South Taranaki District Council

Eltham, Hawera, Kaponga, Manaia, Patea, Opunake and Otakeho Landfills

Monitoring Programme

Annual Report

2017-2018

Technical Report 2018-30

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Executive summary

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 2017 to June 2018 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess STDC's environmental and consent compliance 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, Hawera, Kaponga, Manaia, Opunake and Patea landfills. Triennial monitoring of the Otakeho 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.

STDC holds 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 consents include a total of 63 conditions setting out the requirements that STDC must satisfy.

To monitor compliance with these conditions during the 2017-2018 year, Council staff conducted 11 inspections, took 26 discharge and receiving environment samples, and conducted two biomonitoring surveys.

One incident was recorded by the Council in regards to these landfill sites during the monitoring year. This was in relation to the closed Opunake landfill. At an inspection, water troughs were found to be overflowing, causing ponding on the cap. This non-compliance with consent was resolved promptly.

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

During the year, STDC demonstrated a good level of environmental and good level of administrative performance in relation to the Hawera and Opunake 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 Otakeho closed landfill consents.

For reference, in the 2017-2018 year, consent holders were found to achieve a high level of environmental performance and compliance for 76% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 20% of the 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 high level in the year under review.

This report includes recommendations for the 2018-2019 year.

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1 Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is for the period July 2017 to June 2018 by the Taranaki Regional Council (the Council) on the monitoring programme 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, Kaponga, Manaia, Opunake, and Patea landfills. The monitoring programmes in place for the Kaponga and Otakeho closed landfills are intermittent programmes, implemented on a triennial basis. The programme for the Kaponga closed landfill was implemented during the year under review. The programme for Otakeho will next be implemented in the 2018-2019 year.

One of the intents of the *Resource Management Act 1991* (RMA) is that environmental management should be integrated across all media, so that a consent holder's use of water, air, and land should be considered from a single comprehensive environmental perspective. Accordingly, the Council generally implements integrated environmental monitoring programmes and reports the results of the programmes jointly. This report discusses the environmental effects of STDC's use of water, land and air, and is the 29th combined annual report by the Council for STDC.

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 though annual programmes;
- a summary of the resource consents held by STDC for the closed landfills in their district; 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.

Subsection 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.

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

Subsection 4 presents recommendations to be implemented in the 2018-2019 monitoring year.

Section 9 contains a summary of recommendations to be implemented in the 2018-2019 monitoring year.

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

1.1.3 The Resource Management Act 1991 and monitoring

The RMA primarily addresses environmental 'effects' which are defined as positive or adverse, temporary or permanent, past, present or future, or cumulative. Effects may arise in relation to:

a. the neighbourhood or the wider community around an activity, and may include cultural and social-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); and
e. risks to the neighbourhood or environment.

In drafting and reviewing conditions on discharge permits, and in implementing monitoring programmes, the Council is recognising the comprehensive meaning of 'effects' inasmuch as is appropriate for each activity. Monitoring programmes are not only based on existing permit conditions, but also on the obligations of the RMA to assess the effects of the exercise of consents. In accordance with Section 35 of the RMA, the Council undertakes compliance monitoring for consents and rules in regional plans, and maintains an overview of the performance of resource users and consent holders. Compliance monitoring, including both activity and impact monitoring, enables the Council to 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 STDC. 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 consent holder 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 STDC'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 interpretation, are as follows:

Environmental Performance

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

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

For example:

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

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

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

Administrative performance

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

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

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

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

For reference, in the 2017-2018 year, consent holders were found to achieve a high level of environmental performance and compliance for 76% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 20% of the consents, a good level of environmental performance and compliance was achieved.

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 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 Resource consents

STDC holds 10 resource consents the details of which are summarised in the table below.

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 Managwhero Stream in the Waingongoro catchment	-	1 June 2023
Hawera	0444-4	To discharge up to 2,800 m^3/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	-	Expired - S.124 Protection
	5831-2	To divert an unnamed tributary of the Tawhiti Stream	June 2019	1 June 2034
Kaponga	3459-3	To discharge stormwater and leachate from the former Kaponga landfill site into an unnamed tributary of the Waiokura Stream	-	1 June 2023
Manaia	3952-2	To discharge leachate and stormwater from the closed Manaia landfill and from composting operations into the Waiokura 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

Landfill site	Consent no.	Purpose	Review	Expiry
	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 air from the Patea municipal landfill		1 June 2022

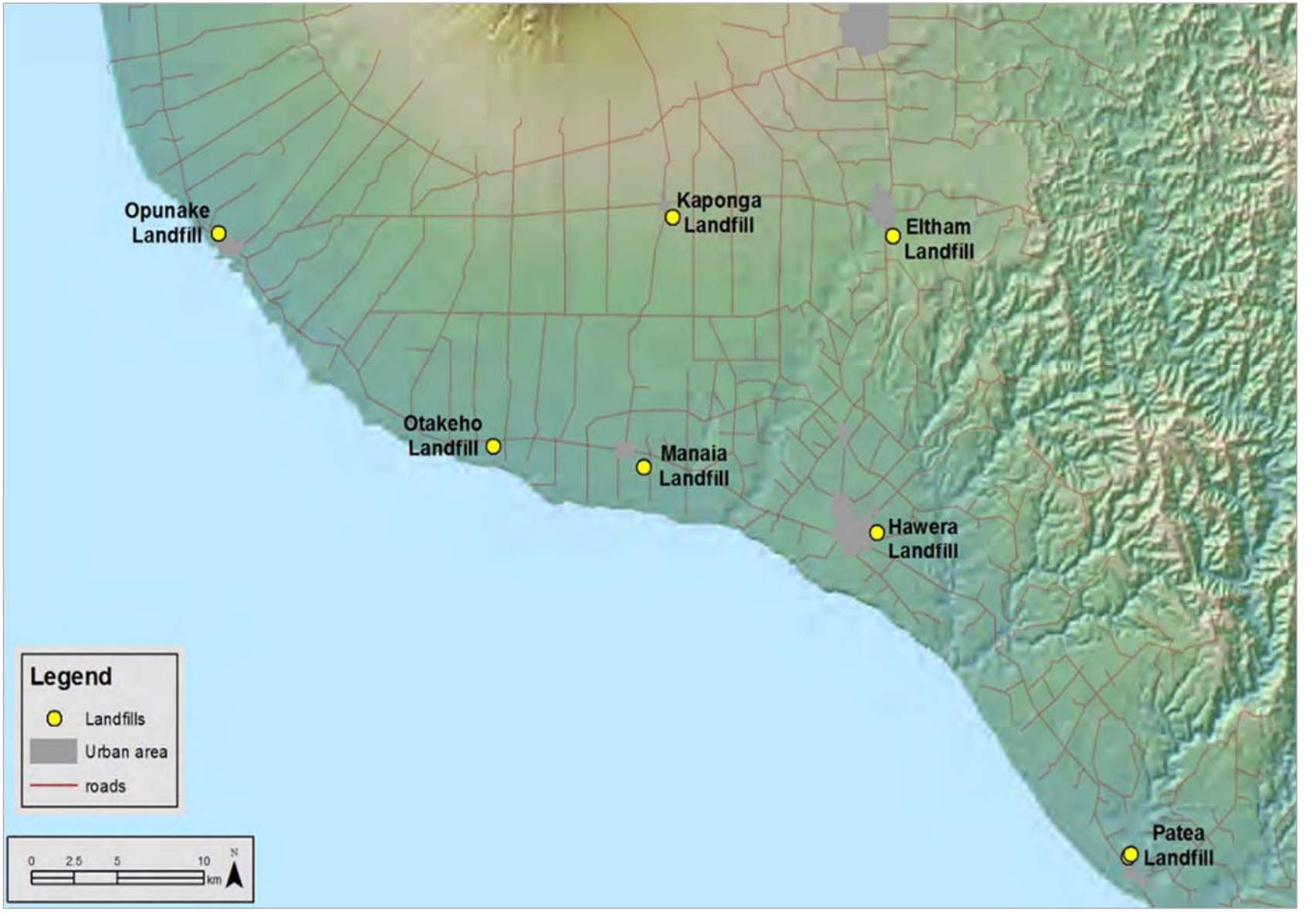

Figure 1 Regional map of STDC landfills

1.4 Monitoring programme

1.4.1 Introduction

Section 35 of the RMA sets 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	4	0
Hawera	Tawhiti	0	1	9
Kaponga	Waiokura	0	1	1
Manaia	Waiokura	0	2	6
Otakeho	Taikatu	Next monitored 2019-2020		
Opunake	Otahi	0	3	4
Patea	Patea	0	3	6
Total		**2**	**14**	**26**

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 14 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 26 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/wastewater treatment plant programmes to assess if the discharges of leachate and stormwater were having any 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 Street, 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 access any impact from the landfill on the stream. Generally no deterioration in water quality was found when comparing upstream and downstream sites.

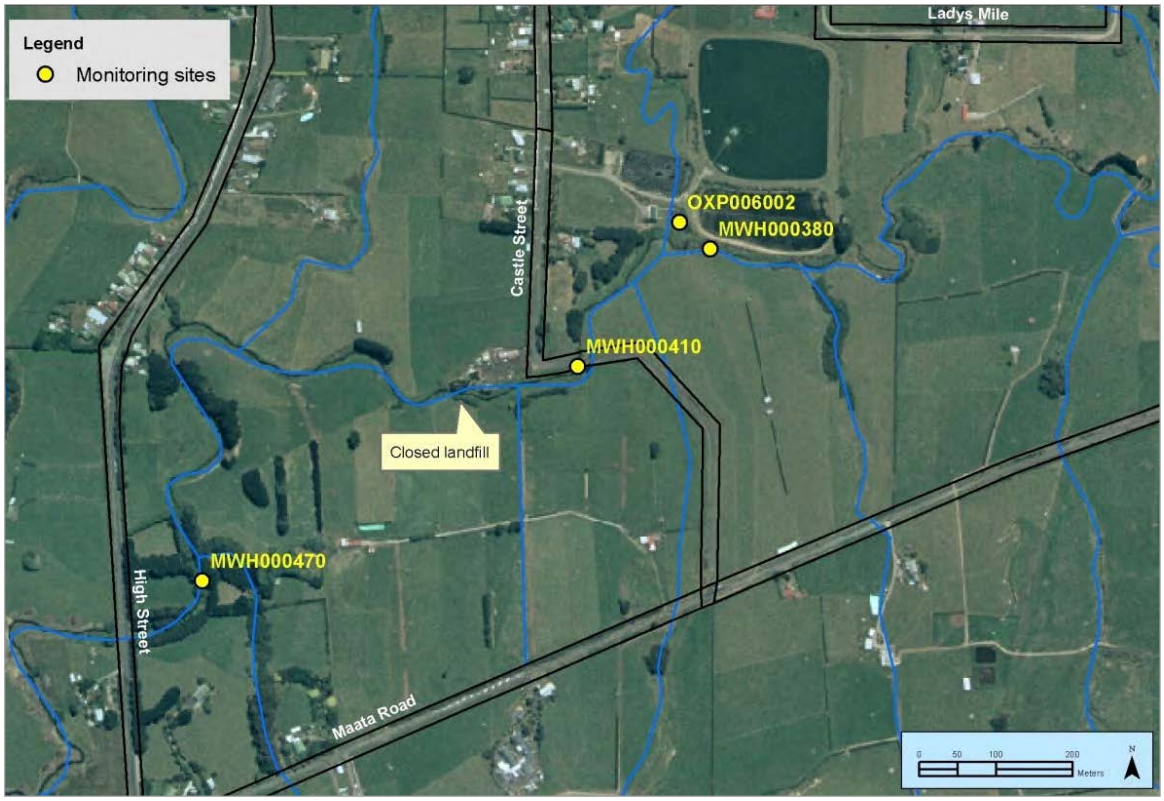

Figure 2 Eltham landfill and sampling sites

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

2.2 Resource consents

2.2.1 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.

2.3 Results

2.3.1 Inspections

6 April 2018

An inspection was carried out at the closed Eltham landfill. There appeared to be no issue with slumping or leachate entering the stream. The cap remained fully intact and was well grassed.

Although only one compliance monitoring inspection per year is scheduled, the site is visually inspected four times a year in conjunction with the Eltham wastewater treatment plant compliance monitoring inspections, and any issues recorded. There were no issues found during the year under review.

2.3.2 Biomonitoring

Two biomonitoring surveys were undertaken during the period under review, which were conducted in November 2017 and March 2018. 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.

2.3.3 Investigations, interventions, and incidents

In the 2017-2018 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 the Eltham landfill or provisions in Regional Plans.

2.4 Discussion

2.4.1 Discussion of site 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.

2.4.2 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.

2.4.3 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 consent 3387-3

Purpose: ***To discharge stormwater and leachate from the former Eltham landfill site into the Mangawhero Stream***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
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	No further opportunity for review	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**
Overall assessment of administrative performance in respect of this consent		**High**

N/A = not applicable

During the 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.

2.4.4 Recommendations from the 2016-2017 Annual Report

1. THAT in the first instance the monitoring of discharges from the closed landfill at Eltham in the 2017-2018 year 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.

2.4.5 Alterations to monitoring programmes for 2018-2019

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 2018-2019, 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 2018-2019

2.5 Recommendations

1. THAT in the first instance, the monitoring of discharges from the closed landfill at Eltham continues at the same level as in 2017-2018.
2. THAT should there be any issues with environmental or administrative performance in the 2018-2019, 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 3. 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 2 (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.

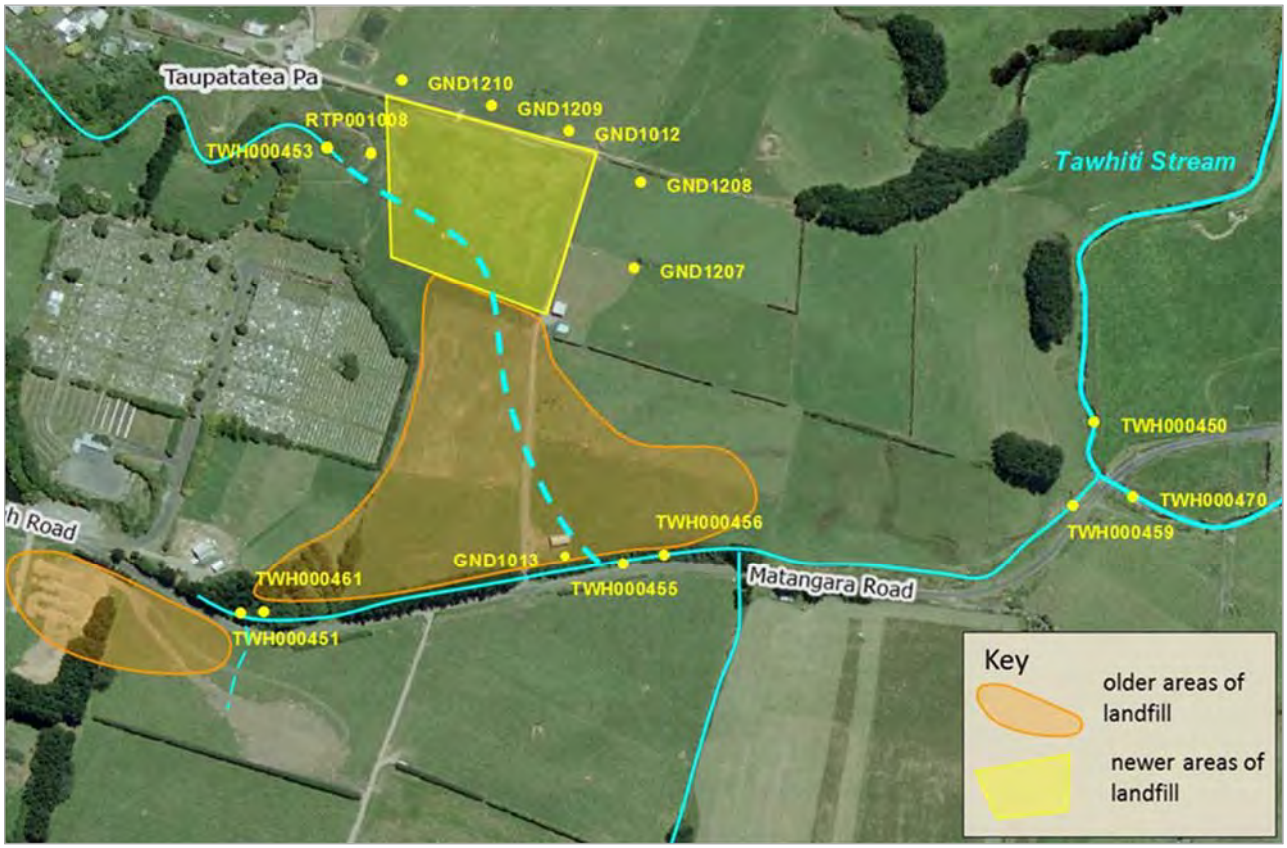

Figure 3 Aerial view of Hawera landfill and sampling sites

3.2 Resource consents

3.2.1 Land use permit

STDC holds land use permit 5831-2 to divert 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.

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.

3.2.2 Water discharge permit

STDC holds water discharge permit 0444-4(5) 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 groundwater 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

3.3 Results

3.3.1 Inspections

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

9 February 2018

An inspection was carried out at the closed Hawera landfill in overcast conditions with a light north westerly wind.

The cap was intact and grassed, with no ponding evident. There was no sign of recent grazing or stock damage, and the batters were well maintained. No slumping, cracking or erosion was noted. The stormwater drains were clear and free-flowing.

No ponded water was evident. The leachate sump was approximately half full. The pump was operational at the time of inspection, with no sign of overflows from the system and no odours detected in this vicinity. Methane testing was carried out at the leachate sump; no gases were detected. The site was fully secure with permanent fencing. No odour or dust issues were noted either on or off site. It was noted that the site has been taken over by a new leaseholder.

Groundwater and leachate samples were collected, while surface water samples had been collected the week prior to this inspection.

3.3.2 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, although a number were above the historical medians, particularly at the time of the February survey.

Table 4 Chemical analysis of the Hawera landfill leachate samples

Parameter	Unit	9 Feb 2018	27 June 2018	All Data (given where N >5)		
				Min	Max	Median
Alkalinity Total	g/m³ $CaCO_3$	1020	580	130	1310	926
Ammoniacal nitrogen	g/m³ N	129	52	0.308	176	117
Un-ionised ammonia	g/m³	0.416	0.36	0.00022	1.26	0.213
Chloride	g/m³	313	110	41	1,100	262
Chromium Dissolved	g/m³	<0.03	0.0006	<0.03	<0.03	<0.03
Conductivity @ 20°C	mS/m@20°C	267	145.9	44	319	228
Dissolved reactive phosphorus	g/m³ P	0.009	0.002	<0.003	0.030	0.004
Filtered COD	g/m³	140	72	11	290	113
Iron Acid Soluble	g/m³	0.61	13.5	0.38	71.8	34.3
Mercury Total	g/m³	a	0.00004	<0.0001	0.0016	<0.0001
Nitrite/nitrate nitrogen	g/m³ N	0.44	0.72	<0.01	3.97	0.04

Parameter	Unit	9 Feb 2018	27 June 2018	All Data (given where N >5)		
				Min	Max	Median
pH	pH	6.9	7.2	6.4	7.6	6.8
Temperature	°C	17.8	20.0	12.9	36.2	16.8
Zinc Dissolved	g/m³	0.005	0.0040	<0.005	0.086	0.008

Key: a laboratory error

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. It is noted that most of the contaminants show a distinct seasonal variation.

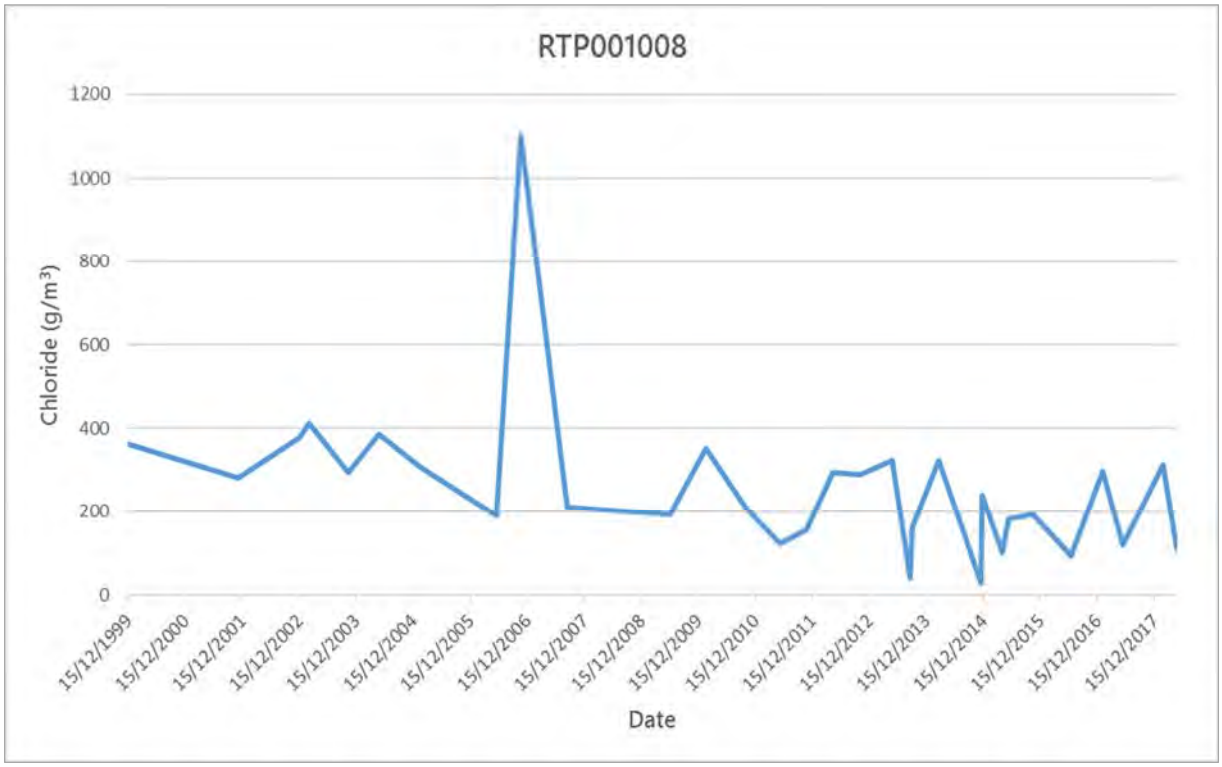

Figure 4 Hawera landfill leachate chloride concentration; 1999 – 2018

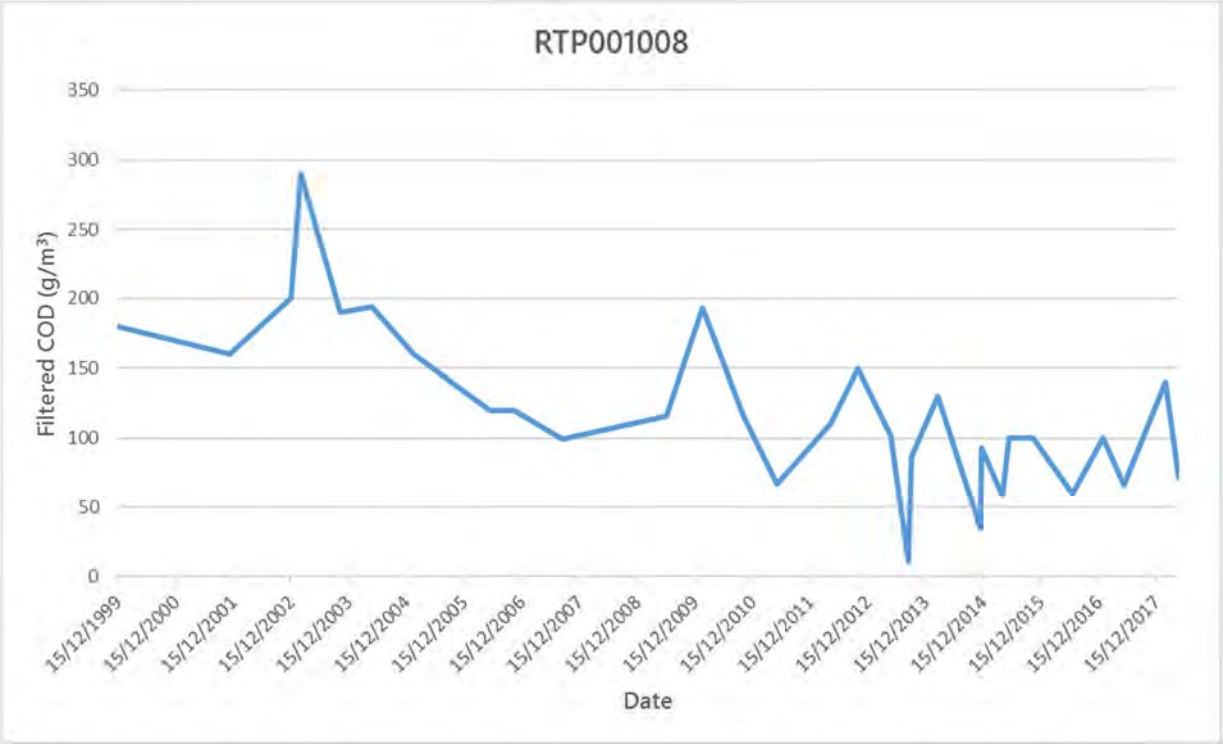

Figure 5 Hawera landfill leachate filtered chemical oxygen demand; 1999 – 2018

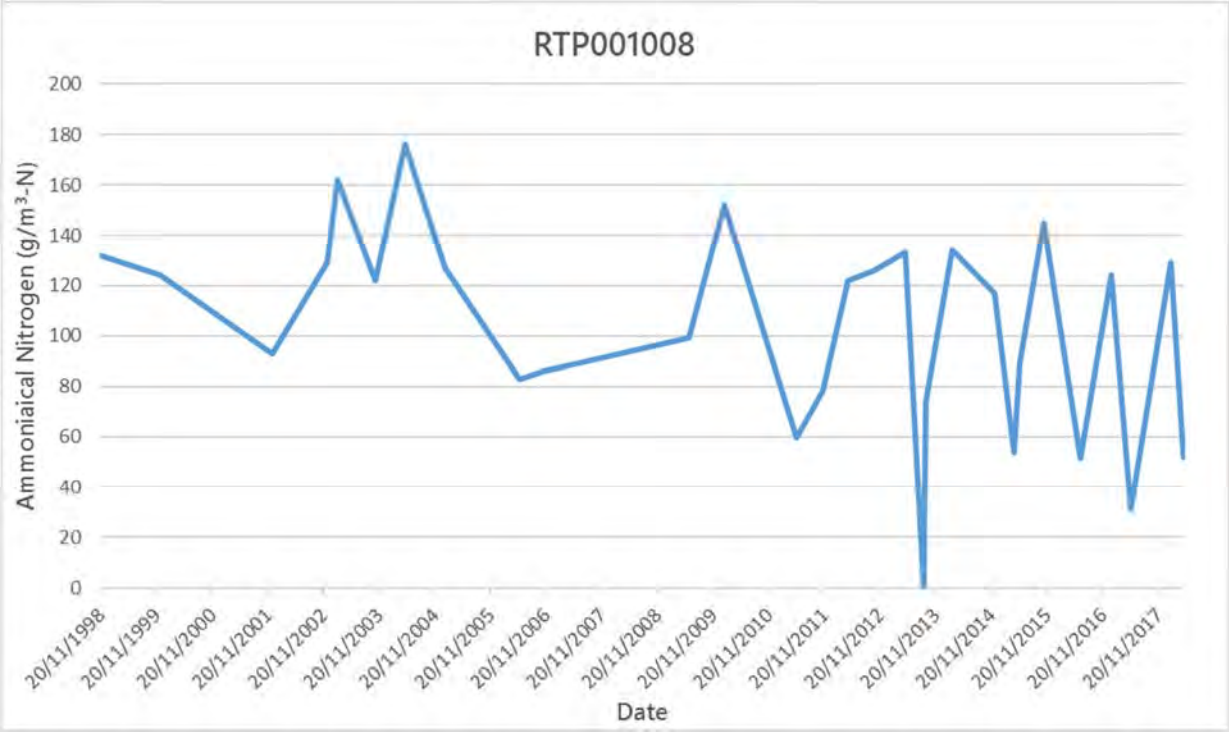

Figure 6 Hawera landfill leachate ammoniacal nitrogen, 1998 - 2018

3.3.3 Results of groundwater monitoring

Two groundwater surveys were undertaken during the year under review. The results of the chemical analyses are set out in Table 5.

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

Parameter	Unit	GND1012		GND1013	
		9 Feb 2018	27 June 2018	9 Feb 2018	27 June 2018
Alkalinity	g/m^3 $CaCO^3$	505	500	123	88
Chloride	g/m^3	93.2	86	20.6	19.8
Filtered COD	g/m^3	a	48	<5	3
Conductivity @ 20°C	mS/m	137	135.9	30.9	34.5
Dissolved reactive phosphorus	g/m^3	0.009	0.002	0.010	0.002
Acid soluble iron	g/m^3	53.9	59	<0.03	0.01
Level	m	4.345	-	3.844	-
Unionised ammonia	g/m^3	0.068	0.092	<0.00001	0.005
Ammoniacal nitrogen	g/m^3 N	46.0	48	0.003	0.005
Nitrite/nitrate nitrogen	g/m^3 N	19.1	0.049	3.26	7.1
pH	pH	6.6	6.7	6.3	6.7
Temperature	°C	16.6	15.6	16.8	14.0
Dissolved zinc	g/m^3	0.010	0.0022	<0.005	0.0028

Key: a laboratory error

As with previous monitoring periods, bore GND1012 exhibits elevated levels of landfill contamination indicators, such as increased chlorides, alkalinity, iron, 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 alkalinity, conductivity and filtered chemical oxygen demands. It is noted that bore GND1013 is further from the most recently landfilled areas and as a result has far lower levels of these landfill indicator species (Figure 8, Figure 9 and Figure 10).

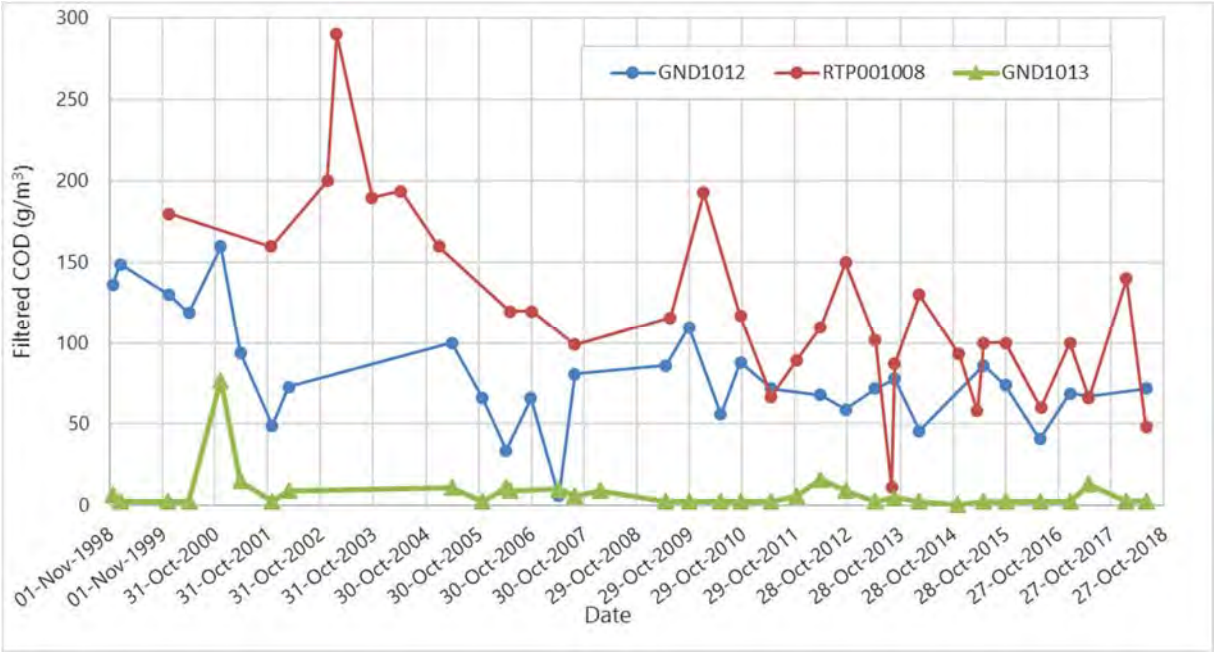

Figure 7 Comparison of filtered chemical oxygen demand between GND1012, GND1013 and RTP001008

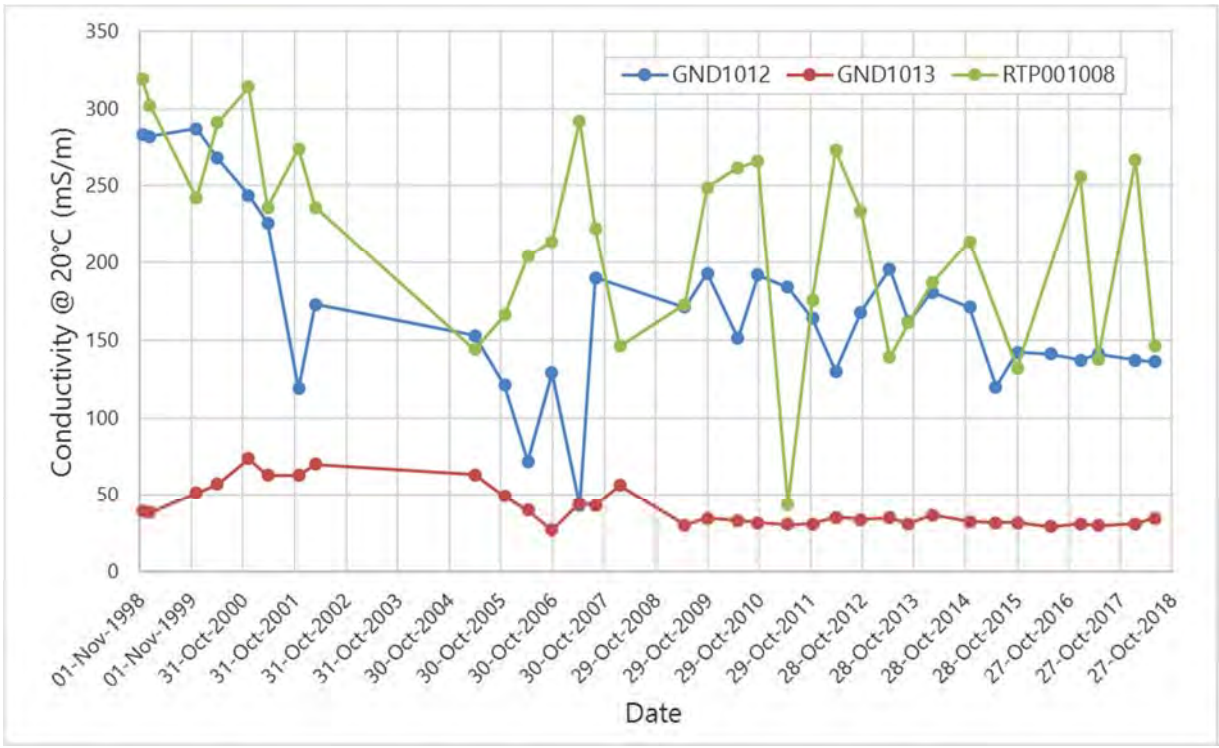

Figure 8 Comparison of conductivity between GND1012, GND1013 and RTP001008

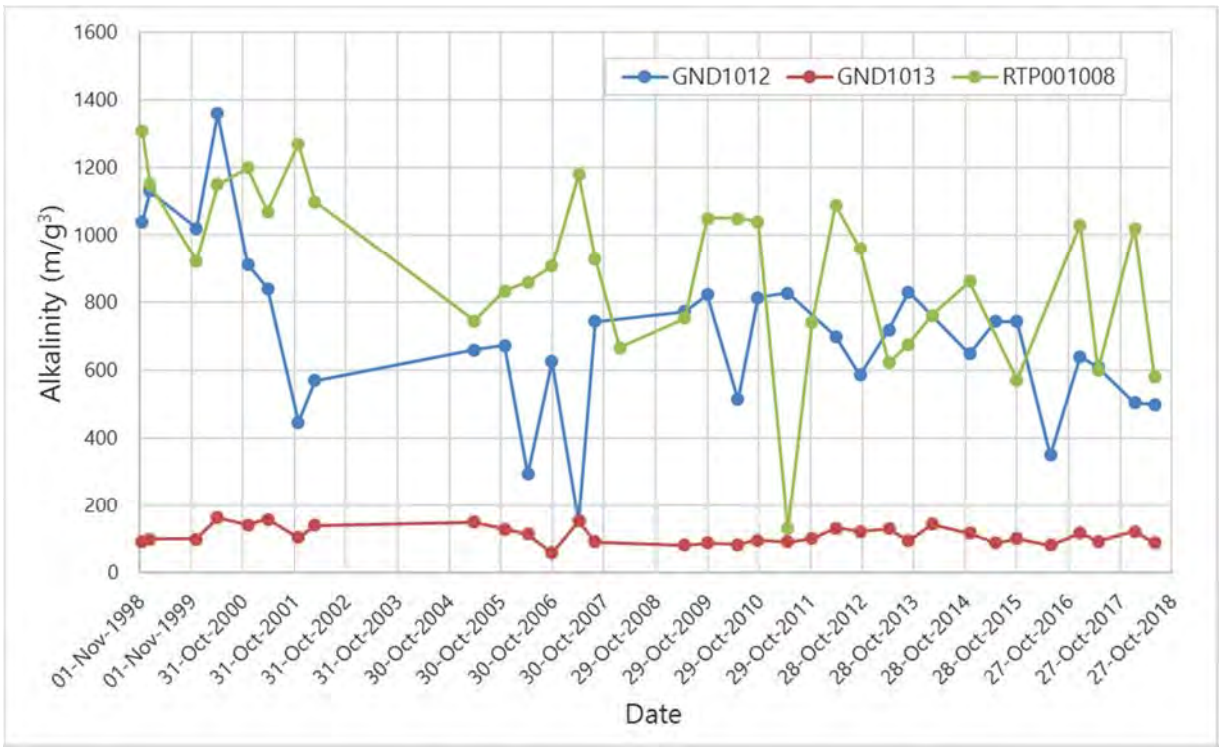

Figure 9 Comparison of alkalinity between GND1012, GND1013 and RTP001008

3.3.4 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. Historically, this uppermost monitoring site in the roadside tributary has been found to contain similar levels of contaminants to the landfill tributary at the culvert outlet, which is unsurprising given the extent of historical filling in the area as shown in Figure 3. During the year under review, monitoring showed that the levels of BOD, unionised ammonia and ammoniacal nitrogen were elevated in relation to the landfill tributary, which may have been as a result to the high rainfall and agricultural activities around the headwaters of the roadside tributary.

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, 31 January 2018

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 50 m d/s of landfill culvert	TWH000459 10 m u/s confluence	TWH000450 u/s of Matangara Road and roadside tributary	TWH000470 d/s of Matangara Road and roadside tributary
Alkalinity	g/m^3	124	114	113	90	123	112	94	76	78
BOD	g/m^3	11	0.7	3.3	1.0	3.2	4.6	3.1	0.6	1.2
Conductivity	mS/m	34.5	37.4	37.0	28.0	35.6	36.1	33.5	25.2	26.3
Dissolved reactive phosphorus	g/m^3	0.022	0.006	0.012	0.014	0.011	0.010	0.014	0.030	0.030
Acid soluble iron	g/m^3	11.1	3.83	2.19	0.79	2.69	1.82	1.37	0.55	0.68
Unionised ammonia	g/m^3-N	0.02886	0.00672	0.00737	0.00048	0.00921	0.00742	0.01405	0.00152	0.00416
Ammoniacal nitrogen	g/m^3-N	3.97	1.76	1.22	0.034	2.88	1.51	0.228	0.024	0.066
Nitrate/nitrite nitrogen	g/m^3	0.72	0.86	1.25	1.09	1.18	1.45	1.09	1.08	1.04
pH	pH	7.3	7.0	7.2	7.5	6.9	7.1	8.2	8.1	8.1
Temperature	Deg C	16.4	17.0	17.0	19.1	17.7	17.3	17.9	21.4	21.3
Dissolved zinc	g/m^3	<0.005	0.008	0.014	<0.005	0.007	0.008	<0.005	<0.005	<0.005

3.3.5 Investigations, interventions, and incidents

In the 2017-2018 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with STDC's conditions in the Hawera landfill resource consents or provisions in Regional Plans.

3.4 Discussion

3.4.1 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.

3.4.2 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.

3.4.3 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

Purpose: ***To discharge up to 2,800 m³/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***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
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
6. Maintain the leachate collection system	Site specific monitoring programme – inspection	Yes

Purpose: *To discharge up to 2,800 m³/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*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
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		**Good**
Overall assessment of administrative performance in respect of this consent		**Good**

N/A = not applicable

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

Purpose: *To divert an unnamed tributary of the Tawhiti Stream*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
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		**N/A**
Overall assessment of administrative performance in respect of this consent		**N/A**

N/A = not applicable

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

3.4.4 Recommendations from the 2016-2017 Annual Report

In the 2016-2017 Annual Report it was recommended:

1. THAT 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.

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

3.4.5 Alterations to monitoring programmes for 2018-2019

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 2018-2019, 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 2018-2019.

3.5 Recommendations

1. THAT in the first instance, monitoring of discharges from Hawera landfill in the 2018-2019 year remains unchanged from the 2017-2018 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 2018-2019, 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 10). 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 Waiokura Stream.

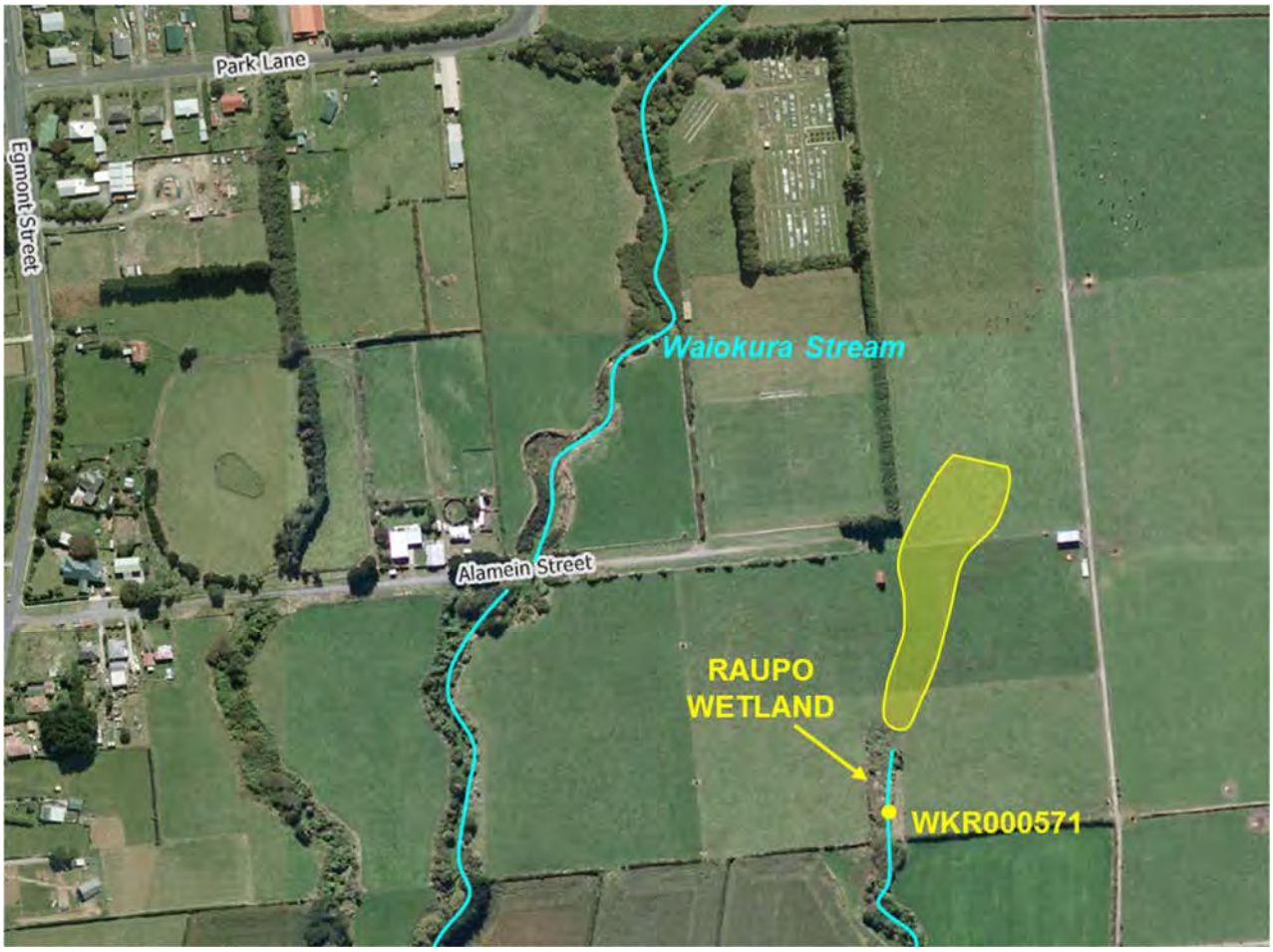

Figure 10 Aerial view of the Kaponga landfill site

4.2 Resource consents

4.2.1 Water discharge permit

STDC holds water discharge permit 3459-3 to cover the discharge of leachate and stormwater from Kaponga landfill into an unnamed tributary of the Waiokura 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.

4.3 Results

4.3.1 Inspections

During the year under review one inspection of the Kaponga landfill was conducted, as per programmed. This landfill is monitored on a triennial basis, and is due to be inspected again in the 2020-2021 year.

30 August 2017

The Kaponga landfill site was inspected in overcast conditions with a light northeasterly breeze. The cap was intact and well-vegetated, with no sign of recent grazing. There was no slumping, cracking, or erosion on either cap or batters, although both were damp and soft underfoot following recent heavy rain. The batters were tidy and stable, and with no exposed refuse noted. The stormwater drains were well-formed and free-flowing. The road scraping material that had previously been obstructing flow in the drain on the cap had been cleared. The drains were damp with minimal ponding. A shallow, unconfined spring has emerged at the head of the wetland, likely associated with extremely high rainfall over recent months. The surrounding area was very wet underfoot. A water sample was collected at the outlet of the wetland, where abundant iron oxide deposits on the streambed were noted. Site security and fencing was intact, and no odour or dust issues were noted.

4.3.2 Results of receiving water monitoring

Water springs from the toe of the landfill and this then feeds into a raupo wetland. The sampling point is where the wetland discharges into an unnamed tributary of the Waiokura Stream. A sample was collected on 30 August 2017 and the results are presented in Table 9.

Table 9 Chemical analysis of the surface water sample taken downstream of the Kaponga landfill site

Parameter	Units	WKR000571 ~ 150 m downstream of Kaponga landfill
Alkalinity	g/m^3 CaCO^3	63
Conductivity @ 20°C	mS/m	18.5
Acid soluble iron	g/m^3	4.29
Unionised ammonia	g/m^3	0.00007
Ammoniacal nitrogen	g/m^3-N	0.03
pH	pH	6.9
Temperature	°C	12.5
Dissolved zinc	g/m^3	0.019

4.3.3 Investigations, interventions, and incidents

In the 2017-2018 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with STDC's conditions in the Kaponga landfill resource consents or provisions in Regional Plans.

4.4 Discussion

4.4.1 Discussion of site performance

In the year under review it was found that receiving water samples taken on 30 August 2017 all complied with consent conditions. In comparison to the previous monitoring period for this site (2014-2015) there was a noticeable decrease of acid soluble iron, while the other parameters showed no obvious change between the years.

A contingency plan is in place for the site as required by consent conditions.

4.4.2 Environmental effects of exercise of consents

Leachate will continue to be generated at the site for some time, and this will be discharged, via the spring at the toe of the landfill, into the raupo treatment wetland. The findings gathered during the period under review indicate that the landfill's presence is not having any significant effect on the receiving environment.

4.4.3 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 10.

Table 10 Summary of performance for Kaponga closed landfill stormwater and leachate consent 3459-3

Purpose: ***To discharge stormwater and leachate from the former Kaponga landfill site into an unnamed tributary of the Waiokura Stream***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Adopt best practice	Inspection	Yes
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	Inspection	Yes
4. Maintain all stormwater and leachate collection systems	Inspection	Yes
5. No adverse impact on aquatic life	Inspection	Yes
6. Optional review provision re environmental effects	N/A	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**
Overall assessment of administrative performance in respect of this consent		**High**

N/A = not applicable

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

4.4.4 Recommendations from the 2016-2017 Annual Report

1. THAT in the first instance, the Kaponga landfill triennial monitoring programme remains in place with monitoring next scheduled for the 2020-2021 period.
2. THAT should there be any issues with environmental or administrative performance in the 2020-2021 years, monitoring of the Kaponga landfill may be adjusted to reflect any additional investigation or intervention as found necessary.

4.4.5 Alterations to monitoring programmes for 2018-2019

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 2018-2019, 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 2018-2021.

4.5 Recommendations

1. THAT in the first instance, the Kaponga landfill triennial monitoring programme remains in place with monitoring next scheduled for the 2020-2021 period.
2. THAT should there be any issues with environmental or administrative performance in the 2018-2021, monitoring of the Kaponga landfill may be adjusted to reflect any additional investigation or intervention as found necessary.

5 Manaia landfill

5.1 Introdcution

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.

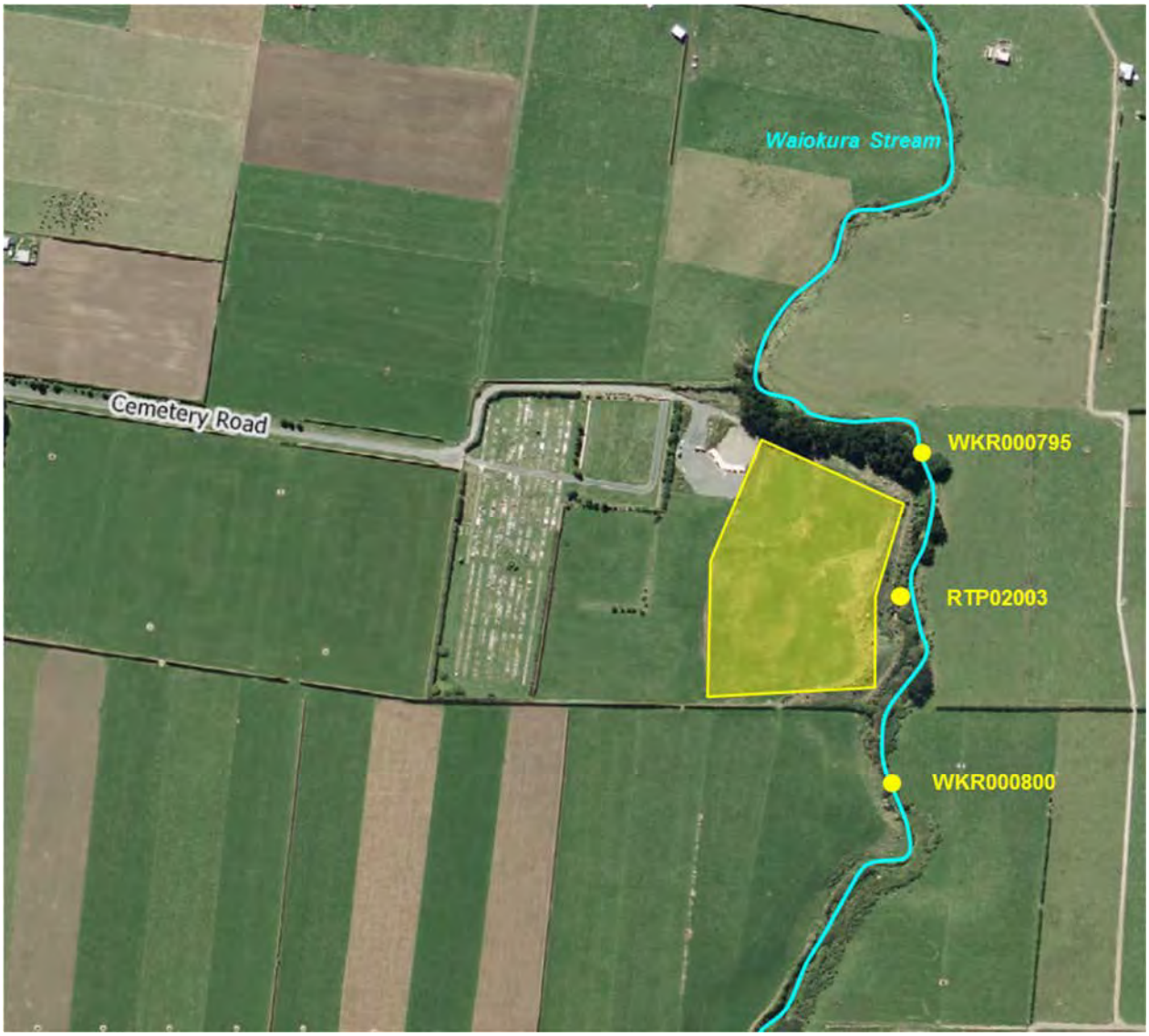

Figure 11 Aerial view of Manaia landfill showing sampling sites and landfill footprint

5.2 Resource consents

5.2.1 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.

5.3 Results

5.3.1 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.

30 April 2017

The Manaia landfill site was inspected in fine weather with light wind conditions, following heavy downpours over the previous few days. The cap was damp underfoot but mostly firm. Some localised minor pasture damage was evident, associated with recent cattle grazing and fertilizer spreading. No erosion, slumping, or cracking was noted on either the cap or batters. The batters were well-vegetated and stable. No exposed refuse was noted. The stormwater drains were clear of obstructions and showed signs of recent flow, although no overflows. Slight ponding was observed in the northwest drain following recent rain. The leachate drains were clear and damp, with no ponding observed. All flow was contained. The northern and eastern drains were well-maintained, clear of gorse and free-flowing. Samples were taken upstream and downstream of the landfill. The Waiokura Stream was in fresh at the time. Site signage and security measures were intact and in place. No odour or dust issues were noted.

4 April 2018

The Manaia landfill site was inspected in overcast weather with a moderate westerly wind. The cap was intact and well-drained. The vegetation cover was good, with no cracking, slumping, or exposed refuse noted. The cap had not been grazed for some time. The batters were intact and vegetated, and these appeared to have been grazed recently. No ponding was apparent despite heavy rain the previous day. The stormwater drains were well-formed and dry, with no sign of ponding or recent flow. The leachate drains were dry and no discharge was occurring at the time. Samples were taken upstream and downstream of the landfill, and from the leachate pond. Access to the leachate pond has improved as a result of the recent

grazing. The site was secure with good signage and permanent fencing in place. There were no odour or dust issues noted.

5.3.2 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 11) on two occasions. The results are presented in Table 11.

Table 11 Chemical analysis of discharge and receiving waters at Manaia landfill

		30 August 2017			4 April 2018		
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^3 $CaCO_3$	-	-	-	62	384	62
BOD	g/m^3	-	-	-	0.8	10	0.8
Conductivity @ 20°C	mS/m	25.3	76.4	25.5	24.6	114	24.7
Dissolved reactive phosphorus	g/m^3 P	-	-	-	0.057	<0.003	0.056
Acid soluble iron	g/m^3	-	-	-	0.32	0.05	0.33
Unionised ammonia	g/m^3 N	0.00021	0.00431	0.0040	0.00176	0.00157	0.00163
Ammoniacal nitrogen	g/m^3 N	0.021	2.20	0.032	0.047	0.041	0.044
Nitrite/nitrate nitrogen	g/m^3 N	-	-	-	2.68	0.01	2.54
pH	pH	7.6	6.9	7.7	8.0	8.0	8.0
Suspended solids	g/m^3	-	-	-	9	36	9
Temperature	Deg.C	11.7	-	11.2	17.1	17.4	17.0
Dissolved zinc	g/m^3	0.016	-	<0.005	<0.005	0.007	<0.005

On both sampling occasions results generally showed 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 oxygen demand (BOD) in the leachate sample on 4 April 2018 was high, but this was shown to have no significant effect on the receiving waters as the BOD downstream was found to be the same as the upstream site. Unionised ammonia concentrations were also well below the 0.025 g/m^3 guideline given in the Regional Freshwater Plan to protect aquatic ecosystems that may be subjected to long term exposure.

5.3.3 Investigations, interventions, and incidents

In the 2017-2018 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with STDC's conditions in the Manaia landfill resource consents or provisions in Regional Plans.

5.4 Discussion

5.4.1 Discussion of site performance

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

5.4.2 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.

5.4.3 Evaluation of performance

A tabular summary of STDC's compliance record at Manaia landfill for the year under review is set out in Table 12.

Table 12 Summary of performance for Manaia consent 3952-2

Purpose: ***To discharge leachate and stormwater from the closed Manaia landfill and from composting operations into the Waiokura Stream***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
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 landfall 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_3 in the Waiokura Stream	Site specific monitoring programme – water sampling	Yes
8. Optional review provision re environmental effects	N/A	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**
Overall assessment of administrative performance in respect of this consent		**High**

N/A = not applicable

During the 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.

5.4.4 Recommendations from the 2016-2017 Annual Report

In the 2016-2017 Annual Report, it was recommended:

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.

These recommendations were implemented.

5.4.5 Alterations to monitoring programmes for 2018-2019

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 2018-2019, 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 2018-2019.

5.5 Recommendations

1. THAT in the first instance, the monitoring of discharges from the closed landfill at Manaia in the 2018-2019 year continues at the same level as in 2017-2018.
2. THAT should there be issues with environmental or administrative performance in 2018-2019, 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 on Whitcombe Road, and was used to service the township of Opunake and the surrounding rural areas. Waste from Rahotu 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 12 Aerial view of Opunake landfill footprint and sampling sites

6.2 Resource consents

6.2.1 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. The consent expired on 1 June 2018. As an application to renew the consent was lodged more than six months before the expiry date, under Section 124 of the RMA, STDC can continue to operate the site under the expired consent until a decision is made on the application.

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.

6.3 Results

6.3.1 Inspections

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

30 August 2017

The cap was intact and wet underfoot following heavy rain prior to the inspection. Some minor stock damage was observed. This was localised, in areas around gateways, while the rest of the cap and batters were well-vegetated. The water troughs were full but not overflowing. The batters were intact and had been recently grazed. No slumping, cracking, or exposed refuse was noted. The stormwater system on the cap was wet, with ponding in the southern corner adjacent to the discharge point. The remaining drains were free-flowing and tidy. The leachate drains were clear of obstructions and full of flowing water. The southern drain was discharging to the Otahi Stream at approximately 1 L/min. Samples were collected of the discharge and of the receiving waters upstream and downstream of the site. Fencing onsite was intact and permanent with repairs to riparian fencing underway. The leaseholder was on site at the time of inspection. Recent gorse spraying had been carried out. All sampling sites had good access. No odour or dust issues were noted.

4 April 2018

This inspection was conducted in fine weather with light wind conditions. The cap and batters were intact and well-grassed with no slumping, cracking or exposed refuse. There was significant localised ponding apparent around both water troughs on the cap, and the surrounding area was waterlogged and boggy. The southernmost trough was overflowing at the time of inspection, and photos were taken. The batters were in good condition, and showed no sign of stock damage or recent grazing. The stormwater drains were dry and unobstructed. No sign of ponding was noted. The leachate drains were dry and well-vegetated, with no ponding or signs of recent flow. No discharge was occurring to the Otahi Stream. The fencing was permanent and intact with the riparian fence repairs completed. No stock were on site at the time of inspection. There were no odour or dust issues.

6.3.2 Results of discharge and receiving environment monitoring

6.3.2.1 Surface water

Samples were collected from the leachate drain, and the Otahi Stream at sites above, below and adjacent to the landfill on 30 August 2017 (Figure 12). The results are presented in Table 13.

Table 13 Chemical analysis of receiving water samples taken at Opunake closed landfill on 30 August 2017

Parameter	Units	RTP002002 Leachate	OTH000310 u/s of landfill	OTH000320 Adjacent to landfill	OTH000340 d/s of landfill
Alkalinity	g/m^3 $CaCO_3$	566	58	58	59
Biochemical oxygen demand	g/m^3	1.7	0.9	0.9	0.8
Conductivity @ 20 °C	mS/m	118	21.5	21.5	21.5
Dissolved reactive P	g/m^3	<0.003	0.047	0.047	0.046
Acid soluble iron	g/m^3	1.89	0.47	0.48	0.50
Unionised ammonia	g/m^3 N	0.15796	0.00084	0.0092	0.00096
Ammoniacal nitrogen	g/m^3 N	21.9	0.051	0.056	0.060
pH	pH	7.4	7.8	7.8	7.8
Temperature	Deg.C	13.2	12.0	12.0	11.6
Dissolved zinc	g/m^3	0.109	<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. The levels of unionised ammonia and ammoniacal nitrogen in the leachate discharge was atypically high, the highest on record for this site. This can most likely be attributed to the recent grazing of the batters, and the associated stock effluent entering the leachate, rather than the breakdown of landfill material. 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.

6.3.3 Investigations, interventions, and incidents

In the 2017-2018 period, the Council was required to undertake significant additional investigations and interventions, or record incidents, in association with STDC's conditions in the Opunake landfill resource consents or provisions in Regional Plans.

4 April 2018

There was significant localised ponding was observed around both water troughs on the cap, causing the surrounding area to become waterlogged and soggy. At the time of inspection the southernmost trough was overflowing, photos were taken, which are shown below (Photo 1 and Photo 2).

This was determined to be a non-compliance under condition 5 of consent 0526-3. The discharge of contaminant, namely leachate from a closed landfill, onto or into land in circumstances that may have resulted in that contaminant entering water, namely the Otahi Stream, when the discharge was not expressly allowed by a rule in a resource consent.

STDC were contacted and advised of the contravention. They undertook repairs and the subsequent re-inspection on 3 May 2018 found that repairs had been undertaken and the consent was being complied with.

Photo 1 North water trough overflowing, Opunake landfill

Photo 2 South water trough overflowing, Opunake landfill

6.4 Discussion

6.4.1 Discussion of site 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 is in place for the site. The incident that occurred on 4 April 2018 regarding overflowing water troughs was quickly dealt with, leading to no further action by the Council.

6.4.2 Environmental effects of exercise of consents

During the year under review there was only one issue regarding water troughs overflowing, causing ponding and waterlogging on the cap, this was quickly remedied. No other issues of concern relating to leachate discharges from the site, landfill gas, or water quality in the Otahi Stream were found as a result of the landfill.

6.4.3 Evaluation of environmental performance

A tabular summary of STDC's compliance record at the Opunake landfill for the year under review is set out in Table 14.

Table 14 Summary of performance for Opunake closed landfill stormwater and leachate consent 0526-3

Purpose: ***To discharge stormwater and leachate from the closed Opunake landfill into the Otahi Stream***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. STDC shall adopt the best practicable option	Site specific monitoring programme – programme management	Water troughs overflowing
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 the plan	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		**Good**
Overall assessment of administrative performance in respect of this consent		**Good**

N/A = not applicable

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

6.4.4 Recommendations from the 2016-2017 Annual Report

In the 2016-2017 Annual Report it was recommended:

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.

These recommendations were implemented.

6.4.5 Alterations to monitoring programmes for 2018-2019

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 2018-2019, 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 2018-2019.

6.5 Recommendations

1. THAT in the first instance, monitoring of discharges from Opunake landfill in the 2018-2019 year continues at the same level as in 2017-2018.
2. THAT should there be any issues with the environmental or administrative performance in 2018-2019, 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.

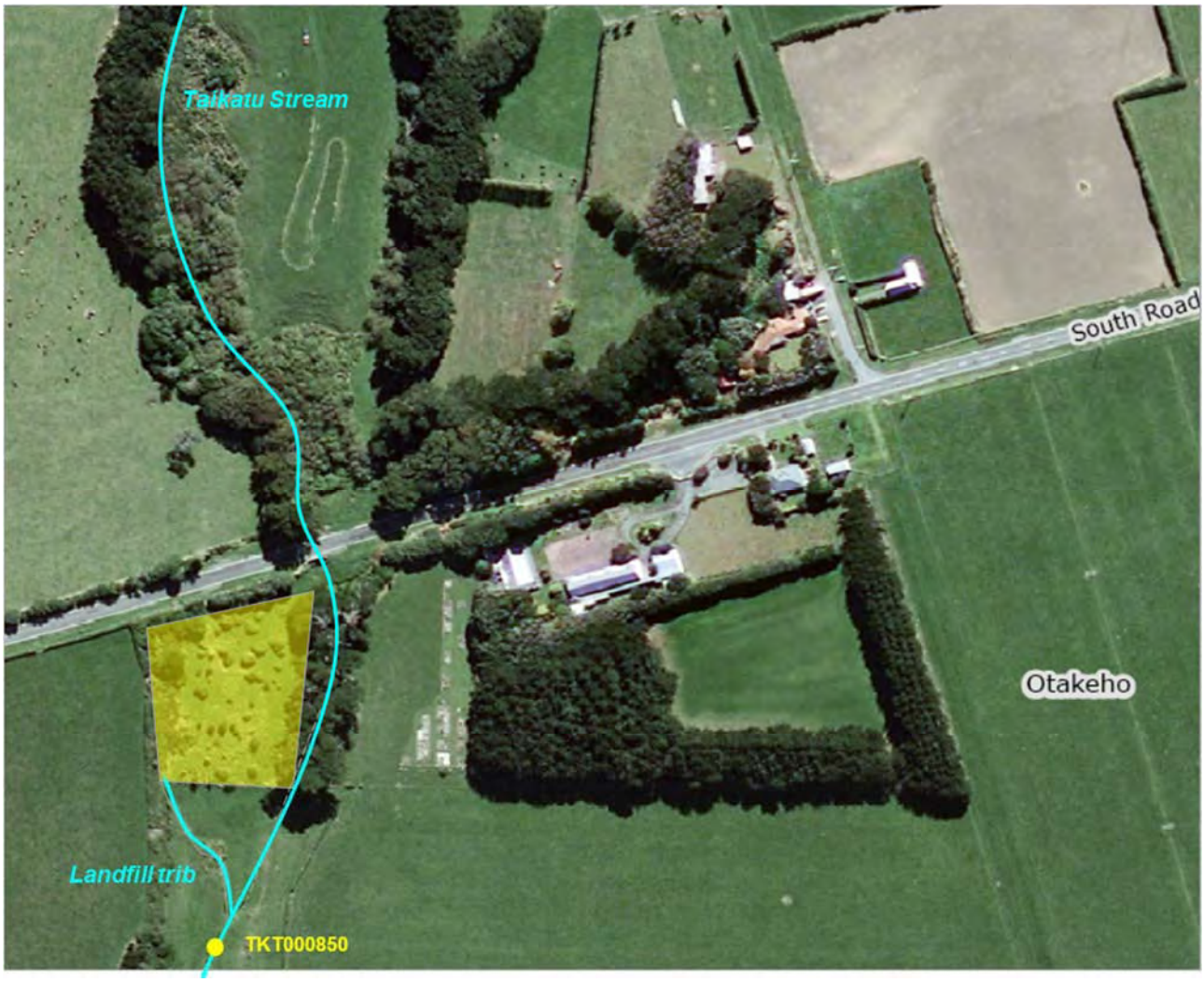

Figure 13 Aerial image of Otakeho landfill and monitoring site in the Taikatu Stream

7.2 Resource consent

7.2.1 Water discharge permit

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. The consent expired on 1 June 2018. As an application to renew the consent was lodged more than six months before the expiry

date, under Section 124 of the RMA, STDC can continue to operate the site under the expired consent until a decision is made on the application.

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.

7.3 Results

Monitoring of this site is scheduled to be undertaken on a triennial basis, with the programme next scheduled to be implemented in the 2019-2020 year. Therefore no inspections or sampling were undertaken during the period under review.

7.3.1 Investigations, interventions, and incidents

In the 2017-2018 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with STDC's conditions in the Otakeho landfill resource consents or provisions in Regional Plans.

7.4 Discussion

7.4.1 Evaluation of performance

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

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

Purpose: To discharge stormwater and leachate from the closed Otakeho landfill into the Taikatu Steam		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Prevent or minimise any likely adverse effects on the environment	Inspections	N/A
2. Exercise of consent in accordance with application	Inspections	N/A
3. Prepare and maintain contingency plan	Updated plan for site provided in July 2013	N/A
4. Notice required for changes to contingency plan	No changes to plan	N/A

Purpose: To discharge stormwater and leachate from the closed Otakeho landfill into the Taikatu Steam		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
5. Monitoring to satisfaction of Council	Inspections	N/A
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		**N/A**
Overall assessment of administrative performance in respect of this consent		**N/A**

N/A = not applicable

During the year, the environmental and administrative performances of STDC in relation to the Otakeho closed landfill consent were not assessed.

7.4.2 Recommendations from the 2016-2017 Annual Report

1. THAT in the first instance, the Otakeho landfill triennial monitoring programme remains in place with monitoring next scheduled to be implemented in the 2019-2020 period.

7.4.3 Alterations to monitoring programmes for 2018-2019

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 2018-2019, 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 2018-2020.

7.5 Recommendations

1. THAT in the first instance, the Otakeho landfill triennial monitoring programme remains in place with monitoring next scheduled to be implemented in the 2019-2020 period.
2. THAT should there be issues with environmental or administrative performance in 2018-2020, 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 14) 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.

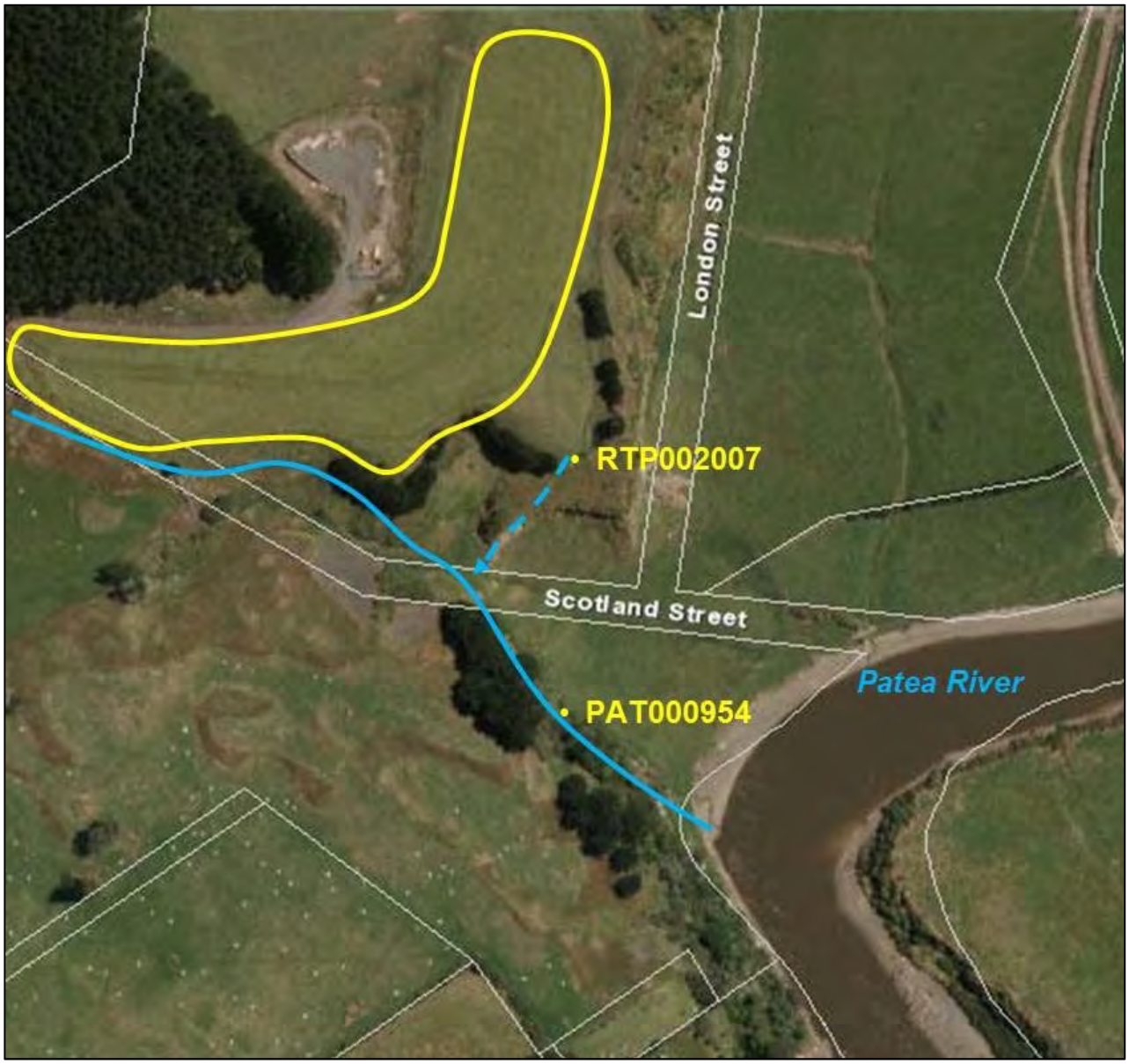

Figure 14 Aerial view of the landfill at Patea showing sampling sites (landfill footprint in yellow)

8.2 Resource consents

8.2.1 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 in the 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.

8.2.2 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.

8.3 Results

8.3.1 Inspections

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

30 August 2017

The landfill cap was fully intact showing no slumping and reasonable grass cover. The cap area had recently been grazed. Although the perimeter drains were holding some surface water, there was no discharge occurring to the lower interceptor pit. However, the interceptor pit was full and some discharge from it was occurring, which allowed wastewater and receiving water samples to be collected on this occasion. STDC were advised that the interceptor pit outlet culvert and drain required cleaning to allow unimpeded flow. No Leachate or odour issues were noted.

8 February 2018

An inspection was undertaken at the closed Patea landfill site, during fine weather conditions. No water quality samples were required by the monitoring programme on this occasion. The landfill cap was fully intact. All collection drains and sumps were dry, showing no recent discharge. No leachate or odour issues were noted.

14 May 2018

An inspection was undertaken at the closed Patea landfill site in overcast conditions. The landfill cap was fully intact, showing no slumping. The area had not been recently grazed, and had good grass cover. Although the top perimeter drains had stopped discharging, there was a slight flow trickling into the lower interceptor pit. The interceptor pit was full and discharging. Discharge and receiving water samples were collected on this occasion.

8.3.2 Discharge and receiving water monitoring

During the 2016-2017 period six water samples were taken at the site. The leachate/stormwater (RTP002007), upstream (PAT000950) and downstream of the landfill (PAT00954) were sampled. The location of the sampling sites is shown in Figure 14 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	30 August 2017			14 May 2018		
		RTP002007 leachate	PAT000950 upstream	PAT000954 downstream	RTP002007 leachate	PAT000950 upstream	PAT000954 downstream
Alkalinity	g/m^3 $CaCO_3$	163	112	125	59	94	109
BOD	g/m^3	4.8	2.4	4.1	10	2.5	1.8
Conductivity @ 20°C	mS/m	41.3	60.1	63.3	24	59.1	64.1
Acid soluble iron	g/m^3	1.58	1.31	1.08	0.45	0.43	0.47
Unionised ammonia	g/m^3 N	0.04680	0.01921	0.02564	0.03241	0.00604	0.00112
Ammoniacal nitrogen	g/m^3 N	7.98	1.51	1.27	2.42	0.276	0.122
pH	g/m^3	7.3	7.6	7.8	7.6	7.8	7.9
Temperature	°C	13.5	14.7	14.8	15.4	15.9	15.1
Dissolved zinc	g/m^3	<0.005	<0.005	0.005	<0.005	<0.005	<0.005

The results indicate that there was some contamination in the collected leachate 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 and the unionised ammonia of the downstream tributary on 30 August.

In the tributary, the unionised ammonia concentration marginally exceeded the 0.025 g/m^3 guideline on 30 August, reaching 0.026 g/m^3 downstream of the landfill. The guideline is given in the Regional Freshwater Plan to protect aquatic ecosystems that may be subjected to long term exposure.

At the August inspection it was reported that the landfill and surrounding areas that drain into the leachate/stormwater system had recently been grazed. This is likely to have been the major contributing factor to the higher than median levels of BOD, ammoniacal nitrogen and unionised ammonia levels on this occasion.

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.

8.3.3 Investigations, interventions, and incidents

In the 2017-2018 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with the STDC's conditions in the Patea landfill resource consents or provisions in Regional Plans.

8.4 Discussion

8.4.1 Discussion of site performance

The site was found to be well vegetated with no evidence of stock damage to the cap. There were no odour or leachate issues found at the time of inspection.

8.4.2 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 unlikely to be having any significant effect on the environment.

8.4.3 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

Purpose: ***To discharge surface stormwater and leachate from the Patea municipal landfill into an unnamed tributary of the Patea River***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
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
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		**High**
Overall assessment of administrative performance in respect of this consent		**High**

N/A = not applicable

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

Purpose: ***To discharge emissions into the air from the Patea municipal landfill activities***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Prepare and maintain a site contingency plan	Plan on file dated August 2013	Yes
2. Prepare and maintain a landfill operations and management plan	Site specific monitoring programme – programme management	Yes

Purpose: *To discharge emissions into the air from the Patea municipal landfill activities*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
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	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		**High**
Overall assessment of administrative performance in respect of this consent		**High**

N/A = not applicable

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

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*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
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
Overall assessment of consent compliance and environmental performance in respect of this consent		**N/A –consent no longer exercised**
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.

8.4.4 Recommendations from the 2016-2017 Annual Report

In the 2016-2017 Annual Report, it was recommended:

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.

These recommendations were implemented.

8.4.5 Alterations to monitoring programmes for 2018-2019

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 2018-2019, 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 2018-2019.

8.5 Recommendations

1. THAT in the first instance, the monitoring of discharges from the closed Patea landfill in the 2018-2019 year remains unchanged from that of 2017-2018.
2. THAT should there be issues with environmental or administrative performance in 2018-2019, 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 monitoring of discharges from the closed landfill at Eltham in the 2017-2018 year continues at the same level as in 2017-2018.
2. THAT should there be any issues with environmental or administrative performance in the 2018-2019, 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 2018-2019 year remains unchanged from the 2017-2018 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 2018-2019, 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 2020-2021 period.
6. THAT should there be any issues with environmental or administrative performance in the 2018-2021, 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 monitoring of discharges from the closed landfill at Manaia in the 2017-2018 year continues at the same level as in 2017-2018.
8. THAT should there be issues with environmental or administrative performance in 2018-2019, monitoring of the Manaia landfill may be adjusted to reflect any additional investigation or intervention as found necessary.
9. THAT in the first instance, the monitoring of discharges from the closed Patea landfill in the 2017-2018 year remains unchanged from that of 2017-2018.
10. THAT should there be issues with environmental or administrative performance in 2018-2019, monitoring of the Patea landfill may be adjusted to reflect any additional investigation or intervention as found necessary.
11. THAT in the first instance, monitoring of discharges from Opunake landfill in the 2018-2019 year continues at the same level as in 2017-2018.
12. THAT should there be any issues with the environmental or administrative performance in 2018-2019, monitoring of the Opunake landfill may be adjusted to reflect any additional investigation or intervention as found necessary.
13. THAT in the first instance, the Otakeho landfill triennial monitoring programme remains in place with monitoring next scheduled to be implemented in the 2019-2020 period.

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	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^3	Grams per cubic metre, and equivalent to milligrams per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures.
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.
L/s	Litres per second.
MCI	Macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats.
mS/m	Millisiemens per metre.
Mixing zone	The zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to 7 times the width of the stream at the discharge point.
NH_4	Ammonium, normally expressed in terms of the mass of nitrogen (N).
NH_3	Unionised ammonia, normally expressed in terms of the mass of nitrogen (N).
pH	A numerical system for measuring acidity in solutions, with 7 as neutral. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5.

Physicochemical	Measurement of both physical properties (e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment.
Resource consent	Refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15).
RMA	*Resource Management Act 1991* and including all subsequent amendments.
SS	Suspended solids.
SQMCI	Semi quantitative macroinvertebrate community index.
Temp	Temperature, measured in °C (degrees Celsius).
Zn*	Zinc.

*an abbreviation for a metal or other analyte may be followed by the letters 'As', to denote the amount of metal recoverable in acidic conditions. This is taken as indicating the total amount of metal that might be solubilised under extreme environmental conditions. The abbreviation may alternatively be followed by the letter 'D', denoting the amount of the metal present in dissolved form rather than in particulate or solid form.

For further information on analytical methods, contact a Science Services Manager.

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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

Consent 3387-3

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

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. 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

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

General conditions

a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; 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.

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

Consent 3459-3

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

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. 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,

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

Consent 3952-2

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:	20 January 2005

Conditions of Consent

Consent Granted:	To discharge leachate and stormwater from the Manaia Landfill into the Waiokura Stream at or about GR: P21:078-823
Expiry Date:	1 June 2023
Review Date(s):	June 2011, June 2017
Site Location:	Manaia Landfill, Cemetery Road, Manaia
Legal Description:	Pt Sec 23 Blk VII Waimate SD
Catchment:	Waiokura

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. 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.

7. Any discharge from the landfill 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. 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 20 January 2005

For and on behalf of
Taranaki Regional Council

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Director-Resource Management

Opunake

Consent 0526-3

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

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. 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,

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

Consent 3953-3

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

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 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.

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

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. 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.

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. 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.

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

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Director-Resource Management

Consent 4636-2

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

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. 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.

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, Environmental Scientist
Document	2042220
Report	DS087
Date	27 April 2018

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, November 2017

Introduction

This spring survey was the first of two surveys programmed for the 2017-2018 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 22nd 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' technique was used for site 1 and site 5 in the Mangawhero Stream and site 8 in the Waingongoro River (illustrated in Figure 1) on 6 November 2017.

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+

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)

TRC Grading	MCI	$SQMCI_s$
Excellent	>140	>7.00
Very Good	120-140	6.00-7.00
Good	100-119	5.00-5.99
Fair	80-99	4.00-4.99
Poor	60-79	3.00-3.99
Very Poor	<60	<3.00

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 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 11 units or more in MCI values is considered significantly different (Stark 1998).

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, 26 days after a fresh in excess of 3 times median flow and 29 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 14.4-15.5 °C. Water levels were moderate and water speed was swift. The water was brown and cloudy for site 1, uncoloured and cloudy for site 5 and uncoloured and clear for site 8. The substrate at the three sites comprised either entirely of hard clay (site 1), a mixture of gravel/cobble/boulder (sites 5 and 8).

Site 1 had no algal mats and widespread filamentous algae. Site 5 had widespread algal mats and filamentous algae. 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 4 Summary of macroinvertebrate taxa numbers and MCI values for previous surveys performed between January 1985 and March 2017

Site No.	N	No of taxa			MCI value			SQMCIs value		
		Median	Range	Current survey	Median	Range	Current survey	Median	Range	Current survey
1	55	16	10-25	13	74	58-85	72	4.1	1.5-6.3	3.0
5	50	20	13-30	16	79	63-102	88	3.1	1.5-6.4	3.2
8	44	20	14-30	19	94	77-111	101	4.3	2.4-7.6	7.4

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

Table 5 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 6 November 2017

Taxa List	Site Number	MCI score	1	5	8
	Site Code		MWH000380	MWH000490	WGG000665
	Sample Number		FWB17412	FWB17413	FWB17409
NEMATODA	Nematoda	3	R	-	-
ANNELIDA (WORMS)	Oligochaeta	1	C	A	R
	Lumbricidae	5	R	-	-
MOLLUSCA	*Potamopyrgus*	4	C	R	-
CRUSTACEA	*Paracalliope*	5	C	R	-
	Talitridae	5	-	C	-
EPHEMEROPTERA (MAYFLIES)	*Austroclima*	7	-	-	R
	Coloburiscus	7	-	-	C
	Deleatidium	8	R	C	XA
	Nesameletus	9	-	-	R
	Zephlebia group	7	-	-	R
PLECOPTERA (STONEFLIES)	*Zelandobius*	5	-	R	R
MEGALOPTERA (DOBSONFLIES)	*Archichauliodes*	7	-	-	R
TRICHOPTERA (CADDISFLIES)	*Hydropsyche (Aoteapsyche)*	4	R	C	A
	Costachorema	7	-	R	C
	Hydrobiosis	5	C	-	R
	Pycnocentria	7	-	R	-
	Pycnocentrodes	5	-	R	R
DIPTERA (TRUE FLIES)	*Aphrophila*	5	-	A	R
	Chironomus	1	R	-	-
	Maoridiamesa	3	C	VA	A
	Orthocladiinae	2	A	A	A
	Polypedilum	3	R	R	-
	Tanytarsini	3	-	R	R
	Ephydridae	4	-	-	R
	Austrosimulium	3	R	R	C
	Tanyderidae	4	-	-	R
	No of taxa		13	16	19
	MCI		72	88	101
	SQMCIs		3.0	3.2	7.4
	EPT (taxa)		3	6	10
	%EPT (taxa)		23	38	53

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

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

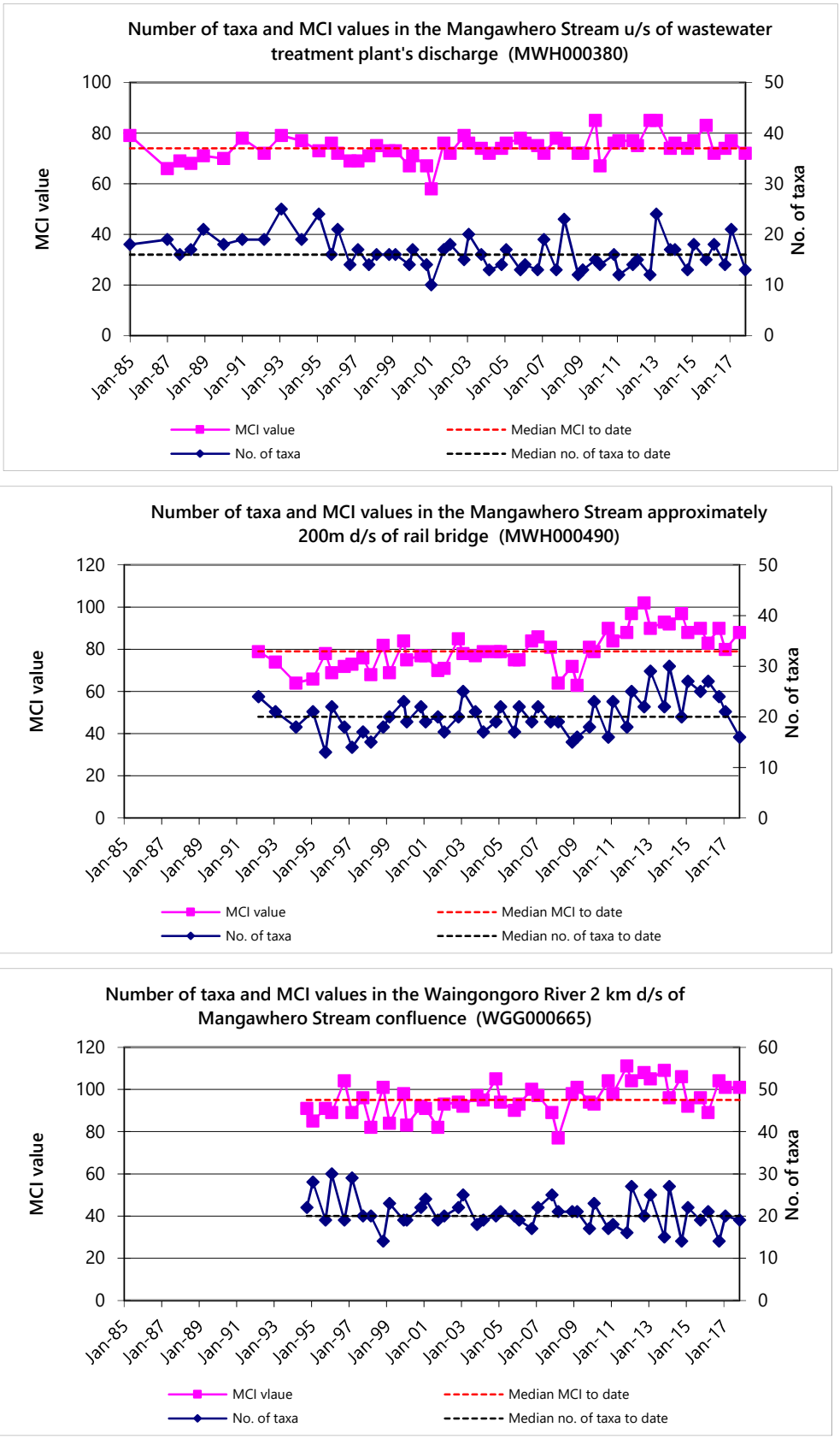

Figure 2 Taxa richness and MCI scores recorded at each site to date for Mangawhero Stream sites sampled in relation to the Eltham WWTP

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) which was two less taxa than the historic median (16 taxa) and seven taxa less than the previous survey on February 2017 (21 taxa).

The MCI score of 72 units indicated a community of 'poor' biological health which was not significantly different to the median MCI score (74 units) and to the previous survey (77 units). The $SQMCI_S$ score of 3.0 units was significantly lower (Stark, 1998) than the median $SQMCI_S$ score (4.1 units) (Table 3) and to the previous survey (4.5 units).

The community was characterised by one 'tolerant' taxon [midges (Orthocladiinae)] (Table 3).

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

A moderately low macroinvertebrate community richness of 16 taxa was found at site 5 ('primary impacted' site) (Table 3) which was four less taxa than the historic median (20 taxa) and five taxa less than the previous survey on February 2017 (21 taxa).

The MCI score of 88 units indicated a community of 'fair' biological health which was not significantly higher (Stark, 1998) than the median MCI score (79 units) and the previous survey (80 units). The $SQMCI_S$ score of 3.1 units was not significantly different to the median $SQMCI_S$ score of 3.2 units (Table 3) and to the previous survey (3.4 units).

The community was characterised by three 'tolerant' taxa [oligochaete worms and midges (*Maoridiamesa* and Orthocladiinae)] (Table 3).

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

A moderately low macroinvertebrate community richness of 19 taxa was found at site 8 ('secondary impacted' site) at the time of the spring survey (Table 3) which was one taxon less than the historic median (20 taxa) and the previous survey on February 2017 (20 taxa).

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 (94 units) and to the previous survey (101 units). The $SQMCI_S$ score of 7.4 units was significantly higher than the median $SQMCI_S$ score of 4.3 units (Table 3) and the previous survey (4.8 units).

The community was characterised by three 'tolerant' taxa [caddisfly (*Hydropsyche/Aoteapsyche*) and midges (*Maoridiamesa* and Orthocladiinae)] and 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

Macroinvertebrate richnesses were slightly lower than historical medians at all three surveyed sites (by 3-4 taxa) with a typical downstream increase in taxa richness at the 'impacted' sites (sites 5 and 8) compared with the control site (site 1).

The 'impacted' sites also had significantly higher MCI scores than the 'control' site and site 8 had a significantly higher $SQMCI_S$ score 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 $SQMCI_S$ support this observation.

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); presumably due to site 8 being further away from the discharge point and diluted by the Waingongoro River. Therefore, historic waste discharges had less of an effect on the macroinvertebrate community present at site 8 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 effect on the macroinvertebrate communities present in the Mangawhero Stream and Waingongoro River. Samples were processed to provide number of taxa (richness), MCI, and $SQMCI_S$ scores for each site.

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

The 'impacted' sites had higher macroinvertebrate indices (taxa number, MCI score and $SQMCI_S$ score) than the 'control' site. This would be due to both 'impacted' sites having better physical stream habitat conditions for macroinvertebrates in combination with a lack of discharges from the Eltham WWTP. Site 5 also had non-significant improvement for MCI and $SQMCI_S$ scores compared with its historical median and site 8 showed a significant improvement for the $SQMCI_S$ score compared with its historical median consistent with post diversion results.

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	Rae West, Job manager
From	Darin Sutherland, Environmental Scientist
Document	2079218
Report	DS096
Date	29 June 2018

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, March 2018

Introduction

This summer survey was the second of two surveys programmed for the 2017-2018 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 wastewater treatment plant (WWTP) consented overflow facility to the Mangawhero Stream in recent years. No overflows to the stream have occurred since this time.

This survey was performed some seven 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.

Methods

Current biomonitoring sites are presented in Table 1. The standard '400 ml kick sampling' technique was used to collect streambed (benthic) macroinvertebrates from the Mangawhero Stream and Waingongoro River on 21 March 2018.

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 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)

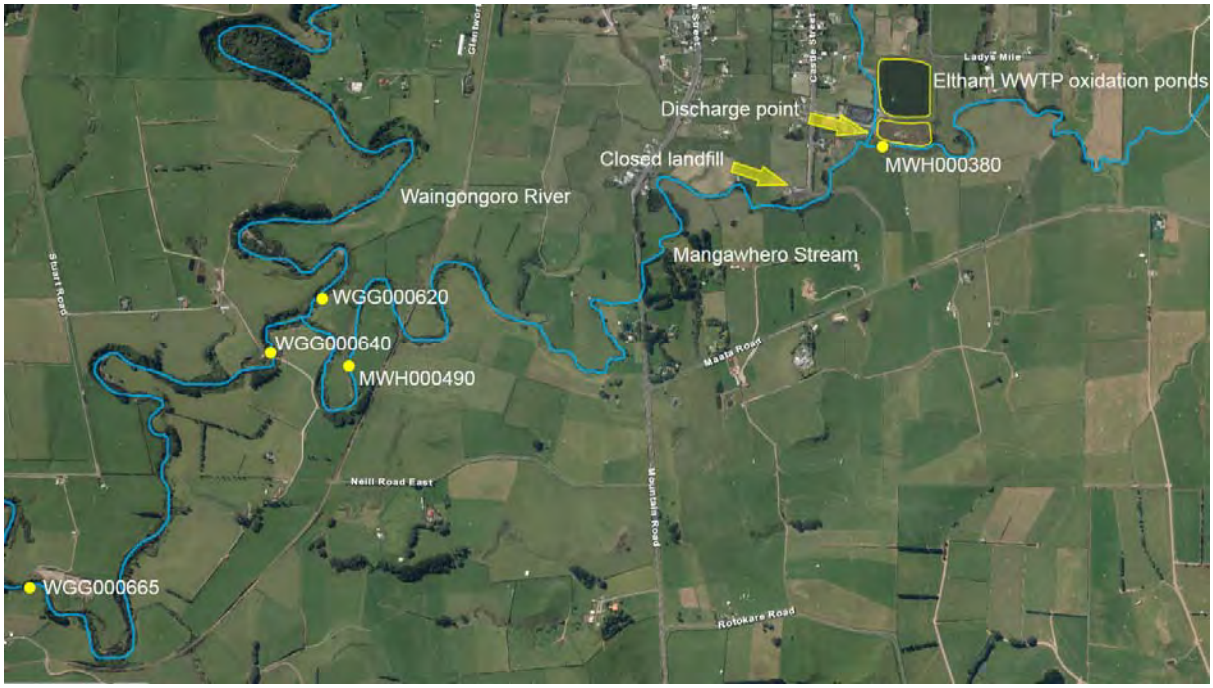


Figure 1 Aerial location map of biomonitoring site locations in the Mangawhero Stream and Waingongoro River in relation to Eltham WWTP and landfill

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 ($SQMCI_s$) has also been calculated for the taxa present at each site by multiplying each taxon score by a loading factor (related to its abundance), totalling these products, and dividing by the sum of the loading factors (Stark, 1998 and 1999). The loading factors were 1 for rare (R), 5 for common (C), 20 for abundant (A), 100 for very abundant (VA) and 500 for extremely abundant (XA). Unlike the MCI, the $SQMCI_s$ is not multiplied by a scaling factor of 20, so that its corresponding range of values is 20x lower. A difference of 0.9 units or more in $SQMCI_s$ 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 16.1-16.3 °C. Water speed was swift and the water was brown and cloudy at site 1 and grey and cloudy at site 5. The substrate at site 1 was hard clay while at site 5 it was a mixture of fine and coarse gravels, cobble and boulder. Site 1 had slippery algal mats and no filamentous algae. There was patchy leaves on the streambed and macrophytes growing on the streambed. Site 5 had widespread algal mats and patchy filamentous algae. Site 5 had patchy leaves on the streambed and 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 15.6-16.3. Water speed was swift and the water was uncoloured and cloudy at sites 6 and 8. Site 7 had grey cloudy water. The substrate at all three sites comprised predominately cobble/ coarse gravel. Site 6 had slippery algal mats and no filamentous algae. There was patchy leaves on the streambed. Site 7 also had slippery algal mats and no filamentous algae. There were also patchy leaves on the streambed. Site 8 had patchy algal mats and no filamentous algae. There was patchy moss and leaves on the streambed. All sites 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 November 2017 and the current survey

Site No.	N	No of taxa			MCI value			SQMCIs value		
		Median	Range	Current survey	Median	Range	Current survey	Median	Range	Current survey
1	56	16	10-25	17	74	58-85	64	4.1	1.5-6.3	2.5
5	51	20	13-30	21	79	63-102	87	3.2	1.5-6.4	3.4
6	32	26	16-35	21	96	77-116	101	5.7	3.7-6.8	7.4
7	31	26	17-35	16	92	78-109	96	4.5	2.2-7.0	6.0
8	45	20	14-30	15	95	77-111	89	4.4	2.4-7.6	6.8

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 21 March 2018

Taxa List	Site Number	MCI score	1	5	6	7	8
	Site Code		MWH000380	MWH000490	WGG000620	WGG000640	WGG000665
	Sample Number		FWB18179	FWB18180	FWB18174	FWB18175	FWB18176
PLATYHELMINTHES (FLATWORMS)	*Cura*	3	R	R	-	-	-
NEMERTEA	Nemertea	3	C	A	C	C	R
NEMATODA	Nematoda	3	R	R	-	-	-
ANNELIDA (WORMS)	Oligochaeta	1	A	R	-	-	R
	Lumbricidae	5	C	R	R	-	-
MOLLUSCA	*Physa*	3	-	-	-	R	-
	Potamopyrgus	4	A	A	R	R	R
	Sphaeriidae	3	R	-	-	-	-
CRUSTACEA	Ostracoda	1	C	-	-	-	-
	Paracalliope	5	R	A	-	-	-
EPHEMEROPTERA (MAYFLIES)	*Austroclima*	7	-	-	R	C	-
	Coloburiscus	7	-	-	A	C	R
	Deleatidium	8	-	C	XA	VA	VA
	Zephlebia group	7	-	-	R	-	-
COLEOPTERA (BEETLES)	Elmidae	6	-	A	A	R	R
MEGALOPTERA (DOBSONFLIES)	*Archichauliodes*	7	-	C	A	R	C
TRICHOPTERA (CADDISFLIES)	*Hydropsyche (Aoteapsyche)*	4	R	A	A	A	A
	Hydrobiosis	5	R	C	C	C	R
	Beraeoptera	8	-	-	R	-	-
	Oxyethira	2	A	-	-	-	-
	Pycnocentria	7	-	R	R	R	-
	Pycnocentrodes	5	-	R	A	A	-
	Triplectides	5	-	R	-	-	-
DIPTERA (TRUE FLIES)	*Aphrophila*	5	-	-	C	-	R
	Eriopterini	5	-	-	-	-	R
	Limonia	6	R	-	-	-	-
	Chironomus	1	C	-	-	-	-
	Harrisius	6	-	R	-	-	-
	Maoridiamesa	3	-	R	-	-	-
	Orthocladiinae	2	A	VA	C	A	C
	Polypedilum	3	-	-	C	C	-
	Tanytarsini	3	-	A	C	C	C
	Empididae	3	-	-	R	-	-
	Muscidae	3	R	C	-	-	-
	Austrosimulium	3	C	C	R	C	R
	Tanyderidae	4	-	-	R	-	R
	No of taxa		17	21	21	16	15
	MCI		64	87	101	96	89
	SQMCIs		2.5	3.4	7.4	6.0	6.8
	EPT (taxa)		2	6	9	7	4
	%EPT (taxa)		12	29	43	44	27

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

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

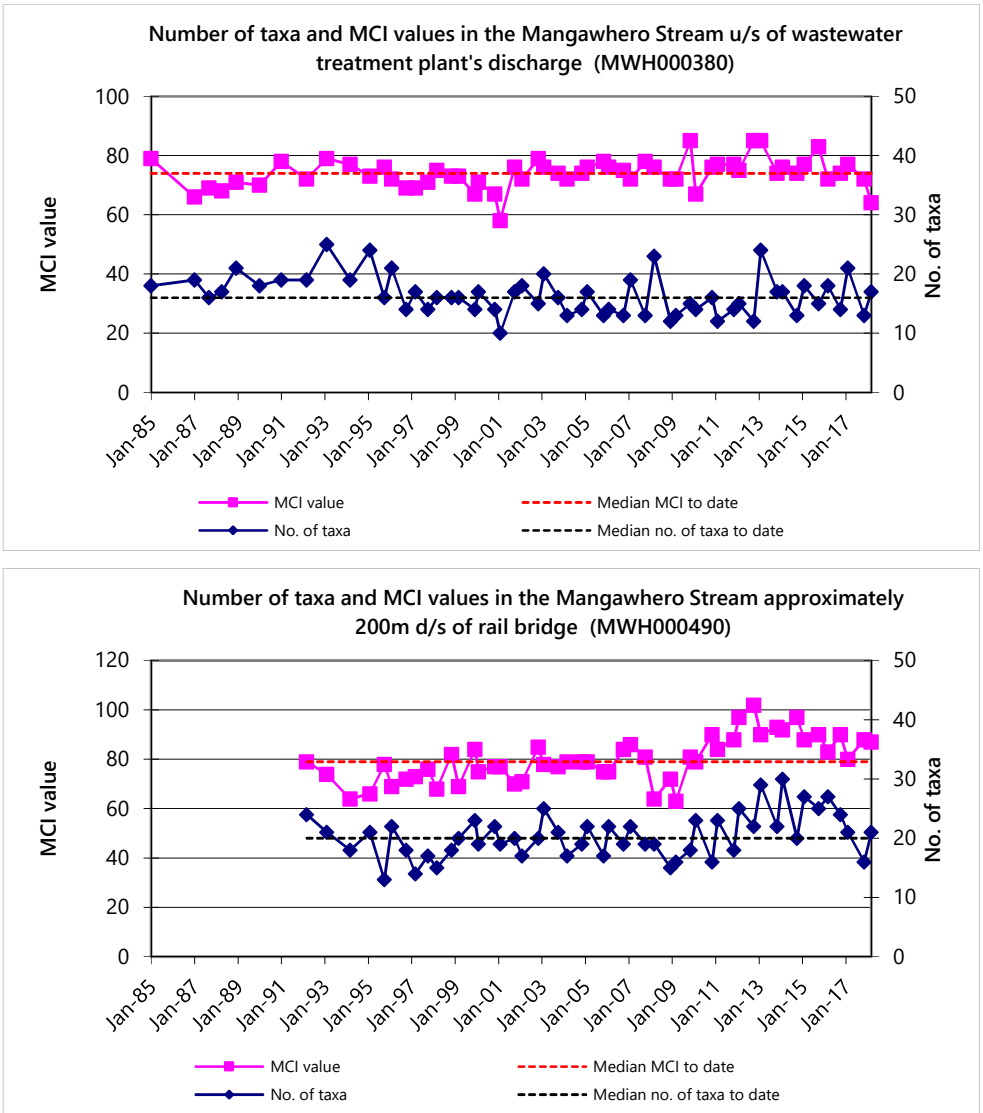


Figure 2 Taxa richness and MCI scores recorded at each site to date for Mangawhero Stream sites

Site 1 (upstream of the WWTP outfall)

A moderate macroinvertebrate community richness of 17 taxa was found at site 1 ('control' site) at the time of the summer survey (Table 3) which was one taxon more than the historic median (16 taxa) and three taxa more than the previous survey on November 2017 (13 taxa) (Figure 2).

The MCI score of 64 units indicated a community of 'poor' biological health which was not significantly different to the median MCI score (74 units) and to the previous survey (72 units). The $SQMCI_S$ score of 2.5 units was significantly lower (Stark, 1998) than the median $SQMCI_S$ score (4.1 units) (Table 3) but not significantly different to the previous survey (3.0 units).

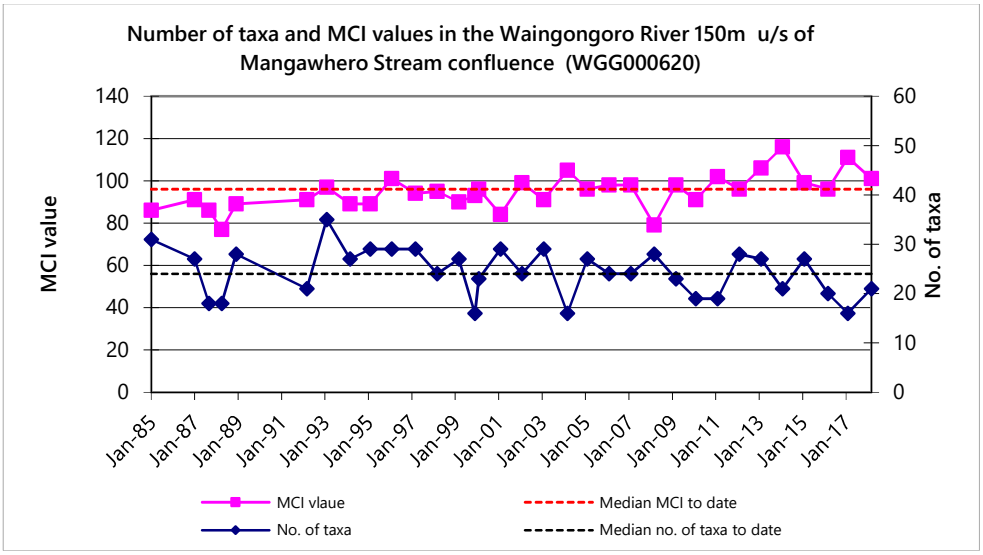
The community was characterised by four 'tolerant' taxa [oligochaete worms, snail (*Potamopyrgus*), caddisfly (*Oxyethira*) and midge (Orthocladiinae)] (Table 3).

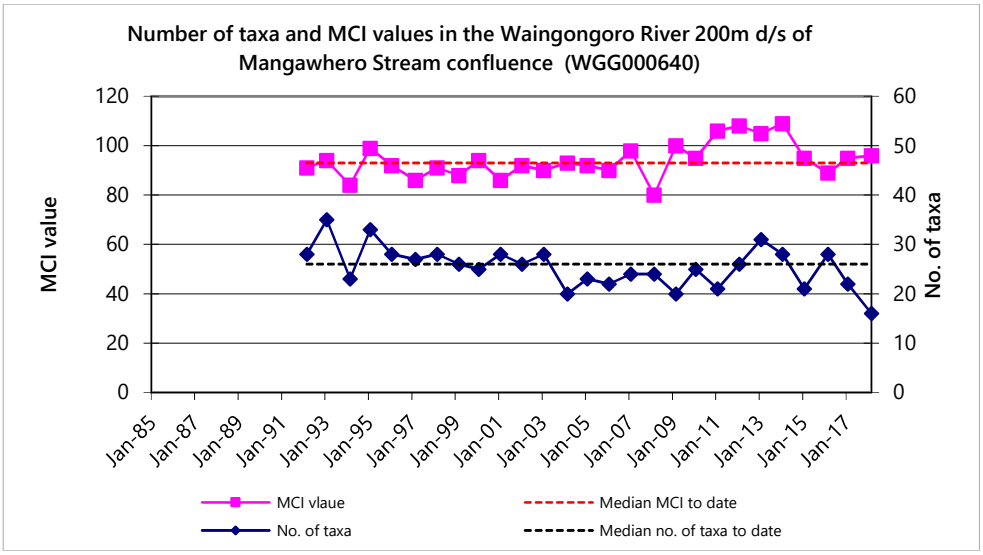
Site 5 (downstream of Mangawharawhara Stream confluence; approx 3 km below the WWTP outfall and old landfill)

A moderate macroinvertebrate community richness of 21 taxa was found at site 5 ('primary impacted' site) (Table 3) which was one more than the historic median (20 taxa) and five taxa more than the previous survey (16 taxa) (Figure 2).

The MCI score of 87 units indicated a community of 'fair' biological health which was not significantly different (Stark, 1998) to the median MCI score (79 units) and the previous survey (88 units) (Figure 2). The $SQMCI_S$ score of 3.4 units was not significantly different to the median $SQMCI_S$ score of 3.2 units (Table 3) and to the previous survey (3.2 units).

The community was characterised by six 'tolerant' taxa [proboscis worm (Nemertea), oligochaete worms, snail (*Potamopyrgus*), caddisfly (*Hydropsyche/Aoteapsyche*) and midges (*Maoridiamesa* and Tanytarsini)] and two 'moderately sensitive' taxa [amphipod (*Paracalliope*) and beetle (Elmidae)] (Table 3).





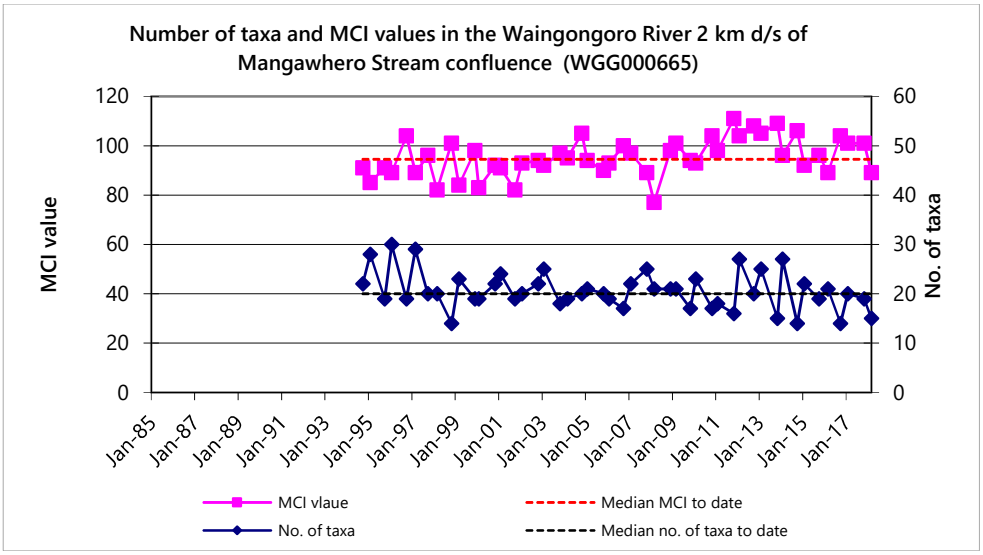


Figure 3 Taxa richness and MCI scores recorded at each site to date for Waingongoro River sites

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

A moderate macroinvertebrate community richness of 21 taxa was found at site 6 (Waingongoro River 'control' site) at the time of the survey (Table 4) which was lower than the median taxa richness of 26 taxa but five taxa higher than the previous survey on February 2017 (16 taxa) (Figure 3).

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 95 units, or the previous survey (111 units). The $SQMCI_S$ score of 7.4 units was significantly higher than the median $SQMCI_S$ score of 5.7 units but not significantly different to the previous survey (6.8 units) (Table 4).

The community was dominated by one 'tolerant' taxon [caddisfly (*Hydropsyche/Aoteapsyche*)], four 'moderately sensitive' taxa [mayfly (*Coloburiscus*), beetle (Elmidae), dobsonfly (*Archichauliodes*), caddisfly (*Pycnocentrodes*)], 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 16 taxa was found at site 7 ('secondary impact' site) at the time of the survey (Table 4) which was substantially lower than the median taxa richness of 26 taxa and six taxa lower than the previous survey on February 2017 (22 taxa) (Figure 3).

The MCI score of 96 units indicated a community of 'fair' biological health which was not significantly different (Stark, 1998) to the median MCI score of 92 units and the previous survey (95 units) (Figure 3). The $SQMCI_S$ score of 6.0 units was significantly higher (Stark, 1998) than the median $SQMCI_S$ score of 4.5 units but not significantly different to the previous survey (5.5 units) (Table 4).

The community was dominated by two 'tolerant' taxa [caddisfly (*Hydropsyche/Aoteapsyche*) and orthoclad midges], one 'moderately sensitive' taxon [caddisfly (*Pycnocentrodes*)], 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 15 taxa was found at site 8 ('tertiary impact site) at the time of the survey (Table 4) which was five taxa lower than the median taxa richness (20 taxa) taxa and five taxa lower than the previous survey on November 2017 (20 taxa) (Figure 3).

The MCI score of 89 units indicated a community of 'fair' biological health which was not significantly different (Stark, 1998) to the median MCI score of 95 units but was significantly lower than the previous survey (101 units) (Figure 3). The $SQMCI_S$ score of 6.8 units was significantly higher (Stark, 1998) than the median $SQMCI_S$ score of 4.4 units and to the previous survey (4.8 units) (Table 4).

The community was dominated by one 'tolerant' taxon [caddisfly (*Hydropsyche/Aoteapsyche*) 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 one taxon of historic median levels for both sites, with a slight increase in richness of four taxa from the upstream 'control' site to the downstream' impact site. The Mangawhero Stream 'control' site had 'poor' health which was typical for the site with the MCI score not significantly different to the historic median. The downstream 'impact' site had 'fair' health which was again typical for that site as the MCI score was not significantly different to the historic median. 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 'impact' site. The $SQMCI_S$ score was significantly lower than usual at the 'control' site but was typical at the 'impact' site. Congruent with the MCI score, there was a significant downstream decrease in score. Overall, the 'control' site macroinvertebrate community appears to be in poorer health than normal while the 'impact' site was in typical health. There was no evidence of discharges or leakage from the WWTP or closed landfill site having any impact on the macroinvertebrate community between the two sites at the time of the survey.

The Waingongoro River sites, including the 'control' site, all had lower than usual taxa richnesses (by 5-10 taxa) compared with historic medians. MCI scores were not significantly different from historic medians and there was no significant difference between the 'control' site, site 6, and site 7 and between sites 7 and 8 though there was an overall significant decrease between sites 6 and 8. This would be due to a general deterioration of macroinvertebrate health in a downstream direction as observed in the majority of Taranaki ringplain streams and rivers and would not be directly attributable to pollution from the Mangawhero Stream.

Taxa composition was noticeably 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 and less tolerant 'taxa' such (e.g. Potamopyrgus mud snails) which were at lower abundances compared with the Mangawhero Stream. This caused significant differences in SQMCIS scores between the two waterbodies. There was a significant difference between sites 6 and 7 but not sites 6 and 8 which was largely caused by a decrease in Deleatidium mayflies downstream of site 6 and an increase in orthoclad

midges at site 7. This may be due to nutrient enrichment as the Mangawhero Stream may be more eutrophic than the Waingongoro River.

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 also be attributed to the closed landfill. Given the lack of impacts from the WWTP and closed landfill site the five site summer survey is unnecessary. Therefore, it is recommended that the three site survey used for the spring period be implemented for the summer period as well with the two additional sites used as provisional survey sites in the event of significant discharges occurring from the WWTP.

Summary

On the 21st March 2018 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 effect on the macroinvertebrate communities present in the Mangawhero Stream and Waingongoro River. Samples were processed to provide number of taxa (richness), MCI, and $SQMCI_S$ scores for each site.

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

Taxa richnesses were similar to historical median taxa richnesses at the Mangawhero Stream sites, while there was an overall drop in richnesses at the Waingongoro River sites. The MCI and $SQMCI_S$ scores for the three potentially impacted sites (sites 5, 7 and 8) were all higher or not significantly different to historical medians in the Mangawhero Stream and there were significant increases in MCI and $SQMCI_S$ scores between sites 1 and 5. There was probably a slight decrease in overall macroinvertebrate health in a downstream direction for the Waingongoro River sites, as reflected in the historic medians, probably as a result of cumulative impacts, particularly for the furthest downstream site (site 8) and the influence of the Mangawhero Stream which would appear to be more eutrophic than the Waingongoro River.

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.

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