

Hongihongi and Herekawe Streams  
Joint Monitoring Programme  
Biennial Report  
2012-2014  
Technical Report 2014–60

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## Executive summary

This report for the period 1 July 2012 to 30 June 2014 describes the monitoring programme implemented by the Taranaki Regional Council to assess the environmental performance of consent holders in the Hongihongi and Herekawe catchments during the period under review.

The Hongihongi Stream discharges at the western end of Ngamotu Beach, New Plymouth. Eight resource consents, which include a total of 42 conditions, are held by six companies situated on Breakwater Road, Ngamotu Road and Centennial Drive. There are five consents to discharge stormwater into the Hongihongi Stream; two consents to discharge tanker deballast water into the Hongihongi Stream, and one consent to discharge cooling water and groundwater seepage onto Ngamotu Beach.

The Herekawe Stream discharges to the middle of Back Beach, New Plymouth and receives stormwater discharged from the Omata Tank Farm. Four resource consents, which include a total of 46 conditions, are held by three companies. The consents are for the discharge of stormwater into the Herekawe Stream, and hydrotest water to land. In addition, Methanex Motunui Limited holds two certificates of compliance to discharge stormwater from the Omata Tank Farm. A stormwater discharge to the Herekawe Stream from the site of Dow AgroSciences and the Paritutu/Spotswood area is monitored and reported separately.

Monitoring of the Hongihongi catchment consisted of eight inspections, and discharge sampling on five occasions for most sites. The Hongihongi Stream itself was sampled on seven occasions.

Monitoring of the Herekawe catchment consisted of eight inspections and discharge sampling on three or four occasions for most sites. The Herekawe Stream itself was sampled on seven occasions and four biomonitoring surveys were conducted.

Site inspections for both catchments consistently revealed no areas of concern. Sites were found to be well maintained, bunded areas secure and stormwater treatment systems operating effectively. Macroinvertebrate community index (MCI) values from the October 2012 biological monitoring survey was the highest ever recorded for that site. The other 3 biological monitoring surveys conducted also recorded consistently high MCI values.

No unauthorised incidents were observed for any of the Hongihongi sites in the 2012-2014 monitoring period. There were thirteen unauthorised incidents investigated in the Herekawe catchment, five of which related to the stream itself or to discharges into it. The majority of the incidents involved complaints lodged by members of the public regarding discolouration of the Herekawe Stream. Upon investigation there was discolouration evident, however it was confirmed to be due to naturally occurring iron oxide. There was no evidence during the period under review of any effects due to discharges from the consent holders monitored within this programme.

During the monitoring period, all Companies monitored within the Hongihongi and Herekawe catchments demonstrated a high level of environmental performance and compliance with their resource consents.

This report includes recommendations for the 2014 -2015 year.



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# 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 prepared by the Taranaki Regional Council (the Council). The report describes the monitoring programme associated with resource consents held by the owners and operators of the tank farms and terminals located in the Hongihongi and Herekawe catchments.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the consents relating to discharges to water within the Hongihongi and Herekawe catchments. This is the 19th combined report to be prepared by the Council to cover the discharges to the Hongihongi and Herekawe Streams.

### 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 *Resource Management Act 1991* and the Council's obligations and general approach to monitoring sites through annual programmes.

Section 2 sets out the resource consents held by companies in the Hongihongi catchment, the nature of the monitoring programme in place for the period under review, and a description of the activities and operations conducted in the catchment. This section presents the results of monitoring in the Hongihongi catchment during the period under review (including scientific and technical data), discusses these results, their interpretation and their significance for the environment.

Section 3 sets out the resource consents held by companies in the Herekawe catchment, the nature of the monitoring programme in place for the period under review, and a description of the activities and operations conducted in the catchment. This section presents the results of monitoring in the Herekawe catchment during the period under review (including scientific and technical data), discusses these results, their interpretation and their significance for the environment.

Section 4 presents recommendations to be implemented in the 2014-2015 monitoring year.

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 a discharger, 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 (for example 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 discharge source. 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 performance of resource users against regional plans and consents.

Compliance monitoring, including impact monitoring, also enables the Council to continuously assess its own performance in resource management as well as that of resource users (particularly consent holders). It further enables the Council to continually re-evaluate its approach and that of consent holders to resource management, and ultimately through the refinement of methods, to move closer to achieving sustainable development of the region's resources.

#### 1.1.4 Evaluation of environmental performance

As well as discussing the various details of the performance and extent of compliance by companies in the catchments during the period under review, this report also assigns an overall performance rating. The categories used by the Council, and their interpretation, are as follows:

- A **high** level of environmental performance and compliance indicates that essentially there were no adverse environmental effects to be concerned about, and no, or inconsequential non-compliance with conditions.
- A **good** level of environmental performance and compliance indicates that adverse environmental effects of activities during the monitoring period were negligible or minor at most, or, 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, or, there were perhaps some items noted on inspection notices for attention but these items were not urgent nor critical, and follow-up inspections showed they have been dealt with, and any inconsequential non-compliances with conditions were resolved positively, co-operatively, and quickly.
- **Improvement required (environmental) or improvement required (administrative compliance)** (as appropriate) indicates that the Council may have been obliged to record a verified unauthorised incident involving measurable environmental impacts, and/or, there were measurable environmental effects arising from activities and intervention by Council staff was required and there were matters that required urgent intervention, took

some time to resolve, or remained unresolved at the end of the period under review, and/or, there were on-going issues around meeting resource consent conditions even in the absence of environmental effects. Abatement notices may have been issued.

- **Poor performance (environmental) or poor performance (administrative compliance)** indicates generally that the Council was obliged to record a verified unauthorised incident involving significant environmental impacts, or there were material failings to comply with resource consent conditions that required significant intervention by the Council even in the absence of environmental effects. Typically there were grounds for either a prosecution or an infringement notice.

## 2. Hongihongi catchment

### 2.1 Resource consents

#### 2.1.1 Water and coastal discharge permits

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.

A summary of the consents for activities in the Hongihongi catchment during the monitoring period is given in Table 1. These consents are discussed in more detail in the following sections. Copies of the consents are attached in Appendix I.

**Table 1** Resource consents for activities in the Hongihongi catchment

Consent holder	Consent number	Purpose of consent	Date granted	Next review	Expiry
Bulk Storage Terminals Ltd	0276-2	To discharge treated stormwater and waste saltwater	24/07/1996	-	*2014
	4488-2	To discharge stormwater	07/02/1996	-	*2014
Fonterra Co-operative Group Ltd	0671-3	To discharge cooling water and groundwater seepage	07/12/2001	-	2020
Greymouth Facilities Ltd	3914-2	To discharge treated tanker deballast water, and treated oil contaminated water	12/06/1996	-	*2014
Liquigas Ltd	4524-2	To discharge process water and stormwater	03/12/2007	2020	2026
New Zealand Oil Services Ltd	1020-3	To discharge stormwater and treated wastewater	01/05/1996	-	*2014
Shell Todd Oil Services Ltd	0170-2	To discharge treated tanker deballast water	12/06/1996	-	Surrendered 30/09/2013
	5542-1	To discharge treated stormwater	15/09/1999	-	2015

\*Applications for consent renewals were received by the Council within required time frames.

The operational boundaries of the consents monitored in the Hongihongi catchment are identified in Figure 1.

Two other consents, 6369-1 and 7526-1, both for abrasive blasting activities within the Hongihongi catchment, were monitored under a separate programme (Regional abrasive blasting).



**Figure 1** Consent holder property boundaries in the Hongihongi catchment

## 2.2 Monitoring programme

### 2.2.1 Introduction

Section 35 of the RMA sets out an obligation for 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 for the Hongihongi catchment consisted of three primary components set out below.

### 2.2.2 Programme liaison and management

There is generally a significant investment of time and resources by the Council in ongoing liaison with resource consent holders over:

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

### 2.2.3 Site inspections

Each of the consent holders' sites were inspected over the monitoring period, usually on eight occasions. The main points of interest were plant processes with potential or actual discharges to receiving watercourses, including contaminated stormwater and process wastewaters. 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 surveyed for environmental effects.

### 2.2.4 Chemical sampling

During the 2012 – 2014 period, the Council undertook five wet weather sampling runs. Both the discharges from the sites and the water upstream and downstream of the discharges and mixing zone were sampled and analysed for a range of relevant parameters. Sites sampled during the monitoring period are presented in Figure 2.



Figure 2 Sampling sites in the Hongihongi catchment

## 2.3 Bulk Storage Terminals Ltd

### 2.3.1 Site description

Bulk Storage Terminals Ltd (BST) operate a chemical storage facility on Centennial Drive, New Plymouth (Figure 3). Chemicals are transported to and from the facility by road tanker and by pipeline to the port.



Resource consent 0276-2 is held for the lower, eastern part of the site (formerly occupied by Caltex Oil NZ Ltd) which includes two tanks in a bunded area at the rear. The front half of the site is sub leased to Bidvest Foodservice. Stormwater from this part of the site is treated via the main three-stage concrete separator and two smaller three-stage concrete yard separators, before being discharged to the Hongihongi Stream, via the New Plymouth District Council (NPDC) underground stormwater drain on Centennial Drive.

Resource consent 4488-2 is held for the upper, western part of the site, where ten storage tanks are bunded into three separate areas. Animal fat and vegetable fats/oils are in one area, and industrial chemicals and petrochemicals in the other areas. Pipeline flushings and stormwater from bunded areas are tested (and pH adjusted if necessary) before being discharged to trade waste. Stormwater from the remainder of this part of the site is discharged to the NPDC stormwater system.



**Figure 3** Aerial photograph of the Bulk Storage Terminals Ltd site

### 2.3.2 Resource consents

BST hold coastal discharge permit **0276-2** to discharge up to 30 litres/second of treated stormwater and waste saltwater from an oil terminal site into the coastal marine area of the Hongihongi Stream.

This permit was issued by the Council on 24 July 1996, to Caltex Oil New Zealand Limited, as a resource consent under Section 87(c) of the RMA.

The consent was transferred to Kaneb Terminals Ltd on 9 March 2005 and then to BST on 24 August 2008, and is due to expire on 1 June 2014. An application to renew consent 0276-2 was received on 28 November 2013.

Condition 1 lists effects which the discharge should not have on the receiving waters after reasonable mixing.

Condition 2 places limits on certain chemical parameters in the discharge.

Condition 3 requires the maintenance of a contingency plan.

Condition 4 is a review provision.

A copy of the permit is attached to this report in Appendix I.

BST hold coastal discharge permit **4488-2** to discharge up to 68 litres/second of stormwater from an industrial chemical storage site into the Hongihongi Stream. This permit was issued by the Council on 15 January 2002, to BST, as a resource consent under Section 87(c) of the RMA. The consent is due to expire on 1 June 2014. An application to renew consent 4488-2 was received on 28 November 2013.

Condition 1 lists effects that the discharge shall not have on the Hongihongi Stream.

Condition 2 places limits on certain chemical parameters in the discharge.

Condition 3 requires the maintenance of a contingency plan.

Condition 4 is a review provision.

A copy of the permit is attached to this report in Appendix I.

### **2.3.3 Results**

#### **2.3.3.1 Inspections**

The site was inspected on the following dates:

- 22 August 2012
- 12 September 2012
- 11 April 2013
- 24 June 2013
- 2 August 2013
- 21 November 2013
- 7 April 2014
- 6 June 2014

On each occasion the tank bunds, stormwater drains, and separators were checked, and an odour survey conducted, and no issues were noted (for example bunds and stormwater drains were free of any evidence of contaminants). Company staff usually accompanied the Council inspector.

### 2.3.3.2 Results of discharge monitoring

Results of sample analysis are presented in Table 2.

**Table 2** Results for BST stormwater prior to discharge (STW001043)

Sample number	Date	Conductivity (mS/m@20C)	Oil and Grease (g/m <sup>3</sup> )	pH	Suspended solids (g/m <sup>3</sup> )	Temperature (°C)
<i>Consented limit</i>		-	15	6.0 - 9.0	100	-
TRC136022	20 May 2013	19	0.6	10.2	<2	13.4
TRC136279	17 Jun 2013	14	<0.5	10.7	4	14.1
TRC137090	24 Sep 2013	15.6	<0.5	9	34	14.7
TRC149802	17 Apr 2014	8.8	<0.5	7.7	14	14.3

Table 2 shows that the pH measured on 20 May 2013 and 17 June 2013 were above the levels applying to the consented discharge. During the period under review, samples were collected from the bunded area prior to release into the stormwater system. It is likely that the sample collected was from a pocket of water recently treated with caustic soda as this is used by the consent holder to regulate the pH of stormwater prior to release. These potential breaches of the consented pH limits were discussed with the consent holder. Further mixing of bund water prior to measuring pH and release into the stormwater system was decided on as the first course of action. Since this has been implemented the pH of samples have been within consented limits.

### 2.3.4 Evaluation of performance

A tabular summary of the consent holder's compliance record for the period under review is set out in Tables 3 and 4.

**Table 3** Summary of performance for consent 0276-2: to discharge up to 30 litres/second of treated stormwater and waste saltwater from an oil terminal site into the coastal marine area of the Hongihongi Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Discharge not to have adverse effects on receiving waters	Inspections and sampling of receiving waters	Yes
2. Limits on certain chemical parameters in discharge	Sampling of discharge	N/A
3. Maintenance of a contingency plan	Plan approved 14 July 2011	Yes
4. Review provision	No further option for review prior to expiry in 2014	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		<b>High</b>

**Table 4** Summary of performance for consent 4488-2: to discharge up to 68 litres/second of stormwater from an industrial chemical storage site into the Hongihongi Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Discharge not to have adverse effects on receiving waters	Inspections and sampling of receiving waters	Yes
2. Limits on certain chemical parameters in discharge	Sampling of ponded stormwater prior to discharge	Potentially no – However, actual discharge not sampled.
3. Maintenance of a contingency plan	Plan approved 14 July 2011	Yes
4. Review provision	No further option for review prior to expiry in 2014	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High

## 2.4 Fonterra Co-operative Group Limited – New Plymouth Coolstores

### 2.4.1 Site description

Fonterra Co-operative Group Limited (Fonterra) operate a coolstore on a site in New Plymouth where there has been a coolstore since 1896 (Figure 4). Water used for cooling is discharged to a holding pond on the site, which overflows via a stormwater drain onto Ngamotu Beach. Oily water seeping from a disused oil well on the site, that was active between 1910 and 1920, is discharged through a separator to the holding pond.

### 2.4.2 Resource consent

Fonterra holds coastal discharge permit **0671-3** to discharge up to 960 cubic metres/day of cooling water and 7.2 cubic metres/day of groundwater seepage from a reservoir at the rear of the Company's installation via a stormwater drain onto Ngamotu Beach. This permit was issued by the Council to Taranaki Coolstores Ltd on 7 December 2001 as a resource consent under Section 87(c) of the RMA. It was transferred to NZMP New Plymouth Coolstores on 17 April 2003 before being transferred on 4 November 2003 to Fonterra. It is due to expire on 1 June 2020.

This is not a discharge to the Hongihongi Stream, but due to its close proximity to the other storage tank facilities, it is included in this monitoring programme.

Condition 1 requires the adoption of the best practicable option.

Condition 2 requires the exercise of the consent to be in accordance with the application's supporting information.

Condition 3 places a limit on the temperature of the water discharged.

Condition 4 prohibits the discharge of cooling water treatment chemicals without prior permission of Council.

Condition 5 lists effects which the discharge should not have on Ngamotu Beach.

Condition 6 places limits on concentrations of certain contaminants in the discharge.

Condition 7 is a review provision.

A copy of the permit is attached to this report in Appendix I.

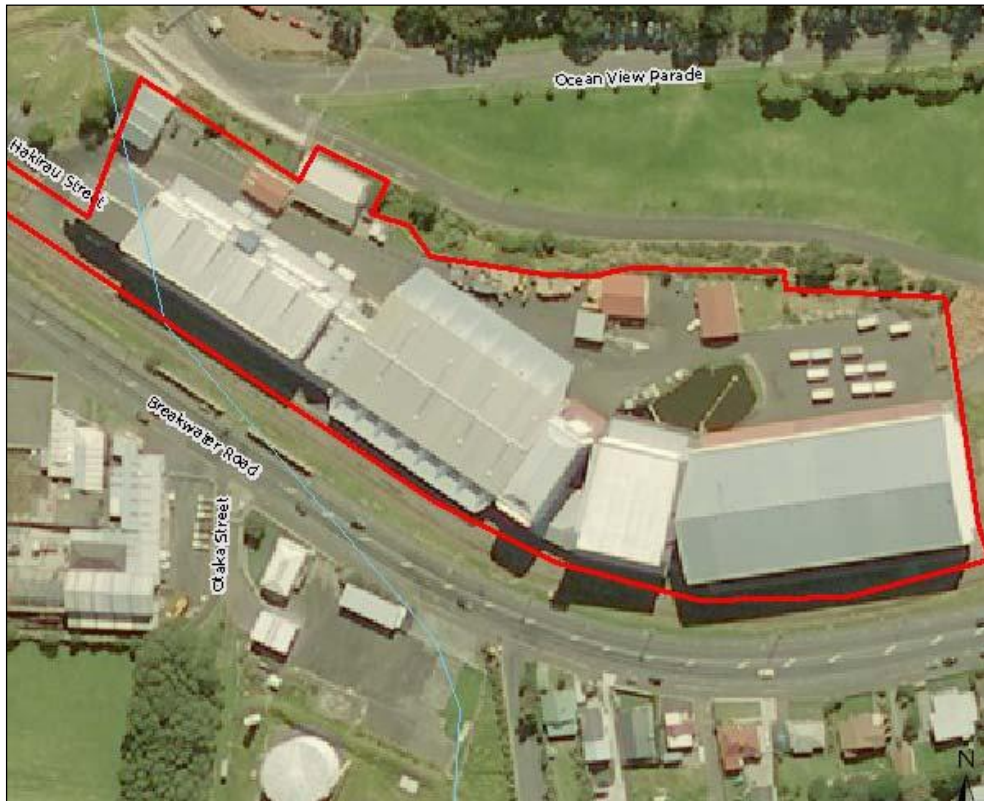


Figure 4 Aerial photograph of Fonterra NP Coolstores

## 2.4.3 Results

### 2.4.3.1 Inspections

The site was inspected on the following dates:

- 11 February 2013
- 10 April 2013
- 16 May 2013
- 24 June 2013
- 2 August 2013
- 15 October 2013
- 3 April 2014
- 26 June 2014

On each occasion the cooling water pond, stormwater drains, oil separator, and discharge outlet at Ngamotu Beach were checked and no issues were noted (for example bunds and stormwater drains were free of any evidence of contaminants or spills, such as hydrocarbon sheens). Company staff usually accompanied the Council inspector.

### 2.4.3.2 Results of discharge monitoring

Five samples were collected from the holding pond during the period under review. All results from the sample analysis complied with the consent limits and are presented in Table 5.

**Table 5** Results for Fonterra cooling water and stormwater discharge (STW002053)

Sample number	Date	Conductivity (mS/m@20C)	Oil and Grease (g/m <sup>3</sup> )	pH	Suspended solids (g/m <sup>3</sup> )	Temperature (°C)
<i>Consented limit</i>		-	15	6.0 - 9.0	100	<25
TRC136017	20 May 2013	20.8	<0.5	7.7	4	17.6
TRC136282	17 Jun 2013	20.8	<0.5	7.7	7	17.1
TRC136388	24 Jun 2013	30.4	<0.5	7.9	3	15.6
TRC137075	23 Sep 2013	20.2	No result	7.8	7	19.8
TRC149806	17 Apr 2014	13.3	<0.5	7.6	8	18.6

### 2.4.4 Evaluation of performance

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

**Table 6** Summary of performance for consent 0671-3: to discharge up to 960 cubic metres/day of cooling water and 7.2 cubic metres/day of groundwater seepage from a reservoir at the rear of the company's installation via a stormwater drain onto Ngamotu Beach

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adoption of best practicable option	Inspections	Yes
2. Exercise of consent in accordance with application	Inspections	Yes
3. Limits temperature of water	Sampling of discharge	Yes
4. Discharge not to contain water treatment chemicals	Inspection, sampling and liaison with consent holder	Yes
5. Discharge not to have adverse effects on Ngamotu Beach	Inspections and sampling	Yes
6. Limits on certain chemical parameters in discharge	Sampling of discharge	Yes
7. Review provision	No further option for review prior to expiry in 2020	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High

## 2.5 Greymouth Facilities Ltd – Deballast facility

### 2.5.1 Site description

This facility (Figure 5) was constructed to treat deballast water from vessels docked at the port. However, it has not been in use since 1996. Greymouth took over the site from Methanex in 2008.



Figure 5 Aerial photograph of the Greymouth and STOS deballast sites

### 2.5.2 Resource consent

Greymouth held coastal discharge permit **3914-2** to discharge up to 8000 cubic metres/day of treated tanker deballast water, and occasionally treated oil contaminated water, other than tanker deballast, into the Hongihongi Stream.

Consent 3914-2 was issued by the Council to Methanex Motunui Ltd on 12 June 1996 as a resource consent under Section 87(c) of the RMA. The consent was then transferred to Greymouth on 29 September 2008, and expired on 1 June 2014. A renewal application has not been received; this site is no longer consented to discharge into the Hongihongi Stream.

Condition 1 lists effects the discharge shall not have on the receiving waters.

Condition 2 places limits on certain chemical parameters in the discharge.

Condition 3 prohibits discharge of wastewaters other than deballast water without prior approval.

Condition 4 requires the maintenance of a contingency plan.

Condition 5 is a review provision.

A copy of the permit is attached to this report in Appendix I.

## **2.5.3 Results**

### **2.5.3.1 Inspections**

The site was inspected on the following dates:

22 August 2012

13 February 2013

11 April 2013

24 June 2013

24 February 2014

3 April 2014

6 June 2014

27 June 2014

On each occasion the tank bund, stormwater drains, and the separator were checked. No issues were noted. There continued to be no product stored on site, up until early 2014. During the inspection on 3 April 2014, it was noted that new tanks were being stored on site. Subsequent inspections indicate increased activity at the site.

### **2.5.3.2 Results of discharge monitoring**

No discharge monitoring was carried out during the period under review, as the site remained unused for treatment and discharge of ballast water.

## **2.5.4 Evaluation of performance**

A tabular summary of the consent holder's compliance record for the year under review is set out in Table 7.



**Table 7** Summary of performance for consent 3914-2: to discharge up to 8000 m<sup>3</sup>/day of treated tanker deballast water, and occasionally treated oil contaminated water, other than tanker deballast, into the Hongihongi Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Discharge not to have adverse effects on receiving waters	Inspections of potential sources and receiving waters	Yes
2. Limits on certain chemical parameters in discharge	Not assessed – no discharge	N/A
3. No effluents from treatment of wastewaters other than tanker deballast water to be discharged	Inspections	Yes
4. Provision of a contingency plan	Site not in use	N/A
5. Review provision	No further option for review prior to expiry in 2014	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High

## 2.6 Liquigas Ltd

### 2.6.1 Site description

The Liquigas LPG storage depot has been in operation since 1983. Onsite storage consists of ten 220 cubic metre bullet tanks which are encased in a minimum of 1 metre of sand on all sides within two truncated brick pyramids. A cathodic protection system is used to minimise corrosion of the tanks. LPG is received via a pipeline from Shell Todd Oil Service's Maui Production Station at Oaonui and is piped off site to Newton King Tanker Terminal for national distribution by ship.

### 2.6.2 Resource consent

Liquigas hold water discharge permit **4524-2** to discharge from an LPG storage site:

- (a) process water from LPG storage tank de-watering;
- (b) water used to decommission and recommission LPG storage tanks;
- (c) LPG pipeline flushing water over a two-day period during emergency repairs; and
- (d) stormwater into the Hongihongi Stream.

This permit was issued by the Council on 3 December 2007 as a resource consent under Section 87(e) of the RMA. It is due to expire on 1 June 2026.

Condition 1 requires the consent holder to adopt the best practicable option to prevent or minimise any adverse effects.

Condition 2 limits the size of stormwater collection catchment area.

Condition 3 limits the volume of process water discharged per day.

Condition 4 relates to the consent holder preparing and maintaining a contingency plan.

Condition 5 relates to the pipe flushing water and the water used to decommission and recommission the LPG storage tanks, and to keeping records of the discharges.

Condition 6 requires the consent holder to notify the Council, 24 hours prior to discharging pipe flushing water or water used to decommission or recommission the storage tanks.

Condition 7 relates to the consent holder providing the Council with the results of any physicochemical analysis.

Condition 8 relates to concentration limits for the discharge.

Condition 9 is a review provision.

A copy of the permit is attached to this report in Appendix I.

## **2.6.3 Results**

### **2.6.3.1 Inspections**

The site was inspected on the following dates:

11 April 2013

8 May 2013

28 May 2013

24 October 2013

24 February 2014

8 April 2014

4 June 2014

On each occasion the truck load-out areas and stormwater drains were checked, and no issues were noted. Company staff usually accompanied the Council inspector.

### **2.6.3.2 Results of discharge monitoring**

The Hongihongi Stream is culverted for approximately 500 metres under the LPG storage depot and Port Taranaki land, prior to discharging to the coast at the western end of Ngamotu Beach.

Five stormwater samples were collected during the period under review. All results from the sample analysis complied with the consented limits. These results are presented in Table 8.

**Table 8** Results for Liquigas stormwater discharge (STW001104)

Sample number	Date	Conductivity (mS/m@20C)	Hydrocarbons (g/m <sup>3</sup> )	pH	Suspended solids (g/m <sup>3</sup> )	Temperature (°C)
<i>Consented limit</i>		-	15	6.0 - 9.0	100	-
TRC136018	20 May 2013	23.5	<0.5	7.4	2	14.8
TRC136089	28 May 2013	5.4	<0.5	6.9	15	8.5
TRC136281	17 Jun 2013	20.9	<0.5	7.5	2	15
TRC137076	23 Sep 2013	14.3	1.3	7.3	8	16.5
TRC149804	17 Apr 2014	7.2	0.5	7.2	19	15.2

## 2.6.4 Evaluation of performance

A tabular summary of the consent holder's compliance record for the period under review is set out in Table 9.

**Table 9** Summary of performance for Consent 4524-2: to discharge from an LPG storage site: (a) process water; (b) water used to decommission and re-commission the LPG storage tanks; (c) LPG pipeline flushing water over a two-day period during emergency repairs; (d) stormwater into the Hongihongi Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt best practicable option	Inspections of site and sampling	Yes
2. Stormwater catchment area limit	Inspections of site	Yes
3. Process water discharge not to exceed 30 litres/day	Inspections of site and records	Yes
4. Maintenance of a contingency plan	Plan approved 25 November 2013	Yes
5. Keep records of discharges during decommissioning/recommissioning	Liaison with consent holder	Yes
6. Notify TRC 24 hours prior to discharge	Notifications received	Yes
7. Provide results of any analysis carried out	Liaison with consent holder – results received	Yes
8. Concentration limits in discharge	Sampling	Yes
9. Review provision	Next option for review June 2020	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High

## 2.7 New Zealand Oil Services Ltd – Ngamotu Road

### 2.7.1 Site description

This New Zealand Oil Services (NZOS) installation is primarily used for the storage of diesel which is then distributed from the site to either the Centennial Drive site or bunkered to vessels at Port Taranaki.

There are two storage tanks in a fully bunded area on the western side of the site (Figure 6). Only one of these tanks is currently in use, as the southern most tank has been decommissioned.

Hydrostatic testing is undertaken at least once every five years. Most operational water generated on the site now comes from condensation or water entrained in the cargos; this and any stormwater is treated via the separator before discharging to the NPDC stormwater system.

### **2.7.2 Resource consent**

NZOS holds coastal discharge permit **1020-3** to discharge up to 30.13 litres/second of stormwater and treated wastewater from a petroleum storage facility into the Hongihongi Stream. This permit was issued by the Council on 1 May 1996 to Shell NZ Ltd, as a resource consent under Section 87(c) of the RMA. The consent was transferred to NZOS on 17 September 1999, and expired on 1 June 2014. However, an application to re-new the consent was received on 28 November 2013.

Condition 1 lists effects the discharge shall not have on the receiving waters.

Condition 2 places limits on certain chemical parameters in the discharge.

Condition 3 prohibits discharge of wastewater from truck washing.

Condition 4 requires the maintenance of a contingency plan.

Condition 5 is a review provision.

A copy of the permit is attached to this report in Appendix I.



**Figure 6** Aerial photograph of the New Zealand Oil Services Ltd Ngamotu Road site

## 2.7.3 Results

### 2.7.3.1 Inspections

The site was inspected on the following dates:

- 12 September 2012
- 11 April 2013
- 19 April 2013
- 24 June 2013
- 22 October 2013
- 24 February 2014
- 6 June 2014
- 27 June 2014

Company staff usually accompanied the Council inspector. On each occasion the tank bunds, stormwater drains, and the separator were checked, and no issues were noted. During the period under review bund repairs were carried out as the bund was found to be ineffectively sealed (likely due to damage caused when hand rails were installed into the bund floor).

### 2.7.3.2 Results of discharge monitoring

Five samples were collected from the Ngamotu Road site during the period under review. The results of the analysis are presented in Table 10. All results complied with the consent limits.

**Table 10** Results for NZOS treated stormwater discharge (IND001011)

Sample number	Date	Conductivity (mS/m@20C)	Hydrocarbons (g/m <sup>3</sup> )	pH	Suspended solids (g/m <sup>3</sup> )	Temperature (°C)
<i>Consented limit</i>		-	15	6.0 - 9.0	50	-
TRC135726	19 Apr 2013	4.4	<0.5	7	4	18
TRC136024	20 May 2013	2.6	<0.5	6.7	3	13.5
TRC136278	17 Jun 2013	5.1	<0.5	6.9	17	13.9
TRC137073	23 Sep 2013	6.1	<0.5	7	4	15.3
TRC149801	17 Apr 2014	6	<0.5	7.1	5	16.7

### 2.7.4 Evaluation of performance

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

**Table 11** Summary of performance for consent 1020-3 to discharge up to 30.13 litres/sec of stormwater and treated wastewater from a petroleum storage facility into the Hongihongi Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Discharge not to have adverse effects on receiving waters	Inspections and sampling of receiving waters	Yes
2. Limits on certain chemical parameters in discharge	Sampling of discharge	Yes
3. No wastewater from truck washing to be discharged	Inspections	Yes
4. Provision of a contingency plan	Plan approved 10 December 2012	Yes
5. Review provision	No further option for review prior to expiry in 2014	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High

## 2.8 Shell Todd Oil Services Limited – Deballast facility

### 2.8.1 Site description

This facility was constructed to treat deballast water from vessels docked at the port. Consent 0170-2 was surrendered on the 30 September 2013, as the site is no longer in operation. However, uncontaminated stormwater is still discharged from the site into the Hongihongi Stream. A separator system is in place to ensure that the stormwater discharge off-site complies with the Regional Fresh Water Plan permitted activity rule 23.

## **2.8.2 Resource consents**

Shell Todd Oil Services Ltd held coastal discharge permit **0170-2** to discharge up to 7,000 cubic metres/day of treated tanker deballast water from Maui and Kapuni condensate tankers into the Hongihongi Stream. This permit was issued by the Council on 12 June 1996 as a resource consent under Section 87(c) of the RMA. Consent 0170-2 was surrendered on the 30 September 2013.

Condition 1 lists effects that the discharge shall not have on the receiving waters.

Condition 2 places limits on certain chemical parameters in the discharge.

Condition 3 requires the maintenance of a contingency plan.

Condition 4 is a review provision.

A copy of the permit is attached to this report in Appendix I.

## **2.8.3 Results**

No samples were collected by the Council, and the site was not inspected during the period under review as the site is now empty and unused.

## **2.9 Shell Todd Oil Services Limited – Paritutu Tank Farm**

### **2.9.1 Process description**

This installation is located on the corner of Paritutu Road and Centennial Drive. It consists of five condensate storage tanks banded into three separate areas (Figure 7). The tank bunds have been progressively upgraded, and they are all now lined and HSNO compliant.

Stormwater from the site is sampled to confirm compliance with consent conditions prior to being directed to the API separator for treatment and discharge via the NPDC stormwater system on Centennial Drive to the Hongihongi Stream.



**Figure 7** Aerial photograph of the Shell Todd Oil Services Ltd Paritutu Tank Farm

## 2.9.2 Resource consent

Shell Todd Oil Services Ltd (STOS) holds coastal discharge permit **5542-1** to discharge treated stormwater from a petrochemical storage tank facility into the coastal marine area of the Hongihongi Stream. This permit was issued by the Council on 15 September 1999 as a resource consent under Section 87(c) of the RMA. It is due to expire on 1 June 2015.

Condition 1 lists effects that the discharge shall not have on the receiving waters.

Condition 2 places limits on certain chemical parameters in the discharge.

Condition 3 requires the maintenance of a contingency plan.

Condition 4 is a review provision.

A copy of the permit is attached to this report in Appendix I.

## 2.9.3 Results

### 2.9.3.1 Inspections

The site was inspected on the following dates:

- 18 February 2013
- 18 April 2013
- 15 May 2013



- 18 June 2013
- 04 April 2014
- 03 June 2014
- 27 June 2014

On each occasion the tank bunds and stormwater drains were checked, and no issues were noted. Company staff usually accompanied the Council inspector.

### 2.9.3.2 Results of discharge monitoring

Five samples were collected from the Paritutu Tank Farm site during the period under review. The results of the analysis are presented in Table 12. All results complied with the consented limits. STOS tests the stormwater collected in the bunds and only discharges it through the separator if it meets consent conditions.

**Table 12** Results for STOS Paritutu Tank Farm stormwater discharge (STW002040)

Sample number	Date	Conductivity (mS/m@20C)	Hydrocarbons (g/m <sup>3</sup> )	pH	Suspended solids (g/m <sup>3</sup> )	Temperature (°C)
<i>Consented limit</i>		-	15	6.0 - 9.0	50	-
TRC135723	18 Apr 2013	15.9	<0.5	8	4	18.4
TRC136030	21 May 2013	9.3	<0.5	7.3	<2	12.6
TRC136303	18 Jun 2013	9.7	<0.5	7.6	2	14.2
TRC137071	23 Sep 2013	9.6	<0.5	7.5	6	15.2
TRC149799	17 Apr 2014	12	<0.5	7.3	<2	16.3

### 2.9.4 Evaluation of performance

A tabular summary of the consent holder's compliance record for the period under review is set out in Table 13.

**Table 13** Summary of performance for consent 5542-1 to discharge treated stormwater from a petrochemical storage tank facility into the coastal marine area of the Hongihongi Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Discharge not to have adverse effects on receiving waters	Inspections and sampling of receiving waters	Yes
2. Limits on certain chemical parameters in discharge	Sampling of discharge	Yes
3. Maintenance of a contingency plan	Plan approved 19 August 2010	Yes
4. Review provision	No further option for review prior to expiry in 2015	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		<b>High</b>

## 2.10 Hongihongi Stream

### 2.10.1 Inspections

Inspections of the Hongihongi Stream mouth were conducted in conjunction with industrial site inspections during the period under review. No conspicuous or adverse environmental effects were noted during any of the inspections.

### 2.10.2 Results of receiving environment monitoring

Samples were collected from the Hongihongi Stream on the same day that samples of stormwater were collected from the various industrial sites. The Hongihongi Stream was sampled on seven separate occasions during the period under review. Results of the sample analysis are presented in Table 14.

Upstream and downstream samples were collected and analysed for conductivity, hydrocarbon concentration, pH, temperature, and turbidity. Upstream and downstream samples had similar results for most parameters, indicating little, if any, adverse effects on the stream from industries discharging stormwater.

The difference in conductivity between upstream and downstream samples can be attributed to the incoming tide occurring when sampling from the culvert at Ngamotu Beach.

On 20 May 2013, 24 September 2013, and 17 April 2014 there was a noticeable increase in turbidity between upstream and downstream sites. A sample was collected and analysed from each site discharging into the Hongihongi Stream. All samples complied with consented limits for suspended solids.

The increase in turbidity between the upstream and downstream sites could be related to the progression of the rainfall event between collecting the two stream samples, and/or run off and erosion from stream banks that occurs as a river flows towards the ocean.

**Table 14** Results for the Hongihongi Stream (HGI000500 and HGI000990)

Sample number	Date	Location	Conductivity (mS/m@20C)	Hydrocarbons (g/m <sup>3</sup> )	pH	Temperature (°C)	Turbidity (NTU)
TRC135724	18 Apr 2013	Upstream	19.6	<0.5	7.2	16.6	1.8
TRC135725	18 Apr 2013	Downstream	20.5	<0.5	7.3	16.9	3.1
TRC135727	19 Apr 2013	Upstream	19.9	<0.5	7.2	16.9	1.2
TRC135728	19 Apr 2013	Downstream	12.8	<0.5	7.3	16.6	4.6
TRC136016	20 May 2013	Upstream	20.8	<0.5	7.2	14.5	1.5
TRC136020	20 May 2013	Downstream	18.5	<0.5	7.2	15	8
TRC136276	17 Jun 2013	Upstream	19.4	<0.5	7.2	14.4	1.7
TRC136277	17 Jun 2013	Downstream	101	<0.5	7.4	15.3	4.4
TRC137074	23 Sep 2013	Upstream	20.1	<0.5	7.1	15.5	6.2
TRC137077	23 Sep 2013	Downstream	556	<0.5	7.4	16.1	9.1

Sample number	Date	Location	Conductivity (mS/m@20C)	Hydrocarbons (g/m <sup>3</sup> )	pH	Temperature (°C)	Turbidity (NTU)
TRC137091	24 Sep 2013	Upstream	20.8	<0.5	7.3	14.7	1.3
TRC137092	24 Sep 2013	Downstream	382	<0.5	7.3	15.1	18
TRC149808	17 Apr 2014	Upstream	8.6	<0.5	7.2	15.1	3.8
TRC149809	17 Apr 2014	Downstream	137	<0.5	7.2	15.3	23

## 2.11 Investigations, interventions, and incidents

The monitoring programme for the 1 July 2012 to 30 June 2014 period was based on what was considered to be an appropriate level of monitoring, review of data, and liaison with the consent holder. During the period under review, 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).

There were no unauthorised incidents in the Hongihongi catchment in relation to industries monitored under this programme in the 2012-2014 monitoring period.

## 2.12 Discussion

### 2.12.1 Discussion of site performance

Industries within the Hongihongi catchment have the potential to cause major pollution events if the operations are not well managed and storage facilities kept in good state.

During the 2012-2014 monitoring period, inspections of sites found them to be generally tidy and well managed. No concerns about the operation of site stormwater systems were noted.

### 2.12.2 Environmental effects of exercise of consents

The Hongihongi Stream is piped for approximately 500 metres before exiting at the western end of Ngamotu Beach, a popular recreational beach located near Port Taranaki. Inspections and the results of discharge monitoring at individual sites

showed that consent conditions were being complied with. The results of sampling the Hongihongi Stream and foreshore inspections confirmed that there were no adverse effects occurring on either the stream or Ngamotu Beach.

### **2.12.3 Evaluation of performance**

Tabular summaries of the compliance records for the year under review are set out in the relevant section for each consent holder.

During the year under review, all of the companies demonstrated a high level of environmental performance and compliance with the resource consents.

### **2.12.4 Recommendations from the 2011-2012 Annual Report**

In the 2011-2012 Annual Report, it was recommended:

1. THAT the monitoring programme for discharges to the Hongihongi Stream for the 2012-2013 year is maintained at the same level as in 2011-2012 (with the inclusion of sampling not completed in the 2011-2012 year).

This recommendation was implemented.

### **2.12.5 Alterations to monitoring programmes for 2014-2015**

In designing and implementing the monitoring programmes for air/water discharges in the region, the Council has taken into account the extent of information made available by previous authorities, its relevance under the Resource Management Act, the obligations of the Act in terms of monitoring emissions/discharges and effects, and subsequently reporting to the regional community, 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 emitting to the atmosphere/discharging to the environment.

It is proposed that for 2014-2015 the programme is implemented at the same level as in the 2012-2013 and 2013-2014 monitoring periods.

A recommendation to this effect is presented in Section 4 of this report.

### **2.12.6 Exercise of optional review of consent**

No resource consents provide for an optional review in June 2015.

### 3. Herekawe catchment

#### 3.1 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.

A summary of the consents for activities in the Herekawe catchment during the monitoring period is given in Table 15. These consents are discussed in more detail in the following sections. Copies of the consents are attached in Appendix II.

There are consented discharges into the Herekawe Stream from the urban area to the north and east (New Plymouth District Council) and Dow AgroSciences. Monitoring of the combined stormwater discharge is reported separately.

**Table 15** Resource consents for activities in the Herekawe catchment

Consent holder	Consent number	Purpose of consent	Date granted	Next review	Expiry
Chevron New Zealand	7152-1	To discharge treated stormwater and hydrotest water	21/09/2007	2020	2026
Origin Energy Resources (Kupe) Ltd	7368-1	To discharge treated stormwater into the Herekawe Stream and to discharge hydrotest water to land, where it may enter Lloyd Pond A, and into the Herekawe Stream	22/07/2009	2020	2026
Shell Todd Oil Services Ltd	1316-3	To discharge treated and untreated stormwater, tank bleed-off and hydrostatic test water	10/01/2002	-	2020
	1944-3	To discharge uncontaminated stormwater and treated stormwater	16/05/2008	2020	2026
New Plymouth District Council	5125-1	To discharge up to 6700 litres/second of stormwater into the Herekawe Stream	04/04/1997	-	*2014

\*Applications for consent renewals were received by the Council within required time frames.

The operational boundaries of the consents monitored in the Herekawe catchment within the Herekawe Stream programme are identified in Figure 8.



**Figure 8** Consent holders' property boundaries in the Herekawe catchment

## 3.2 Monitoring programme

### 3.2.1 Introduction

Section 35 of the RMA sets out an obligation for the Council to gather information, monitor, and conduct research on the exercise of resource consents, and the effects arising, within the Taranaki region.

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 for the Herekawe catchment consisted of four primary components outlined below.

### 3.2.2 Programme liaison and management

There is generally a significant investment of time and resources by the Council in ongoing liaison with resource consent holders over:

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

### 3.2.3 Site inspections

Each of the consent holders' sites were inspected over the monitoring period. The main points of interest were plant processes with potential or actual discharges to receiving watercourses, including contaminated stormwater and process wastewaters. 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 surveyed for environmental effects.

### 3.2.4 Chemical sampling

The Council undertook four wet weather runs during the period under review. Site discharges and receiving waters (upstream and downstream of discharges, as well as the mixing zone) were sampled and water quality parameters were analysed (Figure 9).



Figure 9 Sampling sites in the Herekawe catchment

### 3.2.5 Biomonitoring surveys

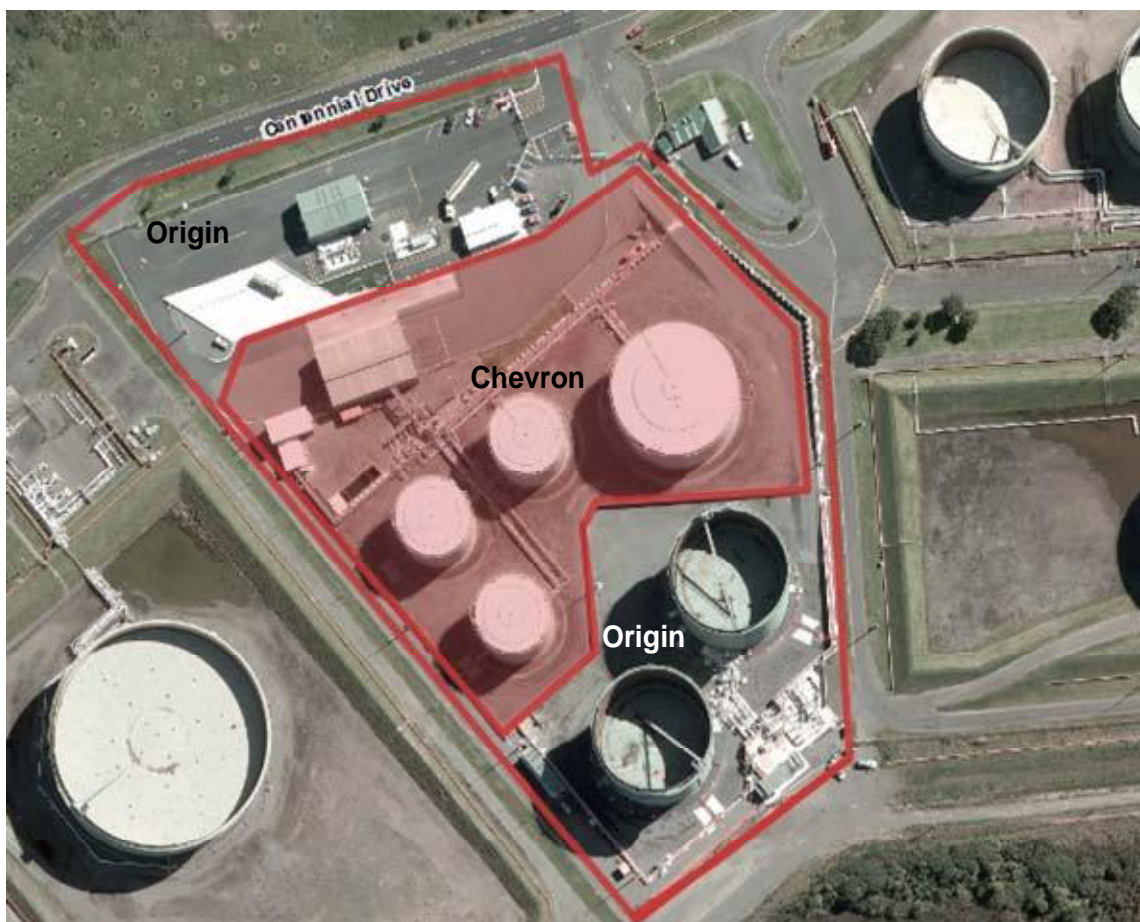
Biological surveys were performed on four occasions in the Herekawe Stream to assess whether stormwater discharges from the various sites have had any adverse effects on the macroinvertebrate communities of the stream.

### 3.3 Chevron New Zealand

#### 3.3.1 Process description

Chevron New Zealand (Chevron) operates a hydrocarbon storage facility on Centennial Drive, New Plymouth (Figure 10). The site is approximately 3 hectares in size, and there are four tanks on the site for storing hydrocarbons. The tanks are contained in a bunded area. Stormwater from the bunded area is manually directed to a three stage separator (30,000 litre capacity) after it is checked to ensure there is no contamination.

There is also a truck wash and truck parking on the site. Discharges from the truck wash site are directed to the New Plymouth District Council trade waste system. Stormwater discharges from the truck parking area are directed to the separator.



**Figure 10** Aerial photograph of the Chevron site showing the division between Chevron and Origin Energy

#### 3.3.2 Resource consents

Chevron holds water discharge permit **7152-1** to discharge treated stormwater and hydrotest water from a hydrocarbon storage facility into the Herekawe Stream. This permit was issued by the Council on 21 September 2007 under Section 87(d) of the RMA. The consent was varied on 31 March 2009 to include the discharge of hydrotest water, and is due to expire on 1 June 2026.



Condition 1 requires the consent holder to adopt the best practicable option to prevent or minimise effects on the environment.

Condition 2 requires the exercise of the consent be undertaken in accordance with documentation submitted in support of the application.

Condition 3 states that all stormwater shall be directed for treatment through the stormwater treatment system.

Condition 4 states that above ground hazardous substance storage areas shall be bunded with drainage to sumps, and not to the stormwater system.

Condition 5 states there shall be no discharge of wastewater from truck washing operations to the stormwater system.

Condition 6 states the concentration limits for the discharge.

Condition 7 requires the consent holder to prepare a contingency plan to be approved by Council.

Condition 8 requires the consent holder to prepare an operation and management plan to the satisfaction of Council.

Condition 9 is a review provision.

A copy of the permit is attached to this report in Appendix II.

### **3.3.3 Results**

#### **3.3.3.1 Inspections**

The site was inspected on the following dates:

- 12 September 2012
- 12 February 2013
- 18 April 2013
- 17 June 2013
- 21 November 2013
- 28 February 2014
- 8 April 2014
- 3 June 2014

On each occasion the tank bunds, stormwater drains, nature of any discharges from the site, and the separator (including any contents) were checked. The tanks were empty during all inspections, the site tidy, and no issues were noted.

#### **3.3.3.2 Results of discharge monitoring**

Two samples were collected from the separator at the Chevron site during the period under review. The results of the analysis are presented in Table 16. All results complied with the consented limits.

**Table 16** Results for Chevron separator discharge (STW002038)

Sample number	Date	Chloride (g/m <sup>3</sup> )	Conductivity (mS/m@20C)	Hydrocarbons (g/m <sup>3</sup> )	pH	Suspended solids (g/m <sup>3</sup> )	Temperature (°C)
<i>Consented limit</i>		50	-	15	6.0 - 9.0	100	-
TRC137082	23 Sep 2013	24.5	13.1	<0.5	7.2	2	14.3
TRC1410067	27 May 2014	35.6	16.1	<0.5	7.1	4	12.8

### 3.3.4 Evaluation of performance

A tabular summary of the consent holder's compliance record for the year under review is set out in Table 17.

**Table 17** Summary of performance for consent 7152-1 to discharge treated stormwater and hydrotest water from a hydrocarbon storage facility into the Herekawe Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt best practicable option	Inspections and records	Yes
2. Exercise of consent to be undertaken in accordance with documentation submitted in support of application	Inspections and records	Yes
3. All stormwater to be directed for treatment prior to discharge	Inspections	Yes
4. Hazardous storage areas are to be bunded with drainage to sumps	Inspections	Yes
5. No discharge from truck washing operations to stormwater	Inspections	Yes
6. Concentration limits	Samples collected	Yes
7. Contingency plan	Plan approved 29 November 2010	Yes
8. Management plan	Plan approved 29 November 2010	Yes
9. Review provision	Option for review June 2014 was not exercised	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High

## 3.4 Methanex Motunui Ltd - Omata 1 and 2

### 3.4.1 Background

Methanol from Methanex's Motunui and Waitara Valley production plants is pumped to the Omata 1 site for storage prior to being pumped to the Port facility for loading onto tankers. The Omata 2 site has been decommissioned for several years with no product stored on the site. Some work was carried out on the site in 2014, but at present it remains in a decommissioned state. Methanex holds certificates of compliance for the discharge of stormwater from both sites. Methanex continued to collect stormwater discharge samples from Omata 2 throughout its decommissioned period, even with no products being held on the site to ensure there was no

contamination. Methanex also provide monitoring data to the Council for both sites. Both sites are inspected by the Council in conjunction with inspections of surrounding sites at the Omata Tank Farm.

### 3.4.2 Results

#### 3.4.2.1 Inspections

The sites were inspected on the following dates:

- 19 April 2013
- 22 May 2013
- 18 June 2013
- 24 October 2013
- 24 February 2014
- 7 April 2014
- 4 June 2014

On each occasion the tank bunds, stormwater drains, and the separator were checked and no issues were noted.

#### 3.4.2.2 Results of discharge monitoring

Methanex carried out monitoring of banded stormwater prior to discharging, and provided these to the Council during inspections. All results complied with permitted activity conditions. One sample was collected from the Methanex Omata 1 site during the period under review. The results of the analysis are presented in Table 18. All results complied with the permitted activity limits.

**Table 18** Results for Methanex Omata 1 storm water discharge (STW002039)

Sample number	Date	Chloride (g/m <sup>3</sup> )	Conductivity (mS/m@20C)	Hydrocarbons (g/m <sup>3</sup> )	Ph	Suspended solids (g/m <sup>3</sup> )	Temperature (°C)	Turbidity (NTU)
<i>Permitted limit</i>		-	-	15	6.0 - 9.0	100	-	-
TRC1410066	27 May 2014	94.1	33.4	<0.5	7	26	6	30

## 3.5 Origin Energy Resources (Kupe) Ltd

### 3.5.1 Process description

Origin operates the Kupe Omata Tank Farm located on Centennial Drive, New Plymouth. The Tank Farm is a hydrocarbon storage facility covering approximately 1.5ha of land adjacent to the Chevron storage facility.

The southern part of the site includes two hydrocarbon storage tanks. The northern part of the site, along the road frontage, includes a tanker unloading building, staff facilities and the stormwater treatment system. The stormwater treatment oil separator has a capacity of 9.6 m<sup>3</sup>. Stormwater directed to the treatment system includes the banded area for the tanks and stormwater from the tank roofs. In the unlikely event that there are any spills in the tanker unloading facility, they are directed to an underground storage sump.

### 3.5.2 Resource consent

Origin holds water discharge permit **7368-1** to discharge treated stormwater into the Herekawe Stream and to discharge hydrotest water to land, where it may enter Lloyd Pond A, and into the Herekawe Stream. This permit was issued by the Council on 22 July 2009 under Section 87(d) of the RMA.

In February 2012 there was a variation to the consent conditions regarding chloride concentration limits in the discharge, and condition 4 was also changed so that only stormwater from process areas was required to be redirected through the stormwater treatment system. Consent **7368-1** is due to expire on 1 June 2026.

Condition 1 requires the consent holder to notify the Council prior to the discharge of hydrotest water.

Condition 2 requires the consent holder to maintain a contingency plan.

Condition 3 requires the consent holder to adopt the best practicable option to prevent or minimise effects on the environment.

Conditions 4 and 5 concern the treatment of stormwater and hydrotest water.

Conditions 6 and 7 set concentration limits for discharges.

Condition 8 concerns effects on the Herekawe Stream.

Condition 9 relates to scour and erosion.

Condition 10 relates to the provision of test results.

Conditions 11 and 12 concern lapse and review of the consent.

A copy of the permit is attached to this report in Appendix II.

### 3.5.3 Results

#### 3.5.3.1 Inspections

The site was inspected on the following dates:

- 12 September 2012
- 12 February 2013
- 18 April 2013
- 17 June 2013
- 21 November 2013
- 28 February 2014
- 8 April 2014
- 3 June 2014

On each occasion the tank bunds, silt traps, stormwater drains, separator, the nature of any discharge, and overall site condition were checked, and no issues were noted. The site was observed to be actively in use at the time of each inspection.

### Results of discharge monitoring

Three samples were collected by Council during the period under review, the results of the analysis are presented in Table 19. All results complied with the consented limits.

**Table 19** Results for Origin treated stormwater discharge (IND002041)

Sample number	Date	Chloride (g/m <sup>3</sup> )	Conductivity (mS/m@20C)	Hydrocarbons (g/m <sup>3</sup> )	pH	Suspended solids (g/m <sup>3</sup> )	Temperature (°C)
<i>Consented Limit</i>		300	-	15	6.0 - 9.0	100	-
TRC135720	18 Apr 2013	21.1	11.4	<0.5	7.3	<2	19.2
TRC136034	21 May 2013	7.1	3.8	<0.5	7	<2	15
TRC1410494	26 Jun 2014	76.7	29.3	<0.5	7	<2	15.4

### 3.5.4 Evaluation of performance

A tabular summary of the consent holder's compliance record for the year under review is set out in Table 20.

**Table 20** Summary of performance for consent 7368-1 to discharge treated stormwater into the Herekawe Stream and to discharge hydrotest water to land, where it may enter Lloyd Pond A, and into the Herekawe Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Notify Council prior to discharging hydrotest water	No notifications received - No hydrotest water discharged during monitoring period	N/A
2. Maintain a contingency plan	Plan received 31 May 2011	Yes
3. Adopt best practicable option	Inspections and records	Yes
4. Process area stormwater to be directed for treatment prior to discharge	Inspections	Yes
5. Hydrotest water to be filtered prior to discharge	No hydrotest water discharged during monitoring period	N/A
6. Concentration limits for discharges to water	Sampling	Yes
7. Concentration limits for discharges to land	Not sampled	N/A
8. Discharge not to give rise to certain effects in the receiving waters	Inspections and sampling of receiving waters	Yes
9. Consent holder to remedy erosion or scouring	Inspections - no erosion or scouring	N/A
10. Consent holder to provide test results upon request	Results not requested	N/A
11. Lapse condition	Not applicable - consent exercised	N/A
12. Review provision	Option for review June 2014 was not exercised	N/A

Condition requirement	Means of monitoring during period under review	Compliance achieved?
Overall assessment of consent compliance and environmental performance in respect of this consent		High

### 3.6 Shell Todd Oil Services Ltd (Energy Infrastructure Ltd)

#### 3.6.1 Process description

Energy Infrastructure Ltd (EIL) facilities (Figure 11) include three crude oil storage tanks and an 18" pipeline to the Newton King wharf for load-out of product. A road tanker unloading facility, export pumps and a control room are included within the EIL facilities. Crude oil from the McKee, Waihapa, Kaimiro, Maui, Ngatoro and Pohokura fields is collected and stored in the storage tanks prior to shipping through Port Taranaki. Stormwater from the site is sampled to confirm compliance with consent conditions prior to being directed to the API separator for treatment and discharge to the Herekawe Stream. During the period under review the bunds for tanks T101 and T102 were upgraded to meet HSNO compliance.

#### 3.6.2 Resource consent

Shell Todd Oil Services (STOS) hold water discharge permit **1316-3** to discharge up to 3120 cubic metres/day (36 litres/second) of treated and untreated stormwater including bleed-off from tank de-watering and hydrostatic test water from a liquid hydrocarbon storage facility into the Herekawe Stream, and to discharge untreated stormwater onto and into land during periods of bund construction and maintenance works.

This permit was issued by the Council on 10 January 2002 under Section 87(d) of the RMA to Fletcher Challenge Energy Taranaki Ltd. The consent was transferred to STOS on 15 May 2002 and is due to expire on 1 June 2020.

Changes were made to the purpose of the consent in November 2010 in order to allow for discharge of untreated stormwater onto and into land during periods of bund construction and maintenance works.

A change of consent condition 7 to increase the chloride concentration limit for discharge from 50 g/m<sup>3</sup> to 300 g/m<sup>3</sup> was approved on 29 August 2013.

Condition 1 requires the adoption of the best practicable option.

Condition 2 places a limit on the size of the stormwater catchment area.

Conditions 3 and 10 require preparation and maintenance of a contingency plan.

Condition 4 requires all contaminated site water to be treated prior to discharge.

Condition 5 requires the design, management and maintenance of the stormwater system to be in accordance with application information.

Condition 6 requires hazardous substance storage areas be bunded, with drainage to sumps, and not the stormwater system.

Condition 7 places limits on certain chemical parameters in the discharge.

Conditions 8 and 9 list effects which are prohibited in the receiving waters.

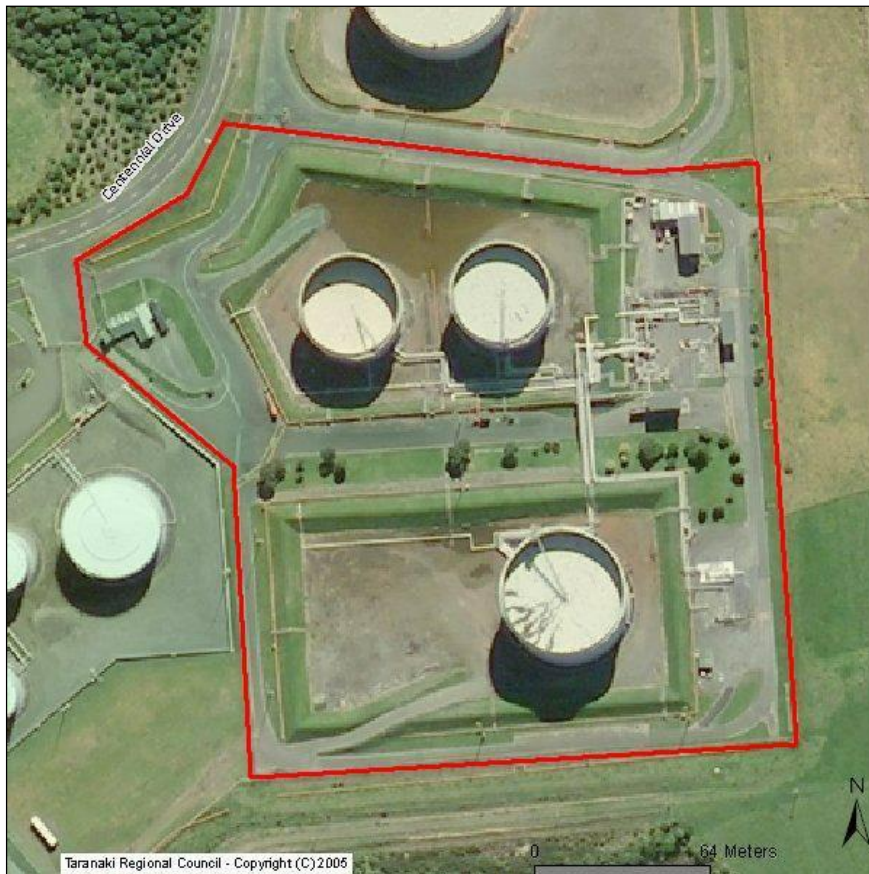
Conditions 11 and 12 require the preparation and maintenance of a management plan and the adherence to such management plan.

Condition 13 deals with notification of changes to the operation and management plan.

Condition 14 requires notification prior to reinstatement of the site.

Condition 15 is a review provision.

A copy of the permit is attached to this report in Appendix II.



**Figure 11** Aerial photograph of the EIL site

### 3.6.3 Results

#### 3.6.3.1 Inspections

The site was inspected on the following dates:

- 18 February 2013
- 18 April 2013
- 15 May 2013
- 18 June 2013
- 24 January 2014
- 4 April 2014
- 3 June 2014

On each occasion the tank bunds, stormwater drains, firewater system, the separator, the nature of any discharges, and the general site condition were checked, and no issues were noted. Site maintenance undertaken during the period under review included cleaning of tanks and the sealing of bunding at the site. Two incidents were reported during the period under review. However, only one applied to the STOS site specifically.

On 23 April 2013 a complaint was received concerning discolouration of the Herekawe Stream in New Plymouth. Investigation found that there was a discolouration, and this was occurring as a result of bund reconstruction works in the Omata Tank Farm site. The Company had undertaken routine sampling prior to the discharge, which showed that suspended solid levels were within resource consent conditions. Samples were taken by the Council at the time of inspection and analysis confirmed this.

#### 3.6.3.2 Results of discharge monitoring

Four samples were collected by the Council from the EIL facilities during the period under review. The results of the analysis are presented in Table 21. All results complied with the consented limits.

**Table 21** Results for STOS (EIL) treated stormwater discharge (STW002010)

Sample number	Date	Chloride (g/m <sup>3</sup> )	Conductivity (mS/m@20C)	Hydrocarbons (g/m <sup>3</sup> )	pH	Suspended solids (g/m <sup>3</sup> )	Temperature (°C)
<i>Consented limit</i>		300	-	15	6.5 - 8.5	100	-
TRC135717	18 Apr 2013	10.6	2.8	<0.5	7	<2	18.2
TRC136032	21 May 2013	7.8	4	<0.5	6.6	<2	14.8
TRC137080	23 Sep 2013	14.8	9.7	<0.5	7.1	2	17.4
TRC1410493	26 Jun 2014	20.9	13	<0.5	7.2	13	14.8

During the period under review consent condition 7 was varied to change the acceptable chloride limit from 50g/m<sup>3</sup> to 300g/m<sup>3</sup>. During extensive periods of dry weather, due to the prevailing wind direction and proximity of the site to the coast, residual sea salt accumulates in the bunded areas and is eventually flushed through the stormwater system.

The discharge is ultimately into the marine environment where conductivity is high, and chloride levels are in the range of 19,000g/m<sup>3</sup>. The Omata Tank Farm final discharge point is within a tidally influenced section of the lower Herekawe Stream,



where during particular weather conditions, the stream will also be subject to elevated chloride levels.

The amended chloride limit was developed to be more consistent with the “Ambient Water Quality Guidelines for Chlorides” (British Columbia Government Ministry of Environment, 2003) by averaging their values of 150g/m<sup>3</sup> (chronic 30 day limit) and 600g/m<sup>3</sup> (maximum acute limit).

### 3.6.4 Evaluation of performance

A tabular summary of the consent holder’s compliance record for the period under review is set out in Table 22.

**Table 22** Summary of performance for Consent 1316-3 To discharge up to 3120 m<sup>3</sup>/day [36 litres/sec] of treated and untreated stormwater including bleed-off from tank de-watering and hydrostatic test water from a liquid hydrocarbon storage facility into the Herekawe Stream and onto and into land during bund construction and maintenance

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adoption of best practicable option	Inspections	Yes
2. Limit on stormwater catchment area	Inspections	Yes
3. Provision of a contingency plan	Plan received	Yes
4. All contaminated site water to be treated prior to discharge	Inspections	Yes
5. Stormwater system to be designed, managed and maintained in accordance with application documentation	Inspections	Yes
6. Above ground hazardous substances storage areas to be bunded	Inspections	Yes
7. Limits on certain parameters in the discharge	Sampling of discharge	Yes
8. Discharge not to cause increase in temperature or BOD in receiving waters	Not assessed	N/A
9. Discharge not to give rise to certain effects in the receiving waters	Inspections and sampling of receiving waters	Yes
10. Annual preparation and maintenance of a contingency plan	Plan received	Yes
11. Preparation and maintenance of operation and management plan	Plan approved 19 August 2010	Yes
12. Consent to be exercised in accordance with operation and management plan	Inspections	Yes
13. Notification of Council prior to changes to operation and management plan	Not applicable in monitoring year under review	N/A

Condition requirement	Means of monitoring during period under review	Compliance achieved?
14. Council to be advised in writing prior to reinstatement of site and reinstatement to be minimise effects on stormwater quality	Site not reinstated in monitoring year under review	N/A
15. Review provision	Option for review June 2014 was not exercised	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High

### 3.7 Shell Todd Oil – T3500 site

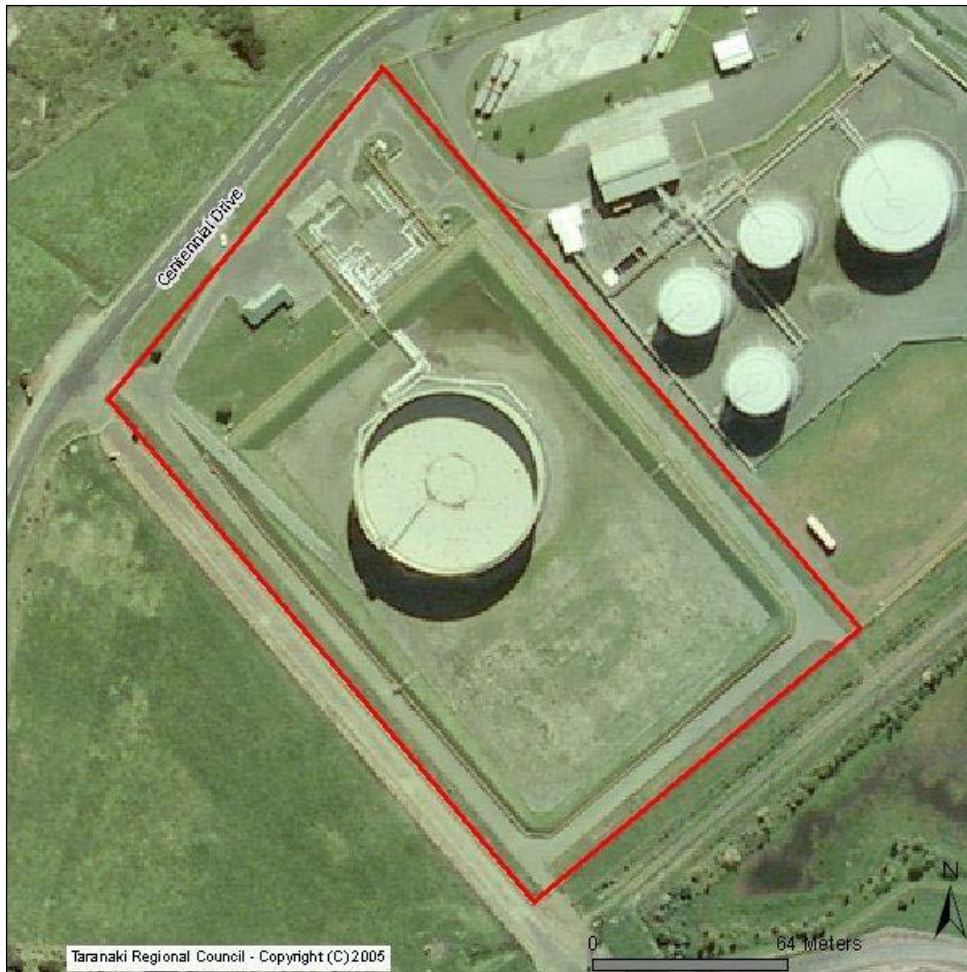
#### 3.7.1 Process description

The site consists of a single 35,000 cubic metre condensate storage tank (T-3500) inside an earth bund, ancillary fire fighting and operating systems and a control building (Figure 12). T3500 is currently used to store Pohokura condensate. There is equipment on site for loading and unloading condensate from road tankers and for loading glycol-contaminated water for return to the Pohokura Production Station. Facilities also exist for transferring product from T-3500 via the Energy Infrastructure Limited (EIL) tank farm and to the port. The T3500 bund was upgraded to meet HSNO compliance during the 2012-2013 monitoring year.

Uncontaminated stormwater from road drains is discharged directly to the Herekawe Stream. Potentially contaminated stormwater is generated in two areas:

- T-3500 tank bunded area;
- General service area where the loadout pumps and general service pumps are located.

Stormwater from these two areas is sampled to confirm compliance with consent conditions prior to being directed to the API separator for treatment and discharge to the Herekawe Stream.



**Figure 12** Aerial photograph of the STOS T-3500 site

### 3.7.2 Resource consent

STOS holds water discharge permit **1944-3** to discharge uncontaminated stormwater and treated stormwater from the Maui condensate storage facility via the existing piped stormwater drain into the Herekawe Stream. This permit was issued by the Council on 16 May 2008 under Section 87(d) of the RMA, and is due to expire on 1 June 2026.

A change of consent condition 8 to increase the chloride concentration limit for discharge from 50 g/m<sup>3</sup> to 300 g/m<sup>3</sup> was approved on 29 August 2013.

Condition 1 requires the consent holder adopt the best practicable option to prevent or minimise any adverse effects.

Condition 2 requires the exercise of this consent be undertaken in accordance with the documentation submitted.

Condition 3 relates to maintenance of a stormwater management plan.

Condition 4 relates to the consent holder maintaining a contingency plan.

Condition 5 requires above ground hazardous substance storage areas be bunded, with drainage to sumps, and not to the stormwater system.

Condition 6 relates to directing stormwater through a stormwater treatment system prior to discharge.

Condition 7 states that the consent holder shall provide the Council with the results of any physicochemical analysis on the stormwater discharged to the Herekawe Stream.

Condition 8 relates to concentration limits.

Condition 9 relates to consent lapse on the expiry of five years after the date of issue of this consent.

Condition 10 is a review provision.

A copy of the permit is attached to this report in Appendix II.

### 3.7.3 Results

#### 3.7.3.1 Inspections

The site was inspected on the following dates:

- 18 February 2013
- 18 April 2013
- 15 May 2013
- 18 June 2013
- 4 April 2014
- 3 June 2014

On each occasion the tank bunds, stormwater drains, the nature of any discharge, the firewater system, the separator, and the overall site condition were checked, and no issues were noted.

#### 3.7.3.2 Results of discharge monitoring

Four samples were collected by the Council from the T3500 tank bund site during the period under review. The results of the analysis are presented in Table 23. All results complied with the consented limits.

**Table 23** Results for STOS T-3500 site bunded stormwater (STW002008)

Sample Number	Date	Chloride (g/m <sup>3</sup> )	Conductivity (mS/m@20C)	Hydrocarbons (g/m <sup>3</sup> )	pH	Suspended solids (g/m <sup>3</sup> )	Temperature (°C)
<i>Consented Limit</i>		300	-	15	6.0 - 9.0	100	-
TRC136033	21 May 2013	8	5.5	<0.5	6.8	5	11.9
TRC136338	19 Jun 2013	14.3	10.6	<0.5	7.6	7	12.8
TRC137079	23 Sep 2013	14	8.7	<0.5	6.9	3	17
TRC1410503	27 Jun 2014	24.1	12	<0.5	7.3	3	13.8

### 3.7.4 Evaluation of performance

A tabular summary of the consent holder's compliance record for the period under review is set out in Table 24.

**Table 24** Summary of performance for consent 1944-3 to discharge uncontaminated stormwater and treated stormwater from the Maui condensate storage facility via the existing piped stormwater drain into the Herekawe Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt best practicable option	Inspections of site	Yes
2. Consent shall be undertaken in accordance with documentation submitted	Inspections of site and sampling	Yes
3. Maintenance of a stormwater management plan	Plan approved 19 August 2010	Yes
4. Maintenance of a contingency plan	Plan approved 19 August 2010	Yes
5. Hazardous substance storage	Inspections of site	Yes
6. Potentially contaminated stormwater to be directed for treatment through stormwater treatment system	Inspections of site and sampling	Yes
7. Provide TRC with results of physicochemical analysis	Results provided to TRC	Yes
8. Concentration limits in discharge	Sampling	Yes
9. Consent lapse	N/A	N/A
10. Review provision	Option for review June 2014 was not exercised	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		<b>High</b>

## 3.8 Herekawe Stream

### 3.8.1 Inspections

Inspections of the Herekawe Stream were made in conjunction with industrial site inspections, and no conspicuous or adverse environmental effects were noted during these visits.

However, several complaints were received during the period under review regarding discoloured discharges into the Herekawe Stream. These complaints were all investigated and confirmed to be natural iron oxidisation.

STOS initiated a CCTV investigation of the pipework to determine the source of the orange discharge. It was found that iron rich groundwater is seeping into the pipeline through cracks and joins between the pipes. This means that orange discharge occurs even if there is no discharge from the sites at the Omata Tank Farm itself.

The pipeline collects stormwater for the entire Omata Tank Farm area, therefore finding a solution to the discoloration of the discharge entering the Herekawe Stream is the responsibility of all operators within the Omata Tank Farm.

During the 2013-2014 monitoring year STOS initiated meetings with the Council and the other consent holders who discharge into the pipeline, which discharges into the Herekawe Stream, to discuss options for remedying effects of the discoloured discharge. Although the discoloured discharge is not caused by the consent holders, the public perception is that the discharge is contamination coming from the tank farm.

To date STOS has redirected fire water away from the pipeline and back into a storage tank to be reused. This has resulted in less flushing of iron oxide from the pipeline when routine fire water testing occurs. STOS also plans to continue CCTV investigation to assess the condition of the pipework, and repair areas where groundwater intrusion is occurring if practical.

In future, any complaints received regarding discharge from the Omata Tank Farm will be logged against all consent holders within the Omata Tank Farm unless the cause can be attributed to specific consent holders.

### 3.8.2 Results of discharge monitoring

Stormwater from the Omata Tank Farm is discharged approximately 60m upstream of the mouth of the Herekawe Stream. When the stream level is high, the discharge mixes with the receiving water at the pipe outlet, making it difficult to obtain a sample of the discharge. Seven samples of this discharge were collected during the period under review. Results of the sample analysis are presented in Table 25.

**Table 25** Results for the Omata tank farm combined discharge (STW002002)

Sample number	Date	Chloride (g/m <sup>3</sup> )	Conductivity (mS/m@20C)	Hydrocarbons (g/m <sup>3</sup> )	pH	Suspended solids (g/m <sup>3</sup> )	Temperature (°C)
TRC136036	21 May 2013	13.6	7.4	<0.5	7	74	13.7
TRC136339	19 Jun 2013	9.3	5.5	0.9	7.4	31	13
TRC136353	20 Jun 2013	25.1	14.9	<0.5	7.4	22	12.3
TRC137083	23 Sep 2013	17.2	11.4	<0.5	7.4	4	16.4
TRC1410068	27 May 2014	78.7	27.1	<0.5	7.2	49	8.9
TRC1410492	26 Jun 2014	43.6	19.5	<0.5	7.3	8	15.2
TRC1410502	27 Jun 2014	22.7	11.1	<0.5	7.3	7	13.8

The NPDC / Dow AgroSciences stormwater discharge enters the Herekawe Stream slightly downstream and on the opposite bank from the tank farm discharge. Six samples were collected from the DOW AgroSciences sample point under a separate monitoring program (Dow Agrosciences (NZ) Ltd). A sample was also collected on 8 February 2013 to determine what impact, if any, NPDC / Dow AgroSciences stormwater discharge was having on the receiving waters of the Herekawe Stream. The results are presented in Table 26.

**Table 26** Results for the NPDC/Dow AgroSciences stormwater discharge (STW001098)

Sample number	Date	Conductivity (mS/m@20C)	Ph	Temperature (°C)	Turbidity (NTU)
TRC122678	16 Aug 2012	3.1	6.9	12.2	8.4
TRC123313	30 Oct 2012	13.9	7.2	21	1.2
TRC134744	08 Feb 2013	5.7	7.2	21.4	2.2
TRC135402	20 Mar 2013	9.1	7.1	18.9	5.4
TRC136235	12 Jun 2013	3.9	6.8	12	1.7
TRC149496	19 Mar 2014	19.2	7.1	20.1	8.7
TRC1410033	19 May 2014	3.6	6.7	14.6	3

These results indicate that this discharge is unlikely to be impacting on the results for the Herekawe Stream sampling site downstream of the Omata Tank Farm discharge.

### 3.8.3 Results of receiving environment monitoring

The Herekawe Stream was sampled upstream and downstream of the combined Omata Tank Farm discharge on several occasions during the period under review. Results of the sample analysis are presented in Table 27.

**Table 27** Results for the Herekawe Stream (HRK000085 and HRK000097)

Date	Location	Chloride (g/m <sup>3</sup> )	Conductivity (mS/m@20C)	Hydrocarbons (g/m <sup>3</sup> )	Ph	Temperature (°C)	Turbidity (NTU)
18 Apr 2013	Upstream	28.9	18.2	<0.5	7.5	16.7	2.7
18 Apr 2013	Downstream	26.3	16.2	<0.5	7.4	16.7	3.8
18 Apr 2013	Upstream	28.5	18.3	<0.5	7.5	17	3
18 Apr 2013	Downstream	27.5	16.6	<0.5	7.5	17	3.1
21 May 2013	Upstream	26.2	15.1	<0.5	7.1	13.9	160
21 May 2013	Downstream	26.5	15.1	<0.5	7.2	14	93
23 Sep 2013	Upstream	24.7	15.3	<0.5	7.4	15.3	4.2
23 Sep 2013	Downstream	23.4	15.1	<0.5	7.5	15.5	3.4
27 May 2014	Upstream	30.3	17.6	<0.5	7.4	9.8	2.2
27 May 2014	Downstream	47.6	21.7	<0.5	7.3	9.4	17
26 Jun 2014	Upstream	27.3	16.1	<0.5	7.4	15.1	4.9
26 Jun 2014	Downstream	29	16.6	<0.5	7.4	15.2	4.4
27 Jun 2014	Upstream	25.8	14.6	<0.5	7.5	13.2	6.2
27 Jun 2014	Downstream	26.2	14.2	<0.5	7.5	13.3	6.1

Results are similar for upstream and downstream sites, indicating little, if any, adverse effects on the stream by stormwater discharging from the Omata Tank Farm.

The analysis of water samples taken from the Herekawe Stream indicate that on several occasions, the concentrations of chlorides, conductivity and turbidity were greater upstream of the discharge point than those measured downstream. This is a

result of the discharge, which is comprised predominantly of rainwater, diluting the concentrations of these parameters downstream of the discharge point.

On 27 May 2014 turbidity increased by 14.8 NTU between the upstream site and site downstream of the discharge point. As the suspended solids measurement of the combined Omata Tank Farm discharge was 49g/m<sup>3</sup>, the discharge was within consented limits.

### 3.8.4 Biomonitoring

Four freshwater biological surveys were conducted upstream and downstream of the combined Omata Tank Farm discharge to the Herekawe Stream between 1 July 2012 and 30 June 2014. These biological surveys were carried out on the following dates:

- 5 October 2012
- 12 February 2013
- 19 November 2013
- 4 February 2014

A combination of the Council's standard 'kick-sampling' and 'sweep sampling' techniques were used at two established sites to collect streambed macroinvertebrates from the Herekawe Stream. Samples were sorted and identified to provide the number of taxa (richness) and macroinvertebrate community index (MCI) and semi quantitative macroinvertebrate community index (SQMCI<sub>s</sub>) scores for each site. Sampling sites are shown in Figure 13.



**Figure 13** Biomonitoring sites in the Herekawe Stream



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<sub>s</sub> takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities. It may be the more appropriate index if non-organic impacts are occurring.

Significant differences in either the MCI or SQMCI<sub>s</sub> between sites may indicate the degree of adverse effects (if any) of the discharges being monitored.

In October 2012 the macroinvertebrate communities at the sites both upstream and downstream of the discharges contained quite similar proportions of 'sensitive' macroinvertebrate taxa. Whereas in February 2013, November 2013 and February 2014 the macroinvertebrate communities at the sites upstream and downstream of the discharges contained quite different proportions of 'sensitive' macroinvertebrate taxa. Differences in MCI scores between the upstream 'control' site and the site downstream of the discharges are more attributable to habitat differences of these sites (the downstream site is slower flowing and more sedimented), rather than the discharges to the stream.

All four macroinvertebrates surveys confirmed that there were minimal changes in the number and composition of dominant taxa in communities in a downstream direction (as reflected in a moderate decrease in SQMCI<sub>s</sub> scores), and there were no significant changes in terms of historical community compositions at the downstream site.

All four macroinvertebrate surveys of the Herekawe Stream were performed under low flow conditions and indicated that the streambed communities had not been detrimentally affected by discharges of stormwater to the stream from the Omata Tank Farm, New Plymouth District Council, or other industrial sites.

Table 28 presents the MCI and SQMCI<sub>s</sub> scores for the macroinvertebrate surveys conducted during the period under review.

**Table 28** Results of the current and previous surveys (since April 1986) performed at upstream and downstream sites in the Herekawe Stream in relation to the Omata Tank Farm and other stormwater discharges

Survey	Site	Numbers of taxa			MCI values		
		Median	Range	Current Survey	Median	Range	Current Survey
Spring 2012	Upstream	17	11-23	21	86	68-97	99
	Downstream	14	9-22	16	71	54-96	95
Summer 2013	Upstream	18	11-23	23	86	68-99	93
	Downstream	15	9-22	18	72	54-96	70
Spring 2013	Upstream	18	11-23	15	86	68-99	93
	Downstream	15	9-22	19	71	54-96	76
Summer 2014	Upstream	18	11-23	23	86	68-99	90
	Downstream	15	9-22	16	72	54-96	64

The full biological monitoring reports are attached in Appendix III.

### 3.9 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).

In the 2012-2014 monitoring period there were 13 unauthorised incidents investigated by the Council in the Herekawe catchment. A number of these related to observations by a complainant, of discoloration in the Herekawe Stream. These complaints were investigated by the Council, and it was confirmed that the stormwater and wastewater systems were operating within resource consent conditions, and the discoloration appeared to be iron oxide from groundwater which occurs naturally in the Taranaki region. Unauthorised incidents related to the Herekawe Stream itself are described below. Other incidents related to various smoke, odour, and sediment complaints at sites are not included within this programme.

23 April 2013: Investigation of a complaint concerning the Herekawe Stream confirmed that it was discoloured. This was occurring as a result of bund reconstruction works in the Omata Tank Farm site. The Company had undertaken routine sampling prior to the discharge, which showed that suspended solid levels were within resource consent conditions. Samples were taken by the Council at the time of inspection and analysis supported this.

26 December 2013: a complaint was received regarding "brown sludge" entering the Herekawe Stream from the Omata Tank Farm outfall. Investigation resulted in no further action, as it was deemed to be a natural event.

16 January 2014: A complaint was received concerning discoloration in the Herekawe Stream. An inspection of the stream found that orange coloured water was discharging from a pipe, causing the whole stream to become orange. A meeting was held with the companies who discharge into the pipeline to discuss options for remedying effects. STOS undertook works to redirect the fire testing water away from the pipeline and back into a storage tank for reuse. Works have also been planned to fix damaged pipes to minimise groundwater intrusion.

16 February 2014: A complaint was received regarding the discolouration of the Herekawe Stream. Investigation resulted in no further action as the stream was running clear at time of inspection.

25 March 2014: Notification was received regarding filleted fish carcasses having been dumped in the Herekawe Stream. Investigation found that the fish had been dumped by persons unknown. New Plymouth District Council removed the carcasses.

## **3.10 Discussion**

### **3.10.1 Discussion of site performance**

Activities at the Omata Tank Farm have the potential to cause major pollution events if the operations are not well managed. During the 2012-2014 monitoring period, inspections of sites found them to be generally tidy and well managed. No concerns about the operation of site stormwater systems were raised.

### **3.10.2 Environmental effects of exercise of consents**

The Herekawe Stream discharges onto Back Beach, a popular recreational beach located south of Paritutu Rock. As well as the combined discharge from the Omata Tank Farm, it also receives New Plymouth District Council and Dow AgroSciences stormwater from a drain on the true right bank of the Herekawe Stream just below the combined discharge.

In the monitoring period under review the discharges from the Omata Tank Farm did not appear to be having any adverse effect on the receiving waters of the Herekawe Stream. This is supported by the findings of the biological surveys, inspections and the results obtained from discharge and receiving waters sampling.

### **3.10.3 Evaluation of performance**

Tabular summaries of the compliance records for the period under review are set out in the relevant section for each consent holder.

During the period under review, Chevron, STOS and Origin demonstrated a high level of environmental performance and compliance with the resource consents.

### **3.10.4 Recommendations from the 2011-2012 Annual Report**

In the 2011-2012 Annual Report, it was recommended:

1. THAT the monitoring programme for discharges to the Hongihongi Stream for the 2012-2013 year is maintained at the same level as in 2011-2012 (with the inclusion of sampling not completed in the 2011-2012 year).
2. THAT the monitoring programme for discharges to the Herekawe Stream in the 2012-2013 year is maintained at the same level as in 2011-2012.

These recommendations were implemented in full.

### **3.10.5 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 Resource Management Act, the obligations of the Act in terms of monitoring discharges and effects, and subsequently reporting to the regional community, 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 is implemented at the same level as in the 2012-2013 and 2013-2014 monitoring periods.

A recommendation to this effect is presented in Section 4 of this report.

### **3.10.6 Exercise of optional review of consent**

No resource consents provide for an optional review in June 2015.

#### **4. Recommendations**

1. THAT the monitoring programme for discharges to the Hongihongi Stream for the 2014-2015 year is maintained at the same level as in 2013-2014.
2. THAT the monitoring programme for discharges to the Herekawe Stream in the 2014-2015 year is maintained at the same level as in 2013-2014.

## Glossary of common terms and abbreviations

The following abbreviations and terms may be used within this report:

Biomonitoring	Assessing the health of the environment using aquatic organisms.
bund	A wall around a tank to contain its contents in the case of a leak.
Condy	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m.
Cumec	A volumetric measure of flow- 1 cubic metre per second (1 m <sup>3</sup> s <sup>-1</sup> ).
Fresh	Elevated flow in a stream, such as after heavy rainfall.
g/m <sup>3</sup>	Grammes per cubic metre, and equivalent to milligrammes per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures.
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.
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.
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.

SQ_MCI	Semi quantitative macroinvertebrate community index.
Temp	Temperature, measured in °C (degrees Celsius).
Turb	Turbidity, expressed in NTU.
UI	Unauthorised Incident.
UIR	Unauthorised Incident Register – contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan.

For further information on analytical methods, contact the Council's laboratory.

## Bibliography and references

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- Taranaki Regional Council 2006: 'Hongihongi and Herekawe Streams Joint Monitoring Programme Annual Report 2005-2006'; Technical Report 06-21, Taranaki Regional Council, Stratford.
- Taranaki Regional Council 2007: 'Hongihongi and Herekawe Streams Joint Monitoring Programme Annual Report 2006-2007'; Technical Report 07-115, Taranaki Regional Council, Stratford.



Taranaki Regional Council 2008 'Hongihongi and Herekawe Streams Joint Monitoring Programme Annual Report 2007-2008'; Technical Report 08-10, Taranaki Regional Council, Stratford.

Taranaki Regional Council 2010 'Hongihongi and Herekawe Streams Joint Monitoring Programme Annual Report 2008-2009'; Technical Report 09-27, Taranaki Regional Council, Stratford.

Taranaki Regional Council 2011 'Hongihongi and Herekawe Streams Joint Monitoring Programme Annual Report 2009-2010'; Technical Report 10-77, Taranaki Regional Council, Stratford.

Taranaki Regional Council 2012 'Hongihongi and Herekawe Streams Joint Monitoring Programme Annual Report 2010-2011'; Technical Report 11-76, Taranaki Regional Council, Stratford.

Taranaki Regional Council 2013 'Hongihongi and Herekawe Streams Joint Monitoring Programme Annual Report 2011-2012'; Technical Report 12-87, Taranaki Regional Council, Stratford.



## **Appendix I**

### **Resource consents held by companies in the Hongihongi catchment**



**SURRENDERED**  
30-9-2013

TRK960170



PRIVATE BAG 713  
47 CLOTON ROAD  
STRATFORD  
NEW ZEALAND  
PHONE 0-6-765 7127  
FAX 0-6-765 5097

### COASTAL PERMIT

**Pursuant to the RESOURCE MANAGEMENT ACT 1991  
a resource consent is hereby granted by the  
Taranaki Regional Council**

Name of Consent Holder: SHELL TODD OIL SERVICES LIMITED  
PRIVATE BAG 2035 NEW PLYMOUTH

Renewal Granted Date: 12 June 1996

### CONDITIONS OF CONSENT

Consent Granted: TO DISCHARGE UP TO 7000 CUBIC METRES/DAY OF TREATED TANKER DEBALLAST WATER FROM MAUI AND KAPUNI CONDENSATE TANKERS INTO THE HONGIHONGI STREAM AT OR ABOUT GR: P19:996-374

Expiry Date: 1 June 2014

Review Date[s]: June 2002 and June 2008

Site Location: NGAMOTU ROAD NEW PLYMOUTH

Legal Description: LOT 1 DP4743 PT SEC 811 GREY DIST BLK IV PARITUTU SD

Catchment: HONGIHONGI 388.001

For General, Standard and Special Conditions pertaining to this consent please see reverse side of this document.

SURRENDERED

TRK960170

**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 discharge shall not contain contaminants which will, or are likely to, give rise to any of the following effects in the receiving waters, after allowing for reasonable mixing:
  - (a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended material;
  - (b) any conspicuous change in colour or visual clarity;
  - (c) any emission of objectionable odour;
  - (d) any significant adverse effects on aquatic life.
- 2) THAT components of the discharge shall not exceed the following concentrations:


pH [range]	6 - 9
oil and grease	15 gm <sup>-3</sup>

This condition shall apply prior to the entry of the discharge into the Hongihongi Stream at a designated sampling point approved by the General Manager, Taranaki Regional Council.

- 3) THAT the consent holder shall provide, within three months of the granting of this consent, 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.
- 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 on the environment arising from the exercise of this consent.

Signed at Stratford on 12 June 1996

For and on behalf of  
TARANAKI REGIONAL COUNCIL

  
GENERAL MANAGER



**Coastal Permit  
Pursuant to the Resource Management Act 1991  
a resource consent is hereby granted by the  
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](http://www.trc.govt.nz)

Please quote our file number  
on all correspondence

Name of  
Consent Holder: Bulk Storage Terminals Limited  
P O Box 5280  
MT MAUNGANUI

Consent Granted  
Date: 24 July 1996

**Conditions of Consent**

Consent Granted: To discharge up to 30 litres/second of treated stormwater  
and waste saltwater from an oil terminal site into the  
coastal marine area of the Hongihongi Stream at or about  
GR: P19:993-376

Expiry Date: 1 June 2014

Review Date(s): June 2002, June 2008

Site Location: Centennial Drive, New Plymouth

Legal Description: Lot 3 DP 4742 Pt Sec 811 Grey Dist Blk IV Paritutu SD

Catchment: Hongihongi  
Tasman Sea

*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;
  - (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 discharge shall not, after allowing for reasonable mixing, 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 colour or visual clarity;
  - c) any emission of objectionable odour;
  - d) an significant adverse effects on aquatic life, habitats or ecology.

- 2. That components of the discharge shall not exceed the following concentrations:

pH [range]	6 - 9	
Oil and grease	15	gm <sup>3</sup>
Suspended solids	50	gm <sup>3</sup>

This condition shall apply prior to the entry of the stormwater into the Centennial Drive stormwater drain at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

- 3. That the consent holder shall 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.

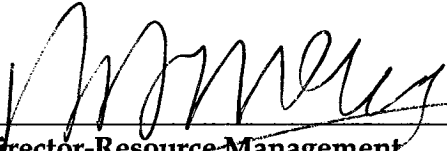


Consent 0276-2

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 on the environment arising from the exercise of this consent.

Transferred at Stratford on 24 August 2006

For and on behalf of  
Taranaki Regional Council



---

Director-Resource Management



**Coastal Permit**  
**Pursuant to the Resource Management Act 1991**  
**a resource consent is hereby granted by the**  
**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

Name of Consent Holder: Fonterra Co-operative Group Ltd, New Plymouth Coolstore  
P O Box 6039  
NEW PLYMOUTH      **New Address:**  
P O Box 459  
Hamilton 3240

Consent Granted Date: 7 December 2001

**Conditions of Consent**

Consent Granted: To discharge up to 960 cubic metres/day of cooling water and 7.2 cubic metres/day of groundwater seepage from a reservoir at the rear of the company's installation via a stormwater drain onto Ngamotu Beach at or about GR: P19:001-376

Expiry Date: 1 June 2020

Review Date(s): June 2008, June 2014

Site Location: 20 Hakirau Street, New Plymouth

Legal Description: Lot 1 DP 17360 Blk IV Paritutu SD

Catchment: Tasman Sea

**General conditions**

- a) 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) 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. At all times the consent holder shall adopt the best practicable option to prevent or minimise any actual or likely adverse effect on the environment associated with the discharge.
- 2. The exercise of this resource consent shall be undertaken in general accordance with the information supplied in support of the application.
- 3. The temperature of the water discharged must remain below 25 degrees Celsius at all times.
- 4. The discharge shall not contain any cooling water treatment chemical without the prior written permission of the Chief Executive, Taranaki Regional Council.
- 5. The discharge shall not give rise to any of the following effects on Ngamotu Beach:
  - 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 of the sea;
  - c) any emission of objectionable odour;
  - d) any significant adverse effects on aquatic life.
- 6. The components of the discharge shall not exceed the following concentrations:

pH [range]	6 - 9
Oil and grease [infrared spectroscopic technique]	15 gm <sup>-3</sup>
Suspended solids	100 gm <sup>-3</sup>

This condition shall apply prior to the entry of the stormwater onto Ngamotu Beach at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

Consent 0671-3

7. 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.

Transferred at Stratford on 4 November 2003

For and on behalf of  
Taranaki Regional Council



---

**Chief Executive**



**Coastal Permit**  
**Pursuant to the Resource Management Act 1991**  
**a resource consent is hereby granted by the**  
**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](http://www.trc.govt.nz)

Please quote our file number  
on all correspondence

Name of  
Consent Holder: Greymouth Facilities Limited  
Private Bag 1394  
Shortland Street  
AUCKLAND

Consent Granted  
Date: 12 June 1996

**Conditions of Consent**

Consent Granted: To discharge up to 8000 cubic metres/day of treated tanker  
deballast water, and occasionally treated oil contaminated  
water, other than tanker deballast, into the Hongihongi  
Stream at or about (NZTM) 1689459E-5675836N

Expiry Date: 1 June 2014

Review Date(s): June 2002, June 2008

Site Location: Tanker Deballast Treatment, Ngamotu Road, New  
Plymouth

Legal Description: Lot 1 DP 15486 City of New Plymouth Blk IV Paritutu SD

Catchment: Hongihongi

*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 discharge shall not contain contaminants which will, or are likely to, give rise to any of the following effects in the receiving waters, after allowing for reasonable mixing:
  - (a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended material;
  - (b) any conspicuous change in colour or visual clarity;
  - (c) any emission of objectionable odour;
  - (d) any significant adverse effects on aquatic life.

- 2) That components of the discharge shall not exceed the following concentrations:

pH [range]6 - 9  
oil and grease 15 gm<sup>3</sup>

This condition shall apply prior to the entry of the discharge into the Hongihongi Stream at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

- 3) That no effluents from treatment of wastewaters other than tanker deballast water shall be discharged, without the prior approval of the Chief Executive, Taranaki Regional Council.
- 4) That the consent holder shall provide, within three months of the granting of this consent, 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.

Consent 3914-2

- 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 on the environment arising from the exercise of this consent.

Transferred at Stratford on 29 September 2008

For and on behalf of  
Taranaki Regional Council



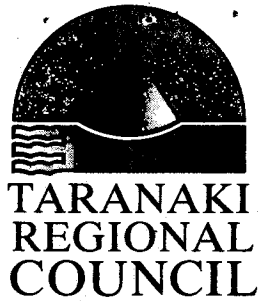
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**Director-Resource Management**





TRK964488



COASTAL PERMIT

Pursuant to the RESOURCE MANAGEMENT ACT 1991  
a resource consent is hereby granted by the  
Taranaki Regional Council

PRIVATE BAG 713  
47 CLOTON ROAD  
STRATFORD  
NEW ZEALAND  
PHONE 0-6-765 7127  
FAX 0-6-765 5097

Name of Consent Holder: BULK STORAGE TERMINALS LIMITED  
PO BOX 9 NEW PLYMOUTH

Renewal Granted Date: 7 February 1996

CONDITIONS OF CONSENT

Consent Granted: TO DISCHARGE UP TO 68 LITRES/SECOND OF STORMWATER FROM AN INDUSTRIAL CHEMICAL STORAGE SITE INTO THE HONGIHONGI STREAM AT OR ABOUT GR: P19:995-376

Expiry Date: 1 June 2014

Review Date[s]: June 2002 and June 2008

Site Location: CENTENNIAL DRIVE NEW PLYMOUTH

Legal Description: LOT 2 DP8465 BLK IV PARITUTU SD

Catchment: HONGIHONGI 388.001

*NB - legal description now Lot 1 DP 19306 Blk IV Paritutu SD*

For General, Standard and Special Conditions pertaining to this consent please see reverse side of this document.

TRK964488

### 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 after allowing for reasonable mixing the discharge shall not give rise to any of the following effects in the receiving waters of the Hongihongi Stream:
  - (a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended material;
  - (b) any conspicuous change in 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) THAT components of the discharge shall not exceed the following concentrations:

pH [range]	6 - 9
Oil and grease	
[infrared spectroscopic technique]	15 gm <sup>-3</sup>
Suspended solids	100 gm <sup>-3</sup>

This condition shall apply prior to the entry of the stormwater into Centennial Drive stormwater drain at a designated sampling point approved by the General Manager, Taranaki Regional Council.
- 3) THAT the consent holder shall maintain 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 chemicals.
- 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 on the environment arising from the exercise of this consent.

Signed at Stratford on 7 February 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**

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

Name of  
Consent Holder:           Liquigas Limited  
                                  P O Box 450  
                                  NEW PLYMOUTH 4340

Consent Granted           3 December 2007  
Date:

**Conditions of Consent**

Consent Granted:        To discharge from an LPG storage site:  
                                  (a) process water from LPG storage tank de-watering;  
                                  (b) water used to decommission and recommission LPG  
                                  storage tanks;  
                                  (c) LPG pipeline flushing water over a two-day period  
                                  during emergency repairs; and  
                                  (d) stormwater;  
                                  into the Hongihongi Stream at or about  
                                  2599612E-6237879N

Expiry Date:             1 June 2026

Review Date(s):         June 2014, June 2020

Site Location:           Hutchens Place, New Plymouth

Legal Description:       Lot 1 DP 20289 Sec 221 Fitzroy Dist Lot 2 DP 4961 Lot 1  
                                  DP 7383 Lot 1 DP 16190 Lot 1 DP 17440 Lot 2 DP 17441  
                                  Lot 1 DP 18065 Lot 1 DP 19494 Lot 1 DP 19698 Lot 1 DP  
                                  19917 Sec 1 SO 13626

Catchment:               Hongihongi

**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 collected from a catchment area of no more than 20,000 m<sup>2</sup>.
- 3. The volume of process water discharged from LPG storage tank de-watering shall not exceed 30 litres per day.
- 4. The consent holder shall maintain a contingency plan, approved by the Chief Executive, Taranaki Regional Council, 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 discharge.
- 5. For the pipe flushing water and the water used to decommission and recommission the LPG storage tanks, the consent holder shall keep records of the date and time that the discharges to the Hongihongi Stream begin and end, and the volume of water discharged. These records shall be made available to the Chief Executive, Taranaki Regional Council, upon request.
- 6. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least 24 hours prior to discharging either pipe flushing water or the water used to decommission or recommission the LPG storage tanks. Notification shall include the consent number and a brief description of the activity consented and be emailed to [worknotification@trc.govt.nz](mailto:worknotification@trc.govt.nz). Notification by fax or post is acceptable only if the consent holder does not have access to email.
- 7. The consent holder shall provide to the Chief Executive, Taranaki Regional Council, the results of any physicochemical analysis carried out on water which is discharged to the Hongihongi Stream.

8. Concentrations of the following components shall not be exceeded in the discharge:

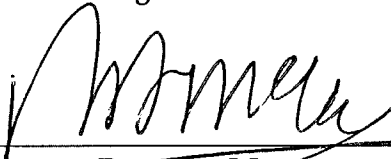
<b>Component</b>	<b>Concentration</b>
pH (range)	6.0 - 9.0
suspended solids	100 gm <sup>-3</sup>
total recoverable hydrocarbons [infrared spectroscopic technique]	15 gm <sup>-3</sup>

This condition shall apply prior to the entry of the stormwater and process water into the Hongihongi Stream, at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

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 3 December 2007

For and on behalf of  
Taranaki Regional Council



~~Director Resource Management~~



## Coastal Permit

**Pursuant to the Resource Management Act 1991  
a resource consent is hereby granted by the  
Taranaki Regional Council**

PRIVATE BAG 713  
47 CLOTON ROAD  
STRATFORD  
NEW ZEALAND  
PHONE 0-6-765 7127  
FAX 0-6-765 5097

Name of  
Consent Holder: Shell Todd Oil Services Limited  
Private Bag 2035  
NEW PLYMOUTH

Consent Granted  
Date: 15 September 1999

### Conditions of Consent

Consent Granted: To discharge treated stormwater from a petrochemical storage tank facility into the coastal marine area of the Hongihongi Stream at or about GR: P19:998-379

Expiry Date: 1 June 2015

Review Date(s): June 2003, June 2009

Site Location: Pioneer Road, Ngamotu Beach, New Plymouth

Legal Description: Coastal Reserve Blk IV Paritutu SD

Catchment: Tasman Sea

**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 after allowing for reasonable mixing, the discharge shall not give rise to 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) any significant adverse environmental effects on aquatic life, habitats or ecology.

- 2. THAT components of the discharge shall not exceed the following concentrations:

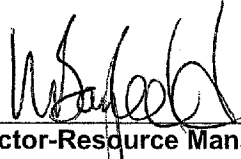
pH [range]	6-9
hydrocarbons [infrared spectroscopic technique]	15 gm <sup>-3</sup>
total organic carbon [provided the methodology is to the satisfaction of the General Manager, Taranaki Regional Council]	15 gm <sup>-3</sup>
suspended solids	50 gm <sup>-3</sup>

This condition shall apply prior to the entry of the stormwater into the Centennial Drive stormwater drain at a designated sampling point approved by the General Manager, Taranaki Regional Council.

- 3. THAT the consent holder shall maintain 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.
- 4. THAT 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 2003 and/or June 2009, for the purpose of ensuring that the conditions are adequate to deal with any adverse environmental effects of the discharge 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.

Signed at Stratford on 15 September 1999

For and on behalf of  
Taranaki Regional Council

  
\_\_\_\_\_  
Director-Resource Management

TRK961020



**DISCHARGE PERMIT**

**Pursuant to the RESOURCE MANAGEMENT ACT 1991  
a resource consent is hereby granted by the  
Taranaki Regional Council**

PRIVATE BAG 713  
47 CLOTON ROAD  
STRATFORD  
NEW ZEALAND  
PHONE 0-6-765 7127  
FAX 0-6-765 5097

Name of Consent Holder: **SHELL NEW ZEALAND LIMITED  
PO BOX 447 NEW PLYMOUTH**

Renewal Granted Date: **1 May 1996**

**CONDITIONS OF CONSENT**

Consent Granted: **TO DISCHARGE UP TO 30.13 LITRES/SECOND OF  
STORMWATER AND TREATED WASTEWATER FROM A  
PETROLEUM STORAGE FACILITY INTO THE HONGIHONGI  
STREAM AT OR ABOUT GR: P19:988-369**

Expiry Date: **1 June 2014**

Review Date[s]: **June 2002 and June 2008**

Site Location: **8-22 NGAMOTU ROAD, NEW PLYMOUTH**

Legal Description: **SBDN 1 & 2A ALLOTMENT 2 DP4742 PT SEC 811 GREY DIST  
BLK IV PARITUTU SD**

Catchment: **HONGIHONGI 388.001**

For General, Standard and Special Conditions pertaining to this consent please see reverse side of this document.



TRK961020

### 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 discharge shall not contain contaminants which will, or are likely to, give rise to any of the following effects in the receiving waters, after allowing for 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 colour or visual clarity;
  - (c) any emission of objectionable odour;
  - (d) any significant adverse effects on aquatic life.
- 2) THAT components of the discharge shall not exceed the following concentrations:

pH [range]	6 - 9
Oil and grease [infrared spectroscopic technique]	15 gm <sup>-3</sup>
Suspended solids	50 gm <sup>-3</sup>

This condition shall apply prior to the entry of the stormwater into the Centennial Drive stormwater drain at a designated sampling point approved by the General Manager, Taranaki Regional Council.

- 3) THAT there shall be no wastewater from truck washing operations discharged after 31 December 1996.
- 4) THAT the consent holder shall, within three months of the granting of this consent, 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.

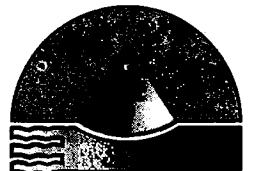
TRK961020

- 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 on the environment arising from the exercise of this consent.

Signed at Stratford on 1 May 1996

For and on behalf of  
TARANAKI REGIONAL COUNCIL

  
GENERAL MANAGER



**TARANAKI  
REGIONAL  
COUNCIL**

PRIVATE BAG 713  
47 CLOTON ROAD  
STRATFORD  
NEW ZEALAND  
PHONE 0-6-765 7127  
FAX 0-6-765 5097

## **Appendix II**

### **Resource consents held by companies in the Herekawe catchment**



**Discharge Permit**  
**Pursuant to the Resource Management Act 1991**  
**a resource consent is hereby granted by the**  
**Taranaki Regional Council**

Name of  
Consent Holder: Shell Todd Oil Services Ltd  
Private Bag 2035  
NEW PLYMOUTH 4342

Decision Date (Change): 29 August 2013

Commencement Date 29 August 2013 (Granted: 10 January 2002)  
(Change):

**Conditions of Consent**

Consent Granted: To discharge up to 3120 cubic metres/day (36 litres/second) of treated and untreated stormwater including bleed-off from tank de-watering and hydrostatic test water from a liquid hydrocarbon storage facility into the Herekawe Stream and to discharge untreated stormwater onto and into land during periods of bund construction and maintenance works

Expiry Date: 1 June 2020

Review Date(s): June 2014

Site Location: Omata Tank Farm, Centennial Drive, New Plymouth

Legal Description: Lot 4 DP 20912 (Discharge source & site)

Grid Reference (NZTM) 1688300E-5674390N

Catchment: Herekawe

*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 of the discharge on any water body.
2. The maximum stormwater catchment area shall be no more than 20,000 m<sup>2</sup>.
3. Prior to the exercise of this consent, the consent holder shall provide for the written approval of the Chief Executive, Taranaki Regional Council, site specific details relating to contingency planning for the production site.
4. All contaminated site water including bleed-off from tank de-watering and hydrostatic test water from liquid hydrocarbon storage facilities to be discharged to the Herekawe Stream under this permit, shall be directed for treatment through the stormwater treatment system for discharge in accordance with the special conditions of this permit.
5. The design, management and maintenance of the stormwater system shall be generally undertaken in accordance with the information submitted in support of the application.
6. Any above ground hazardous substances storage areas shall be bunded with drainage to sumps, or other appropriate recovery systems, and not to the stormwater catchment.

7. The following concentrations shall not be exceeded in the discharge:

<b>Component</b>	<b>Discharge to</b>	<b>Concentration</b>
pH (range)	land and water	6.5-8.5
suspended solids	water	100 gm <sup>-3</sup>
total recoverable hydrocarbons (infrared spectroscopic technique)	land and water	15 gm <sup>-3</sup>
chloride	water	300 gm <sup>-3</sup>
chloride	land	700 gm <sup>-3</sup>

This condition shall apply prior to the entry of treated stormwater into the Herekawe Stream and prior to the discharge of untreated stormwater to land, at designated sampling points approved by the Chief Executive, Taranaki Regional Council.

8. After allowing for reasonable mixing, within a mixing zone extending 15 metres downstream of the discharge point the discharge shall not give rise to any of the following effects in the receiving waters of the Herekawe Stream:
- an increase in temperature of more than 2 degrees Celsius; and
  - an increase in biochemical oxygen demand of more than 2.00 gm<sup>-3</sup>.
9. After allowing for reasonable mixing, within a mixing zone extending 15 metres downstream of the discharge point the discharge shall not give rise to any of the following effects in the receiving waters of the Herekawe Stream:
- the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
  - any conspicuous change in the colour or visual clarity;
  - any emission of objectionable odour;
  - the rendering of fresh water unsuitable for consumption by farm animals;
  - any significant adverse effects on aquatic life.
10. The consent holder shall prepare annually 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.
11. 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:
- the loading and unloading of materials;
  - maintenance of conveyance systems;
  - general housekeeping;
  - management of the interceptor system.

## Consent 1316-3

12. 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.
13. 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.
14. The Chief Executive, Taranaki Regional Council, shall be advised in writing at least 48 hours prior to the reinstatement of the site and the reinstatement shall be carried out so as to minimise effects on stormwater quality.
15. 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, 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 29 August 2013

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: Shell Todd Oil Services Ltd  
Private Bag 2035  
NEW PLYMOUTH 4342

Decision Date (Change): 29 August 2013

Commencement Date 29 August 2013 (Granted: 16 May 2008)  
(Change):

**Conditions of Consent**

Consent Granted: To discharge uncontaminated stormwater and treated stormwater from the Maui condensate storage facility via the existing piped stormwater drain into the Herekawe Stream

Expiry Date: 1 June 2026

Review Date(s): June 2014, June 2020

Site Location: 281 Centennial Drive, New Plymouth

Legal Description: Lot 4 DP 20912 (Discharge source & site)

Grid Reference (NZTM) 1687854E-5674365N

Catchment: Herekawe

*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 substantially accordance with the documentation submitted in support of application 5004. In the case of any contradiction between the documentation submitted in support of application 5004 and the conditions of this consent, the conditions of this consent shall prevail.
3. The consent holder shall maintain a stormwater management plan to the satisfaction of the Chief Executive, Taranaki Regional Council. This plan shall document how the site is to be managed in order to minimise the contaminants that become entrained in the stormwater.
4. The consent holder shall maintain a contingency plan, approved by the Chief Executive, Taranaki Regional Council, 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 discharge.
5. Any above ground hazardous substances storage areas shall be bunded with drainage to sumps, or other appropriate recovery systems, and not to the stormwater catchment.
6. All potentially contaminated stormwater shall be directed for treatment through the stormwater treatment system for discharge in accordance with the special conditions of this permit.
7. The consent holder shall provide to the Chief Executive, Taranaki Regional Council, the results of any physicochemical analysis carried out on the stormwater which is discharged to the Herekawe Stream.

## Consent 1944-3

8. The following concentrations shall not be exceeded in the discharge:

Component	Concentration
pH (range)	6.0 -9.0
suspended solids	100 gm <sup>-3</sup>
total recoverable hydrocarbons (infrared spectroscopic technique)	15 gm <sup>-3</sup>
chloride	300 gm <sup>-3</sup>

This condition shall apply prior to the entry of the stormwater into the receiving waters of the Herekawe Stream, at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

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 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 29 August 2013

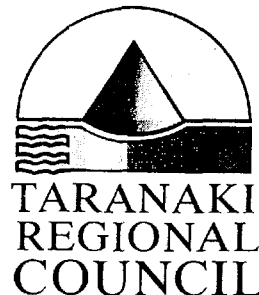
For and on behalf of  
Taranaki Regional Council

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**Director-Resource Management**



TRK975125



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: 4 April 1997

## CONDITIONS OF CONSENT

Consent Granted: TO DISCHARGE UP TO 6700 LITRES/SECOND OF  
STORMWATER INTO THE HEREKAWE STREAM AT OR  
ABOUT GR: P19:986-367

Expiry Date: 1 June 2014

Review Date[s]: June 2002 and June 2008

Site Location: RANGITAKE DRIVE NEW PLYMOUTH

Legal Description: LOT 77 DP11375 BLK IV PARITUTU SD

Catchment: HEREKAWE 388.000

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 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.

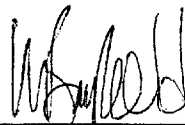
**SPECIAL CONDITIONS**

- 1. THAT after allowing for reasonable mixing the discharge shall not give rise to any of the following effects in the receiving waters of the Herekawe Stream:
  - (i) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended material;
  - (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; and
  - (v) any significant adverse effects on aquatic life.
- 2. THAT the components of the discharge shall not exceed the following concentrations:

pH (range)	6 - 9
Oil and grease [infrared spectroscopic technique]	15 gm <sup>-3</sup>
Suspended solids	100 gm <sup>-3</sup>
- 3. THAT 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 adequately deal with the environmental effects 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 the time.

Signed at Stratford on 4 April 1997

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**

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

Name of  
Consent Holder: Chevron New Zealand  
P O Box 6153  
Moturoa  
NEW PLYMOUTH

Change To  
Conditions Date: 31 March 2009 [Granted: 21 September 2007]

### Conditions of Consent

Consent Granted: To discharge treated stormwater and hydrotest water from a hydrocarbon storage facility into the Herekawe Stream at or about (NZTM) 1687947E-5674350N

Expiry Date: 1 June 2026

Review Date(s): June 2014, June 2020

Site Location: 283 Centennial Drive, New Plymouth

Legal Description: Lot 2 DP 20912

Catchment: Herekawe

*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**

**Condition 1 – unchanged**

- 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.

**Conditions 2 and 3 – changed**

- 2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of applications 4755 and 6224. In the case of any contradiction between the documentation submitted in support of applications 4755 and 6224 and the conditions of this consent, the conditions of this consent shall prevail.
- 3. All stormwater and hydrotest water shall be directed for treatment through the stormwater treatment system for discharge in accordance with the special conditions of this permit.

**Conditions 4 and 5 – unchanged**

- 4. Any above ground hazardous substances storage areas shall be bunded with drainage to sumps, or other appropriate recovery systems, and not to the stormwater catchment.
- 5. There shall be no discharge of wastewater from truck washing operations to the stormwater system.

**Condition 6 – changed**

- 6. The following concentrations shall not be exceeded in the discharge:



Component	Concentration
pH (range)	6.0 – 9.0
suspended solids	100 gm <sup>-3</sup>
total recoverable hydrocarbons [infrared spectroscopic technique]	15 gm <sup>-3</sup>
chloride	50 gm <sup>-3</sup>


This condition shall apply prior to the entry of the treated stormwater and hydrotest water into the receiving waters of the Herekawe Stream, at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

**Conditions 7 to 9 – unchanged**

7. Within three months of the granting of this consent, the consent holder shall prepare and maintain a contingency plan to be approved by the Chief Executive, Taranaki Regional Council, outlining 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 to the satisfaction of the Chief Executive, Taranaki Regional Council. This plan shall document how the site is to be managed in order to minimise the contaminants that become entrained in the stormwater. The plan shall cover 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.
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 March 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**

CHIEF EXECUTIVE  
PRIVATE BAG 713  
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NEW ZEALAND  
PHONE: 06-765 7127  
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on all correspondence

Name of  
Consent Holder: Origin Energy Resources (Kupe) Limited  
Private Bag 2202  
NEW PLYMOUTH 4342

Decision Date  
(Change): 16 February 2012

Commencement  
Date (Change): 16 February 2012 [Granted: 22 July 2009]

### Conditions of Consent

Consent Granted: To discharge treated stormwater into the Herekawe Stream and to discharge hydrotest water to land, where it may enter Lloyd Pond A, and into the Herekawe Stream

Expiry Date: 1 June 2026

Review Date(s): June 2014, June 2020

Site Location: 283 Centennial Drive / 8 Beach Road, New Plymouth

Legal Description: Lot 2 DP 20912 (Discharge source & site)

Catchment: Herekawe

*For General, Standard and Special conditions  
pertaining to this consent please see reverse side of this document*  
www.trc.govt.nz

### General condition

- 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

#### Information and notification

1. The consent holder shall notify the Chief Executive, Taranaki Regional Council, for each period that the discharge of hydrotest water is expected to commence. Notification shall be no less than 24 hours before the discharge commences. Notification shall include the consent number and be emailed to [worknotification@trc.govt.nz](mailto:worknotification@trc.govt.nz).
2. The consent holder shall maintain a contingency plan outlining 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. The consent holder will be obligated to provide Taranaki Regional Council with a copy of the most recent contingency plan.

#### Discharges from the site

3. Notwithstanding any other condition of this consent, the consent holder shall at all times adopt the best practical 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.
4. Hydrotest water and stormwater from potential contamination sites identified in the Origin Stormwater and contingency plan (tank compound, tank roofs, truck unloading facility, truck pump skid and export pump skid) shall be directed for treatment through the stormwater treatment system, detailed within the information submitted in support of consent application 6071 and 6997, before being discharged to the Herekawe Stream. Perimeter and roading stormwater drains may be discharged directly into Herekawe Stream providing that spill control measures outlined in the Spill Contingency Plan are implemented.
5. All hydrotest water shall be appropriately treated via a filter cloth; or other such method approved by the Chief Executive, Taranaki Regional Council; before being discharged to land.

6. Constituents of the discharge shall meet the standards shown in the following table [for discharges to the Herekawe Stream].

<u>Constituent</u>	<u>Standard</u>
pH	Within the range 6.0 to 9.0
suspended solids	Concentration not greater than 100 gm <sup>-3</sup>
total recoverable hydrocarbons	Concentration not greater than 15 gm <sup>-3</sup> [as determined by infrared spectroscopic technique]
chloride	Concentration not greater than 300 gm <sup>-3</sup>
free chlorine	Concentration not greater than 0.2 gm <sup>-3</sup>

This condition shall apply before entry of the treated stormwater and/or hydrotest water into the receiving waters of the Herekawe Stream at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

7. Constituents of the discharge shall meet the standards shown in the following table [for discharges to land in the vicinity of Lloyd Pond A].

<u>Constituent</u>	<u>Standard</u>
pH	Within the range 6.0 to 9.0
suspended solids	Concentration not greater than 100 gm <sup>-3</sup>
total recoverable hydrocarbons	Concentration not greater than 1 gm <sup>-3</sup> [as determined by infrared spectroscopic technique]
chloride	Concentration not greater than 50 gm <sup>-3</sup>
free chlorine	Concentration not greater than 0.2 gm <sup>-3</sup>

This condition shall apply before entry of the treated hydrotest water into or onto land at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

8. After allowing for a mixing zone of 25 metres, the discharge shall not give rise to any of the following effects in the Herekawe 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. Any erosion, scour or instability of the bed or banks or Lloyd Pond A and/or the Herekawe Stream that is attributable to the discharges authorised by this consent shall be remedied by the consent holder.

**Monitoring results**

10. Results of the monthly water samples taken from the discharge sump [undertaken during the release of stormwater from the facility] shall be made available to the Chief Executive, Taranaki Regional Council, on request.

**Lapse and review dates**

11. 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.
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 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.

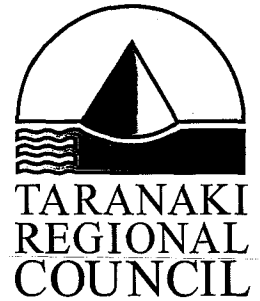
Signed at Stratford on 16 February 2012

For and on behalf of  
Taranaki Regional Council



---

Chief Executive



CHIEF EXECUTIVE  
PRIVATE BAG 713  
47 CLOTEN ROAD  
STRATFORD  
NEW ZEALAND  
PHONE: 06-765 7127  
FAX: 06-765 5097  
www.trc.govt.nz

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on all correspondence

## Certificate of Compliance

**Pursuant to section 139 of the Resource Management Act 1991  
a certificate of compliance is hereby issued by the  
Taranaki Regional Council**

- Name of certificate holder** Methanex Motunui Limited  
Private Bag 2011  
New Plymouth
- Site location** Omata Tank Farm, Centennial Drive at or about  
GR: 2598345E-6237329N  
[legal description: Lot 3 DP 20912]
- Proposal/Activity** To discharge stormwater from a storage facility at the Omata Tank Farm 1 into the Herekawe Stream via the main stormwater drain, in accordance with the proposal set out in application 4601
- Certification** The Taranaki Regional Council hereby certifies that:
- The discharge stormwater from a storage facility at the Omata Tank Farm 1 into the Herekawe Stream via the main stormwater drain as outlined within the documentation supplied in support of the application is a permitted activity pursuant to Rule 23 of the Regional Fresh Water Plan for Taranaki [1997] at the date of receipt of the application for this certificate provided that it complies with and continues to comply with the following conditions:
- *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 tradewaste 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;*
- *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<sub>5</sub> 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.*

Any discharge which causes any of the above conditions to be breached is not permitted and may be the subject of enforcement action.

Signed at Stratford on 6 May 2008

For and on behalf of  
Taranaki Regional Council



**Director—Resource Management**

Certificate of compliance 1239-0



PRIVATE BAG 713  
47 CLOTEN ROAD  
STRATFORD  
NEW ZEALAND  
PHONE 0-6-765 7127  
FAX 0-6-765 5097

## Certificate of Compliance

**Pursuant to section 139 of the Resource Management Act 1991  
a certificate of compliance is hereby issued by the  
Taranaki Regional Council**

**Name of certificate holder** Methanex Motunui Limited  
Private Bag 2011  
New Plymouth

**Site location** The Omata Tank Farm, Centennial Drive, New Plymouth, at  
or about 2598219E 6236661N

**Proposal/Activity** To discharge stormwater from the bunded areas around the  
hydrocarbon storage tanks at the Omata Tank Farm into the  
Herekawe Stream via an outlet at 2598329E 6236946N.

**Certification** The Taranaki Regional Council hereby certifies that

(a) The discharge of stormwater from the bunded areas  
around the hydrocarbon storage tanks at the Omata  
Tank Farm into the Herekawe Stream [as outlined within  
the documentation submitted in support of the  
application (Methanex New Zealand Limited 2001)] is a  
permitted activity pursuant to Rule 23 of the Regional  
Fresh Water Plan for Taranaki at the date of receipt of  
the application for this certificate.

Signed at Stratford on 29 November 2001

For and on behalf of  
Taranaki Regional Council



Chief Executive

## **Appendix III**

### **Herekawe Stream biomonitoring reports**



To Job Managers, David Olsen & James Kitto  
 From Freshwater Biologist, CR Fowles  
 Doc No 1320017  
 Report No CF603  
 Date 6 March 2014

## Biomonitoring of the Herekawe Stream in relation to the Omata Tank Farm and other stormwater discharges, surveyed in February 2014

### Introduction

This biological survey was the second of two scheduled for the Herekawe Stream in the 2013-2014 monitoring year to assess whether there had been any detrimental effects on the Herekawe Stream from stormwater discharges originating from STOS, Dow Agro Sciences, Chevron, Origen Energy and NPDC. The previous survey (CF596) was performed in spring, 2013 as scheduled. The results from surveys performed since the 2001-02 monitoring year are discussed in reports referenced at the end of this report.

### Methods

The standard '400 ml kick-net' and sweep-sampling' techniques were used to collect streambed macroinvertebrates at a 'control' site ('kick-net') and another downstream site (mainly 'kick-net' and limited 'sweep-sampling') in the Herekawe Stream (Table 1, Figure 1) on 4 February 2014. The 'sweep-sampling' technique is very similar to Protocol C2 (soft-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark et al, 2001). The 'kick-sampling' technique is very similar to Protocol C1 (hard-bottomed, semi-quantitative) of the same protocols.

**Table 1** Biomonitoring sites in the Herekawe Stream in relation to stormwater discharges

Site No.	Site Code	GPS Reference	Location
1	HRK 000085	E1688283 N5674972	Upstream of Centennial Drive culvert and stormwater discharges
2	HRK 000094	E1688201 N5675010	Downstream of stormwater discharges, approx. 75 m above coast

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. By

averaging the scores obtained from a list of taxa taken from one site and multiplying by a scaling factor of 20, a Macroinvertebrate Community Index (MCI) value was obtained. The MCI is a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. More 'sensitive' taxa inhabit less polluted waterways.

A semi-quantitative MCI value (SQMCI<sub>s</sub>) 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 & 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<sub>s</sub> is not multiplied by a scaling factor of 20, so that its corresponding range of values is 20x lower, ranging from 0 to 10 SQMCI<sub>s</sub> units.



**Figure 1** Biomonitoring sites in the Herekawe Stream

## Results

At the time of this late morning survey, the water temperature in the Herekawe Stream ranged from 17.0° C to 17.3° C at the two sites. No stormwater discharges were occurring from the right bank or the left bank outfalls at the time of the survey. The channel at site 1 was narrow and constrained by gabion baskets on the banks and bed of the stream where the substrate was comprised mainly of sand, gravels, and cobbles with some silt, wood, and boulders. The stream at this site had a low, clear, uncoloured, swift flow and there were patchy periphyton mats and widespread filamentous algae on the bed. No macrophytes were recorded at the edges of the stream at this partially shaded site.

The substrate at site 2 was comprised mainly of silt, sand, and wood with a small proportion of gravel and boulders. The site can periodically be affected by salt water under extremely high tide and very low flow conditions. The clear, uncoloured, low flow at this site was slightly deeper and much slower moving than at site 1 upstream. There were patchy filamentous algae and thin periphyton mats noted on the harder substrate components of the bed during the survey. Aquatic macrophytes were recorded at intervals along the stream margins. The small area of macrophytes was sweep-sampled at site 2 and the woody

substrate and the limited area of cobble-boulder substrate were kick-sampled for macroinvertebrates at this site.

The survey was performed 27 days after a fresh in excess of 3 times median flow and 30 days after a fresh in excess of 7 times median flow in the catchment in accordance with Taranaki Regional Council biomonitoring fieldwork protocols.

### Macroinvertebrates

A number of surveys have been performed previously at these two sites. Results of the current and past surveys are summarised in Table 2 and the results of the current survey presented in Table 3.

**Table 2** Results of the current and previous surveys (since April 1986) performed at sites 1 and 2 in the Herekawe Stream in relation to the Omata Tank Farm and other stormwater discharges

Site	Number of previous surveys	Numbers of taxa			MCI values		
		Median	Range	Current Survey	Median	Range	Current Survey
1	56	18	11-23	23	86	68-99	90
2	56	15	9-22	16	72	54-96	64

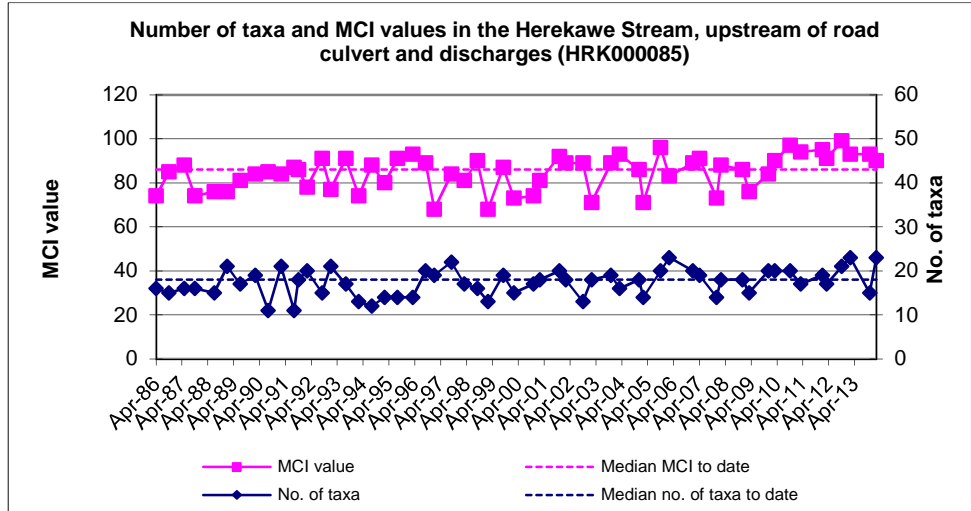
**Table 3** Macroinvertebrate fauna of the Herekawe Stream in relation to Omata Tank Farm and other stormwater discharges sampled on 4 February 2014

Taxa List	Site Number		MCI score	1	2
	Site Code	Sample Number		HRK000085	HRK000094
				FWB14038	FWB14039
NEMERTEA	Nemertea		3	R	-
NEMATODA	Nematoda		3	R	-
ANNELIDA (WORMS)	Oligochaeta		1	VA	VA
HIRUDINEA (LEECHES)	Hirudinea		3	-	R
MOLLUSCA	<i>Potamopyrgus</i>		4	XA	XA
	Sphaeriidae		3	-	R
CRUSTACEA	Copepoda		5	-	R
	Ostracoda		1	-	R
	<i>Paracalliope</i>		5	XA	VA
	<i>Paratya</i>		3	-	A
	<i>Paranephrops</i>		5	R	R
EPHEMEROPTERA (MAYFLIES)	<i>Austroclima</i>		7	C	-
	<i>Coloburiscus</i>		7	C	-
	<i>Deleatidium</i>		8	R	-
PLECOPTERA (STONEFLIES)	<i>Megaleptoperla</i>		9	R	-
COLEOPTERA (BEETLES)	Elmidae		6	R	-
TRICHOPTERA (CADDISFLIES)	<i>Psilochorema</i>		6	R	-
	<i>Oxyethira</i>		2	C	C
	<i>Triplectides</i>		5	C	A
DIPTERA (TRUE FLIES)	<i>Aphrophila</i>		5	C	-
	Eriopterini		5	R	-
	<i>Chironomus</i>		1	-	VA
	<i>Maoridiamesa</i>		3	R	-
	Orthoclaadiinae		2	A	R
	<i>Polypeditum</i>		3	C	C
	Tanypodinae		5	R	C
	Empididae		3	R	R
	<i>Austrosimulium</i>		3	R	-
	Tanyderidae		4	R	-
No of taxa				23	16
MCI				90	64
SQMCIs				4.2	3.4
EPT (taxa)				6	1
%EPT (taxa)				26	6
'Tolerant' taxa		'Moderately sensitive' taxa	'Highly sensitive' taxa		

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

### Site 1 (upstream of stormwater discharges)

A moderately richness of 23 taxa was recorded at this site, which was five taxa more than the median and equal with the maximum numbers of taxa from previous surveys at this site (Table 2), and above richnesses typically found in the lower reaches of small coastal streams elsewhere in Taranaki (TRC, 1999 (updated 2013)).



**Figure 2** Number of taxa and MCI values in the Herekawe Stream upstream of the Centennial Road culvert since monitoring began in 1986

There were only four taxa dominant in the community (Table 3). These included one 'moderately sensitive' taxon [extremely abundant amphipod (*Paracalliope*)] and three 'tolerant' taxa [snail (*Potamopyrgus*), oligochaete worms, and orthoclad midges]. Most of these taxa are commonly found in habitats typical of the lower gradient reaches of small coastal streams, many of which are particularly abundant in association with periphyton and/or aquatic macrophytes. However, some of the more 'sensitive' taxa also present at this site (e.g. mayflies, stonefly, beetles, and some caddisflies) are associated with swifter flowing, harder substrates, and also amongst aquatic vegetation (e.g. amphipods, craneflies, and caddisfly).

Characteristic macroinvertebrate taxa in the communities at this site prior to this summer 2014 survey are listed in Table 4.

**Table 4** Characteristic taxa (abundant, very abundant, extremely abundant) recorded in the Herekawe Stream at Centennial Drive between April 1986 and November 2013 [56 surveys], and by the summer 2014 survey

Taxa List		MCI Score	Total abundances	% of Surveys	Survey Summer 2014
ANNELIDA	Oligochaeta	1	33	59	VA
MOLLUSCA	<i>Potamopyrgus</i>	4	56	100	XA
CRUSTACEA	Ostracoda	1	2	4	
	<i>Paracalliope</i>	5	35	63	XA
EPHEMEROPTERA	<i>Austroclima</i>	7	4	7	
	<i>Coloburiscus</i>	7	11	20	
PLECOPTERA	<i>Acroperla</i>	5	1	2	
TRICHOPTERA	<i>Aoteapsyche</i>	4	1	2	
	<i>Oxyethira</i>	2	12	21	
	<i>Triplectides</i>	5	12	21	
DIPTERA	<i>Aphrophila</i>	5	4	7	
	Orthoclaadiinae	2	25	45	A
	<i>Polypedilum</i>	3	2	4	
	<i>Austrosimulium</i>	3	17	30	



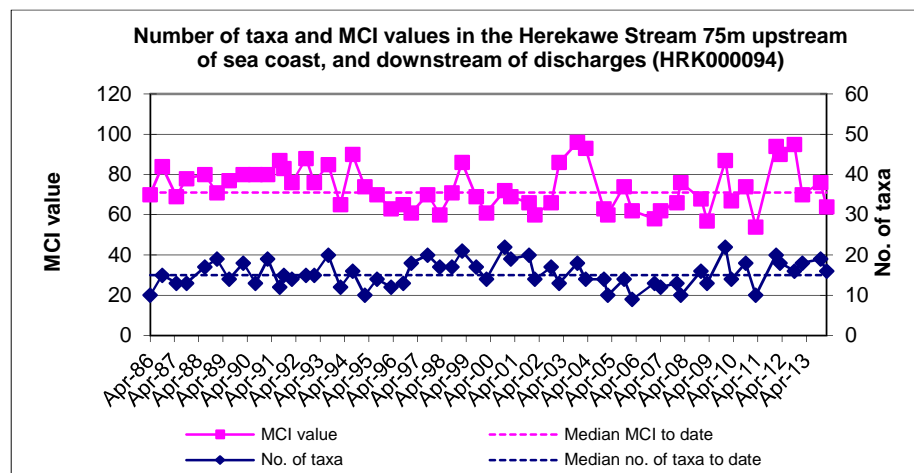
Prior to the current survey, 14 taxa had characterised the community at this site on occasions. These have comprised six 'moderately sensitive' and eight 'tolerant' taxa i.e. an absence of 'highly sensitive' taxa and a relatively high proportion of 'tolerant' taxa as would be expected in the lower reaches of a small coastal stream. Predominant taxa have included only the one 'moderately sensitive' taxon [amphipod (*Paracalliope*)] and two 'tolerant' taxa [oligochaete worms and snail (*Potamopyrgus*)]. This snail taxon has characterised this site's community on every occasion.

Four of the historically characteristic taxa were dominant in the summer 2014 community and comprised all three of the predominant taxa (above) together with another one 'tolerant' taxon which previously had been characteristic of this site's communities on 45% of occasions (Table 4). The three taxa which were recorded as very or extremely abundant in summer had characterised this site's communities on 59% to 100% of past surveys.

The MCI score (90 units) reflected the presence of a significant proportion of 'sensitive' taxa (52% of richness). The score was four units above the median of scores, but nine units lower than the maximum, found by previous surveys (Table 2, Figure 2). It was also a significant (Stark, 1998) 12 units higher than the median score found by 188 previous surveys of sites below 25 masl in similar lowland coastal streams (TRC, 1999 (updated, 2013)). The moderate SQMCI<sub>s</sub> value of 4.2 units (Table 3) reflected the numerical dominance of the 'tolerant' snail and 'sensitive' amphipod in particular at this site. The presence of a relatively high proportion of 'sensitive' taxa indicated reasonably good physicochemical water quality conditions preceding this survey.

## Site 2 (downstream of stormwater discharges)

A slightly above median richness of 16 taxa was found at this slower flowing site although it was noticeably more sandier and less of a cobble-boulder substrate habitat than usual. This richness was seven taxa fewer than recorded upstream (Table 2, Figure 3) although it should be noted that seven of these taxa (44% of richness) were recorded as rarities (less than 5 individuals per taxon). Although nine of these taxa were also present at the upstream site 1 and the two sites shared three of the dominant taxa (with two ('tolerant') and one ('moderately sensitive') other taxa characteristic at this site (2)), the two sites had only 34% of taxa in common of the total taxa (29) found over this short reach. Neither of the two 'highly sensitive' taxa present upstream (although only as rarities) was found at this site.



**Figure 3** Number of taxa and MCI values in the Herekawe Stream downstream of industrial stormwater discharges since monitoring began in 1986

There was an increase (of 21%) in the proportion of 'tolerant' taxa in this community with 69% of the total taxa number. This was due mainly to the loss of six 'sensitive' taxa present (although mainly as rarities) at the upstream site. Taxa characteristic of this community included the one 'moderately sensitive' taxon and two 'tolerant' taxa dominant at the upstream site together with another one 'moderately sensitive' taxon [vegetation-cased caddisfly (*Triplectides*)] and two 'tolerant' taxa [very abundant midge (*Chironomus*); and freshwater shrimp (*Paratya*)].

Characteristic macroinvertebrate taxa in the communities at this site prior to this summer 2014 survey are listed in Table 5.

**Table 5** Characteristic taxa (abundant, very abundant, extremely abundant) recorded in the Herekawe Stream downstream of Centennial Drive between April 1986 and November 2013 [56 surveys], and by the summer 2014 survey

Taxa List		MCI Score	Total abundances	% of Surveys	Survey Summer 2014
NEMERTEA	Nemertea	3	1	2	
ANNELIDA	Oligochaeta	1	31	55	VA
MOLLUSCA	<i>Physa</i>	3	1	2	
	<i>Potamopyrgus</i>	4	52	93	XA
	Sphaeriidae	3	2	4	
CRUSTACEA	Ostracoda	1	10	18	
	<i>Paracalliope</i>	5	27	48	VA
	<i>Paratya</i>	3	1	2	A
EPHEMEROPTERA	<i>Coloburiscus</i>	7	5	9	
ODONATA	<i>Xanthocnemis</i>	4	1	2	
HEMIPTERA	<i>Sigara</i>	3	3	5	
TRICHOPTERA	<i>Hydrobiosis</i>	5	2	4	
	<i>Oxyethira</i>	2	15	27	
	<i>Triplectides</i>	5	7	13	A
DIPTERA	<i>Aphrophila</i>	5	4	7	
	<i>Chironomus</i>	1	11	20	VA
	<i>Maoridiamesa</i>	3	1	2	
	Orthoclaadiinae	2	35	63	
	<i>Polypedilum</i>	3	4	7	
	Empididae	3	1	2	
ACARINA	<i>Austrosimulium</i>	3	8	14	
	Acarina	5	2	4	

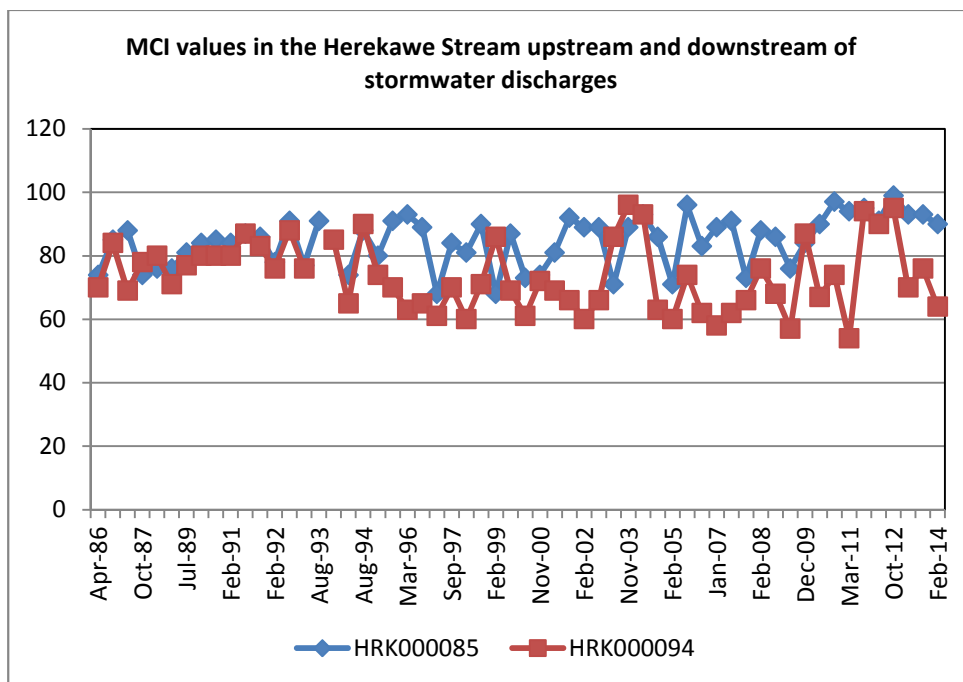
Prior to the current survey, 22 taxa had characterised the community at this site on occasions. These have comprised six 'moderately sensitive' and sixteen 'tolerant' taxa i.e. an absence of 'highly sensitive' taxa and a very high proportion of 'tolerant' taxa as would be expected in the lower reaches of a small coastal stream, particularly with a softer, more sedimented substrate. Predominant taxa have included only the three 'tolerant' taxa [oligochaete worms, snail (*Potamopyrgus*), and orthoclad midges].

Six of the historically characteristic taxa were dominant in the current survey community and comprised two of the predominant taxa (above) together with another two 'tolerant' and two 'moderately sensitive' taxa which previously had been characteristic of this site's communities (Table 5). The four taxa which were recorded as very or extremely abundant in summer had characterised this site's communities on 48% to 93 % of past surveys.

The MCI value of 64 units was an insignificant eight units lower than the median of previous values (Table 2) but a significant (Stark 1998) 26 units less than the score recorded at site 1. This was due to the much smaller proportion of 'sensitive' taxa in the community (particularly the absence of all mayflies, stoneflies, and beetles which are more commonly associated with harder substrates and swifter flow conditions), as a result of the more ponded and slower flow of water and the higher proportion of fine-sedimented substrate at this site. This reflected the very different habitat to that at the upstream 'control' site 1, rather than the effects of stormwater discharges. Sand inundation and saltwater penetration have occurred at this site in the past as a result of very high tides coincident with low stream flow conditions. However, many of the differences between the communities at sites 1 and 2 related to the presence/absence of taxa rarities (less than five individuals per taxon), rather than significant differences in individual taxon abundances [Note: removing these rarities from the two communities' compositions reduced the downstream decrease in MCI score to 18 units]. The two significant downstream differences in numerically increased abundances of individual 'tolerant' taxa and decreased abundances of individual 'moderately sensitive' taxa recorded between sites, resulted in a decrease of only 0.8 unit in SQMCI<sub>s</sub> value at the downstream site 2, despite the similarity in numerically most dominant (characteristic) taxa between sites.

## Discussion

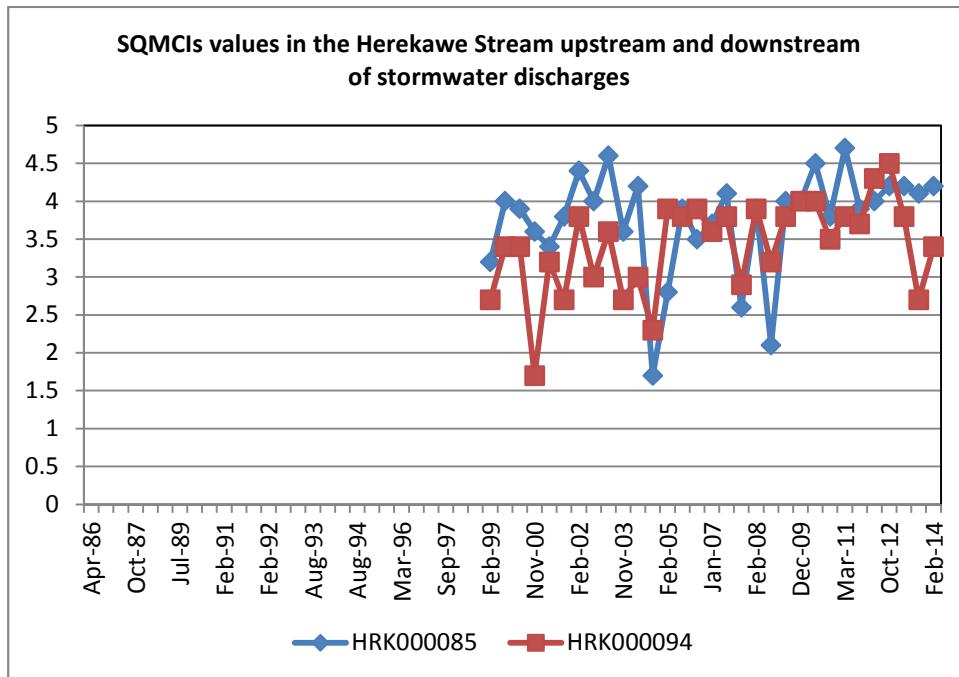
The MCI values recorded since monitoring of these sites began in 1986 are illustrated in Figure 4.



**Figure 4** MCI values at sites upstream (site 1) and downstream (Site 2) of the stormwater discharges from the Omata tank farm area since monitoring began in 1986

There was a distinct change in the MCI values in 1995 when values at site 2 decreased markedly in comparison with those recorded at site 1, upstream of the culvert. Between March and September 1995 the habitat in the Herekawe Stream at site 2 changed significantly. Prior to the September 1995 survey, the stream at this site had a more riffle-like habitat. Although the water was slower flowing (compared to site 1), the stream had been shallower and contained a greater proportion of cobbles. A natural dam of debris and rocks

appeared downstream between these two surveys, causing the stream to pond around site 2, becoming deeper and very slow flowing. The substrate became more dominated by silt and macrophyte beds developed. This habitat generally supports fewer 'sensitive' taxa and therefore MCI values generally reflected a poorer community. The very low flow conditions surveyed at the time of post 2002 summer surveys however, indicated more similar conditions at site 2 to pre-1995 habitat, particularly the absence of aquatic macrophytes, reversing recent trends in MCI scores. Ponding at site 2 became more apparent again during many of the last fourteen (spring and summer) surveys, and at the time of the current survey, with the MCI value reflecting such a habitat.



**Figure 5** SQMCI<sub>s</sub> values for surveys conducted in the Herekawe Stream since 1999 (when SQMCI<sub>s</sub> was first implemented)

The SQMCI<sub>s</sub> values over the surveys conducted since 1999 suggest that while there have been differences in community composition, it is likely that the dominant taxa on many occasions were similar between sites, and SQMCI<sub>s</sub> values at both sites have followed a similar pattern (Figure 5). The exception has been certain post-2004 surveys when the SQMCI<sub>s</sub> highlighted some significant differences in community composition at site 2 in terms of increased abundances within several individual 'sensitive' taxa in a downstream direction. Since this date, with two exceptions (spring 2008, spring 2010, spring 2013, and on this occasion), the two sites have had relatively similar SQMCI<sub>s</sub> values. This had been the case at the time of the four surveys immediately prior to spring 2013, in particular.

It is unlikely that any differences in macroinvertebrate communities between site 1 and site 2 in recent years have been due to stormwater discharges from the Omata Tank Farm, NPDC or Dow Agro Sciences. There have been no records of major changes to community compositions, i.e. significant loss of characteristic taxa, at the site (2) below these discharges, indicative of minimal impacts of stormwater discharges.

## Conclusions

This summer 2014 survey of the Herekawe Stream performed under low flow conditions indicated that the streambed communities had not been detrimentally affected by discharges of stormwater to the stream from the Omata Tank Farm, New Plymouth District Council, or other industrial sites. The macroinvertebrate communities at the sites both upstream and downstream of the discharges contained quite different proportions of 'sensitive' macroinvertebrate taxa which were most probably related to variations in stream habitat with a lower proportion present at the slower flowing, more sedimented downstream site, but the two sites had similar numerically most dominant (characteristic) taxa.

The numbers of taxa and MCI scores were insignificantly different and mainly higher than the respective medians of results found by previous surveys at each site. The MCI value downstream was 26 units lower than that recorded upstream at the time of this summer survey due to marked physical habitat differences (softer substrate and slower flowing nature of the site) downstream of the discharges. This was a similar deterioration in MCI score to that found by several previous surveys principally since the mid 1990's when habitat changed markedly at the downstream site. There was a much lower proportion of 'sensitive' taxa in the community at this site, and there was an increase in the number of dominant 'tolerant' taxa and some changes in the composition of the dominant taxa.

Larger differences in the MCI value between sites 1 and 2 have been illustrated by historical data since 1995. Before 1995 both of these sites contained similar numbers of taxa and MCI values. A change in the habitat occurred at site 2 in 1995 when the faster flowing stream with substrate more characteristic of a riffle altered to a slow flowing, deeper, and ponded area with silt and from time to time macrophyte beds dominating the substrate. Saltwater penetration as far upstream as the road culvert (Figure 1), under extremely high tide and very low stream flow conditions, may have influenced community composition at site 2 on occasions. These changes in habitat are more likely to be the cause of lower MCI values at this downstream site since 1995 and at the time of the current survey rather than stormwater discharges from the Omata Tank Farm area. [However, under the low flow conditions of some of the more recent summer surveys, this trend in MCI scores was reversed (e.g. in 2009, 2010, and 2011) and in spring 2012].

## Summary

The Council's standard 'kick-sampling' and 'sweep-sampling' techniques were used at two established sites, to collect streambed macroinvertebrates from the Herekawe Stream. Samples were sorted and identified to provide the number of taxa (richness) and MCI and SQMCI<sub>s</sub> 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<sub>s</sub> takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities. It may be the more appropriate index if non-organic impacts are occurring.

Significant differences in either the MCI or SQMCI<sub>s</sub> between sites may indicate the degree of adverse effects (if any) of the discharges being monitored.

This summer macroinvertebrate survey indicated that the discharge of treated stormwater and discharges from the Omata Tank Farm or Dow Agro Sciences sites had not had any detrimental effect on the macroinvertebrate communities of the stream. Stormwater discharges had occurred on several occasions in the three months since the preceding spring survey. A significant change in the MCI scores between the upstream 'control' site and site downstream of the discharges was more attributable to habitat differences between these sites. There were several changes in the number and composition of dominant taxa in communities in a downstream direction (as reflected in a moderate decrease in SQMCI<sub>s</sub> scores) but there were no significant changes in terms of historical community compositions at the downstream site.

The macroinvertebrate communities of the stream were generally dominated by more 'tolerant' than 'sensitive' taxa, particularly at the downstream site. Taxonomic richnesses (numbers of taxa) were higher at the time of this summer survey at the upstream site but lower at the downstream site, compared to the previous spring survey, while MCI scores were lower.

MCI and SQMCI<sub>s</sub> scores indicated that the stream communities deteriorated from 'fair' (upstream) to 'poor' health at the slower flowing, weedier downstream site, where the health was below the typical condition recorded in similar small Taranaki coastal streams. However, the relatively recent community initiatives to create the Herekawe walkway and extensive adjacent riparian planting in the 1.5 km reach immediately upstream of Centennial Drive (Report: CF485) should maintain or contribute towards a gradual improvement in stream health over future years, and it is noted that this summer MCI score at the upstream site was 4 units above the median for the 28-year period of monitoring. This site has recently shown a more positive improvement in MCI scores which has become a statistically significant temporal trend for the 18-year period between 1995 and 2013 (TRC, 2014).

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To Job Managers, David Olsen & James Kitto  
From Freshwater Biologist, CR Fowles  
Doc No 1312404  
Report No CF596  
Date 18 February 2014

## **Biomonitoring of the Herekawe Stream in relation to the Omata Tank Farm and other stormwater discharges, surveyed in November 2013**

### **Introduction**

This biological survey was the first of two scheduled for the Herekawe Stream in the 2013-2014 monitoring year to assess whether there had been any detrimental effects on the Herekawe Stream from stormwater discharges originating from STOS, Dow Agro Sciences, Chevron, Origen Energy and NPDC. The previous survey was performed in summer, 2013 as scheduled. The results from surveys performed since the 2001-02 monitoring year are discussed in reports referenced at the end of this report.

### **Methods**

The standard '400 ml kick-net' and sweep-sampling' techniques were used to collect streambed macroinvertebrates at a 'control' site ('kick-net') and another downstream site (mainly 'kick-net' and limited 'sweep-sampling') in the Herekawe Stream (Table 1, Figure 1) on 19 November 2013. The 'sweep-sampling' technique is very similar to Protocol C2 (soft-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark et al, 2001). The 'kick-sampling' technique is very similar to Protocol C1 (hard-bottomed, semi-quantitative) of the same protocols.

**Table 1** Biomonitoring sites in the Herekawe Stream in relation to stormwater discharges

Site No.	Site Code	GPS Reference	Location
1	HRK 000085	E1688283 N5674972	Upstream of Centennial Drive culvert and stormwater discharges
2	HRK 000094	E1688201 N5675010	Downstream of stormwater discharges, approx. 75 m above coast

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. By

averaging the scores obtained from a list of taxa taken from one site and multiplying by a scaling factor of 20, a Macroinvertebrate Community Index (MCI) value was obtained. The MCI is a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. More 'sensitive' taxa inhabit less polluted waterways.

A semi-quantitative MCI value (SQMCI<sub>s</sub>) 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 & 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<sub>s</sub> is not multiplied by a scaling factor of 20, so that its corresponding range of values is 20x lower, ranging from 0 to 10 SQMCI<sub>s</sub> units.



**Figure 1** Biomonitoring sites in the Herekawe Stream

## Results

At the time of this early afternoon survey, the water temperature in the Herekawe Stream was 18.5°C at the two sites. No stormwater discharges were occurring from the right bank or the left bank outfalls at the time of the survey. The channel at site 1 was narrow and constrained by gabion baskets on the banks and bed of the stream where the substrate comprised mainly gravels and cobbles with some silt, sand, wood, and boulders. The stream at this site had a moderate, clear, uncoloured, swift flow and there were thin periphyton mats and widespread filamentous algae on the bed. Some macrophytes were recorded at the edges of the stream at this partially shaded site.

The substrate at site 2 comprised mainly silt and sand with some wood and a small proportion of cobbles and boulders. The site can periodically be affected by salt water under extremely high tide and very low flow conditions. The clear, uncoloured, moderate flow at this site was slightly deeper and slower moving than at site 1 upstream. There were patchy filamentous algae and thin periphyton mats noted on the harder substrate components of the bed during the survey. Aquatic macrophytes were recorded at intervals along the stream margins. The small area of macrophytes was sweep-sampled at site 2 and the woody

substrate and the limited area of cobble-boulder substrate were kick-sampled for macroinvertebrates at this site.

The survey was performed 12 days after a fresh in excess of 3 times median flow and 18 days after a fresh in excess of 7 times median flow in the catchment in accordance with Taranaki Regional Council biomonitoring fieldwork protocols.

### Macroinvertebrates

A number of surveys have been performed previously at these two sites. Results of the current and past surveys are summarised in Table 2 and the results of the current survey presented in Table 3.

**Table 2** Results of the current and previous surveys (since April 1986) performed at sites 1 and 2 in the Herekawe Stream in relation to the Omata Tank Farm and other stormwater discharges

Site	Number of previous surveys	Numbers of taxa			MCI values		
		Median	Range	Current Survey	Median	Range	Current Survey
1	55	18	11-23	15	86	68-99	93
2	55	15	9-22	19	71	54-96	76

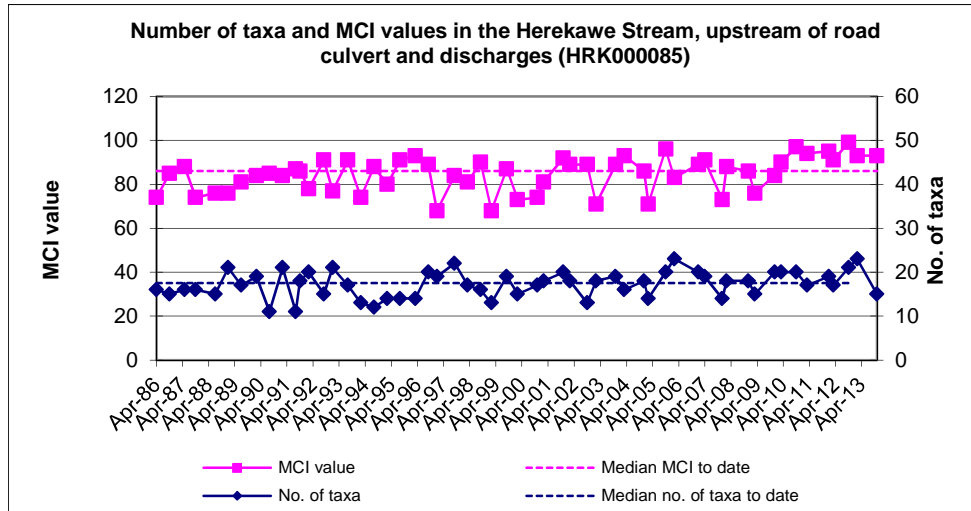
**Table 3** Macroinvertebrate fauna of the Herekawe Stream in relation to Omata Tank Farm and other stormwater discharges sampled on 19 November 2013

Taxa List	Site Number	MCI score	1	2
	Site Code		HRK000085	HRK000094
	Sample Number		FWB13335	FWB13336
ANNELIDA (WORMS)	Oligochaeta	1	A	XA
	Lumbricidae	5	R	-
MOLLUSCA	Lymnaeidae	3	-	R
	<i>Polamopyrgus</i>	4	VA	XA
	Sphaeriidae	3	-	R
CRUSTACEA	Ostracoda	1	-	R
	<i>Paracalliope</i>	5	VA	VA
	<i>Paranephrops</i>	5	-	R
EPHEMEROPTERA (MAYFLIES)	<i>Austroclima</i>	7	C	R
	<i>Coloburiscus</i>	7	R	-
	<i>Deleatidium</i>	8	R	-
HEMIPTERA (BUGS)	<i>Anisops</i>	5	-	R
COLEOPTERA (BEETLES)	Elmidae	6	C	R
TRICHOPTERA (CADDISFLIES)	<i>Hydrobiosis</i>	5	C	-
	<i>Hudsonema</i>	6	-	R
	<i>Oxyethira</i>	2	-	R
	<i>Triplectides</i>	5	R	C
DIPTERA (TRUE FLIES)	<i>Aphrophila</i>	5	R	R
	<i>Chironomus</i>	1	-	A
	Orthocladinae	2	A	A
	<i>Polypedilum</i>	3	R	A
	<i>Austrosimulium</i>	3	R	R
	Tanyderidae	4	R	-
ACARINA (MITES)	Acarina	5	-	R
		No of taxa	15	19
		MCI	93	76
		SQMCI	4.1	2.7
		EPT (taxa)	5	3
		%EPT (taxa)	33	16
		'Tolerant' taxa	'Moderately sensitive' taxa	
		'Highly sensitive' taxa		

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

### Site 1 (upstream of stormwater discharges)

A moderate richness of fifteen taxa was recorded at this site, which was three taxa fewer than the median number of taxa from previous surveys at this site (Table 2), but relatively typical of richnesses found in the lower reaches of small coastal streams elsewhere in Taranaki.



**Figure 2** Number of taxa and MCI values in the Herekawe Stream upstream of the Centennial Road culvert since monitoring began in 1986

There were only four taxa dominant in the community (Table 3). These included one 'moderately sensitive' taxon [amphipod (*Paracalliope*)] and three 'tolerant' taxa [snail (*Potamopyrgus*), oligochaete worms, and orthoclad midges]. Most of these taxa are commonly found in habitats typical of the lower gradient reaches of small coastal streams, many of which are particularly abundant in association with periphyton and/or aquatic macrophytes. However, some of the more 'sensitive' taxa also present at this site (e.g. mayflies, beetles, and some caddisflies) are associated with swifter flowing, harder substrates, and also amongst aquatic vegetation (e.g. amphipods and some other caddisflies).

Characteristic macroinvertebrate taxa in the communities at this site prior to the spring 2013 survey are listed in Table 4.

**Table 4** Characteristic taxa (abundant, very abundant, extremely abundant) recorded in the Herekawe Stream at Centennial Drive between April 1986 and February 2013 [55 surveys], and by the spring 2013 survey

Taxa List		MCI Score	Total abundances	% of Surveys	Survey Spring 2013
ANNELIDA	Oligochaeta	1	32	58	A
MOLLUSCA	<i>Potamopyrgus</i>	4	55	100	VA
CRUSTACEA	Ostracoda	1	2	4	
	<i>Paracalliope</i>	5	34	62	VA
EPHEMEROPTERA	<i>Austroclima</i>	7	4	7	
	<i>Coloburiscus</i>	7	11	20	
PLECOPTERA	<i>Acroperla</i>	5	1	2	
TRICHOPTERA	<i>Aoteapsyche</i>	4	1	2	
	<i>Oxyethira</i>	2	12	22	
	<i>Triplectides</i>	5	12	22	
DIPTERA	<i>Aphrophila</i>	5	4	7	
	Orthoclaadiinae	2	24	44	A
	<i>Polypedilum</i>	3	2	4	
	<i>Austrosimulium</i>	3	17	31	

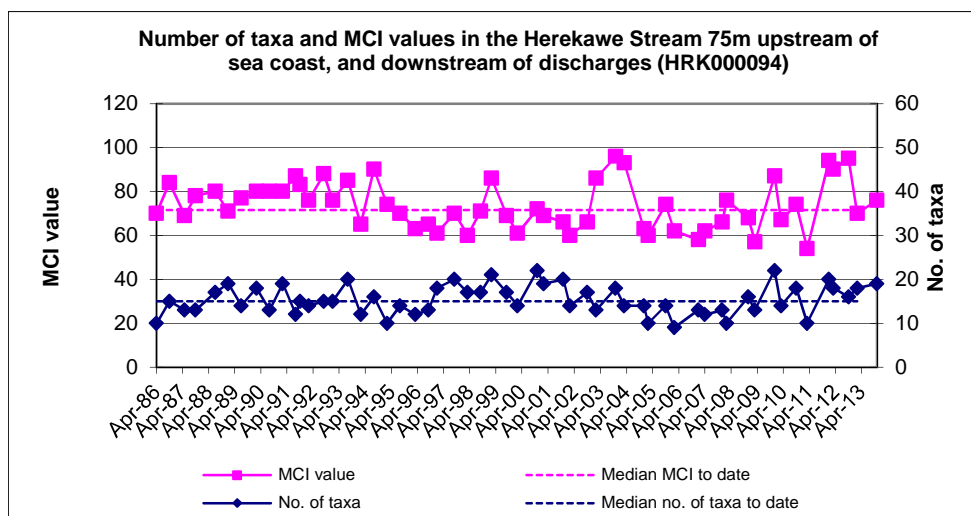
Prior to the current survey, 14 taxa had characterised the community at this site on occasions. These have comprised six 'moderately sensitive' and eight 'tolerant' taxa i.e. an absence of 'highly sensitive' taxa and a relatively high proportion of 'tolerant' taxa as would be expected in the lower reaches of a small coastal stream. Predominant taxa have included only the one 'moderately sensitive' taxon [amphipod (*Paracalliope*)] and two 'tolerant' taxa [oligochaete worms and snail (*Potamopyrgus*)]. This snail taxon has characterised this site's community on every occasion.

Four of the historically characteristic taxa were dominant in the spring 2013 community and comprised all three of the predominant taxa (above) together with another one 'tolerant' taxon which previously had been characteristic of this site's communities (Table 4). The two taxa which were recorded as very abundant had characterised this site's communities on 62% to 100% of past surveys.

The MCI score (93 units) reflected the presence of a significant proportion of 'sensitive' taxa (60% of richness). The score was 7 units above the median of scores, but six units lower than the maximum, found by previous surveys (Table 2, Figure 2). It was also a very significant (Stark, 1998) 15 units higher than the median score found by 188 previous surveys of sites below 25 masl in similar lowland coastal streams (TRC, 1999 (updated, 2013)). The moderate SQMCI<sub>s</sub> value of 4.1 units (Table 3) reflected the numerical dominance of the 'tolerant' snail and 'sensitive' amphipod in particular at this site. The relatively high proportion of 'sensitive' taxa indicated reasonably good physicochemical water quality conditions preceding this survey.

## Site 2 (downstream of stormwater discharges)

An above median richness of 19 taxa was found at this slower flowing site although it was noticeably more sandier and less of a cobble-boulder substrate habitat than usual. This richness was four taxa more than recorded upstream (Table 2, Figure 3) although it should be noted that 12 of these taxa (63% of richness) were recorded as rarities (less than 5 individuals per taxon). Although ten of these taxa were also present at the upstream site 1 and the two sites shared four of the dominant taxa (with two other ('tolerant') taxa characteristic at this site (2)), the two sites had only 42% in common of the total taxa (24) found over this short reach



**Figure 3** Number of taxa and MCI values in the Herekawe Stream downstream of industrial stormwater discharges since monitoring began in 1986

There was an increase (of 13%) in the proportion of 'tolerant' taxa in this community with 53% of the total taxa number. This was due mainly to the addition of five 'tolerant' taxa present (although mainly as rarities) at the downstream site. Taxa characteristic of this community included the one 'moderately sensitive' taxon and three 'tolerant' taxa dominant at the upstream site together with another two 'tolerant' taxa [midges (*Chironomus* and *Polypedilum*)].

Characteristic macroinvertebrate taxa in the communities at this site prior to the spring 2013 survey are listed in Table 5.

**Table 5** Characteristic taxa (abundant, very abundant, extremely abundant) recorded in the Herekawe Stream downstream of Centennial Drive between April 1986 and February 2013 [55 surveys], and by the spring 2013 survey

Taxa List		MCI Score	Total abundances	% of Surveys	Survey Spring 2013
NEMERTEA	Nemertea	3	1	2	
ANNELIDA	Oligochaeta	1	30	55	XA
MOLLUSCA	<i>Physa</i>	3	1	2	
	<i>Potamopyrgus</i>	4	51	93	XA
	Sphaeriidae	3	2	4	
CRUSTACEA	Ostracoda	1	10	18	
	<i>Paracalliope</i>	5	26	47	VA
	<i>Paratya</i>	3	1	2	
EPHEMEROPTERA	<i>Coloburiscus</i>	7	5	9	
ODONATA	<i>Xanthocnemis</i>	4	1	2	
HEMIPTERA	<i>Sigara</i>	3	3	5	
TRICHOPTERA	<i>Hydrobiosis</i>	5	2	4	
	<i>Oxyethira</i>	2	15	27	
	<i>Triplectides</i>	5	7	13	
DIPTERA	<i>Aphrophila</i>	5	4	7	
	<i>Chironomus</i>	1	10	18	A
	<i>Maoridiamesa</i>	3	1	2	
	Orthoclaadiinae	2	34	62	A
	<i>Polypedilum</i>	3	3	5	A
	Empididae	3	1	2	
ACARINA	<i>Austrosimulium</i>	3	8	15	
	Acarina	5	2	4	

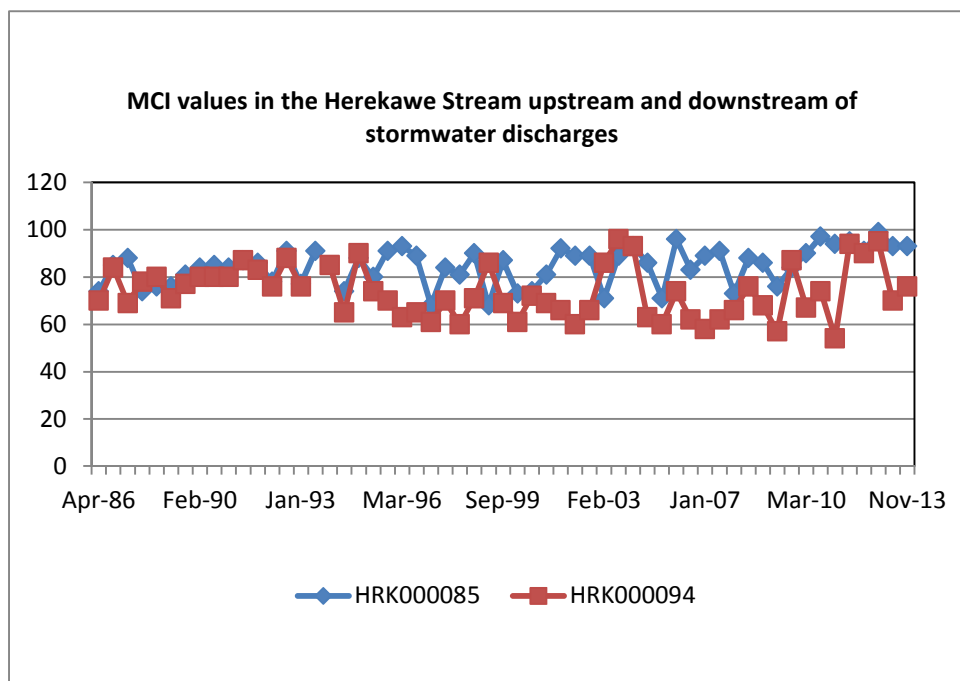
Prior to the current survey, 22 taxa had characterised the community at this site on occasions. These have comprised six 'moderately sensitive' and sixteen 'tolerant' taxa i.e. an absence of 'highly sensitive' taxa and a very high proportion of 'tolerant' taxa as would be expected in the lower reaches of a small coastal stream, particularly with a softer, more sedimented substrate. Predominant taxa have included only the three 'tolerant' taxa [oligochaete worms, snail (*Potamopyrgus*), and orthoclad midges].

Six of the historically characteristic taxa were dominant in the current survey community and comprised three of the predominant taxa (above) together with another two 'tolerant' and one 'moderately sensitive' taxa which previously had been characteristic of this site's communities (Table 5). The three taxa which were recorded as very or extremely abundant during spring had characterised this site's communities on 47% to 93 % of past surveys.

The MCI value of 76 units was an insignificant five units higher than the median of previous values (Table 2) but a significant (Stark 1998) 17 units less than the score recorded at site 1. This was due to the smaller proportion of 'sensitive' taxa in the community (particularly the absence of most mayflies which are more commonly associated with harder substrates and swifter flow conditions), as a result of the more ponded and slower flow of water and the higher proportion of fine-sedimented substrate at this site. This reflected the very different habitat to that at the upstream 'control' site 1, rather than the effects of stormwater discharges. Sand inundation and saltwater penetration have occurred at this site in the past as a result of very high tides coincident with low stream flow conditions. However, many of the differences between the communities at sites 1 and 2 related to the presence/absence of taxa rarities (less than five individuals per taxon), rather than significant differences in individual taxon abundances [Note: removing these rarities from the two communities' compositions enlarged the downstream decrease in MCI score to 26 units]. The three significant differences in numerically increased abundances of individual 'tolerant' taxa recorded between sites, resulted in a decrease of 1.4 units in SQMCI<sub>s</sub> value at the downstream site 2, despite the similarity in dominant (characteristic) taxa between sites.

## Discussion

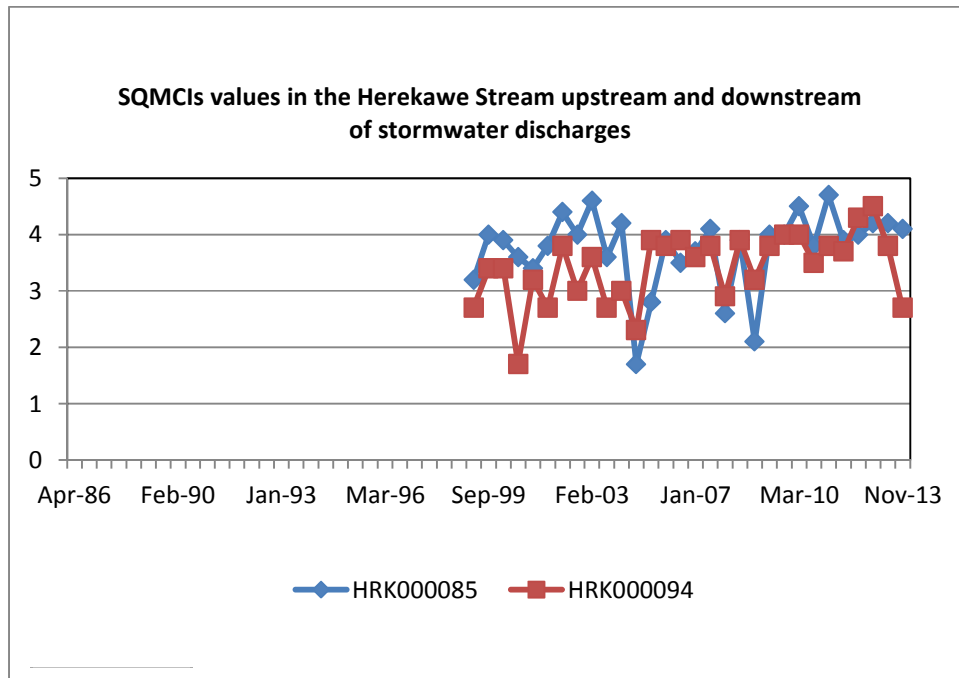
The MCI values recorded since monitoring of these sites began in 1986 are illustrated in Figure 4.



**Figure 4** MCI values at sites upstream (site 1) and downstream (Site 2) of the stormwater discharges from the Omata tank farm area since monitoring began in 1986

There was a distinct change in the MCI values in 1995 when values at site 2 decreased markedly in comparison with those recorded at site 1, upstream of the culvert. Between March and September 1995 the habitat in the Herekawe Stream at site 2 changed significantly. Prior to the September 1995 survey, the stream at this site had a more riffle-like habitat. Although the water was slower flowing (compared to site 1), the stream had been shallower and contained a greater proportion of cobbles. A natural dam of debris and rocks appeared downstream between these two surveys, causing the stream to pond around site 2, becoming deeper and very slow flowing. The substrate became more dominated by silt and

macrophyte beds developed. This habitat generally supports fewer 'sensitive' taxa and therefore MCI values generally reflected a poorer community. The very low flow conditions surveyed at the time of post 2002 summer surveys however, indicated more similar conditions at site 2 to pre-1995 habitat, particularly the absence of aquatic macrophytes, reversing recent trends in MCI scores. Ponding at site 2 became more apparent again during many of the last fourteen (spring and summer) surveys, and at the time of the current survey, with the MCI value reflecting such a habitat.



**Figure 5** SQMCI<sub>s</sub> values for surveys conducted in the Herekawe Stream since 1999 (when SQMCI<sub>s</sub> was first implemented)

The SQMCI<sub>s</sub> values over the surveys conducted since 1999 suggest that while there have been differences in community composition, it is likely that the dominant taxa on many occasions were similar between sites, and SQMCI<sub>s</sub> values at both sites have followed a similar pattern (Figure 5). The exception has been certain post-2004 surveys when the SQMCI<sub>s</sub> highlighted some significant differences in community composition at site 2 in terms of increased abundances within several individual 'sensitive' taxa in a downstream direction. Since this date, with two exceptions (spring 2008, spring 2010, and on this occasion), the two sites have had relatively similar SQMCI<sub>s</sub> values. This had been the case at the time of the four previous surveys in particular.

It is unlikely that any differences in macroinvertebrate communities between site 1 and site 2 in recent years have been due to stormwater discharges from the Omata Tank Farm, NPDC or DowAgro Sciences. There have been no records of major changes to community compositions, i.e. significant loss of characteristic taxa, at the site (2) below these discharges, indicative of minimal impacts of stormwater discharges.

## Conclusions

This spring 2013 survey of the Herekawe Stream performed under very low flow conditions indicated that the streambed communities had not been detrimentally affected by discharges of stormwater to the stream from the Omata Tank Farm, New Plymouth District Council, or other industrial sites. The macroinvertebrate communities at the sites both upstream and



downstream of the discharges contained quite different proportions of 'sensitive' macroinvertebrate taxa which were most probably related to variations in stream habitat with a lower proportion present at the slower flowing, more sedimented downstream site, but the two sites had very similar dominant (characteristic) taxa.

The numbers of taxa and MCI scores were insignificantly different and mainly higher than the respective medians of results found by previous surveys. The MCI value downstream was 17 units lower than that recorded upstream at the time of this spring survey due to marked physical habitat differences (softer substrate and slower flowing nature of the site) downstream of the discharges. This was a similar deterioration in MCI score to that found by several previous surveys principally since the mid 1990's when habitat changed markedly at the downstream site. There was a much lower proportion of 'sensitive' taxa in the community at this site, although there was minimal change in the number or composition of the dominant taxa.

Larger differences in the MCI value between sites 1 and 2 have been illustrated by historical data since 1995. Before 1995 both of these sites contained similar numbers of taxa and MCI values. A change in the habitat occurred at site 2 in 1995 when the faster flowing stream with substrate more characteristic of a riffle altered to a slow flowing, deeper, and ponded area with silt and from time to time macrophyte beds dominating the substrate. Saltwater penetration as far upstream as the road culvert (Figure 1), under extremely high tide and very low stream flow conditions, may have influenced community composition at site 2 on occasions. These changes in habitat are more likely to be the cause of lower MCI values at this downstream site since 1995 and at the time of the current survey rather than stormwater discharges from the Omata Tank Farm area. [However, under the low flow conditions of some of the more recent summer surveys, this trend in MCI scores was reversed (e.g. in 2009, 2010, and 2011) and in spring 2012].

## Summary

The Council's standard 'kick-sampling' and 'sweep-sampling' techniques were used at two established sites, to collect streambed macroinvertebrates from the Herekawe Stream. Samples were sorted and identified to provide the number of taxa (richness) and MCI and SQMCI<sub>s</sub> 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<sub>s</sub> takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities. It may be the more appropriate index if non-organic impacts are occurring.

Significant differences in either the MCI or SQMCI<sub>s</sub> between sites may indicate the degree of adverse effects (if any) of the discharges being monitored.

This spring macroinvertebrate survey indicated that the discharge of treated stormwater and discharges from the Omata Tank Farm or Dow Agro Sciences sites had not had any detrimental effect on the macroinvertebrate communities of the stream. Stormwater discharges had occurred on several of occasions in the three months preceding this survey. A significant change in the MCI scores between the upstream 'control' site and site downstream of the discharges was more attributable to habitat differences between these sites. There were minimal changes in the number and composition of dominant taxa in

communities in a downstream direction (as reflected in a moderate decrease in SQMCI<sub>s</sub> scores) and there were no significant changes in terms of historical community compositions at the downstream site.

The macroinvertebrate communities of the stream were generally dominated by more 'tolerant' than 'sensitive' taxa. Taxonomic richnesses (numbers of taxa) were lower at the time of this spring survey particularly at the upstream site, compared to the previous summer survey, but MCI scores were similar or slightly higher.

MCI and SQMCI<sub>s</sub> scores indicated that the stream communities deteriorated from 'fair' (upstream) to 'poor' health at the slower flowing, weedier downstream site, where the health was below the typical condition recorded in similar small Taranaki coastal streams. However, the relatively recent community initiatives to create the Herekawe walkway and extensive adjacent riparian planting in the 1.5 km reach immediately upstream of Centennial Drive (Report: CF485) should maintain or contribute towards a gradual improvement in stream health over future years, and it is noted that this spring MCI score at the upstream site was within 6 units of the maximum (recorded recently in spring, 2012) for the 28 year period of monitoring. This site has recently shown a more positive improvement in MCI scores which has become a statistically significant temporal trend for the 18 year period between 1995 and 2013 (TRC, 2014).

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To Job Managers, David Olsen & James Kitto  
From Freshwater Biologist, CR Fowles  
Doc No 1190295  
Report No CF569  
Date 30 April 2013

## Biomonitoring of the Herekawe Stream in relation to the Omata Tank Farm and other stormwater discharges, surveyed in February 2013

### Introduction

This biological survey was the second of two scheduled for the Herekawe Stream in the 2012-2013 monitoring year to assess whether there had been any detrimental effects on the Herekawe Stream from stormwater discharges originating from STOS, Dow Agro Sciences, Chevron, Origen Energy and NPDC. The previous survey was performed in spring, 2012 as scheduled. The results from surveys performed since the 2001-02 monitoring year are discussed in reports referenced at the end of this report.

### Methods

The standard '400 ml kick-net' and sweep-sampling' techniques were used to collect streambed macroinvertebrates at a 'control' site ('kick-net') and another downstream site (mainly 'kick-net' and limited 'sweep-sampling') in the Herekawe Stream (Table 1, Figure 1) on 12 February 2013. The 'sweep-sampling' technique is very similar to Protocol C2 (soft-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark et al, 2001). The 'kick-sampling' technique is very similar to Protocol C1 (hard-bottomed, semi-quantitative) of the same protocols.

**Table 1** Biomonitoring sites in the Herekawe Stream in relation to stormwater discharges

Site No.	Site Code	Map Reference	Location
1	HRK 000085	P19: 984367	Upstream of Centennial Drive culvert and stormwater discharges
2	HRK 000094	P19: 983368	Downstream of stormwater discharges, approx. 75 m above coast

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. By

averaging the scores obtained from a list of taxa taken from one site and multiplying by a scaling factor of 20, a Macroinvertebrate Community Index (MCI) value was obtained. The MCI is a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. More 'sensitive' taxa inhabit less polluted waterways.

A semi-quantitative MCI value (SQMCI<sub>s</sub>) 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 & 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<sub>s</sub> is not multiplied by a scaling factor of 20, so that its corresponding range of values is 20x lower, ranging from 0 to 10 SQMCI<sub>s</sub> units.



**Figure 1** Biomonitoring sites in the Herekawe Stream

## Results

At the time of this late morning survey, the water temperature in the Herekawe Stream ranged from 17.7°C to 17.9°C at the two sites. No stormwater discharges were occurring from the right bank or the left bank outfalls at the time of the survey. The channel at site 1 was narrow and constrained by gabion baskets on the banks and bed of the stream where the substrate comprised mainly sand and cobbles with some silt, gravels, and boulders. The stream at this site had a very low, clear, uncoloured, swift flow and there were thin periphyton mats and patchy filamentous algae on the bed. No macrophytes were recorded at the edges of the stream at this partially shaded site.

The substrate at site 2 comprised mainly sand with some gravel, wood, and a smaller proportion of cobbles and boulders than more recently. The site can periodically be affected by salt water under extremely high tide and very low flow conditions. The clear, uncoloured, very low flow at this site was slightly deeper and slower moving than at site 1 upstream. There were patchy filamentous algae but no periphyton mats noted on the harder substrate components of the bed during the survey. Aquatic macrophytes were recorded at intervals along the stream margins. The small area of macrophytes was sweep-sampled at

site 2 and the woody substrate and the limited area of gravel-cobble-boulder substrate were kick-sampled for macroinvertebrates at both sites.

The survey was performed seven days after a fresh in excess of 3 times median flow and 87 days after a fresh in excess of 7 times median flow in the catchment in accordance with Taranaki Regional Council biomonitoring fieldwork protocols.

### Macroinvertebrates

A number of surveys have been performed previously at these two sites. Results of the current and past surveys are summarised in Table 2 and the results of the current survey presented in Table 3.

**Table 2** Results of the current and previous surveys (since April 1986) performed at sites 1 and 2 in the Herekawe Stream in relation to the Omata Tank Farm and other stormwater discharges

Site	Number of previous surveys	Numbers of taxa			MCI values		
		Median	Range	Current Survey	Median	Range	Current Survey
1	54	18	11-23	23	86	68-99	93
2	54	15	9-22	18	72	54-96	70

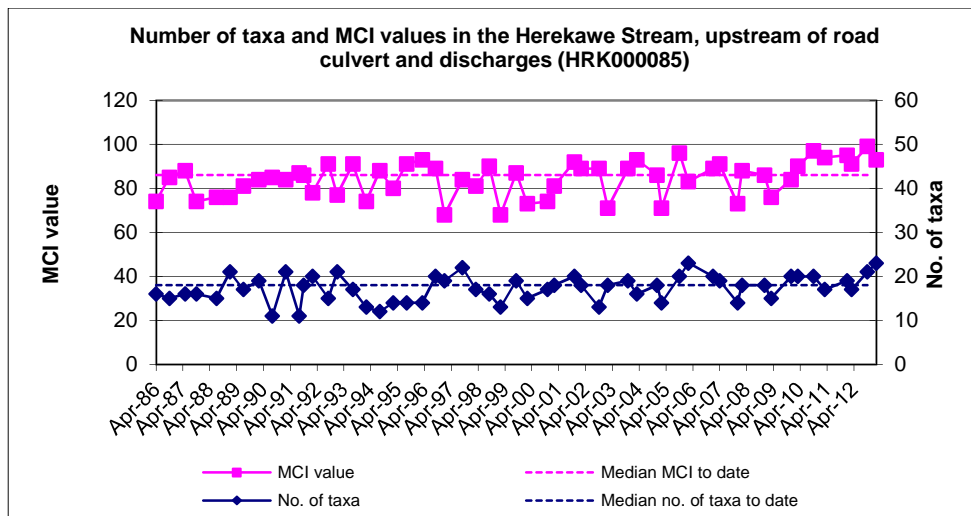
**Table 3** Macroinvertebrate fauna of the Herekawe Stream in relation to Omata Tank Farm and other stormwater discharges sampled on 12 February 2013

Taxa List	Site Number		MCI score	1	2
	Site Code			HRK000085	HRK000094
	Sample Number			FWB13057	FWB13058
NEMATODA	Nematoda		3	-	R
ANNELIDA (WORMS)	Oligochaeta		1	A	VA
	Lumbricidae		5	R	-
MOLLUSCA	Lymnaeidae		3	R	-
	<i>Potamopyrgus</i>		4	XA	XA
CRUSTACEA	Sphaeriidae		3	-	R
	<i>Paracalliope</i>		5	XA	XA
	<i>Paratya</i>		3	-	R
EPHEMEROPTERA (MAYFLIES)	<i>Austroclima</i>		7	R	-
	<i>Coloburiscus</i>		7	C	-
PLECOPTERA (STONEFLIES)	<i>Megaleptoperla</i>		9	R	-
COLEOPTERA (BEETLES)	<i>Zelandobius</i>		5	R	-
	Elmidae		6	R	-
TRICHOPTERA (CADDISFLIES)	Dytiscidae		5	-	R
	<i>Aoteapsyche</i>		4	R	-
	<i>Hydrobiosis</i>		5	C	R
	<i>Orthopsyche</i>		9	R	-
	<i>Psilochorema</i>		6	R	R
	<i>Oxyethira</i>		2	VA	VA
	<i>Triplectides</i>		5	R	C
DIPTERA (TRUE FLIES)	Eriopterini		5	R	-
	<i>Paralimnophila</i>		6	R	-
	<i>Chironomus</i>		1	C	VA
	Orthoclaadiinae		2	C	C
	<i>Polypedilum</i>		3	-	R
	Tanypodinae		5	-	C
	Empididae		3	R	R
	<i>Austrosimulium</i>		3	R	R
	Tanyderidae		4	R	R
			No of taxa	23	18
			MCI	93	70
			SQMCI	4.2	3.8
			EPT (taxa)	9	3
			%EPT (taxa)	39	17
'Tolerant' taxa		'Moderately sensitive' taxa		'Highly sensitive' taxa	

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

### Site 1 (upstream of stormwater discharges)

A moderate richness of twenty-three taxa was recorded at this site, which was five taxa more than the median number of taxa from previous surveys at this site (Table 2).



**Figure 2** Number of taxa and MCI values in the Herekawe Stream upstream of the Centennial Road culvert since monitoring began in 1986

There were only four taxa dominant in the community (Table 3). These included one 'moderately sensitive' taxon [extremely abundant amphipod (*Paracalliope*)] and three 'tolerant' taxa [extremely abundant snail (*Potamopyrgus*); oligochaete worms, and algal-piercing caddisfly (*Oxyethira*)]. Most of these taxa are commonly found in habitats typical of the lower gradient reaches of small coastal streams, many of which are particularly abundant in association with periphyton and/or aquatic macrophytes. However, some of the more 'sensitive' taxa also present at this site (e.g. mayflies and certain caddisflies) are associated with swifter flowing, harder substrates, and amongst aquatic vegetation (e.g. amphipods and some other caddisflies).

Characteristic macroinvertebrate taxa in the communities at this site prior to the summer 2013 survey are listed in Table 4.

**Table 4** Characteristic taxa (abundant, very abundant, extremely abundant) recorded in the Herekawe Stream at Centennial Drive between April 1986 and October 2012 [54 surveys], and by the summer 2013 survey

Taxa List		MCI Score	Total abundances	% of Surveys	Survey Summer 2013
ANNELIDA	Oligochaeta	1	31	57	A
MOLLUSCA	<i>Potamopyrgus</i>	4	54	100	XA
CRUSTACEA	Ostracoda	1	2	4	
	<i>Paracalliope</i>	5	33	61	XA
EPHEMEROPTERA	<i>Austroclima</i>	7	4	7	
	<i>Coloburiscus</i>	7	11	20	
PLECOPTERA	<i>Acroperla</i>	5	1	2	
TRICHOPTERA	<i>Aoteapsyche</i>	4	1	2	
	<i>Oxyethira</i>	2	11	20	VA
	<i>Triplectides</i>	5	12	22	
DIPTERA	<i>Aphrophila</i>	5	4	7	
	Orthoclaadiinae	2	24	44	
	<i>Polypedilum</i>	3	2	4	
	<i>Austrosimulium</i>	3	17	31	



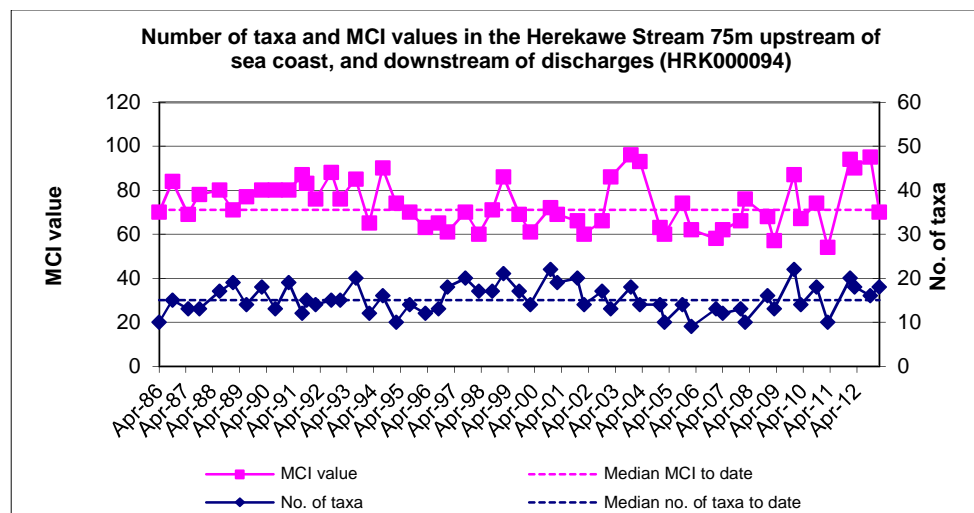
Prior to the current survey, 14 taxa had characterised the community at this site on occasions. These have comprised six 'moderately sensitive' and eight 'tolerant' taxa i.e. an absence of 'highly sensitive' taxa and a relatively high proportion of 'tolerant' taxa as would be expected in the lower reaches of a small coastal ringplain stream. Predominant taxa have included only the one 'moderately sensitive' taxon [amphipod (*Paracalliope*)] and two 'tolerant' taxa [oligochaete worms and snail (*Potamopyrgus*)].

Four of the historically characteristic taxa were dominant in the summer 2013 community and comprised three of the predominant taxa (above) together with another one 'tolerant' taxon which previously had been characteristic of this site's communities (Table 4). The three taxa which were recorded as extremely or very abundant had characterised this site's communities on 20 to 100% of past surveys.

The MCI score (93 units) reflected the presence of a significant proportion of 'sensitive' taxa (57% of richness). The score was 7 units above the median of scores, but six units lower than the maximum, found by previous surveys (Table 2, Figure 2). It was also a very significant (Stark, 1998) 18 units higher than the median score found by 225 previous surveys of sites below 25 masl in similar lowland coastal streams on the ringplain (TRC, 1999 updated, 2012)). The moderate SQMCI<sub>s</sub> value of 4.2 units (Table 3) reflected the numerical dominance of the 'tolerant' snail and 'sensitive' amphipod in particular at this site. The relatively high proportion of 'sensitive' taxa indicated reasonably good physicochemical water quality conditions preceding this survey.

## Site 2 (downstream of stormwater discharges)

A slightly above median richness of 18 taxa was also found at this slower flowing site although it was noticeably more sandier and less of a cobble-boulder substrate habitat than usual. This richness was five taxa fewer than recorded upstream (Table 2, Figure 3). Although twelve of these taxa were also present at the upstream site 1 and the two sites shared three of the dominant taxa (with one other taxon characteristic at this site (2)), the two sites had only 41% in common of the total taxa (29) found over this short reach



**Figure 3** Number of taxa and MCI values in the Herekawe Stream downstream of industrial stormwater discharges since monitoring began in 1986

There was a significant increase in the proportion of 'tolerant' taxa in this community with 67% of the total taxa number. This was due mainly to the loss of nine 'sensitive' taxa present

only as rarities at the upstream site. Taxa characteristic of this community included the one 'moderately sensitive' taxon and three 'tolerant' taxa dominant at the upstream site and another 'tolerant' taxon [midge (*Chironomus*)].

Characteristic macroinvertebrate taxa in the communities at this site prior to the summer 2013 survey are listed in Table 5.

**Table 5** Characteristic taxa (abundant, very abundant, extremely abundant) recorded in the Herekawe Stream downstream of Centennial Drive between April 1986 and October 2012 [54 surveys], and by summer 2013 survey

Taxa List		MCI Score	Total abundances	% of Surveys	Surveys
					Summer 2013
NEMERTEA	Nemertea	3	1	2	
ANNELIDA	Oligochaeta	1	29	54	VA
MOLLUSCA	<i>Physa</i>	3	1	2	
	<i>Potamopyrgus</i>	4	50	93	XA
	Sphaeriidae	3	2	4	
CRUSTACEA	Ostracoda	1	10	19	
	<i>Paracalliope</i>	5	25	46	XA
	<i>Paratya</i>	3	1	2	
EPHEMEROPTERA	<i>Coloburiscus</i>	7	5	9	
ODONATA	<i>Xanthocnemis</i>	4	1	2	
HEMIPTERA	<i>Sigara</i>	3	3	6	
TRICHOPTERA	<i>Hydrobiosis</i>	5	2	4	
	<i>Oxyethira</i>	2	14	26	VA
	<i>Triplectides</i>	5	7	13	
DIPTERA	<i>Aphrophila</i>	5	4	7	
	<i>Chironomus</i>	1	9	17	VA
	<i>Maoridiamesa</i>	3	1	2	
	Orthoclaadiinae	2	34	63	
	<i>Polypedilum</i>	3	3	6	
	Empididae	3	1	2	
	<i>Austrosimulium</i>	3	8	15	
ACARINA	Acarina	5	2	4	

Prior to the current survey, 22 taxa had characterised the community at this site on occasions. These have comprised six 'moderately sensitive' and sixteen 'tolerant' taxa i.e. an absence of 'highly sensitive' taxa and a very high proportion of 'tolerant' taxa as would be expected in the lower reaches of a small coastal ringplain stream, particularly with a softer, more sedimented substrate. Predominant taxa have included only the one 'moderately sensitive' taxon [amphipod (*Paracalliope*)] and three 'tolerant' taxa [oligochaete worms, snail (*Potamopyrgus*), and orthoclad midges].

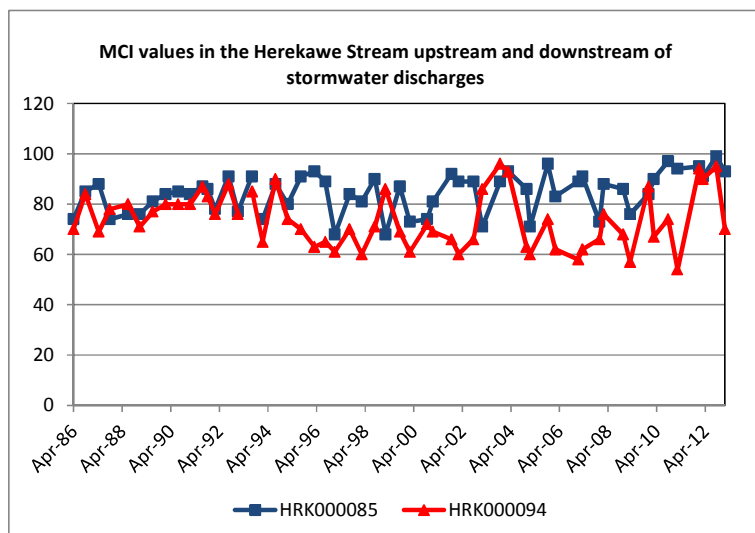
Five of the historically characteristic taxa were dominant in the current survey community and comprised three of the predominant taxa (above) together with another two 'tolerant' taxa which previously had been characteristic of this site's communities (Table 5). The five taxa which were recorded as very or extremely abundant during summer had characterised this site's communities on 17 to 93 % of past surveys.

The MCI value of 70 units was an insignificant two units lower than the median of previous values (Table 2) but a significant (Stark 1998) 23 units less than the score recorded at site 1.

This was due to the much smaller proportion of 'sensitive' taxa in the community (particularly the absence of mayflies and most caddisflies which are more commonly associated with harder substrates and swifter flow conditions), as a result of the more ponded and slower flow of water and the higher proportion of fine-sedimented substrate at this site. This reflected the very different habitat to that at the upstream 'control' site 1, rather than the effects of stormwater discharges. Sand inundation and saltwater penetration have occurred at this site in the past as a result of very high tides coincident with low stream flow conditions. However, most of the differences between the communities at sites 1 and 2 related to the presence/absence of taxa rarities (less than five individuals per taxon), rather than significant differences in individual taxon abundances [Note: removing these rarities from the two communities' compositions however, reduced the downstream decrease in MCI score to an insignificant 5 units]. The few significant differences in numerical abundances of individual taxa recorded between sites, resulted in only a minor decrease of 0.4 unit in SQMCI<sub>s</sub> value at the downstream site 2, due to the similarity in dominant (characteristic) taxa abundances between sites.

## Discussion

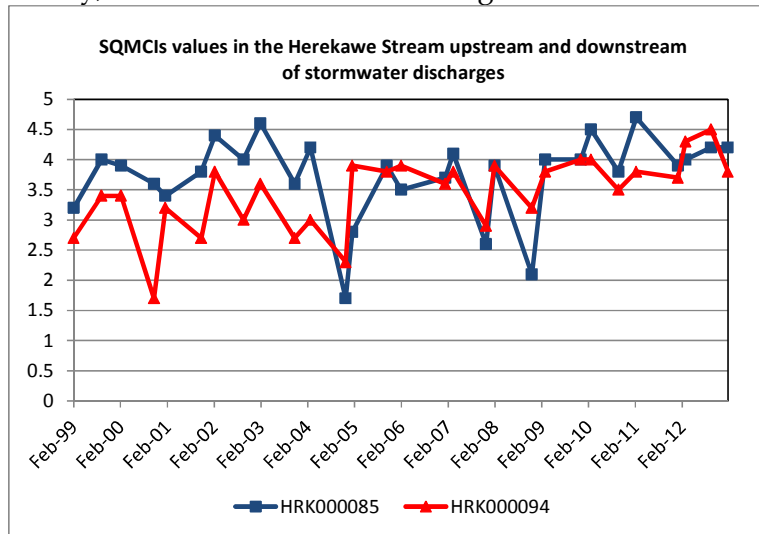
The MCI values recorded since monitoring of these sites began in 1986 are illustrated in Figure 4.



**Figure 4** MCI values at sites upstream (site 1) and downstream (Site 2) of the stormwater discharges from the Omata tank farm area since monitoring began in 1986

There was a distinct change in the MCI values in 1995 when values at site 2 decreased markedly in comparison with those recorded at site 1, upstream of the culvert. Between March and September 1995 the habitat in the Herekawe Stream at site 2 changed significantly. Prior to the September 1995 survey, the stream at this site had a more riffle-like appearance. Although the water was slower flowing (compared to site 1), the stream had been shallower and contained a greater proportion of cobbles. A natural dam of debris and rocks appeared between these two surveys, causing the stream to pond around site 2, becoming deeper and very slow flowing. The substrate became more dominated by silt and macrophyte beds developed. This habitat generally supports fewer 'sensitive' taxa and therefore MCI values generally reflected a poorer community. The very low flow conditions surveyed at the time of post 2002 summer surveys however, indicated more similar conditions at site 2 to pre-1995 habitat, particularly the absence of aquatic macrophytes, reversing recent trends in MCI scores. Ponding at site 2 became more apparent again during

many of the last twelve spring and the summer surveys, and at the time of the current survey, with the MCI value reflecting such a habitat.



**Figure 5** SQMCI<sub>s</sub> values for surveys conducted in the Herekawe Stream since 1999 (when SQMCI<sub>s</sub> was first implemented)

The SQMCI<sub>s</sub> values over the surveys conducted since 1999 suggest that while there have been differences in community composition, it is likely that the dominant taxa on many occasions were similar between sites, and SQMCI<sub>s</sub> values at both sites have followed a similar pattern (Figure 5). The exception has been certain post-2004 surveys when the SQMCI<sub>s</sub> highlighted some significant differences in community composition at site 2 in terms of increased abundances within several individual 'sensitive' taxa in a downstream direction. Since this date, with two exceptions (spring, 2008 and 2010), the two sites have had relatively similar SQMCI<sub>s</sub> values. This has been the case at the time of the four latest surveys in particular.

It is unlikely that any differences in macroinvertebrate communities between site 1 and site 2 in recent years have been due to stormwater discharges from the Omata Tank Farm, NPDC or Dow Agro Sciences. There have been no records of major changes to community compositions, i.e. significant loss of characteristic taxa, at the site (2) below these discharges, indicative of minimal impacts of stormwater discharges.

## Conclusions

This summer 2013 survey of the Herekawe Stream performed under very low flow conditions indicated that the streambed communities had not been detrimentally affected by discharges of stormwater to the stream from the Omata Tank Farm, New Plymouth District Council or other industrial sites. The macroinvertebrate communities at the sites both upstream and downstream of the discharges contained quite different proportions of 'sensitive' macroinvertebrate taxa which were most probably related to variations in stream habitat with a much lower proportion present at the slower flowing, more sedimented downstream site, but had very similar dominant (characteristic) taxa.

The numbers of taxa and MCI scores were insignificantly different than the respective medians of results found by previous surveys. The MCI value downstream was 23 units lower than that recorded upstream at the time of this summer survey due to marked physical habitat differences (softer substrate and slower flowing nature of the site) downstream of the discharges. This was a similar deterioration in MCI score to that found

by several previous surveys principally since the mid 1990's when habitat changed markedly at the downstream site. There was a much lower proportion of 'sensitive' taxa in the community at this site, although there was minimal change in the number or composition of the dominant taxa.

Differences in the MCI value between sites 1 and 2 have been illustrated by historical data since 1995. Before 1995 both of these sites contained similar numbers of taxa and MCI values. A change in the habitat occurred at site 2 in 1995 when the faster flowing stream with substrate more characteristic of a riffle altered to a slow flowing, deeper, and ponded area with silt and from time to time macrophyte beds dominating the substrate. Saltwater penetration as far upstream as the road culvert (Figure 1), under extremely high tide and very low stream flow conditions, may have influenced community composition at site 2 on occasions. These changes in habitat are more likely to be the cause of lower MCI values at this downstream site since 1995 and at the time of the current survey rather than stormwater discharges from the Omata Tank Farm area. [However, under the low flow conditions of some of the more recent summer surveys, this trend in MCI scores was reversed (e.g. in 2009, 2010, and 2011) and in spring 2012].

## Summary

The Council's standard 'kick-sampling' and 'sweep-sampling' techniques were used at two established sites, to collect streambed macroinvertebrates from the Herekawe Stream. Samples were sorted and identified to provide the number of taxa (richness) and MCI and SQMCI<sub>s</sub> 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<sub>s</sub> takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities. It may be the more appropriate index if non-organic impacts are occurring.

Significant differences in either the MCI or SQMCI<sub>s</sub> between sites may indicate the degree of adverse effects (if any) of the discharges being monitored.

This summer macroinvertebrate survey indicated that the discharge of treated stormwater and discharges from the Omata Tank Farm or Dow Agro Sciences sites had not had any detrimental effect on the macroinvertebrate communities of the stream. Stormwater discharges had occurred on a number of occasions in the three months preceding this survey. Significant changes in the MCI scores between the upstream 'control' site and site downstream of the discharges were more attributable to habitat differences between these sites. There were minimal changes in the number and composition of dominant taxa in communities in a downstream direction (as reflected in a very small decrease in SQMCI<sub>s</sub> scores) and there were no significant changes in terms of historical community compositions at the downstream site.

The macroinvertebrate communities of the stream were generally dominated by an equal balance of 'tolerant' and 'sensitive' taxa. Taxonomic richnesses (numbers of taxa) were slightly higher at the time of this summer survey at both sites compared to the previous spring survey, but MCI scores were lower.

MCI and SQMCI<sub>s</sub> scores indicated that the stream communities deteriorated from 'fair' to 'poor' health at the slower flowing, weedier downstream site, where the health was below the typical condition recorded in similar small Taranaki coastal streams. However, the relatively recent community initiatives to create the Herekawe walkway and extensive adjacent riparian planting in the 1.5 km reach immediately upstream of Centennial Drive (Report: CF485) should maintain or contribute towards a gradual improvement in stream health over future years, and it is noted that this summer MCI score at the upstream site was within 6 units of the maximum (recorded most recently in spring, 2012) for the 27 year period of monitoring. This site has recently shown a more positive trend of improvement in MCI scores (TRC, 2013).

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To Job Managers, David Olsen & James Kitto  
From Freshwater Biologist, CR Fowles  
Doc No 1128877  
Report No CF559  
Date 28 November 2012

## Biomonitoring of the Herekawe Stream in relation to the Omata Tank Farm and other stormwater discharges, surveyed in October 2012

### Introduction

This biological survey was the first of two scheduled for the Herekawe Stream in the 2012-2013 monitoring year to assess whether there had been any detrimental effects on the Herekawe Stream from stormwater discharges originating from STOS, Dow Agro Sciences, Methanex, Chevron, and NPDC. The previous survey, normally performed in summer, was delayed by frequent wet weather until early autumn. The results from surveys performed since the 2001-02 monitoring year are discussed in reports referenced at the end of this report.

### Methods

The standard '400 ml kick-net' and sweep-sampling' techniques were used to collect streambed macroinvertebrates at a 'control' site ('kick-net') and another downstream site (mainly 'kick-net' and limited 'sweep-sampling') in the Herekawe Stream (Table 1, Figure 1) on 5 October 2012. The 'sweep-sampling' technique is very similar to Protocol C2 (soft-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark et al, 2001). The 'kick-sampling' technique is very similar to Protocol C1 (hard-bottomed, semi-quantitative) of the same protocols.

**Table 1** Biomonitoring sites in the Herekawe Stream in relation to stormwater discharges

Site No.	Site Code	Map Reference	Location
1	HRK 000085	P19: 984367	Upstream of Centennial Drive culvert and stormwater discharges
2	HRK 000094	P19: 983368	Downstream of stormwater discharges, approx. 75 m above coast

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. By averaging the scores obtained from a list of taxa taken from one site and multiplying by a scaling factor of 20, a Macroinvertebrate Community Index (MCI) value was obtained. The MCI is a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. More 'sensitive' taxa inhabit less polluted waterways.

A semi-quantitative MCI value (SQMCI<sub>s</sub>) 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 & 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<sub>s</sub> is not multiplied by a scaling factor of 20, so that its corresponding range of values is 20x lower, ranging from 0 to 10 SQMCI<sub>s</sub> units.



**Figure 1** Biomonitoring sites in the Herekawe Stream

## Results

At the time of this mid morning survey, the water temperature in the Herekawe Stream was 12.6°C at both sites. No stormwater discharges were occurring from the right bank or the left bank outfalls at the time of the survey. The channel at site 1 was narrow and constrained by gabion baskets on the banks and bed of the stream where the substrate was comprised mainly of sand and cobbles with some silt, gravels, and boulders. The stream at this site had a low, clear, uncoloured, swift flow and there were no periphyton mats but patchy filamentous algae on the bed. Macrophytes were patchy at the edges of the stream at this partially shaded site.

The substrate at site 2 was comprised mainly of sand with some gravel, wood, and an increased proportion of cobbles and boulders than usual. The site can periodically be affected by salt water under extremely high tide and very low flow conditions. The clear, uncoloured flow at this site was slightly deeper and slower moving than at site 1 upstream. There were no filamentous algae and only thin periphyton mats noted on the hard substrate components of the bed during the survey. Aquatic macrophytes were recorded at intervals

along the stream margins. The small area of macrophytes was sweep-sampled at site 2 and the woody substrate and the gravel-cobble-boulder substrates were kick-sampled for macroinvertebrates at both sites.

The survey was performed eight days after a fresh in excess of 3 times median flow and 18 days after a fresh in excess of 7 times median flow in the catchment in accordance with Taranaki Regional Council biomonitoring fieldwork protocols.

### Macroinvertebrates

A number of surveys have been performed previously at these two sites. Results of the current and past surveys are summarised in Table 2 and the results of the current survey presented in Table 3.

**Table 2** Results of the current and previous surveys (since April 1986) performed at sites 1 and 2 in the Herekawe Stream in relation to the Omata Tank Farm and other stormwater discharges

Site	Number of previous surveys	Numbers of taxa			MCI values		
		Median	Range	Current Survey	Median	Range	Current Survey
1	53	17	11-23	21	86	68-97	99
2	53	14	9-22	16	71	54-96	95

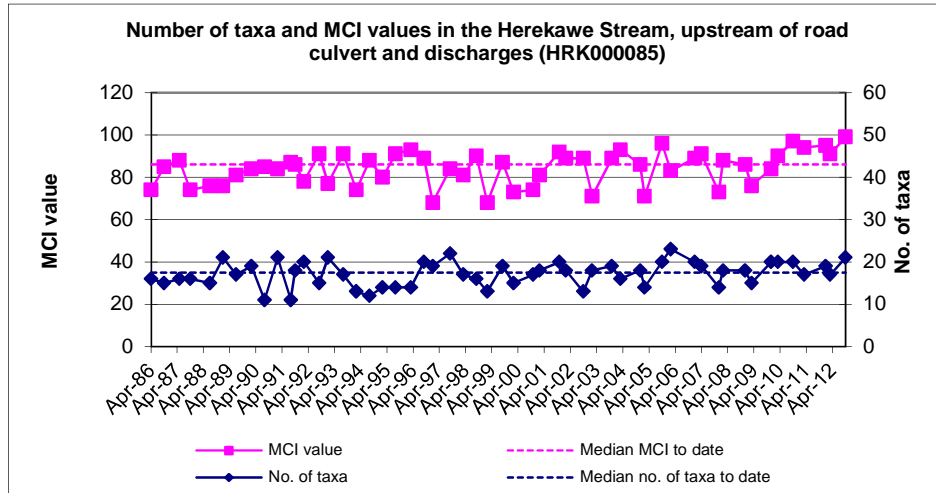
**Table 3** Macroinvertebrate fauna of the Herekawe Stream in relation to Omata Tank Farm and other stormwater discharges sampled on 5 October 2012

Taxa List	Site Number	MCI score	1	2
	Site Code		HRK000085	HRK000094
	Sample Number		FWB12362	FWB12363
ANNELIDA (WORMS)	Oligochaeta	1	A	C
MOLLUSCA	<i>Potamopyrgus</i>	4	VA	C
CRUSTACEA	<i>Paracalliope</i>	5	A	C
EPHEMEROPTERA (MAYFLIES)	<i>Austroclima</i>	7	R	R
	<i>Coloburiscus</i>	7	A	A
	<i>Zephlebia group</i>	7	C	-
PLECOPTERA (STONEFLIES)	<i>Acroperla</i>	5	R	-
	<i>Zelandobius</i>	5	R	-
COLEOPTERA (BEETLES)	Elmidae	6	R	R
TRICHOPTERA (CADDISFLIES)	<i>Costachorema</i>	7	-	R
	<i>Hydrobiosis</i>	5	R	R
	<i>Orthopsyche</i>	9	R	R
	<i>Hudsonema</i>	6	R	-
	<i>Oxyethira</i>	2	-	R
	<i>Pycnocentroides</i>	5	R	-
	<i>Triplectides</i>	5	R	C
DIPTERA (TRUE FLIES)	<i>Aphrophila</i>	5	C	A
	Eriopterini	5	R	R
	<i>Maoridiamesa</i>	3	-	R
	Orthoclaadiinae	2	C	A
	<i>Polypedillum</i>	3	R	-
	Empididae	3	R	-
	<i>Austrosimulium</i>	3	-	R
	Tanyderidae	4	R	-
ACARINA (MITES)	Acarina	5	R	-
No of taxa			21	16
MCI			99	95
SQMCIs			4.2	4.5
EPT (taxa)			10	6
%EPT (taxa)			48	38
'Tolerant' taxa		'Moderately sensitive' taxa		'Highly sensitive' taxa

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

### Site 1 (upstream of stormwater discharges)

A moderate richness of twenty-one taxa was recorded at this site, which was four taxa more than the median number of taxa from previous surveys at this site (Table 2, **Error! Reference source not found.**).



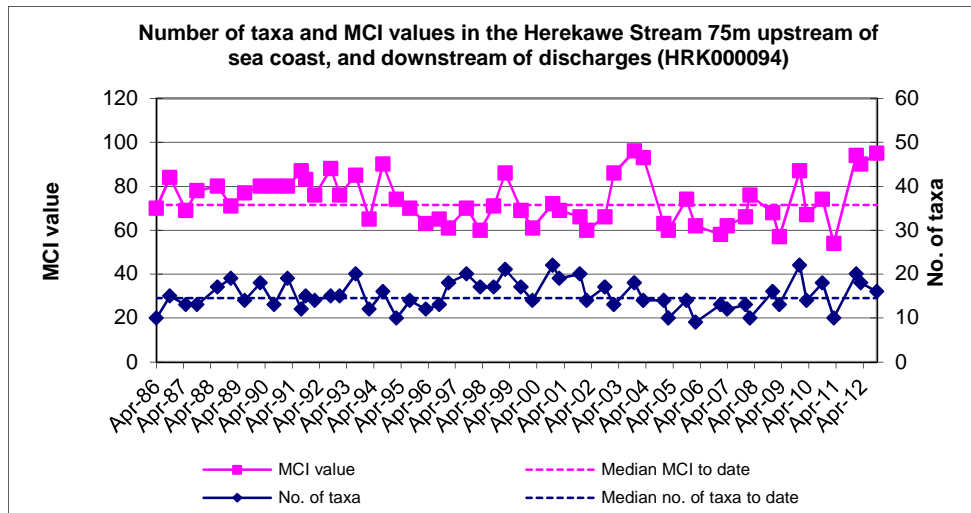
**Figure 2** Number of taxa and MCI values in the Herekawe Stream upstream of the Centennial Road culvert since monitoring began in 1986

There were only four taxa dominant in the community (Table 3). These included two 'moderately sensitive' taxa [amphipod (*Paracalliope*) and mayfly (*Coloburiscus*)] and two 'tolerant' taxa [very abundant snail (*Potamopyrgus*); and oligochaete worms]. Most of these taxa are commonly found in habitats typical of the lower gradient reaches of small coastal streams, many of which are particularly abundant in association with periphyton and/or aquatic macrophytes. However, some of the more 'sensitive' taxa also present at this site (e.g. mayflies and certain caddisflies) are associated with swifter flowing, harder substrates, and amongst aquatic vegetation (e.g. amphipods and some other caddisflies).

The MCI score (99 units) reflected the presence of a significant proportion of 'sensitive' taxa (71% of richness). The score was a significant (Stark, 1998) 13 units above the median of scores, and two units above the maximum, found by previous surveys (Table 2, Figure 2). It was also a very significant (Stark, 1998) 24 units higher than the median score found by 225 previous surveys of sites below 25 masl in similar lowland coastal streams on the ringplain (TRC, 1998 updated, 2012)). The moderate SQMCI<sub>s</sub> value of 4.2 units (Table 3) reflected the numerical dominance of the 'tolerant' snail in particular at this site. However, the presence of one 'highly sensitive' taxa (although only as a rarity) and abundances of two 'moderately sensitive' taxa indicated reasonably good physicochemical water quality conditions preceding this survey.

### Site 2 (downstream of stormwater discharges)

A slightly above median richness of 16 taxa was also found at this, slightly slower flowing site although it was noticeably less sandier and more of a cobble-boulder substrate habitat than usual. This richness was five taxa fewer than recorded upstream (Table 2, Figure 3). Twelve of these taxa were also present at the upstream site 1 but the two sites shared only one of the dominant taxa with two other taxa characteristic at this site (2).

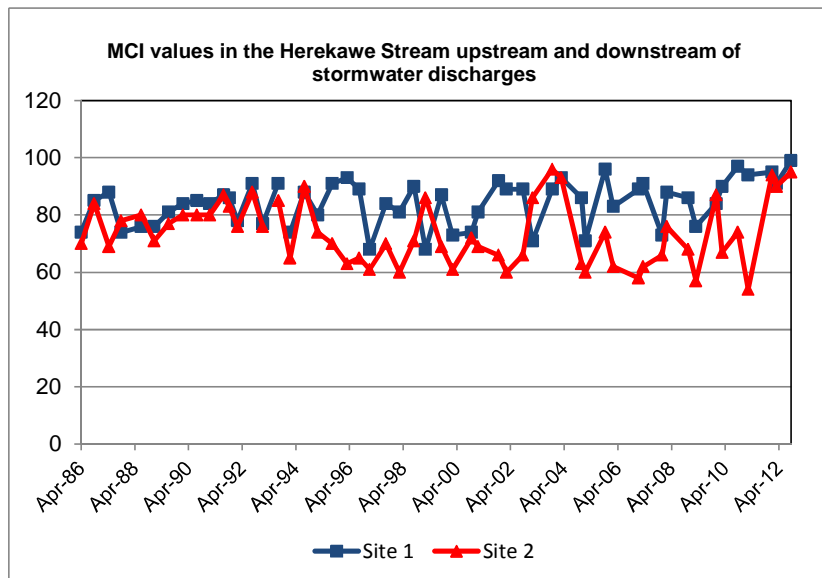


**Figure 3** Number of taxa and MCI values in the Herekawe Stream downstream of industrial stormwater discharges since monitoring began in 1986

Along with one 'highly sensitive' taxon present (as a rarity), there was a significant proportion of 'sensitive' taxa in this community with 69% of the total taxa number. Taxa characteristic of this community included two of the dominant 'moderately sensitive' taxa at the upstream site and one of the 'tolerant' taxon [orthoclad midges]. The MCI value of 95 units was a very significant 24 units higher than the median of previous values and only one unit below the maximum recorded at this site previously (Table 2). It was also an insignificant (Stark 1998) four units less than the score recorded at site 1. This was a reflection of the relatively high proportion of 'sensitive' taxa in the community due to the presence of some harder substrate components and swifter flow as well as the reduction in sandier substrate and macrophyte beds at this site. Although this represented some variation in habitat to that at the upstream 'control' site 1, the relative similarities in community compositions and MCI scores were indicative of no effects of recent stormwater discharges. Sand inundation and saltwater penetration have occurred at this site in the past as a result of very high tides and low stream flow conditions. There was only one significant difference between the communities at sites 1 and 2 with the minor differences related to the presence/absence of taxa rarities (less than five individuals per taxon) rather than significant differences in individual taxon abundances. This was reflected in the SQMCI<sub>s</sub> values which were almost identical (within 0.3 unit) at the two sites, the difference being due almost solely to a decrease in number of 'tolerant' snails at site 2.

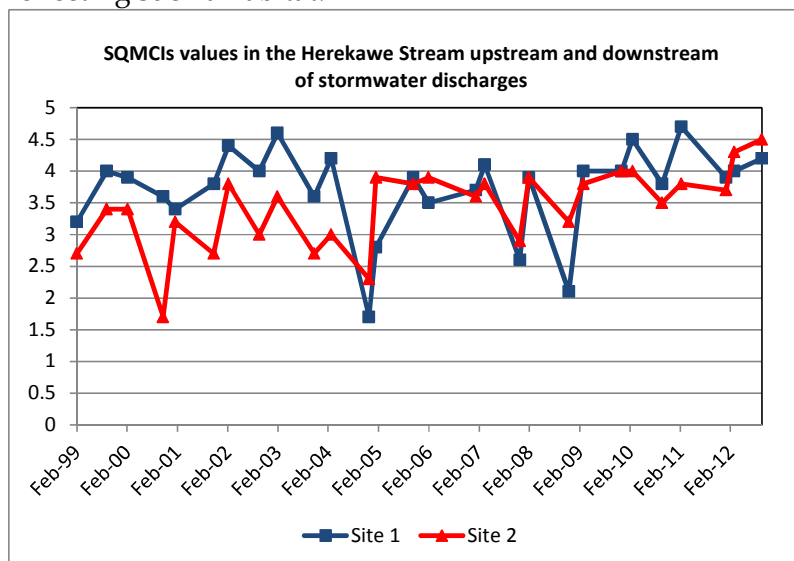
## Discussion

The MCI values recorded since monitoring of these sites began in 1986 are illustrated in Figure 4.



**Figure 4** MCI values at sites upstream (site 1) and downstream (Site 2) of the stormwater discharges from the Omata tank farm area since monitoring began in 1986

There was a distinct change in the MCI values in 1995 when values at site 2 decreased markedly in comparison with those recorded at site 1, upstream of the culvert. Between March and September 1995 the habitat in the Herekawe Stream at site 2 changed significantly. Prior to the September 1995 survey, the stream at this site had a more riffle-like appearance. Although the water was slower flowing (compared to site 1), the stream had been shallower and contained a greater proportion of cobbles. A natural dam of debris and rocks appeared between these two surveys, causing the stream to pond around site 2, becoming deeper and very slow flowing. The substrate became more dominated by silt and macrophyte beds developed. This habitat generally supports fewer 'sensitive' taxa and therefore MCI values generally reflected a poorer community. The very low flow conditions surveyed at the time of post 2002 summer surveys however, indicated more similar conditions at site 2 to pre-1995 habitat, particularly the absence of aquatic macrophytes, reversing recent trends in MCI scores. However, ponding at site 2 became more apparent again during any the last eleven spring and the summer surveys, but at the time of the current survey, flow was shallower with a substantially harder substrate with the MCI value reflecting such a habitat.



**Figure 5** SQMCI<sub>s</sub> values for surveys conducted in the Herekawe Stream since 1999 (when SQMCI<sub>s</sub> was first implemented)

The SQMCI<sub>s</sub> values over the surveys conducted since 1999 suggest that while there are differences in community composition, it is likely that the dominant taxa on many occasions are similar between sites, and SQMCI<sub>s</sub> values at both sites have followed a similar pattern (Figure 5). The exception has been certain post-2004 surveys when the SQMCI<sub>s</sub> highlighted some significant differences in community composition at site 2 in terms of increased abundances within several individual 'sensitive' taxa in a downstream direction. Since this date, with one exception (spring, 2008), the two sites have had relatively similar SQMCI<sub>s</sub> values. This has been the case at the time of the three latest surveys in particular.

It is unlikely that any differences in macroinvertebrate communities between site 1 and site 2 in recent years have been due to stormwater discharges from the Omata Tank Farm, NPDC or Dow Agro Sciences. There have been no records of major changes to community compositions, i.e. significant loss of characteristic taxa, at the site (2) below these discharges, indicative of minimal impacts of stormwater discharges.

## Conclusions

This spring 2012 survey of the Herekawe Stream performed under low flow conditions after a wet early spring period indicated that the streambed communities had not been detrimentally affected by recent discharges of stormwater to the stream from the Omata Tank Farm, New Plymouth District Council or other industrial sites. The macroinvertebrate communities at the sites both upstream and downstream of the discharges contained quite similar proportions of 'sensitive' macroinvertebrate taxa although there were some variations in stream habitat between sites.

The numbers of taxa were slightly higher than previous medians and MCI scores at both sites were significantly higher than the respective medians of results found by previous surveys. The MCI value downstream was only four units lower than that recorded upstream at the time of this spring survey despite some physical habitat differences downstream of the discharges. This was dissimilar to the deterioration in MCI score found by several previous surveys principally since the mid 1990's when habitat changed markedly at the downstream site. There were similar proportions of 'sensitive' taxa in the community at both sites and minimal although there were some changes in the composition of the dominant taxa.

Differences in the MCI value between sites 1 and 2 have been illustrated by historical data since 1995. Before 1995 both of these sites contained similar numbers of taxa and MCI values. A change in the habitat occurred at site 2 in 1995 when the faster flowing stream with substrate more characteristic of a riffle altered to a slow flowing, deeper, and ponded area with silt and from time to time macrophyte beds dominating the substrate. Saltwater penetration as far upstream as the road culvert (Figure 1), under extremely high tide and very low stream flow conditions, may have influenced community composition at site 2 on occasions. These changes in habitat are more likely to be the cause of lower MCI values at this downstream site since 1995 although at the time of the current survey the similarity in MCI scores was indicative of no recent impacts of stormwater discharges from the Omata Tank Farm area. However, under the low flow conditions of some of the more recent surveys, this trend in MCI scores had been reversed (e.g. in 2009, 2010, and 2011).

## Summary

The Council's standard 'kick-sampling' and 'sweep-sampling' techniques were used at two established sites, to collect streambed macroinvertebrates from the Herekawe Stream. Samples were sorted and identified to provide the number of taxa (richness) and MCI and SQMCI<sub>s</sub> 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<sub>s</sub> takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities. It may be the more appropriate index if non-organic impacts are occurring.

Significant differences in either the MCI or SQMCI<sub>s</sub> between sites may indicate the degree of adverse effects (if any) of the discharges being monitored.

This spring macroinvertebrate survey indicated that recent discharges of treated stormwater and discharges from the Omata Tank Farm and/or Dow Agro Sciences sites had not had any detrimental effect on the macroinvertebrate communities of the stream. Stormwater discharges had occurred on a number of occasions during a wet early spring period preceding this survey. Minimal change in the MCI scores between the upstream 'control' site and site downstream of the discharges was attributable to some reduction in historical habitat differences between these sites. There were minimal changes in the number but some change in the composition of dominant taxa in communities in a downstream direction although there was a significant improvement in terms of historical community composition at the downstream site.

The macroinvertebrate communities of the stream were generally characterised by a combination of 'tolerant' and 'moderately sensitive' taxa. Taxonomic richnesses (numbers of taxa) were slightly higher at the time of this survey compared to medians of previous historical survey at both sites.

MCI and SQMCI<sub>s</sub> scores at both sites indicated that the stream communities were of 'fair' and generally better than the typical condition recorded in similar small Taranaki coastal streams. The relatively recent community initiatives to create the Herekawe walkway and extensive adjacent riparian planting in the 1.5 km reach immediately upstream of Centennial Drive (Report: CF485) should maintain or contribute towards a gradual improvement in stream 'health' over future years, and it is noted that this 'spring' MCI score at the upstream site was a significant 13 units above the median and within one unit of the maximum (recorded more recently in spring, 2010) for the 27 year period of monitoring.

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