

South Taranaki District Council  
Eltham, Hawera, Kaponga, Manaia, Patea,  
Opunake and Otakeho Landfills  
Monitoring Programme Annual Report  
2016-2017

Technical Report 2017-39

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## Executive summary

The South Taranaki District Council (STDC) holds consents to cover the discharge of leachate and stormwater from seven closed landfills. The landfills are at Kaponga and Manaia in the Waiokura catchment, Patea in the Patea catchment, Opunake in the Otahi catchment, Hawera in the Tangahoe catchment, Otakeho in the Taikatu catchment and Eltham in the Waingongoro catchment.

This report for the period July 2016 to June 2017 describes the monitoring programmes implemented by the Taranaki Regional Council (the Council) to assess STDC's environmental performance during the period under review. The report also details the results of the monitoring undertaken and assesses the environmental effects of STDC's activities at the Eltham, Manaia, Hawera, Otakeho, Opunake, and Patea landfills. Triennial monitoring of the Kaponga closed landfill was not scheduled to take place during the year under review.

### **During the monitoring period, STDC demonstrated an overall high level of environmental performance.**

In relation to its closed landfills STDC hold 10 resource consents consisting of eight discharge of stormwater and/or leachate to water consents, one discharge to air consent, and one land use consent. These permits have a total of 63 special conditions that STDC must adhere to.

To monitor compliance with these conditions during the 2016-2017 year, Council staff conducted 11 inspections, took 31 discharge and receiving environment samples, and conducted three biomonitoring surveys.

No incidents were recorded by the Council in regards to these landfill sites during the monitoring year.

During the year, STDC demonstrated a high level of environmental and high level of administrative performance in relation to the Eltham, Hawera, Manaia, Otakeho, Opunake and Patea closed landfill consents as defined in Section 1.1.5.

During the year, the environmental performance and administrative performance of STDC was not assessed in relation to the Kaponga closed landfill consents.

For reference, in the 2016-2017 year, consent holders were found to achieve a high level of environmental performance and compliance for 74 % of consents monitored through the Taranaki tailored monitoring programmes, while for another 21 % of consents, a good level of environmental performance and compliance was achieved.

In terms of overall environmental and compliance performance by the consent holder over the last several years, this report shows that the consent holder's performance remains at a good or high level.



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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 for the period July 2016 to June 2017 by the Taranaki Regional Council (the Council) on the monitoring programmes associated with resource consents held by South Taranaki District Council (STDC) for closed municipal landfills in the district. STDC maintains seven closed landfills, which are located in Eltham, Hawera, Kaponga, Manaia, Opunake, Otakeho and Patea.

This report covers the results and findings of the monitoring programmes implemented by the Council in respect of the consents held by STDC that relate to discharges to water and air from the Eltham, Hawera, Manaia, Opunake, and Patea. The monitoring programmes in place for the Kaponga and Otakeho closed landfills are intermittent programmes, implemented on a triennial basis. These programmes will next be implemented in the 2017-2018 year (Kaponga) and the 2018-2019 year (Otakeho). One of the intents of the *Resource Management Act 1991* (RMA) is that environmental management should be integrated across all media, so that a consent holder's use of water, air, and land should be considered from a single comprehensive environmental perspective. Accordingly, the Council generally implements integrated environmental monitoring programmes and reports the results of the programmes jointly. This is the 28<sup>th</sup> combined monitoring report discussing the environmental effects of the STDC's use of water, land, and air with respect to the closed landfills it maintains.

### 1.1.2 Structure of this report

**Section 1** of this report is a background section. It sets out general information about:

- consent compliance monitoring under the RMA and the Council's obligations;
- the Council's approach to monitoring sites through annual programmes;
- a summary of the resource consents held by STDC; and
- the nature of the monitoring programme in place for the period under review.

Each of the closed landfills is then discussed in a separate section (Sections 2 to 8).

In each subsection 1 (e.g. Section 2.1) there is a general description of the landfilled site and its discharges, an aerial photograph or map showing the location of the former landfill, and an outline of the matters covered by the water discharge permit.

**Section 2** presents the results of monitoring of the STDC's activities at each of the sites during the period under review, including scientific and technical data.

**Section 3** discusses the results, their interpretation, and their significance for the environment in the immediate vicinity of the site under discussion.

**Section 4** presents recommendations to be implemented in the 2017-2018 monitoring year.

**Section 5** contains a summary of recommendations for the 2017-2018 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 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' in as much as is appropriate for each activity. Monitoring programmes are not only based on existing permit conditions, but also on the obligations of the RMA to assess the effects of the exercise of consents. In accordance with Section 35 of the RMA, the Council undertakes compliance monitoring for consents and rules in regional plans, and maintains an overview of the performance of resource users and consent holders. Compliance monitoring, including both activity and impact monitoring, enables the Council to continually re-evaluate its approach and that of consent holders to resource management and, ultimately, through the refinement of methods and considered responsible resource utilisation, to move closer to achieving sustainable development of the region's resources.

### 1.1.4 Investigations, interventions, and incidents

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

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

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

### 1.1.5 Evaluation of environmental and administrative performance

Besides discussing the various details of the performance and extent of compliance by STDC, this report also assigns them a rating for their environmental and administrative performance during the period under review.

Environmental performance is concerned with actual or likely effects on the receiving environment from the activities during the monitoring year.

Administrative performance is concerned with the consent holder's approach to demonstrating consent compliance in site operations and management including the timely provision of information to Council (such as contingency plans and water take data) in accordance with consent conditions.

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

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

### Environmental Performance

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

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

For example:

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

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

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

### Administrative compliance

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

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

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

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

For reference, in the 2016-2017 year, consent holders were found to achieve a high level of environmental performance and compliance for 74 % of the consents monitored through the Taranaki tailored monitoring programmes, while for another 21 % of the consents, a good level of environmental performance and compliance was achieved.

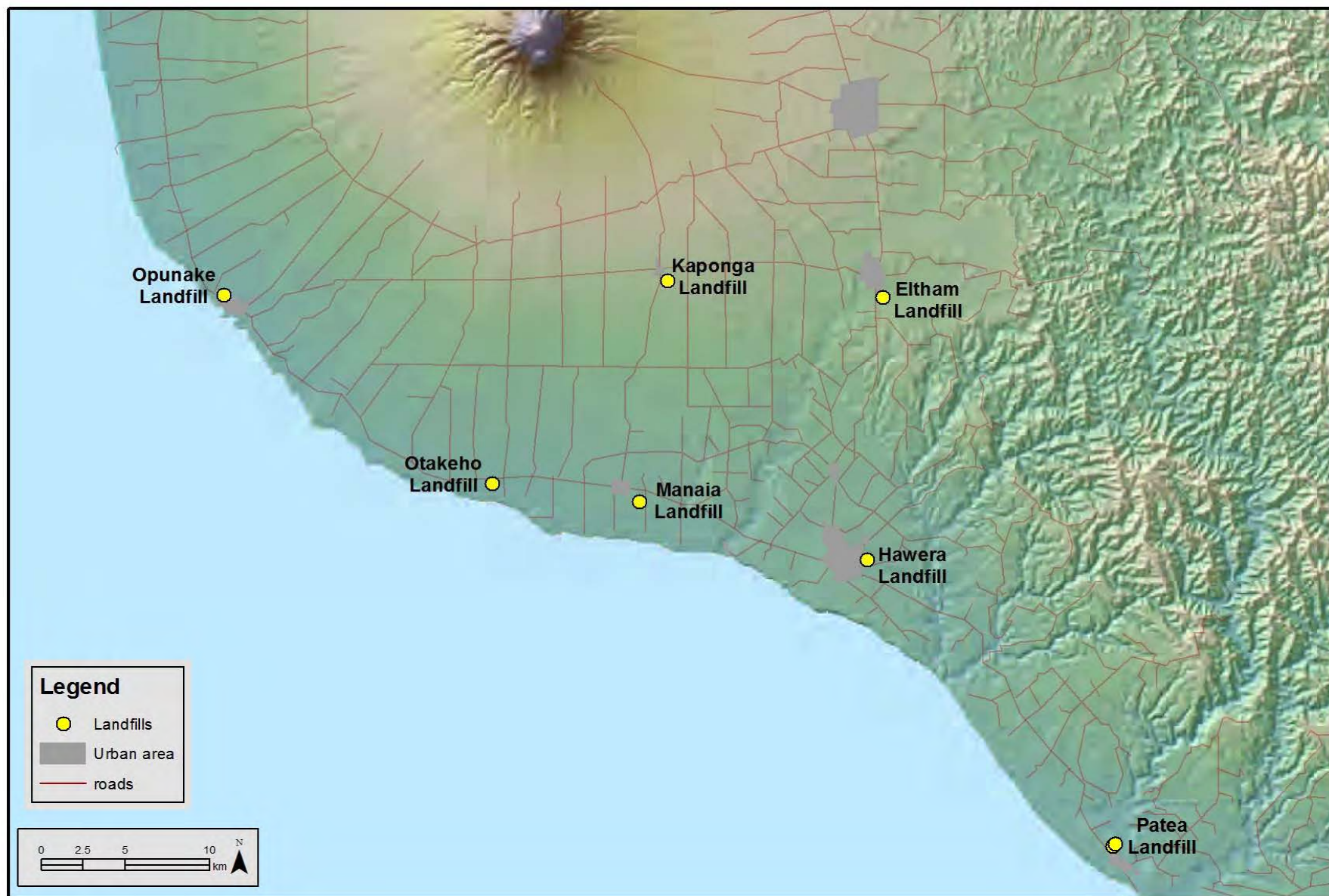


Figure 1 Regional map of STDC landfills



## 1.2 Process description

STDC maintained seven closed municipal landfills in the South Taranaki District during the 2016-2017 period (Figure 1). All these sites tend to have a long history of waste disposal and, as older facilities, do not have engineered liners. Landfills of this nature are designated as Class B landfills in the MfE publication Module 2: Hazardous Waste Guidelines, Landfill Waste Acceptance Criteria and Landfill Classification (2004). The number of open landfills in the district steadily decreased over a number of years and there have been no operating landfills in the South Taranaki district since the Patea landfill closed in 2007.

Currently the only general municipal landfill in operation in the Taranaki region is the Colson Road landfill, which is operated by the New Plymouth District Council as a regional facility.

## 1.3 Summary of resource consents

STDC hold 10 resource consents associated with the closed landfills they maintain. A summary of the consents is given in Table 1, with more detailed information on the consents held for each landfill site provided later in the report under each of the landfill's subsection 1.

Section 13(1)(a) of the RMA stipulates that no person may in relation to the bed of any lake or river use, erect, reconstruct, place, alter, extend, remove, or demolish any structure or part of any structure in, on, under, or over the bed, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations.

STDC holds a land use consent to cover the diversion of an unnamed tributary of the Tawhiti Stream under the Hawera closed landfill.

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.

There are consents held by STDC for each of the sites to allow for the discharge of leachate and stormwater.

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

There is an air discharge consent held by STDC for the Patea closed landfill.

**Table 1 Summary of the STDC closed municipal landfill consents and their key dates**

Landfill site	Consent no.	Purpose	Review	Expiry
Eltham	3387-3	To discharge stormwater and leachate from the former Eltham landfill site into the Mangawhero Stream in the Waingongoro catchment		1 June 2023
Hawera	0444-4	To discharge up to 2,800 m <sup>3</sup> /day of leachate and stormwater from the closed Matangara landfill, Hawera, to groundwater and into an unnamed tributary of the Tawhiti Stream in the Tangahoe catchment	-	Application Received
	5831-2	To divert an unnamed tributary of the Tawhiti Stream	June 2019	1 June 2034



Landfill site	Consent no.	Purpose	Review	Expiry
Kaponga	3459-3	To discharge stormwater and leachate from the former Kaponga landfill site into an unnamed tributary of the Waiohura Stream	-	1 June 2023
Manaia	3952-2	To discharge leachate and stormwater from the closed Manaia landfill and from composting operations into the Waiohura Stream	-	1 June 2023
Opunake	0526-3	To discharge stormwater and leachate from the closed Opunake landfill into the Otahi Stream	-	1 June 2018
Otakeho	3953-3	To discharge leachate and stormwater from the closed Otakeho municipal landfill onto and into land	-	1 June 2018
Patea	0427-3	To discharge surface water and leachate from the Patea municipal landfill into an unnamed tributary of the Patea River		1 June 2022
	7268-1	To discharge stormwater and sediment onto and into land and into an unnamed tributary of the Patea River from earthworks associated with the closure of the Patea landfill		1 June 2022
	4636-2	To discharge emissions into the air from the Patea municipal landfill		1 June 2022

This summary of consent conditions may not reflect the full requirements of each condition. The consent conditions in full can be found in the resource consents which are appended to this report.

## 1.4 Monitoring programme

### 1.4.1 Introduction

Section 35 of the RMA sets out obligations upon the Council to gather information, monitor, and conduct research on the exercise of resource consents within the Taranaki region. The Council is also required to assess the effects arising from the exercising of these consents and report upon them.

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 sites consisted of four primary components, which are described in Sections 1.4.2 to 1.4.5. The type and number of environmental monitoring elements carried out at each site are summarised in Table 2.

Table 2 Council monitoring activity in relation to the STDC closed municipal landfills in the year under review

Landfill	Catchment	Biological surveys	Inspections	Samples taken
Eltham	Waingongoro	2	1	0
Hawera	Tawhiti	0	3	15
Kaponga	Waiokura	Next monitored 2017-2018		
Manaia	Waiokura	0	2	6
Otakeho	Taikatu			
Opunake	Otahi	1	2	4
Patea	Patea	0	3	6
<b>Total</b>		<b>3</b>	<b>11</b>	<b>31</b>

### 1.4.2 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;
- in discussion over monitoring requirements;
- preparation for any consent reviews, renewals or new consent applications;;
- advice on the Council's environmental management strategies and content of regional plans and;
- consultation on associated matters.

### 1.4.3 Site inspections

A total of 11 inspections were undertaken focusing on stormwater and silt control, and the condition of landfill caps. 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.

### 1.4.4 Chemical sampling

Discharges and the receiving waters associated with the landfills were sampled during the monitoring period as described in Table 2. A total of 31 samples were collected and analysed for various water quality parameters depending on the site.

### 1.4.5 Biomonitoring surveys

Two biomonitoring surveys were performed in conjunction with the Eltham landfill/waste water treatment plant programmes to assess if the discharges of leachate and stormwater were having any effect on aquatic ecosystems.

Two biomonitoring surveys were performed at the closed Eltham landfill and one at the Opunake to assess if these sites were having an effect on aquatic ecosystems.

## 2 Eltham landfill

### 2.1 Introduction

#### 2.1.1 Site description

This landfill used to service the township of Eltham and surrounding rural areas but was closed in 1992 due to exhaustion of landfill capacity. The 0.71 ha site is located on Castle Road, just downstream of the Eltham oxidation ponds (Figure 2). The area is generally well rehabilitated, with the majority of the area grassed. The landfill is monitored by the Council under the Eltham wastewater treatment plant/Eltham landfill combined monitoring programme.

Historically the water quality in the Mangawhero Stream was quite poor due to the discharges from the Eltham wastewater treatment plant and it was difficult to fully assess any impact from the landfill on the stream. Generally no deterioration in water quality was found when comparing upstream and downstream sites.

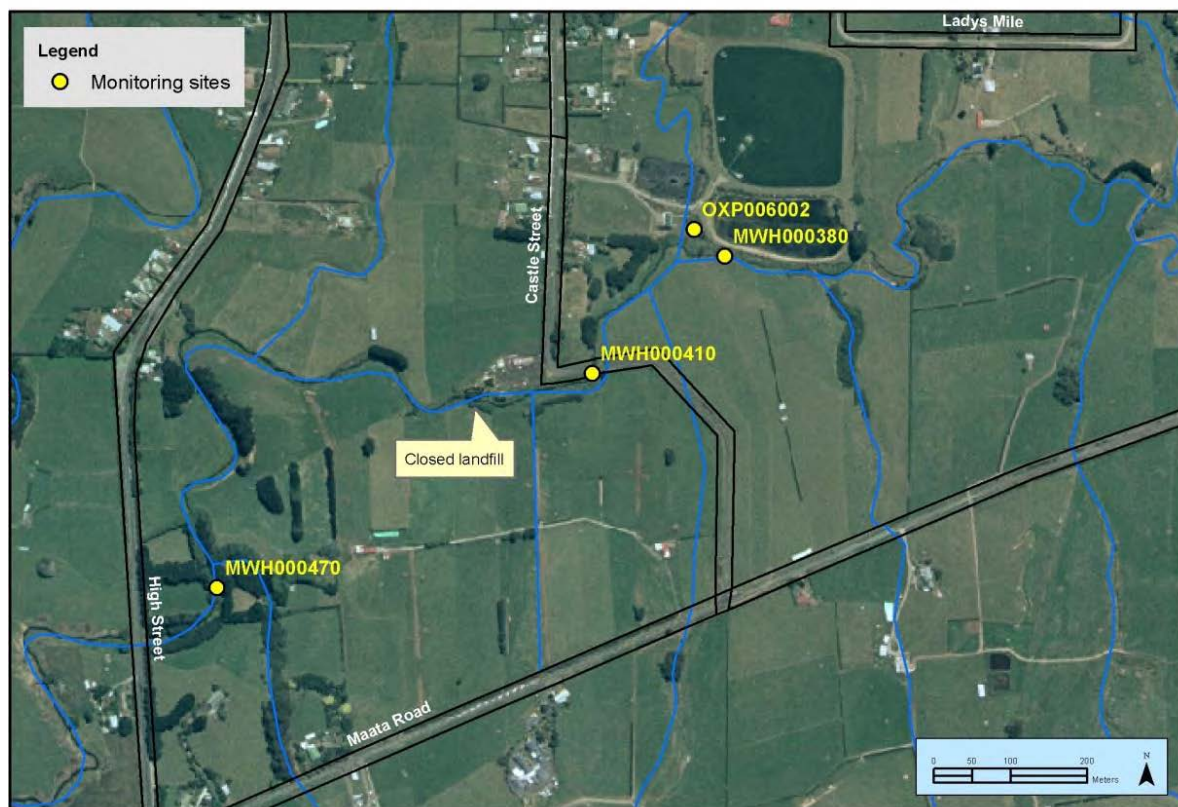


Figure 2 Eltham landfill and sampling sites

Now that the Eltham waste water treatment plant pumps its effluent to the Hawera wastewater treatment plant, the waterquality in the Mangawhero Stream has improved and monitoring has been reduced.

#### 2.1.2 Water discharge permit

STDC holds water discharge permit **3387-3** to cover the discharge of leachate and stormwater from Eltham landfill into the Mangawhero Stream. This permit was issued by the Council on 17 March 2005 under Section 87(e) of the RMA. It is due to expire on 1 June 2023.

Condition 1 requires the consent holder to adopt the best practicable option.

Condition 2 requires the consent holder to prepare a site contingency plan.

Condition 3 requires the consent holder to monitor adjacent surface water and groundwater.

Condition 4 states that any discharge from the site shall not cause adverse environmental effects.

The last condition (5) provides opportunities for Council to review the conditions of the consent.

This summary of consent conditions may not reflect the full requirements of each condition. The consent conditions in full can be found in the resource consent which is appended to this report.

## 2.2 Results

### 2.2.1 Inspections

4 October 2016

The annual inspection of the disused Eltham Landfill was carried out in overcast conditions after recent heavy rain.

A site drawing was used to locate the covered tip face and screen planting area. There appeared to be no issue with slumping or leachate entering the stream. It was noted that the old landfill area blends aesthetically into the surrounding farmland. Pasture grass coverage was widespread and appeared to be healthy. No slumping, cracking or exposed refuse was noted on the cap. A drain adjacent to Castle Street was previously reported as a leachate receptor. This was found to be a farm drain and had no connection to the landfill. Planted trees were still acting as a good screen but it was identified that some trees may need replacing at some stage.

The property owner was contacted and they reported no noticeable slumping and that no waste material had resurfaced over the past few years.

### 2.2.2 Biomonitoring

Two biomonitoring surveys were undertaken during the period under review, which were conducted in October 2016 and February 2017. These surveys were conducted primarily as part of the monitoring programme for the Eltham wastewater treatment plant. However, these surveys also include sites upstream and downstream of the landfill to monitor for potential effects from this site.

The results of both surveys undertaken during the period under review indicated that there were no impacts from leachate from the closed landfill on the macroinvertebrate communities of the lower Mangawhero Stream.

Full copies of the biomonitoring reports are appended to this report.

### 2.2.3 Investigations, interventions, and incidents

In the 2016-2017 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with conditions in resource consents relating to Eltham landfill or provisions in Regional Plans.

## 2.3 Discussion

### 2.3.1 Discussion of plant performance

The site has been closed for approximately 25 years and no incidents or complaints were logged by Council during the year under review. The consent holder has a management and contingency plan in place for the site.

### 2.3.2 Environmental effects of exercise of consents

In the past it has been difficult to accurately gauge the effects associated with the discharge of leachate from the Eltham landfill. This was because any effect that the leachate may have had on the Mangawhero Stream was masked by the discharge of wastes from the Eltham wastewater treatment plant. However, the works to pump Eltham's wastewater treatment plant discharge to Hawera's wastewater treatment plant were completed approximately six years ago, and the water quality in the Mangawhero Stream has been showing some improvement. The results of the macroinvertebrate surveys indicate that the presence of the landfill is having very little effect on water quality.

### 2.3.3 Evaluation of performance

A tabular summary of STDC's compliance record at Eltham landfill for the year under review is set out in Table 3.

**Table 3 Summary of performance for Eltham closed landfill stormwater and leachate consent 3387-3**

<b>Purpose: To discharge stormwater and leachate from the former Eltham landfill site into the Mangawhero Stream</b>		
<b>Condition requirement</b>	<b>Means of monitoring during period under review</b>	<b>Compliance achieved?</b>
1. STDC shall adopt the best practicable option	Site specific monitoring programme – programme management	Yes
2. STDC shall prepare and maintain a site contingency plan	Site specific monitoring programme – programme management	Yes
3. The site and associated water shall be monitored	Site specific monitoring programme – inspection and biological monitoring	Yes
4. Discharges from the site shall not cause adverse environmental effects	Site specific monitoring programme – inspection and biological monitoring	Yes
5. Optional review provision	Provision for review in June 2017	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		<b>High</b>
Overall assessment of administrative performance in respect of this consent		<b>High</b>

N/A = not applicable

During the year under review, STDC demonstrated a high level of environmental and high level of administrative performance in relation to the Eltham landfill consent as defined in Section 1.1.5.

### 2.3.4 Recommendations from the 2015-2016 Annual Report

In the 2015-2016 Annual Report, it was recommended:

1. THAT for the 2016-2017 period, the monitoring of discharges from the closed landfill at Eltham continue at the same level as 2015-2016.

### 2.3.5 Alterations to monitoring programmes for 2017-2018

In designing and implementing the monitoring programmes for water discharges in the region, the Council has taken into account:

- the extent of information already made available through monitoring or other means to date;
- its relevance under the RMA;
- the Council's obligations to monitor consented activities and their effects under the RMA;
- the record of administrative and environmental performances of the consent holder; and
- reporting to the regional community.

The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki exercising resource consents.

It is proposed that for 2017-2018, the programme remains unchanged.

It should be noted that the proposed programme represents a reasonable and risk-based level of monitoring for the site in question. The Council reserve the right to subsequently adjust the programme from that initially prepared, should the need arise if potential or actual non-compliance is determined at any time during 2017-2018.

## 2.4 Recommendations

1. THAT in the first instance, the 2017-2018 period, the monitoring of discharges from the closed landfill at Eltham continues at the same level as in 2016-2017.
2. THAT should there be any issues with environmental or administrative performance in the 2017-2018, monitoring of the closed landfill at Eltham may be adjusted to reflect any additional investigation or intervention as found necessary.



## 3 Hawera landfill

### 3.1 Introduction

#### 3.1.1 Site description

The Matangara Road municipal landfill was used for domestic waste disposal for the Hawera District. A small unnamed tributary of the Tawhiti Stream flowed down a deep gully (approximately 30 m) from the north-west to the south-east of the landfill site. The stream was directed into a 750 mm pipe and waste was deposited into the landfill over the pipe, shown as a dashed line on Figure 2. The stream exits the culvert where it discharges into a roadside drain (later referred to as the roadside tributary) that runs adjacent to Matangara Road. The roadside tributary flows into the Tawhiti Stream approximately 400 m downstream of the culvert.

The landfill closed in September 1998, and STDC reinstated the site. Leachate is captured via leachate collection lines in the landfill and is pumped to the Hawera wastewater treatment plant from a pump station located near the upstream end of the culvert under the landfill as illustrated in Figure 3 (RTP001008). Groundwater monitoring has shown that some leachate is entering the groundwater in the immediate vicinity of the site, but this appears to be having only a very minor effect at the southern boundary of the site.

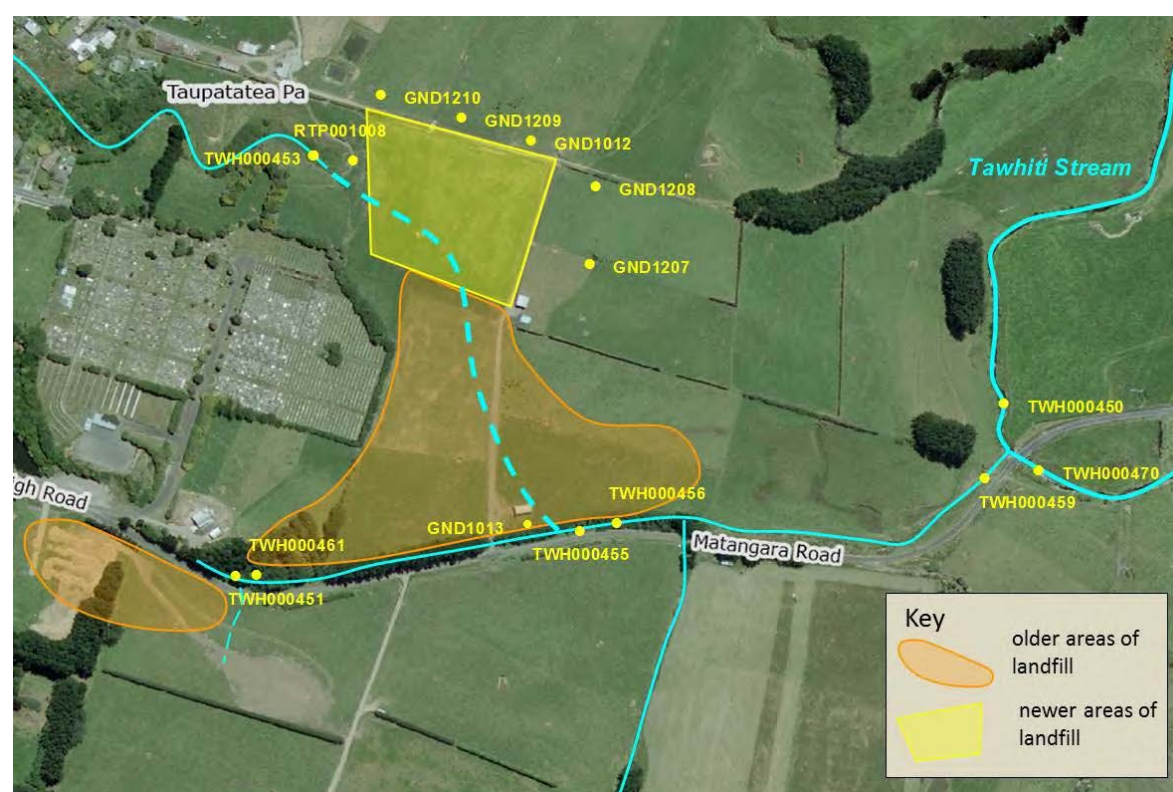


Figure 3 Aerial view of Hawera landfill and sampling sites. The older areas of landfill area shown in orange and the newer areas in yellow

## 3.1.2 Resource consents

### 3.1.2.1 Land use permit

STDC held land use permit **5831-1** to culvert an unnamed tributary of the Tawhiti Stream. This permit was issued by the Council on 28 June 2001 was renewed on the 28 June 2016 and is due to expire on the 1 June 2034.

#### **5831-1**

Condition 1 requires that the consent holder to ensure that the diversion pipe is as clear as is practicable of any blockages.

Condition 2 prohibits the structure from obstructing fish passage.

Condition 3 contains provisions for review of the conditions of the consent.

### 3.1.2.2 Water discharge permit

STDC holds water discharge permit **0444-4** to cover the discharge of leachate and stormwater from Hawera landfill onto and into groundwater and an unnamed tributary of the Tawhiti Stream. This permit was issued by the Council on 28 June 2001 under Section 87(e) of the RMA. It is expired on 1 June 2016.

As an application to renew this consent was received prior to 1 March 2016 (more than three months prior to the expiry of the consent), under Section 124 of the RMA, STDC can continue to manage the closed site under the conditions of the expired consent until a decision is made on the renewal.

Condition 1 requires the consent holder to adopt the best practicable option.

Conditions 2 and 3 require maintenance of the landfill cap and provision and maintenance of a post closure management plan.

Conditions 4, 5 and 6 require the consent holder to adhere to the management plan, control the flow of surface water on the site, and maintain the leachate collection system.

Condition 7 deals with the mixing zone for the discharge and condition 8 prohibits certain effects on the receiving water from the discharge beyond that mixing zone.

Conditions 9 and 10 require ground water monitoring and bore maintenance.

The last two conditions (11 and 12) provided opportunities for Council to review the conditions of the consent.

During the renewal process, further information was informally requested regarding:

- groundwater quality to the north and east of the former disposal area, and
- surface water quality in the Tawhiti Stream, which also flows from the north, past the eastern side of the site.

These permits are attached to this report in Appendix I.

This summary of consent conditions may not reflect the full requirements of each condition. The consent conditions in full can be found in the resource consent which is appended to this report

## 3.2 Results

### 3.2.1 Inspections

One inspection was undertaken during the period under review, as programmed.



16 November 2016

The inspection was undertaken in overcast showery conditions with a north westerly wind.

The cap was well grassed and intact with no sign of recent grazing or stock damage. No slumping or cracking was observed. The ground was damp underfoot due to recent rain but no ponding was noted on the cap. The batters were intact and grassed with no evidence of slumping, cracking or exposed refuse.

The stormwater drains were well grassed and free draining. The drains showed signs of recent flow, but were not discharging at the time of the inspection. The leachate collection and pumping system was operating and no odours were detected around the sump area. It was noted that there was no evidence of overflow or spills from the system.

The site was fully secured by permanent fencing. No odour or dust issues were noted. Methane testing was undertaken at the leachate sump and no gasses were detected. Consent holder notified that surface water samples were collected. Samples appeared clear to slightly turbid and were gathered in moderate to high flows.

### 3.2.2 Results of discharge monitoring

Two leachate samples were collected at the leachate sump (site RTP001008) during the year under review. The results are presented in Table 4 and the location of the sampling site is shown in Figure 3.

Results indicate that waste in the landfill is still actively degrading and releasing contaminants. The high chloride, filtered chemical oxygen demand and ammoniacal nitrogen concentrations are typical values for landfill leachate and, as expected, these contaminants are gradually trending down over time (Figure 4, Figure 5, and Figure 6). All of the results obtained during the year under review were below the maximum values previously recorded, and most were also below the historical medians.

**Table 4 Chemical analysis of the Hawera landfill leachate samples**

Parameter	Unit	16 Jan 2017	25 May 2017	All Data (given where N >5)		
				Min	Max	Median
Alkalinity Total	g/m <sup>3</sup> CaCO <sub>3</sub>	1030	600	130	1310	908
Ammoniacal nitrogen	g/m <sup>3</sup> N	124	31.3	0.308	176	117
Un-ionised ammonia	g/m <sup>3</sup>		-	0.00022	1.230	0.213
Chloride	g/m <sup>3</sup>	297		41	1100	261.5
Chromium Dissolved	g/m <sup>3</sup>	<0.03	<0.03	<0.03	0.03	0.02
Conductivity @ 20°C	mS/m@20°C	256	138	44	319	228
Dissolved reactive phosphorus	g/m <sup>3</sup> P	0.005	<0.003	<0.003	0.03	0.004
Filtered COD	g/m <sup>3</sup>	100	66	11	290	113
Iron Acid Soluble	g/m <sup>3</sup>	47.2	15.0	0.38	71.8	34.3
Mercury Total	g/m <sup>3</sup>	<0.0001	<0.0001	<0.0001	0.0016	<0.0001
Nitrite/nitrate nitrogen	g/m <sup>3</sup> N	0.05	0.11	<0.01	3.97	0.04
pH	pH	7.0	6.9	6.4	7.6	6.8
Temperature	Deg.C			12.9	36.2	16.8

Parameter	Unit	16 Jan 2017	25 May 2017	All Data (given where N >5)		
				Min	Max	Median
Zinc Dissolved	g/m <sup>3</sup>	0.017	<0.005	<0.005	0.086	0.008

As most of this leachate is pumped to the Hawera wastewater treatment plant, the majority of the contaminants found in these samples have no direct effect on surface waters near the site. However, they do give an indication of the contaminant concentration's present in the subsurface flows that have the potential to enter groundwater at this site, due to the lack of an engineered liner.

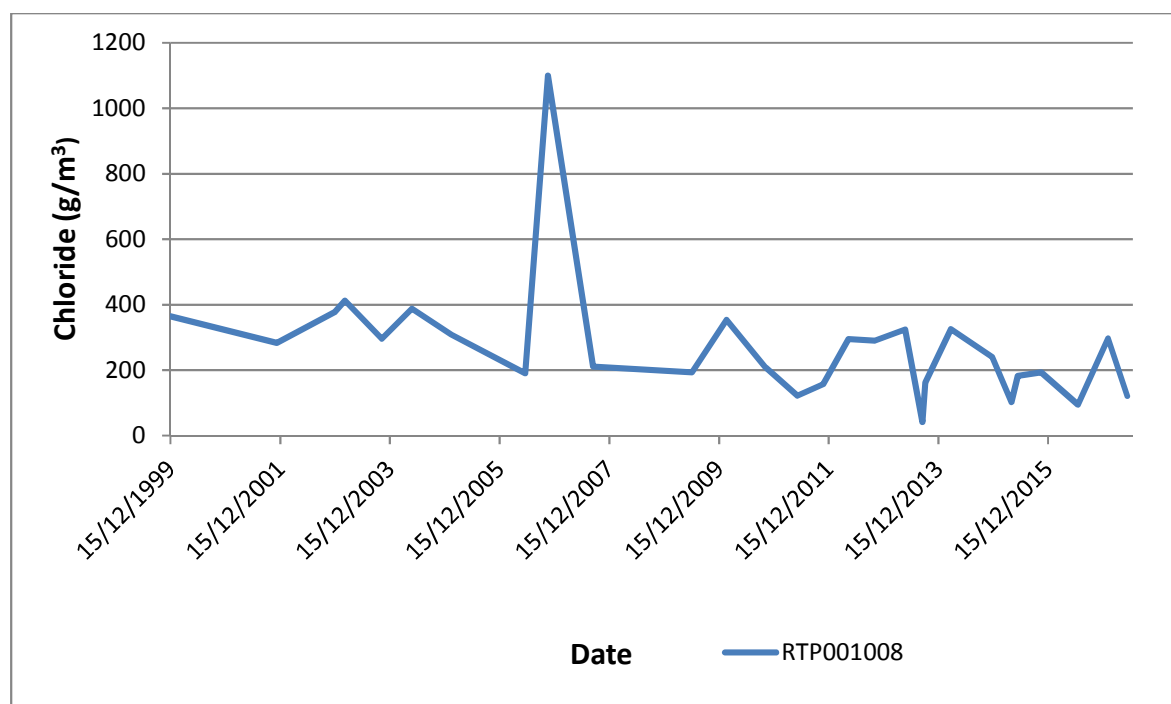


Figure 4 Hawera landfill leachate chloride concentration, 1999 to 2017

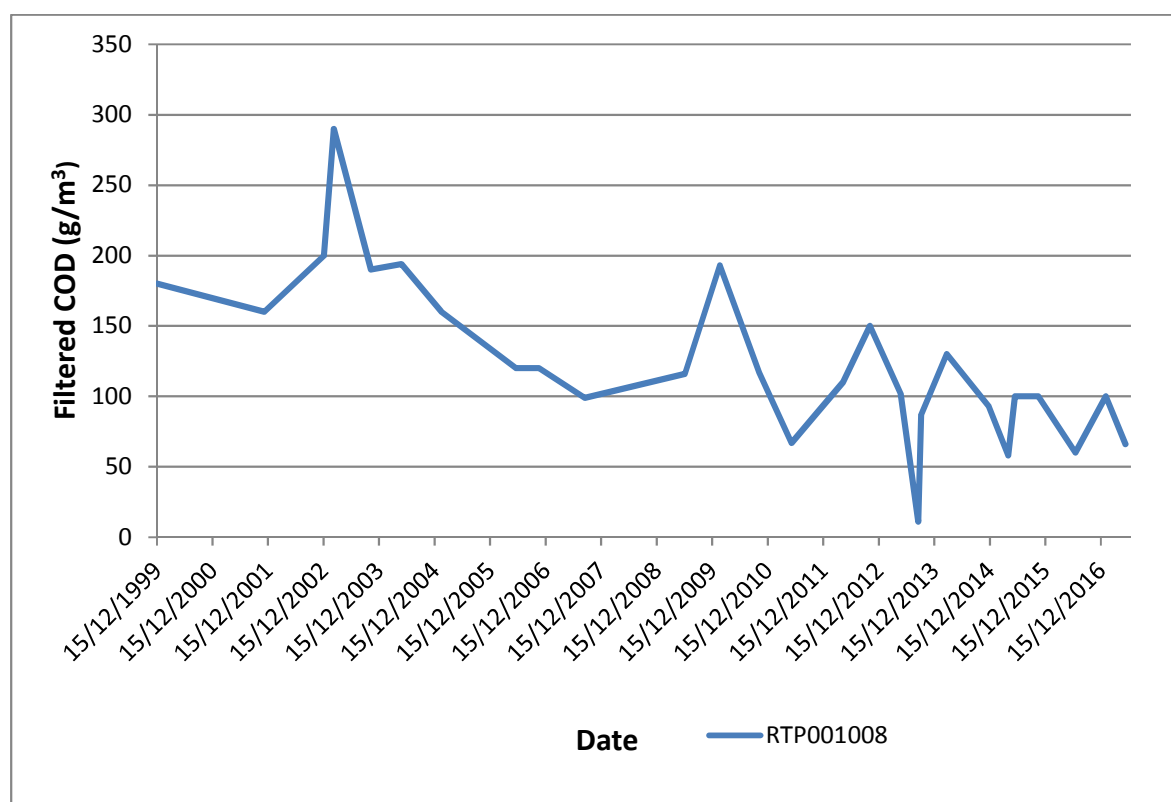


Figure 5 Hawera landfill leachate filtered chemical oxygen demand, 1999 to 2017

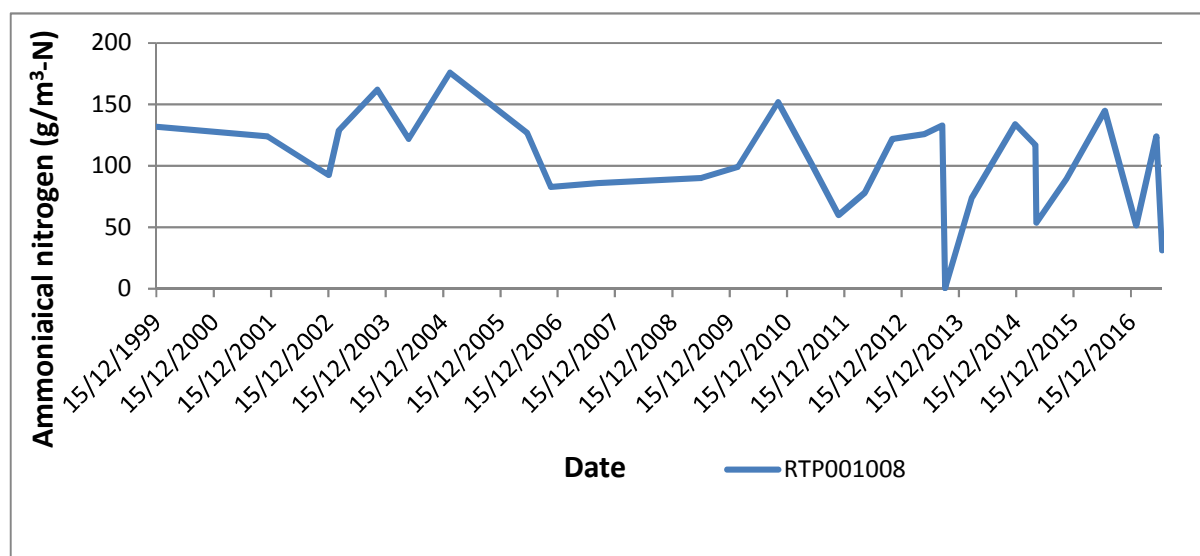


Figure 6 Hawera landfill leachate ammoniacal nitrogen concentration, 1998 to 2017

### 3.2.3 Results of groundwater monitoring

Four groundwater samples were collected during the year under review. The results of the chemical analyses are set out in Table 5.

#### 16 January 2017

Bores GND1012 and GND1013 were sampled using a peristaltic pump. The groundwater samples were both clear, but it was noted that the sample from bore GND1012 had a sweet odour. The leachate sample was turbid brown. No issues were noted with the landfill site.

#### 25 May 2017

Bores GND1012 and 1013 were sampled using a peristaltic pump. A leachate sample was collected using a bailer. The landfill cap looked good. It was noted that the leachate sump had an hydrocarbon odour and sheen, and the sample had a slightly turbid orange-brown appearance.

Table 5 Chemical analysis of groundwater samples from the bores at Hawera landfill

Parameter	Unit	GND1012		GND1013	
		16 Jan 2017	25 May 2017	16 Jan 2017	25 May 2017
Alkalinity	g/m³ CaCO <sub>3</sub>	640	610	117	93
Chloride	g/m³	117	107	17.1	15.0
Filtered COD	g/m³	69	67	<5	13
Conductivity @ 20°C	mS/m	142	141	31.0	29.9
Dissolved reactive phosphorus	g/m³	0.004	0.007	0.008	<0.003
Acid soluble iron	g/m³	77.4	76.1	0.37	<0.03
Level	m	4.214	3.831	3.715	3.120
Unionised ammonia	g/m³ N	0.12970	0.06450	<0.00001	<0.00001
Ammoniacal nitrogen	g/m³ N	56.2	30.1	<0.003	<0.003

Parameter	Unit	GND1012		GND1013	
		16 Jan 2017	25 May 2017	16 Jan 2017	25 May 2017
Nitrite/nitrate nitrogen	g/m <sup>3</sup> N	3.48	0.02	3.31	5.86
pH	pH	6.8	6.8	6.5	6.8
Temperature	Deg.C	16.4	15.4	15.6	15.4
Dissolved zinc	g/m <sup>3</sup>	<0.005	<0.005	<0.005	<0.005

As with previous monitoring periods, bore GND1012 exhibits elevated levels of landfill contamination indicators, such as increased chlorides, COD, alkalinity, iron, unionised ammonia and ammoniacal nitrogen. This bore is immediately adjacent to, and down gradient of the landfill footprint, and in recent years has contained a similar level of contaminants to the leachate as indicated by the relative filtered chemical oxygen demands (Figure 7).

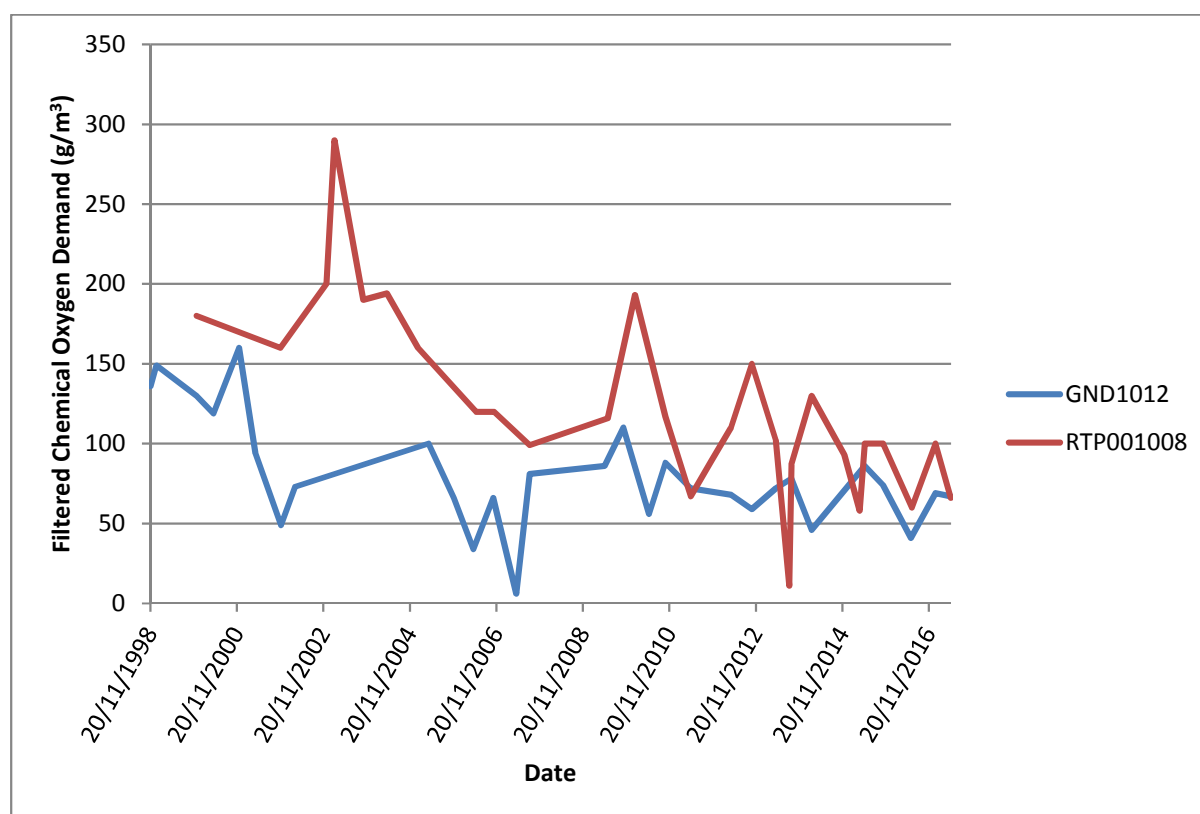


Figure 7 Hawera landfill filtered chemical oxygen demand comparison groundwater (site GND1012) and leachate

Bore GND1013 is further from the most recently landfilled areas and as a result has far lower levels of landfill indicator species as shown by the filtered chemical oxygen demand at this site (Figure 8).

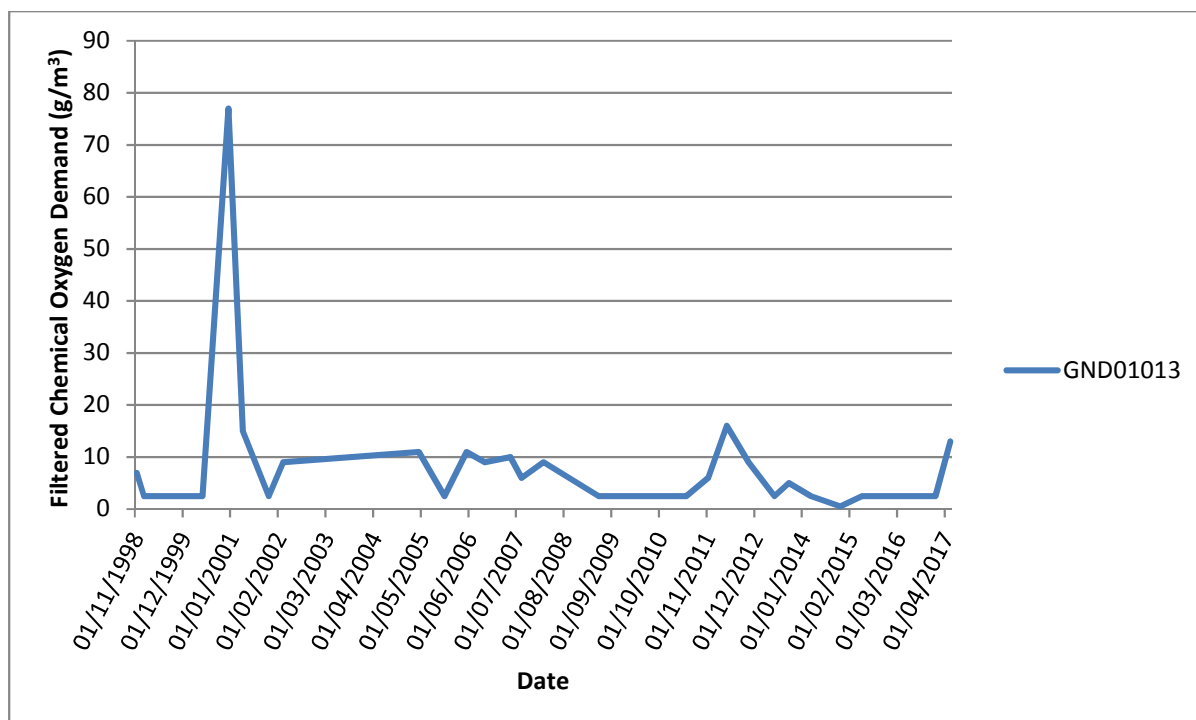


Figure 8 Hawera landfill groundwater filtered chemical oxygen demand, site GND001013

### 3.2.4 Results of surface water monitoring

Nine surface water sites (Figure 3) were sampled on one occasion during the period under review. The results of the chemical analysis of these samples are given in Table 6.

The discharge from the landfill tributary culvert contains elevated levels of ammoniacal nitrogen, iron and alkalinity when compared to the upstream landfill tributary site (TWH000453); this may indicate that some landfill contamination is seeping into the culvert as it passes under the landfill.

The roadside tributary shows moderate levels of contamination, mostly in the form of BOD, iron and ammoniacal nitrogen.

During the year under review the water quality results from the Tawhiti Stream sites show that the inflow from the roadside tributary is not having a significant effect on the water quality in the Tawhiti Stream at the consent compliance point (THW000470). Although the, BOD, conductivity, ammoniacal nitrogen and unionised ammonia were elevated in the roadside tributary above the confluence with the stream, these parameters were found to have reduced in the stream downstream of the confluence.

It is however noted that it is likely that there are also groundwater flows from the landfill area towards the stream to the north west of the site. At this stage there are no monitoring sites upstream of these potential groundwater inflows, and so TWH000450 may not be a true control site for monitoring of this landfill. This situation and the potential implications will be considered more during the consent renewal process.

Table 6 Chemical analysis of surface water in the vicinity of the Hawera landfill site, 16 November 2016

Parameter	Unit	Roadside tributaries upstream of landfill tributary			Landfill tributary		Roadside tributary downstream of landfill tributary		Tawhiti Stream	
		TWH000451 20m u/s of SW drain	TWH000461 SW trib in-flow culvert	TWH000452 u/s landfill culvert	TWH000453 10 m u/ s of landfill	TWH000455 Discharge from culvert under landfill	TWH000456 50m d/s of landfill culvert	TWH000459 10 m u/s confluence	TWH000450 u/s of Matangara Road and	TWH000470 d/s of Matangara Road and
Alkalinity	g/m <sup>3</sup>	123	106	115	69	114	110	93	66	69
BOD	g/m <sup>3</sup>	11	0.6	1.2	0.8	1.2	1.4	2.0	1.4	1.6
Conductivity	mS/m	34.6	32.5	35.0	25.3	34.9	33.9	32.3	25.7	26.6
Dissolved reactive phosphorus	g/m <sup>3</sup>	0.021	0.010	0.005	0.011	0.011	0.011	0.014	0.043	0.039
Acid soluble iron	g/m <sup>3</sup>	41.8	3.96	2.44	0.63	1.72	2.75	1.82	1.24	1.46
Unionised ammonia	g/m <sup>3</sup> -N	0.01893	0.00750	0.00814	0.00048	0.00959	0.00804	0.01635	0.00051	0.00268
Ammoniacal nitrogen	g/m <sup>3</sup> -N	2.42	1.46	1.27	0.048	1.19	1.60	0.804	0.024	0.127
Nitrate/nitrite nitrogen	g/m <sup>3</sup>	0.71	1.13	1.25	1.48	1.36	1.45	1.29	1.90	1.76
pH	pH	7.4	7.2	7.3	7.5	7.4	7.2	7.8	7.8	7.8
Temperature	Deg C	14.3	14.8	14.7	14.6	14.7	14.5	14.9	15.5	15.4
Dissolved zinc	g/m <sup>3</sup>	<0.005	0.024	0.023	0.013	0.022	0.019	0.007	<0.005	<0.005

### 3.2.5 Investigations, interventions, and incidents

In the 2016-2017 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with conditions in resource consents associated with the Hawera landfill, or provisions in Regional Plans.

## 3.3 Discussion

### 3.3.1 Discussion of site performance

In general, the Hawera landfill was well managed and the consent holder has a management and contingency plan in place for the site. The final cap appeared in good condition and was found to be well grassed at the time of the inspections. The leachate collection system was found to be functional, and there were no issues noted at the inspections that might indicate significant flow obstructions in the culvert under the landfill.

### 3.3.2 Environmental effects of exercise of consents

The physicochemical monitoring associated with consent 0444 indicates the leachate discharge from the landfill shows some very minor effects on the water quality in the culvert flowing below the landfill and on water quality in the roadside tributary. Despite this, the landfill is having no significant effect on the water quality of the Tawhiti Stream.

Groundwater in the immediate vicinity of the deposited refuse is affected by the presence of the landfill, but no significant effects were detected in the adjacent waterways monitored.

### 3.3.3 Evaluation of performance

A tabular summary of STDC's compliance record at Hawera landfill for the year under review is set out in Table 7 and Table 8.

**Table 7 Summary of performance for Hawera closed landfill leachate consent 0444-4**

<b>Purpose: To discharge up to 2,800 m<sup>3</sup>/day of leachate and stormwater from the closed Matangara landfill, Hawera, to groundwater and into an unnamed tributary of the Tawhiti Stream in the Tangahoe catchment</b>		
<b>Condition requirement</b>	<b>Means of monitoring during period under review</b>	<b>Compliance achieved?</b>
1. Best practicable option to prevent or minimise any likely adverse effects on the environment	Site specific monitoring programme – inspection and water sampling	Yes
2. Maintain adequate capping and vegetative cover	Site specific monitoring programme – inspection	Yes
3. Provide a landfill post-closure management plan	Site specific monitoring programme – programme management	Yes
4. Adhere to the landfill management plan	Site specific monitoring programme – programme management	Yes
5. Maintain drains, ponds and contours on site to minimise unwanted water movement and ponding on site	Site specific monitoring programme – inspection	Yes



<b>Purpose: To discharge up to 2,800 m<sup>3</sup>/day of leachate and stormwater from the closed Matangara landfill, Hawera, to groundwater and into an unnamed tributary of the Tawhiti Stream in the Tangahoe catchment</b>		
<b>Condition requirement</b>	<b>Means of monitoring during period under review</b>	<b>Compliance achieved?</b>
6. Maintain the leachate collection system	Site specific monitoring programme – inspection	Yes
7. Mixing zone shall extend 20 m downstream from point of discharge	N/A	N/A
8. Discharge shall not adversely affect the receiving waters	Site specific monitoring programme – inspection and water sampling	Yes
9. Monitoring of groundwater, surface water and leachate	Site specific monitoring programme – water sampling	Yes
10. Monitoring bores shall be maintained	Site specific monitoring programme – inspection	Yes
11. Optional review provision re contamination of the unnamed tributary of the Tawhiti Stream	Not required	N/A
12. Optional review provision re environmental effects	No further provision for review prior to expiry	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		<b>High</b>
Overall assessment of administrative performance in respect of this consent		<b>High</b>

N/A = not applicable

**Table 8 Summary of performance for Hawera closed landfill culvert/diversion consent 5831-2**

<b>Purpose: To divert an unnamed tributary of the Tawhiti Stream</b>		
<b>Condition requirement</b>	<b>Means of monitoring during period under review</b>	<b>Compliance achieved?</b>
1. Diversion pipe to be kept as clear as is practicable	Not assessed	N/A
2. Obstruction of fish passage prohibited	Not assessed	N/A
3. Optional review provision re environmental effects	Next review opportunity June 2019	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		<b>N/A</b>
Overall assessment of administrative performance in respect of this consent		<b>N/A</b>

N/A = not applicable

During the year, STDC demonstrated a high level of environmental and high level of administrative performance in relation to the Hawera landfill consents as defined in Section 1.1.5.

### 3.3.4 Recommendation from the 2015-2016 Annual Report

In the 2015-2016 Annual Report it was recommended:

1. THAT monitoring of discharges from Hawera landfill in the 2016-2017 year remains unchanged from the 2015-2016 monitoring programme. However, it is noted that the appropriateness of the groundwater and surface water monitoring will be reviewed as part of the consent renewal process.

The monitoring programme was unchanged and the consent renewal process is continuing.

### 3.3.5 Alterations to monitoring programmes for 2017-2018

In designing and implementing the monitoring programmes for water discharges in the region, the Council has taken into account:

- the extent of information already made available through monitoring or through other means to date;
- its relevance under the RMA;
- the Council's obligations to monitor consented activities and their effects under the RMA;
- The record of administrative and environmental performance of the consent holder; and
- reporting to the regional community.

The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki exercising resource consents.

It is proposed that for 2017-2018, the programme remains unchanged. However, it is proposed that it be noted that the appropriateness of the groundwater and surface water monitoring be reviewed as part of the consent renewal process.

It should be noted that the proposed programme represents a reasonable and risk-based level of monitoring for the site in question. The Council reserve the right to subsequently adjust the programme from that initially prepared, should the need arise if potential or actual non-compliance is determined at any time during 2017-2018.

## 3.4 Recommendation

1. THAT in the first instance, monitoring of discharges from Hawera landfill in the 2017-2018 year remains unchanged from the 2016-2017 monitoring programme. However, it is noted that the appropriateness of the groundwater and surface water monitoring will be reviewed as part of the consent renewal process.
2. THAT should there be any issues with environmental or administrative performance in the 2017-2018, monitoring of the closed Hawera landfill may be adjusted to reflect any additional investigation or intervention as found necessary.

## 4 Kaponga landfill

### 4.1 Introduction

#### 4.1.1 Site description

STDC (previously as Eltham District Council) operated the Kaponga landfill from the 1970's to 1993. The Kaponga landfill site is located in a gully that also has a wetland fed by a number of springs emanating from within the landfill (Figure 9). This landfill closed in 1993. The cap has been covered by pasture for over a decade, and the site is now part of a dairy farm. On closure, the site was sown in suitable pasture grasses to ensure rapid stormwater runoff and minimise percolation through the capping layer. Raupo growth on the lower face of the reinstated surface provides some natural attenuation of leachate and hence gives protection to the Waikura Stream.

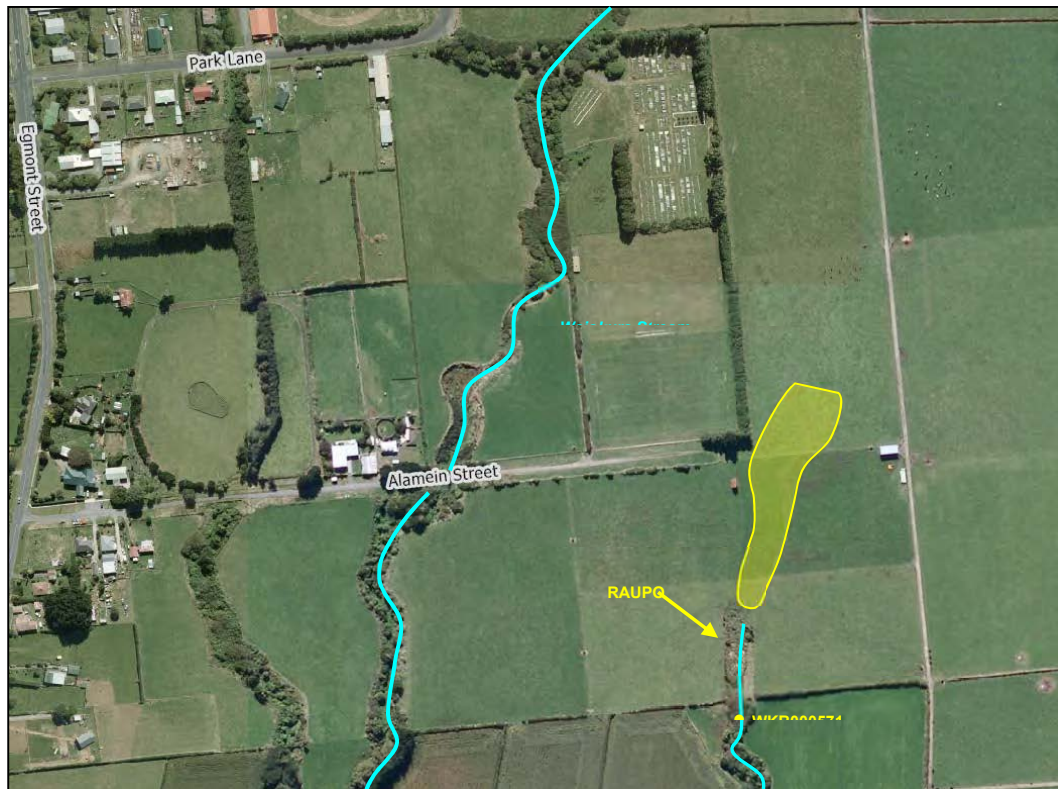


Figure 9 Aerial view of the Kaponga landfill and sampling site

#### 4.1.2 Resource consent

STDC holds water discharge permit **3459-3** to cover the discharge of leachate and stormwater from Kaponga landfill into an unnamed tributary of the Waikura Stream. This permit was issued by the Council on 17 March 2005 under Section 87(e) of the RMA. It is due to expire on 1 June 2023.

Condition 1 requires the consent holder to adopt the best practicable option.

Condition 2 requires the consent holder to prepare a site contingency plan.

Condition 3 requires the consent holder to monitor adjacent surface water and groundwater.

Condition 4 requires the consent holder to install and monitor stormwater and leachate control systems.

Condition 5 states that any discharge from the site shall not cause adverse environmental effects.

The last condition (6) provides opportunities for Council to review the conditions of the consent.

The permit is attached to this report in Appendix I.

This summary of consent conditions may not reflect the full requirements of each condition. The consent conditions in full can be found in the resource consent appended to this report.

## 4.2 Results

### 4.2.1 Inspections

Monitoring of this site is scheduled to be undertaken on a triennial basis, with the programme next scheduled to be implemented in the 2017-2018 year. Therefore the site was not visited during the period under review.

### 4.2.2 Investigations, interventions, and incidents

In the 2016-2017 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with conditions in resource consents related to the Kaponga landfill, or provisions in Regional Plans.

## 4.3 Discussion

### 4.3.1 Evaluation of performance

A tabular summary of STDC's compliance record for the Kaponga landfill for the year under review is set out in Table 9.

**Table 9 Summary of performance for Kaponga closed landfill stormwater and leachate consent 3459-3**

<b>Purpose: To discharge stormwater and leachate from the former Kaponga landfill site into an unnamed tributary of the Waiohura Stream</b>		
<b>Condition requirement</b>	<b>Means of monitoring during period under review</b>	<b>Compliance achieved?</b>
1. Adopt best practice	Not monitored during period this period	Not assessed
2. Prepare and maintain a site contingency plan	Plan on file from August 2013	N/A
3. Monitor ground and surface water on and near the site	Not monitored during period this period	Not assessed
4. Maintain all stormwater and leachate collection systems	Not monitored during period this period	Not assessed
5. No adverse impact on aquatic life	Not monitored during period this period	Not assessed
6. Optional review provision re environmental effects	Next optional review in June 2017	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		<b>N/A</b>
Overall assessment of administrative performance in respect of this consent		<b>N/A</b>

N/A = not applicable

During the year, the environmental performance and administrative performance of STDC was not assessed in relation to the Kaponga closed landfill consent.

### 4.3.2 Recommendation from the 2015-2016 Annual Report

In the 2015-2016 Annual Report, it was recommended:

1. THAT the Kaponga landfill triennial monitoring programme remains in place with monitoring next scheduled for the 2017-2018 period.

This recommendation was implemented.

### 4.3.3 Alterations to monitoring programmes for 2017-2018

In designing and implementing the monitoring programmes for air/water discharges in the region, the Council has taken into account:

- the extent of information already made available through monitoring or other means to date;
- its relevance under the RMA;
- the Council's obligations to monitor consented activities and their effects under the RMA;
- the record of administrative and environmental performances of the consent holder; and
- reporting to the regional community.

The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki exercising resource consents.

It is proposed that for 2017-2018, the programme remains unchanged.

It should be noted that the proposed programme represents a reasonable and risk-based level of monitoring for the site in question. The Council reserves the right to subsequently adjust the programme from that initially prepared, should the need arise if potential or actual non-compliance is determined at any time during 2017-2018.

## 4.4 Recommendations

1. THAT in the first instance, the Kaponga landfill triennial monitoring programme remains in place with monitoring next scheduled for the 2017-2018 period.
2. THAT should there be any issues with environmental or administrative performance in the 2017-2018, monitoring of the Kaponga landfill may be adjusted to reflect any additional investigation or intervention as found necessary.



## 5 Manaia landfill

### 5.1 Introduction

#### 5.1.1 Site description

The Manaia community landfill was in operation from the 1980s and STDC has held consent **3952**, which authorises the discharge of both leachate and stormwater from the site, since 1991. The landfill used to service the township of Manaia and the surrounding rural areas exclusively. However with the closure of the Matangara landfill (Hawera) in June 1998 and the Opunake landfill in November 1999, the landfill's catchment expanded to service these other areas until it closed in June 2006.



Figure 10 Aerial view of Manaia landfill showing sampling sites and landfill footprint

#### 5.1.2 Water discharge permit

STDC holds water discharge permit **3952-2** to cover the discharge of leachate and stormwater from Manaia landfill into the Waiokura Stream. This permit was issued by the Council on 20 June 2005 under Section 87(e) of the RMA. It is due to expire on 1 June 2023.

Condition 1 requires the consent holder to adopt the best practicable option.

Conditions 2 and 3 require the consent holder to prepare and maintain a site contingency plan, and site management plan.

Condition 4 deals with notification of amendments to these plans.

Conditions 5 and 6 deal with groundwater monitoring and maintenance of stormwater and leachate systems.

Condition 7 requires that the discharge shall not cause adverse environmental effects on receiving waters.

The last condition (8) provides opportunities for Council to review the conditions of the consent.

The permit is attached to this report in Appendix I.

This summary of consent conditions may not reflect the full requirements of each condition. The consent conditions in full can be found in the resource consent which is appended to this report.

## 5.2 Results

### 5.2.1 Inspections

Two inspections were carried out during the monitoring year. The inspections focused on the condition of the cap and the management of stormwater and leachate.

#### 17 August 2016

The site was inspected in fine weather with very light wind conditions. The site was unoccupied. The cap was found to be intact and in good condition. There were signs of grazing, but it was not being grazed at the time of inspection. No ponding, cracking, or slumping of the cap was noted. The batters were intact, well grassed and tidy. No slumping or exposed refuse was evident.

The stormwater drains were clear of obstructions and showed no sign of ponding or overflows. Both the grit trap and stormwater pond were dry, and had been well maintained. They had been sprayed and there were no obstructions to flow.

Samples were taken upstream and downstream of the landfill. The leachate pond was also sampled, and access to this was made easy by the well maintained access track.

Site signage and security measures were in place and intact. There were no odour or dust issues noted.

#### 19 April 2017

The site was inspected in fine weather with very light wind conditions. The cap and batters were intact and well-grassed, with no sign of erosion, slumping or cracking. No exposed refuse or stock damage was noted. Minor ponding was apparent in the centre of the cap, which was not unexpected following recent wet weather. The cap had not been grazed in some time.

The stormwater and leachate drains were well grassed. Weed and gorse were observed to be revegetating the drains and the consent holder was informed that these would need some maintenance. Both the grit trap and stormwater pond were dry, and the leachate drain was not discharging at the time of inspection.

Samples were taken upstream and downstream of the landfill, and from the leachate pond.

The site was secure with good signage and permanent fencing in place. Operators were working in the transfer station at the time of inspection. This area was tidy with no windblown refuse apparent. There were no odour or dust issues noted.

## 5.2.2 Results of discharge and receiving environment monitoring

During the year under review samples were collected from the leachate pond and the Waiokura Stream upstream and downstream of the landfill (Figure 10) on two occasions. The results are presented in Table 10.

Table 10 Chemical analysis of discharge and receiving waters at Manaia landfill

		17 August 2016			19 April 2017		
Parameter	Unit	WKR000795 u/s landfill	Leachate RTP002003	WKR000800 d/s of landfill	WKR000795 u/s landfill	Leachate RTP002003	WKR000800 d/s of landfill
Alkalinity	g/m <sup>3</sup> CaCO <sub>3</sub>	-	-	46	56	227	55
BOD	g/m <sup>3</sup>	-	-	0.6	0.7	13	0.6
Conductivity @ 20°C	mS/m	23.7	56.6	23.8	25.1	56.6	25.2
Dissolved reactive phosphorus	g/m <sup>3</sup> P	-	-	0.026	0.044	0.005	0.041
Acid soluble iron	g/m <sup>3</sup>	-	-	0.56	0.44	0.12	0.44
Unionised ammonia	g/m <sup>3</sup> N	0.00010	0.00009	0.00015	0.00037	0.00819	0.00058
Ammoniacal nitrogen	g/m <sup>3</sup> N	0.011	0.045	0.016	0.021	0.858	0.033
Nitrite/nitrate nitrogen	g/m <sup>3</sup> N	-	-	-	3.20	0.05	3.16
pH	pH	7.6	7.0	7.6	7.8	7.5	7.8
Suspended solids	g/m <sup>3</sup>	-	-	-	12	28	11
Temperature	Deg.C	10.8	9.0	10.8	12.8	13.9	11.0
Dissolved zinc	g/m <sup>3</sup>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

On both sampling occasions results generally show little change in water quality between the upstream and downstream sites. This is consistent with historical data and indicates that the presence of the landfill is having little, if any, effect on water quality in the Waiokura Stream. Biochemical available oxygen demand in the leachate sample on the 19 April 2017 was high, but this was shown to have no significant effect on the receiving water as the BOD was found to have decreased downstream in comparison to the upstream site. Unionised ammonia concentrations were also well below the 0.025 g/m<sup>3</sup> guideline given in the Regional Freshwater Plan to protect aquatic ecosystems that may be subjected to long term exposure.

## 5.2.3 Investigations, interventions, and incidents

In the 2016-2017 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with the Manaia landfill resource consent conditions or provisions in Regional Plans.



## 5.3 Discussion

### 5.3.1 Discussion of plant performance

During the year under review, the site was found to be compliant with consent conditions at the time of the inspections.

### 5.3.2 Environmental effects of exercise of consents

There was little variation in water quality in the Waiokura Stream above and below the landfill site, and this is comparable to historical data. The results gathered in this and previous monitoring periods, indicate that the presence of the landfill is not causing any significant adverse effects on the receiving environment.

### 5.3.3 Evaluation of performance

A tabular summary of STDC's compliance record at Manaia landfill for the year under review is set out in Table 11.

**Table 11 Summary of performance for Manaia closed landfill water discharge consent 3952-2**

<b>Purpose: To discharge leachate and stormwater from the closed Manaia landfill and from composting operations into the Waiokura Stream</b>		
<b>Condition requirement</b>	<b>Means of monitoring during period under review</b>	<b>Compliance achieved?</b>
1. STDC shall adopt the best practicable option	Site specific monitoring programme – programme management	Yes
2. STDC shall prepare a site contingency plan	Plan on file dated August 2013	Yes
3. Prepare a landfill management plan	Site specific monitoring programme – programme management	Yes
4. STDC shall notify the Council of changes to plans prior to changes	Site specific monitoring programme – programme management	Yes
5. Monitor site, ground and surface water on and near the site	Site specific monitoring programme – water sampling	Yes
6. Install leachate and stormwater collection, treatment and discharge systems	Site specific monitoring programme – inspection	Yes
7. Limits on BOD and NH <sub>3</sub> in the Waiokura Stream	Site specific monitoring programme – water sampling	Yes
8. Optional review provision re environmental effects	Next optional review June 2017	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		<b>High</b>
Overall assessment of administrative performance in respect of this consent		<b>High</b>

N/A = not applicable

During the year, STDC demonstrated a high level of environmental and high level of administrative performance in relation to the Manaia landfill consent as defined in Section 1.1.5.

### 5.3.4 Recommendation from the 2015-2016 Annual Report

In the 2015-2016 Annual Report, it was recommended:

1. THAT for the 2016-2017 period, the monitoring of discharges from the closed landfill at Manaia remains unchanged from that of 2015-2016.
2. THAT the option for a review of resource consent 3952-2 in June 2017, as set out in condition 8 of the consent, not be exercised, on the grounds that the current conditions are adequate to deal with any potential adverse effects.

This recommendation was implemented.

### 5.3.5 Alterations to monitoring programmes for 2017-2018

In designing and implementing the monitoring programmes for water discharges in the region, the Council has taken into account:

- the extent of information already made available through monitoring or other means to date;
- its relevance under the RMA;
- the Council's obligations to monitor consented activities and their effects under the RMA;
- the record administrative and environmental performance of the consent holder; and
- reporting to the regional community.

The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki exercising resource consents.

It is proposed that for 2017-2018, the monitoring programme remains unchanged.

It should be noted that the proposed programme represents a reasonable and risk-based level of monitoring for the site in question. The Council reserves the right to subsequently adjust the programme from that initially prepared, should the need arise if potential or actual non-compliance is determined at any time during 2017-2018.

## 5.4 Recommendations

1. THAT in the first instance, the 2017-2018 period, the monitoring of discharges from the closed landfill at Manaia continues at the same level as in 2016-2017.
2. THAT should there be issues with environmental or administrative performance in 2017-2018, monitoring of the Manaia landfill may be adjusted to reflect any additional investigation or intervention as found necessary.

## 6 Opunake landfill

### 6.1 Introduction

#### 6.1.1 Site description

The Opunake landfill was operational from 1979, closing in 1999 with the expiry of the 20 year lease of the land. The landfill site is located at Whitcombe Road, and was used to service the township of Opunake and the surrounding rural areas. Waste from Rahoitu and Pungarehu was also disposed of at the landfill. The 4.73 ha site was initially operated in an uncontrolled manner for many years with a significant amount of rubbish being burnt. In 1990 a ban on fires was imposed and the site began to operate under restricted hours. In 1999 STDC submitted a landfill closure plan and had the site reinstated.



Figure 11 Aerial view of Opunake landfill footprint and sampling sites

#### 6.1.2 Water discharge permit

STDC holds water discharge permit **0526-3** to cover the discharge of leachate and stormwater from Opunake landfill into the Otahi Stream. This permit was issued by the Council on 23 August 2005 under Section 87(e) of the RMA. It is due to expire on 1 June 2018.

Condition 1 requires the consent holder to adopt the best practicable option.

Condition 2 requires the consent holder to prepare a site contingency plan and condition 3 requires STDC to notify Council prior to making changes to the plan.

Condition 4 requires the consent holder to monitor adjacent surface water and groundwater.

Condition 5 states that any discharge from the site shall not cause adverse environmental effects.

The last condition (6) provides opportunities for Council to review the conditions of the consent.

The permit is attached to this report in Appendix I.

This summary of consent conditions may not reflect the full requirements of each condition. The consent conditions in full can be found in the resource consent which is appended to this report.

## 6.2 Results

### 6.2.1 Inspections

Two inspections were carried out at the Opunake landfill during the year under review.

#### 17 August 2016

The inspection was conducted in overcast weather with light wind conditions. The cap was intact and well-grassed, with no slumping, cracking, or ponding. Repairs had been carried out to the water troughs and they were no longer ponding on the cap. The batters were in good conditions, being well grassed with no slumping or exposed refuse.

The stormwater drains were dry and free of obstructions, with no sign of recent flow. The lower leachate drains had some ponded water in them, and there were no signs of overflows or obstructions to flow. The stile adjacent to the stormwater discharge was in need of repairs.

The fencing was intact and permanent, with access available to all sampling sites. Silage was being spread on the cap in preparation for grazing at the time of inspection. The site was tidy, with no odour or dust issues. Samples were collected upstream and downstream of the landfill and samples were also taken from the leachate drains.

#### 21 April 2017

The inspection was conducted in fine weather with light wind conditions. The cap and batters were relatively intact and well grassed with no slumping, cracking or exposed refuse observed. Localised ponding was apparent around both water troughs, and the surrounding area was waterlogged and boggy. The batters were in good condition, and showed only minor sign of stock damage on the westernmost side. The cap appeared to have been recently grazed.

The stormwater drains were dry, well grassed, and free-flowing. Minor ponding was apparent at the collection point, which was likely to be due to the recent wet weather. The leachate drains were full of stagnant water, and there was an abundant iron oxide sheen present. The leachate system was not discharging at the time of inspection.

The fencing was permanent, two-strand fencing, the bottom wire of which was not intact.

The site was unoccupied at the time of inspection, and there were no odour or dust issues. Revegetation of gorse and weeds was apparent around the sampling site access.

### 6.2.2 Results of discharge and receiving environment monitoring

#### 6.2.2.1 Surface water

Samples were collected from the leachate drain, and the Otahi Stream at sites above, below and adjacent to the landfill on 17 August 2016 (Figure 11). The results are presented in Table 12 below.

Table 12 Chemical analysis of receiving water samples taken at Opunake closed landfill on 17 August 2016

Parameter	Units	RTP002002 Leachate	OTH000310 u/s of landfill	OTH000320 Adjacent to landfill	OTH000340 d/s of landfill
Alkalinity	g/m <sup>3</sup> CaCO <sub>3</sub>	-	61	62	61
Biochemical oxygen demand	g/m <sup>3</sup>	-	<0.5	0.6	0.5
Conductivity @ 20 °C	mS/m	116	23.9	24.0	24.1
Dissolved reactive P	g/m <sup>3</sup>	0.004	0.063	0.054	0.054
Acid soluble iron	g/m <sup>3</sup>	-	0.42	0.44	0.44
Unionised ammonia	g/m <sup>3</sup> N	0.02656	0.00024	0.00027	0.00029
Ammoniacal nitrogen	g/m <sup>3</sup> N	10.0	0.016	0.018	0.020
pH	pH	7.0	7.8	7.8	7.8
Temperature	Deg.C	12.1	10.9	10.5	10.5
Dissolved zinc	g/m <sup>3</sup>	0.477	<0.005	<0.005	<0.005

There was very little difference in water quality between sites upstream and downstream of the landfill and the water quality at the downstream site was good. As the leachate discharges at a slow rate, the amount of dilution available in the Otahi Stream ensures that the level of contaminants in the stream remain at an acceptable level.

These results, and those from previous years, indicate that the presence of the landfill is not having a significant adverse effect on surface water quality.

### 6.2.3 Biomonitoring

A biological survey was performed on one occasion in the Otahi Stream to determine whether or not the discharge of leachate to the stream had any detrimental effects upon the communities of the stream. Both sites had scores significantly higher MCI scores than historic medians, which possibly indicated that when the landfill was open it did have an impact on macroinvertebrates, and scores have improved since its closure.

### 6.2.4 Investigations, interventions, and incidents

In the 2016-2017 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with the Opunake landfill resource consent conditions in or provisions in Regional Plans.

## 6.3 Discussion

### 6.3.1 Discussion of plant performance

The landfill has been closed for several years and has reverted to pasture. In general, the Opunake landfill was well managed and the consent holder has a management and contingency plan in place for the site.

### 6.3.2 Environmental effects of exercise of consents

During the year under review there were no issues of concern relating to leachate discharges from the site, landfill gas, or water quality in the Otahi Stream as a result of the landfill.

### 6.3.3 Evaluation of environmental performance

A tabular summary of STDC's compliance record at Opunake landfill for the year under review is set out in Table 13.

Table 13 Summary of performance for Opunake closed landfill stormwater and leachate consent 0526-3

<b>Purpose: To discharge stormwater and leachate from the closed Opunake landfill into the Otahi Stream</b>		
<b>Condition requirement</b>	<b>Means of monitoring during period under review</b>	<b>Compliance achieved?</b>
1. STDC shall adopt the best practicable option	Site specific monitoring programme – programme management	Localised ponding identified near water trough
2. Prepare and maintain a site contingency plan	Plan on file dated August 2013	Yes
3. STDC shall inform the Council prior to any changes to these plans	Site specific monitoring programme – programme management	N/A
4. Site water quality shall be monitored	Site specific monitoring programme – water sampling	Yes
5. There shall be no adverse impact on aquatic life as a result of discharges	Site specific monitoring programme – water sampling and inspection	Yes
6. Optional review provision	No further provision for review	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		<b>High</b>
Overall assessment of administrative performance in respect of this consent		<b>High</b>

N/A = not applicable

During the year, STDC demonstrated a high level of environmental and high level of administrative performance in relation to the Opunake landfill consent as defined in Section 1.1.5.

### 6.3.4 Recommendations from the 2015-2016 Annual Report

In the 2015-2016 Annual Report, it was recommended:

1. THAT monitoring of discharges from Opunake landfill in the 2016-2017 year continues at the same level as in 2015-2016.

This recommendation was implemented.

### 6.3.5 Alterations to monitoring programmes for 2017-2018

In designing and implementing the monitoring programmes for water discharges in the region, the Council has taken into account:

- the extent of information already made available through monitoring or other means to date;;
- its relevance under the RMA;
- the Council's obligations to monitor consented activities and their effects under the RMA;
- the record of administrative and environmental performance of the consent holder; and

- reporting to the regional community.

The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki exercising resource consents

It is proposed that for 2017-2018, the monitoring programme remains unchanged.

It should be noted that the proposed programme represents a reasonable and risk based level of monitoring for the site in question. The Council reserves the right to subsequently adjust the programme from that initially prepared, should the need arise if potential or actual non-compliance is determined at any time during 2017-2018.

## 6.4 Recommendation

1. THAT in the first instance, monitoring of discharges from Opunake landfill in the 2017-2018 year continues at the same level as in 2016-2017.
2. THAT should there be any issues with the environmental or administrative performance in 2017-2018, monitoring of the Opunake landfill may be adjusted to reflect any additional investigation or intervention as found necessary.



## 7 Otakeho landfill

### 7.1 Introduction

#### 7.1.1 Site description

The Otakeho Landfill was a small uncontrolled landfill that STDC closed in 1991. STDC at the time also applied for a consent to discharge leachate and stormwater into the Taikatu Stream. This consent was renewed in 2000 and again in 2005. In its current form the consent allows for discharge of leachate and stormwater to land.

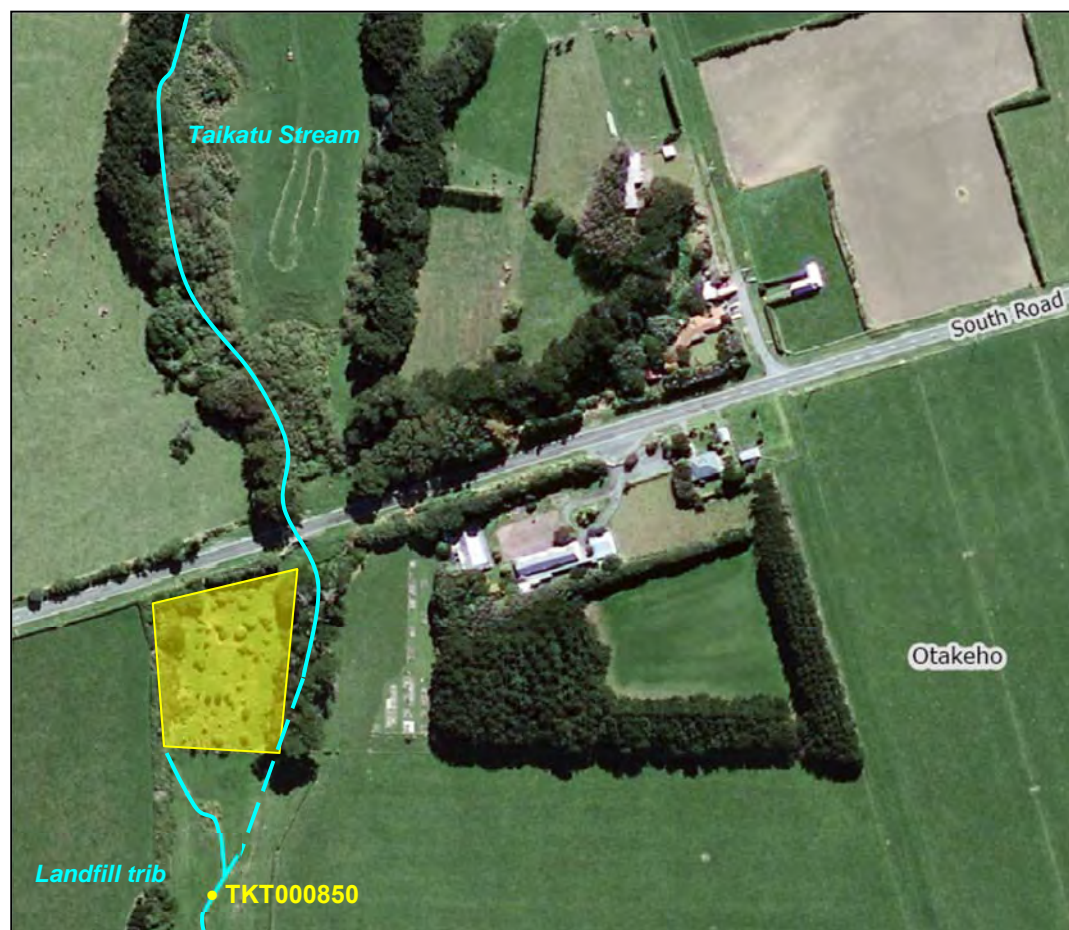


Figure 12 Aerial image of Otakeho landfill and monitoring site in the Taikatu stream

#### 7.1.2 Resource consent

STDC holds water discharge permit **3953-3** to cover the discharge of leachate and stormwater from Otakeho landfill onto and into land in the vicinity of the unnamed tributary of the Tawhiti Stream. This permit was issued by the Council on 22 August 2005 under Section 87(e) of the RMA. It is due to expire on 1 June 2018.

Condition 1 requires the consent holder to adopt the best practicable option.

Condition 2 requires the consent holder to discharge in accordance with consent application information.

Condition 3 requires the consent holder to prepare a site contingency plan and condition 4 requires STDC to notify the Council if changing the contingency plan.



Condition 5 states that the surface water and groundwater will be monitored and condition 6 states that the discharge shall not cause any adverse effect on aquatic life.

The last condition (7) provides opportunities for Council to review the conditions of the consent.

The permit is attached to this report in Appendix I.

This summary of consent conditions may not reflect the full requirements of each condition. The consent conditions in full can be found in the resource consent which is appended to this report.

## 7.2 Results

### 7.2.1 Inspections

Monitoring of this site is scheduled to be undertaken on a triennial basis, with monitoring scheduled to be undertaken during the year under review.

#### 17 August 2016

The site was inspected in fine conditions with a light north westerly wind. The cap was found to be intact and well grassed. It was slightly damp but firm underfoot, with no slumping or cracking noted. There was no ponding evident. The batters were tidy and showed signs of grazing, but they were found to be intact and well grassed, with no slumping or exposed refuse.

The stormwater drains were not well defined, but were free-draining with no obstructions to flow or erosion noted. No sign of recent flow was evident. Access to the site was secure, with permanent fencing in place. There were no odour or dust issues onsite.

A water sample was collected downstream of the landfill, and there were no visual environmental impacts on the stream from the landfill discharge.

### 7.2.2 Receiving water sampling

A water sample was collected 10 m downstream of the confluence of the spring and the unnamed tributary. (Figure 12, Table 14)

**Table 14** Results of chemical analysis of surface water at the Otakeho landfill 18 March 2014, and a summary of historical results 1992-2013

	Alkalinity g/m <sup>3</sup> CaCO	Ammoniacal nitrogen g/m <sup>3</sup> N	Conductivity mS/m @ 20°C	Iron (Acid Soluble) g/m <sup>3</sup>	pH	Temp Deg.C	Unionised ammonia g/m <sup>3</sup> N	Zinc Dissolved g/m <sup>3</sup>
17 Aug 2016	38	0.018	38.8	0.42	7.3	9.7	0.00008	0.009
Minimum	34	0.015	35.3	0.36	7.3	9.7	0.00008	0.005
Maximum	110	0.081	54.8	2.09	7.7	18.0	0.00054	0.026
Median	63	0.038	41.1	0.74	7.5	13.3	0.00031	0.002
Number	13	13	13	12	13	11	2	8

Results of alkalinity, conductivity, ammoniacal nitrogen, iron, and pH were all below the historical medians for this tributary, and the levels of zinc were low and well within the historical range. These results do not indicate any significant contamination from the landfill.

## 7.3 Investigations, interventions, and incidents

In the 2016-2017 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with conditions in resource consents relating to Otakeho landfill or provisions in Regional Plans.

## 7.4 Discussion

### 7.4.1 Evaluation of performance

A tabular summary of STDC's compliance record at Otakeho landfill for the year under review is set out in Table 15.

Table 15 Summary of performance for Otakeho closed landfill leachate and stormwater consent 3953-3

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Prevent or minimise any likely adverse effects on the environment	Inspections	Yes
2. Exercise of consent in accordance with application	Inspections	Yes
3. Prepare and maintain contingency plan	Updated plan for site provided in July 2013	Yes
4. Notice required for changes to contingency plan	No changes to plan	N/A
5. Monitoring to satisfaction of Council	Inspections	Yes
6. Discharge not to cause adverse effects	Sampling and Inspections	Not assessed
7. Optional review provision re environmental effects	No further provision for review	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		<b>High</b>
Overall assessment of administrative performance in respect of this consent		<b>High</b>

N/A = not applicable

During the year, the environmental performance and administrative performance of STDC was high in relation to the Otakeho closed landfill consent.

### 7.4.2 Recommendation from the 2015-2016 Annual Report

The 2015-2016 Annual Report recommended;

1. THAT the Otakeho landfill programme remains in place, and that the programme next be implemented in the 2016-2017 period and triennially thereafter.

### 7.4.3 Alterations to monitoring programmes for 2017-2018

In designing and implementing the monitoring programmes for water discharges in the region, the Council has taken into account:

- the extent of information made already made available through monitoring or other means to date;
- its relevance under the RMA;
- the Council's obligations to monitor consented activities and their effects under the RMA;
- the record of administrative and environmental performance of the consent holder; and
- reporting to the regional community.

The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki exercising resource consents.

It is proposed that for 2017-2018, the monitoring programme remains unchanged.

It should be noted that the proposed programme represents a reasonable and risk-based level of monitoring for the site in question. The Council reserves the right to subsequently adjust the programme from that initially prepared, should the need arise if potential or actual non-compliance is determined at any time during 2017-2018.

## 7.5 Recommendation

1. THAT in the first instance, the Otakeho landfill triennial monitoring programme remains in place with monitoring next scheduled to be implemented in the 2016-2017 period.
2. THAT should there be issues with environmental or administrative performance in 2017-2018, monitoring of the Otakeho landfill may be adjusted to reflect any additional investigation or intervention as found necessary.

## 8 Patea landfill

### 8.1 Introduction

#### 8.1.1 Site description

Prior to 1991, the Patea landfill (Figure 7) was a largely uncontrolled landfill servicing the residents of Patea. In 1992 STDC applied for resource consents to continue operating the landfill under the RMA. The landfill continued to operate until December 2007 and was then covered with a light clay cap. Full landfill closure works commenced in August 2008 and were completed in November of the same year.

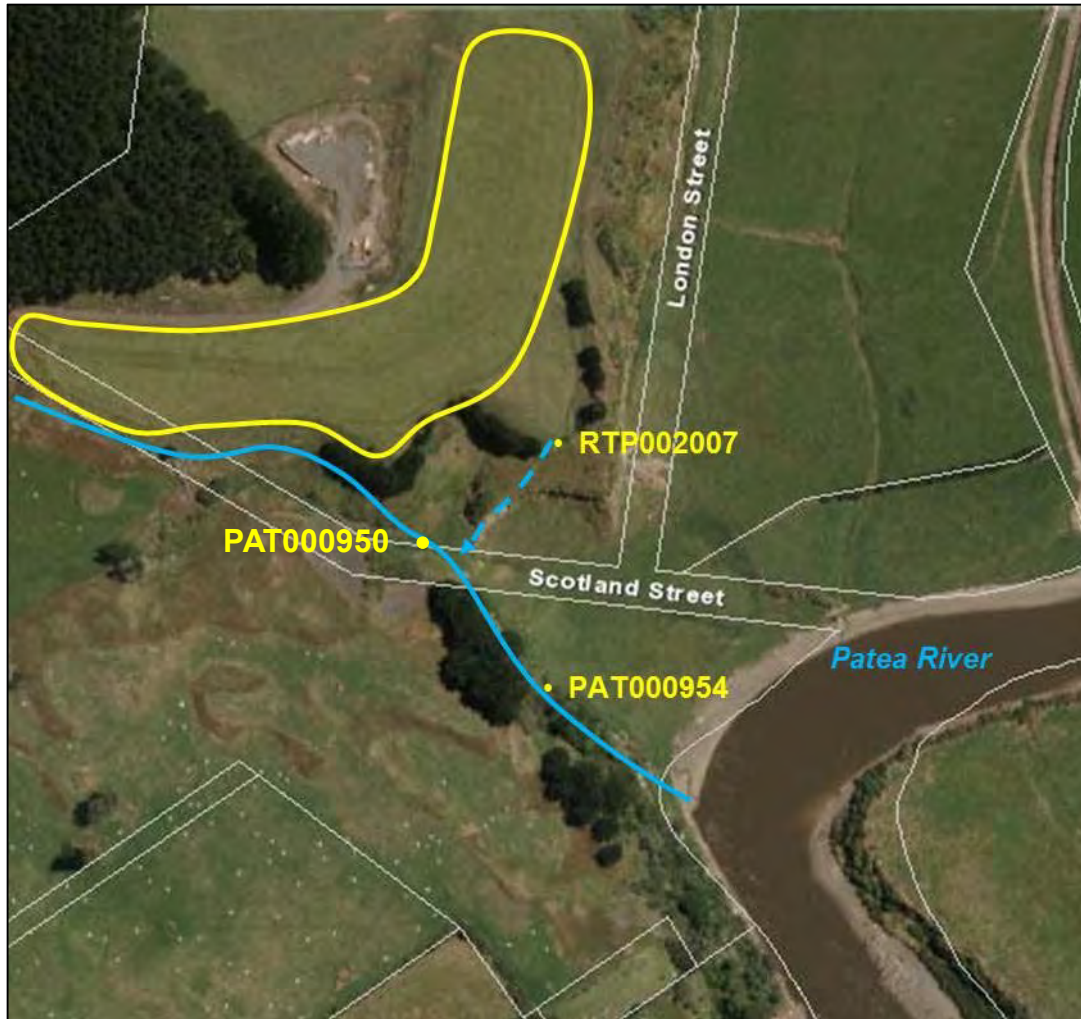


Figure 13 Aerial view of the landfill at Patea showing sampling sites (landfill footprint in yellow)

#### 8.1.2 Resource consents

##### 8.1.2.1 Water discharge permits

###### **Consent 0427-3**

STDC holds water discharge permit **0427-3** to cover the discharge of leachate and stormwater from the Patea landfill into an unnamed tributary of the Patea River. This permit was issued by the Council on 16 December 2003 under Section 87(e) of the RMA. It is due to expire on 1 June 2022.

Conditions 1 and 2 require the consent holder to prepare and maintain a site contingency plan, and site management plan.

Condition 3 deals with notification of amendments to these plans.

Condition 4 requires that the consent be exercised in accordance with information supplied in the application.

Conditions 5 and 6 require groundwater monitoring and maintenance of stormwater and leachate systems.

Condition 7 requires that the discharge shall not cause adverse environmental effects on receiving waters.

Condition 8 requires the consent holder to adopt the best practicable option.

The last condition (9) provides opportunities for Council to review the conditions of the consent.

This summary of consent conditions may not reflect the full requirements of each condition. The consent conditions in full can be found in the resource consent which is appended to this report.

### **Consent 7268-1**

STDC holds water discharge permit **7268-1** to cover the discharge of stormwater from earthworks associated with the closure of Patea landfill into an unnamed tributary of the Patea River. This permit was issued by the Council on 26 March 2008 under Section 87(e) of the RMA. It is due to expire on 1 June 2022.

Condition 1 requires the consent holder to adopt the best practicable option.

Condition 2 requires the consent holder to discharge in accordance with information supplied with the application.

Condition 3 requires the consent holder to notify Council before the exercise of the consent.

Condition 4 requires the consent holder to take reasonable steps to minimise adverse effects.

Condition 5 outlines reinstatement requirements.

Condition 6 is a lapse condition.

Condition 7 provides opportunities for Council to review the conditions of the consent.

This summary of consent conditions may not reflect the full requirements of each condition. The consent conditions in full can be found in the resource consent which is appended to this report.

### **8.1.2.2 Air discharge permit**

STDC holds air discharge permit **4636-2** to cover discharge emissions into the air from Patea municipal landfill. This permit was issued by the Council on 16 December 2003 under Section 87(e) of the RMA. It is due to expire on 1 June 2022.

Condition 1 requires the consent holder to prepare a site contingency plan.

Condition 2 requires STDC to prepare a landfill operations and management plan.

Condition 3 requires STDC to notify any changes to the contingency and management plan.

Condition 4 states that no material shall be burned at the site.

Condition 5 states that the exercise of the consent shall be in accordance with information supplied on application.

Condition 6 requires the consent holder to adopt the best practicable option.

The last condition (7) provides opportunities for Council to review the conditions of the consent.

The permits are attached to this report in Appendix I.

This summary of consent conditions may not reflect the full requirements of each condition. The consent conditions in full can be found in the resource consent which is appended to this report.

## 8.2 Results

### 8.2.1 Inspections

The Patea landfill site was visited three times during the monitoring period.

#### 6 September 2016

The inspection was conducted in fine weather conditions with a westerly wind.

The landfill cap was fully intact, showed no evidence of slumping and had a good grass cover.

Although it had been raining prior to the inspection, no surface water was flowing through the upper perimeter drain. The eastern drain had little flow into the lower receptor pit. The pit was near capacity therefore samples were collected from the pit, and from the receiving waters either side of the discharge.

It was noted that cattle had accessed the lower drain (adjacent to the receptor pit) beyond the landfill boundary. No leachate or odour issues were identified.

#### 23 January 2017

The inspection was undertaken in fine weather with a slight westerly breeze.

The landfill cap was observed to be fully intact and showed no signs of slumping it was also noted the cap had good grass cover. The cap area had recently been grazed. All the perimeter drains were found to be dry following a heavy rainfall event, therefore no discharge & receiving water samples were collected. The bottom pond was nearly full although not discharging. No leachate or odour issues were noted.

#### 15 May 2017

The inspection was undertaken in calm overcast conditions after a heavy rainfall event two days prior.

The landfill cap was observed to be fully intact, showed no slumping and had good grass cover. The cap area had recently been grazed. Although the top perimeter drain was not discharging, a slight flow was trickling into the lower interceptor pit. Wastewater and receiving water samples were collected on this occasion. No leachate or odour issues were noted.

### 8.2.2 Discharge and receiving water monitoring

During the 2016-2017 period six water samples were taken at the site. The leachate/stormwater (RTP002007), and both upstream (PAT000950) and downstream of the landfill (PAT000954) were sampled. The location of these sampling sites is shown in Figure 13 and the results from the chemical analysis of these samples are set out in Table 16.

Table 16 Chemical analysis of samples taken in the vicinity of the Patea closed landfill site

Parameter	Unit	7 September 2016			15 May 2017		
		RTP002007 leachate	PAT000950 upstream	PAT000954 downstream	RTP002007 leachate	PAT000950 upstream	PAT000954 downstream
Alkalinity	g/m <sup>3</sup> CaCO <sub>3</sub>	286	97	105	178	101	116
BOD	g/m <sup>3</sup>	>17	2.5	2.9	5.6	2.4	3.0

Parameter	Unit	7 September 2016			15 May 2017		
		RTP002007 leachate	PAT000950 upstream	PAT000954 downstream	RTP002007 leachate	PAT000950 upstream	PAT000954 downstream
Conductivity @ 20°C	mS/m	76.0	65.6	66.8	44.0	60.2	63.5
Acid soluble iron	g/m <sup>3</sup>	2.56	2.82	2.52	1.57	0.98	0.71
Unionised ammonia	g/m <sup>3</sup> N	0.24787	0.00970	0.02045	0.04037	0.01309	0.00950
Ammoniacal nitrogen	g/m <sup>3</sup> N	12.1	0.581	0.627	3.9	0.639	0.464
pH	g/m <sup>3</sup>	7.8	7.7	8.0	7.6	7.8	7.8
Temperature	°C	15.0	15.3	15.2	11.9	15.0	15.0
Dissolved zinc	g/m <sup>3</sup>	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

The results indicate that there is some contamination in the collected stormwater in the form of elevated alkalinity, BOD, ammoniacal nitrogen and unionised ammonia levels. There was a notable, but not environmentally significant increase in the BOD, ammoniacal nitrogen and unionised ammonia of the tributary downstream of the landfill. This was particularly evident in the BOD on 15 May, and the unionised ammonia on 7 September.

In the tributary, the unionised ammonia concentration remained below the 0.025 g/m<sup>3</sup> guideline but was close on one occasion. The guideline is given in the Regional Freshwater Plan to protect aquatic ecosystems that may be subjected to long term exposure.

Any discharges to the Patea River are unlikely to have a significant adverse effect due to minor levels of contaminants found and the large dilution potential available.

### 8.2.3 Investigations, interventions, and incidents

In the 2016-2017 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with the Patea landfill resource consent conditions or provisions in Regional Plans.

## 8.3 Discussion

### 8.3.1 Discussion of plant performance

The site was found to be well vegetated with no evidence of recent stock damage to the cap. There were no odour or leachate issues found at the time of inspection. It is noted that, on occasion, cattle have been accessing the stormwater/leachate drains and treatment system resulting. This needs to be monitored due to the potential for effects both on the functioning of the system and the quality of the discharge.

### 8.3.2 Environmental effects of exercise of consents

Leachate will continue to generate at the site for some time and this generally seeps out to land via the bluff on the western edge of the land filled area. The information gathered during the period under review indicates that the landfill's presence is not having any significant effect on the environment.

### 8.3.3 Evaluation of performance

A tabular summary of STDC's compliance record for the Patea landfill for the year under review is set out in Table 17 to Table 19.

**Table 17 Summary of performance for Patea closed landfill stormwater and leachate consent 0427-3**

<b>Purpose: To discharge surface stormwater and leachate from the Patea municipal landfill into an unnamed tributary of the Patea River</b>		
<b>Condition requirement</b>	<b>Means of monitoring during period under review</b>	<b>Compliance achieved?</b>
1. Prepare and maintain a site contingency plan	Plan on file dated August 2013	Yes
2. Prepare and maintain a landfill management plan	Site specific monitoring programme – programme management	Yes
3. Advise of any changes being made to the management plan or the site contingency plan	Site specific monitoring programme – programme management	Yes
4. Comply with information submitted in support of application	Site specific monitoring programme – programme management	Yes
5. Monitor ground and surface water on and near the site	Site specific monitoring programme – water sampling	Yes
6. Maintain all stormwater and leachate collection systems	Site specific monitoring programme – inspection	Yes
7. No adverse impact on aquatic life	Site specific monitoring programme – inspection and water sampling	Yes
8. Adopt the best practicable option to prevent or minimise any likely adverse effects on the environment	Site specific monitoring programme – programme management	Yes, but stock management practices to be monitored
9. Optional review provision re environmental effects	No further opportunities for review	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		<b>High</b>
Overall assessment of administrative performance in respect of this consent		<b>High</b>

N/A = not applicable

**Table 18 Summary of performance for Patea closed landfill air discharge consent 4636-2**

<b>Purpose: To discharge emissions into the air from the Patea municipal landfill activities</b>		
<b>Condition requirement</b>	<b>Means of monitoring during period under review</b>	<b>Compliance achieved?</b>
1. Prepare and maintain a site contingency plan	Plan on file dated August 2013	Yes



<b>Purpose: To discharge emissions into the air from the Patea municipal landfill activities</b>		
<b>Condition requirement</b>	<b>Means of monitoring during period under review</b>	<b>Compliance achieved?</b>
2. Prepare and maintain a landfill operations and management plan	Site specific monitoring programme – programme management	Yes
3. Advise of any changes being made to the operations and management plan or the site contingency plan	Site specific monitoring programme – programme management	Yes
4. No material shall be burnt on site	Site specific monitoring programme – inspection	Yes
5. Comply with information submitted in support of application	Site specific monitoring programme – programme management	Yes
6. Prevent or minimise any likely adverse effects on the environment	Site specific monitoring programme – inspection and water sampling	Yes
7. Optional review provision re environmental effects	No further opportunities for review	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		<b>High</b>
Overall assessment of administrative performance in respect of this consent		<b>High</b>

N/A = not applicable

Table 19 Summary of performance for Patea closed landfill stormwater and sediment consent 7268-1

<b>Purpose: To discharge stormwater and sediment onto and into land and into an unnamed tributary of the Patea River from earthworks associated with the closure of the Patea Landfill</b>		
<b>Condition requirement</b>	<b>Means of monitoring during period under review</b>	<b>Compliance achieved?</b>
1. Adopt best practicable option	Site specific monitoring programme – programme management	N/A
2. Exercise consent in accordance with application	Site specific monitoring programme – programme management	N/A
3. Notify before exercising consent	Site specific monitoring programme – programme management	N/A
4. Take reasonable steps to minimise effects	Site specific monitoring programme – programme management	N/A
5. Reinstatement and stabilisation as soon as possible	Site specific monitoring programme – programme management	N/A
6. A lapse condition	N/A	N/A
7. Optional review provision re environmental effects	No further opportunities for review	N/A

<b>Purpose: <i>To discharge stormwater and sediment onto and into land and into an unnamed tributary of the Patea River from earthworks associated with the closure of the Patea Landfill</i></b>		
<b>Condition requirement</b>	<b>Means of monitoring during period under review</b>	<b>Compliance achieved?</b>
Overall assessment of consent compliance and environmental performance in respect of this consent		<b>N/A –consent no longer exercised</b>
Overall assessment of administrative performance in respect of this consent		

N/A = not applicable

During the year, STDC demonstrated a high level of environmental and a high level of administrative performance in relation to the Patea landfill consents as defined in Section 1.1.5.

In the 2016-2017 year, the best practicable option was not always adopted at the site, which resulted in some minor stock damage to the stormwater drains. Stock management at the site during the year under review has improved, but still needs to be monitored due to the potential for effects both on the functioning of the system and the quality of the discharge.

### 8.3.4 Recommendations from the 2015-2016 Annual Report

In the 2015-2016 Annual Report, it was recommended:

1. THAT in the 2016-2017 period, the monitoring of discharges from the closed Patea landfill remains unchanged from that of 2015-201.

This recommendation was implemented.

### 8.3.5 Alterations to monitoring programmes for 2017-2018

In designing and implementing the monitoring programmes for air/water discharges in the region, the Council has taken into account:

- the extent of information already made available through monitoring or other means to date;
- its relevance under the RMA;
- the Council's obligations to monitor consented activities and their effects under the RMA;
- the record of administrative and environmental performances of the consent holder; and
- reporting to the regional community.

The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki exercising resource consents.

It is proposed that for 2017-2018, the monitoring programme remains unchanged.

It should be noted that the proposed programme represents a reasonable and risk-based level of monitoring for the site in question. The Council reserves the right to subsequently adjust the programme from that initially prepared, should the need arise if potential or actual non-compliance is determined at any time during 2016-2018.

## 8.4 Recommendation

1. THAT in the first instance, 2017-2018 period, the monitoring of discharges from the closed Patea landfill remains unchanged from that of 2016-2017.

2. THAT should there be issues with environmental or administrative performance in 2017-2018, monitoring of the Patea landfill may be adjusted to reflect any additional investigation or intervention as found necessary.

## 9 Summary of recommendations

1. THAT in the first instance the 2017-2018 period, the monitoring of discharges from the closed landfill at Eltham continues at the same level as in 2016-2017.
2. THAT should there be any issues with environmental or administrative performance in the 2017-2018, monitoring of the closed landfill at Eltham may be adjusted to reflect any additional investigation or intervention as found necessary.
3. THAT in the first instance monitoring of discharges from Hawera landfill in the 2017-2018 year remains unchanged from the 2016-2017 monitoring programme. However, it is noted that the appropriateness of the groundwater and surface water monitoring will be reviewed as part of the consent renewal process.
4. THAT should there be any issues with environmental or administrative performance in the 2017-2018, monitoring of the closed Hawera landfill may be adjusted to reflect any additional investigation or intervention as found necessary.
5. THAT in the first instance the Kaponga landfill triennial monitoring programme remains in place with monitoring next scheduled for the 2017-2018 period.
6. THAT should there be any issues with environmental or administrative performance in the 2017-2018, monitoring of the Kaponga landfill may be adjusted to reflect any additional investigation or intervention as found necessary
7. THAT in the first instance the 2017-2018 period, the monitoring of discharges from the closed landfill at Manaia continues at the same level as in 2016-2017.
8. THAT should there be issues with environmental or administrative performance in 2017-2018, monitoring of the Manaia landfill may be adjusted to reflect any additional investigation or intervention as found necessary.
9. THAT in the first instance monitoring of discharges from Opunake landfill in the 2017-2018 year continues at the same level as in 2016-2017.
10. THAT should there be any issues with the environmental or administrative performance in 2017-2018, monitoring of the Opunake landfill may be adjusted to reflect any additional investigation or intervention as found necessary.
11. THAT in the first instance the Otakeho landfill triennial monitoring programme remains in place with monitoring next scheduled to be implemented in the 2016-2017 period.
12. THAT should there be issues with environmental or administrative performance in 2017-2018, monitoring of the Otakeho landfill may be adjusted to reflect any additional investigation or intervention as found necessary.
13. THAT in the first instance 2017-2018 period, the monitoring of discharges from the closed Patea landfill remains unchanged from that of 2016-2017.
14. THAT should there be issues with environmental or administrative performance in 2017-2018, monitoring of the Patea landfill may be adjusted to reflect any additional investigation or intervention as found necessary.

## 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.
BOD	Biochemical oxygen demand. A measure of the presence of degradable organic matter, taking into account the biological conversion of ammonia to nitrate.
BODF	Biochemical oxygen demand of a filtered sample.
Bund	A wall around a tank to contain its contents in the case of a leak.
CBOD	Carbonaceous biochemical oxygen demand. A measure of the presence of degradable organic matter, excluding the biological conversion of ammonia to nitrate.
COD	Chemical oxygen demand. A measure of the oxygen required to oxidise all matter in a sample by chemical reaction.
Conductivity	An indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m.
DO	Dissolved oxygen.
DRP	Dissolved reactive phosphorus.
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.
Incident Register	The 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.
MCI	Macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats.
mS/m	Millisiemens per metre.
Mixing zone	The zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to 7 times the width of the stream at the discharge point.
NH <sub>4</sub>	Ammonium, normally expressed in terms of the mass of nitrogen (N).
NH <sub>3</sub>	Unionised ammonia, normally expressed in terms of the mass of nitrogen (N).

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 (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 subsequent amendments.
SS	Suspended solids.

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## Appendix I

### Resource consents held by STDC (in alphabetical order)

(For a copy of the signed resource consent  
please contact the TRC consent department)



Eltham



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

Name of  
Consent Holder: South Taranaki District Council  
Private Bag 902  
HAWERA

Consent Granted  
Date: 17 March 2005

**Conditions of Consent**

Consent Granted: To discharge stormwater and leachate from the former Eltham landfill site into the Mangawhero Stream in the Waingongoro catchment at or about GR: Q20:223-949

Expiry Date: 1 June 2023

Review Date(s): June 2011, June 2017

Site Location: Castle Street, Eltham

Legal Description: Lot 1 DP 9279 Blk X Ngaere SD

Catchment: Waingongoro

Tributary: Mangawhero

**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. Within three months of granting this consent the consent holder shall prepare and maintain a site 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 carried out should such spillage or discharge occur.
- 3. The consent holder shall monitor the site and adjacent surface and groundwaters to the satisfaction of the Chief Executive, Taranaki Regional Council.
- 4. Any discharge shall not, in the opinion of the Chief Executive, Taranaki Regional Council, cause nor be likely to cause any significant adverse effects on aquatic life or receiving water quality.
- 5. 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 2011 and/or June 2017, 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 17 March 2005

For and on behalf of  
Taranaki Regional Council

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**Director-Resource Management**

Hawera





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

Name of  
Consent Holder: South Taranaki District Council  
Private Bag 902  
HAWERA

Consent Granted  
Date: 28 June 2001

**Conditions of Consent**

Consent Granted: To discharge up to 2800 cubic metres/day of leachate and stormwater from the closed Matangara Landfill, Hawera, to groundwater and into an unnamed tributary of the Tawhiti Stream in the Tangahoe catchment at or about GR: Q21:214-788

Expiry Date: 1 June 2016

Review Date(s): June 2004, June 2010

Site Location: former Matangara Landfill, Matangara Road, Hawera

Legal Description: Lot 2 DP 20563 Lot 2 DP 20819 Blk VI Hawera SD

Catchment: Tangahoe

Tributary: Tawhiti

## Consent 0444-4

### 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; and
  - ii) charges authorised by regulations.

### Special conditions

- 1) The consent holder shall at all times adopt the best practicable option, as defined in the Resource Management Act 1991, to prevent or minimise any or likely adverse effects on the environment associated with the discharges of leachate and/or stormwater from the site.
- 2) The consent holder shall maintain an adequate landfill capping and vegetative cover on the site to the satisfaction of the Chief Executive, Taranaki Regional Council.
- 3) The consent holder shall provide a landfill post-closure management plan to the satisfaction of the Chief Executive, Taranaki Regional Council by 1 December 2001; such plan to address site security, litter control, vegetation cover, stormwater diversion, leachate control, site contouring, and cover placement and compaction, in addition to any other matters relevant to the exercise of this consent.
- 4) The consent holder shall adhere to the landfill management plan insofar as it concerns the exercise of this consent at all times.
- 5) The consent holder shall maintain stormwater drains, the sediment detention pond, and/or ground contours at the site, in order to minimise stormwater movement across, or ponding on the site.
- 6) The consent holder shall maintain the leachate collection system at the site in order to minimise leachate discharges to the environment at the site.
- 7) The mixing zone in each condition of this consent shall extend for a distance of 20 metres downstream of the point of the discharge of leachate and stormwater at the confluence of the unnamed tributary of the Tawhiti Stream and the Tawhiti Stream.
- 8) After allowing for reasonable mixing the consent holder shall ensure that the discharge shall not give rise to any of the following effects in the receiving waters of the Tawhiti 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.
- 9) Monitoring of surface waters, groundwater and leachate on or in the vicinity of the site shall be undertaken to the satisfaction of the Chief Executive, Taranaki Regional Council.

## Consent 0444-4

- 10) The two existing monitoring bores shall be maintained to the satisfaction of the Chief Executive, Taranaki Regional Council.
- 11) In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may review any or all of the conditions of this consent in June each year after this consent was granted, should further chemical sampling of the unnamed tributary of the Tawhiti Stream reveal levels of contamination resulting in significant adverse environmental effects.
- 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 2004 and/or June 2010, 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 28 June 2001

For and on behalf of  
Taranaki Regional Council

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**Director-Resource Management**



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

Name of  
Consent Holder: South Taranaki District Council  
Private Bag 902  
Hawera 4640

Decision Date: 28 June 2016

Commencement Date: 28 June 2016

**Conditions of Consent**

Consent Granted: To divert an unnamed tributary of the Tawhiti Stream

Expiry Date: 1 June 2034

Review Date(s): June 2019, June 2022, June 2025, June 2028

Site Location: Matangara Road, Hawera

Grid Reference (NZTM) 1711330E-5617098N (inlet of diversion)  
1711522E-5616758N (outlet of diversion)

Catchment: Tangahoe

Tributary: Tawhiti

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

**General condition**

- a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

**Special conditions**

1. The consent holder shall at all times ensure that the diversion pipe is as clear as is practicable of any blockages.
2. The structure shall not obstruct fish passage.
3. 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 2019 and/or June 2022 and/or June 2025 and/or June 2028, 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 28 June 2016

For and on behalf of  
Taranaki Regional Council

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A D McLay  
**Director - Resource Management**

Kaponga





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

Name of  
Consent Holder: South Taranaki District Council  
Private Bag 902  
HAWERA

Consent Granted  
Date: 17 March 2005

**Conditions of Consent**

Consent Granted: To discharge stormwater and leachate from the former  
Kaponga landfill site into an unnamed tributary of the  
Waiokura Stream at or about GR: P20:095-960

Expiry Date: 1 June 2023

Review Date(s): June 2011, June 2017

Site Location: Alamein Street, Kaponga

Legal Description: Sec 77 Blk XI Kaupokonui SD

Catchment: Waiokura

### **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. Within three months of granting this consent the consent holder shall prepare and maintain a site 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 carried out should such a spillage or discharge occur.
- 3. The consent holder shall monitor the site and adjacent surface and groundwaters to the satisfaction of the Chief Executive, Taranaki Regional Council.
- 4. The consent holder shall install and monitor the leachate and stormwater diversion, collection, treatment and discharge systems, to the satisfaction of the Chief Executive, Taranaki Regional Council.
- 5. Any discharge shall not, in the opinion of the Chief Executive, Taranaki Regional Council, cause nor be likely to cause any significant adverse effects on aquatic life or receiving water quality.
- 6. 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 2011 and/or June 2017, 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,

Consent 3459-3

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 17 March 2005

For and on behalf of  
Taranaki Regional Council

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**Director-Resource Management**



Manaia



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

Name of  
Consent Holder: South Taranaki District Council  
Private Bag 902  
HAWERA 4640

Change To  
Conditions Date: 29 October 2008 [Granted: 20 January 2005]

**Conditions of Consent**

Consent Granted: To discharge leachate and stormwater from the closed  
Manaia landfill and from composting operations into the  
Waiokura Stream at or about (NZTM)  
1697799E-5620638N

Expiry Date: 1 June 2023

Review Date(s): June 2011, June 2017

Site Location: Cemetery Road, Manaia

Legal Description: Pt Sec 23 Blk VII Waimate SD

Catchment: Waiokura

### **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**

#### **Conditions 1 – 6 [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.
- 2. Within three months of granting this consent the consent holder shall prepare and maintain a site 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 carried out should such a spillage or discharge occur.
- 3. Within three months of granting this consent the consent holder shall prepare and maintain a landfill management plan to the satisfaction of the Chief Executive, Taranaki Regional Council, and shall adhere to such a plan in so far as it concerns the exercise of this consent at all times.
- 4. The consent holder shall advise the Taranaki Regional Council one month prior to any changes being made to the landfill management plan and/or the site contingency plan referred to in special conditions 3 and 4. Should the Taranaki Regional Council wish to review either of these plans, one month's notice shall be provided to the consent holder.
- 5. The consent holder shall monitor the site and adjacent surface water and ground water to the satisfaction of the Chief Executive, Taranaki Regional Council.
- 6. The consent holder shall install and maintain leachate and stormwater diversion, collection, treatment and discharge systems, to the satisfaction of the Chief Executive, Taranaki Regional Council.



**[Condition 7 – changed]**

7. That after reasonable mixing, any discharge from the closed landfill or composting operations shall not cause Waiohura Stream to exceed the following parameters;
- a rise in biochemical oxygen demand of 2.0 g/m<sup>3</sup>
  - unionised ammonia of 0.025 g/m<sup>3</sup>

**[Condition 8-unchanged]**

8. 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 2011 and/or June 2017, 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 October 2008

For and on behalf of  
Taranaki Regional Council

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**Director-Resource Management**



Opunake



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

Name of  
Consent Holder: South Taranaki District Council  
Private Bag 902  
HAWERA

Consent Granted  
Date: 23 August 2005

**Conditions of Consent**

Consent Granted: To discharge stormwater and leachate from the closed  
Opunake landfill into the Otahi Stream at or about GR:  
P20:831-951

Expiry Date: 1 June 2018

Review Date(s): June 2006, June 2012

Site Location: Whitcombe Road, Opunake

Legal Description: Secs 1 & 2 SO 13128 Opunake Town Belt Blk IX  
Opunake SD

Catchment: Otahi

### **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. Within three months of granting this consent the consent holder shall prepare and maintain a site 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 carried out should such spillage or discharge occur.
- 3. The consent holder shall advise the Taranaki Regional Council one month prior to any changes being made to the contingency plan. Should the Taranaki Regional Council wish to review this plan, one month's notice shall be provided to the consent holder.
- 4. The monitoring of the site and adjacent surface and groundwaters shall be to the satisfaction of the Chief Executive, Taranaki Regional Council.
- 5. Any discharge shall not, in the opinion of the Chief Executive, Taranaki Regional Council, cause nor be likely to cause any significant adverse effects on aquatic life or receiving water quality.
- 6. 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 2006 and/or June 2012, 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,

Consent 0526-3

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 23 August 2005

For and on behalf of  
Taranaki Regional Council

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**Director-Resource Management**





Otakeho



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

Name of  
Consent Holder: South Taranaki District Council  
Private Bag 902  
HAWERA

Consent Granted  
Date: 22 August 2005

**Conditions of Consent**

Consent Granted: To discharge leachate and stormwater from the closed  
Otakeho Municipal Landfill onto and into land at or about  
GR: P21:990-835

Expiry Date: 1 June 2018

Review Date(s): June 2006, June 2012

Site Location: State Highway 45, Otakeho

Legal Description: Lot 1 DP 18965 Blk V Waimate SD

Catchment: Taikatu

### **General conditions**

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
  - i) the administration, monitoring and supervision of this consent; and
  - ii) charges authorised by regulations.

### **Special conditions**

- 1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.
- 2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of applications 3414, 833 and 274. In the case of any contradiction between the documentation submitted in support of applications 3414, 833 and 274 and the conditions of this consent, the conditions of this consent shall prevail.
- 3. Within three months of granting this consent the consent holder shall prepare and maintain a site 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 carried out should such spillage or discharge occur.
- 4. The consent holder shall advise the Taranaki Regional Council one month prior to any changes being made to the contingency plan. Should the Taranaki Regional Council wish to review this plan, one month's notice shall be provided to the consent holder.
- 5. The monitoring of the site and adjacent surface and groundwaters shall be to the satisfaction of the Chief Executive, Taranaki Regional Council.
- 6. Any discharge shall not, in the opinion of the Chief Executive, Taranaki Regional Council, cause nor be likely to cause any significant adverse effects on aquatic life or receiving water quality.

## Consent 3953-3

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 2006 and/or June 2012, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 22 August 2005

For and on behalf of  
Taranaki Regional Council

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**Director-Resource Management**



Patea





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

Name of  
Consent Holder: South Taranaki District Council  
Private Bag 902  
HAWERA

Consent Granted  
Date: 16 December 2003

**Conditions of Consent**

Consent Granted: To discharge surface stormwater and leachate from the  
Patea municipal landfill into an unnamed tributary of the  
Patea River at or about GR: Q21:360-611

Expiry Date: 1 June 2022

Review Date(s): June 2010, June 2016

Site Location: Patea Municipal Landfill, Scotland Street, Patea

Legal Description: Lot 1 DP 20064 Pt Sec 8 Patea Sbrn All DP 3495 Town of  
Patea Blk VII Carlyle SD

Catchment: Patea

**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. Within three months of granting of this consent the consent holder shall prepare and maintain a site 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 carried out should such a spillage or discharge occur. This shall be reviewed by the Council on an annual basis.
- 2. Within three months of granting of this consent the consent holder shall prepare and maintain a landfill operations and management plan to the satisfaction of the Chief Executive, Taranaki Regional Council, and shall adhere to such a plan in so far as they concern the exercise of this consent at all times. This shall be reviewed by the Council on an annual basis.
- 3. The consent holder shall advise the Taranaki Regional Council one month prior to any changes being made to the operation and management plan and/or site contingency plan. Should the Taranaki Regional Council wish to review either of these plans, one month's notice shall be provided to the consent holder.
- 4. The exercise of this resource consent shall be carried out in general accordance with the information submitted in support of the application [2705].
- 5. The monitoring of the site and adjacent surface and groundwaters shall be to the satisfaction of the Chief Executive, Taranaki Regional Council
- 6. The leachate and stormwater diversion, collection, treatment and discharge systems shall be maintained to the satisfaction of the Chief Executive, Taranaki Regional Council.
- 7. Any discharge shall not, in the opinion of the Chief Executive, Taranaki Regional Council, cause nor be likely to cause any significant adverse effects on aquatic life or receiving water quality.
- 8. Notwithstanding any conditions within this consent, the consent holder shall at all times adopt the best practicable option as defined in Section 2 of the Resource Management Act 1991, to prevent or minimise any actual or potential effect on the environment arising from any discharge at the site.

## Consent 0427-3

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 2010 and/or June 2016, 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 December 2003

For and on behalf of  
Taranaki Regional Council

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**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: South Taranaki District Council  
Private Bag 902  
HAWERA 4640

Consent Granted  
Date: 26 March 2008

**Conditions of Consent**

Consent Granted: To discharge stormwater and sediment onto and into land  
and into an unnamed tributary of the Patea River from  
earthworks associated with the closure of the Patea  
Landfill at or about 2636144E-6161215N

Expiry Date: 1 June 2022

Review Date(s): June 2010, June 2016

Site Location: Patea Landfill, Scotland Street, Patea

Legal Description: All DP 3495

Catchment: Patea

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

### General conditions

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
  - i) the administration, monitoring and supervision of this consent; and
  - ii) charges authorised by regulations.

### Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.
2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of application 4931. In the case of any contradiction between the documentation submitted in support of application 4931 and the conditions of this consent, the conditions of this consent shall prevail.
3. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least seven days prior to the exercise of this consent. 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.
4. The consent holder shall take all reasonable steps to:
  - a. minimise the amount of sediment discharged to the stream;
  - b. minimise the amount of sediment that becomes suspended in the stream; and
  - c. mitigate the effects of any sediment in the stream.

Undertaking work in accordance with Guidelines for Earthworks in the Taranaki region, by the Taranaki Regional Council, will achieve compliance with this condition.

5. All earthwork areas shall be stabilised vegetatively or otherwise as soon as is practicable immediately following completion of soil disturbance activities.
6. 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.

## Consent 7268-1

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 2010 and/or June 2016, 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 26 March 2008

For and on behalf of  
Taranaki Regional Council

---

**Director-Resource Management**





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

Name of  
Consent Holder: South Taranaki District Council  
Private Bag 902  
HAWERA

Consent Granted  
Date: 16 December 2003

**Conditions of Consent**

Consent Granted: To discharge emissions into the air from the Patea  
municipal landfill activities at or about GR: Q21:360-611

Expiry Date: 1 June 2022

Review Date(s): June 2010, June 2016

Site Location: Patea Municipal Landfill, Scotland Street, Patea

Legal Description: Lot 1 DP 20064 Pt Sec 8 Patea Sbrn All DP 3495 Town of  
Patea Blk VII Carlyle SD

**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. Within three months of granting of this consent the consent holder shall prepare and maintain a site 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 carried out should such a spillage or discharge occur. This shall be reviewed by the Council on an annual basis.
- 2. Within three months of granting of this consent the consent holder shall prepare and maintain a landfill operations and management plan to the satisfaction of the Chief Executive, Taranaki Regional Council, and shall adhere to such a plan in so far as they concern the exercise of this consent at all times. This shall be reviewed by the Council on an annual basis.
- 3. The consent holder shall advise the Taranaki Regional Council one month prior to any changes being made to the operation and management plan and/or site contingency plan. Should the Taranaki Regional Council wish to review either of these plans, one month's notice shall be provided to the consent holder.
- 4. No material is to be burnt at the landfill site.
- 5. The exercise of this resource consent shall be carried out in general accordance with the information submitted in support of the application [2707].
- 6. Notwithstanding any conditions within this consent, the consent holder shall at all times adopt the best practicable option as defined in Section 2 of the Resource Management Act 1991, to prevent or minimise any actual or potential effect on the environment arising from any discharge at the site.

## Consent 4636-2

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 2010 and/or June 2016, 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 December 2003

For and on behalf of  
Taranaki Regional Council

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**Director-Resource Management**



## Appendix II

### Biomonitoring reports



**To** Rae West, Job manager  
**From** Darin Sutherland, Scientific Officer  
**Document** 1802098  
**Report** DS056  
**Date** 11 January 2017

## Biomonitoring of the Mangawhero Stream and Waingongoro River in relation to the South Taranaki District Council's Eltham Wastewater Treatment Plant System and Rubbish Tip leachate discharge, October 2016

### Introduction

This spring survey was the first of two surveys programmed for the 2016-2017 monitoring period. Since summer 2011, biomonitoring surveys in the Mangawhero Stream have been reduced from four sites to two sites in recognition of the minimal usage of the WWTP consented overflow facility to the Mangawhero Stream in recent years. No overflows to the stream have occurred since this time.

### Method

This survey was the 21<sup>st</sup> spring biomonitoring programme coincident with riparian planting of the Mangawhero Stream banks and stream willow clearance work over the past several years. It was performed some six years after commissioning of the pipeline for conveyance of the Eltham WWTP wastewater to the Hawera WWTP and the cessation of the discharge of partially treated wastewater into the Waingongoro catchment. No (consented) overflows from the WWTP to the Mangawhero Stream had occurred during this period. Current biomonitoring sites are presented in Table 1.

The standard 400 ml 'kick sampling' and 'sweep netting' techniques were used to collect streambed (benthic) macroinvertebrates from site 1 in the Mangawhero Stream. The 'kick sampling' technique only was used for site 5 in the Mangawhero Stream and site 8 in the Waingongoro River (illustrated in Figure 1) on 18 October 2016.

Table 1 Biomonitoring sites in the Mangawhero Stream and Waingongoro River in relation to the South Taranaki District Council's Eltham Wastewater Treatment Plant System and Rubbish Tip leachate discharge

Site No	Site code	Grid reference	Location
1	MWH000380	E1712475 N5633431	Mangawhero Stream: upstream of wastewater treatment plant's discharge
5	MWH000490	E1710795 N5632738	Mangawhero Stream: approximately 200 m downstream of rail bridge
8	WGG000665	E1709784 N5632049	Waingongoro River: approx 2 km downstream of Mangawhero S. confluence (off Stuart Road)

The 'kick-sampling' and 'vegetation sweep' techniques are very similar to Protocol C1 (hard-bottomed, semi-quantitative) and C2 (soft-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark et al, 2001).



Figure 1 Aerial location map of biomonitoring site locations in the Mangawhero Stream and Waingongoro River in relation to Eltham WWTP and landfill

The 'kick-sampling' and 'vegetation sweep' techniques are very similar to Protocol C1 (hard-bottomed, semi-quantitative) and C2 (soft-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark et al, 2001).

Samples were preserved with Kahle's Fluid for later stereomicroscopic sorting and identification according to documented Taranaki Regional Council methodology and macroinvertebrate taxa abundances scored based on the categories in Table 2.

Table 2 Macroinvertebrate abundance categories

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

Macroinvertebrate Community Index (MCI) values were calculated for taxa present at each site (Stark 1985) with certain taxa scores modified in accordance with Taranaki experience.

A semi-quantitative MCI value, SQMCIs (Stark, 1999) 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 scores, and dividing by the sum of the loading factors. 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).



Where necessary sub-samples of algal and detrital material were also taken from the macroinvertebrate samples at all sites and were scanned under 40-400x magnification to determine the presence or absence of any mats, plumes or dense growths of bacteria, fungi or protozoa ('undesirable biological growths') at a microscopic level. The presence of masses of the organisms is an indicator of organic enrichment within a stream.

## Results

### Site habitat characteristics and hydrology

This spring survey was performed under moderate flow conditions, nine days after a fresh in excess of 3 times median flow and 16 days after a fresh in excess of 7 times median flow in the Waingongoro River.

The water temperatures during the survey were in the range 13.8-14.7 °C. Water levels were moderate and water speed was swift. The water was cloudy for sites 1 and 5 and uncoloured for site 8. Site 1 had brown coloured water, site 5 had grey coloured water and site 8 had uncoloured water. The substrate at the three sites comprised either entirely of hard clay (site 1), a mixture of cobble/boulder (site 5), and gravel/cobble (site 8).

Site 1 had slippery algal mats and filamentous algae were patchy. There was patchy moss and macrophytes growing on the edge of the stream. Site 5 had widespread algal mats and filamentous algae and there was patchy moss and macrophytes on the edge of the river. Site 8 had slippery algal mats and no filamentous algae.

### Macroinvertebrate communities

The results of past biomonitoring surveys performed at the various established stream sites are summarised in Table 1 and illustrated in Figure 2.

**Table 3** Summary of macroinvertebrate taxa numbers and MCI values for previous surveys performed between January 1985 and October 2016

Site No.	N	No of taxa			MCI value			SQMCI <sub>s</sub> value		
		Median	Range	Current survey	Median	Range	Current survey	Median	Range	Current survey
1	53	16	10-25	14	74	58-85	74	4.1	1.5-6.3	2.3
5	48	20	13-30	24	79	63-102	90	3.0	1.5-6.4	4.1
8	44	20	14-30	14	94	77-111	104	4.3	2.4-7.6	7.2

The macroinvertebrate fauna recorded by the current survey at each of the three sites are presented in Table 2.

Table 4 Macroinvertebrate fauna of the Mangawhero Stream (sites 1 and 5) and the Waingongoro River at Stuart Road (site 8) in relation to the Eltham WWTP, sampled on 18 October 2016

Taxa List	Site Number	MCI score	1	5	8
	Site Code		MWH000380	MWH000490	WGG000665
	Sample Number		FWB16235	FWB16236	FWB16237
NEMERTEA	Nemertea	3	R	-	-
NEMATODA	Nematoda	3	-	R	-
ANNELIDA (WORMS)	Oligochaeta	1	VA	A	R
	Lumbricidae	5	-	R	-
MOLLUSCA	<i>Ferrissia</i>	3	-	R	-
	<i>Potamopyrgus</i>	4	A	C	-
CRUSTACEA	<i>Paracalliope</i>	5	C	C	-
	<i>Paranephrops</i>	5	-	R	-
EPHEMEROPTERA (MAYFLIES)	<i>Austroclima</i>	7	C	R	-
	<i>Deleatidium</i>	8	-	A	VA
	<i>Zephlebia group</i>	7	-	-	R
PLECOPTERA (STONEFLIES)	<i>Zelandobius</i>	5	C	C	R
	<i>Zelandoperla</i>	8	-	-	R
COLEOPTERA (BEETLES)	Elmidae	6	-	C	R
MEGALOPTERA (DOBSONFLIES)	<i>Archichauliodes</i>	7	-	R	R
TRICHOPTERA (CADDISFLIES)	<i>Hydropsyche (Aoteapsyche)</i>	4	C	A	C
	<i>Hydrobiosis</i>	5	C	C	C
	<i>Neurochorema</i>	6	-	R	-
	<i>Oxyethira</i>	2	R	-	-
	<i>Pycnocentria</i>	7	-	C	R
	<i>Pycnocentroides</i>	5	-	A	C
DIPTERA (TRUE FLIES)	<i>Aphrophila</i>	5	C	A	R
	<i>Maoridiamesa</i>	3	-	C	R
	Orthocladinae	2	C	A	C
	<i>Polypedilum</i>	3	R	A	-
	Tanytarsini	3	-	A	-
	Empididae	3	R	R	-
	<i>Austrosimulium</i>	3	C	R	-
No of taxa			14	24	14
MCI			74	90	104
SQMCIs			2.3	4.1	7.2
EPT (taxa)			4	8	8
%EPT (taxa)			29	33	57
'Tolerant' taxa		'Moderately sensitive' taxa	'Highly sensitive' taxa		

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

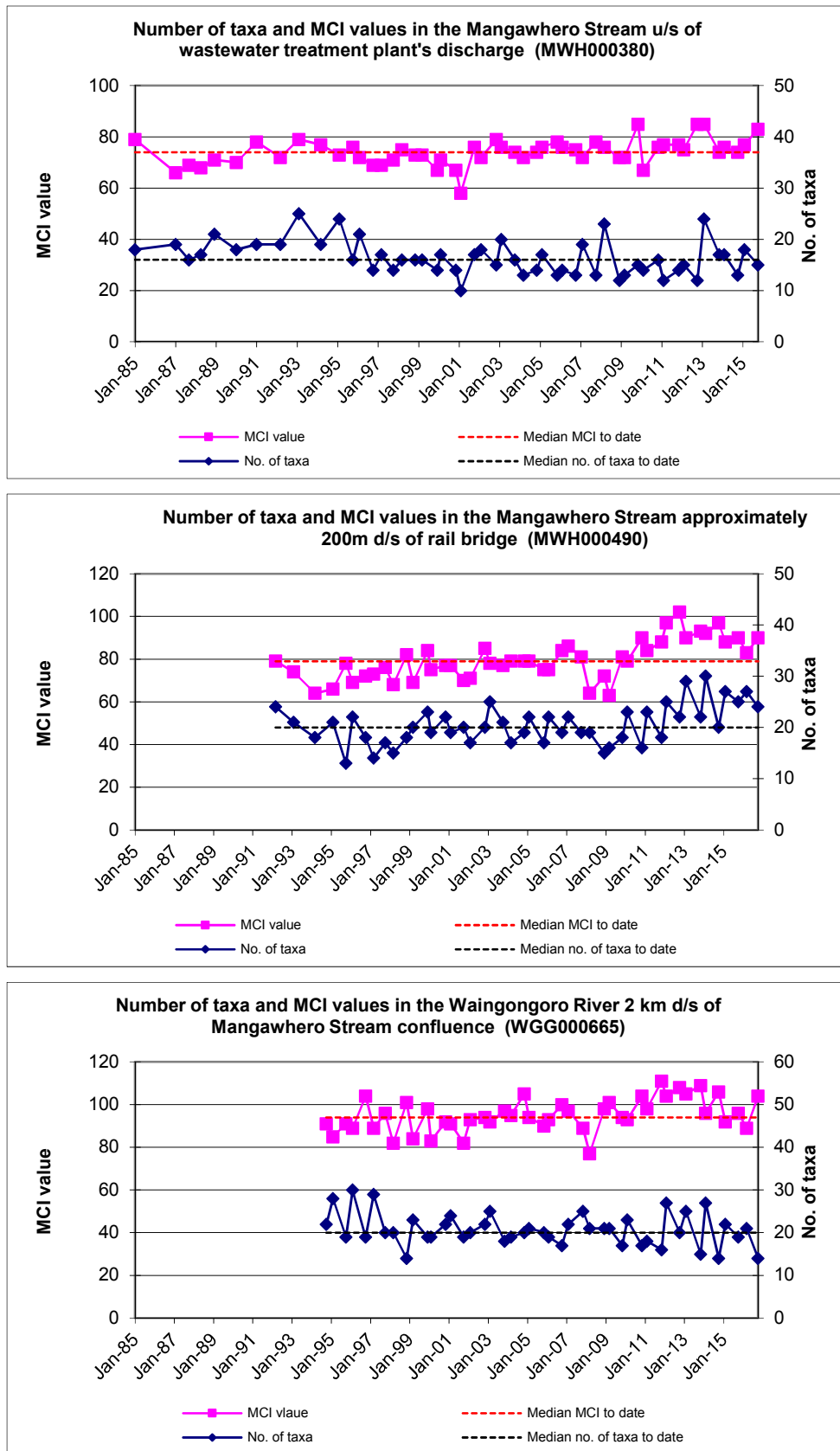


Figure 2 Taxa richness and MCI scores recorded at each site to date for Mangawhero Stream sites

## Site 1 (upstream of the WWTP outfall)

A moderately low macroinvertebrate community richness of 14 taxa was found at site 1 ('control' site) at the time of the spring survey (Table 3).

The MCI score of 74 units indicated a community of 'poor' biological health which was the same score as the median MCI score of 74 units. The SQMCI<sub>s</sub> score of 2.3 units was significantly lower (Stark, 1998) than the median SQMCI<sub>s</sub> score of 4.1 units (Table 3).

The community was characterised by two 'tolerant' taxa [oligochaete worms and snails (*Potamopygus*)] (Table 3).

## Site 5 (downstream of Mangawharawhara Stream confluence; approx 3 km below the WWTP outfall and old landfill)

A moderate macroinvertebrate community richness of 24 taxa was found at site 5 ('primary impacted' site) at the time of the spring survey (Table 3).

The MCI score of 90 units indicated a community of 'fair' biological health but this was significantly higher (Stark, 1998) than the median MCI score of 79 units. The SQMCI<sub>s</sub> score of 4.1 units was also significantly higher than the median SQMCI<sub>s</sub> score of 3.0 units (Table 3).

The community was characterised by five 'tolerant' taxa [oligochaete worms, caddisfly *Hydropsyche*/*Aoteapsyche* and midges (Orthocadiinae, *Polypedilum*, and Tanytarsini)], two 'moderately sensitive' taxa [caddisfly (*Pycnocentria*) and crane fly (*Aphrophila*)] one 'highly sensitive' taxon [mayflies (*Deleatidium*)] (Table 3).

## Waingongoro River site (downstream of the Mangawhero Stream confluence (site 8))

A moderately low macroinvertebrate community richness of 14 taxa was found at site 8 ('secondary impacted' site) at the time of the spring survey (Table 3)

The MCI score of 104 units indicated a community of 'good' biological health which was not significantly different (Stark, 1998) to the median MCI score of 94 units. The SQMCI<sub>s</sub> score of 7.2 units was significantly higher than the median SQMCI<sub>s</sub> score of 4.3 units (Table 3).

The community was characterised by one extremely abundant 'highly sensitive' taxon [mayflies (*Deleatidium*)] (Table 3).

## Microscopic streambed heterotrophic assessment

The microscopic heterotrophic assessments of substrate growths performed for all sites indicated an absence of any mats, plumes or dense growths of heterotrophic organisms at each of the three sites.

## Discussion and conclusions

The 'impacted' sites had higher macroinvertebrate indices than the 'control' site. This would largely be due to both 'impacted' sites having better physical stream habitat conditions for macroinvertebrates. For example, the cobble/boulder and gravel/boulder substrates of sites 5 and 8 respectively provide superior macroinvertebrate habitat compared with the hard clay of site 1. The median values for both taxa number, MCI and SQMCI<sub>s</sub> support this observation.

The removal of WWTP wastes from the Mangawhero Stream has probably contributed to the higher than normal MCI and SQMCI<sub>s</sub> score at site 5 and the higher than normal SQMCI<sub>s</sub> score at site 8. This contrasts with

the 'control' site which had a typical MCI score of 74 units and significantly worse SQMCI<sub>5</sub> score as it was dominated by 'tolerant' taxa.

There has been a noticeable improvement in MCI scores at site 5 and to a slightly lesser extent site 8 since waste water discharges were stopped in mid 2011 (Figure 2). The lack of any significant difference at site 8 between the current survey MCI score and the historical median was presumably due to the site being further away from the discharge point and diluted by the Waingongoro River. Therefore, historic waste discharges presumably had less of an affect on the macroinvertebrate community present at the site making a significant improvement less likely.

No impacts of leachate from the old landfill on the macroinvertebrate community of the lower Mangawhero Stream site were indicated by the results of this spring survey.

The results of the current survey support the current situation where no WWTP discharges are currently entering the Mangawhero Stream and therefore the two downstream sites are not being impacted by the Eltham WWTP. Differences among sites largely reflect habitat differences.

## Summary

The Councils 'kick-sampling' technique was used at two sites and a combination of 'kick-sampling' and 'sweep netting' used at one site to collect macroinvertebrates from two sites on the Mangawhero Stream and one site on the Waingongoro River for the spring survey at the Eltham waste water treatment plant. This has provided data to assess whether discharges have had an affect on the macroinvertebrate communities present in the Mangawhero Stream and Waingongoro River. Samples were processed to provide number of taxa (richness), MCI, and SQMCI<sub>5</sub> scores for each site.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of nutrient enrichment in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The SQMCI<sub>5</sub> takes into account taxa abundances as well as sensitivity to pollution. Significant differences in either the taxa richness, MCI or the SQMCI<sub>5</sub> between sites may indicate the degree of adverse effects (if any) of the discharge being monitored.

The 'impacted' sites had higher macroinvertebrate indices than the 'control' site. This would be due to both 'impacted' sites having better physical stream habitat conditions for macroinvertebrates. Site 5 showed an improvement for MCI and SQMCI<sub>5</sub> scores compared with the historical median and site 8 showed an improvement for the SQMCI<sub>5</sub> score compared with the historical median which was probably a reflection of the lack of discharges from the Eltham WWTP.

Overall, there was no evidence that leachate from the Eltham WWTP or from the closed landfill site for the current monitoring period was having any impact on the macroinvertebrate communities of the Mangawhero Stream and Waingongoro River.

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**To** Job manager, Rae West  
**From** Scientific Officer, Darin Sutherland  
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**Report** DS061  
**Date** 3 April 2017

## Biomonitoring of the Mangawhero Stream and Waingongoro River in relation to the South Taranaki District Council's Eltham Wastewater Treatment Plant System and rubbish tip leachate discharge, February 2017

### Introduction

This summer survey was the second of two surveys programmed for the 2016-2017 monitoring period. Since summer 2011, biomonitoring surveys in the Mangawhero Stream have been reduced from four sites to two sites in recognition of the minimal usage of the WWTP consented overflow facility to the Mangawhero Stream in recent years. No overflows to the stream have occurred since this time.

### Method

This survey was performed some six and a half years after commissioning of the pipeline for conveyance of the Eltham WWTP wastewater to the Hawera WWTP and the cessation of the discharge of partially treated wastewater into the Waingongoro catchment. No (consented) overflows from the WWTP to the Mangawhero Stream had occurred during this period, nor were occurring at the time of the survey. In recognition of the successful diversion of the wastewater, recent surveys have been reduced (by two sites in the Mangawhero Stream) from the previous intensity (see CF528 and other references) and will continue at this level in order to address temporal stream and river 'health' recovery. Current biomonitoring sites are presented in Table 1.

The standard '400 ml kick sampling' technique was used to collect streambed (benthic) macroinvertebrates from site 5 in the Mangawhero Stream and a combination of 'kick sampling' and 'sweep netting' at site 1 in the Mangawhero Stream on 14 February 2017. Two sites in the Waingongoro River (illustrated in Figure 1) and an additional site, established in the river (site 8) approximately 2 km further downstream for monitoring use in conjunction with the Riverlands Eltham Ltd discharges, and the state of the environment monitoring programme, were also sampled on 1 March 2016.

Table 1 Biomonitoring sites in the Mangawhero Stream and Waingongoro River in relation to the South Taranaki District Council's Eltham Wastewater Treatment Plant System and Rubbish Tip leachate discharge

Site No	Site code	Grid reference	Location
1	MWH000380	E1712475 N5633431	Mangawhero Stream: upstream of wastewater treatment plant's discharge
5	MWH000490	E1710795 N5632738	Mangawhero Stream: approximately 200 m downstream of rail bridge
6	WGG000620	E1710708 N5632961	Waingongoro River: approx 150 m upstream of Mangawhero S. confluence
7	WGG000640	E1710554 N5632790	Waingongoro River: approx 200 m downstream of Mangawhero S. confluence
8	WGG000665	E1709784 N5632049	Waingongoro River: approx 2 km downstream of Mangawhero S. confluence (off Stuart Road)

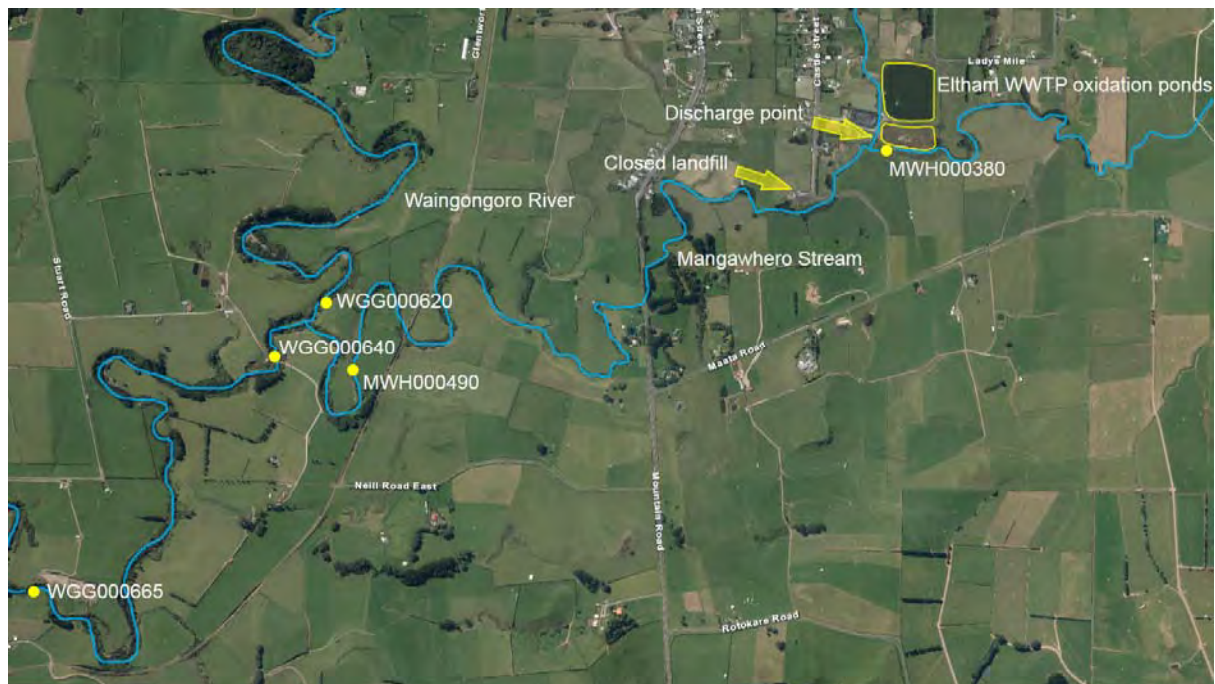


Figure 1 Aerial location map of biomonitoring site locations in the Mangawhero Stream and Waingongoro River in relation to Eltham WWTP and landfill

This 'kick-sampling' technique is very similar to Protocol C1 (hard-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark et al, 2001).

Samples were preserved with Kahle's Fluid for later stereomicroscopic sorting and identification according to documented Taranaki Regional Council methodology and macroinvertebrate taxa abundances scored based on the categories in Table 2.

Table 2 Macroinvertebrate abundance categories

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

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 (Table 3). The MCI is a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. More 'sensitive' communities inhabit less polluted waterways. A difference of 11 units or more in MCI values is considered significantly different (Stark 1998).

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 and 1999). The loading factors were 1 for rare (R), 5 for common (C), 20 for abundant (A), 100 for very abundant (VA) and 500 for extremely abundant (XA). Unlike the MCI, the SQMCI<sub>s</sub> is not multiplied by a scaling factor of 20, so that its corresponding range of values is 20x lower. A difference of 0.9 units or more in SQMCI<sub>s</sub> values is considered significantly different (Stark 1998).

Table 3 Macroinvertebrate health based on MCI ranges which has been adapted for Taranaki streams and rivers (TRC, 2015) from Stark's classification (Stark, 1985, Boothroyd and Stark, 2000, and Stark and Maxted, 2007)

Grading	MCI
Excellent	> 140
Very Good	120-140
Good	100-119
Fair	80-99
Poor	60-79
Very Poor	<60

Where necessary sub-samples of algal and detrital material were also taken from the macroinvertebrate samples at all sites and were scanned under 40-400x magnification to determine the presence or absence of any mats, plumes or dense growths of bacteria, fungi or protozoa ('undesirable biological growths') at a microscopic level. The presence of masses of the organisms is an indicator of organic enrichment within a stream.

## Results

### Site habitat characteristics and hydrology

This summer survey was performed under low flow conditions (approximate 550 l/s) approaching MALF (443 l/s), 22 days after a fresh in excess of 3 times median flow and 23 days after a fresh in excess of 7 times median flow in the Waingongoro River (flow gauging site: Waingongoro River at Eltham). The survey followed a typical summer period with only one significant fresh and three minor freshes recorded over the preceding month.

For the Mangawhero Stream sites the water temperatures during the survey were in the range 17.5-17.6 °C. Water speed was steady and the water was uncoloured and cloudy at site 1 and grey and cloudy at site 5. The substrate at site 1 was mostly hard clay while at site 5 it was a mixture of fine and coarse gravels, cobble and boulder. Site 1 had no algal mats or filamentous algae. There were moss and patchy leaves on the streambed. Site 5 had patchy algal mats and widespread filamentous algae. There were macrophytes growing on the edge of the stream. Site 1 had partial shading from overhanging vegetation and site 5 had no shading.

For the Waingongoro River sites the water temperatures during the survey were in the range 17.7-19.1 °C. Water speed was swift and the water was uncoloured and cloudy. The substrate at all three sites comprised predominately cobble/ coarse gravel. Site 6 had patchy algal mats and filamentous algae. There was moss and patchy leaves on the streambed. Site 7 also had had patchy algal mats and filamentous algae. There were also patchy leaves on the streambed. Site 8 had widespread algal mats and patchy filamentous algae. There was patchy moss on the streambed. Site 6 and 7 had partial shading from overhanging vegetation while site 8 had no shading.

### Macroinvertebrate communities

The results of past biomonitoring surveys performed at the various established stream sites are summarised in Table 4 and illustrated in Figure 2.

**Table 4** Summary of macroinvertebrate taxa numbers and MCI values for previous surveys performed between January 1985 and February 2017

Site No.	N	No of taxa			MCI value			SQMCI <sub>s</sub> value		
		Median	Range	Current survey	Median	Range	Current survey	Median	Range	Current survey
1	54	16	10-25	21	74	58-85	77	4.1	1.5-6.3	4.5
5	49	20	13-30	21	79	63-102	80	3.0	1.5-6.4	4.2
6	30	27	16-35	16	95	77-116	111	5.6	3.7-6.5	6.8
7	30	26	17-35	22	92	78-109	95	4.5	2.2-7.0	5.5
8	45	20	14-30	20	94	77-111	101	4.3	2.4-7.6	4.8

The macroinvertebrate fauna recorded by the current survey at each of the five sites are presented in Table 5.

Table 5 Macroinvertebrate fauna of the Mangawhero Stream (sites 1 and 5) and the Waingongoro River (sites 6, 7 and 8) in relation to the Eltham WWTP, sampled on 14 February 2017

Taxa List	Site Number	MCI score	1	5	6	7	8
	Site Code		MWH000380	MWH000490	WGG000620	WGG000640	WGG000665
	Sample Number		FWB17060	FWB17061	FWB17055	FWB17056	FWB17057
NEMERTEA	Nemertea	3	-	C	-	R	-
ANNELIDA (WORMS)	Oligochaeta	1	R	C	-	R	R
	Lumbricidae	5	R	-	-	-	-
MOLLUSCA	Physa	3	-	R	R	-	-
	Potamopyrgus	4	VA	VA	VA	R	C
CRUSTACEA	Ostracoda	1	C	R	-	-	-
	Paracalliope	5	XA	VA	-	-	-
	Talitridae	5	-	C	-	R	-
EPHEMEROPTERA (MAYFLIES)	Austroclima	7	A	-	R	A	R
	Coloburiscus	7	R	-	C	C	R
	Deleatidium	8	R	-	XA	VA	VA
	Nesameletus	9	-	-	C	-	R
	Zephlebia group	7	C	-	-	R	-
PLECOPTERA (STONEFLIES)	Zelandobius	5	-	-	-	R	-
COLEOPTERA (BEETLES)	Elmidae	6	-	A	C	C	R
	Hydraenidae	8	-	-	R	-	R
MEGALOPTERA (DOBSONFLIES)	Archichauliodes	7	-	C	C	C	C
TRICHOPTERA (CADDISFLIES)	Hydropsyche (Aoteapsyche)	4	C	VA	VA	VA	VA
	Costachorema	7	-	R	C	-	C
	Hydrobiosis	5	C	C	A	A	C
	Beraeoptera	8	-	-	-	R	-
	Oxyethira	2	R	R	-	-	-
	Paroxyethira	2	R	-	-	-	-
	Pycnocentria	7	-	C	-	-	-
	Pycnocentroides	5	-	C	C	C	R
DIPTERA (TRUE FLIES)	Aphrophila	5	R	R	-	A	A
	Chironomus	1	R	-	-	-	-
	Maoridiamesa	3	R	C	R	C	VA
	Orthocladiinae	2	A	A	-	C	A
	Polypedilum	3	R	-	-	C	-
	Tanytarsini	3	R	A	R	A	A
	Empididae	3	-	C	R	C	C
	Muscidae	3	R	C	-	-	R
	Austrosimulium	3	VA	-	-	C	-
	Tanyderidae	4	-	-	-	-	R
	No of taxa		21	21	16	22	20
	MCI		77	80	111	95	101
	SQMCI		4.5	4.2	6.8	5.5	4.8
	EPT (taxa)		6	5	8	9	8
	%EPT (taxa)		29	24	50	41	40
'Tolerant' taxa		'Moderately sensitive' taxa	'Highly sensitive' taxa				

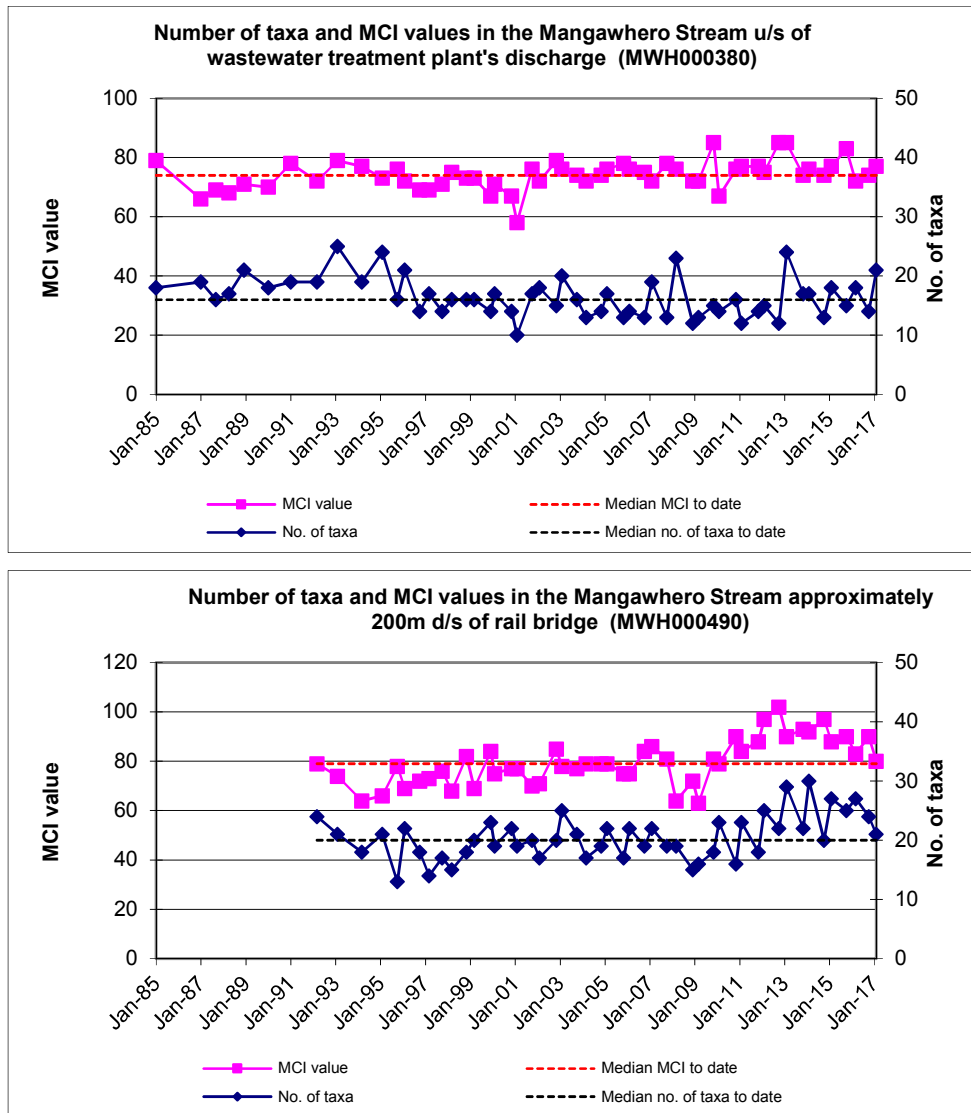


Figure 2 Taxa richness and MCI scores recorded at each site to date for Mangawhero Stream sites

### Site 1 (upstream of the WWTP outfall)

A moderate macroinvertebrate community richness of 21 taxa was found at site 1 (Mangawhero Stream 'control' site) at the time of the summer survey (Table 4) which was slightly higher than the historic median of 16 taxa.

The MCI score of 77 units indicated a community of 'poor' biological health but this was not significantly different (Stark, 1998) to the median MCI score of 74 units. The SQMCI<sub>s</sub> score of 4.5 units was also not significantly different to the median SQMCI<sub>s</sub> score of 4.1 units (Table 4).

The community was dominated by three 'tolerant' taxa [snail (*Potamopygus*), midge (Orthoclaadiinae) and sandfly (*Austrosimulium*], and two 'moderately sensitive' taxa [amphipod (*Paracalliope*) and mayfly (*Austroclima*)] (Table 5).

## Site 5 (downstream of Mangawharawhara Stream confluence; approx 3 km below the WWTP outfall and old landfill)

A moderate macroinvertebrate community richness of 21 taxa was found at site 5 ('primary impact' site) at the time of the survey (Table 4) which was very similar to the historic median score of 20 taxa.

The MCI score of 80 units indicated a community of 'fair' biological health which was not significantly different (Stark, 1998) to the median MCI score of 79 units. However, this was the lowest MCI score recorded at the site since the removal of discharges from the Eltham WWTP and scores appear to be deteriorating over the last four years. The SQMCI<sub>5</sub> score of 3.4 units was also not significantly higher (Stark, 1998) than the median SQMCI<sub>5</sub> score of 3.0 units (Table 4).

The community was dominated by three 'tolerant' taxa [snail (*Potamopygus*), caddisfly (*Hydropsyche/Aoteapsyche*), and midges (Orthocladinae and Tanytarsini)] and two 'moderately sensitive' taxa [amphipod (*Paracalliope*) and elmids beetles] (Table 5).

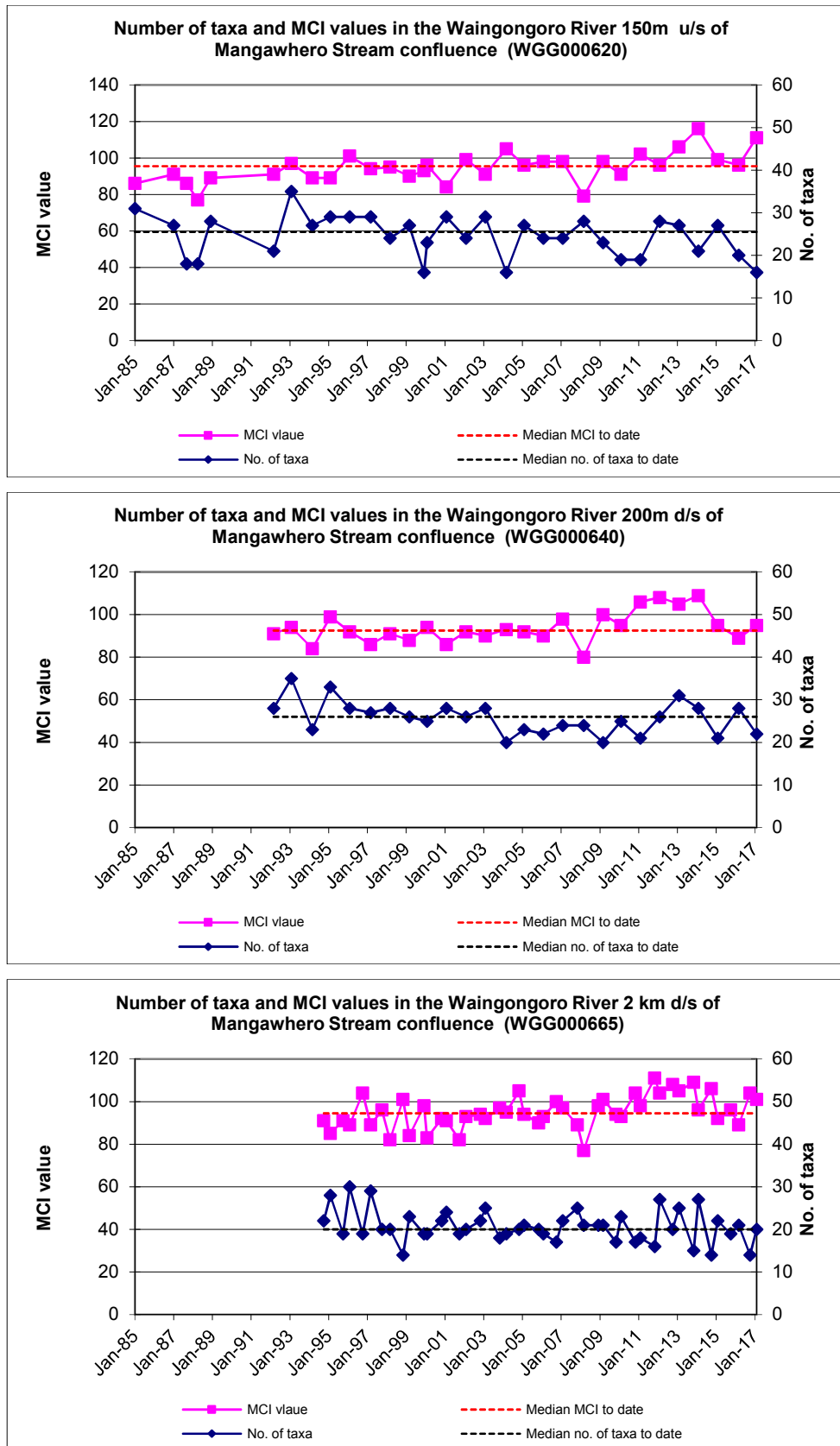


Figure 3 Taxa richness and MCI scores recorded at each site to date for Waingongoro River sites



## Waingongoro River site (Upstream of Mangawhero River confluence (site 6))

A moderate macroinvertebrate community richness of 16 taxa was found at site 6 (Waingongoro River 'control' site) at the time of the survey (Table 4) which was substantially lower than the median taxa richness of 27 taxa.

The MCI score of 111 units indicated a community of 'good' biological health which was significantly higher (Stark, 1998) than the median MCI score of 95 units. The SQMCI<sub>s</sub> score of 6.8 units was also significantly higher than the median SQMCI<sub>s</sub> score of 5.6 units (Table 4).

The community was dominated by two 'tolerant' taxa [snail (*Potamopygus*) and caddisfly (*Hydropsyche/Aoteapsyche*)], one moderately sensitive 'taxon' [caddisfly (*Hydrobiosis*)], and a 'highly sensitive' taxon [mayfly (*Deleatidium*)] (Table 5).

## Waingongoro River site (Downstream of Mangawhero River confluence (site 7))

A moderate macroinvertebrate community richness of 22 taxa was found at site 7 ('secondary impact' site) at the time of the survey (Table 4) which was slightly lower than the median taxa richness of 26 taxa.

The MCI score of 95 units indicated a community of 'fair' biological health which was not significantly different (Stark, 1998) to the median MCI score of 92 units. The SQMCI<sub>s</sub> score of 5.5 units was however significantly higher (Stark, 1998) than the median SQMCI<sub>s</sub> score of 4.5 units (Table 4).

The community was dominated by two 'tolerant' taxa [caddisfly (*Hydropsyche/Aoteapsyche*) and midge (Tanytarsini)], three 'moderately sensitive' taxa [mayfly (*Austroclima*), caddisfly (*Hydrobiosis*) and crane fly (*Aphrophila*)] and one 'highly sensitive' taxon [mayfly (*Deleatidium*)] (Table 5).

## Waingongoro River site (downstream of the Mangawhero Stream confluence (site 8))

A moderate macroinvertebrate community richness of 20 taxa was found at site 8 ('tertiary impact site) at the time of the survey (Table 4) which was equal to the median taxa richness.

The MCI score of 101 units indicated a community of 'good' biological health which was not significantly different (Stark, 1998) to the median MCI score of 94 units. The SQMCI<sub>s</sub> score of 4.8 units was also not significantly different (Stark, 1998) to the median SQMCI<sub>s</sub> score of 4.3 units (Table 4).

The community was dominated by four 'tolerant' taxa [caddisfly (*Hydropsyche/Aoteapsyche*) and midges (*Maoridiamesa*, Orthocladiinae and Tanytarsini)], one 'moderately sensitive' taxon [crane fly (*Aphrophila*)] and one 'highly sensitive' taxon mayfly (*Deleatidium*) (Table 5).

## Microscopic streambed heterotrophic assessment

The microscopic heterotrophic assessments of substrate growths performed for all sites indicated an absence of any mats, plumes or dense growths of heterotrophic organisms at each of the five sites.

## Discussion and conclusions

Taxa richnesses at the Mangawhero Stream sites were within five taxa of historic median levels. The Mangawhero Stream 'control' site had 'poor' health which was typical for the site while the downstream 'impact' site had 'fair' health. The low MCI score at the 'control' site was due to the low quality habitat as the sites' substrate was largely comprised of hard clay which makes poor quality habitat for macroinvertebrates compared with the gravel/cobble substrate at the other four sites. The Mangawhero Stream 'impact' site had an identical taxa richness (21 taxa) to the 'control' site while the MCI score was a non-significant three units higher and SQMCI<sub>s</sub> score 0.3 units lower than the 'control' site scores indicating that there was no difference in the health of the macroinvertebrate community between the two sites at the time of the survey.

The Waingongoro River 'control' site (site 6) had a significantly lower taxa richness (by 11 taxa) compared with the historic median of 27 taxa but the two downstream 'impact' sites taxa richnesses were within four taxa of historical medians indicating relatively normal levels of richness at both sites. MCI scores for the two potentially impacted sites (sites 7 and 8) on the Waingongoro River indicated 'fair' (site 7) or 'good' (site 8) macroinvertebrate community health and were both non-significantly higher than their historical medians, while the 'control' site score was significantly higher than the historical median (by 16 MCI units) and indicated 'good' health. The high 'control' site score resulted in site 7 but not site 8 having a significantly lower MCI score than the 'control' site but this was unlikely to be caused by any impacts at site 7 but rather an atypically high result for the 'control' site.

All five surveyed sites recorded MCI scores either higher than (sites 1, 6, 7 and 8) or not significantly different (site 5 by three units) to the previous summer survey.

There had been a noticeable improvement in MCI scores at site 5 since wastewater discharges were stopped in mid 2011 but unfortunately the current score, though higher than the historical median by one unit, was the lowest recorded MCI score since wastewater discharges stopped (Figure 2). This decrease in condition was unlikely due to the WWTP as no discharges have been recorded but instead could be due to agricultural inputs negating the benefit of the removal of nutrients from the WWTP. Should subsequent surveys see further deterioration, further investigation may be warranted.

Taxa composition was noticeable different between the Mangawhero Stream sites and Waingongoro River sites. The Waingongoro River had more 'highly sensitive' taxa (e.g. *Deleatidium* mayfly) at higher abundances which caused significant differences in SQMCI<sub>s</sub> scores between the two waterbodies. However, there were no significant decreases in score between site 1 and site 5 but there were between sites 6 and 7 and 8 which were largely congruent with the MCI scores. SQMCI<sub>s</sub> scores at all three Waingongoro River sites were all higher than historic medians, with sites 6 and 7 having significantly higher scores.

The results of the current survey largely support the current situation where no WWTP discharges are currently entering the Mangawhero Stream and therefore the three downstream sites are not being impacted by the Eltham WWTP. No significant impacts could be attributed to the closed landfill site but if further deterioration at site 5 occurs in following surveys further investigation may be warranted.

## Summary

The Councils 'kick-sampling' technique was used at one site on the Mangawhero Stream and three sites on the Waingongoro River and a combination of 'kick-sampling' and 'sweep netting' used at one site on the Mangawhero Stream to collect macroinvertebrates for this summer survey in relation to the Eltham waste water treatment plant and a retired landfill site. This has provided data to assess whether discharges from the Eltham WWTP and closed landfill have had an affect on the macroinvertebrate communities present in the Mangawhero Stream and Waingongoro River. Samples were processed to provide number of taxa (richness),

MCI, and SQMCI<sub>5</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>5</sub> takes into account taxa abundances as well as sensitivity to pollution. Significant differences in either the taxa richness, MCI or the SQMCI<sub>5</sub> between sites may indicate the degree of adverse effects (if any) of the discharge being monitored.

Taxa richnesses were either similar to or higher than historical median taxa richnesses except for a drop in richness at the Waingongoro River 'control' site. The MCI and SQMCI<sub>5</sub> scores for the three potentially impacted sites (sites 5, 7 and 8) were all higher than historical medians and there were no significant differences between sites 1 and 5. Site 7 and 8 MCI and SQMCI<sub>5</sub> scores were lower than the Waingongoro River 'control' site but this was due to the 'control' site having significantly higher than normal scores indicating higher than usual macroinvertebrate community health at the 'control' site.

Overall, there was little evidence that leachate from the Eltham WWTP or closed landfill site for the current monitoring period was having any impact on the macroinvertebrate communities present in the Mangawhero Stream and Waingongoro River. However, site 5 appears to be gradually deteriorating in condition. If further deterioration occurs further investigation may be warranted.

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**To** Job Manager, Lorraine Smith  
**From** Scientific Officer, Darin Sutherland  
**Document No** 1894522  
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**Date** 7 July 2017

## Biomonitoring of the Otahi Stream in relation to the closed Opunake landfill leachate discharge, June 2017

### Introduction

The Otahi Stream is a small stream running through the closed Opunake landfill in the township of Opunake. The landfill has been closed for about 16 years and has been re-grassed. The upper reaches of this stream drain farmland between Opua Road and Ihaia Road.

Every two years a macroinvertebrate survey is conducted at two established sampling sites, one above and one below the closed landfill, to assess the effects of any potential leachate from the landfill on macroinvertebrate health.

### Method

The standard '400 ml kick sampling' technique was used to collect streambed (benthic) macroinvertebrates from two established sampling sites in the Otahi Stream (Table 1 and Figure 1) on 8 June 2017 in relation to the discharge of leachate from the close Opunake landfill.

**Table 1** Biomonitoring sites in the Otahi Stream in relation to the Opunake landfill

Site No	Site code	Grid reference	Location
1	OTH000310	E1673233 N5633362	upstream of landfill
2	OTH000350	E1672854 N5633217	upstream of SH45 (downstream of landfill and weir)

This 'kick-sampling' technique is very similar to Protocol C1 (hard-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark et al, 2001).

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 shown in Table 2:

Table 2 Macroinvertebrate abundance categories

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

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams (HBMCI). Recently, a similar scoring system has been developed for macroinvertebrate taxa found in soft bottomed streams (Stark and Maxted, 2004, 2007) (SBMCI). The SBMCI has been used in a number of biomonitoring reports since its inception, and results to date suggest that it is not as effective at assessing the impacts of organic pollution as the HBMCI. For example, results from the February 2008 Mangati survey found a relatively unchanged SBMCI score at a site which had thick growths of sewage fungus (Jansma, 2008b). Therefore this index is considered less appropriate for the assessment of macroinvertebrate communities possibly affected by industrial discharges. Any subsequent reference to MCI refers to the HBMCI.

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 collected 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. A gradation of biological water quality conditions based upon MCI ranges which has been adapted for Taranaki streams and rivers (TRC, 2013) from Stark's classification (Stark, 1985 and Boothroyd and Stark, 2000) (Table 3). More 'sensitive' communities inhabit less polluted waterways. A difference of 10.83 units or more in MCI values is considered significantly different (Stark 1998).

A gradation of biological water quality conditions based upon MCI ranges has been adapted for Taranaki streams and rivers (TRC, 2013) from Stark's classification (Stark, 1985 and Boothroyd and Stark, 2000) (Table 3).

Table 3 Macroinvertebrate health based on MCI ranges which has been adapted for Taranaki streams and rivers (TRC, 2015) from Stark's classification (Stark, 1985, Boothroyd and Stark, 2000, and Stark and Maxted, 2007)

Grading	MCI
Excellent	> 140
Very Good	120-140
Good	100-119
Fair	80-99
Poor	60-79
Very Poor	<60



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 and 1999). The loading factors were 1 for rare (R), 5 for common (C), 20 for abundant (A), 100 for very abundant (VA) and 500 for extremely abundant (XA). Unlike the MCI, the SQMCI<sub>s</sub> is not multiplied by a scaling factor of 20, so that its corresponding range of values is 20x lower. A difference of 0.83 units or more in SQMCI<sub>s</sub> values is considered significantly different (Stark 1998).

Where necessary, sub-samples of periphyton (algae and other micro flora) were also taken from the macroinvertebrate samples and scanned under 40-400x magnification to determine the presence or absence of any mats, plumes or dense growths of bacteria, fungi or protozoa ('undesirable biological growths') at microscopic level. The presence of masses of these organisms can be an indicator of organic enrichment within a stream.

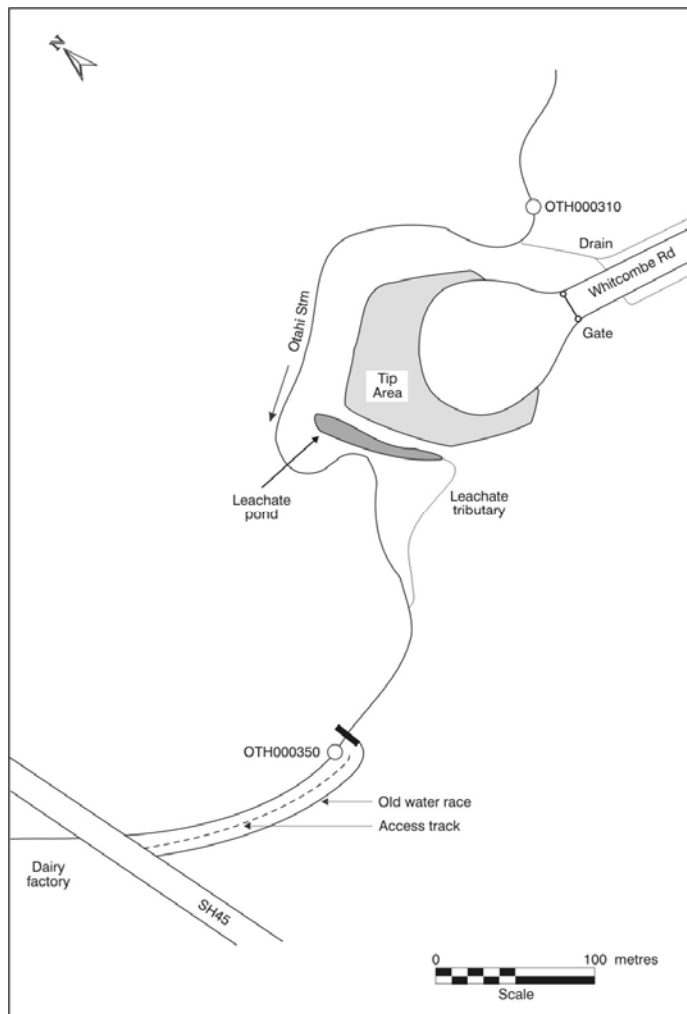


Figure 1 Sampling sites in the Otahi Stream in relation to Opunake landfill

## Results

### Site habitat characteristics and hydrology

Both sites were within the lower reaches of the stream, less than 2 km from the coast, and below 25 m asl in elevation. The Otahi stream is a ringplain stream which is sourced just outside of the National Park boundary. This winter survey was performed under moderate flow conditions (approximately 125% median flow), ten days after a fresh in excess of 3 times median flow and 11 days after a fresh in excess of 7 times median flow (flow gauge on Punehu River at Pihama). The survey followed a wet period with several large freshes far in excess of 7 times median flow recorded over the previous month. The water temperature was 9.5°C at site 1 and 9.0°C at site 2. Site 1 and 2 both had swift flow with uncoloured, clear water.

Substrate at site 1 comprised predominantly of cobbles with some boulder and coarse gravel and small amounts of fine gravel, sand and silt. There were patchy mats and filaments on the substrate and the site was partially shaded from overhanging vegetation. Substrate at site 2 consisted of similar amounts of cobble and coarse gravel with less amounts of sand, boulder, fine gravel and very little silt. There were slippery mats on the substrate and patchy moss. The site was also partially shaded from overhanging vegetation.

### Macroinvertebrate communities

Results from the current survey and previous surveys are summarised in Table 4 and Figure 2 and the more detailed results of the current survey are presented in Table 5.

Table 4 Numbers of taxa and MCI values recorded in the Otahi Stream downstream of MASL, from November 1989 to the current survey

Site No.	N	No of taxa			MCI value			SQMCI <sub>s</sub> value			
		Median	Range	Current survey	Median	Range	Current survey	N	Median	Range	Current survey
1	20	19	15 – 24	17	79	60 – 91	96	11	4.5	3.6 - 5.0	4.3
2	20	21	17 – 24	19	79	68 – 89	95	11	4.7	3.7 - 5.0	4.6

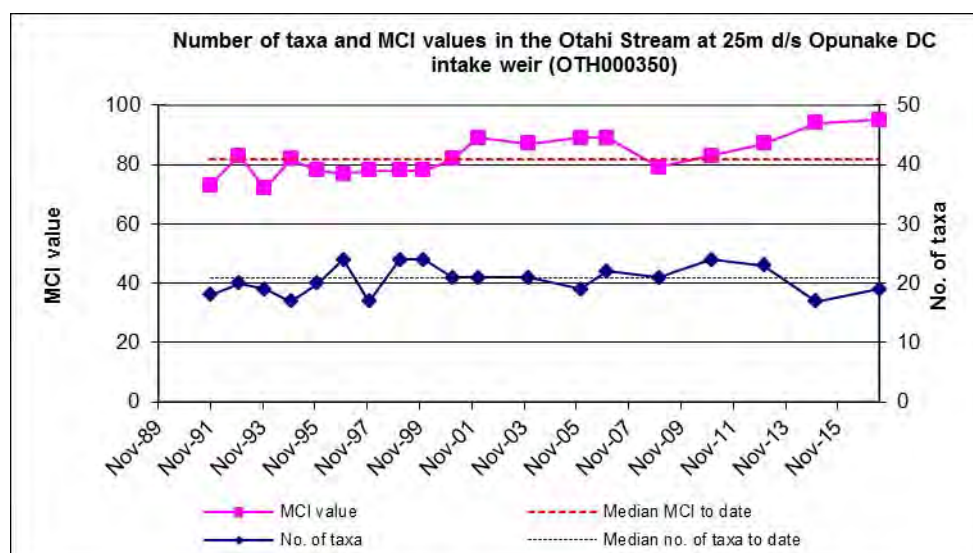
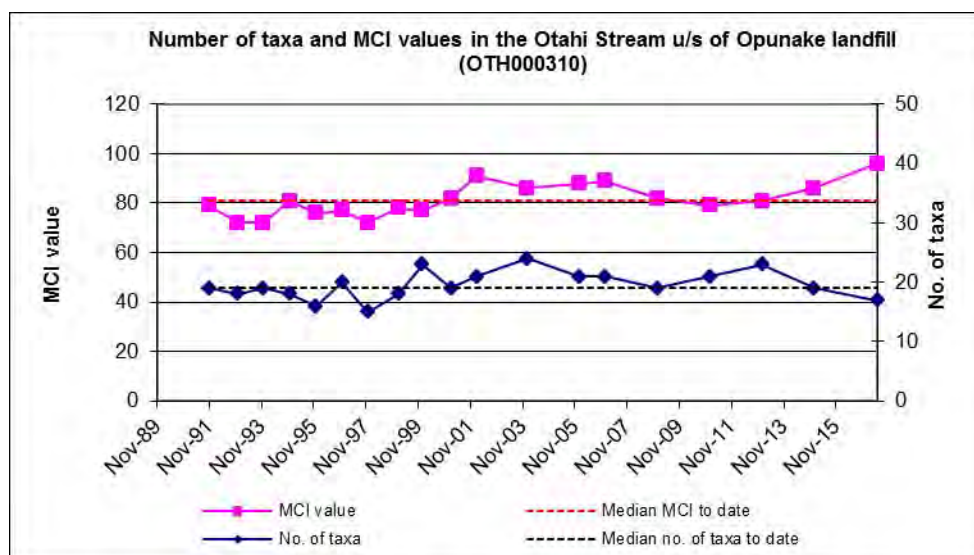


Figure 2 Taxa richness and MCI scores from previous and the current survey at sites upstream and downstream of Opunake landfill

Table 5 Macroinvertebrate fauna of the Otahi Stream in relation to the (closed) Opunake landfill discharges sampled on 8 June 2017

Taxa List	Site Number	MCI score	1	2
	Site Code		OTH000310	OTH000350
	Sample Number		FWB17271	FWB17272
NEMERTEA	Nemertea	3	-	R
NEMATODA	Nematoda	3	-	R
ANNELIDA (WORMS)	Oligochaeta	1	A	R
	Lumbricidae	5	C	R
MOLLUSCA	<i>Potamopyrgus</i>	4	VA	XA
CRUSTACEA	<i>Paracalliope</i>	5	C	A
EPHEMEROPTERA (MAYFLIES)	<i>Austroclima</i>	7	R	C
	<i>Deleatidium</i>	8	A	A
PLECOPTERA (STONEFLIES)	<i>Zelandobius</i>	5	R	R
COLEOPTERA (BEETLES)	Elmidae	6	R	C
MEGALOPTERA (DOBSONFLIES)	<i>Archichauliodes</i>	7	R	C
TRICHOPTERA (CADDISFLIES)	<i>Hydropsyche (Aoteapsyche)</i>	4	A	A
	<i>Hydrobiosis</i>	5	C	C
	<i>Pycnocentria</i>	7	R	C
	<i>Pycnocentrodes</i>	5	VA	XA
DIPTERA (TRUE FLIES)	<i>Triplectides</i>	5	-	R
	<i>Aphrophila</i>	5	A	A
	<i>Maoridiamesa</i>	3	A	C
	Orthocladiinae	2	A	A
	<i>Austrosimulium</i>	3	R	-
No of taxa			17	19
MCI			96	95
SQMCIs			4.3	4.6
EPT (taxa)			7	8
%EPT (taxa)			41	42
'Tolerant' taxa		'Moderately sensitive' taxa	'Highly sensitive' taxa	
R = Rare      C = Common      A = Abundant      VA = Very Abundant      XA = Extremely Abundant				

## Site 1 (OTH000310)

A moderate macroinvertebrate community richness of 17 taxa was found at site 1 at the time of this winter survey. This was two taxa lower than the historical median for this site and to the previous survey on January 2015 (Table 4 and Figure 2).

The MCI score of 96 units indicated a community of 'fair' biological health which was significantly higher (Stark, 1998) than the historical median MCI score (79 units) but not to the preceding survey score (86 units) (Table 4 and Figure 2).

The SQMCI<sub>s</sub> score of 4.3 units was not significantly different (Stark, 1998) to the historical median SQMCI<sub>s</sub> score of 4.5 units and to the previous survey (4.6 units) (Stark, 1998) (Table 4).

A large number of taxa were found in high numbers compared with the relative modest taxa richness found at the site. The community was characterised by five 'tolerant' taxon [oligochaete worms, snail (*Potamopyrgus*), caddisfly (*Hydropsyche-Aoteapsyche*), and midges (*Maoridiamesa* and Orthocladiinae)], two 'moderately sensitive' taxa [stony-cased caddisfly (*Pycnocentrodes*) and crane fly (*Aphrophila*)], and one 'highly sensitive' taxon [mayfly (*Deleatidium*)], (Table 5).

## Site 2 (OTH000350)

A moderate macroinvertebrate community richness of 19 taxa was found at site 2 at the time of this winter survey. This was two taxa lower than the historical median for this site and two taxa higher than the previous survey on January 2015 (Table 4 and Figure 2).

The MCI score of 95 units indicated a community of 'fair' biological health which was significantly higher (Stark, 1998) than the historical median MCI score (79 units) but not to the preceding survey score (94 units) (Table 4 and Figure 2).

The SQMCI<sub>s</sub> score of 4.6 units was not significantly different (Stark, 1998) to the historical median SQMCI<sub>s</sub> score of 4.7 units and to the previous survey (4.8 units) (Stark, 1998) (Table 4).

The community was characterised by three 'tolerant' taxon [snail (*Potamopyrgus*), caddisfly (*Hydropsyche-Aoteapsyche*), and midge (Orthoclaadiinae)], two 'moderately sensitive' taxa [stony-cased caddisfly (*Pycnocentroides*) and crane fly (*Aphrophila*)], and one 'highly sensitive' taxon [mayfly (*Deleatidium*)] (Table 5).

## Microscopic heterotrophic assessment

No visual signs of heterotrophic growths were recorded on the streambed at the time of the survey. No unusual heterotrophic growths were found in the samples from either site in the Otahi Stream upstream and downstream of the closed landfill.

## Discussion and conclusions

Both Otahi Stream sites had moderate macroinvertebrate community richnesses with little community composition variation between sites (only four taxa were not shared out of the reach's total 20 taxa). Taxa richnesses were very similar to historical medians at both sites (within 2 taxa), and to the previous survey (within 2 taxa) at both sites. Taxa richness is the most robust index when ascertaining whether a macroinvertebrate community has been exposed to toxic discharges. Macroinvertebrates when exposed to toxic chemicals may die or deliberately drift downstream thus potentially lowering taxa richness at a site. Many of the dominant taxa are commonly associated with periphyton growths on the stony substrates of the lower reaches of nutrient enriched rivers and streams. Many of these taxa have been dominant on at least 50% of previous survey occasions.

MCI scores indicated that the macroinvertebrate communities were in 'fair' health with no significant difference between sites, or compared with the preceding survey. Both sites had scores significantly higher MCI scores than historic medians which possibly indicated that when the landfill was open it did have an impact on macroinvertebrates and scores have since improved after its closure. There were also no significant differences in SQMCI<sub>s</sub> scores (4.3 and 4.6 units) between the two sites as reflected in the similar community compositions.

The relative similarity in sites' scores was indicative of no recent impacts of rubbish tip leachate seepage discharges on the macroinvertebrate fauna of the Otahi Stream.

## Summary

The Council's standard 'kick-sampling' technique was used at two established sites to collect streambed macroinvertebrates from the Otahi 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, particularly if non-organic impacts are occurring.

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

This winter macroinvertebrate survey indicated that any discharges of leachate from the closed Opunake landfill site had not had any recent detrimental effects on the macroinvertebrate communities of the Otahi Stream. No significant changes in the macroinvertebrate communities were found between the upstream 'control' site and the site downstream of the landfill discharge.

The macroinvertebrate communities of the stream contained relatively high proportions of 'tolerant' taxa at both sites, typical of the lower reaches of ringplain streams. The communities were generally dominated by a combination of several 'moderately sensitive' and 'tolerant' taxa. Taxonomic richnesses (numbers of taxa) at the time of this winter survey were slightly lower in comparison with the historic median. MCI scores indicated that the stream communities were of 'fair' health which was typical for lowland coastal streams draining farmland in Taranaki.

Overall, the macroinvertebrate indices examined indicated that there was no recent impacts of rubbish tip leachate seepage discharges on the macroinvertebrate fauna of the Otahi Stream.

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