.043	0.07	7.5		35	3.6	0.040		<0.01	0.029	<0.00011						<0.002				<0.5	0.0004	7.2	0.0153	0.001193	66	<0.00009	0.0184	14.5		<0.00007	70		0.316	0.52
Mang. 30m d/s Taranaki Saw.	MGO000145	TRC1410201	14:30	0.0012	0.09		0.8		15.4	0.00168		0.001	0.0032	<0.00006						<0.0002	0.00071	0.146				7.2	0.00022		8	<0.00005	0.00025	14.1		<0.00004	7.8		0.023	0.028
Mangaone u/s Ravensdown	MGO000148	TRC1410202	13:30		0.06				16.0			0.002			0.016						0.00085	0.175	0.84			7.2			5			14.0			8.0		0.016	
MMR u/s NZ Railways Corp	MMR000061	-	-																																			
MMR d/s NZ Railways Corp	MMR000100	TRC1410200	15:20						15.9						0.016						0.00066	0.172		<0.5		7.1			6			14.0			7.5			
Ravensdown	STW002003	TRC1410208	15:15						86.6						12.1			1.37			0.08424	33.4	26.6	b		6.9			41			14.5	14.1		20			
Mangaone d/s Ravensdown	MGO000153	TRC1410206	14:20						14.6						0.105						0.00194	0.396	0.99			7.2			15			14.2						
Nankervis Family Trust	IND002039	TRC1410204	12:25						4.8							460			460					<0.5		7.6			92			14.7			82			
Allied Concrete	STW002033	TRC1410205	12:30						23.0															<0.5		8.9			320			14.5			520			
NPDC @ SH3	STW001035	TRC1410207	12:50						2.8							3500			3600		0.00071	0.087		<0.5		7.4			19			14.8			18			
Works settling ponds	IND002002	-	-																																			
Works settling pond discharge	MGO000189	TRC1410223	14:40						13.8															0.6		6.8			34			16.7			43			
Mangaone @ Rifle Range Rd	MGO000190	TRC1410222	14:45						14.7		0.010	0.003			0.138	12000	60000		12000		0.00284	0.421		<0.5		7.3			13			15.4			16	0.043	0.021	
Ponded leachate Ravensdown	SSM000037	TRC1410225	13:35						3.4															<0.5		7.0			19			16.4			42			

Key: AsT = Arsenic, total, g/m^3; B=Boron, g/m^3; BOD = biochemical oxygen demand, g/m^3; FCBOD = filtered carbonaceous biochemical oxygen demand, g/m^3; COD = chemical oxygen demand, g/m^3; Cond = conductivity at 20 C, mS/m; CrT = Chromium, Total, g/m^3; CuAs, CuD, CuT = Copper, acid soluble, dissolved and total, g/m^3; DBT = dibutyltin, g/m^3; DRP = dissolved reactive phosphorus, g/m^{3}P; Coli = *E coli*, n/100ml; Ent = *Enterococcus*, n/100ml; F =fluoride g/m^3; FC = faecal coliform, n/100ml; IPBC = iodopropynyl butylcarbomate (iodocarb), g/m^3: NH_3 = unionised ammonia, g/m^{3}N; NH_4 = ammoniacal nitrogen, g/m^{3}N; NNN = nitrate/nitrite nitrogen, g/m^{3}N; O&G = oil and grease, g/m^3; PERM = permethrin, g/m^3; PRCA = propiconazole, g/m^3; SnT = tin, total, g/m^3; SS = suspended solids, g/m^3; TBT = tributyltin, g/m^3; TEBA = tebuconazole, g/m^3; Temp = temperature, ^{o}C; TP = total phosphorus, g/m^{3}P;TPT = triphenyltin, g/m^3; Turb = turbidity, NTU, ZnAs, ZnD, ZnT = Zinc, acid soluble, dissolved and total, g/m^3

Appendix III

Biomonitoring reports – Macroinvertebrate Surveys

To L Smith, Scientific Officer
From B Jansma and CR Fowles, Scientific Officers
Document 1409675
Report No. CF618
Date 29 September 2014

Biomonitoring of the Lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2012

Introduction

This was the first of two scheduled surveys in the 2012-2013 monitoring programme, for the combined industries of the Fitzroy industrial area. Results from surveys performed since the 2000-2001 monitoring years are discussed in several reports referenced at the end of this report. The monitoring related to the wastewater/stormwater discharge permits tabulated below:

Consent holder	Consent No
Ravensdown	3140,3865
Firth Industries	0392
Hooker Brothers	3141
NPDC (Stormwater)	3138,1126,1275
NPDC (Bewley Road)	4984
TranzRail	1735,3528
Viterra	4548
Allied Concrete Ltd	4539
Taranaki Sawmills	3491
Technix Group Ltd	0021,0291,2230
Works Infrastructure Ltd	3917

Methods

On 28 November 2012, the standard '400 ml kick sampling' technique was used to collect streambed macroinvertebrates from three sites in the lower Waiwhakaiho River and four sites in the Mangaone Stream, while the standard '400 ml sweep-sampling' technique was used to collect streambed macroinvertebrates from site 12 in the Mangaone Stream (Table 1, Figure 1). The 'sweep-net- sampling technique is very similar to Protocol C2 (soft-bottomed, semi-quantitative), and the 'kick-sampling' technique is very similar to Protocol C1 (hard-bottomed, semi-quantitative), of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark *et al*, 2001).

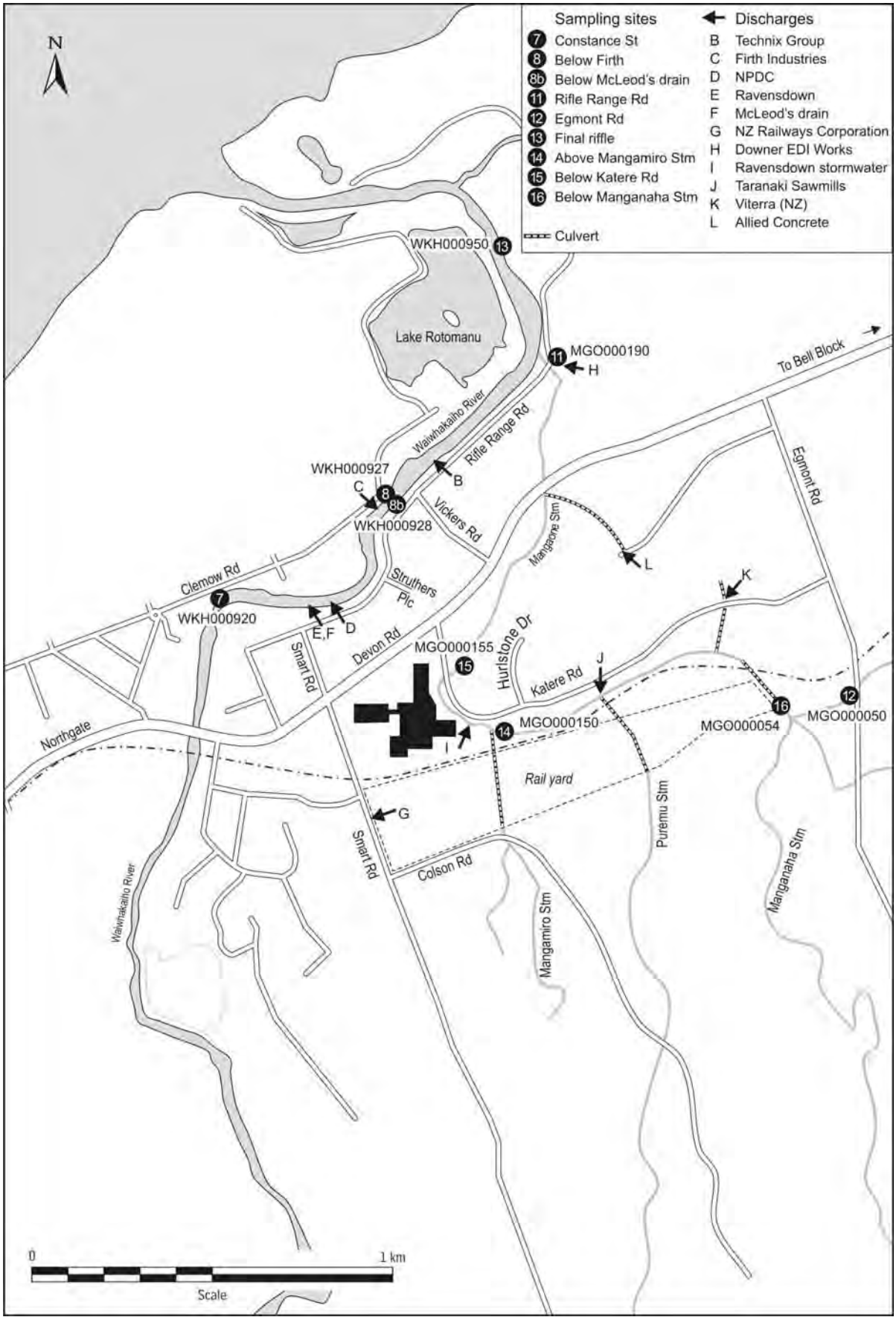


Figure 1 Biomonitoring sites in the Lower Waiwhakaiho River and the Mangaone Stream

The three sites from the Waiwhakaiho River used in this survey have been sampled biannually in recent years. In the Mangaone Stream, two sites have been sampled biannually in the past with sampling of the other three sites (14, 15 and 16) biannually since February 2005.

Table 1 Biomonitoring sites in the Lower Waiwhakaiho River and the Mangaone Stream

Site No	Site Code	Location
7	WKH000920	Waiwhakaiho River, Constance Street
8	WKH000927	Waiwhakaiho River, below Firth industries, west (left) bank
13	WKH000950	Waiwhakaiho River, final riffle downstream of Lake Rotomanu
12	MGO000050	Mangaone Stream, Egmont Road
16	MGO000054	Mangaone Stream, 20m d/s of Manganaha Stream confluence
14	MGO000150	Mangaone Stream, 300m d/s confluence with Puremu Stream
15	MGO000155	Mangaone Stream, 100m d/s fertiliser depot
11	MGO000190	Mangaone Stream, Rifle Range Road

Samples were preserved with Kahle's Fluid for later sorting and identification under a stereomicroscope according to Taranaki Regional Council methodology using protocol P1 of NZMWG protocols for sampling macroinvertebrates in wadeable streams (Stark et al. 2001). Macroinvertebrate taxa found in each sample were recorded as:

R (rare)	= less than 5 individuals;
C (common)	= 5-19 individuals;
A (abundant)	= estimated 20-99 individuals;
VA (very abundant)	= estimated 100-499 individuals;
XA (extremely abundant)	= estimated 500 individuals or more.

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams. Highly 'sensitive' taxa were assigned the highest scores of 9 or 10, while the most 'tolerant' forms scored 1. Sensitivity scores for certain taxa have been modified in accordance with Taranaki experience. Averaging the scores assigned to the taxa found at a site, and multiplying the average by a scaling factor of 20 produces a Macroinvertebrate Community Index (MCI) value.

The MCI was designed as a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. MCI results can also reflect the effects of warm temperatures, slow current speeds and low dissolved oxygen levels, because the taxa capable of tolerating these conditions generally have low sensitivity scores. Usually more 'sensitive' communities (with higher MCI values) inhabit less polluted waterways. The use of this index in non-stony streams (such as the Mangaone Stream site 12) is possible if results are related to physical habitat (e.g. good quality muddy/weedy sites tend to produce lower MCI values than good quality stony sites).

A semi-quantitative MCI value ($SQMCI_S$) has also been calculated for the taxa present at each site by multiplying each taxon score by a loading factor (related to its abundance), totalling these products, and dividing by the sum of the loading factors (Stark, 1998 and 1999. The loading factors were 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 $SQMCI_S$ is not multiplied by a scaling factor of 20, therefore $SQMCI_S$ values range from 1 to 10, while MCI values range from 20 to 200.

Results and discussion

The November 2012 survey was performed during moderately low flows (11 days since the last fresh of both three times and seven times the median flow in the Waiwhakaiho River). The flow at all three sampling sites in the Waiwhakaiho River was clear and uncoloured at the time of this survey. Periphyton mats were patchy at all sites, while growths of filamentous algae were patchy to widespread. Water temperatures in the Waiwhakaiho River ranged from 18.0 to 18.7°C at the time of this late morning survey. Substrate at all three sites comprised predominantly cobbles and gravels, with boulders also being an important component.

In the Mangaone Stream, there was also an uncoloured and clear flow. The cloudiness often recorded in the Mangaone Stream at the sites downstream of the Manganaha Stream, was not observed on this survey occasion. Sites 12 and 16 had a steady water speed, while water speed was swift at sites 14, 15, and 11. Periphyton cover, which was absent at site 12, increased in a downstream direction, with slippery films and patchy filaments present at sites 16 and 14, patchy mats and widespread filaments at site 15, and widespread filaments and patchy mats at site 11. The riffle sampled at site 14 was consistent with that surveyed in the previous survey, although there was increased sediment due to recent bank stabilisation works. Vegetation clearance from the banks adjacent to site 16 had altered habitat (less shading). An observation made at the time of the March 2009 survey at site 11, was that the Waiwhakaiho River may have backed up the Mangaone Stream, reducing the flushing potential of the previous fresh. This was confirmed in 2010 (see Photos in BJ192**Error! Reference source not found.**), and is likely to be a common feature of larger floods in this catchment.

Samples were collected from all sites using the kick sampling technique, except for at site 12, as this was a weedy, silty site. Macrophytes were also present on the bed at site 16, but were absent at all other Mangaone Stream sites. The substrate at site 12 was comprised entirely of silt, with gravels and hard clay predominant at site 16. The substrate at site 14 was comprised mainly of silt, sand, and gravels whereas at sites 15 and 11 it comprised mainly gravels and cobbles. Water temperatures at the time of this early afternoon survey in the Mangaone Stream ranged from 17.6 to 18.3°C.

Macroinvertebrate communities

A summary of taxa numbers and MCI values from previous surveys performed in the Waiwhakaiho River and the Mangaone Stream in relation to the Fitzroy industrial area are presented in Table 2 together with current results. The full results of the survey are presented in Table 3 (Waiwhakaiho River) and Table 4 (Mangaone Stream).

Table 2 Numbers of taxa and MCI and $SQMCI_S$ values recorded in previous surveys performed in the Waiwhakaiho River and Mangaone Stream since July 1983 in relation to the Fitzroy industrial area, together with the results of the survey of 28 November 2012.

Location	Site No.	Numbers of taxa				MCI values			$SQMCI_S$ Values			
		N	Median	Range	Current	Median	Range	Current	N	Median	Range	Current
Waiwhakaiho River	7	52	20	12-29	17	89	66-110	108	28	3.2	1.7-6.5	7.3
	8	50	20	13-30	23	87	69-115	97	28	3.1	1.8-6.3	5.1
	13	43	20	12-28	30	87	67-111	96	28	2.6	1.6-7.4	4.3
Mangaone Stream	12	40	18	8-28	19	81	66-95	84	28	4.3	2.4-4.9	4.7
	16	23	19	3-24	21	85	47-103	90	20	4.1	1.2-5.5	5.2
	14	25	15	6-28	12	68	53-95	73	21	2.5	1.1-3.7	2.5
	15	17	13	7-20	16	66	48-75	81	16	2.2	1.5-3.8	2.5
	11	45	13	4-21	19	65	50-85	85	28	1.9	1.5-3.6	2.5

Table 3 Macroinvertebrate fauna of the Waiwhakaiho River in relation to the Fitzroy industrial area sampled on 28 November 2012

Taxa List	Site Number	MCI score	7	8	13
	Site Code		WKH000920	WKH000927	WKH000950
	Sample Number		FWB12462	FWB12463	FWB12464
NEMATODA	Nematoda	3	-	R	R
ANNELIDA (WORMS)	Oligochaeta	1	R	C	A
	Lumbricidae	5	-	-	R
MOLLUSCA	*Potamopyrgus*	4	-	C	A
CRUSTACEA	Ostracoda	1	-	-	R
	Paracalliope	5	-	-	R
	Paratya	3	-	-	C
EPHEMEROPTERA (MAYFLIES)	*Coloburiscus*	7	C	C	C
	Deleatidium	8	XA	VA	VA
	Nesameletus	9	-	C	R
PLECOPTERA (STONEFLIES)	*Acroperla*	5	-	R	-
	Austroperla	9	-	-	R
	Megaleptoperla	9	R	-	-
	Zelandobius	5	R	R	R
COLEOPTERA (BEETLES)	Elmidae	6	A	VA	A
	Hydraenidae	8	R	R	R
MEGALOPTERA (DOBSONFLIES)	*Archichauliodes*	7	R	C	C
TRICHOPTERA (CADDISFLIES)	*Aoteapsyche*	4	A	VA	VA
	Costachorema	7	A	C	R
	Hydrobiosis	5	C	C	R
	Neurochorema	6	-	R	-
	Beraeoptera	8	R	-	-
	Olinga	9	-	-	R
	Oxyethira	2	-	-	A
	Pycnocentrodes	5	-	R	R
DIPTERA (TRUE FLIES)	*Aphrophila*	5	C	A	VA
	Eriopterini	5	-	-	R
	Maoridiamesa	3	A	VA	VA
	Orthocladiinae	2	A	A	VA
	Tanytarsini	3	R	C	C
	Empididae	3	-	R	C
	Ephydridae	4	R	-	R
	Muscidae	3	-	R	R
	Austrosimulium	3	-	R	C
		No of taxa	17	23	30
		MCI	108	97	96
		SQMCIs	7.3	5.1	4.3
		EPT (taxa)	8	10	10
		%EPT (taxa)	47	43	33

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

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

Waiwhakaiho River

Constance Street (site 7)

A moderate taxa richness (17 taxa) was found at this site, upstream of all discharges from the Fitzroy industrial area. This was three taxa less than the median richness for this site (Table 2 and Figure 2), but within the range of previous richnesses.

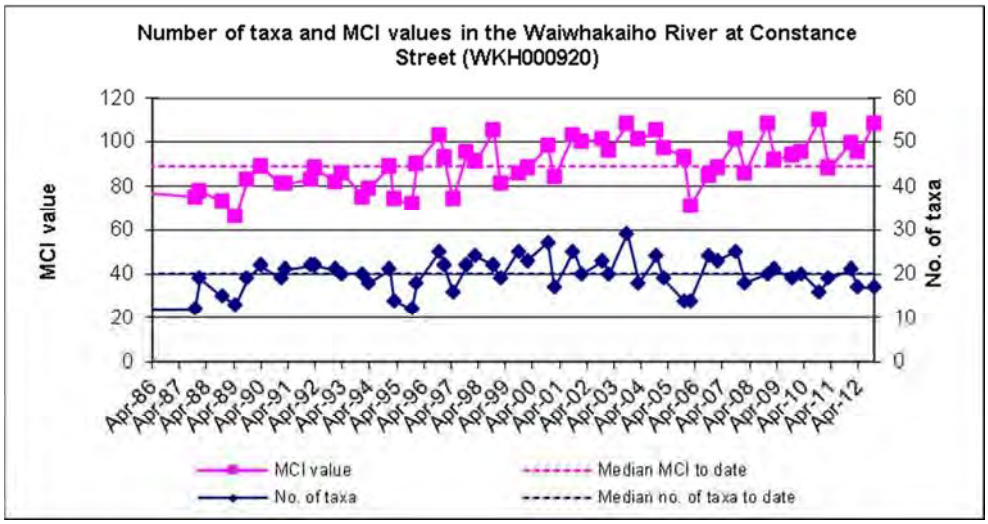


Figure 2 Numbers of taxa and MCI values for Waiwhakaiho River at Constance Street since 1987

Two 'highly sensitive' taxa were present, one of which was recorded as extremely abundant, reflecting good preceding water quality. The community was characterised by three 'tolerant' taxa [net building caddisfly (*Aoteapsyche*) and midges (*Maoridiamesa* and orthoclads)]; two 'moderately sensitive' taxa [elmid beetles and free-living caddisfly (*Costachorema*)]; and the aforementioned 'highly sensitive' taxon [mayfly (*Deleatidium*)].

The relatively high proportion of 'sensitive' taxa (65% of richness) present in the community was reflected in the MCI score of 108 units, a significant 19 units higher than the median score (Stark, 1998) and only two units less than the historical maximum score for this site (Table 2, Figure 2). This was also significantly higher than the previous autumn score, an improved result for this site and significantly higher than predictive values (Stark and Fowles, 2009) for this site situated in the lower reaches of a ringplain river.

The $SQMCI_S$ value of 7.3 units was 4.1 units above the median value for this site, a statistically significant increase (Stark, 1998), and an improvement on the typical values for the lower reaches of ringplain streams and rivers subject to nutrient enrichment. This score reflected the extreme dominance by one 'highly sensitive' taxon and was 0.8 $SQMCI_s$ unit higher than the previous maximum at this site.

Below Firth Industries, left bank (site 8)

This site also had a moderate community richness (23 taxa), three taxa more than the historical median at this site, but within the range of scores previously recorded (Table 2 and Figure 3).

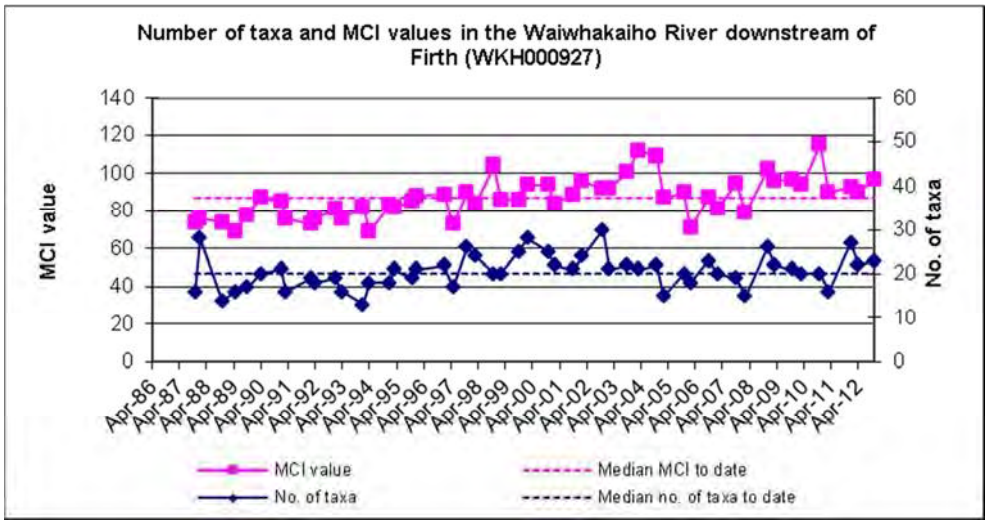


Figure 3 Numbers of taxa and MCI values for Waiwhakaiho River below Firth Industries (left bank) since 1987

Three 'highly sensitive' taxa were found at this site, one of which (the ubiquitous mayfly, *Deleatidium*) was very abundant. The community was characterised by six taxa; three 'tolerant' taxa [net spinning caddisfly (*Aoteapsyche*) and midges (*Maoridiamesa* and orthoclads)]; two 'moderately sensitive' taxa [elmid beetles and cranefly (*Aphrophila*)]; and one 'highly sensitive' taxon [mayfly (*Deleatidium*)]. These characteristic taxa were very similar to those recorded at the upstream site (7).

The increased proportion of 'tolerant' taxa in this site's community (43% of richness) was reflected in the MCI score (97 units). This was not significantly different to the lower score recorded in the previous autumn survey (Figure 2) and was 10 units higher than the median for this site. This was the ninth consecutive survey to record an above median MCI score. The score was a significant 11 units lower than that recorded upstream at site 7, but this was due principally to changes in the presence/absence of several taxa recorded only as rarities (ie less than five individuals per taxon) rather than significant changes in community composition. This score remained several MCI units higher than predictive scores for such a site in the lower reaches of a ringplain river (Stark and Fowles, 2009). Overall, this indicated that this survey was preceded by good water quality conditions at this site.

The reduced abundance of one 'highly sensitive' taxon and increased abundance of one 'moderately sensitive' and two 'tolerant' taxa contributed to a significant reduction in $SQMCI_S$ score (5.1 units), 2.2 units less than that recorded upstream at site 7 (Stark, 1998). However, this remained significantly higher than the historical median for this site and not dissimilar to the historical maximum.

Downstream of Lake Rotomanu (site 13)

A much increased richness of 30 taxa was found at this site situated downstream of all industrial discharges to the lower catchment, within a reach where high tides may slow river current speeds (and very occasionally increase salinity) near the mouth. This richness was seven taxa more than that recorded in the previous autumn survey and ten taxa more than the historical median richness, two taxa above the historical maximum richness, and seven taxa higher than recorded at the site below Firth Industries (8) upstream (Table 2 and Figure 4).

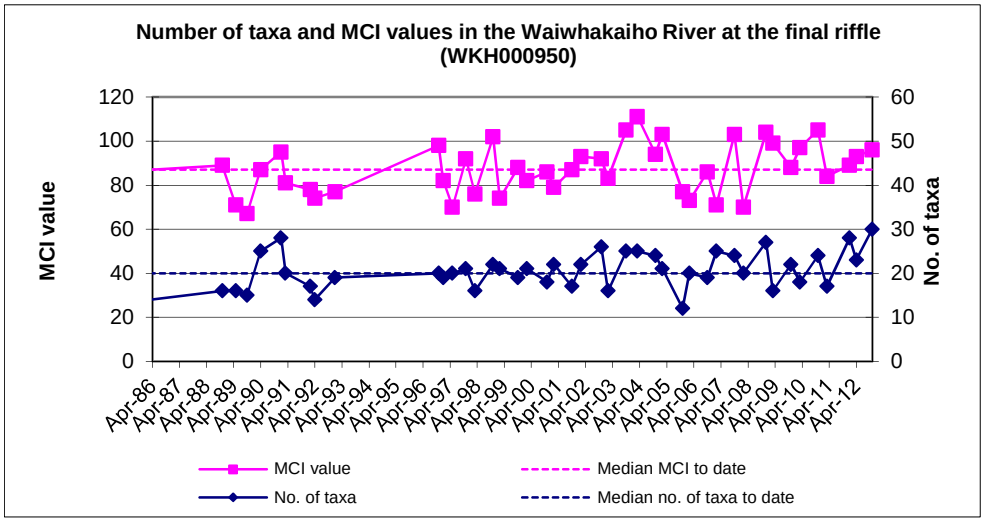


Figure 4 Numbers of taxa and MCI values for Waiwhakaiho River d/s of Lake Rotomanu since 1987

Five 'highly sensitive' taxa were present, again reflecting relatively good preceding flow conditions. The community was characterised by an increased number (six) of 'tolerant' taxa [oligochaete worms, snail (*Potamopyrgus)*, net-spinning caddisfly (*Aoteapsyche*), axe-head cased caddisfly (*Oxyethira*), and midges (*Maoridiamesa* and orthoclads)]; two 'moderately sensitive' taxa [elmid beetles and cranefly (*Aphrophila*)]; and one 'highly sensitive' taxon [mayfly (*Deleatidium*)] suggesting a subtle deterioration in health from that recorded upstream at sites 7 and 8. However, there were only two significant differences in individual taxon abundances recorded between sites 8 and 13 by the current survey, these being increases in numbers within two 'tolerant' taxa. This was a relatively typical result for this site in the lower river reaches near the coast.

The proportion of 'tolerant' taxa in the community at site 13 (47%) was relatively similar to that recorded at site 8, resulting in a similar MCI score of 96 units which was an insignificant nine units higher than the long term median for this site (Figure 4) and higher than predictive values (Stark and Fowles, 2009) for this ring plain site. In addition, an increase in the numerical dominance of some 'tolerant' taxa resulted in the lower $SQMCI_S$ value of 4.3 units. This result was 0.8 unit lower than that recorded upstream at site 8 but was significantly higher than the median score for this site (13), and an insignificant rise of 0.4 unit above that recorded by the previous autumn survey.

Mangaone Stream

Macroinvertebrate samples collected from two sites (11 & 12) in the Mangaone Stream in the past have found distinctly different community compositions at the two sites with much of the variation due to the streambed habitat differences, i.e. sandy-weedy, softer substrate at the upstream site (site 12 at Egmont Road) and harder, stony-gravel substrate at the downstream site (site 11 at Rifle Range Road). Additional sites have been sampled in recent years (in the reach between these historically surveyed sites) to further ascertain why poor water quality is indicated at site 11 at Rifle Range Road despite the improvement in habitat when compared to site 12 upstream of all the industrial discharges.

Table 4 Macroinvertebrate fauna of the Mangaone Stream in relation to the Fitzroy industrial area sampled on 28 November 2012.

Taxa List	Site Number	MCI score	12	16	14	15	11
	Site Code		MGO000050	MGO000054	MGO000150	MGO000155	MGO000190
	Sample Number		FWB12465	FWB12466	FWB12467	FWB12468	FWB12469
NEMERTEA	Nemertea	3	-	R	-	-	-
ANNELIDA (WORMS)	Oligochaeta	1	-	C	VA	VA	XA
	Lumbricidae	5	-	R	-	R	R
HIRUDINEA (LEECHES)	Hirudinea	3	-	-	-	-	R
MOLLUSCA	*Potamopyrgus*	4	XA	VA	VA	VA	XA
	Sphaeriidae	3	R	-	-	-	-
CRUSTACEA	Ostracoda	1	R	-	-	-	R
	Paracalliope	5	XA	VA	R	C	R
	Paraleptamphopidae	5	VA	-	-	-	-
	Paratya	3	R	R	R	-	-
EPHEMEROPTERA (MAYFLIES)	*Austroclima*	7	VA	VA	C	R	R
	Coloburiscus	7	-	R	-	-	-
	Deleatidium	8	-	-	-	-	R
	Zephlebia group	7	A	-	-	-	-
ODONATA (DRAGONFLIES)	*Xanthocnemis*	4	C	-	-	-	-
HEMIPTERA (BUGS)	*Microvelia*	3	R	-	-	-	-
COLEOPTERA (BEETLES)	Elmidae	6	-	C	C	R	C
TRICHOPTERA (CADDISFLIES)	Ecnomidae/Psychomyiidae	6	-	R	-	-	-
	Hydrobiosis	5	R	A	C	C	R
	Orthopsyche	9	-	R	-	R	R
	Psilochorema	6	R	R	-	-	-
	Oxyethira	2	R	R	C	R	C
	Paroxyethira	2	-	-	-	R	-
	Triplectides	5	A	C	-	-	-
DIPTERA (TRUE FLIES)	*Aphrophila*	5	-	R	-	C	C
	Limonia	6	-	-	-	-	R
	Zelandotipula	6	R	-	-	-	-
	Maoridiamesa	3	-	-	R	A	C
	Orthocladiinae	2	-	C	VA	VA	VA
	Polypedilum	3	R	R	C	C	R
	Tanypodinae	5	R	-	-	-	-
	Empididae	3	C	R	-	R	R
	Muscidae	3	-	-	R	R	C
	Austrosimulium	3	A	C	-	-	-
	Tanyderidae	4	-	R	-	-	-
	No of taxa		19	21	12	16	19
	MCI		84	90	73	81	85
	SQMCIs		4.7	5.2	2.5	2.5	2.5
	EPT (taxa)		5	7	2	3	4
	%EPT (taxa)		26	33	17	19	21

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

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

Egmont Road (site 12)

An average community richness (19 taxa) was found amongst the vegetation and the soft silt-bottomed habitat of this site. This was one taxon more than the median richness for this site and the same number of taxa found by the previous autumn survey (Table 2 and Figure 5). This has not yet indicated a return to below median community richness, a trend recorded from 2006 to 2011 (Figure 5).

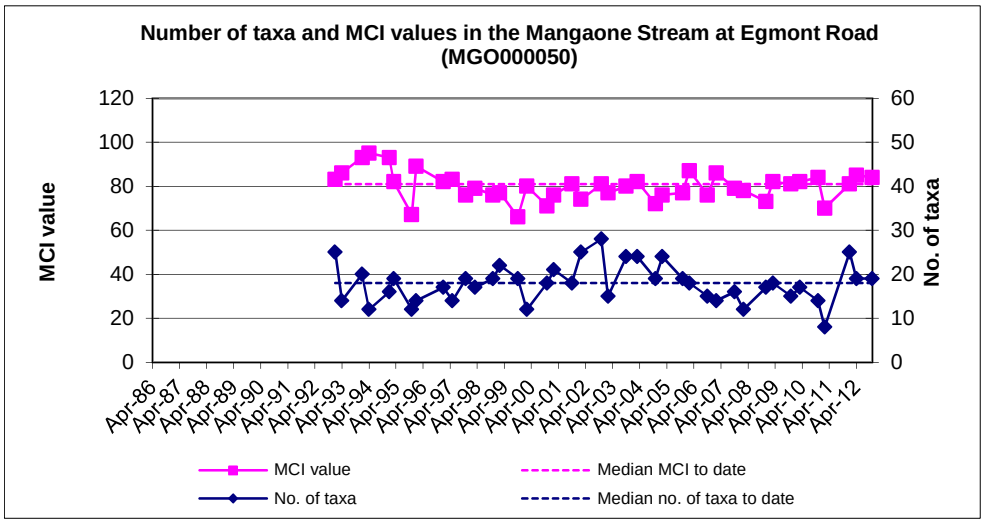


Figure 5 Number of taxa and MCI values for Mangaone Stream at Egmont Road since 1992

No 'highly sensitive' taxa were found in this community (Table 4) which was characterised by seven taxa. These were two 'tolerant' taxa [snail (*Potamopyrgus*) and sandfly (*Austrosimulium*)] and five 'moderately sensitive' taxa [amphipods (*Paracalliope* and paraleptamphopids), mayflies (*Austroclima* and *Zephlebia* group) and vegetation-cased caddisfly (*Triplectides*)]. This was typical of the community found at this site which has been characterised by taxa commonly found amongst vegetation in lowland streams and/or associated with softer-bottomed substrates and indicative of moderate physicochemical water quality.

The community was comprised of a moderate proportion (53%) of 'tolerant' taxa resulting in a slightly above median MCI score of 84 units (Table 2), one unit lower than that recorded by the previous autumn survey (Figure 5).

The numerical dominance by one 'tolerant' and one 'moderately sensitive' taxa in particular resulted in the relatively high SQMCIs value of 4.7 units. This was 0.4 unit higher than the median for this site and amongst the highest scores recorded to date at this site (Table 2).

These results indicated that the macroinvertebrates communities present at this site in the Mangaone Stream were of typical 'fair' health (see TRC, 2013).

20m downstream of Manganaha Stream confluence (site 16)

A moderate richness (21 taxa) was recorded at this site, above the long term median for this site, slightly more than that recorded by the previous autumn survey, and four taxa more than found at the upstream site 12 (Figure 6, Table 2).

There was one 'highly sensitive' taxon present in the community at this site (but only as a rarity). The community was dominated by only one 'tolerant' taxon [snail (*Potamopyrgus*)] and three 'moderately sensitive' taxa [mayfly (*Austroclima)*, amphipod (*Paracalliope*), and free-living caddisfly (*Hydrobiosis*)].

The most significant changes in individual taxon abundances between adjacent sites 12 and 16 included a reduced abundance of two 'moderately sensitive' taxa [mayfly (*Zephlebia* group) and paraleptamphopid amphipod], and the increased abundance of one 'tolerant' taxon [oligochaete worms] and two 'moderately sensitive' taxa [caddisfly (*Hydrobiosis*) and elmid beetles]. The changes recorded at this site (when compared with site 12) were coincident with the increase in periphyton substrate cover at the downstream site, increase in hard substrate, and the resultant change in sampling technique.

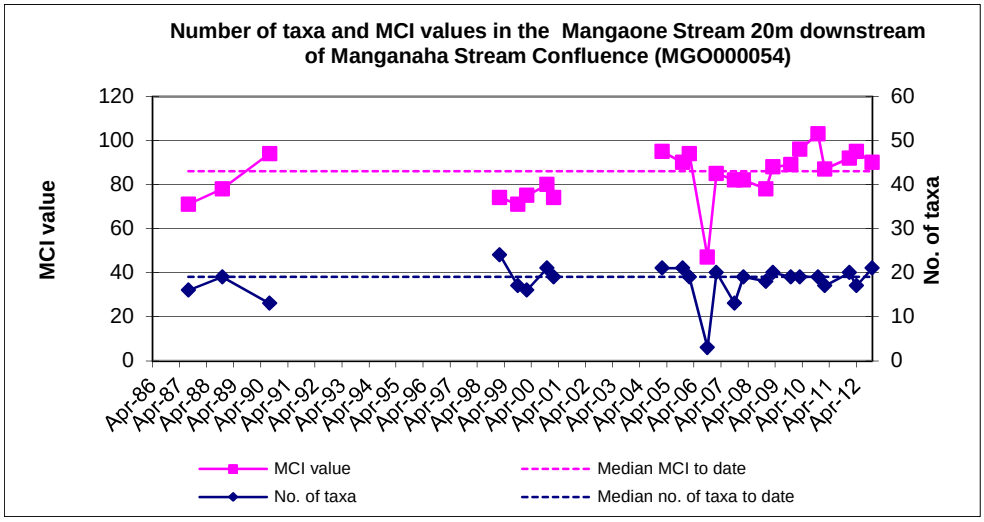


Figure 6 Numbers of taxa and MCI values for the Mangaone Stream downstream of the confluence with Manganaha Stream since 1987

The community was comprised of a moderate proportion of 'tolerant' taxa (48%), resulting in an MCI score of 90 units. This score was a insignificant five units higher than the median for this site and well within the range of previous scores for this site. This score was also an insignificant five units higher than the score at the upstream 'control' site 12 and five units less than recorded by the previous autumn survey.

The numerical dominance by 'tolerant' snails and two 'sensitive' taxa (amphipod and mayfly) resulted in the moderately high $SQMCI_s$ score of 5.2 units, which was a significant 1.1 units higher than the median of past values at this site, and only 0.3 unit below the previous maximum $SQMCI_S$ score recorded at this site by the autumn survey (Table 2). This indicated improved health of the community which was in the 'fair' generic MCI category (TRC, 2013).

Mangaone Stream 300m downstream of Puremu Stream confluence (site 14)

Taxa richness (12 taxa) at this site in the Mangaone Stream, downstream of the Puremu Stream confluence and discharges from Taranaki Sawmills and Viterra (Figure 1), was much lower than at the site directly upstream and also that at the 'control' site at Egmont Road (Table 2). This was also four taxa fewer than recorded by the previous autumn survey, and lower than the long term median for this site. Previous reports have suggested that the sporadic observations of low community richnesses at this site may have been related to

preceding toxic discharges. However, this is unlikely to be the case in the current survey, as richness was well within the range of that previously recorded, although it is possible that these results suggest a more subtle influence related to increased sedimentation through recent bank stabilisation works.

Earlier surveys had noted extensive filamentous algal growth at this site. Although not as apparent during several more recent surveys, such growth was present during the current survey. This may indicate that the surveyed riffle has become more stabilised with reduced substrate turnover during high flows.

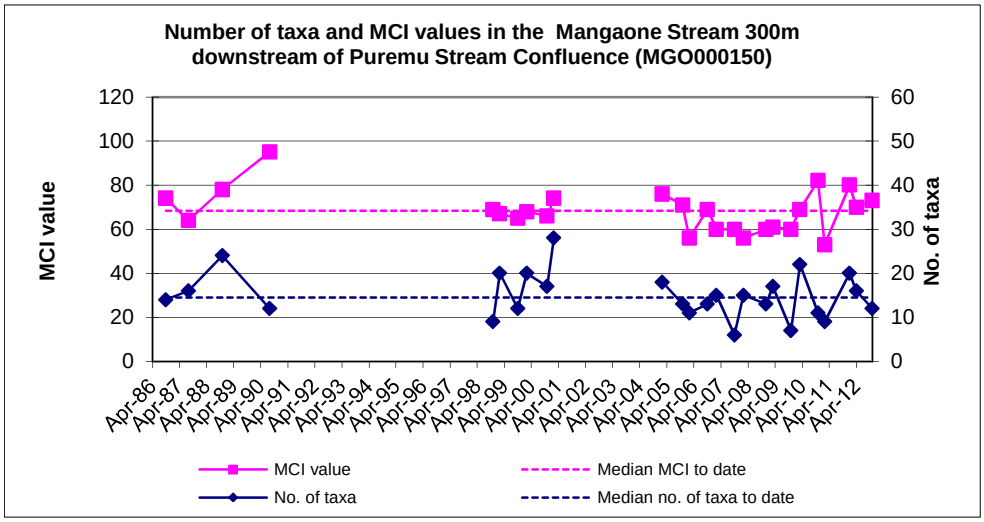


Figure 7 Numbers of taxa and MCI values for Mangaone Stream downstream of the confluence with Puremu Stream since 1986

There were no 'highly sensitive' taxa found in the community which was dominated by only three 'tolerant' taxa [oligochaete worms, snail (*Potamopyrgus*), and orthoclad midges]. Only four 'moderately sensitive' taxa were present in this community, fewer than recorded by the previous survey. There were six significant individual taxon abundance differences between adjacent sites, the most significant being reduced abundances of three 'moderately sensitive' taxa and increased abundances of two 'tolerant' taxa (midges and oligochaete worms).

The increased proportion of 'tolerant' taxa in the community (67% of taxa richness) resulted in a 'poor' MCI score of 73 units. This represented a three unit increase from the score recorded by the previous survey and was five units higher than the long term median and higher than that recorded by eleven of the last twelve surveys (Figure 7). Although this was some improvement for this site, it represented a significant decrease of 17 MCI units (Stark, 1998) compared to the score at site 16 upstream.

The numerical dominance of 'tolerant' taxa (particularly worms and midges) was reflected in the low $SQMCI_s$ value of 2.5 units which was significantly lower than that recorded at the nearest upstream site 16, but equivalent with the median score for this site. It may have reflected better stability of the substrate (and increased periphyton cover) at this site.

Overall, the significant reduction in MCI and $SQMCI_S$ scores at site 14 may be considered to have been related to the poorer habitat compared with the upstream site (16), although the possibility that industrial discharges contributed to this deterioration cannot be discounted.

100 m downstream of the fertilizer depot (site 15)

A moderate richness (16 taxa) was recorded at this site, 100 m downstream of the discharges from the fertilizer depot. This richness was slightly higher than the median historical richness and well within the range recorded over the survey period to date (Table 2).

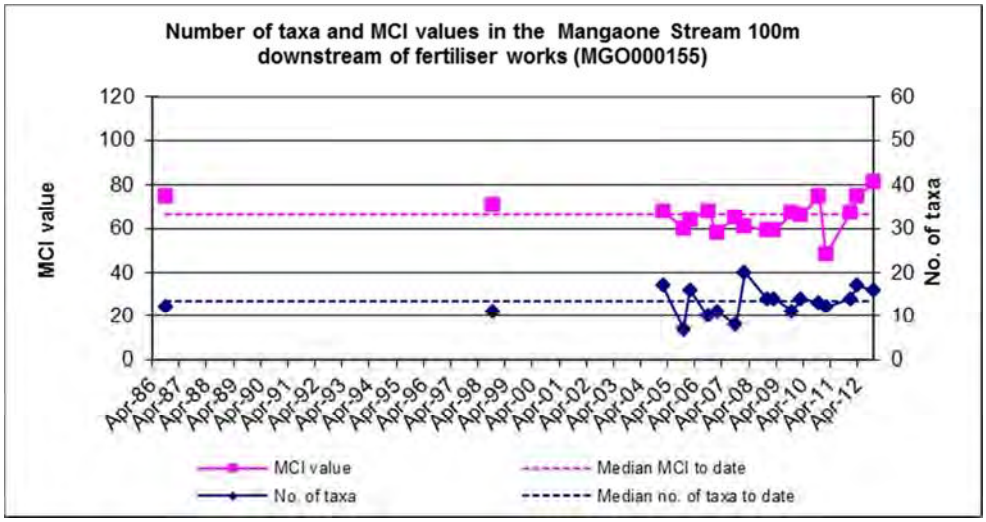


Figure 8 Numbers of taxa and MCI values for Mangaone Stream 100 m downstream of the fertilizer works/depot since 1986

The community was dominated by the same taxa as those characteristic at site 14 upstream with the addition of another 'tolerant' midge taxon (*Maoridiamesa*). Only two significant individual taxon abundance differences were recorded between sites 14 and 15, these being increases in the 'moderately sensitive' cranefly (*Aphrophila*) and 'tolerant' midge (*Maoridiamesa*). This was coincident with increased periphyton cover observed at this site. Mats and filamentous algae, which tend to support communities having higher proportions of 'tolerant' taxa, were patchy and widespread respectively at site 15 in the current survey, and there was a marked increase in harder substrate (cobbles and boulders).

The predominance of 'tolerant' taxa (56% of richness) in this community was reflected in the 'fair' MCI score of 81 units. However, this was a significant (Stark, 1998) 15 units higher than the historical median for this site, six units higher than the previous maximum score, and eight units higher than the score recorded at the nearest upstream site (14). This was also nine units higher than the MCI score recorded by the previous autumn survey at this site. This indicated that the community has improved health, but that overall, the health is still fair, coincident with the extensive algal biomass (compared with past conditions) which could have been due to nutrient inputs from the fertiliser depot. The improvement in biological health at site 15 in the current survey may be related to some reduction in algal biomass indicative of reduced groundwater inputs from the fertiliser depot.

The numerical dominance by 'tolerant' taxa (particularly two 'very tolerant' taxa) resulted in the $SQMCI_S$ value of 2.5 units, 0.3 unit higher than the median for this site, but within the range of previously recorded scores at this site. This score was equal with that recorded upstream, atypical of the trend of downstream deterioration observed by most previous surveys, but this score remained indicative of the poorer communities present downstream of the Puremu Stream confluence.

Rifle Range Road (site 11)

The moderate faunal richness (19 taxa) found at this site was coincident with the generally harder substrate. This richness was higher than the long term median for this site (Table 2 and Figure 9), within two taxa at maximum historical richness, and similar to that recorded by the previous survey. Most recent surveys have shown poorer communities possibly as a result of a combination of factors. These include occasional inundation by high flows in the adjacent Waiwhakaiho River (slowing flows which provide an unsuitable habitat for riffle-dwelling invertebrates (see BJ192**Error! Reference source not found.**) and a lack of downstream drift recruitment of typical stony habitat taxa as the majority of the upstream habitat is softer-bottomed and weedy. Deterioration in physicochemical water quality between sites 12 and 11 may also have been a factor, as this reach, which runs through an industrial catchment, receives several stormwater discharges including localised run-off.

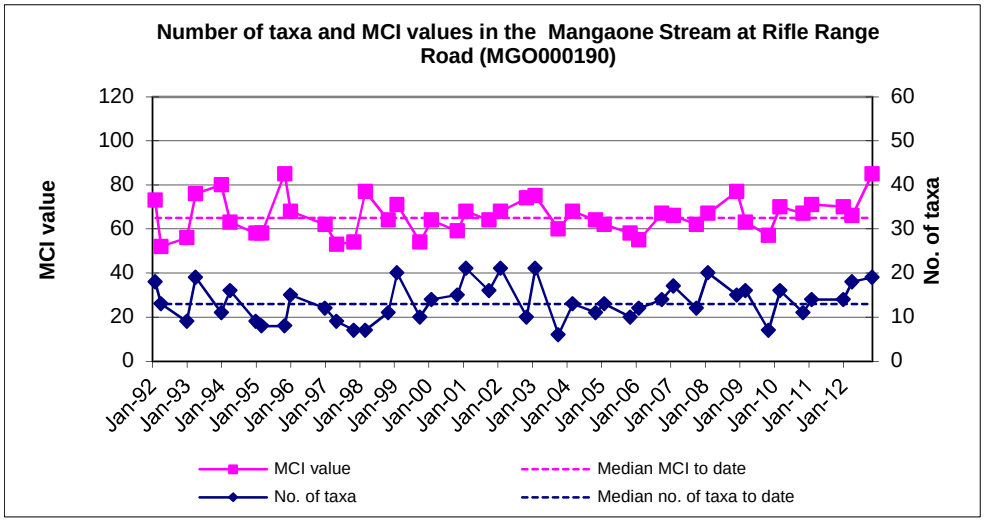


Figure 9 Numbers of taxa and MCI values for Mangaone Stream at Rifle Range Road since 1992

The community was dominated by only three taxa, all 'tolerant' taxa [oligochaete worms, snail (*Potamopyrgus),* and orthoclad midges]. As typically has been recorded, there was a significant contrast in dominant taxa between this site and the upstream 'control' site (12). In addition, there was a significant difference in taxa composition, with only eight taxa common to both sites from a total of 30 taxa found at sites 12 and 11.

The predominance (53% of taxa number) of 'tolerant' taxa in the community was reflected in the 'fair' MCI score of 85 units, although this was equal with the historical maximum (Table 2). This was very similar to the score recorded at site 12, and a four unit increase from the score at the nearest upstream site (16).

While no 'moderately sensitive' taxa were found in abundance, two extremely abundant 'tolerant' taxa contributed to the low $SQMCI_S$ value of 2.5 units. This exceeded the long term median $SQMCI_S$ score by 0.6 unit and was within the range of previous scores. However it was equivalent with the $SQMCI_s$ scores recorded at the nearest upstream sites 14 and 15.

There was significant deterioration in $SQMCI_s$ (and MCI) between sites 16 and 14, and therefore sites 16 and 11, which was more related to the deterioration in habitat, with an influence also from the increase in algal substrate cover downstream of the fertiliser depot.

General comments

The longitudinal trends in the number of taxa, MCI and SQMCI$_S$ values along the reach of the Mangaone Stream surveyed in November 2012 are illustrated in Figure 10.

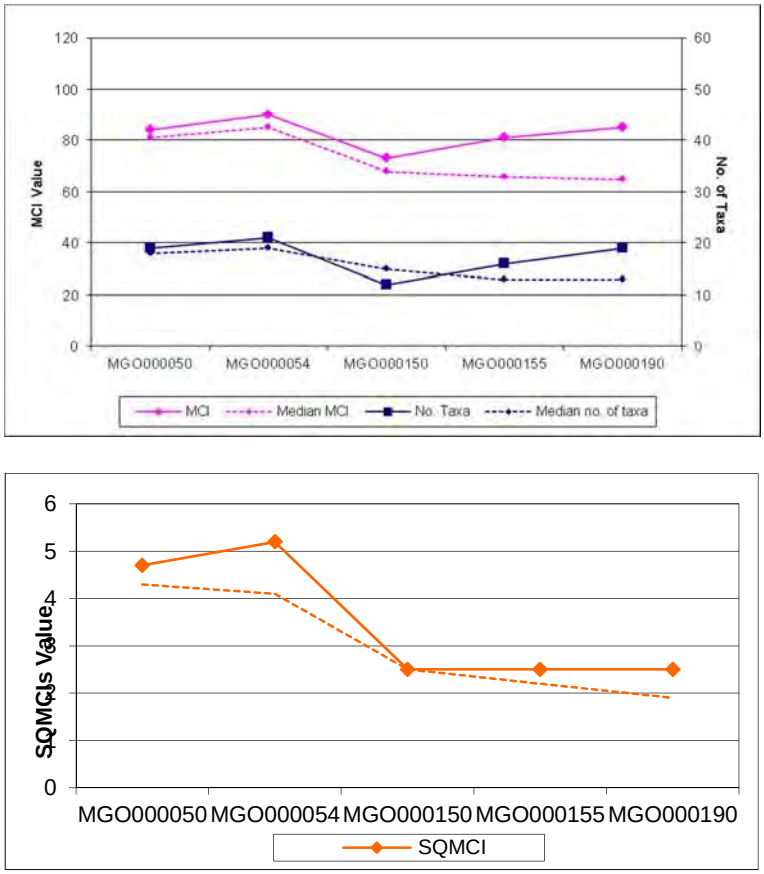


Figure 10 Longitudinal trend in number of taxa, MCI and SQMCI$_S$ values in the Mangaone Stream for the survey of 28 November 2012

The number of taxa tended to decrease in a downstream direction, a more typical result for this stream. The highest richnesses usually have been found at the two sites in the upper reaches of the stream with site 16 recording the highest taxa richness of the current survey. The MCI was also variable, but generally showed a decreasing trend, in the mid reaches with some recovery in the lower reaches.

When considering changes in community structure, the SQMCI$_S$ (which takes into account changes in the abundance of taxa, as well as their sensitivity to pollution) was found to follow a similar pattern to the MCI score in the upper reaches with a more pronounced decrease in mid reaches and minimal recovery through the lower reaches. All sites recorded SQMCI$_S$ scores higher than or equal with their historical medians, with sites 12 and 16 recording the greatest improvement.

More recent sedimentation of the streambed coincident with bank stabilisation works in the vicinity of site 14 may have contributed to the deterioration in biological 'health' at this site.

Summary and conclusions

The Council's standard 'kick-net' and 'sweep-net' sampling techniques were used to collect streambed macroinvertebrates at three sites in the Waiwhakaiho River and five sites in the Mangaone Stream on 28 November 2012, in order to assess whether discharges from the Lower Waiwhakaiho Industrial area had had any adverse effects on the macroinvertebrate communities of these streams. Samples were processed to provide number of taxa (richness), MCI and $SQMCI_S$ scores for each site.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The $SQMCI_S$ takes into account taxa abundances as well as sensitivity to pollution. It may indicate subtle changes in communities, and therefore be the more relevant index if non-organic impacts are occurring. Significant differences in either the MCI or $SQMCI_S$ between sites indicate the degree of adverse effects (if any) of the discharges being monitored.

This survey found that all Waiwhakaiho River sampling sites recorded community richnesses similar to or higher than long term medians for their respective sites. There was a marked increase in richness in a downstream direction, (from 17 to 30 taxa) and there was a typical downstream decrease in MCI scores between the sites. In addition, all sites recorded MCI scores well above their respective medians, and $SQMCI_S$ scores significantly higher than their medians. Communities in the Waiwhakaiho River downstream of Lake Rotomanu may be inhibited from time-to-time by the variable current speeds caused by tidal flooding. These results did not indicate any significant effects of stormwater or wastewater discharges from the Fitzroy industrial area on the macroinvertebrate communities of the Waiwhakaiho River, although it is possible that the Mangaone Stream was contributing to the increased algal growth observed downstream of the confluence where there was an increase in the number of more 'tolerant' taxa characteristic of the community.

It is apparent that the macroinvertebrate communities in the Mangaone Stream were of mainly 'fair' health. Most sites had moderate taxa richnesses, while MCI scores and $SQMCI_S$ scores were above medians at all sites, significantly so for sites 16 and 11 for MCI scores. However, the five sampling sites in the Mangaone Stream showed a marked decline in $SQMCI_S$ values between Egmont Road (site 12) and Rifle Range Road (site 11), with a marked decline of both $SQMCI_S$ and MCI scores between sites 16 and 14. Taranaki sawmills discharges stormwater to the Mangaone Stream between sites 16 and 14, and sediment sampling undertaken in early 2009 had recorded significant concentrations of not only tributyltin in the stream sediments around Taranaki Sawmills, but also elevated concentrations of arsenic, chromium, copper and zinc, all potentially toxic to aquatic biota (see BJ192). The taxa richness at site 14 in the current survey was fewer than the long term median and nine taxa less than at site 16. However, there was increased sedimentation between sites 16 and 14 and sediment sampling undertaken in April 2012, showed less contamination than that recorded in 2009; more indicative of physical habitat induced effects rather than a recently preceding toxic discharge. There was a significant increase in MCI score between sites 14 and 15, which was maintained in the lower reaches, most likely due to habitat improvements. Some reduction in downstream algal biomass may have been indicative of reduced groundwater inputs from the fertiliser depot.

The degree of decline in $SQMCI_S$ values was relatively typical for this stream although all sites recorded values in excess of their respective medians, with the greatest historical MCI

improvement recorded at site 15, downstream of the fertiliser depot. This improvement was a direct result of the reduced algal biomass and increased, more stable hard substrate observed at site 15.

Overall, the results from the current survey indicate improvement from historical results. It appears that in general the degree of sediment contamination in the Mangaone Stream downstream of the Taranaki Sawmills discharge has been reducing, which may have contributed to the improved downstream biological health found by the current survey. In addition, reduced groundwater inputs may have contributed to some of the recovery recorded immediately downstream of the fertiliser depot.

References

TRC Internal reports

Dunning K, 2002a: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, October 2001. TRC report KD87.

Dunning K, 2002b: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2002. TRC report KD114.

Fowles CR and Colgan BG, 2004: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, October 2003. TRC report CF336.

Fowles CR, Colgan BG and Moore SC, 2004: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2004. TRC report CF340.

Fowles CR and Colgan BG, 2005: Biomonitoring of the Lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2004. TRC report CF366.

Fowles CR and Jansma B, 2008a: Biomonitoring of the Lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, October 2007. TRC report CF450.

Fowles CR and Jansma B, 2008b: Biomonitoring of the Lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2008. TRC report CF451

Jansma, B, 2006: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2005. TRC report BJ009.

Jansma, B, 2006: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, October 2006. TRC report BJ015.

Jansma, B, 2007: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2007. TRC report BJ029.

Jansma, B, 2009a: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, December 2008. TRC report BJ084.

Jansma, B, 2009b: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, March 2009. TRC report BJ085.

Jansma, B, 2010a: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2009. TRC report BJ120.

Jansma, B, 2010b: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, March 2010. TRC report BJ121.

Jansma, B, 2011a: Fish kill assessment and biomonitoring of the Mangaone Stream in relation to a discharge of hydrolysed urea, February 2011. TRC Report BJ135.

Jansma, B, 2011b: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2010. TRC report BJ136.

Jansma, B, 2011c: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2011. TRC report BJ137.

Jansma, B, 2013a: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, January 2012. TRC report BJ191.

Jansma, B, 2013b: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, April 2012. TRC report BJ192.

Hope, K. 2005: Biomonitoring of the Lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2005. TRC report KH028.

Hope, K. 2006: Biomonitoring of the Lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2006. TRC report KH085.

McWilliam H, 2001a: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2000. TRC report HM235.

McWilliam H, 2001b: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2001. TRC report HM245.

Moore SC, 2003: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2002. TRC report SM574.

Moore SC, 2003: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2003. TRC report SM582.

TRC, 1998: Some statistics from the Taranaki Regional Council database (FWB) of freshwater macroinvertebrate surveys performed during the period from January 1980 to 31 December 1998. (SEM reference report). TRC technical report 99-17.

TRC, 2013: Fresh water macroinvertebrate fauna biological monitoring programme Annual SEM Report: 2012-2013, Technical Report 2013-48.

External publications

Stark JD, 1985: A macroinvertebrate community index of water quality for stony streams. *Water and Soil* Miscellaneous Publication No. 87.

Stark JD, 1998: SQMCI: a biotic index for freshwater macroinvertebrate coded abundance data. *New Zealand Journal of Marine and Freshwater Research 32(1)*: 55-66.

Stark JD, 1999: An evaluation of TRC's SQMCI biomonitoring index. Cawthron Institute, Nelson. Cawthron Report No. 472.

Stark JD, Boothroyd IKG, Harding JS, Maxted JR, Scarsbrook MR, 2001: Protocols for sampling macroinvertebrates in wadeable streams. New Zealand Macroinvertebrate Working Group Report No. 1. Prepared for the Ministry for the Environment. Sustainable Management Fund Project No. 5103. 57p.

Stark, JD and Fowles, CR 2009: Relationships between MCI, site altitude, and distance from source for Taranaki ringplain streams. Stark Environmental Report No. 2009-01. 47 pp.

To L Smith, Scientific Officer
From B Jansma and CR Fowles, Scientific Officers
Document 1411225
Report No. CF619
Date 1 October 2014

Biomonitoring of the Lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, January/February 2013

Introduction

This was the second of two scheduled surveys in the 2012-2013 monitoring programme, for the combined industries of the Fitzroy industrial area. Results from surveys performed since the 2000-2001 monitoring years are discussed in several reports referenced at the end of this report. The monitoring related to the wastewater/stormwater discharge permits tabulated below:

Consent holder	Consent No
Ravensdown	3140,3865
Firth Industries	0392
Hooker Brothers	3141
NPDC (Stormwater)	3138,1126,1275
NPDC (Bewley Road)	4984
TranzRail	1735,3528
Viterra	4548
Allied Concrete Ltd	4539
Taranaki Sawmills	3491
Technix Group Ltd	0021,0291,2230
Works Infrastructure Ltd	3917

Methods

On 1 February 2013, the standard '400 ml kick sampling' technique was used to collect streambed macroinvertebrates from three sites in the lower Waiwhakaiho River and on 31 January 2013 from four sites in the Mangaone Stream, while the standard '400 ml sweep-sampling' technique was used to collect streambed macroinvertebrates from site 12 in the Mangaone Stream (Table 1, Figure 1). The 'sweep-net- sampling technique is very similar to Protocol C2 (soft-bottomed, semi-quantitative), and the 'kick-sampling' technique is very similar to Protocol C1 (hard-bottomed, semi-quantitative), of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark *et al*, 2001).

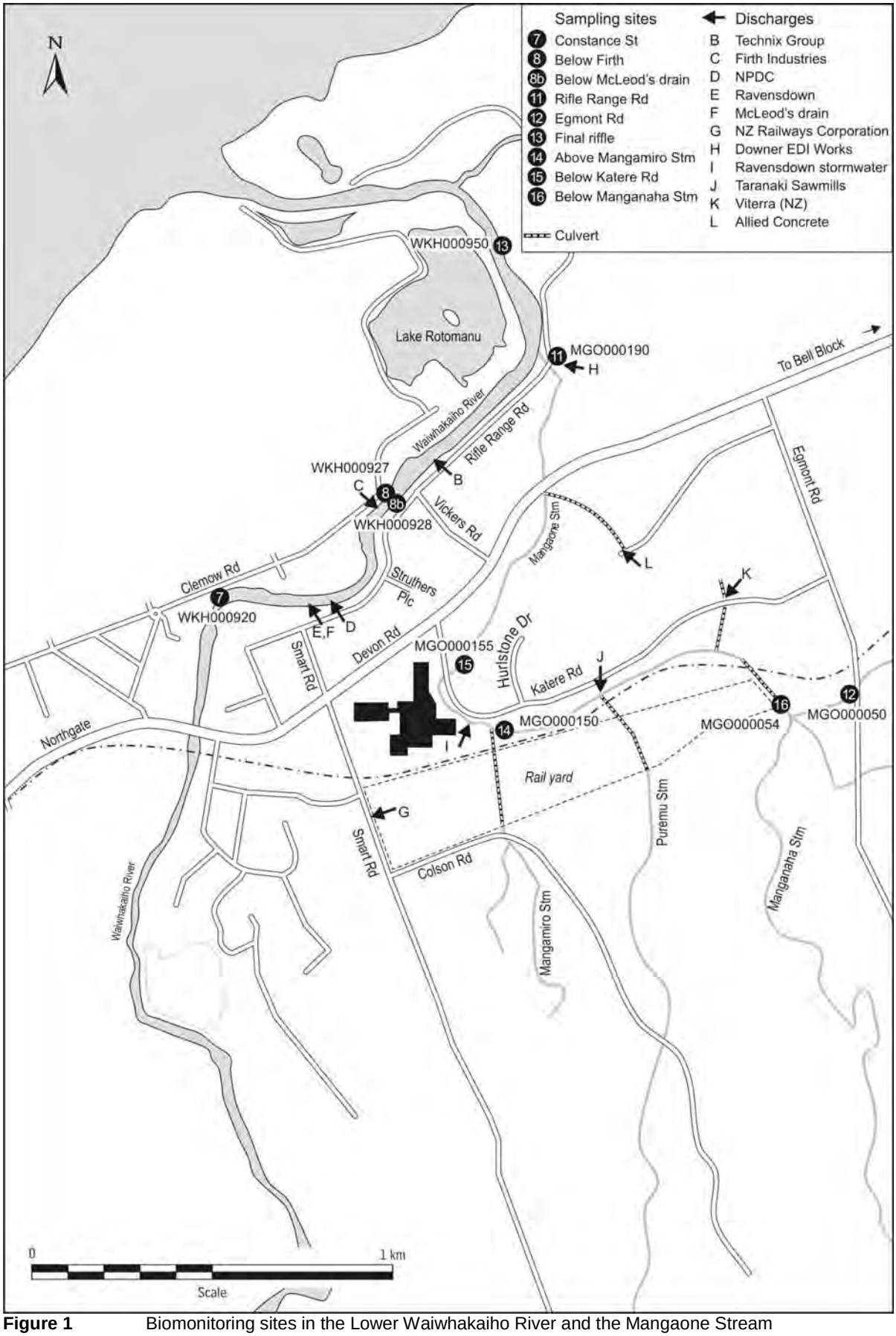


Figure 1 Biomonitoring sites in the Lower Waiwhakaiho River and the Mangaone Stream

The three sites from the Waiwhakaiho River used in this survey have been sampled biannually in recent years. In the Mangaone Stream, two sites have been sampled biannually in the past with sampling of the other three sites (14, 15 and 16) biannually since February 2005.

Table 1 Biomonitoring sites in the Lower Waiwhakaiho River and the Mangaone Stream

Site No	Site Code	Location
7	WKH000920	Waiwhakaiho River, Constance Street
8	WKH000927	Waiwhakaiho River, below Firth industries, west (left) bank
13	WKH000950	Waiwhakaiho River, final riffle downstream of Lake Rotomanu
12	MGO000050	Mangaone Stream, Egmont Road
16	MGO000054	Mangaone Stream, 20m d/s of Manganaha Stream confluence
14	MGO000150	Mangaone Stream, 300m d/s confluence with Puremu Stream
15	MGO000155	Mangaone Stream, 100m d/s fertiliser depot
11	MGO000190	Mangaone Stream, Rifle Range Road

Samples were preserved with Kahle's Fluid for later sorting and identification under a stereomicroscope according to Taranaki Regional Council methodology using protocol P1 of NZMWG protocols for sampling macroinvertebrates in wadeable streams (Stark et al. 2001). Macroinvertebrate taxa found in each sample were recorded as:

R (rare)	= less than 5 individuals;
C (common)	= 5-19 individuals;
A (abundant)	= estimated 20-99 individuals;
VA (very abundant)	= estimated 100-499 individuals;
XA (extremely abundant)	= estimated 500 individuals or more.

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams. Highly 'sensitive' taxa were assigned the highest scores of 9 or 10, while the most 'tolerant' forms scored 1. Sensitivity scores for certain taxa have been modified in accordance with Taranaki experience. Averaging the scores assigned to the taxa found at a site, and multiplying the average by a scaling factor of 20 produces a Macroinvertebrate Community Index (MCI) value.

The MCI was designed as a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. MCI results can also reflect the effects of warm temperatures, slow current speeds and low dissolved oxygen levels, because the taxa capable of tolerating these conditions generally have low sensitivity scores. Usually more 'sensitive' communities (with higher MCI values) inhabit less polluted waterways. The use of this index in non-stony streams (such as the Mangaone Stream site 12) is possible if results are related to physical habitat (e.g. good quality muddy/weedy sites tend to produce lower MCI values than good quality stony sites).

A semi-quantitative MCI value ($SQMCI_S$) has also been calculated for the taxa present at each site by multiplying each taxon score by a loading factor (related to its abundance), totalling these products, and dividing by the sum of the loading factors (Stark, 1998 and 1999. The loading factors were 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 $SQMCI_S$ is not multiplied by a scaling factor of 20, therefore $SQMCI_S$ values range from 1 to 10, while MCI values range from 20 to 200.

Results and discussion

The late January-early February survey was performed during low flows (17 days since the last fresh of both three times and seven times the median flow in the Waiwhakaiho River). The flow at all three sampling sites in the Waiwhakaiho River was clear and uncoloured at the time of this survey. Periphyton mats were patchy at two sites and widespread at the lowest site (13), while growths of filamentous algae were patchy at sites 8 and 13. Water temperatures in the Waiwhakaiho River ranged from 20.8 to 21.3°C at the time of this early afternoon survey. Substrate at all three sites was comprised predominantly of cobbles, gravels, and boulders with some sand present.

In the Mangaone Stream, flow was also low and uncoloured. It was clear at the upstream site (12). The cloudiness often recorded in the Mangaone Stream at all sites downstream of the Manganaha Stream, again was observed on this survey occasion. Sites 12 and 16 had slow to steady water speeds, while water speed was swift at sites 14, 15, and 11. Periphyton cover, which was absent at site 12, increased in a downstream direction, with patchy mats and widespread filaments present at sites 16, 14, and 15, and patchy filaments and mats at site 11. The riffle sampled at site 14 was consistent with that surveyed in the previous survey, without the increased sediment associated with bank stabilisation works at that time. Vegetation clearance from the banks adjacent to site 16 had altered habitat (less shading). An observation made at the time of the March 2009 survey at site 11, was that the Waiwhakaiho River may have backed up the Mangaone Stream, reducing the flushing potential of the previous fresh. This was confirmed in 2010 (see Photos in BJ192), and is likely to be a common feature of larger floods in this catchment.

Samples were collected from all sites using the kick sampling technique, except for at site 12, as this was a weedy, silty site. Macrophytes were absent at all other Mangaone Stream sites with the exception of the margins of site 11. The substrate at site 12 was comprised almost entirely of silt, with hard clay predominant at site 16. The substrate at site 14 was comprised mainly of silt, sand, gravels, and cobbles, whereas at sites 15 and 11 it comprised mainly gravels and cobbles with some silt/sand. Water temperatures at the time of this mid morning survey in the Mangaone Stream ranged from 17.5 to 19.2°C.

Macroinvertebrate communities

A summary of taxa numbers and MCI values from previous surveys performed in the Waiwhakaiho River and the Mangaone Stream in relation to the Fitzroy industrial area are presented in Table 2 together with current results. The full results of the survey are presented in Table 3 (Waiwhakaiho River) and Table 4 (Mangaone Stream).

Table 2 Numbers of taxa and MCI and $SQMCI_S$ values recorded in previous surveys performed in the Waiwhakaiho River and Mangaone Stream since July 1983 in relation to the Fitzroy industrial area, together with the results of the survey of 31 January 2013.

Location	Site No.	Numbers of taxa				MCI values			$SQMCI_S$ Values			
		N	Median	Range	Current	Median	Range	Current	N	Median	Range	Current
Waiwhakaiho River	7	53	20	12-29	24	89	66-110	96	29	3.3	1.7-7.3	4.6
	8	51	20	13-30	23	87	69-115	87	29	3.1	1.8-6.3	4.0
	13	44	20	12-30	26	87	67-111	89	29	2.7	1.6-7.4	3.7
Mangaone Stream	12	41	18	8-28	17	81	66-95	78	29	4.3	2.4-4.9	4.5
	16	24	19	3-24	10	86	47-103	74	21	4.1	1.2-5.5	4.5
	14	26	15	6-28	12	69	53-95	53	22	2.5	1.1-3.7	3.4
	15	18	14	7-20	17	67	48-81	69	17	2.2	1.5-3.8	3.2
	11	46	13	4-21	13	66	50-85	66	29	1.9	1.5-3.6	3.2

Table 3 Macroinvertebrate fauna of the Waiwhakaiho River in relation to the Fitzroy industrial area sampled on 1 February 2013

Taxa List	Site Number	MCI score	7	8	13
	Site Code		WKH000920	WKH000927	WKH000950
	Sample Number		FWB13035	FWB13036	FWB13037
NEMERTEA	Nemertea	3	R	R	R
NEMATODA	Nematoda	3	R	R	C
ANNELIDA (WORMS)	Oligochaeta	1	A	A	A
	Lumbricidae	5	-	R	-
MOLLUSCA	*Potamopyrgus*	4	C	A	A
CRUSTACEA	*Paracalliope*	5	-	-	R
	Paratya	3	-	-	A
EPHEMEROPTERA (MAYFLIES)	*Austroclima*	7	R	R	R
	Coloburiscus	7	-	R	C
	Deleatidium	8	VA	C	R
	Zephlebia group	7	-	-	R
PLECOPTERA (STONEFLIES)	*Megaleptoperla*	9	R	-	-
	Zelandoperla	8	R	-	R
COLEOPTERA (BEETLES)	Elmidae	6	VA	VA	A
MEGALOPTERA (DOBSONFLIES)	*Archichauliodes*	7	C	A	C
TRICHOPTERA (CADDISFLIES)	*Aoteapsyche*	4	VA	VA	XA
	Costachorema	7	R	-	R
	Hydrobiosis	5	A	A	C
	Neurochorema	6	-	C	-
	Olinga	9	R	-	-
	Oxyethira	2	A	A	A
	Pycnocentrodes	5	R	R	-
DIPTERA (TRUE FLIES)	*Aphrophila*	5	C	A	VA
	Maoridiamesa	3	R	R	C
	Orthocladiinae	2	VA	VA	VA
	Polypedilum	3	-	-	R
	Tanytarsini	3	A	A	VA
	Empididae	3	C	C	R
	Ephydridae	4	C	C	-
	Muscidae	3	C	R	R
	Austrosimulium	3	-	-	R
	Tanyderidae	4	R	R	R
	No of taxa		24	23	26
	MCI		96	87	89
	SQMCIs		4.6	4.0	3.7
	EPT (taxa)		9	7	8
	%EPT (taxa)		38	30	31

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

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

Waiwhakaiho River

Constance Street (site 7)

A moderately high taxa richness (24 taxa) was found at this site, upstream of all discharges from the Fitzroy industrial area. This was four taxa more than the median richness for this site (Table 2 and Figure 2), but within the range of previous richnesses.

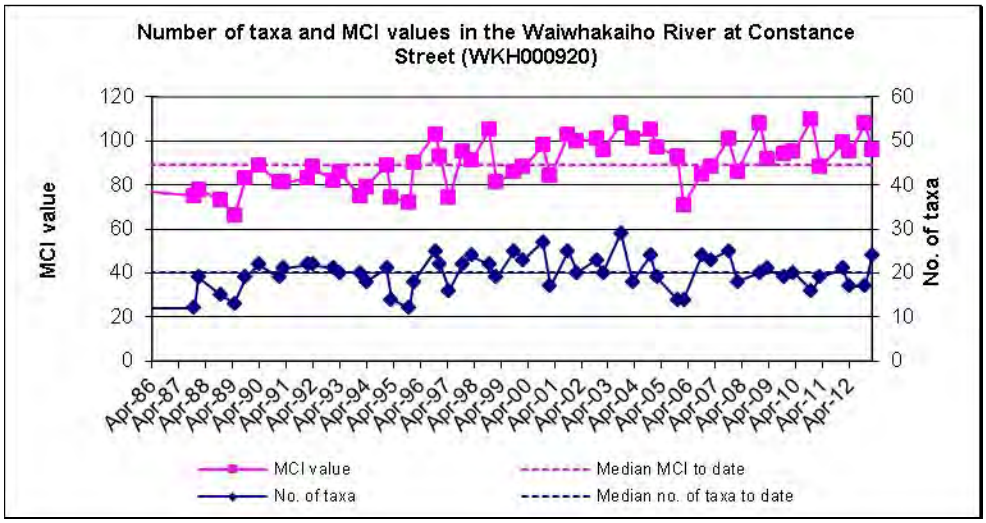


Figure 2 Numbers of taxa and MCI values for Waiwhakaiho River at Constance Street since 1987

Four 'highly sensitive' taxa were present, one of which was recorded as very abundant, reflecting good preceding water quality. The community was characterised by five 'tolerant' taxa [oligochaete worms, net building caddisfly (*Aoteapsyche*), algal-piercing caddisfly (*Oxyethira*), and midges (tanytarsids and orthoclads)]; two 'moderately sensitive' taxa [elmid beetles and free-living caddisfly (*Hydrobiosis*)]; and the aforementioned 'highly sensitive' taxon [mayfly (*Deleatidium*)].

The relatively high proportion of 'tolerant' taxa (54% of richness) present in the community was reflected in the MCI score of 96 units, an insignificant 7 units higher than the median score (Stark, 1998) (Table 2, Figure 2). This was also significantly lower than the previous spring score, a more typical result for this site and slightly higher than predictive values (Stark and Fowles, 2009) for this site situated in the lower reaches of a ringplain river (TRC, 2013).

The $SQMCI_S$ value of 4.6 units was 1.3 units above the median value for this site, a statistically significant increase (Stark, 1998), and somewhat more typical of values for the lower reaches of ringplain streams and rivers subject to nutrient enrichment. This score reflected the numerical dominance by two sensitive' and two 'tolerant' taxa in particular but was a significant 2.7 $SQMCI_s$ units lower than the previous spring survey value (the highest recorded at this site to date).

Below Firth Industries, left bank (site 8)

This site also had a moderately high community richness (23 taxa), three taxa more than the historical median at this site, but within the range of scores previously recorded (Table 2 and Figure 3).

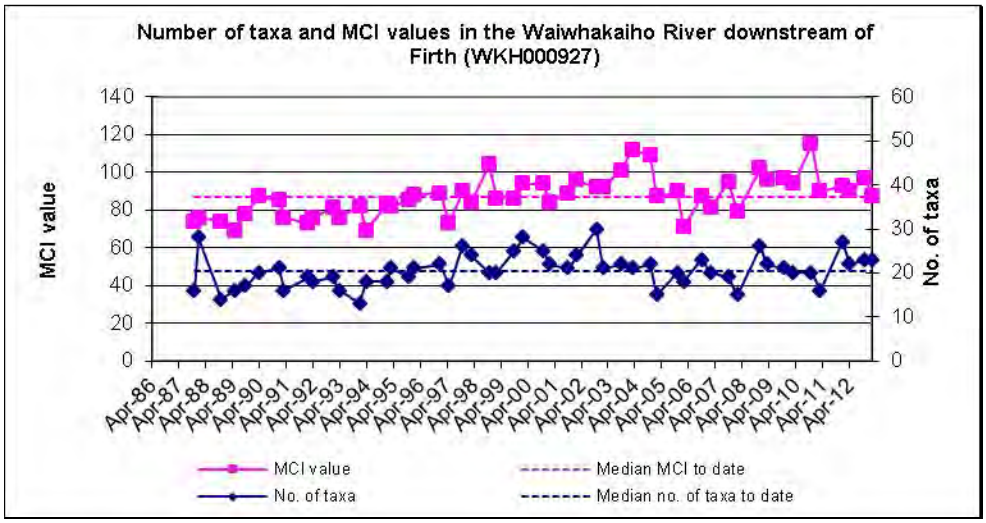


Figure 3 Numbers of taxa and MCI values for Waiwhakaiho River below Firth Industries (left bank) since 1987

Only one 'highly sensitive' taxon was found at this site and unlike at the time of the previous spring survey, this was not characteristic of the site's community. The community was characterised by ten taxa; six 'tolerant' taxa [oligochaete worms, snail (*Potamopyrgus*), net spinning caddisfly (*Aoteapsyche*), algal-piercing caddisfly (*Oxyethira*), and midges (tanytarsids and orthoclads)] and four 'moderately sensitive' taxa [elmid beetles, dobsonfly (*Archichauliodes*), free-living caddisfly (*Hydrobiosis*), and cranefly (*Aphrophila*)]. These characteristic taxa were relatively similar to those recorded at the upstream site (7) with the exception of the absence of any 'highly sensitive' taxa.

The slightly increased proportion of 'tolerant' taxa in this site's community (56% of richness) and the reduction in 'highly sensitive' taxa, was reflected in the MCI score (87 units). This was 10 units lower than the score recorded by the previous spring survey (Figure 2) but was equivalent to the median for this site. This was the tenth consecutive survey to record an equal or above median MCI score. The score was an insignificant nine units lower than that recorded upstream at site 7, and only two significant changes in community composition were recorded. This score remained near, to a few MCI units lower than, predictive scores for such a site in the lower reaches of a ringplain river (Stark and Fowles, 2009). Overall, this indicated that this survey was preceded by relatively good water quality conditions at this site although periphyton substrate cover impacted upon aspects of the physical habitat.

The reduced numerical abundance of the one 'highly sensitive' taxon in particular and increased abundance of one 'tolerant' taxon contributed to a small reduction in $SQMCI_S$ score (4.0 units), 0.6 unit less than that recorded upstream at site 7 (Stark, 1998). However, this remained higher than the historical median for this site although 1.1 $SQMCI_s$ units lower than the value found by the previous spring survey.

Downstream of Lake Rotomanu (site 13)

A slightly increased richness of 26 taxa was found at this site situated downstream of all industrial discharges to the lower catchment, within a reach where high tides may slow river current speeds (and very occasionally increase salinity) near the mouth. This richness was four taxa fewer than that recorded by the previous spring survey and six taxa more than the historical median richness, four taxa below the historical maximum richness, and three taxa higher than recorded at the site below Firth Industries (8) upstream (Table 2 and Figure 4).

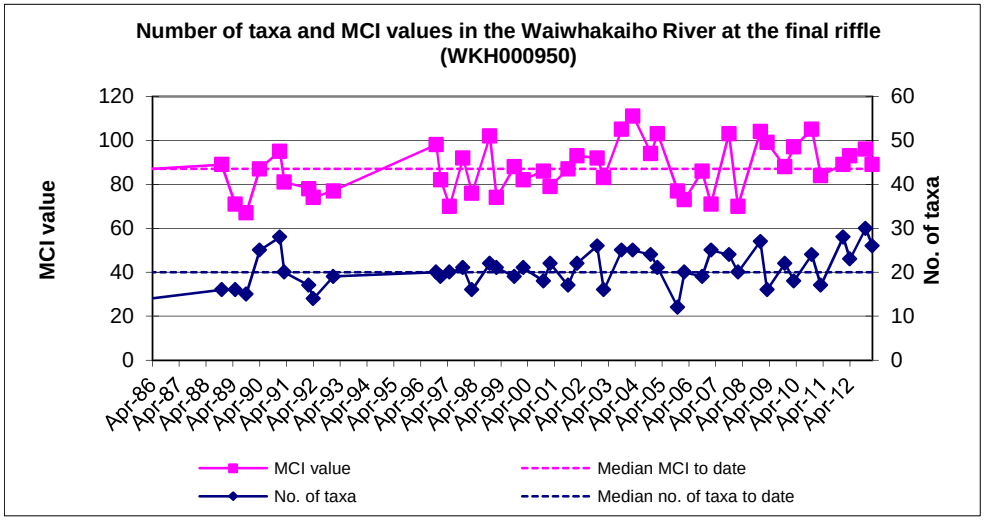


Figure 4 Numbers of taxa and MCI values for Waiwhakaiho River d/s of Lake Rotomanu since 1987

Only two 'highly sensitive' taxa were present (but only as rarities), reflecting relatively good preceding physicochemical quality conditions, but coincident with extensive periphyton substrate cover. The community was characterised by an increased number (seven) of 'tolerant' taxa [oligochaete worms, snail (*Potamopyrgus)*, freshwater shrimp (*Paratya*), net-spinning caddisfly (*Aoteapsyche*), algal-piercing caddisfly (*Oxyethira*), and midges (tanytarsids and orthoclads)]; two 'moderately sensitive' taxa [elmid beetles and cranefly (*Aphrophila*)]; and no 'highly sensitive' taxa suggesting a subtle deterioration in health from that recorded upstream at sites 7 and 8. However, there were only three significant differences in individual taxon abundances recorded between sites 8 and 13 by the current survey, these being an increase in numbers within one 'tolerant' taxon. This was a relatively typical result for this site in the lower river reaches near the coast.

The proportion of 'tolerant' taxa in the community at site 13 (58%) was only slightly higher than that recorded at site 8, resulting in a similar MCI score of 89 units. This score was within two units of the long term median for this site (Figure 4) and relatively similar to predictive values (Stark and Fowles, 2009) for this ring plain site. In addition, an increase in the numerical dominance of several 'tolerant' taxa resulted in the lower $SQMCI_S$ value of 3.7 units. This result was 0.3 unit lower than that recorded upstream at site 8 but was significantly higher than the median score for this site (13), and an insignificant decrease of 0.6 unit below that recorded by the previous spring survey.

Mangaone Stream

Macroinvertebrate samples collected from two sites (11 & 12) in the Mangaone Stream in the past have found distinctly different community compositions at the two sites with much of the variation due to the streambed habitat differences, i.e. sandy-weedy, softer substrate at the upstream site (site 12 at Egmont Road) and harder, stony-gravel substrate at the furthest downstream site (site 11 at Rifle Range Road). Additional sites have been sampled in recent years (in the reach between these historically surveyed sites) to further ascertain why poor water quality is indicated at site 11 at Rifle Range Road despite the improvement in habitat when compared to site 12 upstream of all the industrial discharges.

Table 4 Macroinvertebrate fauna of the Mangaone Stream in relation to the Fitzroy industrial area sampled on 31 January 2013

Taxa List	Site Number	MCI score	12	16	14	15	11
	Site Code		MGO000050	MGO000054	MGO000150	MGO000155	MGO000190
	Sample Number		FWB13023	FWB13024	FWB13025	FWB13026	FWB13027
NEMERTEA	Nemertea	3	-	-	-	R	-
ANNELIDA (WORMS)	Oligochaeta	1	-	R	VA	A	VA
	Lumbricidae	5	-	-	-	R	-
HIRUDINEA (LEECHES)	Hirudinea	3	R	-	-	-	R
MOLLUSCA	*Potamopyrgus*	4	XA	XA	XA	XA	XA
	Sphaeriidae	3	-	-	R	R	-
CRUSTACEA	Ostracoda	1	R	-	A	VA	A
	Paracalliope	5	XA	XA	-	R	R
	Paratya	3	A	R	-	-	-
EPHEMEROPTERA (MAYFLIES)	*Austroclima*	7	C	A	-	-	-
	Zephlebia group	7	C	-	-	-	-
ODONATA (DRAGONFLIES)	*Xanthocnemis*	4	A	-	-	-	-
HEMIPTERA (BUGS)	*Microvelia*	3	C	-	-	-	-
COLEOPTERA (BEETLES)	Elmidae	6	-	-	R	R	-
MEGALOPTERA (DOBSONFLIES)	*Archichauliodes*	7	-	-	-	R	R
TRICHOPTERA (CADDISFLIES)	*Hydrobiosis*	5	-	R	-	-	-
	Psilochorema	6	C	-	-	-	-
	Oxyethira	2	-	C	C	VA	C
	Paroxyethira	2	-	-	R	R	-
	Triplectides	5	VA	R	-	-	-
DIPTERA (TRUE FLIES)	*Aphrophila*	5	-	-	-	R	C
	Chironomus	1	-	-	R	-	-
	Corynoneura	3	C	-	-	-	-
	Orthocladiinae	2	R	R	C	C	VA
	Polypedilum	3	R	-	R	C	A
	Tanytarsini	3	-	-	-	-	C
	Paradixa	4	A	-	-	-	-
	Empididae	3	R	R	-	R	-
	Muscidae	3	-	-	R	A	A
	Austrosimulium	3	C	-	-	-	-
	Tanyderidae	4	-	-	R	R	R
	No of taxa		17	10	12	17	13
	MCI		78	74	53	69	66
	SQMCIs		4.5	4.5	3.4	3.2	3.2
	EPT (taxa)		4	3	0	0	0
	%EPT (taxa)		24	30	0	0	0
'Tolerant' taxa	'Moderately sensitive' taxa		'Highly sensitive' taxa				

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

Egmont Road (site 12)

A moderate community richness (17 taxa) was found amongst the vegetation and the soft silt-bottomed habitat of this site. This was one taxon less than the median richness for this site and the two taxa fewer than found by the previous spring survey (Table 2 and Figure 5). This has not yet indicated a return to continually below median community richness, a trend recorded from 2006 to 2011 (Figure 5).

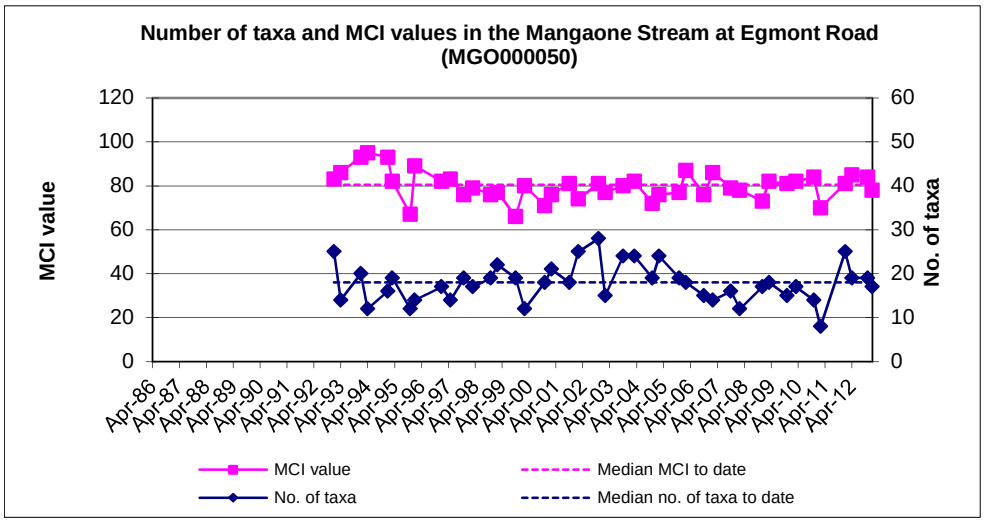


Figure 5 Number of taxa and MCI values for Mangaone Stream at Egmont Road since 1992

No 'highly sensitive' taxa were found in this community (Table 4) which was characterised by six taxa. These were four 'tolerant' taxa [extremely abundant snail (*Potamopyrgus*); freshwater shrimp (*Paratya*), damselfly (*Xanthocnemis*), and dixid midges)] and two 'moderately sensitive' taxa [extremely abundant amphipod (*Paracalliope);* and vegetation-cased caddisfly (*Triplectides*)]. This was relatively typical of the community found at this site which has been characterised by taxa commonly found amongst vegetation in lowland streams and/or associated with softer-bottomed substrates and indicative of moderate physicochemical water quality. However, there was an increase in characteristic 'tolerant' taxa and a decrease in 'sensitive' taxa in comparison with those of the previous spring.

The community was comprised of a high proportion (71%) of 'tolerant' taxa resulting in a slightly below median MCI score of 78 units (Table 2), six units lower than that recorded by the previous spring survey (Figure 5).

The numerical dominance by one 'tolerant' and one 'moderately sensitive' taxa in particular resulted in the relatively high $SQMCI_S$ value of 4.5 units. This was 0.2 unit higher than the median for this site and amongst the higher scores recorded to date at this site (Table 2).

These results indicated that the macroinvertebrates communities present at this site in the Mangaone Stream were of relatively typical 'poor' health (see TRC, 2013) under late summer, low flow stream conditions.

20m downstream of Manganaha Stream confluence (site 16)

A poor richness (10 taxa) was recorded at this site, well below the long term median for this site, and far fewer than that recorded by the previous spring survey. This richness was seven taxa less than found at the upstream site 12 (Figure 6, Table 2), coincident with extensive periphyton substrate cover (particularly by filamentous algae) and steady, low, cloudier flow conditions.

There were no 'highly sensitive' taxa present in the community at this site which was dominated by one 'tolerant' taxon [extremely abundant snail (*Potamopyrgus*)] and two 'moderately sensitive' taxa [mayfly (*Austroclima)* and extremely abundant amphipod (*Paracalliope*)].

There were several significant changes in individual taxon abundances between adjacent sites 12 and 16 with the most significant including a reduced abundance of one 'moderately sensitive' taxon [caddisfly (*Triplectides*)], and decreased abundances of two 'tolerant' taxa [dixid midges and damselfly (*Xanthocnemis*)]. The changes recorded at this site (when compared with site 12) were coincident with the marked increase in periphyton substrate cover at the downstream site, increase in hard clay substrate, absence of macrophytes, and the resultant change in sampling technique.

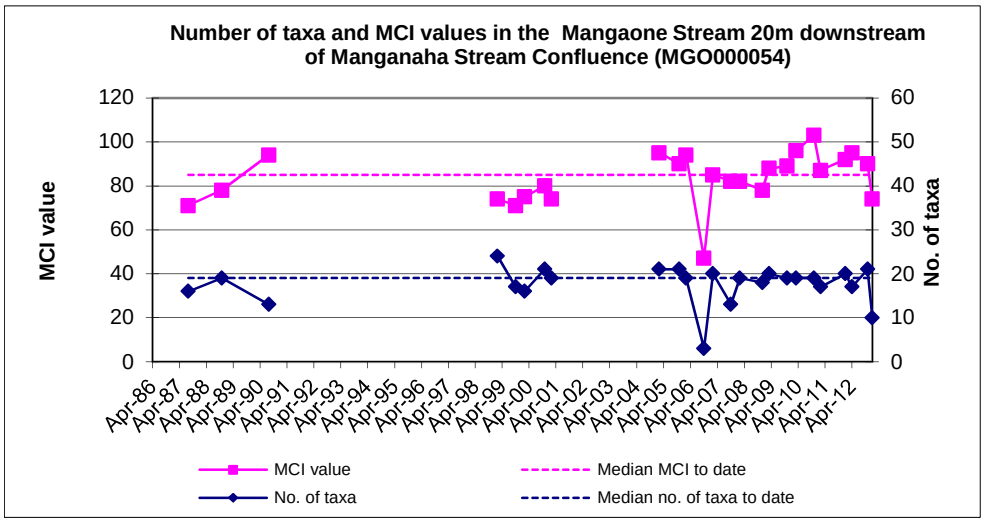


Figure 6 Numbers of taxa and MCI values for the Mangaone Stream downstream of the confluence with Manganaha Stream since 1987

The community was comprised of a high proportion of 'tolerant' taxa (60%), resulting in an MCI score of 74 units. This score was a significant (Stark, 1998) 12 units lower than the median for this site although well within the range of previous scores for this site. This score was also an insignificant four units lower than the score at the upstream 'control' site 12 but a significant 16 units less than recorded by the previous spring survey performed under higher flow conditions.

The numerical dominance by 'tolerant' snails and 'sensitive' amphipod taxa resulted in the moderately high $SQMCI_s$ score of 4.5 units, which was 0.4 unit higher than the median of past values at this site, and 0.7 unit below the $SQMCI_S$ score recorded at this site by the spring survey (Table 2). This indicated some decrease in the health of the community which was in the 'poor' generic MCI category (TRC, 2013) at the time of these late summer, low flow conditions.

Mangaone Stream 300m downstream of Puremu Stream confluence (site 14)

Taxa richness (12 taxa) at this site in the Mangaone Stream, downstream of the Puremu Stream confluence and discharges from Taranaki Sawmills and Viterra (Figure 1), was slightly higher than at the site directly upstream but lower than that at the 'control' site at Egmont Road (Table 2). This richness was equivalent with that recorded by the previous spring survey but lower than the long term median for this site. Previous reports have suggested that the sporadic observations of low community richnesses at this site may have been related to preceding toxic discharges. The current survey results don't suggest a similar recent occurrence although there had been increased sedimentation noted at this site adjacent to recent bank stabilisation works at the time of the spring survey some two months previously.

Earlier surveys had noted extensive filamentous algal growth at this site. Although not as apparent during several more recent surveys, such growth was extensive again during the current survey. This may indicate that the surveyed riffle has become more stabilised with reduced substrate turnover during high flows, allowing for greater periphyton establishment.

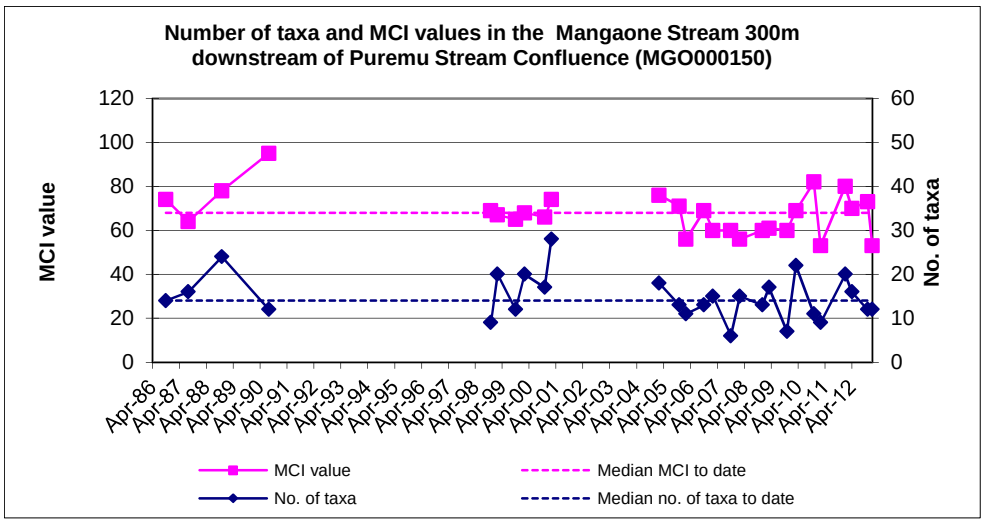


Figure 7 Numbers of taxa and MCI values for Mangaone Stream downstream of the confluence with Puremu Stream since 1986

There were no 'highly sensitive' taxa found in the community which was dominated by only three 'tolerant' taxa [oligochaete worms, extremely abundant snail (*Potamopyrgus*); and ostracod seed shrimps]. Only one 'moderately sensitive' taxon was present in this community (and only as a rarity), which was several such taxa fewer than recorded by the previous survey. There were four significant individual taxon abundance differences between adjacent sites, the most significant being reduced abundances of two 'moderately sensitive' taxa and increased abundances of two extremely 'tolerant' taxa (ostracods and oligochaete worms).

The increased proportion of 'tolerant' taxa in the community (92% of taxa richness) resulted in a 'very poor' MCI score of 53 units. This represented a significant (Stark, 1998) 20 unit decrease from the score recorded by the spring previous survey and was equal with the long term minimum score and lower than those recorded by all but one previous surveys (Figure

7). This was a marked deterioration for this site and represented a significant decrease of 25 MCI units (Stark, 1998) compared to the score at site 16 upstream.

The numerical dominance by 'tolerant' taxa (particularly worms and snails) was reflected in the relatively low $SQMCI_s$ value of 3.4 units which was significantly lower than that recorded at the nearest upstream site 16, but higher than the median score for this site. The extreme abundance of algal-associated snails reflected greater stability of the substrate (coincident with increased periphyton cover) at this site.

Overall, the significant reduction in MCI and $SQMCI_S$ scores at site 14 due to losses of several 'sensitive' taxa may be considered to have been related to the poorer habitat compared with the upstream site (16), but possibly as a result of industrial discharges during low summer flow conditions contributing to this deterioration.

100 m downstream of the fertilizer depot (site 15)

An increased, moderate richness (17 taxa) was recorded at this site, 100 m downstream of the discharges from the fertilizer depot. This richness was slightly higher than the median historical richness and well within the range recorded over the survey period to date (Table 2).

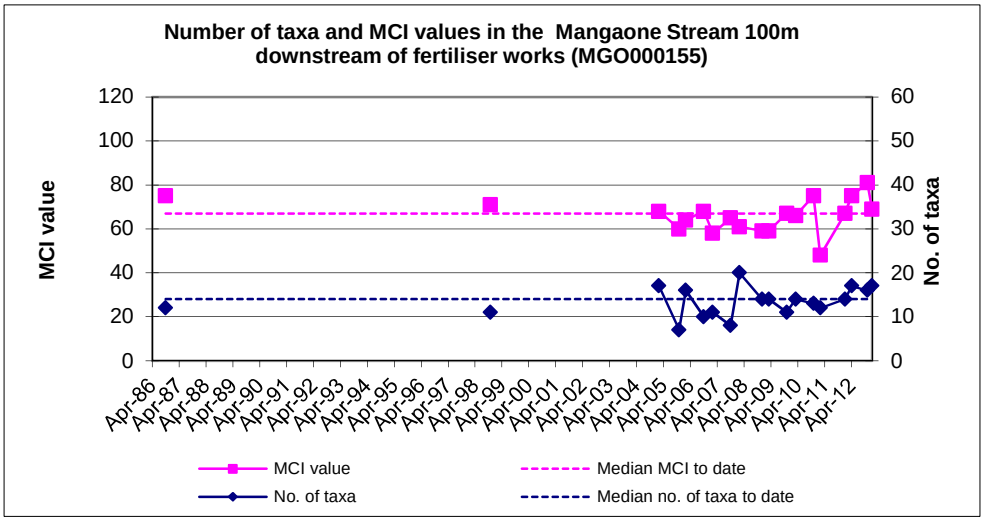


Figure 8 Numbers of taxa and MCI values for Mangaone Stream 100 m downstream of the fertilizer works/depot since 1986

The community was dominated by the same taxa as those characteristic at site 14 upstream with the addition of two other 'tolerant' taxa [algal-piercing caddisfly (*Oxyethira*) and muscid flies]. Only two significant individual taxon abundance differences were recorded between sites 14 and 15, these being increases in 'tolerant' muscid flies and caddisfly taxa. This was coincident with extensive periphyton cover observed at this site. Thick mats and filamentous algae, which tend to support communities having higher proportions of 'tolerant' taxa, were patchy and widespread respectively at site 15 in the current survey, and there was some increase in harder substrate (cobbles and boulders).

The predominance of 'tolerant' taxa (71% of richness) in this community was reflected in the 'poor' MCI score of 69 units. This was an insignificant two units higher than the historical median for this site, but a significant 16 units higher than the score recorded at the nearest upstream site (14). However, this was also a significant 12 units lower than the MCI score

recorded by the previous spring survey at this site. This indicated that the community had deteriorated in health, and that overall, the health remained 'fair' to 'poor', coincident with the extensive algal biomass (compared with past conditions) which could have been due to nutrient inputs from the fertiliser depot. The summer decrease in biological health at site 15 in the current survey may have been related to an increase in algal biomass possibly indicative of a greater ratio of groundwater inputs from the fertiliser depot to surface water.

The numerical dominance by 'tolerant' taxa (particularly two 'very tolerant' taxa) resulted in the $SQMCI_S$ value of 3.2 units, 1.0 unit higher under summer, low flow conditions than the median for this site, and within the range of previously recorded scores at this site. This score was only 0.2 unit less than that recorded upstream, more typical of the trend of downstream deterioration observed by most previous surveys, but this score remained indicative of the poorer communities present downstream of the Puremu Stream confluence.

Rifle Range Road (site 11)

The poorer faunal richness (13 taxa) found at this site was coincident with thick, patchy periphyton substrate cover and increased (marginal) aquatic vegetation. This richness was equivalent with the long term median for this site (Table 2 and Figure 9) and six taxa fewer than recorded by the previous spring survey. Most recent surveys have shown poorer communities possibly as a result of a combination of factors. These include occasional inundation by high flows in the adjacent Waiwhakaiho River (slowing flows which provide an unsuitable habitat for riffle-dwelling invertebrates (see BJ192) and a lack of downstream drift recruitment of typical stony habitat taxa as the majority of the upstream habitat is softer-bottomed and weedy. Deterioration in physicochemical water quality between sites 12 and 11 may also have been a factor, as this reach, which runs through an industrial catchment, receives several stormwater discharges including localised run-off and groundwater seepage inputs.

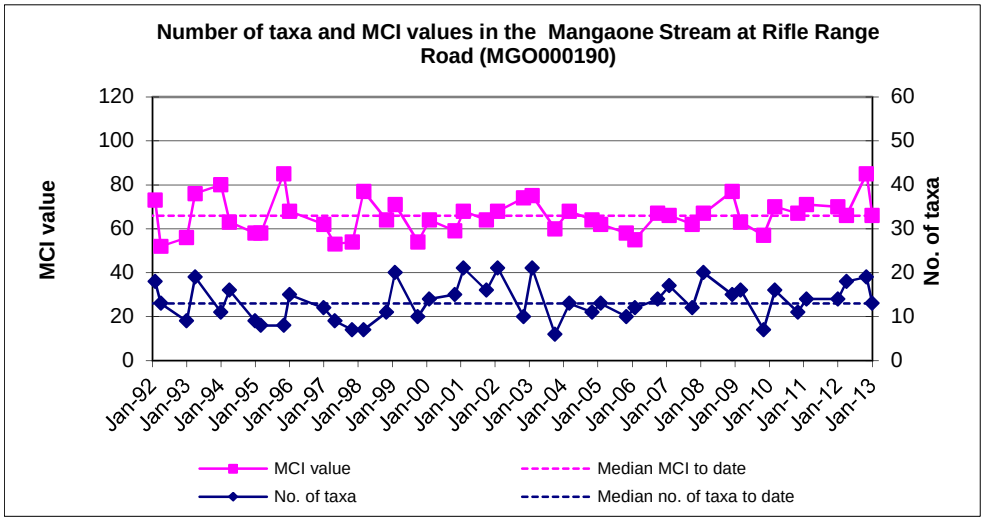


Figure 9 Numbers of taxa and MCI values for Mangaone Stream at Rifle Range Road since 1992

The community was dominated by six taxa, all 'tolerant' taxa [oligochaete worms, extremely abundant snail (*Potamopyrgus*); ostracod seed shrimps, midges (orthoclads and *Polypedilum*), and muscid flies]. As typically has been recorded, there was a significant contrast in dominant taxa between this site and the upstream 'control' site (12). In addition, there was a

significant difference in taxa composition, with only six taxa common to both sites from a total of 24 taxa found at sites 12 and 11.

The predominance (77% of taxa number) of 'tolerant' taxa in the community was reflected in the 'poor' MCI score of 66 units, although this was equal with the historical median (Table 2). This was a significant (Stark, 1998) 12 units lower than the score recorded at site 12, and a three unit decrease from the score at the nearest upstream site (16).

While no 'moderately sensitive' taxa were found in abundance, three very or extremely abundant 'tolerant' taxa contributed to the relatively low $SQMCI_S$ value of 3.2 units. However, this was above the long term median $SQMCI_S$ score by 1.3 units and was toward the maximum of the range of previous scores. It was with 0.2 unit of the $SQMCI_s$ scores recorded at the nearest upstream sites 14 and 15.

There was significant deterioration in $SQMCI_s$ (and MCI) between sites 16 and 14, and therefore between sites 16 and 11, which was more related to some deterioration in habitat, with an influence also from the increased density of algal substrate cover downstream of the fertiliser depot.

General comments

The longitudinal trends in the number of taxa, MCI and $SQMCI_s$ values along the reach of the Mangaone Stream surveyed in January 2013 are illustrated in Figure 10.

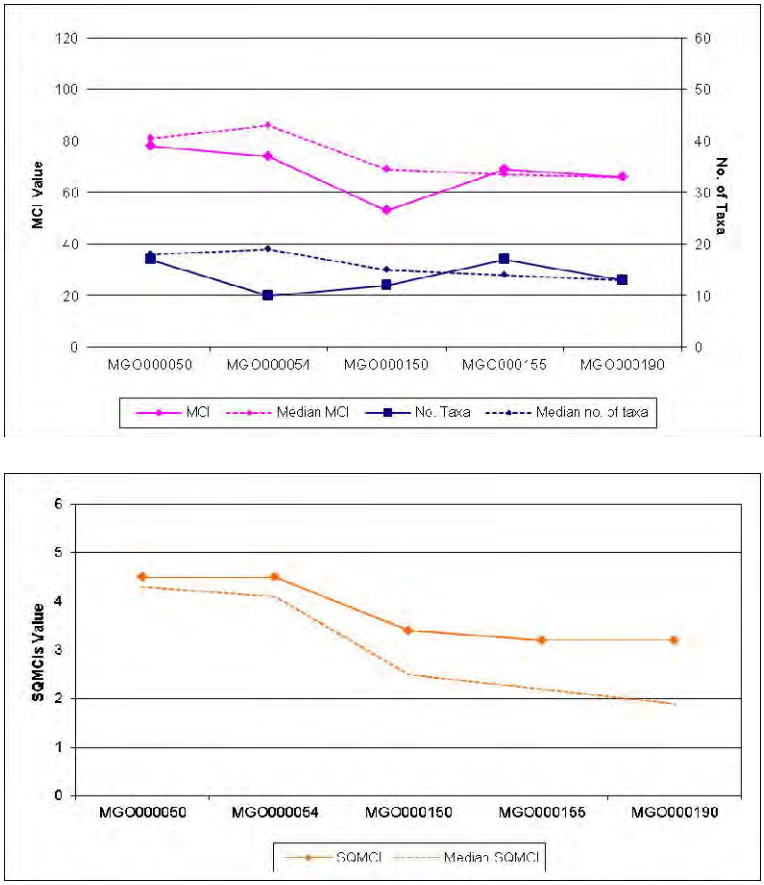


Figure 10 Longitudinal trend in number of taxa, MCI and $SQMCI_s$ values in the Mangaone Stream for the survey of 31 January 2013

The number of taxa tended to decrease in a downstream direction, (with the exception of site 15), a more typical result for this stream. The highest richnesses usually have been found at the two sites in the upper reaches of the stream but atypically site 16 recorded the lowest taxa richness on this current survey occasion. The MCI was also variable, but generally showed a decreasing trend, in the mid reaches with some recovery in the lower reaches. All sites showed scores lower than, or very similar to, historical median scores; more typical of poorer biological communities found under summer, lower flow conditions.

When considering changes in community structure, the $SQMCI_S$ (which takes into account changes in the abundance of taxa, as well as their sensitivity to pollution) was found to follow a similar pattern to the MCI score in the upper reaches with a less pronounced decrease in mid reaches and no recovery through the lower reaches. All sites recorded $SQMCI_S$ scores higher than or equal with their historical medians, with sites 15 and 11 recording the greatest improvement.

Marked deterioration in biological 'health' at site 14, coincident with extensive periphyton substrate cover, is unlikely to have been related to a preceding toxic discharge, as the presence of large numbers of snails and oligochaete worms was more indicative of algal smothering effects.

Summary and conclusions

The Council's standard 'kick-net' and 'sweep-net' sampling techniques were used to collect streambed macroinvertebrates under late summer low flow conditions at three sites in the Waiwhakaiho River and five sites in the Mangaone Stream on 1 February and 31 January 2013 respectively, in order to assess whether discharges from the Lower Waiwhakaiho Industrial area had had any adverse effects on the macroinvertebrate communities of these streams. Samples were processed to provide number of taxa (richness), MCI and $SQMCI_S$ scores for each site.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The $SQMCI_S$ takes into account taxa abundances as well as sensitivity to pollution. It may indicate subtle changes in communities, and therefore be the more relevant index if non-organic impacts are occurring. Significant differences in either the MCI or $SQMCI_S$ between sites indicate the degree of adverse effects (if any) of the discharges being monitored.

This survey found that all Waiwhakaiho River sampling sites recorded community richnesses higher than long term medians for their respective sites. There was a small increase in richness in a downstream direction (from 24 to 26 taxa), and there was a typical downstream decrease in MCI scores between the sites but not as pronounced as that found by the previous spring survey. In addition, all sites recorded MCI scores equivalent to, or above, their respective medians, and $SQMCI_S$ scores significantly higher than their medians. Communities in the Waiwhakaiho River downstream of Lake Rotomanu may be inhibited from time-to-time by the variable current speeds caused by tidal flooding. These results did not indicate any significant effects of stormwater or wastewater discharges from the Fitzroy industrial area on the macroinvertebrate communities of the Waiwhakaiho River, although it is possible that the Mangaone Stream was contributing to the increased algal growth

observed downstream of the confluence where there was a decrease in the number of more 'sensitive' taxa characteristic of the community.

It is apparent that the macroinvertebrate communities in the Mangaone Stream were of mainly 'poor' health. Most sites had moderate to poorer taxa richnesses, while MCI scores were near to medians at three sites, or significantly below medians for sites 16 and 11. $SQMCI_S$ scores ranged from 0.2 to 1.3 units above sites' medians principally due to the extremely abundant snail populations (associated with extensive periphyton substrate cover and/or aquatic vegetation) present at all sites. However, the five sampling sites in the Mangaone Stream showed a significant decline in MCI and $SQMCI_S$ values between Egmont Road (site 12) and Rifle Range Road (site 11), with a marked decline of MCI scores in particular between sites 16 and 14. Taranaki sawmills discharges stormwater to the Mangaone Stream between sites 16 and 14, and sediment sampling undertaken in early 2009 had recorded significant concentrations of not only tributyltin in the stream sediments around Taranaki Sawmills, but also elevated concentrations of arsenic, chromium, copper and zinc, all potentially toxic to aquatic biota (see BJ192). Although the taxa richness recorded at site 14 by the current survey was fewer than the long term median, it was two taxa more than found upstream at site 16 which had a poor richness much lower than the historical median. Previously, there had been increased sedimentation between sites 16 and 14 and sediment sampling undertaken in April 2012, showed less contamination than that recorded in 2009; more indicative of physical habitat induced effects, rather than a recently preceding toxic discharge. There was a significant increase in MCI score between sites 14 and 15, which was maintained in the lower reaches, most likely due to some habitat improvement. Increased downstream algal biomass may have been indicative of impacts from greater groundwater inputs from the fertiliser depot under summer low flow conditions.

The decline in $SQMCI_S$ values was relatively typical for this stream although all sites recorded values in excess of their respective medians and the rate of decline was not as marked as that found by the previous spring survey.

Overall, the results from the current survey indicated typical summer, low flow poorer biological health in the communities of the middle and lower reaches of the Mangaone Stream, coincident with extensive periphyton substrate cover. The extensive periphyton cover and sedimentation of the stream bed are likely to be the primary drivers behind the poor community health, as, it appears that the sediment contamination in the Mangaone Stream downstream of the Taranaki Sawmills discharge may be reducing. Groundwater inputs may have contributed to more extensive algal substrate cover immediately downstream of the fertiliser depot.

References

TRC Internal Reports

Dunning K, 2002a: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, October 2001. TRC report KD87.

Dunning K, 2002b: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2002. TRC report KD114.

Fowles CR and Colgan BG, 2004: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, October 2003. TRC report CF336.

Fowles CR, Colgan BG and Moore SC, 2004: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2004. TRC report CF340.

Fowles CR and Colgan BG, 2005: Biomonitoring of the Lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2004. TRC report CF366.

Fowles CR and Jansma B, 2008a: Biomonitoring of the Lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, October 2007. TRC report CF450.

Fowles CR and Jansma B, 2008b: Biomonitoring of the Lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2008. TRC report CF451

Jansma, B, 2006: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2005. TRC report BJ009.

Jansma, B, 2006: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, October 2006. TRC report BJ015.

Jansma, B, 2007: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2007. TRC report BJ029.

Jansma, B, 2009a: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, December 2008. TRC report BJ084.

Jansma, B, 2009b: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, March 2009. TRC report BJ085.

Jansma, B, 2010a: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2009. TRC report BJ120.

Jansma, B, 2010b: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, March 2010. TRC report BJ121.

Jansma, B, 2011a: Fish kill assessment and biomonitoring of the Mangaone Stream in relation to a discharge of hydrolysed urea, February 2011. TRC Report BJ135.

Jansma, B, 2011b: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2010. TRC report BJ136.

Jansma, B, 2011c: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2011. TRC report BJ137.

Jansma, B, 2013a: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, January 2012. TRC report BJ191.

Jansma, B, 2013b: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, April 2012. TRC report BJ192.

Jansma, B & Fowles, CR, 2014: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2012. TRC report CF618.

Hope, K. 2005: Biomonitoring of the Lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2005. TRC report KH028.

Hope, K. 2006: Biomonitoring of the Lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2006. TRC report KH085.

McWilliam H, 2001a: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2000. TRC report HM235.

McWilliam H, 2001b: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2001. TRC report HM245.

Moore SC, 2003: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2002. TRC report SM574.

Moore SC, 2003: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2003. TRC report SM582.

TRC, 1998: Some statistics from the Taranaki Regional Council database (FWB) of freshwater macroinvertebrate surveys performed during the period from January 1980 to 31 December 1998. (SEM reference report). TRC technical report 99-17.

TRC, 2013: Fresh water macroinvertebrate fauna biological monitoring programme Annual SEM Report: 2012-2013, Technical Report 2013-48.

External publications

Stark JD, 1985: A macroinvertebrate community index of water quality for stony streams. *Water and Soil* Miscellaneous Publication No. 87.

Stark JD, 1998: SQMCI: a biotic index for freshwater macroinvertebrate coded abundance data. *New Zealand Journal of Marine and Freshwater Research 32(1*): 55-66.

Stark JD, 1999: An evaluation of TRC's SQMCI biomonitoring index. Cawthron Institute, Nelson. Cawthron Report No. 472.

Stark JD, Boothroyd IKG, Harding JS, Maxted JR, Scarsbrook MR, 2001: Protocols for sampling macroinvertebrates in wadeable streams. New Zealand Macroinvertebrate Working Group Report No. 1. Prepared for the Ministry for the Environment. Sustainable Management Fund Project No. 5103. 57p.

Stark, JD and Fowles, CR 2009: Relationships between MCI, site altitude, and distance from source for Taranaki ringplain streams. Stark Environmental Report No. 2009-01. 47 pp.

To L Smith, Scientific Officer
From B Jansma and CR Fowles, Scientific Officers
Document 1413739
Report No. CF620
Date 7 October 2014

Biomonitoring of the Lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2013

Introduction

This was the first of two scheduled surveys in the 2013-2014 monitoring programme, for the combined industries of the Fitzroy industrial area. Results from surveys performed since the 2000-2001 monitoring years are discussed in several reports referenced at the end of this report. The monitoring related to the wastewater/stormwater discharge permits tabulated below:

Consent holder	Consent No
Ravensdown	3140,3865
Firth Industries	0392
Hooker Brothers	3141
NPDC (Stormwater)	3138,1126,1275
NPDC (Bewley Road)	4984
TranzRail	1735,3528
Viterra	4548
Allied Concrete Ltd	4539
Taranaki Sawmills	3491
Technix Group Ltd	0021,0291,2230
Works Infrastructure Ltd	3917

Methods

On 15 November 2013, the standard '400 ml kick sampling' technique was used to collect streambed macroinvertebrates from three sites in the lower Waiwhakaiho River and on 14 November 2013 from four sites in the Mangaone Stream, while the standard '400 ml sweep-sampling' technique was used to collect streambed macroinvertebrates from site 12 in the Mangaone Stream (Table 1, Figure 1). The 'sweep-net- sampling technique is very similar to Protocol C2 (soft-bottomed, semi-quantitative), and the 'kick-sampling' technique is very similar to Protocol C1 (hard-bottomed, semi-quantitative), of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark *et al*, 2001).

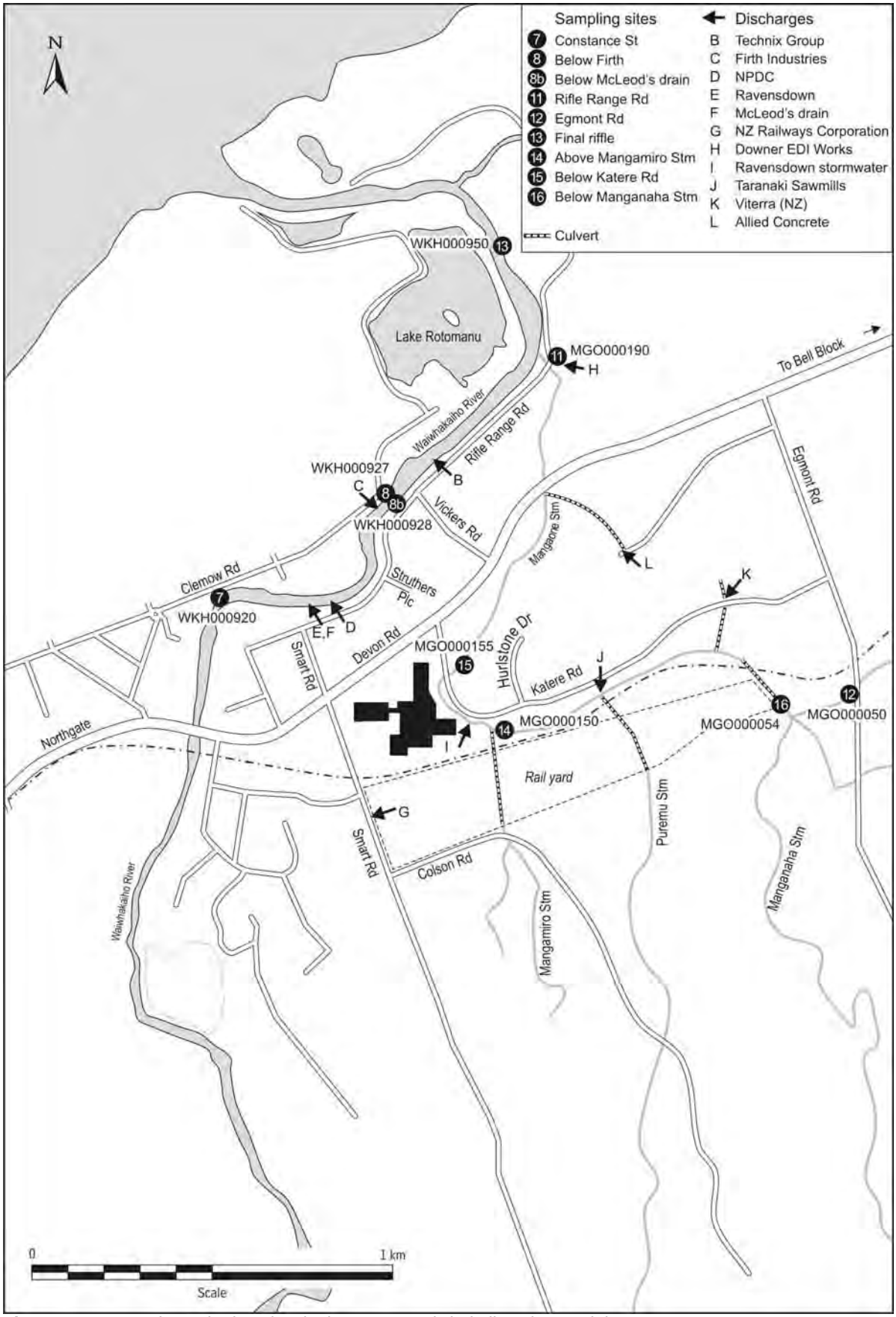


Figure 1 Biomonitoring sites in the Lower Waiwhakaiho River and the Mangaone Stream

The three sites from the Waiwhakaiho River used in this survey have been sampled biannually in recent years. In the Mangaone Stream, two sites have been sampled biannually in the past with sampling of the other three sites (14, 15 and 16) biannually since February 2005.

Table 1 Biomonitoring sites in the Lower Waiwhakaiho River and the Mangaone Stream

Site No	Site Code	Location
7	WKH000920	Waiwhakaiho River, Constance Street
8	WKH000927	Waiwhakaiho River, below Firth industries, west (left) bank
13	WKH000950	Waiwhakaiho River, final riffle downstream of Lake Rotomanu
12	MGO000050	Mangaone Stream, Egmont Road
16	MGO000054	Mangaone Stream, 20m d/s of Manganaha Stream confluence
14	MGO000150	Mangaone Stream, 300m d/s confluence with Puremu Stream
15	MGO000155	Mangaone Stream, 100m d/s fertiliser depot
11	MGO000190	Mangaone Stream, Rifle Range Road

Samples were preserved with Kahle's Fluid for later sorting and identification under a stereomicroscope according to Taranaki Regional Council methodology using protocol P1 of NZMWG protocols for sampling macroinvertebrates in wadeable streams (Stark et al. 2001). Macroinvertebrate taxa found in each sample were recorded as:

R (rare)	= less than 5 individuals;
C (common)	= 5-19 individuals;
A (abundant)	= estimated 20-99 individuals;
VA (very abundant)	= estimated 100-499 individuals;
XA (extremely abundant)	= estimated 500 individuals or more.

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams. Highly 'sensitive' taxa were assigned the highest scores of 9 or 10, while the most 'tolerant' forms scored 1. Sensitivity scores for certain taxa have been modified in accordance with Taranaki experience. Averaging the scores assigned to the taxa found at a site, and multiplying the average by a scaling factor of 20 produces a Macroinvertebrate Community Index (MCI) value.

The MCI was designed as a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. MCI results can also reflect the effects of warm temperatures, slow current speeds and low dissolved oxygen levels, because the taxa capable of tolerating these conditions generally have low sensitivity scores. Usually more 'sensitive' communities (with higher MCI values) inhabit less polluted waterways. The use of this index in non-stony streams (such as the Mangaone Stream site 12) is possible if results are related to physical habitat (e.g. good quality muddy/weedy sites tend to produce lower MCI values than good quality stony sites).

A semi-quantitative MCI value ($SQMCI_S$) has also been calculated for the taxa present at each site by multiplying each taxon score by a loading factor (related to its abundance), totalling these products, and dividing by the sum of the loading factors (Stark, 1998 and 1999. The loading factors were 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 $SQMCI_S$ is not multiplied by a scaling factor of 20, therefore $SQMCI_S$ values range from 1 to 10, while MCI values range from 20 to 200.

Results and discussion

The November 2013 survey was performed during moderate flow conditions (8 days since the last fresh of three times median flow and 14 days after seven times the median flow in the Waiwhakaiho River). The flow at all three sampling sites in the Waiwhakaiho River was clear and uncoloured at the time of this survey. Periphyton mats were patchy at site 8 and widespread at the other two sites, while growths of filamentous algae were patchy at all sites. Water temperatures in the Waiwhakaiho River ranged from 17.4 to 18.1°C at the time of this early afternoon survey. Substrate at all three sites was comprised predominantly of cobbles and gravels, with boulders also being an important component at sites 8 and 13.

The moderate flow in the Mangaone Stream was also uncoloured and clear. The cloudiness often recorded in the Mangaone Stream at the sites downstream of the Manganaha Stream, was not observed on this survey occasion. Sites 12 and 16 had a steady water speed, while water speed was swift at sites 14, 15, and 11. Periphyton cover, which was confined to thin mats at site 12, increased in a downstream direction, with a slippery film and patchy filaments present at site 16 , and patchy mats and widespread filaments at sites 14, 15, and 11. Aquatic macrophytes were common in the stream at sites 12, 15, and 11 and at the stream margins at site 14. Vegetation clearance from the banks adjacent to site 16 had altered habitat (less shading). An observation made at the time of the March 2009 survey at site 11, was that the Waiwhakaiho River may have backed up the Mangaone Stream, reducing the flushing potential of the previous fresh. This was confirmed in 2010 (see photos in BJ192), and is likely to be a common feature of larger floods in this catchment.

Samples were collected from all sites using the kick sampling technique, except for site 12, as this was mainly a weedy, silty site. The substrate at site 12 was comprised mainly of hard clay and silt, with gravels and hard clay predominant at site 16. The substrate at site 14 was comprised mainly of silt, sand, and gravels (with some cobbles), whereas at sites 15 and 11 it comprised mainly gravels and cobbles with a greater proportion of boulders at site 15. Water temperatures at the time of this late morning survey in the Mangaone Stream ranged from 14.2° to 16.2°C.

Macroinvertebrate communities

A summary of taxa numbers and MCI values from previous surveys performed in the Waiwhakaiho River and the Mangaone Stream in relation to the Fitzroy industrial area are presented in Table 2 together with current results. The full results of the survey are presented in Table 3 (Waiwhakaiho River) and Table 4 (Mangaone Stream).

Table 2 Numbers of taxa and MCI and $SQMCI_S$ values recorded in previous surveys performed in the Waiwhakaiho River and Mangaone Stream since July 1983 in relation to the Fitzroy industrial area, together with the results of the survey of 14 November 2013

Location	Site No.	Numbers of taxa				MCI values			$SQMCI_S$ Values			
		N	Median	Range	Current	Median	Range	Current	N	Median	Range	Current
Waiwhakaiho River	7	54	20	12-29	19	89	66-110	96	30	3.3	1.7-7.3	3.2
	8	52	21	13-30	24	87	69-115	88	30	3.2	1.8-6.3	3.3
	13	45	20	12-30	16	87	67-111	83	30	2.9	1.6-7.4	1.6
Mangaone Stream	12	42	18	8-28	21	81	66-95	91	30	4.3	2.4-4.9	4.9
	16	25	19	3-24	24	85	47-103	88	22	4.2	1.2-5.5	4.5
	14	27	14	6-28	18	68	53-95	77	23	2.5	1.1-3.7	2.5
	15	19	14	7-20	23	67	48-81	77	18	2.2	1.5-3.8	3.5
	11	47	13	4-21	14	65	50-85	67	30	1.9	1.5-3.6	2.4

Table 3 Macroinvertebrate fauna of the Waiwhakaiho River in relation to the Fitzroy industrial area sampled on 15 November 2013

Taxa List	Site Number	MCI score	7	8	13
	Site Code		WKH000920	WKH000927	WKH000950
	Sample Number		FWB13326	FWB13327	FWB13328
NEMERTEA	Nemertea	3	-	R	-
NEMATODA	Nematoda	3	-	R	R
ANNELIDA (WORMS)	Oligochaeta	1	A	A	XA
	Lumbricidae	5	-	R	R
MOLLUSCA	*Potamopyrgus*	4	C	C	A
CRUSTACEA	*Paratya*	3	-	-	R
EPHEMEROPTERA (MAYFLIES)	*Austroclima*	7	R	-	-
	Coloburiscus	7	R	R	-
	Deleatidium	8	A	C	R
PLECOPTERA (STONEFLIES)	*Acroperla*	5	R	-	-
	Austroperla	9	R	-	-
	Zelandobius	5	-	R	-
COLEOPTERA (BEETLES)	Elmidae	6	C	A	C
MEGALOPTERA (DOBSONFLIES)	*Archichauliodes*	7	R	C	R
TRICHOPTERA (CADDISFLIES)	*Aoteapsyche*	4	A	VA	A
	Costachorema	7	C	R	R
	Hydrobiosis	5	R	C	-
	Neurochorema	6	-	R	-
	Oxyethira	2	R	R	R
	Pycnocentrodes	5	-	R	-
DIPTERA (TRUE FLIES)	*Aphrophila*	5	C	A	A
	Maoridiamesa	3	A	VA	A
	Orthocladiinae	2	VA	VA	VA
	Tanytarsini	3	C	C	-
	Empididae	3	-	R	R
	Ephydridae	4	-	R	-
	Muscidae	3	R	R	R
	Austrosimulium	3	R	-	-
ACARINA (MITES)	Acarina	5	-	R	-
		No of taxa	19	24	16
		MCI	96	88	83
		SQMCIs	3.2	3.3	1.6
		EPT (taxa)	8	8	3
		%EPT (taxa)	42	33	19

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

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

Waiwhakaiho River

Constance Street (site 7)

A moderate taxa richness (19 taxa) was found at this site, upstream of all discharges from the Fitzroy industrial area. This was one taxon less than the median richness for this site (Table 2 and Figure 2), but within the range of previous richnesses.

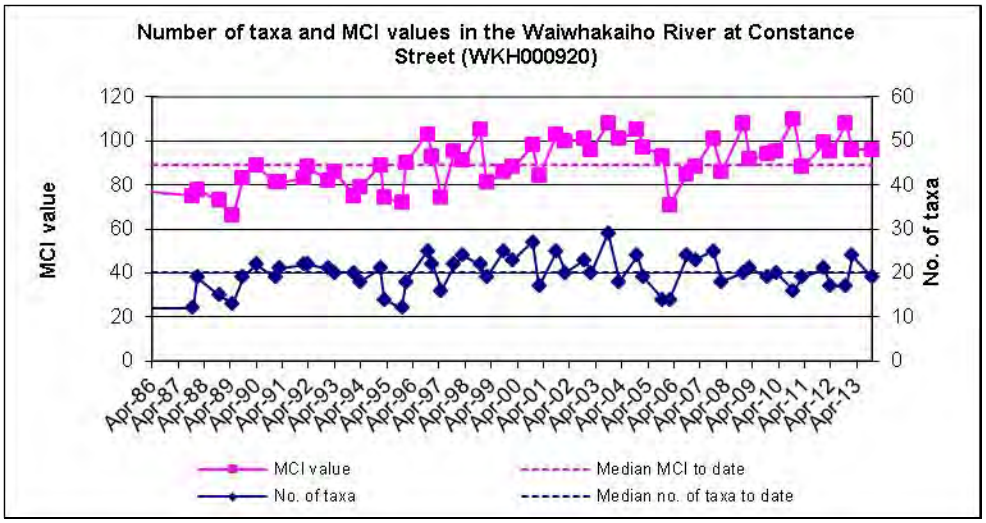


Figure 2 Numbers of taxa and MCI values for Waiwhakaiho River at Constance Street since 1987

Two 'highly sensitive' taxa were present, one of which was recorded as abundant, reflecting good preceding physicochemical water quality. The community was characterised by four 'tolerant' taxa [oligochaete worms, net building caddisfly (*Aoteapsyche*), and midges (*Maoridiamesa* and orthoclads)]; no 'moderately sensitive' taxa; and the aforementioned 'highly sensitive' taxon [mayfly (*Deleatidium*)].

The relative even balance between 'tolerant' and 'sensitive' taxa (53% of richness) present in the community was reflected in the MCI score of 96 units, an insignificant 7 units higher than the median score for this site (Table 2, Figure 2). This was equal with the previous late summer survey score, a more typical result for this site, and slightly higher than predictive values (Stark and Fowles, 2009) for this site situated in the lower reaches of a ringplain river (TRC, 2013).

The $SQMCI_S$ value of 3.2 units was 0.1 unit below the median value for this site, more typical of values for the lower reaches of ringplain streams and rivers subject to nutrient enrichment. This score reflected the dominance by mainly 'tolerant' taxa, particularly very 'tolerant' midges, and was 1.4 $SQMCI_s$ units lower than the previous late summer survey score at this site.

Below Firth Industries, left bank (site 8)

This site also had a moderate community richness (24 taxa), three taxa more than the historical median at this site, but within the range of scores previously recorded (Table 2 and Figure 3).

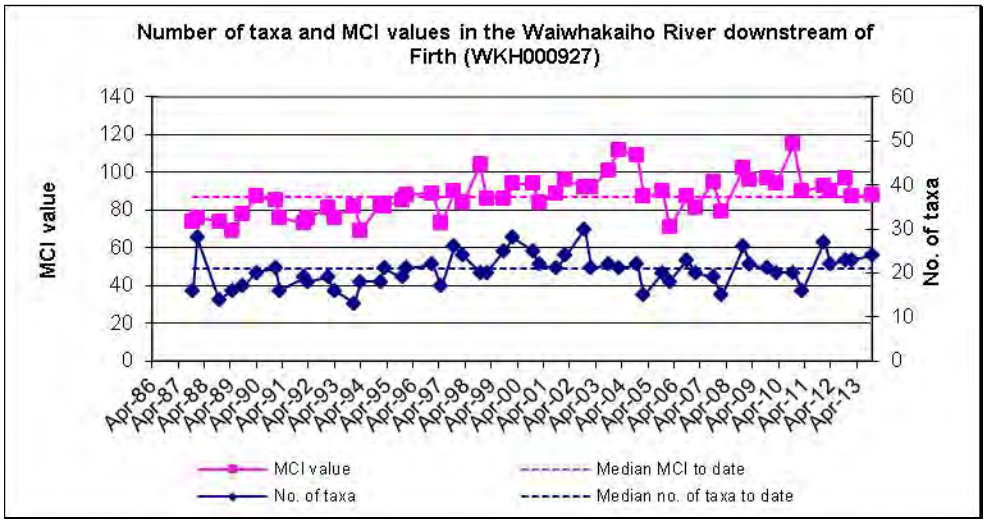


Figure 3 Numbers of taxa and MCI values for Waiwhakaiho River below Firth Industries (left bank) since 1987

Only one 'highly sensitive' taxon was found at this site, but not in abundance. The community was characterised by six taxa; four 'tolerant' taxa [oligochaete worms, net spinning caddisfly (*Aoteapsyche*), and midges (*Maoridiamesa* and orthoclads)]; and two 'moderately sensitive' taxa [elmid beetles and cranefly (*Aphrophila*)]. These characteristic taxa were identical to those recorded at the upstream site (7) in terms of 'tolerant' taxa but dissimilar for the 'sensitive' taxa.

The slight downstream increase in proportion of 'tolerant' taxa in this site's community (50% of richness) was reflected in the MCI score (88 units). This was very similar to the score recorded by the previous late summer survey (Figure 2) and was one unit higher than the median for this site. This was the tenth consecutive survey to record an equal or above median MCI score. The score was an insignificant eight units lower than that recorded upstream at site 7, and no significant changes in community composition were recorded. This score remained near, to a few, MCI units lower than predictive scores for such a site in the lower reaches of a ringplain river (Stark and Fowles, 2009). Overall, this indicated that this survey was preceded by relatively good physicochemical water quality conditions at this site although the periphyton substrate cover impacted on aspects of the physical habitat.

Despite the reduced numerical abundance of one 'highly sensitive' taxon, increased abundances within two 'moderately sensitive' taxa contributed to a similar $SQMCI_S$ score (3.3 units), 0.1 unit higher than that recorded upstream at site 7 (Stark, 1998). This remained very similar to the historical median for this site but 0.7 unit lower than the value found by the previous late summer survey.

Downstream of Lake Rotomanu (site 13)

A poorer richness of 16 taxa was found at this site situated downstream of all industrial discharges to the lower catchment, within a reach where high tides may slow river current speeds (and very occasionally increase salinity) near the mouth. This richness was ten taxa fewer than that recorded by the previous late summer survey and four taxa fewer than the historical median richness, four taxa above the historical minimum richness, and eight taxa lower than recorded at the site below Firth Industries (8) upstream (Table 2 and Figure 4).

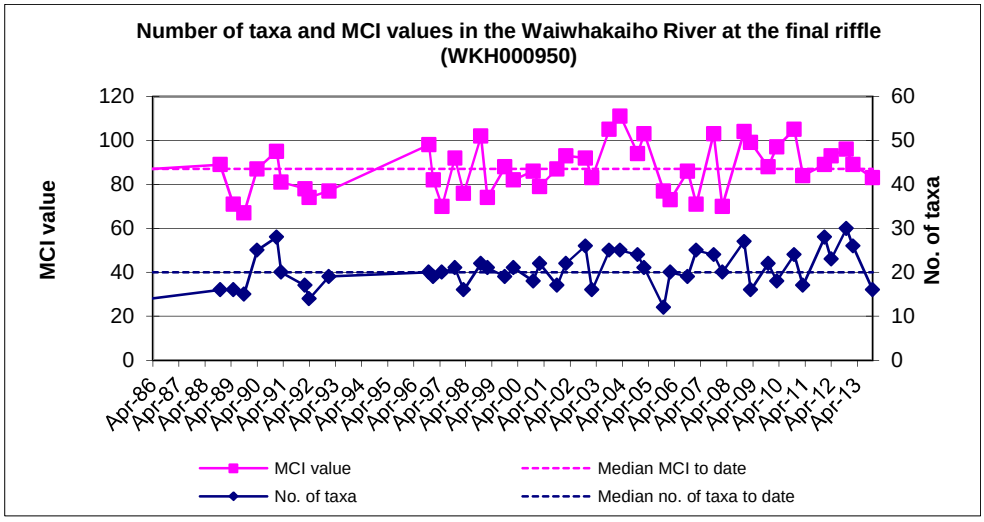


Figure 4 Numbers of taxa and MCI values for Waiwhakaiho River d/s of Lake Rotomanu since 1987

Only one 'highly sensitive' taxon was present (but only as a rarity) while the community was characterised by an increased number (five) of 'tolerant' taxa [oligochaete worms, snail (*Potamopyrgus)*, net-spinning caddisfly (*Aoteapsyche*), and midges (*Maoridiamesa* and orthoclads)]; and one 'moderately sensitive' taxon [cranefly (*Aphrophila*)] suggesting a subtle deterioration in health from that recorded upstream at sites 7 and 8. However, there were only three significant differences in individual taxon abundances recorded between sites 8 and 13 by the current survey; in particular, a marked increase in number within one 'tolerant' taxon. This was a relatively typical result for this site in the lower river reaches near the coast.

The proportion of 'tolerant' taxa in the community at site 13 (63%) was higher that recorded at site 8, resulting in a lower MCI score of 83 units which was an insignificant four units lower than the long term median for this site (Figure 4) and slightly lower than predictive values (Stark and Fowles, 2009) for this ring plain site. In addition, a marked increase in the numerical dominance of one very 'tolerant' taxon resulted in the much lower SQMCI$_S$ value of 1.6 units. This result was a significant 1.7 units lower than that recorded upstream at site 8 and was significantly lower than the median score for this site (13), and a significant decrease of 2.1 units below that recorded by the previous late summer survey, coincident with widespread periphyton substrate cover.

Mangaone Stream

Macroinvertebrate samples collected from two sites (11 & 12) in the Mangaone Stream in the past have found distinctly different community compositions at the two sites with much of the variation due to the streambed habitat differences, i.e. sandy-weedy, softer substrate at the upstream site (site 12 at Egmont Road) and harder, stony-gravel substrate at the downstream site (site 11 at Rifle Range Road). Additional sites have been sampled in recent years (in the reach between these historically surveyed sites) to further ascertain why poor water quality is indicated at site 11 at Rifle Range Road despite the improvement in habitat when compared to site 12 upstream of all the industrial discharges.

Table 4 Macroinvertebrate fauna of the Mangaone Stream in relation to the Fitzroy industrial area sampled on 15 November 2013

Taxa List	Site Number	MCI score	12	16	14	15	11
	Site Code		MGO000050	MGO000054	MGO000150	MGO000155	MGO000190
	Sample Number		FWB13308	FWB13309	FWB13310	FWB13311	FWB13312
PLATYHELMINTHES	*Cura*	3	-	-	-	R	-
NEMERTEA	Nemertea	3	-	-	-	R	R
NEMATODA	Nematoda	3	-	R	R	R	-
ANNELIDA	Oligochaeta	1	-	A	VA	VA	VA
	Lumbricidae	5	-	-	R	R	R
HIRUDINEA	Hirudinea	3	-	-	R	-	-
MOLLUSCA	*Physa*	3	-	-	-	-	R
	Potamopyrgus	4	A	VA	VA	XA	VA
CRUSTACEA	Ostracoda	1	-	R	R	-	-
	Isopoda	5	-	-	-	-	R
	Paracalliope	5	XA	VA	C	A	R
	Paraleptamphopidae	5	VA	R	-	-	-
	Paratya	3	C	R	-	-	R
EPHEMEROPTERA	*Austroclima*	7	VA	A	R	R	-
	Coloburiscus	7	-	C	-	-	-
	Zephlebia group	7	C	A	-	-	-
ODONATA	*Xanthocnemis*	4	A	-	-	-	-
	Hemicordulia	5	R	-	-	-	-
HEMIPTERA	*Microvelia*	3	R	-	-	-	-
COLEOPTERA	Elmidae	6	R	C	R	R	-
	Hydrophilidae	5	R	-	-	-	-
MEGALOPTERA	*Archichauliodes*	7	-	R	-	R	-
TRICHOPTERA	*Aoteapsyche*	4	-	R	-	-	-
	Costachorema	7	-	-	R	R	-
	Ecnomidae/Psychomyiidae	6	-	R	-	-	-
	Hydrobiosis	5	C	A	R	C	-
	Orthopsyche	9	-	R	-	-	-
	Polyplectropus	6	R	-	-	-	-
	Psilochorema	6	R	-	-	-	-
	Oxyethira	2	-	R	R	C	C
	Paroxyethira	2	-	-	-	R	-
	Triplectides	5	A	C	-	-	-
DIPTERA	*Aphrophila*	5	-	R	C	C	C
	Chironomus	1	-	-	-	R	-
	Maoridiamesa	3	-	-	R	C	-
	Orthocladiinae	2	R	A	VA	A	VA
	Polypedilum	3	R	C	C	C	R
	Tanypodinae	5	R	-	-	-	-
	Tanytarsini	3	-	R	-	-	-
	Ceratopogonidae	3	-	-	-	R	-
	Paradixa	4	C	-	-	-	-
	Empididae	3	R	R	R	R	R
	Muscidae	3	-	-	-	R	C
	Austrosimulium	3	VA	C	-	-	-
	Tanyderidae	4	-	-	R	-	-
ACARINA	Acarina	5	-	-	-	R	-
		No of taxa	21	24	18	23	14
		MCI	91	88	77	77	67
		SQMCIs	4.9	4.5	2.5	3.5	2.4
		EPT (taxa)	6	8	3	3	0
		%EPT (taxa)	29	33	17	13	0
'Tolerant' taxa	'Moderately sensitive' taxa		'Highly sensitive' taxa				

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

Egmont Road (site 12)

A moderate community richness (21 taxa) was found amongst the vegetation and the soft silt-hard clay-bottomed habitat of this site. This was three taxa more than the median richness for this site and four taxa more than found by the previous late summer survey (Table 2 and Figure 5). This has not yet indicated a return to continually below median community richness, a trend recorded from 2006 to 2011 (Figure 5).

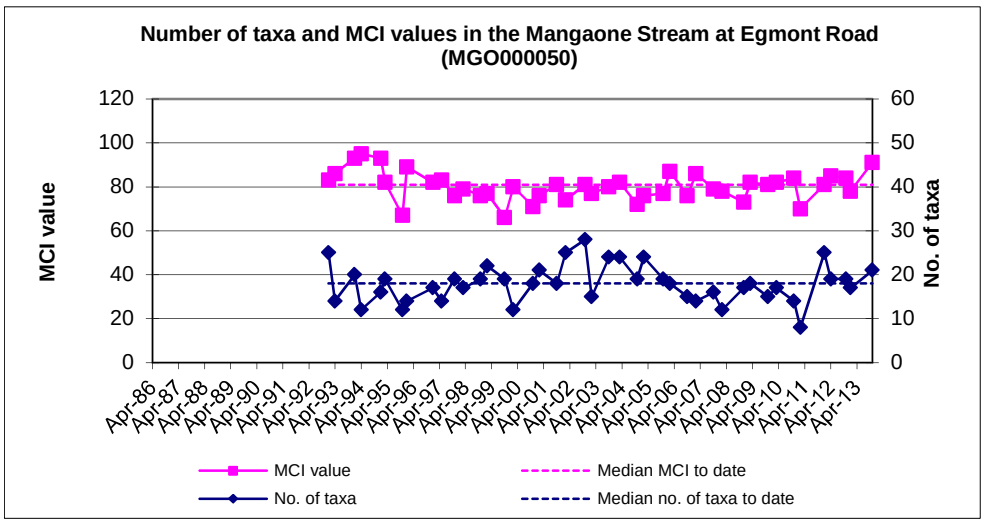


Figure 5 Number of taxa and MCI values for Mangaone Stream at Egmont Road since 1992

No 'highly sensitive' taxa were found in this community (Table 4) which was characterised by seven taxa. These were three 'tolerant' taxa [snail (*Potamopyrgus*), damselfly (*Xanthocnemis*), and sandfly (*Austrosimulium*)] and four 'moderately sensitive' taxa [amphipods (*Paracalliope* (extremely abundant) and paraleptamphopids), mayfly (*Austroclima*) and vegetation-cased caddisfly (*Triplectides*)]. This was typical of the community found at this site which has been characterised by taxa commonly associated with vegetation in lowland streams and/or with softer-bottomed substrates and indicative of moderate physicochemical water quality.

The community was comprised of a relatively high proportion (57%) of 'moderately sensitive' taxa resulting in a well above median MCI score of 91 units (by 10 units, Table 2), and a significant 13 units higher than that recorded by the previous late summer survey (Figure 5).

The numerical dominance by two 'moderately sensitive' taxa in particular resulted in the relatively high $SQMCI_S$ value of 4.9 units. This was 0.6 unit higher than the median for this site and equal with the highest score recorded to date at this site (Table 2).

These results indicated that the macroinvertebrates communities present at this site in the Mangaone Stream under spring moderate flow conditions were of typical 'fair' health (see TRC, 2013), but an improvement on the 'poorer' health found by the previous late summer survey.

20m downstream of Manganaha Stream confluence (site 16)

A moderately high richness (24 taxa) was recorded at this site, which was above the long term median for this site, far more than that recorded by the previous late summer survey, and three taxa more than found at the upstream site 12 (Figure 6, Table 2).

There was one 'highly sensitive' taxon present in the community at this site (although only as a rarity). The community was dominated by three 'tolerant' taxa [oligochaete worms, snail (*Potamopyrgus*), and orthoclad midges] and four 'moderately sensitive' taxa [mayflies (*Austroclima* and *Zephlebia* group), amphipod (*Paracalliope*), and free-living caddisfly (*Hydrobiosis*)].

There were several significant changes in individual taxon abundances between adjacent sites 12 and 16 with the most significant including reduced abundances of one 'moderately sensitive' taxon [paraleptamphopid amphipods] and increased abundance of one very 'tolerant' taxon [oligochaete worms]. The changes recorded at this site (when compared with site 12) were coincident with the increase in periphyton substrate cover at the downstream site, increased hard-gravel substrate, and the resultant change in sampling technique.

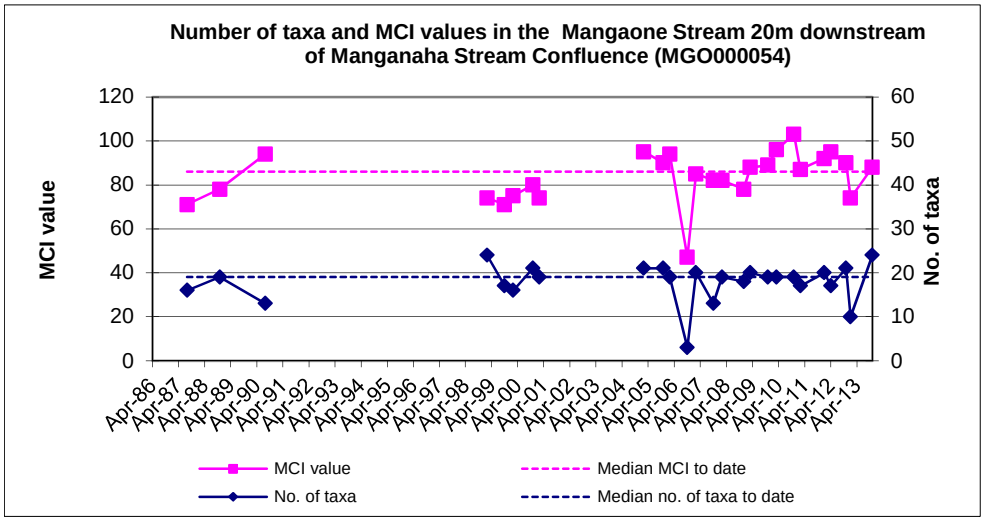


Figure 6 Numbers of taxa and MCI values for the Mangaone Stream downstream of the confluence with Manganaha Stream since 1987

The community was comprised of equal proportions of 'tolerant' and 'sensitive' taxa (50%), resulting in an MCI score of 88 units. This score was a insignificant three units higher than the median for this site and well within the range of previous scores for this site. This score was also an insignificant three units lower than the score at the upstream 'control' site 12 but a significant (Stark, 1998) 14 units more than recorded by the previous late summer survey.

The numerical dominance by 'tolerant' snails and one 'sensitive' taxon (amphipods) resulted in the moderately high $SQMCI_s$ score of 4.5 units, which was 0.3 unit higher than the median of past values at this site, and equal with the $SQMCI_S$ score recorded at this site by the late summer survey (Table 2). This indicated improved health of the community which was in the 'fair' generic MCI category (TRC, 2013) at the time of these spring moderate flow conditions.

Mangaone Stream 300m downstream of Puremu Stream confluence (site 14)

Taxa richness (18 taxa) at this site in the Mangaone Stream, downstream of the Puremu Stream confluence and discharges from Taranaki Sawmills and Viterra (Figure 1), was lower than at the site directly upstream and also that at the 'control' site at Egmont Road (Table 2). However, richness was six taxa more than recorded by the previous late summer survey, and higher than the long term median for this site. Previous reports have suggested that the sporadic observations of low community richnesses at this site may have been related to preceding toxic discharges. The current survey results don't appear to reflect a similar recent occurrence but there was some increase in sedimentation at this site adjacent to more recent bank stabilisation works.

Earlier surveys had noted extensive filamentous algal growth at this site. Although not as apparent during several more recent surveys, such growth again was widespread during the current survey. This may indicate that the surveyed riffle has become more stabilised with reduced substrate turnover during high flows, allowing for greater periphyton establishment.

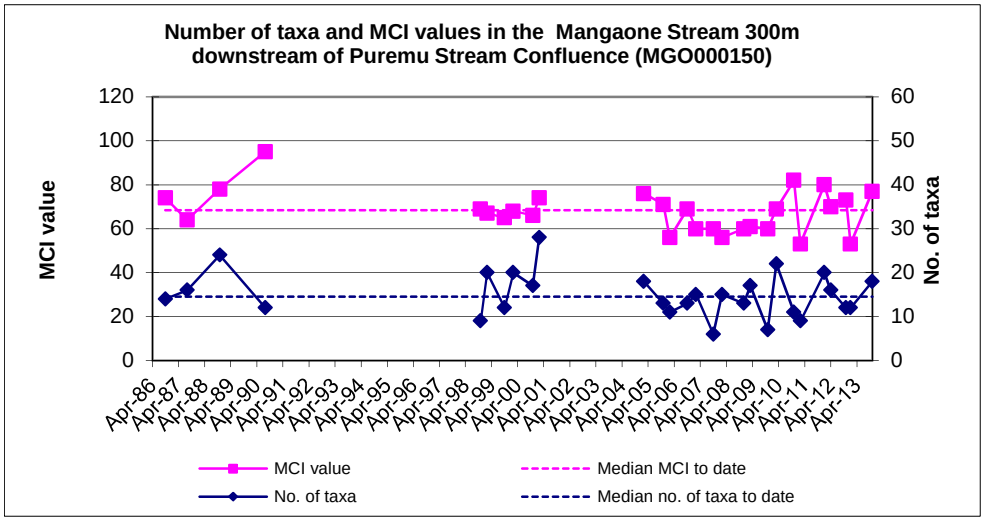


Figure 7 Numbers of taxa and MCI values for Mangaone Stream downstream of the confluence with Puremu Stream since 1986

There were no 'highly sensitive' taxa found in the community which was dominated by only three 'tolerant' taxa [oligochaete worms, snail (*Potamopyrgus*), and orthoclad midges]. Only five 'moderately sensitive' taxa were present in this community and only in low numbers. This was four taxa more than recorded by the previous late summer survey. There were seven significant individual taxon abundance differences between adjacent sites, the most significant being reduced abundances of two 'moderately sensitive' taxa.

The increased proportion of 'tolerant' taxa in the community (61% of taxa richness) resulted in a 'poor' MCI score of 77 units. However, this represented a significant (Stark, 1998) 24 units increase from the score recorded by the previous late summer survey and was nine units higher than the long term median and higher than that recorded by twelve of the last fourteen surveys (Figure 7). Although this represented some improvement in health for this site, it was a significant decrease of 11 MCI units (Stark, 1998) compared to the score at site 16 upstream, typical of the trend at this site.

The numerical dominance by 'tolerant' taxa (particularly worms and midges) was reflected in the low $SQMCI_s$ value of 2.5 units which was significantly lower than that recorded at the nearest upstream site 16, but equivalent with the median score for this site. It may have reflected better stability of the substrate (and increased periphyton cover) at this site where algal-associated snails were also very abundant.

Overall, the significant reduction in MCI and $SQMCI_S$ scores at site 14, due to losses and/or reduced abundances of several 'moderately sensitive' taxa, may be considered to have been related to the poorer habitat compared with that at the upstream site (16), but possibly as a result of industrial discharges contributing to this deterioration.

100 m downstream of the fertilizer depot (site 15)

An increased, moderately high richness (23 taxa) was recorded at this site, 100 m downstream of the discharges from the fertilizer depot. This richness was well above the median historical richness and three taxa more than the maximum recorded over the survey period to date (Table 2).

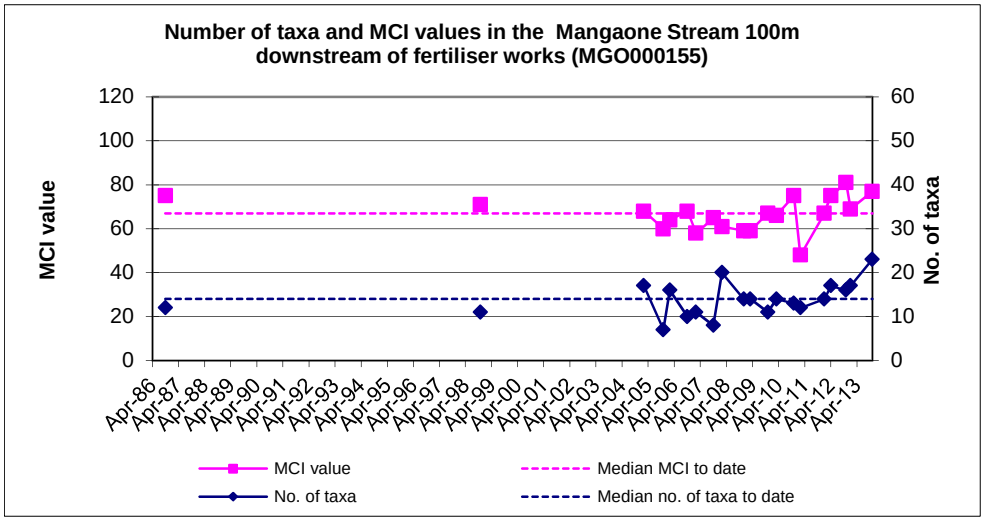


Figure 8 Numbers of taxa and MCI values for Mangaone Stream 100 m downstream of the fertilizer works/depot since 1986

The community was dominated by the same taxa as those characteristic at site 14 upstream with the addition of one 'moderately sensitive' taxon [amphipod (*Paracalliope*)]. No significant individual taxon abundance differences were recorded between sites 14 and 15. This was coincident with similar periphyton cover observed at this site. Mats and filamentous algae, which tend to support communities having higher proportions of 'tolerant' taxa, were patchy and widespread respectively at site 15 in the current survey, and there was a marked increase in harder substrate (cobbles and boulders) and reduction in gravels.

The predominance of 'tolerant' taxa (61% of richness) in this community was reflected in the 'poor' MCI score of 77 units. This was an insignificant (Stark, 1998) 10 units higher than the historical median for this site, but amongst the highest previous scores, and equal with the score recorded at the nearest upstream site (14). This was also eight units higher than the MCI score recorded in the previous late summer survey at this site. This indicated that the community had improved health, but that overall, health was still 'fair', coincident with the extensive algal biomass which could have been due to nutrient inputs from the fertiliser

depot. The improvement in biological health at site 15 in the current late spring survey may have been related to some reduction in algal biomass indicative of reduced impacts of groundwater inputs from the fertiliser depot.

The numerical dominance by 'tolerant' taxa (particularly one snail taxon) resulted in the $SQMCI_S$ value of 3.5 units, 1.3 units higher than the median for this site, and within 0.3 unit of the maximum of previously recorded scores at this site. This score was 1.0 unit above that recorded upstream, atypical of the trend of downstream deterioration observed by most previous surveys, but this score remained indicative of the poorer communities present downstream of the Puremu Stream confluence.

Rifle Range Road (site 11)

The poorer faunal richness (14 taxa) found at this site was coincident with the extensive periphyton substrate cover and presence of aquatic vegetation. This richness was very similar to the long term median for this site (Table 2 and Figure 9), and similar to that recorded by the previous late summer survey. Most recent surveys have shown poorer communities possibly as a result of a combination of factors. These include occasional inundation by high flows in the adjacent Waiwhakaiho River (slowing flows which provide an unsuitable habitat for riffle-dwelling invertebrates (see BJ192) and a lack of downstream drift recruitment of typical stony habitat taxa as the majority of the upstream habitat is softer-bottomed and more weedy. Deterioration in physicochemical water quality between sites 12 and 11 may also have been a factor, as this reach, which runs through an industrial catchment, receives several stormwater discharges including localised run-off.

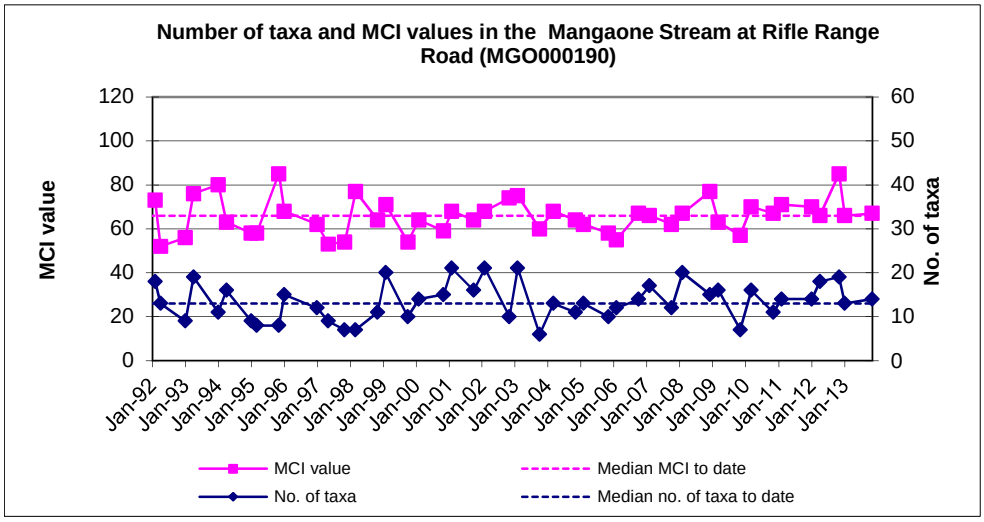


Figure 9 Numbers of taxa and MCI values for Mangaone Stream at Rifle Range Road since 1992

The community was dominated by only three taxa, all 'tolerant' taxa [oligochaete worms, snail (*Potamopyrgus*), and orthoclad midges]. As typically has been recorded, there was a significant contrast in dominant taxa between this site and the upstream 'control' site (12). In addition, there was a significant difference in taxa composition, with only six taxa common to both sites from a total of 28 taxa found at these two sites (12 and 11).

The predominance (71% of taxa number) of 'tolerant' taxa in the community was reflected in the 'poor' MCI score of 67 units, although this was within one unit of the historical median

(Table 2) and one unit above the score found by the previous late summer survey. This was a significant (Stark, 1998) 24 units lower than the score recorded at site 12, and a ten unit decrease from the score at the nearest upstream site (16).

While no 'moderately sensitive' taxa were found in abundance, two very abundant 'tolerant' taxa contributed to the low SQMCI$_S$ value of 2.4 units. This exceeded the long term median SQMCI$_S$ score by 0.5 unit and was within the range of previous scores. However it was lower than the SQMCI$_s$ scores recorded at the nearest upstream sites 14 and 15 by 0.1 to 1.1 units.

There was significant deterioration in SQMCI$_s$ (and MCI) between sites 16 and 14, and therefore sites 16 and 11, which was more related to the deterioration in habitat, with an influence also from the increase in algal substrate cover and aquatic vegetation downstream of the fertiliser depot.

General comments

The longitudinal trends in the number of taxa, MCI and SQMCI$_s$ values along the reach of the Mangaone Stream surveyed in November 2013 are illustrated in Figure 10.

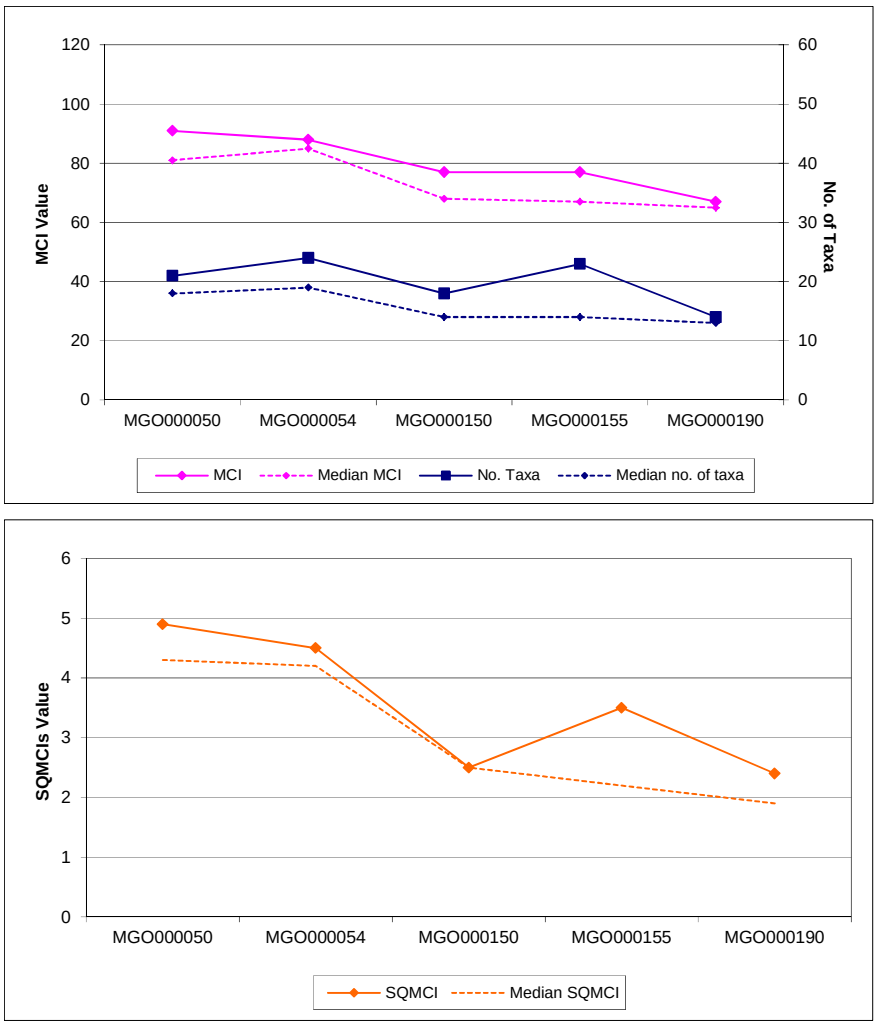


Figure 10 Longitudinal trend in number of taxa, MCI and SQMCI$_S$ values in the Mangaone Stream for the survey of 15 November 2013

The number of taxa tended to decrease in a downstream direction (with the exception of site 15), a more typical result for this stream. The highest richnesses usually have been found at the two sites in the upper reaches of the stream with site 16 recording the highest taxa richness of the current survey. The MCI was also variable, but generally showed a decreasing trend, through the mid reaches without the recovery more recently found in the lower reaches. All sites showed scores higher than historical median scores, more typical of biological communities found under moderate, cooler flow conditions in spring.

When considering changes in community structure, the $SQMCI_S$ (which takes into account changes in the abundance of taxa, as well as their sensitivity to pollution) was found to follow a relatively similar pattern to the MCI score in the upper reaches with a more pronounced decrease in mid reaches and minimal recovery through the lower reaches. All sites recorded $SQMCI_S$ scores slightly higher than or equal with their historical medians, with site 15 recording the greatest improvement due to an extreme abundance of snails amongst the extensive periphyton substrate cover at this site.

Summary and conclusions

The Council's standard 'kick-net' and 'sweep-net' sampling techniques were used to collect streambed macroinvertebrates at three sites in the Waiwhakaiho River and five sites in the Mangaone Stream on 15 November 2013, in order to assess whether discharges from the Lower Waiwhakaiho Industrial area had had any adverse effects on the macroinvertebrate communities of these streams. Samples were processed to provide number of taxa (richness), MCI and $SQMCI_S$ scores for each site.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The $SQMCI_S$ takes into account taxa abundances as well as sensitivity to pollution. It may indicate subtle changes in communities, and therefore be the more relevant index if non-organic impacts are occurring. Significant differences in either the MCI or $SQMCI_S$ between sites indicate the degree of adverse effects (if any) of the discharges being monitored.

This survey found that all Waiwhakaiho River sampling sites recorded community richnesses similar to or within four taxa of long term medians for their respective sites. There was no trend in richness in a downstream direction, but there was a typical downstream decrease in MCI scores between the sites. In addition, all sites recorded MCI scores insignificant different from their respective medians, and $SQMCI_S$ scores similar to their medians with the exception of a much lower value at the furthest downstream site. Communities in the Waiwhakaiho River downstream of Lake Rotomanu may be inhibited from time-to-time by the variable current speeds caused by tidal flooding. These results did not indicate any significant effects of stormwater or wastewater discharges from the Fitzroy industrial area on the macroinvertebrate communities of the Waiwhakaiho River, although it is possible that the Mangaone Stream was contributing to the increased algal growth observed downstream of the confluence where there was a decrease in the number of more 'sensitive' taxa characteristic of the community.

It is apparent that the macroinvertebrate communities in the Mangaone Stream were of 'fair' health in the upper reaches deteriorating to 'poor' health in a downstream direction. Most

sites had moderate taxa richnesses, while MCI scores and $SQMCI_S$ scores were above or near to medians at all sites, significantly so for sites 12 and 15. However, the five sampling sites in the Mangaone Stream showed a marked decline in MCI and $SQMCI_S$ values between Egmont Road (site 12) and Rifle Range Road (site 11), with a particularly marked decline in both $SQMCI_S$ and MCI scores between sites 16 and 14. Taranaki sawmills discharges stormwater to the Mangaone Stream between sites 16 and 14, and sediment sampling undertaken in early 2009 had recorded significant concentrations of not only tributyltin in the stream sediments around Taranaki Sawmills, but also elevated concentrations of arsenic, chromium, copper and zinc, all potentially toxic to aquatic biota (see BJ192). Previously there had been increased sedimentation between sites 16 and 14 and sediment sampling undertaken in April 2012, showed less contamination than that recorded in the 2009; more indicative of physical habitat induced effects, rather than a recently preceding toxic discharge. There was no change in MCI score between sites 14 and 15 but further deterioration in the lower reaches, most likely due to poorer habitat. Increased downstream algal biomass and aquatic vegetation within the stream may have been indicative of impacts from groundwater inputs from the fertiliser depot.

The degree of decline in $SQMCI_S$ values was relatively typical for this stream although most sites recorded values slightly in excess of their respective medians. The greatest historical MCI improvement was recorded at sites 12 (Egmont Road) and 15, downstream of the fertiliser depot. The latter improvement was coincident with increased, more stable hard substrate observed at site 15.

Overall, the results from the current survey indicated some improvements in comparison with historical results. It appears that in general the degree of sediment contamination in the Mangaone Stream downstream of the Taranaki Sawmills discharge has been reducing, although poorer downstream biological health was found by the current survey. Groundwater inputs may have contributed to some of this deterioration recorded immediately downstream of the fertiliser depot in the lower reaches of the stream, particularly the paucity of 'sensitive' taxa.

References

TRC Internal Reports

Dunning K, 2002a: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, October 2001. TRC report KD87.

Dunning K, 2002b: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2002. TRC report KD114.

Fowles CR and Colgan BG, 2004: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, October 2003. TRC report CF336.

Fowles CR, Colgan BG and Moore SC, 2004: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2004. TRC report CF340.

Fowles CR and Colgan BG, 2005: Biomonitoring of the Lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2004. TRC report CF366.

Fowles CR and Jansma B, 2008a: Biomonitoring of the Lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, October 2007. TRC report CF450.

Fowles CR and Jansma B, 2008b: Biomonitoring of the Lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2008. TRC report CF451

Jansma, B, 2006: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2005. TRC report BJ009.

Jansma, B, 2006: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, October 2006. TRC report BJ015.

Jansma, B, 2007: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2007. TRC report BJ029.

Jansma, B, 2009a: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, December 2008. TRC report BJ084.

Jansma, B, 2009b: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, March 2009. TRC report BJ085.

Jansma, B, 2010a: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2009. TRC report BJ120.

Jansma, B, 2010b: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, March 2010. TRC report BJ121.

Jansma, B, 2011a: Fish kill assessment and biomonitoring of the Mangaone Stream in relation to a discharge of hydrolysed urea, February 2011. TRC Report BJ135.

Jansma, B, 2011b: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2010. TRC report BJ136.

Jansma, B, 2011c: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2011. TRC report BJ137.

Jansma, B, 2013a: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, January 2012. TRC report BJ191.

Jansma, B, 2013b: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, April 2012. TRC report BJ192.

Jansma, B and Fowles, CR, 2014: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2012. TRC report CF618.

Jansma, B and Fowles, CR, 2014: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, January/February 2013. TRC report CF619.

Hope, K. 2005: Biomonitoring of the Lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2005. TRC report KH028.

Hope, K. 2006: Biomonitoring of the Lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2006. TRC report KH085.

McWilliam H, 2001a: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2000. TRC report HM235.

McWilliam H, 2001b: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2001. TRC report HM245.

Moore SC, 2003: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2002. TRC report SM574.

Moore SC, 2003: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2003. TRC report SM582.

TRC, 1998: Some statistics from the Taranaki Regional Council database (FWB) of freshwater macroinvertebrate surveys performed during the period from January 1980 to 31 December 1998. (SEM reference report). TRC technical report 99-17.

TRC, 2013: Fresh water macroinvertebrate fauna biological monitoring programme Annual SEM Report: 2012-2013, Technical Report 2013-48.

External publications

Stark JD, 1985: A macroinvertebrate community index of water quality for stony streams. *Water and Soil* Miscellaneous Publication No. 87.

Stark JD, 1998: SQMCI: a biotic index for freshwater macroinvertebrate coded abundance data. *New Zealand Journal of Marine and Freshwater Research 32(1*): 55-66.

Stark JD, 1999: An evaluation of TRC's SQMCI biomonitoring index. Cawthron Institute, Nelson. Cawthron Report No. 472.

Stark JD, Boothroyd IKG, Harding JS, Maxted JR, Scarsbrook MR, 2001: Protocols for sampling macroinvertebrates in wadeable streams. New Zealand Macroinvertebrate Working Group Report No. 1. Prepared for the Ministry for the Environment. Sustainable Management Fund Project No. 5103. 57p.

Stark, JD and Fowles, CR 2009: Relationships between MCI, site altitude, and distance from source for Taranaki ringplain streams. Stark Environmental Report No. 2009-01. 47 pp.

To L Smith, Scientific Officer
From B Jansma and CR Fowles, Scientific Officers
Document 1415717
Report No. CF621
Date 10 October 2014

Biomonitoring of the Lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2014

Introduction

This was the second of two scheduled surveys in the 2013-2014 monitoring programme, for the combined industries of the Fitzroy industrial area. Results from surveys performed since the 2000-2001 monitoring years are discussed in several reports referenced at the end of this report. The monitoring related to the wastewater/stormwater discharge permits tabulated below:

Consent holder	Consent No
Ravensdown	3140,3865
Firth Industries	0392
Hooker Brothers	3141
NPDC (Stormwater)	3138,1126,1275
NPDC (Bewley Road)	4984
TranzRail	1735,3528
Farmlands	4548
Allied Concrete Ltd	4539
Taranaki Sawmills	3491
Technix Group Ltd	0021,0291,2230
Works Infrastructure Ltd	3917

Methods

On 14 February 2014, the standard '400 ml kick sampling' technique was used to collect streambed macroinvertebrates from three sites in the lower Waiwhakaiho River and on 13 February 2014 from four sites in the Mangaone Stream, while the standard '400 ml sweep-sampling' technique was used to collect streambed macroinvertebrates from site 12 and a combination of the two techniques from site 16 in the Mangaone Stream (Table 1, Figure 1). The 'sweep-net- sampling technique is very similar to Protocol C2 (soft-bottomed, semi-quantitative), and the 'kick-sampling' technique is very similar to Protocol C1 (hard-bottomed, semi-quantitative), of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark *et al*, 2001).

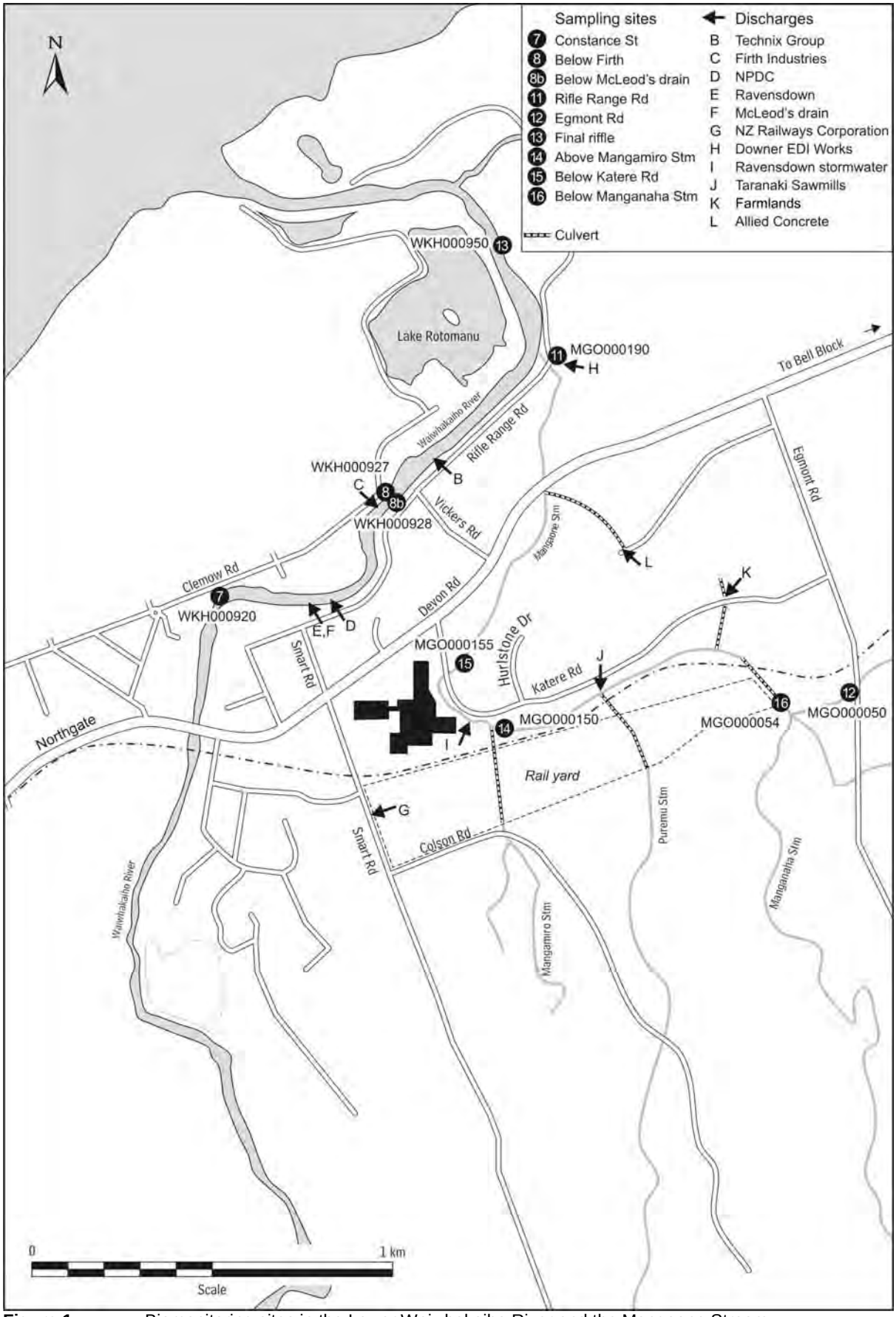


Figure 1 Biomonitoring sites in the Lower Waiwhakaiho River and the Mangaone Stream

The three sites from the Waiwhakaiho River used in this survey have been sampled biannually in recent years. In the Mangaone Stream, two sites have been sampled biannually in the past with sampling of the other three sites (14, 15 and 16) biannually since February 2005.

Table 1 Biomonitoring sites in the Lower Waiwhakaiho River and the Mangaone Stream

Site No	Site Code	Location
7	WKH000920	Waiwhakaiho River, Constance Street
8	WKH000927	Waiwhakaiho River, below Firth industries, west (left) bank
13	WKH000950	Waiwhakaiho River, final riffle downstream of Lake Rotomanu
12	MGO000050	Mangaone Stream, Egmont Road
16	MGO000054	Mangaone Stream, 20m d/s of Manganaha Stream confluence
14	MGO000150	Mangaone Stream, 300m d/s confluence with Puremu Stream
15	MGO000155	Mangaone Stream, 100m d/s fertiliser depot
11	MGO000190	Mangaone Stream, Rifle Range Road

Samples were preserved with Kahle's Fluid for later sorting and identification under a stereomicroscope according to Taranaki Regional Council methodology using protocol P1 of NZMWG protocols for sampling macroinvertebrates in wadeable streams (Stark et al. 2001). Macroinvertebrate taxa found in each sample were recorded as:

R (rare)	= less than 5 individuals;
C (common)	= 5-19 individuals;
A (abundant)	= estimated 20-99 individuals;
VA (very abundant)	= estimated 100-499 individuals;
XA (extremely abundant)	= estimated 500 individuals or more.

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams. Highly 'sensitive' taxa were assigned the highest scores of 9 or 10, while the most 'tolerant' forms scored 1. Sensitivity scores for certain taxa have been modified in accordance with Taranaki experience. Averaging the scores assigned to the taxa found at a site, and multiplying the average by a scaling factor of 20 produces a Macroinvertebrate Community Index (MCI) value.

The MCI was designed as a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. MCI results can also reflect the effects of warm temperatures, slow current speeds and low dissolved oxygen levels, because the taxa capable of tolerating these conditions generally have low sensitivity scores. Usually more 'sensitive' communities (with higher MCI values) inhabit less polluted waterways. The use of this index in non-stony streams (such as the Mangaone Stream site 12) is possible if results are related to physical habitat (e.g. good quality muddy/weedy sites tend to produce lower MCI values than good quality stony sites).

A semi-quantitative MCI value ($SQMCI_S$) has also been calculated for the taxa present at each site by multiplying each taxon score by a loading factor (related to its abundance), totalling these products, and dividing by the sum of the loading factors (Stark, 1998 and 1999. The loading factors were 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 $SQMCI_S$ is not multiplied by a scaling factor of 20, therefore $SQMCI_S$ values range from 1 to 10, while MCI values range from 20 to 200.

Results and discussion

The February 2014 survey was performed during moderate flow conditions (18 days since the last fresh of three times median flow and 19 days after seven times the median flow in the Waiwhakaiho River). The flow at all three sampling sites in the Waiwhakaiho River was clear and uncoloured at the time of this survey. Periphyton mats and filamentous algae were patchy at all sites. Water temperatures in the Waiwhakaiho River ranged from 19.3 to 20.0°C at the time of this mid-day survey. Substrate at all three sites was comprised predominantly of cobbles and boulders, with gravels also being an important component.

Photos 1 & 2 Thick filamentous algal substrate cover and marginal aquatic vegetation at site 11, February 2014

The low flow at sites 12 and 16 and moderate flow at the other three sites in the Mangaone Stream were also uncoloured and clear. The cloudiness often recorded in the Mangaone Stream at the sites downstream of the Manganaha Stream, was not observed on this survey occasion. Site 12 had a slow flow, site 16 had a steady water speed, while water speed was swift at sites 14, 15, and 11. Periphyton cover, which was confined to thin mats at site 12, increased in a downstream direction, with a slippery film and patchy filaments present at site 16, and patchy mats and filaments at sites 14 and 15, while site 11 had patchy mats and widespread filaments (see Photos 1 and 2). Aquatic macrophytes were common in the stream at sites 12, 14, and 15 and at the stream margins at sites 16 and 11. Vegetation clearance from the banks adjacent to site 16 had altered habitat (less shading). An observation made at the time of the March 2009 survey at site 11, was that the Waiwhakaiho River may have backed up the Mangaone Stream, reducing the flushing potential of the previous fresh. This was confirmed in 2010 (see photos in BJ192), and is likely to be a common feature of larger floods in this catchment.

Samples were collected from all sites using the kick sampling technique, except for site 12, as this was mainly a weedy, silty site and site 16 where some of the marginal vegetation was sweep-sampled as well. The substrate at site 12 was comprised entirely of silt, with gravels, sand and silt predominant at site 16. The substrate at site 14 was comprised mainly of silt, sand, and gravels (with some cobbles and boulders), whereas at sites 15 and 11 it comprised mainly gravels and cobbles with a greater proportion of cobbles at site 11 and boulders at site 15. Water temperatures at the time of this late morning-early afternoon survey in the Mangaone Stream ranged from 17.5° to 19.0°C.

Macroinvertebrate communities

A summary of taxa numbers and MCI values from previous surveys performed in the Waiwhakaiho River and the Mangaone Stream in relation to the Fitzroy industrial area are

presented in Table 2 together with current results. The full results of the survey are presented in Table 3 (Waiwhakaiho River) and Table 4 (Mangaone Stream).

Table 2 Numbers of taxa and MCI and SQMCI$_S$ values recorded in previous surveys performed in the Waiwhakaiho River and Mangaone Stream since July 1983 in relation to the Fitzroy industrial area, together with the results of the survey of 13 and 14 February 2014

Location	Site No.	Numbers of taxa				MCI values			SQMCI$_S$ Values			
		N	Median	Range	Current	Median	Range	Current	N	Median	Range	Current
Waiwhakaiho River	7	55	20	12-29	25	89	66-110	90	31	3.3	1.7-7.3	3.2
	8	53	21	13-30	23	87	69-115	84	31	3.3	1.8-6.3	3.7
	13	46	20	12-30	20	87	67-111	77	31	2.7	1.6-7.4	2.6
Mangaone Stream	12	43	18	8-28	23	81	66-95	81	31	4.3	2.4-4.9	4.6
	16	26	19	3-24	26	86	47-103	85	23	4.2	1.2-5.5	4.4
	14	28	15	6-28	25	69	53-95	77	24	2.5	1.1-3.7	3.4
	15	20	14	7-23	17	67	48-81	68	19	2.2	1.5-3.8	3.8
	11	48	13	4-21	17	66	50-85	62	31	1.9	1.5-3.6	2.6

Table 3 Macroinvertebrate fauna of the Waiwhakaiho River in relation to the Fitzroy industrial area sampled on 14 February 2014

Taxa List	Site Number	MCI score	7	8	13
	Site Code		WKH000920	WKH000927	WKH000950
	Sample Number		FWB14121	FWB14122	FWB14123
NEMERTEA	Nemertea	3	-	R	C
NEMATODA	Nematoda	3	R	-	-
ANNELIDA (WORMS)	Oligochaeta	1	VA	A	VA
	Lumbricidae	5	C	R	R
MOLLUSCA	*Physa*	3	R	-	-
	Potamopyrgus	4	A	A	VA
CRUSTACEA	Ostracoda	1	-	R	-
	Paratya	3	-	-	VA
EPHEMEROPTERA (MAYFLIES)	*Austroclima*	7	R	-	-
	Coloburiscus	7	R	-	R
	Deleatidium	8	A	R	-
	Ichthybotus	8	R	-	-
	Zephlebia group	7	R	-	-
HEMIPTERA (BUGS)	*Saldula*	5	-	R	-
COLEOPTERA (BEETLES)	Elmidae	6	C	A	A
	Staphylinidae	5	-	R	-
MEGALOPTERA (DOBSONFLIES)	*Archichauliodes*	7	R	R	C
TRICHOPTERA (CADDISFLIES)	*Aoteapsyche*	4	VA	VA	VA
	Costachorema	7	-	R	-
	Hydrobiosis	5	A	A	C
	Neurochorema	6	-	R	-
	Oxyethira	2	A	A	C
	Pycnocentrodes	5	R	R	-
DIPTERA (TRUE FLIES)	*Aphrophila*	5	C	C	C
	Maoridiamesa	3	C	R	C
	Orthocladiinae	2	A	A	XA
	Tanytarsini	3	A	C	C
	Empididae	3	C	R	R
	Ephydridae	4	C	A	R
	Muscidae	3	A	C	C
	Austrosimulium	3	R	-	R
	Tanyderidae	4	R	-	R
		No of taxa	25	23	20
		MCI	90	84	77
		SQMCIs	3.2	3.7	2.6
		EPT (taxa)	8	6	3
		%EPT (taxa)	32	26	15
'Tolerant' taxa	'Moderately sensitive' taxa		'Highly sensitive' taxa		

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

Waiwhakaiho River

Constance Street (site 7)

A moderate taxa richness (25 taxa) was found at this site, upstream of all discharges from the Fitzroy industrial area. This was five taxa more than the median richness for this site (Table 2 and Figure 2), but within the range of previous richnesses.

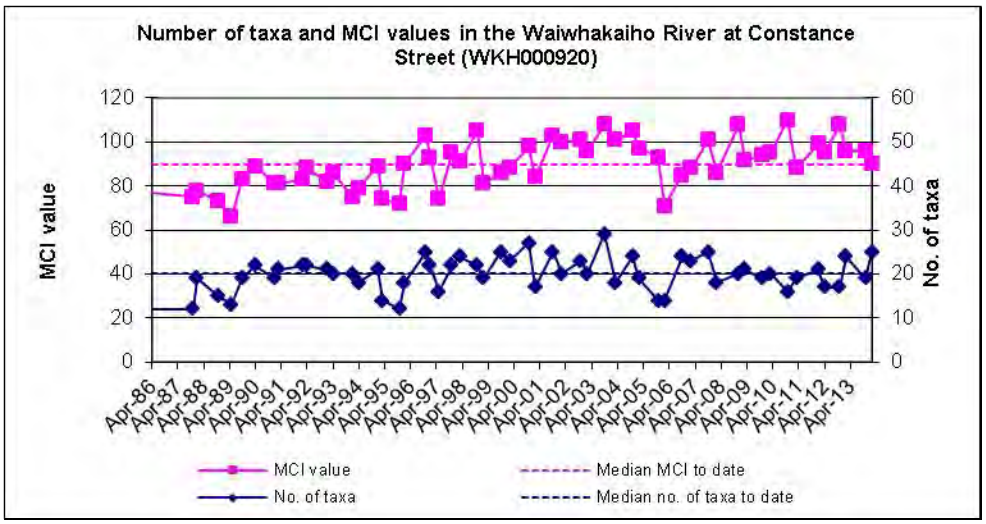


Figure 2 Numbers of taxa and MCI values for Waiwhakaiho River at Constance Street since 1987

Two 'highly sensitive' taxa were present, one of which was recorded as abundant, reflecting good preceding physicochemical water quality. The community was characterised by seven 'tolerant' taxa [oligochaete worms, snail (*Potamopyrgus*), net-building caddisfly (*Aoteapsyche*), algal-piercing caddisfly (*Oxyethira*), midges (tanytarsids and orthoclads), and muscid flies]; one 'moderately sensitive' taxon [free-living caddisfly (*Hydrobiosis*)]; and the aforementioned 'highly sensitive' taxon [mayfly (*Deleatidium*)]. This was a marked increase in the number of 'tolerant' taxa compared with the characteristic taxa of the earlier spring (2013) survey community.

The lower proportion of 'sensitive' taxa (44% of richness) present in the community was reflected in the MCI score of 90 units, an insignificant one unit higher than the median score for this site (Table 2, Figure 2). This was six units less than the previous spring survey score, and slightly lower (by 5 to 7 units) than predictive values (Stark and Fowles, 2009) for this site situated in the lower reaches of a ringplain river (TRC, 2013).

The $SQMCI_S$ value of 3.2 units was 0.1 unit below the median value for this site, more typical of values for the lower reaches of ringplain streams and rivers subject to nutrient enrichment. This score reflected the numerical dominance by mainly 'tolerant' taxa, particularly very 'tolerant' oligochaete worms and 'tolerant' net-building caddisfly, and was equal with the previous spring survey score at this site.

Below Firth Industries, left bank (site 8)

This site also had a moderate community richness (23 taxa), two taxa more than the historical median at this site, but within the range of scores previously recorded (Table 2 and Figure 3).

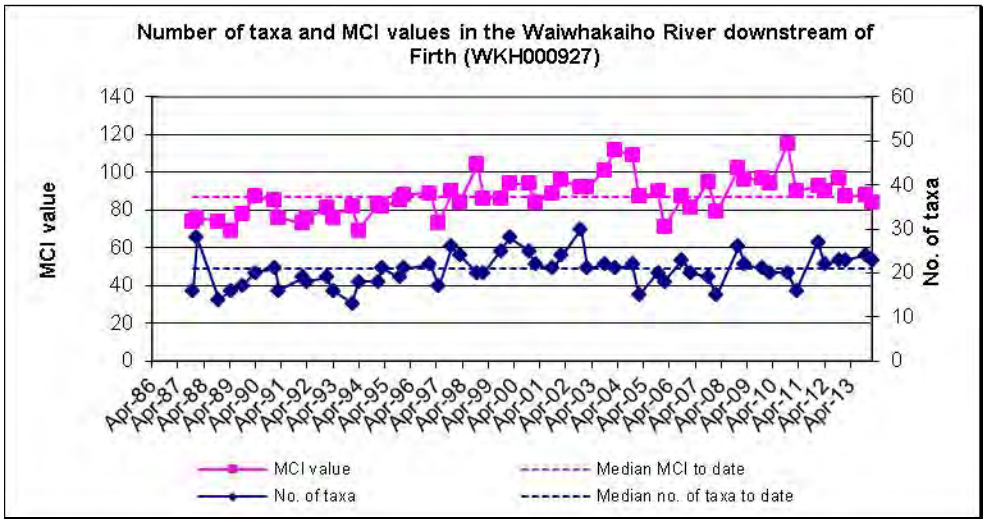


Figure 3 Numbers of taxa and MCI values for Waiwhakaiho River below Firth Industries (left bank) since 1987

Only one 'highly sensitive' taxon was found at this site. The community was characterised by eight taxa; six 'tolerant' taxa [oligochaete worms, snail (*Potamopyrgus*), net-building caddisfly (*Aoteapsyche*), algal-piercing caddisfly (*Oxyethira*), orthoclad midges, and ephydrid shore flies] and two 'moderately sensitive' taxa [elmid beetles and free-living caddisfly (*Hydrobiosis*)]. These characteristic taxa were almost identical to those recorded at the upstream site (7) in terms of 'tolerant' taxa but dissimilar for the 'sensitive' taxa. They also represented an increased number of 'tolerant' taxa in comparison with the characteristic community taxa found by the earlier spring (2013) survey.

The significant proportion of 'tolerant' taxa in this site's community (52% of richness) was reflected in the MCI score (84 units). This was four units lower than the score recorded by the previous spring survey (Figure 2) and was three units lower than the median for this site. This was the first survey since summer 2008 to record a below median MCI score. However, the score was an insignificant six units lower than that recorded upstream at site 7, and only one significant change in community composition was recorded. This was a marked decrease in numerical abundance of a 'highly sensitive' mayfly taxon. This score remained a few MCI units lower than predictive scores for such a site in the lower reaches of a ringplain river (Stark and Fowles, 2009). Overall, this indicated that this survey was preceded by relatively good physicochemical water quality conditions at this site although the relatively extensive periphyton substrate cover impacted on aspects of the physical habitat.

Despite the reduced numerical abundance of one 'highly sensitive' taxon, an increased abundance within one 'moderately sensitive' taxon and reduced abundance within one 'very tolerant' taxon contributed to a slightly higher $SQMCI_S$ score (3.7 units), 0.5 unit higher than that recorded upstream at site 7 (Stark, 1998). This was 0.4 unit above the historical median for this site and 0.4 unit higher than the value found by the previous late summer survey.

Downstream of Lake Rotomanu (site 13)

A moderate richness of 20 taxa was also found at this site situated downstream of all industrial discharges to the lower catchment, within a reach where high tides may slow river current speeds (and very occasionally increase salinity) near the mouth. This richness was four taxa more than that recorded by the previous spring survey, equal with the historical

median richness, and three taxa lower than recorded at the site below Firth Industries (8) upstream (Table 2 and Figure 4).

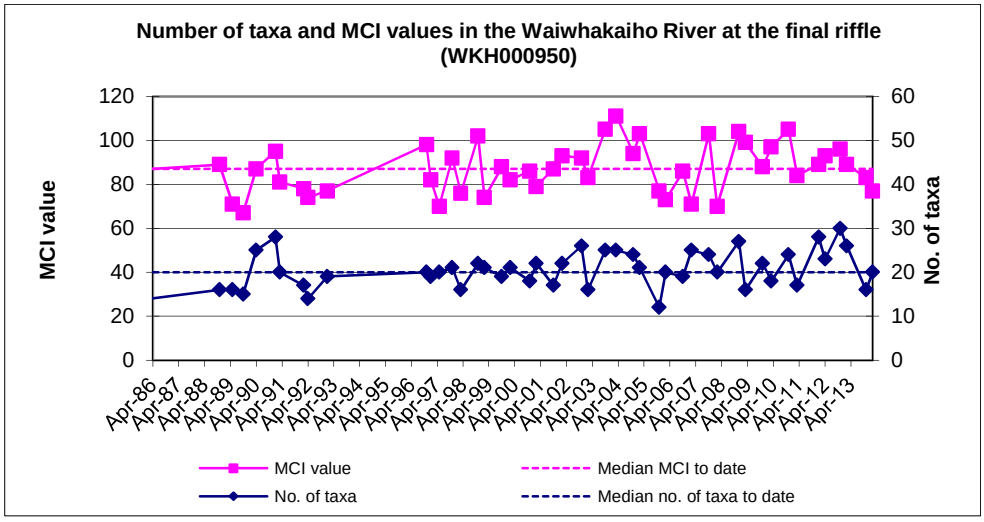


Figure 4 Numbers of taxa and MCI values for Waiwhakaiho River d/s of Lake Rotomanu since 1987

No 'highly sensitive' taxa were recorded while the community was characterised by five 'tolerant' taxa [oligochaete worms, snail (*Potamopyrgus)*, freshwater shrimp (*Paratya*), net-building caddisfly (*Aoteapsyche*), and orthoclad midges]; and one 'moderately sensitive' taxon [elmid beetles] suggesting a subtle deterioration in health from that recorded upstream at sites 7 and 8. However, there were only three significant differences in individual taxon abundances recorded between sites 8 and 13 by the current survey; in particular, marked increases in numbers within two 'tolerant' taxa. This was a relatively typical result for this site in the lower river reaches near the coast.

The high proportion of 'tolerant' taxa in the community at site 13 (75%) was higher than that recorded at site 8, resulting in a lower MCI score of 77 units which was an insignificant ten units lower than the long term median for this site (Figure 4) but significantly lower than predictive values (Stark and Fowles, 2009) for this ring plain site. In addition, a marked increase in the numerical dominance of two 'tolerant' taxa resulted in the lower $SQMCI_S$ value of 2.6 units. This result was a significant 1.1 units lower than that recorded upstream at site 8 but was above the median score for this site (13), and an increase of 0.7 unit above that recorded by the previous spring (2013) survey, coincident with patchy periphyton substrate cover.

Mangaone Stream

Macroinvertebrate samples collected from the two sites at the upper (site 12) and lower (site 11) ends of the surveyed reach in the Mangaone Stream in the past have found distinctly different community compositions at the two sites with much of the variation due to the streambed habitat differences, i.e. sandy-weedy, softer substrate at the upstream site (site 12 at Egmont Road) and harder, stony-gravel substrate at the downstream site (site 11 at Rifle Range Road). Additional sites have been sampled in recent years (in the reach between these historically surveyed sites) to further ascertain why poor water quality is indicated at site 11 at Rifle Range Road despite the improvement in habitat when compared to site 12 upstream of all the industrial discharges.

Table 4 Macroinvertebrate fauna of the Mangaone Stream in relation to the Fitzroy industrial area sampled on 13 February 2014

Taxa List	Site Number	MCI score	12	16	14	15	11
	Site Code		MGO000050	MGO000054	MGO000150	MGO000155	MGO000190
	Sample Number		FWB14114	FWB14115	FWB14116	FWB14117	FWB14118
COELENTERATA	Coelenterata	3	-	-	R	-	-
PLATYHELMINTHES	*Cura*	3	-	-	R	R	R
NEMERTEA	Nemertea	3	-	R	R	-	R
NEMATODA	Nematoda	3	-	-	R	-	R
ANNELID	Oligochaeta	1	R	A	VA	A	VA
	Lumbricidae	5	-	-	R	C	-
HIRUDINE	Hirudinea	3	-	-	R	R	R
MOLLUSCA	*Physa*	3	R	-	C	R	R
	Potamopyrgus	4	XA	XA	XA	XA	XA
	Sphaeriidae	3	-	R	-	-	-
CRUSTACEA	Ostracoda	1	R	R	A	A	VA
	Paracalliope	5	XA	XA	A	A	-
	Paraleptamphopidae	5	VA	C	R	-	-
	Paratya	3	C	R	-	-	-
EPHEMEROPTERA	*Austroclima*	7	C	C	R	-	-
	Coloburiscus	7	-	R	-	-	-
	Zephlebia group	7	C	-	R	-	-
ODONATA	*Xanthocnemis*	4	A	-	-	-	-
HEMIPTERA	*Microvelia*	3	C	-	-	-	-
COLEOPTERA	Elmidae	6	-	C	-	-	-
	Hydrophilidae	5	R	-	-	-	-
MEGALOPTERA	*Archichauliodes*	7	-	R	R	-	-
TRICHOPTERA	*Aoteapsyche*	4	-	-	-	-	R
	Costachorema	7	-	-	R	-	-
	Ecnomidae/Psychomyiidae	6	-	R	-	-	-
	Hydrobiosis	5	-	R	A	C	R
	Neurochorema	6	-	-	-	R	-
	Orthopsyche	9	-	R	-	-	-
	Polyplectropus	6	R	-	-	-	-
	Oxyethira	2	R	A	A	C	XA
	Paroxyethira	2	-	-	-	R	-
	Triplectides	5	VA	C	-	-	-
DIPTERA	*Aphrophila*	5	-	-	C	R	R
	Zelandotipula	6	R	-	-	-	-
	Harrisius	6	-	R	-	-	-
	Maoridiamesa	3	-	-	C	-	C
	Orthocladiinae	2	R	A	A	R	VA
	Polypedilum	3	-	R	R	-	-
	Tanypodinae	5	R	-	-	-	-
	Paradixa	4	A	R	-	-	-
	Empididae	3	R	C	R	-	R
	Ephydridae	4	R	R	-	-	-
	Muscidae	3	-	-	C	C	A
	Sciomyzidae	3	-	R	-	-	-
	Austrosimulium	3	C	C	C	C	-
	Tanyderidae	4	-	R	-	-	-
ACARINA	Acarina	5	R	-	-	R	C
		No of taxa	23	26	25	17	17
		MCI	81	85	77	68	62
		SQMCIs	4.6	4.4	3.4	3.8	2.6
		EPT (taxa)	4	6	4	2	2
		%EPT (taxa)	17	23	16	12	12

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

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

Egmont Road (site 12)

A moderate community richness (23 taxa) was found amongst the vegetation and the soft silt- bottomed habitat of this site. This was five taxa more than the median richness for this site and two taxa more than found by the previous spring (2013) survey (Table 2 and Figure 5). This has not yet indicated a return to continually below median community richness, a trend recorded from 2006 to 2011 (Figure 5).

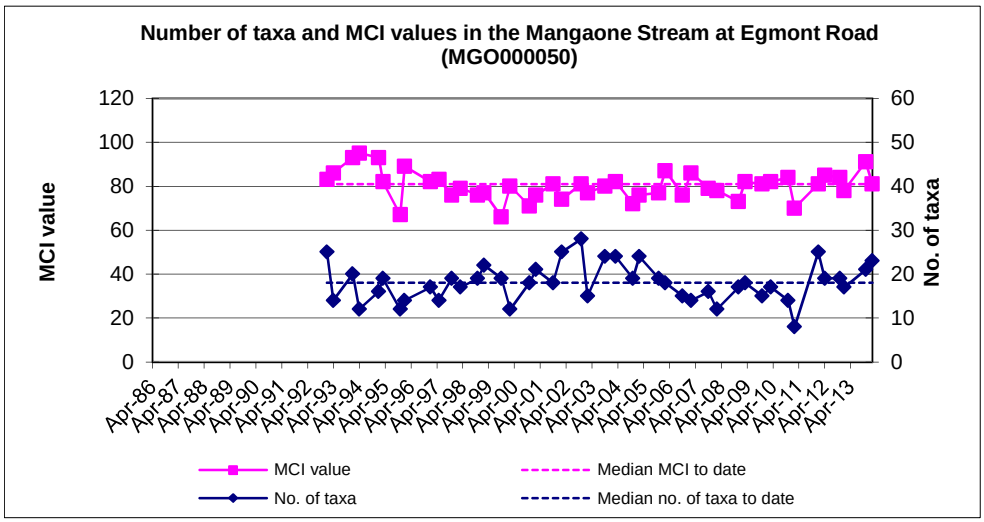


Figure 5 Number of taxa and MCI values for Mangaone Stream at Egmont Road since 1992

No 'highly sensitive' taxa were found in this community (Table 4) which was characterised by six taxa. These were three 'tolerant' taxa [extremely abundant snail (*Potamopyrgus*); damselfly (*Xanthocnemis*), and dixid midges] and three 'moderately sensitive' taxa [amphipods (*Paracalliope* (extremely abundant) and paraleptamphopids), and vegetation-cased caddisfly (*Triplectides*)]. This was typical of the community found at this site which has been characterised by taxa commonly associated with vegetation in lowland streams and/or with softer-bottomed substrates and indicative of moderate physicochemical water quality.

The community was comprised of a relatively high proportion (57%) of 'tolerant taxa resulting in the MCI score of 81 units which was equivalent with the historical median score (Table 2) and an insignificant 10 units lower than that recorded by the previous spring survey (Figure 5).

The numerical dominance shared by one 'moderately sensitive' and one 'tolerant' taxa in particular resulted in the relatively high $SQMCI_S$ value of 4.6 units. This was 0.3 unit higher than the median for this site and within 0.3 unit of the highest score recorded to date at this site (Table 2).

These results indicated that the macroinvertebrate community present at this site in the Mangaone Stream under late summer low flow conditions were of 'fair' health (see TRC, 2013), but with some deterioration in health from that found by the previous spring survey performed under higher, cooler flow conditions.

20m downstream of Manganaha Stream confluence (site 16)

A moderately high richness (26 taxa) was recorded at this site, which was above the long term median for this site, two taxa more than that recorded by the previous spring survey, and three taxa more than found at the upstream site 12 (Figure 6, Table 2).

There was one 'highly sensitive' taxon present in the community at this site (although only as a rarity). The community was dominated by four 'tolerant' taxa [oligochaete worms, extremely abundant snail (*Potamopyrgus*); algal-piercing caddisfly (*Oxyethira*), and orthoclad midges] and only one 'moderately sensitive' taxon [extremely abundant amphipod (*Paracalliope*)], representing a marked reduction in characteristic 'sensitive' taxa compared to the community found by the spring (2013) survey.

There were many significant changes in individual taxon abundances between adjacent sites 12 and 16 with the most significant including reduced abundances of two 'moderately sensitive' taxa [paraleptamphopid amphipods and vegetation-cased caddisfly] and increased abundances of three very 'tolerant' taxa [oligochaete worms, algal-piercing caddisfly, and orthoclad midges]. The changes recorded at this site (when compared with site 12) were coincident with an increase in periphyton substrate cover and decrease in aquatic vegetation, at the downstream site, increased hard-gravel substrate, and the resultant partial change in sampling technique.

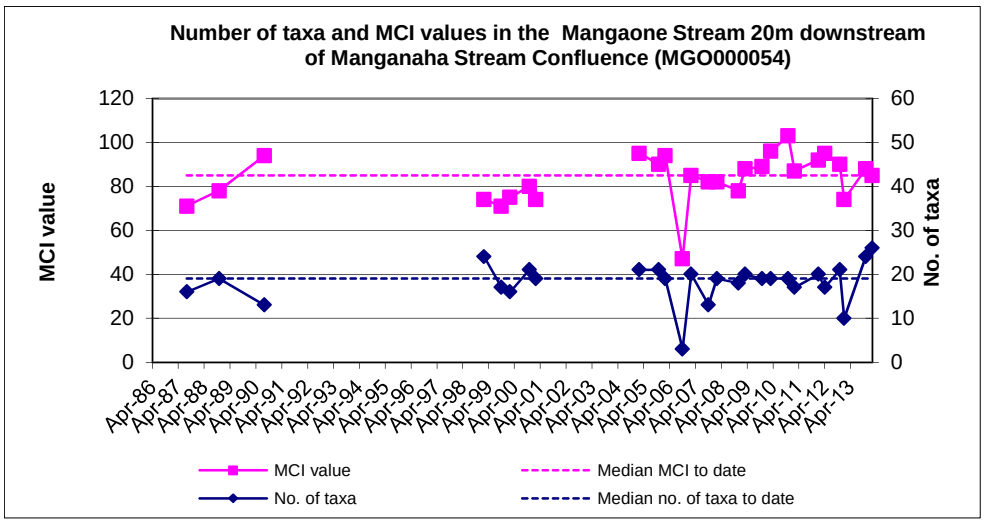


Figure 6 Numbers of taxa and MCI values for the Mangaone Stream downstream of the confluence with Manganaha Stream since 1987

The community was comprised of a significant proportion of 'tolerant' taxa (56%), resulting in an MCI score of 85 units. This score was a insignificant one unit lower than the median for this site and therefore, well within the range of previous scores for this site. This score was also an insignificant four units higher than the score at the upstream 'control' site 12 and an insignificant (Stark, 1998) three units less than recorded by the previous spring survey.

The numerical dominance by 'tolerant' snails and one 'sensitive' taxon (amphipods) resulted in the moderately high $SQMCI_s$ score of 4.4 units, which was within 0.2 unit of the median of past values at this site, and very similar to the $SQMCI_S$ score recorded at this site by the previous spring survey (Table 2). This indicated typical health of the community which was in the 'fair' generic MCI category (TRC, 2013) at the time of these late summer, lower flow conditions.

Mangaone Stream 300m downstream of Puremu Stream confluence (site 14)

Moderately high taxa richness (25 taxa) at this site in the Mangaone Stream, downstream of the Puremu Stream confluence and discharges from Taranaki Sawmills and Farmlands (Figure 1), was very similar to that at the site directly upstream and also that at the 'control'

site at Egmont Road (Table 2). However, richness was seven taxa more than recorded by the previous spring survey, and well above the long term median for this site. Previous reports have suggested that the sporadic observations of low community richnesses at this site may have been related to preceding toxic discharges. The current survey results didn't appear to reflect a similar recent occurrence nor did they reflect impacts of increased sedimentation recorded at this site adjacent to bank stabilisation works in recent years.

Earlier surveys had noted extensive filamentous algal growth at this site. Although not as apparent during several more recent surveys, such growth was patchy at the time of the current survey and aquatic vegetation was also present. This may indicate that the surveyed riffle has become more stabilised with reduced substrate turnover during high flows, allowing for greater periphyton establishment.

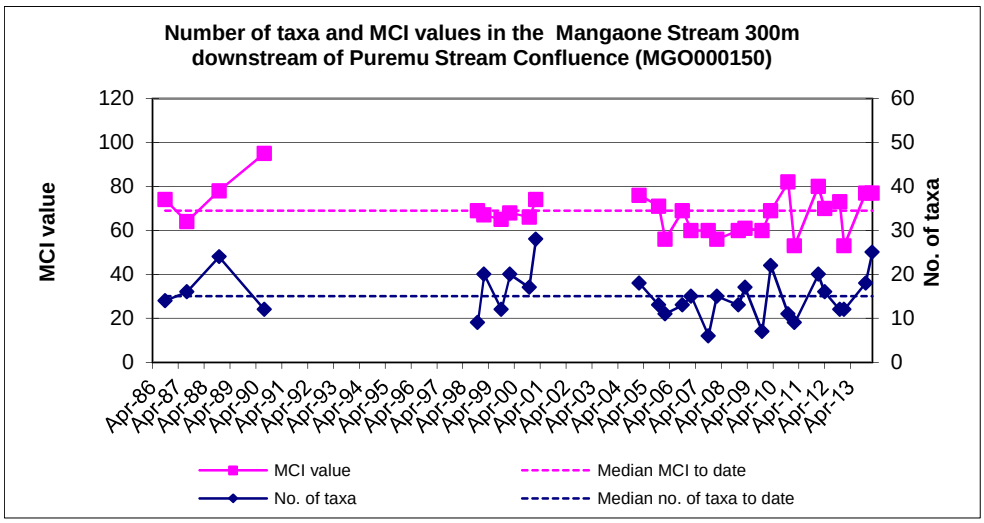


Figure 7 Numbers of taxa and MCI values for Mangaone Stream downstream of the confluence with Puremu Stream since 1986

There were no 'highly sensitive' taxa found in the community which was dominated by five 'tolerant' taxa [oligochaete worms, extremely abundant snail (*Potamopyrgus*); ostracod seed shrimps, algal-piercing caddisfly (*Oxyethira*), and orthoclad midges] and two 'moderately sensitive' taxa [amphipod (*Paracalliope*) and free-living caddisfly (*Hydrobiosis*)]. This was four characteristic taxa more than recorded by the previous spring survey. There were nine significant individual taxon abundance differences between adjacent sites, the most significant being a reduced abundance within one 'moderately sensitive' taxon and an increased abundance within one 'very tolerant' taxon.

The increased proportion of 'tolerant' taxa in the community (64% of taxa richness) resulted in a 'poor' MCI score of 77 units. However, this represented a significant (Stark, 1998) 24 units increase from the score recorded by the previous late summer survey, although no change in comparison with the previous spring survey, and was eight units higher than the long term median and higher than that recorded by twelve of the last fifteen surveys (Figure 7). Although this represented some improvement in health for this site, it was a decrease of eight MCI units compared to the score at site 16 upstream, typical of the trend at this site.

The numerical dominance by 'tolerant' taxa (particularly worms and snail) was reflected in the relatively low $SQMCI_s$ value of 3.4 units which was one unit lower than that recorded at the nearest upstream site 16, but 0.9 unit above the median score for this site. It may have reflected better stability of the substrate (and increased periphyton cover and aquatic vegetation) at this site.

Overall, the reductions in MCI and $SQMCI_S$ scores at site 14, due to gains and/or increased abundances of certain 'tolerant' taxa, may be considered to have been related to the poorer habitat compared with that at the upstream site (16), but possibly as a result of industrial discharges contributing to this deterioration.

100 m downstream of the fertilizer depot (site 15)

A decreased, moderate richness (17 taxa) was recorded at this site, 100 m downstream of the discharges from the fertilizer depot. This richness was slightly above the median historical richness but six taxa fewer than recorded by the previous spring survey (Table 2), which found the maximum richness to date.

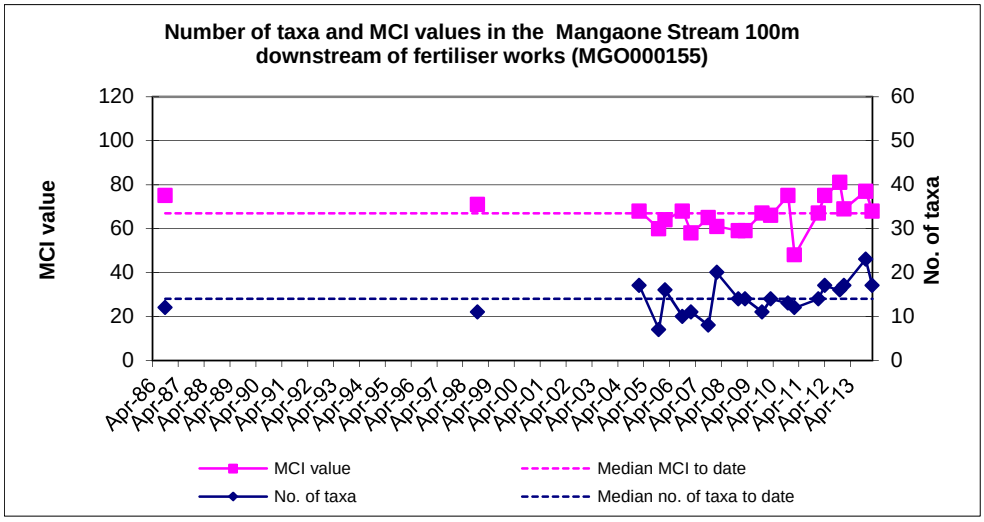


Figure 8 Numbers of taxa and MCI values for Mangaone Stream 100 m downstream of the fertilizer works/depot since 1986

The community was dominated by four of the same taxa as those characteristic at site 14 upstream with the addition of one 'moderately sensitive' taxon [caddisfly (*Hydrobiosis*)] and two 'tolerant' taxa [caddisfly (*Oxyethira*) and orthoclad midges]. Only two significant individual taxon abundance differences were recorded between sites 14 and 15 coincidental with similar periphyton cover and aquatic vegetation observed at this site. Mats and filamentous algae, which tend to support communities having higher proportions of 'tolerant' taxa, were patchy at site 15 in the current survey, aquatic vegetation was present throughout the stream, and there was an increase in gravels and boulders and reduction in cobbles as components of the substrate.

The predominance of 'tolerant' taxa (65% of richness) in this community was reflected in the 'poor' MCI score of 68 units. This was an insignificant (Stark, 1998) one unit higher than the historical median for this site, and nine units lower than the score recorded at the nearest upstream site (14). This was also nine units lower than the MCI score recorded by the previous spring survey at this site. This indicated a more typical decrease in community health under summer warmer, lower flow conditions, but that overall, health was still 'fair', coincident with the extensive algal biomass and aquatic vegetation at this site. The deterioration in biological health at site 15 recorded by the current summer survey may have been related to increased algal biomass indicative of impacts of groundwater inputs from the fertiliser depot.

The numerical dominance by 'tolerant' taxa (particularly one snail taxon) resulted in the $SQMCI_S$ value of 3.8 units, 1.6 units higher than the median for this site, and equal with the maximum of previously recorded scores at this site. This score was 0.4 unit above that recorded upstream, atypical of the trend of downstream deterioration observed by most previous surveys, but this score remained indicative of poorer communities present downstream of the Puremu Stream confluence.

Rifle Range Road (site 11)

The moderate faunal richness (17 taxa) found at this site was coincident with the extensive periphyton substrate cover (particularly the widespread increase in filamentous algae (Photos 1 and 2)) and presence of aquatic vegetation. This richness was four taxa more than the long term median for this site (Table 2 and Figure 9), and three taxa more than recorded by the previous spring survey. Most recent surveys have shown poorer communities possibly as a result of a combination of factors. These include occasional inundation by high flows in the adjacent Waiwhakaiho River (slowing flows which provide an unsuitable habitat for riffle-dwelling invertebrates (see BJ192) and a lack of downstream drift recruitment of typical stony habitat taxa as the majority of the upstream habitat is softer-bottomed and weedy. Deterioration in physicochemical water quality between sites 12 and 11 may also have been a factor, as this reach, which runs through an industrial catchment, receives several stormwater discharges including localised run-off.

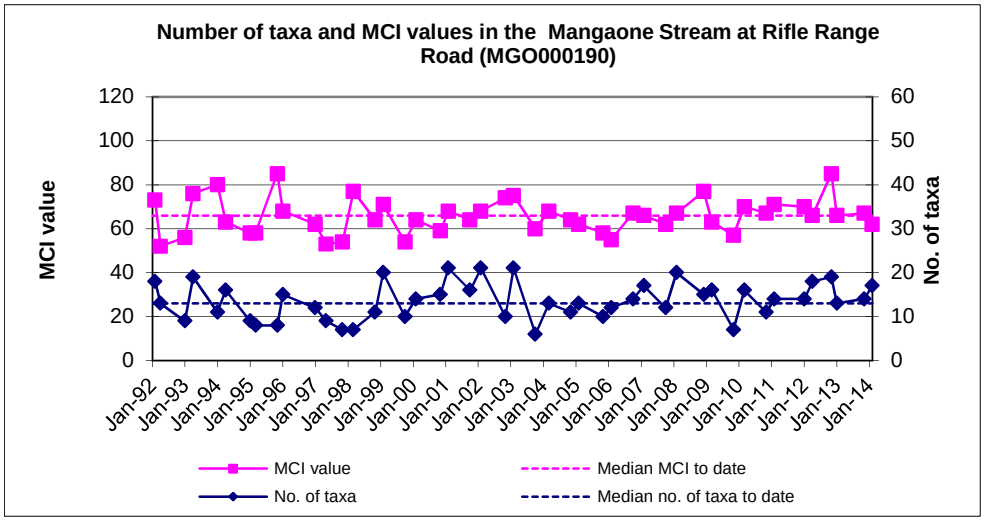


Figure 9 Numbers of taxa and MCI values for Mangaone Stream at Rifle Range Road since 1992

The community was dominated by six taxa, all 'tolerant' taxa [oligochaete worms, extremely abundant snail (*Potamopyrgus);* ostracod seed shrimps, extremely abundant algal-piercing caddisfly (*Oxyethira*); muscid flies, and orthoclad midges]. As typically has been recorded, there was a significant contrast in dominant taxa between this site and the upstream 'control' site (12). In addition, there was a significant difference in taxa composition, with only eight taxa (and one characteristic taxon) common to both sites from a total of 32 taxa found at these two sites (12 and 11).

The predominance (82%) of 'tolerant' taxa in the community was reflected in the 'poor' MCI score of 62 units, which was four units lower than the historical median (Table 2) and five units lower than the score found by the previous spring survey. This was a significant (Stark, 1998) 19 units lower than the score recorded at site 12, and a six unit decrease from the score at the nearest upstream site (16).

With no 'moderately sensitive' taxa were found in abundance, five very or extremely abundant 'tolerant' taxa resulted in a low $SQMCI_S$ value of 2.6 units. However, this still exceeded the long term median $SQMCI_S$ score by 0.7 unit and was within the range of previous scores. However, it was significantly lower than the $SQMCI_s$ scores recorded at the nearest upstream sites 14 and 15 by 0.8 to 1.2 units.

There was significant deterioration in $SQMCI_s$ (and MCI to a lesser extent) between sites 16 and 14, and more so between sites 16 and 11, which was more related to the deterioration in habitat (increase in algal substrate cover and aquatic vegetation) downstream of the fertiliser depot.

General comments

The longitudinal trends in the number of taxa, MCI and $SQMCI_s$ values along the reach of the Mangaone Stream surveyed in February 2014 are illustrated in Figure 10.

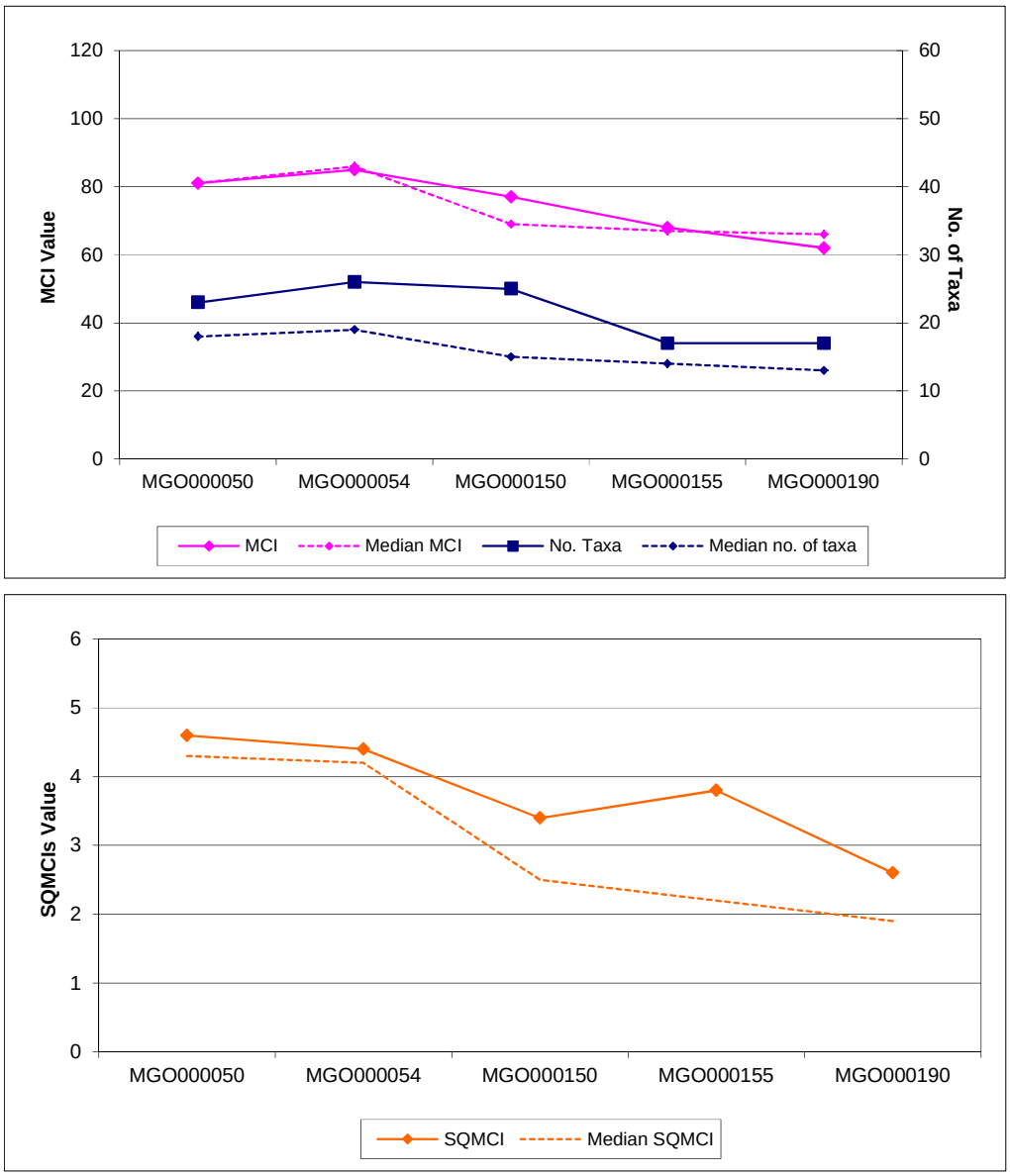


Figure 10 Longitudinal trend in number of taxa, MCI and $SQMCI_s$ values in the Mangaone Stream for the survey of 13 February 2014

The number of taxa tended to decrease in a downstream direction, a more typical result for this stream. The highest richnesses usually have been found at the two sites in the upper reaches of the stream with site 16 recording the highest taxa richness of the current survey. The MCI was also variable, but showed a decreasing trend through the mid reaches without the recovery more recently found in the lower reaches. All sites showed scores insignificantly different from historical median scores, and more typical of biological communities found under lower, warmer flow conditions in late summer.

When considering changes in community structure, the $SQMCI_S$ scores (which take into account abundances within taxa, as well as their sensitivity to pollution) was found to follow a relatively similar pattern to the MCI scores in the upper reaches with a slightly more pronounced decrease in mid reaches and minimal recovery through the lower reaches. All sites recorded $SQMCI_S$ scores slightly higher than or equal with their historical medians, with site 15 recording the greatest improvement mainly due to the extreme abundance of snails amongst the extensive periphyton substrate cover and vegetation at this site.

Summary and conclusions

The Council's standard 'kick-net' and 'sweep-net' sampling techniques were used to collect streambed macroinvertebrates at three sites in the Waiwhakaiho River and five sites in the Mangaone Stream on 14 and 13 February 2014 respectively, in order to assess whether discharges from the Lower Waiwhakaiho Industrial area had had any adverse effects on the macroinvertebrate communities of these streams. Samples were processed to provide number of taxa (richness), MCI and $SQMCI_S$ scores for each site.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The $SQMCI_S$ takes into account taxa abundances as well as sensitivity to pollution. It may indicate subtle changes in communities, and therefore be the more relevant index if non-organic impacts are occurring. Significant differences in either the MCI or $SQMCI_S$ between sites indicate the degree of adverse effects (if any) of the discharges being monitored.

This survey found that all Waiwhakaiho River sampling sites recorded community richnesses similar to or slightly above long term medians for their respective sites. There was no trend in richness in a downstream direction, but there was a typical downstream decrease in MCI scores between the sites. In addition, all sites recorded MCI scores insignificantly different from their respective medians (although site 13 had a score 10 units lower), and $SQMCI_S$ scores similar to their medians with the lowest value at the furthest downstream site. Communities in the Waiwhakaiho River downstream of Lake Rotomanu may be inhibited from time-to-time by the variable current speeds caused by tidal flooding. These results did not indicate any significant effects of stormwater or wastewater discharges from the Fitzroy industrial area on the macroinvertebrate communities of the Waiwhakaiho River, although it is possible that the Mangaone Stream was contributing to the increased algal growth observed downstream of the confluence where there was a small decrease in the number of more 'sensitive' taxa characteristic of the community and a more marked increase in the proportion of 'tolerant' taxa comprising the community.

It is apparent that the macroinvertebrate communities in the Mangaone Stream were of 'fair' health in the upper reaches deteriorating to 'poor' health in a downstream direction. Most sites had moderate taxa richnesses decreasing in a downstream direction, while MCI scores

and $SQMCI_S$ scores were above or near to medians at all sites, more so at site 14. However, the five sampling sites in the Mangaone Stream showed a marked decline in MCI and $SQMCI_S$ values between Egmont Road (site 12) and Rifle Range Road (site 11), with a particularly marked decline in both $SQMCI_S$ and MCI scores between sites 16 and 14. Taranaki sawmills discharges stormwater to the Mangaone Stream between sites 16 and 14, and sediment sampling undertaken in early 2009 had recorded significant concentrations of not only tributyltin in the stream sediments around Taranaki Sawmills, but also elevated concentrations of arsenic, chromium, copper and zinc, all potentially toxic to aquatic biota (see BJ192). Previously there had been increased sedimentation between sites 16 and 14. Further sediment sampling undertaken in April 2012 and early March 2014, showed less contamination than that recorded in 2009; more indicative of physical habitat induced effects contributing to the smaller degree of biological health deterioration found more recently. There was a further decrease in MCI score between sites 14 and 15 and some further deterioration in the lower reaches, most likely due to poorer habitat. Increased downstream algal biomass and aquatic vegetation within the stream may have been indicative of impacts from groundwater inputs from the fertiliser depot particularly under summer lower flow conditions.

The degree of decline in $SQMCI_S$ values was relatively typical for this stream although most sites recorded values up to one unit in excess of their respective medians. The highest MCI improvement in terms of historical data, was recorded at site 14 (downstream of the Puremu Stream). This improvement was coincident with increased, more stable hard substrate despite the extensive periphyton substrate cover.

Overall, the results from the current survey indicated some improvements in comparison with historical results. It appears that in general the degree of sediment contamination in the Mangaone Stream downstream of the Taranaki Sawmills discharge has reduced, although a gradual deterioration in downstream biological health was found by the current survey. Groundwater inputs may have contributed to some of this deterioration recorded immediately downstream of the fertiliser depot in the lower reaches of the stream, particularly the paucity of 'sensitive' taxa under these late summer warmer, lower flow conditions.

References

TRC Internal Reports

Dunning K, 2002a: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, October 2001. TRC report KD87.

Dunning K, 2002b: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2002. TRC report KD114.

Fowles CR and Colgan BG, 2004: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, October 2003. TRC report CF336.

Fowles CR, Colgan BG and Moore SC, 2004: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2004. TRC report CF340.

Fowles CR and Colgan BG, 2005: Biomonitoring of the Lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2004. TRC report CF366.

Fowles CR and Jansma B, 2008a: Biomonitoring of the Lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, October 2007. TRC report CF450.

Fowles CR and Jansma B, 2008b: Biomonitoring of the Lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2008. TRC report CF451

Jansma, B, 2006: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2005. TRC report BJ009.

Jansma, B, 2006: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, October 2006. TRC report BJ015.

Jansma, B, 2007: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2007. TRC report BJ029.

Jansma, B, 2009a: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, December 2008. TRC report BJ084.

Jansma, B, 2009b: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, March 2009. TRC report BJ085.

Jansma, B, 2010a: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2009. TRC report BJ120.

Jansma, B, 2010b: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, March 2010. TRC report BJ121.

Jansma, B, 2011a: Fish kill assessment and biomonitoring of the Mangaone Stream in relation to a discharge of hydrolysed urea, February 2011. TRC Report BJ135.

Jansma, B, 2011b: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2010. TRC report BJ136.

Jansma, B, 2011c: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2011. TRC report BJ137.

Jansma, B, 2013a: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, January 2012. TRC report BJ191.

Jansma, B, 2013b: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, April 2012. TRC report BJ192.

Jansma, B and Fowles, CR, 2014: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2012. TRC report CF618.

Jansma, B and Fowles, CR, 2014: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, January/February 2013. TRC report CF619.

Jansma, B and Fowles, CR, 2014: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2013. TRC report CF620.

Hope, K. 2005: Biomonitoring of the Lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2005. TRC report KH028.

Hope, K. 2006: Biomonitoring of the Lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2006. TRC report KH085.

McWilliam H, 2001a: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2000. TRC report HM235.

McWilliam H, 2001b: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2001. TRC report HM245.

Moore SC, 2003: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, November 2002. TRC report SM574.

Moore SC, 2003: Biomonitoring of the lower Waiwhakaiho River and the Mangaone Stream in the Fitzroy Industrial Area, February 2003. TRC report SM582.

TRC, 1998: Some statistics from the Taranaki Regional Council database (FWB) of freshwater macroinvertebrate surveys performed during the period from January 1980 to 31 December 1998. (SEM reference report). TRC technical report 99-17.

TRC, 2013: Fresh water macroinvertebrate fauna biological monitoring programme Annual SEM Report: 2012-2013, Technical Report 2013-48.

External publications

Stark JD, 1985: A macroinvertebrate community index of water quality for stony streams. *Water and Soil* Miscellaneous Publication No. 87.

Stark JD, 1998: SQMCI: a biotic index for freshwater macroinvertebrate coded abundance data. *New Zealand Journal of Marine and Freshwater Research 32(1*): 55-66.

Stark JD, 1999: An evaluation of TRC's SQMCI biomonitoring index. Cawthron Institute, Nelson. Cawthron Report No. 472.

Stark JD, Boothroyd IKG, Harding JS, Maxted JR, Scarsbrook MR, 2001: Protocols for sampling macroinvertebrates in wadeable streams. New Zealand Macroinvertebrate Working Group Report No. 1. Prepared for the Ministry for the Environment. Sustainable Management Fund Project No. 5103. 57p.

Stark, JD and Fowles, CR 2009: Relationships between MCI, site altitude, and distance from source for Taranaki ringplain streams. Stark Environmental Report No. 2009-01. 47 pp.

Appendix IV

Biomonitoring report – Fish Survey

Memorandum

To Lorraine Smith, Scientific Officer
From B Jansma, Scientific Officer
Document No. 1524463
Report No BJ253
Date 15 June 2015

Fish survey conducted in the Waiwhakaiho River and Mangaone Stream in relation to discharges from the Waiwhakaiho Industrial area, January 2014

Introduction

This fish survey was conducted as a component of the 2013-2014 monitoring programme, to monitor discharges from the combined industries of the Fitzroy (Lower Waiwhakaiho) industrial area. Results from fish surveys performed prior to the current monitoring year are discussed in references listed at the end of this report. The monitoring related to the wastewater/stormwater discharge permits tabulated below:

Consent holder	Consent No
Ravensdown	3140,3865
Firth Industries	0392
Hooker Brothers	3141
NPDC (Stormwater)	3138,1126,1275
NPDC (Bewley Road)	4984
TranzRail	1735,3528
Farmlands	4548
Allied Concrete Ltd	4539
Taranaki Sawmills	3491
Technix Group Ltd	0021,0291,2230
Works Infrastructure Ltd	3917

An electric fishing survey was performed on 24 January 2014 in the Mangaone Stream and the Waiwhakaiho River, to assess whether stormwater and wastewater discharges to the river or stream had had any adverse effects on fish populations.

Regular surveys of fish populations have been conducted since 1999 in relation to the Lower Waiwhakaiho Industrial area, using two survey methods – night spotting and electric fishing. Both methods have their advantages and disadvantages for determining fish populations. When used together these methods can provide comprehensive fish community data. The results of the past fish surveys are summarised in the references and this data is also considered in this report.

A pollution incident in February 2011 resulted in a significant fish kill in the Mangaone Stream, affecting all three sites monitored in the Mangaone Stream in the current survey. It is anticipated that the current survey will document what recovery has occurred with regards to the fish communities at these three sites.

Methods

In this survey, conducted on 24 January 2014, three sites were surveyed in the Mangaone Stream, and two sites were surveyed in the Waiwhakaiho River. The sites were surveyed using the electric fishing method, which employed a Kainga EFM machine. Those fish captured were identified and counted, where possible. Inevitably some fish eluded capture, although some were identified before reaching cover. The length of each fish was estimated, following which they were released. The results of this survey are presented in Table 2 and Table 3.

The area surveyed at each site ranged from 60 to 90 m^2 in the Waiwhakaiho River and 30 to 45 m^2 in the Mangaone Stream. Details of the sites surveyed are given in Table 1 and the location of sites surveyed in relation to the industrial area and discharges are shown in Figure 1.

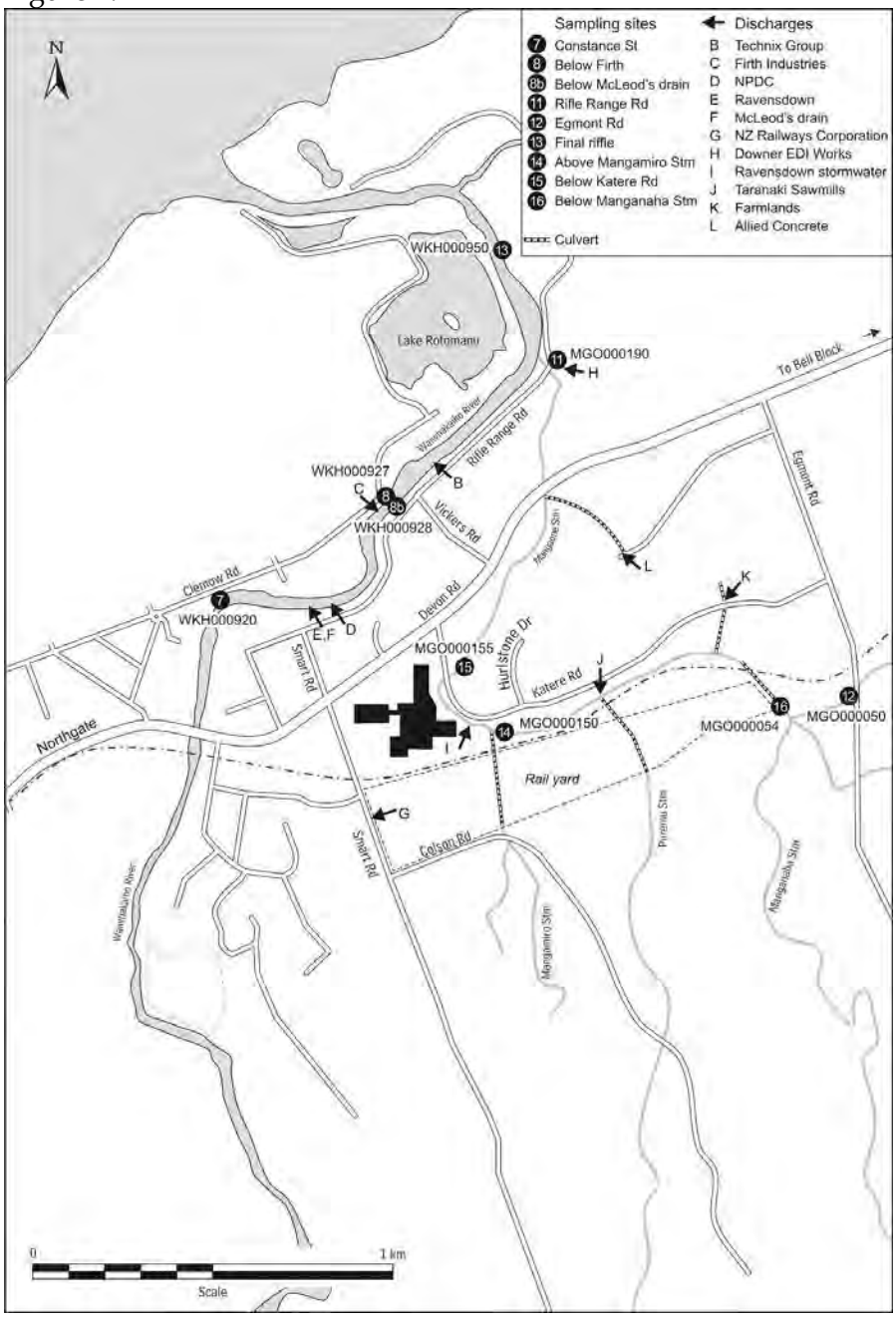


Figure 1 Monitoring sites in the Mangaone Stream including fish survey sites

Table 1 Sites surveyed for fish in the Mangaone Stream and Waiwhakaiho River in January 2014

River	Site No	Site Code	Location
Waiwhakaiho River	7	WKH000920	Constance Street
	13	WKH000950	Final riffle downstream of Lake Rotomanu
Mangaone Stream	12	MGO000050	Egmont Road
	15	MGO000155	100m downstream of fertiliser depot
	11	MGO000190	Rifle Range Road

It should be noted that the Waiwhakaiho River downstream of the meeting of the waters is subject to significant flow variation during the day. This is due to the operation of the Mangorei hydroelectric power scheme, which on the day of sampling, resulted in an increase in flow of approximately 4 cumecs three hours prior to sampling. The water level increased signifiantly as a result (Figure 2). This has real implications for fish surveys, as it is likely that most of the area surveyed had very little water overnight, prior to the survey. As a result, there is likely to be a reduced abundance of fish in these areas.

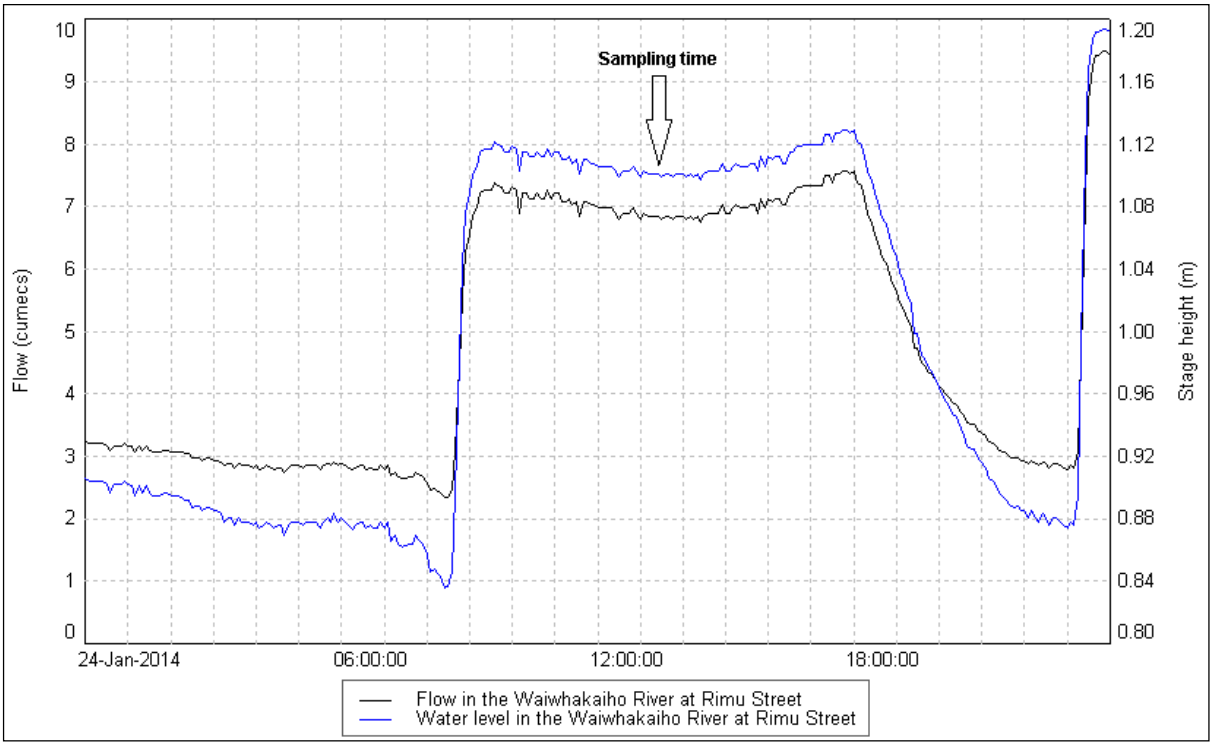


Figure 2 Flow and water level in the Waiwhakaiho River at Rimu Street on 24 January 2014.

Results

The results of the current fishing survey are summarised in Table 2 and Table 3.

Table 2 Fish species and abundance recorded in the Waiwhakaiho River during the current survey.

Site		Constance Street (site 7)	Final riffle downstream of Lake Rotomanu (site 13)
Area fished (m^2):		60	90
Longfin eel (*Anguilla dieffenbachii*)	Number	6	1
	Length range (mm)	100-200	250
Shortfin eel (*Anguilla australis*)	Number	2	-
	Length range (mm)	150-200	-
Redfin bully (*Gobiomorphus huttoni*)	Number	12	-
	Length range (mm)	50-70	-
Inanga (*Galaxias maculatus*)	Number	-	3
	Length range (mm)	-	40-50
Unidentified bully (*Gobiomorphus sp.*)	Number	8	3
	Length range (mm)	<30	<30
UID eel (*Anguilla sp.*)	Number	9	4
	Length range (mm)	60-70	50-60
Total number of species		3	3
Total number of fish		37	11

Table 3 Fish species and abundance recorded in the Mangaone Stream during the current survey.

Site		Egmont Rd (Site 12)	Downstream fertiliser depot (Site 15)	Rifle Range Road (Site 11)
Area fished (m^2):		30	40	45
Longfin eel (*Anguilla dieffenbachii*)	Number	1	3	2
	Length range (mm)	120	100-950	200-500
Shortfin eel (*Anguilla australis*)	Number	7	8	6
	Length range (mm)	150-400	80-800	150-700
Redfin bully (*Gobiomorphus huttoni*)	Number	-	1	7
	Length range (mm)	-	50	50-60
Inanga (*Galaxias maculatus*)	Number	7	2	1
	Length range (mm)	50-90	90-100	70
Common bully (*Gobiomorphus cotidianus*)	Number	-	1	-
	Length range (mm)	-	110	-
Unidentified kokopu (*Galaxias sp.*)	Number	1	-	-
	Length range (mm)	110	-	-
Unidentified galaxiid (*Galaxias sp.*)	Number	-	2	-
	Length range (mm)	-	80-80	-
Unidentified bully (*Gobiomorphus sp.*)	Number	-	-	-
	Length range (mm)	-	-	-
UID eel (*Anguilla sp.*)	Number	5	6	26
	Length range (mm)	100-250	50-300	60-700
Total number of species		4	5	4
Total number of fish		21	23	42

Table 4 Fish species recorded in the June 2007 electric fishing survey

Site	At Egmont Road (u/s industrial area)	Manganaha Stream (u/s industrial area)	Below Firth (within industrial area)	At Rifle Range Road (d/s industrial area)
Fish species	Site 12	Site M4	Site 15	Site 11
Inanga	1	-	-	2
Shortfin eel	2	-	2	-
Longfin eel	2	-	4	2
Common bully	2	-	2	3
Redfinned bully	1	4	5	21
Brown trout	-	-	1	-
Elver	12	3	26	12
UID* galaxiid	-	-	1(whitebait)	6 (whitebait)
UID* eel	2	1	5	4
Number of species	5	2	5	4
Total abundance	22	8	46	50

*UID = unidentified

Table 5 Fish species recorded in the March 2010 spotlighting survey

Site	At Egmont Road (u/s industrial area)	Near Katere Rd drain (within industrial area)	D/S Puremu St (within industrial area)	At Rifle Range Road (d/s industrial area)
Fish species	Site 12	Site 17	Site 14	Site 11
Inanga	Abundant	Abundant	6	2
Longfin eel				1
Redfinned bully		1	1	1
UID* eel	3	1		1
Number of species	2	3	2	3
Total abundance	>23	>22	7	5

Habitat in the Waiwhakaiho River was relatively similar between sites, with the substrate dominated by boulders and cobbles, and patchy growths of periphyton mats and filaments. In the Mangaone Stream, the Egmont Road site was dominated by fine substrate and extensive macrophyte growth. There was also undercut banks and overhanging vegetation, comprising good cover for the fish community. The two downstream sites had a change in substrate, with cobbles and boulders dominated. There was also a reduction in the amount of macrophyte growth, and only the middle site (site 15) had undercut banks. Neither site had any overhanging vegetation. Although the cover at the Egmont Rd site was good for the fish communities, it made this site difficult to survey, as fish were often taking refuge under this cover.

Due to the size of the Waiwhakaiho River, it was quite difficult to survey. In addition, the areas surveyed were likely to have had little to no flow hours prior to this survey, and as such the results of this survey are likely to be an underrepresentation of the communities present in the river at these sites. The upstream site (site 7) supported three species, being longfin eel, shortfin eel and redfin bully (Table 2). Downstream (site 13), inanga were recorded, and it is likely that shortfin eel and redfin bully were also present, although not recorded. In addition to those fish recorded through electric fishing, numerous whitebait were observed, as was a small school of grey mullet. The Constance St site had a fish abundance of 0.62 fish/m^2, while at the last riffle, there was a fish abundance of 0.12 fish/m^2 recorded.

Four fish species were recorded at Egmont Road, including one kokopu that could not be identified to species level. The highest species richness of this survey was recorded downstream of the fertiliser depot, with four species recorded at Rifle Range Road (Table 3).

This is a moderate species richness for these sites, and is similar to that recorded in the previous electric fishing survey, undertaken in 2007 (Table 4). It is also an improvement from the richness recorded in the most recent survey, undertaken in 2010 (Table 5). However, this will be related to the survey methodology (spotlighting), which often records a lower species richness than electric fishing.

A pollution incident that occurred in February 2011 resulted in a significant fish kill in the Mangaone Stream. It was estimated at the time that the majority of fish in the affected reach were killed, and all three sites surveyed in the current survey were affected by this incident. The results from the current survey indicate that the fish community is well on its way to recovery, with six separate species recorded. Of note was the presence of a number of moderate sized eels

Table 3), that would have been present in the river system prior to 2011. Although some of these eels may have survived the pollution incident it is likely that these fish have repopulated the affected reach by moving upstream from the Waiwhakaiho River or downstream from unaffected reaches. The number of elvers recorded, especially at Rifle Range Rd, indicates that this recovery is set to continue.

Shortfin eel (*Anguilla australis*) were recorded at Constance Street in the Waiwhakaiho River and all three sites in the Mangaone Stream in the current survey. They were also the most abundant species recorded. Longfin eel (*Anguilla dieffenbachii*) were recorded at all sites in both the river and stream, a result consistent with previous surveys. Observations made following the pollution incident indicated that there were a significant number of juvenile eels in the stream, but that adult eels were also common. The current survey also recorded a large number of juvenile eels, with 29 recorded in the Mangaone Stream, mostly at Rifle Range Rd.

Inanga (*Galaxias maculatus*) were recorded at site 13 in the Waiwhakaiho River, and at all three sites in the Mangaone Stream, where they were most abundant at Egmont Rd. This site had slower flow and extensive macrophyte growth, which is preferred habitat for inanga. This species is relatively short-lived, with few living longer than two years. However, this species is the main contributor to the whitebait fishery and large numbers of juvenile inanga enter the rivers each spring, so it is therefore not unexpected to find a healthy population of this species in the Mangaone Stream three years after the pollution incident. This species is also relatively tolerant to poor water quality, so their presence isn't necessarily an indication of good preceding water quality. However, this species is one of the least able to negotiate culverts and other barriers to fish species, and as this species was recorded throughout the stream, indicates that there is no barrier to the passage of fish below the Egmont Road site.

Redfin bullies (*Gobiomorphus huttoni*) were not recorded in high numbers during the current survey, with the exception of the Waiwhakaiho River at Constance Street, where twelve were recorded. Previous surveys have recorded this species as abundant at the lower sites, where the substrate and short distance from the sea promote good habitat for this species. This result was repeated in the current survey, with the Rifle Range Rd site recording seven individuals.

Although no torrentfish (*Cheimarrichthys fosteri*) were recorded in either the Waiwhakaiho River of Mangaone Stream in the current survey, they have been recorded at the Rifle Range Road site in the past and previous surveys have recorded large numbers of torrentfish in riffles of the Waiwhakaiho River. Although no torrentfish have been recorded at Egmont Road to date, habitat at this site (clay and silt substrate and slow flowing water) is unsuitable for torrentfish.

Brown trout have been recorded in the Mangaone Stream by previous surveys (Table 3). Brown trout were not recorded in this survey, but one individual was killed by the February 2011 pollution incident. The presence of trout is an indication of good preceding water quality, as trout are considered relatively susceptible to toxins, especially when compared to some natives such as inanga and eels. Trout are also regularly observed in the lower reaches of the Waiwhakaiho River.

Banded kokopu were not recorded in this survey, although one identified kokopu was recorded at the Egmont Road site. In addition, live banded kokopu have been observed in the headwaters of the Mangaone Stream, upstream of the monitored sites. This indicates that

passage for this species has not been restricted by industrial discharges to this catchment, which is promising, as juveniles of this species are some of the more sensitive to contamination, such as suspended sediment and ammonia (Boubee, Dean, West and Barrier (1997), Richardson (1997)).

Table 3 shows the presence of fish recorded in the Mangaone Stream surveyed occasionally since 1991. Several species have previously been recorded as abundant (greater than 20 individuals) at the Rifle Range Road site. All of the fish recorded in the current survey have been recorded previously at some point. Surveys to date indicate that the diversity of fish was generally higher downstream of industrial discharges (at Rifle Range Road), compared to the site upstream of the discharges. As previously mentioned, this is most likely due to the differences in habitat between sites.

A juvenile lamprey (*Geotria australis*) was recovered from the Mangaone Stream following the pollution incident. This is the first record of this species in the Mangaone Stream. The life stage of the individual fish that was recovered (ammocoete) indicates that juvenile lamprey were surviving in the Mangaone Stream. Although this species is likely to be tolerant of nutrient enriched water quality, the presence of this species is a good result, as it increases the known distribution of this 'nationally vulnerable' species.

Grey mullet, and yellow-eyed mullet, both marine species that occasionally enter freshwater, have also been recorded occasionally in the Mangaone Stream at Rifle Range Road. Grey mullet are frequently observed in the Waiwhakaiho River also, and were observed during the current survey.

Table 6 Occurrence of fish recorded in previous surveys in the Mangaone Stream

Site	Egmont Road (site 12) MGO000050	Rifle Range Road (site 11) MGO000190	Whole catchment
Red-fin bully	P	A	P
Common bully	P	A	P
Giant bully	P	P	P
Giant kokopu	-	P	P
Banded kokopu	P	P	P
Inanga	P	P	P
Longfin eel	P	A	P
Shortfin eel	P	A	P
Torrent-fish	-	P	P
Common smelt	-	P	P
Brown trout	-	P	P
Yellow eyed mullet	-	P	P
Grey mullet	-	P	P
Lamprey			P
Total number of fish species	7	13	14

Conclusions

This January 2014 survey indicated that fish communities in the Waiwhakaiho River and Mangaone Stream generally had a moderate species diversity at all sites. Observations made following the 2011 pollution incident indicated that the Mangaone Stream is capable of supporting a relatively rich fish community, with high numbers of eel, and the first record of lamprey of all surveys conducted. Fish surveys undertaken in streams with good fish cover,

such as that present in the Mangaone Stream, can provide an underrepresentation due to those fish taking refuge not being recorded. This is likely to be the case in the current survey, and as such, the current results are considered to reflect a relatively health community, that is well on its way to recovery following the pollution incident of 2011. The communities at previously monitored sites (Egmont Road and Rifle Range Road) had an improved richness when compared to the previous survey, and it is considered that this is a reflection of the variation in sampling technique. There was no indication that industrial discharges to the Mangaone Stream had had a detrimental effect upon the fish communities of the waterway prior to this survey. The difference in diversity and species composition between the sites in the current, and also past surveys, can be attributed to very different habitats at the sites.

With regards to the Waiwhakaiho River results, surveying this river was hindered by the variation in flow caused by the operation of the hydroelectric power scheme located upstream. The area of river surveyed had only been inundated by water a few hours prior to the survey being performed, and as such the relatively low species richness recorded is a reflection of the fact that fish had not yet moved into this area, rather than a reflection of any water quality issues.

The current level of monitoring is appropriate, and it is recommended that future monitoring repeats that undertaken in the current survey, being a three site electric fishing survey in the Mangaone Stream and two site electric fishing survey in the Waiwhakaiho River, undertaken every three years. Although spotlighting has the potential to record different species to that recorded through electric fishing, it is considered that electric fishing is the most appropriate method for these sites. It should be noted that there are plans to improve flood protection in this catchment, and this may impact on fish communities, either by the creation of barriers to fish passage, or disturbance of habitat.

References

Boubee, JAT, Dean, TL, West, DW & Barrier, RFG, 1997: Avoidance of suspended sediment by the juvenile migratory stage o six New Zealand native fish species. New Zealand Journal of Marine and Freshwater Research: Vol 31 pgs 61-69.

Colgan B, 2003: Fish survey in the Mangaone Stream, April 2003. Internal Memorandum, 16 October 2003.

Colgan B, 2004: Fish survey in the Mangaone Stream, April 2004. Internal Memorandum, 13 October 2004.

Dunning K, 2001: Fish survey in the Mangaone Stream, March 2001. Internal Memorandum, 17 October 2001.

Jansma, B, 2008: Fish survey conducted in the Mangaone Stream in relation to discharges from the Waiwhakaiho Industrial area, June 2007. Report No. BJ105.

Jansma, B, 2011: Fish survey conducted in the Mangaone Stream in relation to discharges from the Waiwhakaiho Industrial area, March 2010. Report No. BJ134.

Jansma, B, 2011: Fish kill assessment and biomonitoring of the Mangaone Stream in relation to a discharge of hydrolysed urea, February 2011. Report No. BJ135.

McWilliam H, 1999: Fish survey in the lower Waiwhakaiho River and the Mangaone Stream, May 1999. Internal Memorandum, 18 September 1999.

McWilliam H, 2000: Fish survey in the lower Waiwhakaiho River and the Mangaone Stream, April 2000. Internal Memorandum, 20 April 2000.

Richardson, J, 1997: Acute ammonia toxicity for eight New Zealand indigenous freshwater species. New Zealand Journal of Marine and Freshwater Research: Vol 31 pgs. 185-190.

Appendix V

Rule 23 of the Regional Freshwater Plan for Taranaki (permitted stormwater rule)

Discharge of stormwater

Activity	Rule	Standards/Terms/Conditions	Classification	Notification	Control/Discretion	Policy Reference
Discharge of stormwater into or onto land or into water (excluding those wetlands listed in Appendix II) that is not provided for by Rules 25-27	23	• The discharge shall not originate from any industrial or trade premise where the active area of the site is greater than 0.5 ha, unless there is an interceptor system in place that is designed and managed so that it will keep stormwater from entraining contaminants; • The discharge shall not originate from any industrial or trade premise where hazardous substances are used, stored or potentially spilt unless: (i) there is an interceptor system in place that is designed and managed so that it will keep stormwater from entraining contaminants; or (ii) there is an interceptor system in place that is designed and managed so that it is capable of capturing contaminated stormwater and either diverting it to trade waste or containing it and/or removing or reducing the contaminants such that: - any spills can be recovered; - the discharge shall not contain any persistent or bioaccumulative substances; - the discharge shall not breach any other specified condition of this rule; and a spill contingency and interceptor system maintenance plan is maintained and regularly updated for the site; • The discharge shall not originate from any industrial or trade premises where the movement of rock, earth or other soil material is taking place, unless that movement is being undertaken in connection with site landscaping, or the installation, construction, maintenance or demolition of buildings, structures or equipment; • The discharge shall not be greater than is able to be discharged from a pipe of 900 mm in diameter;	Permitted			

Discharge of stormwater (continued)

Activity	Rule	Standards/Terms/Conditions	Classification	Notification	Control/Discretion	Policy Reference
		• The discharge shall not cause significant erosion, scour or deposition; • Discharge that will, or is liable to enter surface water, shall not exceed the following: pH 6.0-9.0 oil and grease 15 gm^{-3} suspended solids 100 gm^{-3} BOD 5 gm^{-3} unionised ammonia 0.025 gm^{-3} free chlorine 0.2 gm^{-3} • The discharge shall not give rise to any of the following effects in receiving waters after reasonable mixing: (a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials; (b) any conspicuous change in the colour or visual clarity; (c) any emission of objectionable odour; (d) the rendering of fresh water unsuitable for consumption by farm animals; (e) any significant adverse effects on aquatic life.	Permitted			

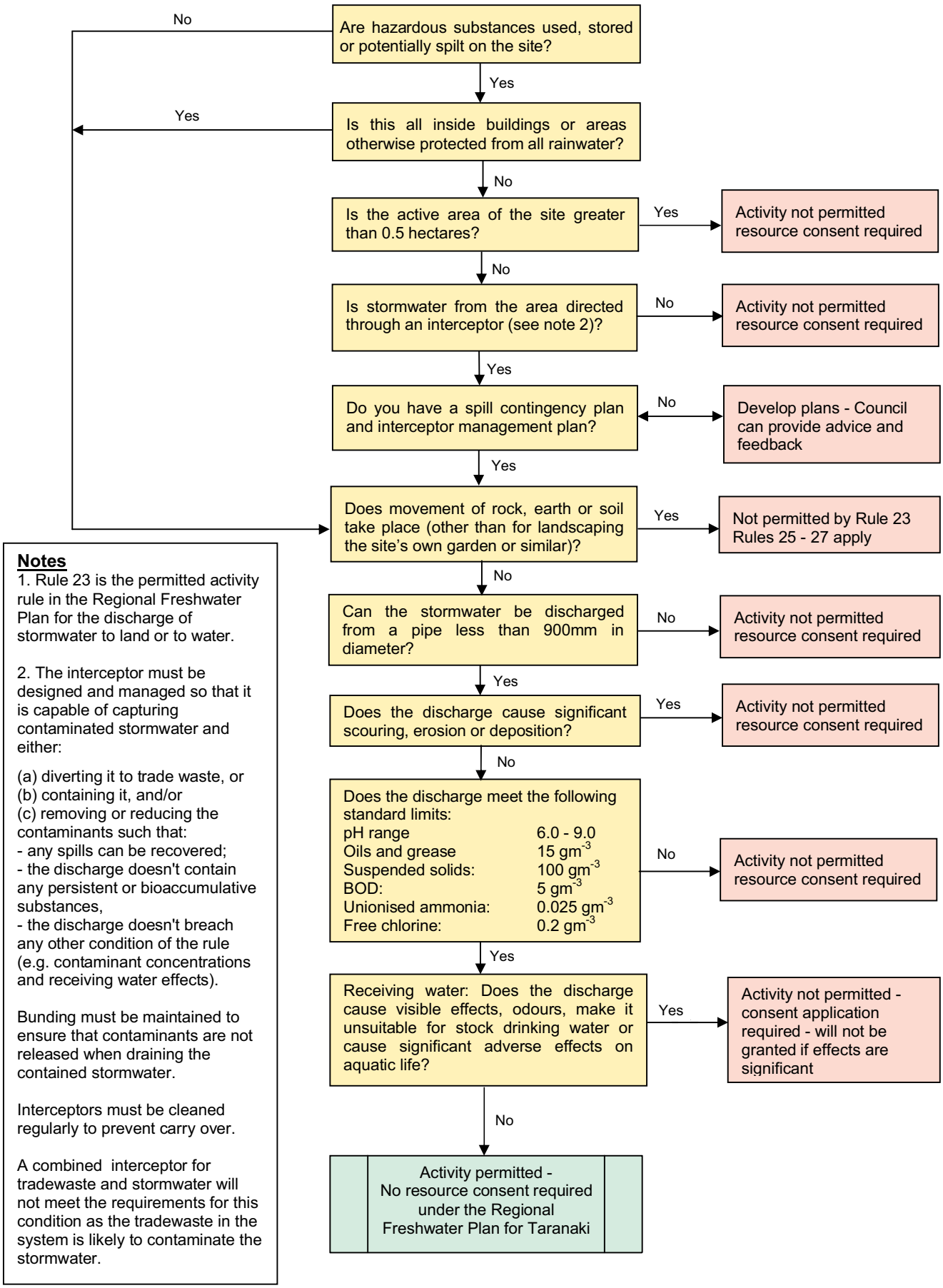
Explanation

Rule 23 provides for the large number of stormwater discharges that have no or only minor adverse effects on the environment. A resource consent is not required for stormwater discharges to either land or water so long as the discharge can comply with the conditions of this rule. The first condition restricts discharges from industrial or trade that are over 0.5 hectares in area, unless the site has a means of ensuring that stormwater will not be contaminated [a roofed site is a good example of this]. The reference to the 'active area' of the site refers to that part of the site where industrial and trade activity is taking place, including areas on site where goods, products, hazardous substances or other materials are stored, used or potentially split, but does not include areas that are grassed; landscaped; or roofed; or carparks which are used exclusively for non-goods vehicles.

Any sites storing and/or using hazardous substances must either ensure that the stormwater cannot be contaminated [for example is the site is roofed] or that an interceptor system is designed and managed so that contaminated stormwater is diverted to trade waste or captured and contained and/or treated so that the contamination is removed and reduced. In this regard the bunding of hazardous substances and the capture and treatment of stormwater would enable the discharge of stormwater from sites under 0.5 hectares to be a permitted activity. The condition also requires that a contingency plan be maintained and regularly updated for the site.

The third condition restricts the discharge of stormwater from any industrial and trade premises where the movement of rock and other earth material is taking place, other than the types of minor works outlined in the condition. This is consistent with other rules in the Plan relating to stormwater discharges from soil disturbance activities.

Rule 23 also contains conditions relating to the receiving environment to ensure that adverse effects are avoided, remedied or mitigated. Conditions relate to both water quality [by specifying discharge limits and receiving water effects] and the quantity of water that is being discharged [to avoid erosion, scour or deposition].



Notes

1. Rule 23 is the permitted activity rule in the Regional Freshwater Plan for the discharge of stormwater to land or to water.

2. The interceptor must be designed and managed so that it is capable of capturing contaminated stormwater and either:

(a) diverting it to trade waste, or
(b) containing it, and/or
(c) removing or reducing the contaminants such that:
- any spills can be recovered;
- the discharge doesn't contain any persistent or bioaccumulative substances,
- the discharge doesn't breach any other condition of the rule (e.g. contaminant concentrations and receiving water effects).

Bunding must be maintained to ensure that contaminants are not released when draining the contained stormwater.

Interceptors must be cleaned regularly to prevent carry over.

A combined interceptor for tradewaste and stormwater will not meet the requirements for this condition as the tradewaste in the system is likely to contaminate the stormwater.