South Taranaki District Council
Eltham, Hawera, Kaponga, Manaia, Patea, Opunake and Otakeho Landfills Monitoring Programme Annual Report 2013- 2014

Technical Report 2014-9

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Executive summary

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

This report for the period July 2013 -June 2014 describes the monitoring programmes implemented by the Taranaki Regional Council (the Council) to assess STDC's environmental performance during the period under review, and the results and the environmental effects of STDC's activities at the Eltham, Manaia, Hawera, Opunake, Kaponga, Otakeho and Patea landfills.

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

In relation to its closed landfills STDC hold 10 resource consents consisting of eight discharge of stormwater and/or leachate to water consents, one discharge to air consent, and one land use consent. These permits have a total of 67 special conditions that STDC must adhere to.

To monitor compliance with these conditions during the 2013-2014 year, Council staff conducted 10 inspections, took 29 discharge and receiving environment samples, and conducted two biomonitoring surveys.

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

There were no significant issues observed at these sites and no adverse effects were noted. In regards to all the landfill sites, STDC demonstrated a high level of environmental performance and a high level of administrative performance.

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

This report includes recommendations for the 2014-2015 year.

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Kaponga
Manaia
Opunake
Otakeho
Patea

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1. Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is the Annual Report for the period July 2013-June 2014 by the Taranaki Regional Council (the Council) on the monitoring programmes associated with resource consents held by South Taranaki District Council (STDC) for municipal landfills. STDC maintains seven closed landfills at Manaia, Eltham, Hawera, Opunake, Kaponga, 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 its closed landfill sites.

One of the intents of the *Resource Management Act 1991* (RMA) is that environmental management should be integrated across all media, so that a consent holder's use of water, air, and land should be considered from a single comprehensive environmental perspective. Accordingly, the Council generally implements integrated environmental monitoring programmes and reports the results of the programmes jointly. This is the 25th combined monitoring report discussing the environmental effects of the STDC's use of water, land, and air in respect to the closed landfills it maintains.

1.1.2 Structure of this report

Section 1 of this report is a background section. It sets out general information about compliance monitoring under the RMA and the Council's obligations and general approach to monitoring sites through annual programmes, the landfill resource consents held by STDC shown in the nature of the monitoring programme in place for the period under review and a description of the activities and operations conducted by STDC.

Sections 2- 8 present the results of monitoring during the period under review, including scientific and technical data for each landfill. The results for each landfill are discussed and interpreted and recommendations are made for the next monitoring period.

Section 9 presents a summary of recommendations to be implemented in the 2014-2015 monitoring year.

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

1.1.3 The Resource Management Act 1991 and monitoring

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

(a) the neighbourhood or the wider community around a discharger, and may include cultural and socio-economic effects;
(b) physical effects on the locality, including landscape, amenity and visual effects;

(c) ecosystems, including effects on plants, animals, or habitats, whether aquatic or terrestrial;
(d) natural and physical resources having special significance (for example recreational, cultural, or aesthetic);
(e) risks to the neighbourhood or environment.

In drafting and reviewing conditions on discharge permits, and in implementing monitoring programmes, the Council is recognising the comprehensive meaning of 'effects' inasmuch as is appropriate for each 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 Evaluation of environmental and administrative performance

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

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

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

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

Environmental Performance

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

- **Good** Likely or actual adverse effects of activities on the receiving environment were negligible or minor at most. There were some such issues noted during monitoring, from self reports, or in response to unauthorised

incident reports, but these items were not critical, and follow-up inspections showed they have been dealt with. These minor issues were resolved positively, co-operatively, and quickly. The Council was not obliged to issue any abatement notices or infringement notices in relation to the minor non-compliant effects; however abatement notices may have been issued to mitigate an identified potential for an environmental effect to occur.

For example:

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

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

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

Administrative compliance

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

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

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

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

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

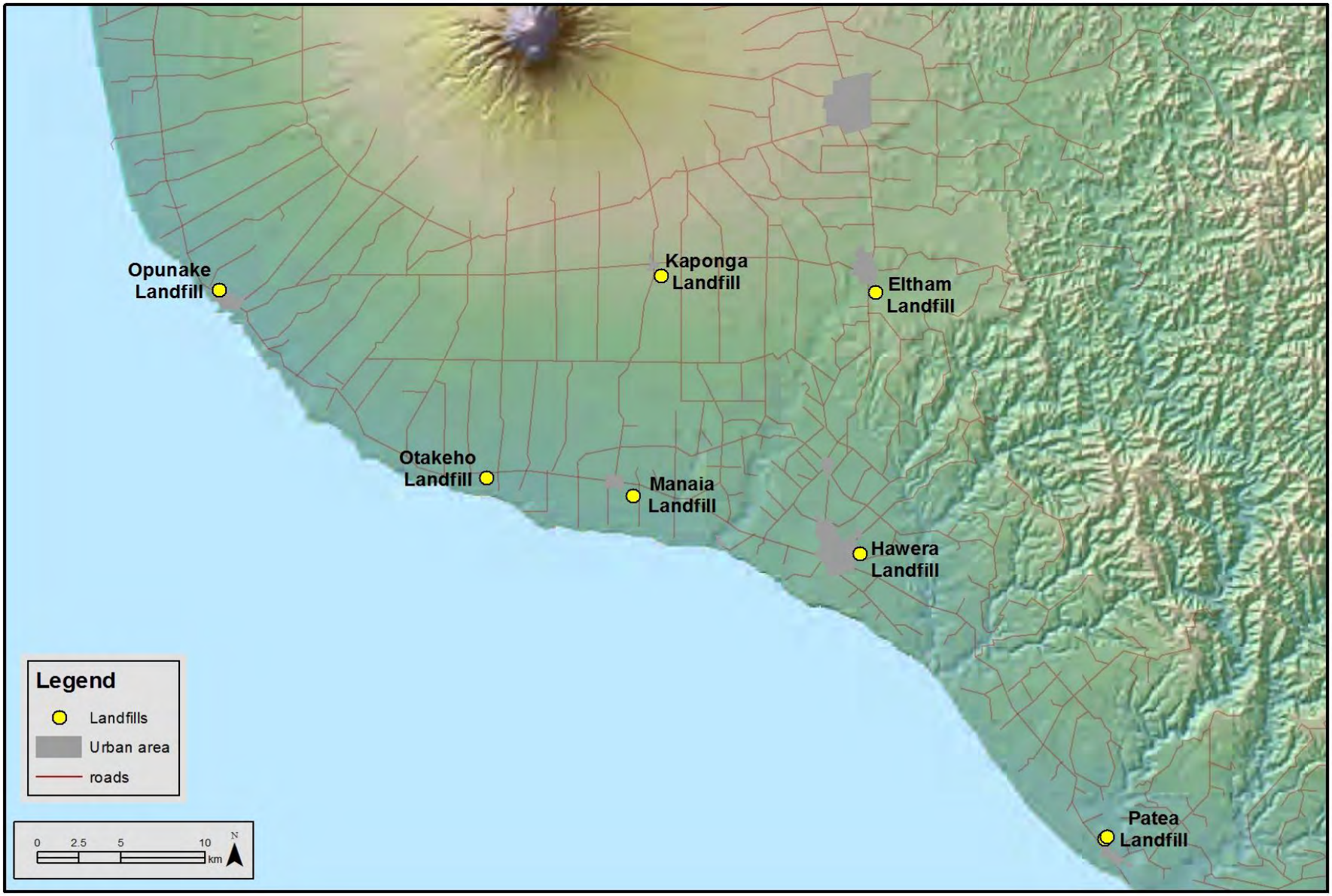

Figure 1 Regional map of STDC landfills

1.2 Process description

STDC maintained seven closed municipal landfills in the South Taranaki district during the 2013-2014 period (Figure 1). All these sites tend to have a long history of waste disposal and as such do not have engineered liners and are thus classed as Class B landfills as designated 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 has steadily decreased over the years and currently the only general municipal landfill in operation in the Taranaki region is the Colson Rd Landfill which is operated by the New Plymouth District Council as a regional facility.

1.3 Resource consents

STDC hold 10 resource consents associated with the closed landfills they maintain. A summary of the consents is given in Table 1 and more detailed information is given in sections 1.3.1 to 1.3.3.

Table 1 Summary table of resource consents and key dates associated with each municipal landfill in South Taranaki

Landfill site	Consent no.	Purpose	Review	Expire
Hawera	0444-4	To discharge up to 2,800 cubic metres/day of leachate from a closed landfill into an unnamed tributary of the Tawhiti Stream	June 2004 June 2010	1 June 2016
	5831-1	To divert an unnamed tributary of the Tawhiti Stream	June 2004 June 2010	1 June 2016
Patea	0427-3	To discharge surface water and leachate from the Patea municipal landfill into an unnamed tributary of the Patea River	June 2010 June 2016	1 June 2022
	7268-1	To discharge stormwater form earthworks	June 2010 June 2016	1 June 2022
	4636-2	To discharge emissions into the air from the Patea municipal landfill	June 2010 June 2016	1 June 2022
Manaia	3952-2	To discharge leachate and stormwater from the Manaia landfill into the Waiokura Stream	June 2011 June 2017	1 June 2023
Kaponga	3459-3	To discharge stormwater and leachate from the Kaponga landfill into an unnamed tributary of the Waiokura Stream	June 2011 June 2017	1 June 2023
Otakeho	3953-3	To discharge leachate and stormwater from the closed Otakeho municipal landfill onto and into land	June 2006 June 2012	1 June 2018
Eltham	3387-3	To discharge stormwater and leachate from the former Eltham landfill into the Mangawhero Stream	June 2011 June 2017	1 June 2023
Opunake	0526-3	To discharge stormwater and leachate from the closed Opunake landfill into the Otahi Stream	June 2006 June 2012	1 June 2018

1.3.1 Water discharge permits

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

Consent 0444-4

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

Special condition 1 requires the consent holder to adopt the best practicable option.

Special conditions 2 and 3 deal with maintaining the landfill cap and provision of a post closure management plan.

Special 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.

Special condition 7 deals with the mixing zone for the discharge and special condition 8 states the effects the discharge shall not have on receiving water.

Special conditions 9 and 10 deal with ground water monitoring and bore maintenance.

The last two conditions (11 and 12) are review provisions.

The permit is attached to this report in Appendix I.

Consent 0427-3

STDC holds water discharge permit **0427-3** to cover the discharge of leachate and stormwater from 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.

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

Special condition 3 deals with notification of amendments to these plans.

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

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

Special condition 7 requires that the discharge shall not cause adverse

environmental effects on receiving waters.

Special condition 8 requires the consent holder to adopt the best practicable option.

The last condition (9) is a review provision.

The permit is attached to this report in Appendix I.

Consent 3952-2

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.

Special condition 1 requires the consent holder to adopt the best practicable option.

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

Special condition 4 deals with notification of amendments to these plans.

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

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

The last condition (8) is a review provision.

The permit is attached to this report in Appendix I.

Consent 3459-3

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.

Special condition 1 requires the consent holder to adopt the best practicable option.

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

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

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

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

The last condition (6) is a review provision.

The permit is attached to this report in Appendix I.

Consent 3953-3

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

Special condition 1 requires the consent holder to adopt the best practicable option.

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

Special 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.

Special 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) relates to consent review.

The permit is attached to this report in Appendix I.

Consent 3387-3

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.

Special condition 1 requires the consent holder to adopt the best practicable option.

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

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

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

The last condition (5) is a review provision.

The permit is attached to this report in Appendix I.

Consent 0526-3

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

Special condition 1 requires the consent holder to adopt the best practicable option.

Special condition 2 requires the consent holder to prepare a site contingency plan and condition 3 requires STDC to notify of changes to the plan.

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

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

The last condition (6) is a review provision.

The permit is attached to this report in Appendix I.

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.

Special condition 1 requires the consent holder to adopt the best practicable option.

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

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

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

Special condition 5 outlines reinstatement requirements.

Special condition 6 is a lapse condition.

Special condition 7 is a review condition.

1.3.2 Air discharge permit

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

Consent 4636-2

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.

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

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

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

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

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

Special condition 6 requires the consent holder to adopt the best practicable option.

The last condition (7) is a review provision.

The permit is attached to this report in Appendix I.

1.3.3 Land use permit

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

Consent 5831-1

STDC hold land use permit **5831-1** to culvert an unnamed tributary of the Tawhiti Stream. This permit was issued by the Council on 28 June 2001 as a resource consent under Section 87(e) of the RMA. It is due to expire on 1 June 2016.

Special condition 1 relates to informing the Council of works to be carried out.

Special condition 2 states that the exercise of the consent should be

undertaken in accordance to documents submitted with the application.

Special condition 3 requires the consent holder to adopt the best practicable option.

Special condition 4 requires the consent holder to minimise streambed disturbance.

Special condition 5 requires the consent holder to maintain the culvert.

Special condition 6 relates to preparation of a contingency plan relating to blockages of the culvert.

Special condition 7 is a review condition.

The permit is attached to this report in Appendix I.

1.4 Monitoring programme

1.4.1 Introduction

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

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

The monitoring programme for the sites consisted of four primary components.

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 reviews;
- renewals;
- new consents;
- advice on the Council's environmental management strategies and content of regional plans and;
- consultation on associated matters.

1.4.3 Site inspections

The landfill sites were inspected during the monitoring period as described in Table 2. A total of 10 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 29 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 programme to assess if the discharges of leachate and stormwater were having any effect on aquatic ecosystems.

Table 2 STDC monitoring activity for the monitoring period 2013-2014

Landfill	Catchment	Biological surveys	Inspections	Samples taken
Patea	Patea	0	3	4
Manaia	Waiokura	0	2	4
Hawera	Tawhiti	0	1	18
Otakeho	Taikatu	0	1	1
Eltham	Waingongoro	2	1	0
Opunake	Otahi	0	2	2
Total		2	10	29

2. Hawera landfill

2.1 Background

The Matangara Road Municipal Landfill was used for domestic waste disposal for the Hawera District. A natural stream flowed down a deep gully (approximately 30 metres) from the north-west to the south-east of the landfill site (unnamed tributary of the Tawhiti Stream). The stream was directed into a 750 mm pipe and waste was deposited into the landfill over the pipe. The stream now flows underneath the landfill area. The stream exits the diversion pipe where it intersects with a roadside drain which flows into a second unnamed tributary (roadside tributary) that runs adjacent to Matangara Road. This 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 waste water treatment plant.

2.2 Results

2.2.1 Inspections

One inspection was carried out in the 2013-2014 monitoring year, on 28 May 2014.

The cap on the landfill was well vegetated and appeared sound. There were no issues in regards to cracking, slumping or erosion. The receiving waters were inspected and no visual effects were noted in Tawhiti Stream. The usual deposits of iron oxide were present in the upper reaches of the unnamed tributary, otherwise this was running clean and clear.

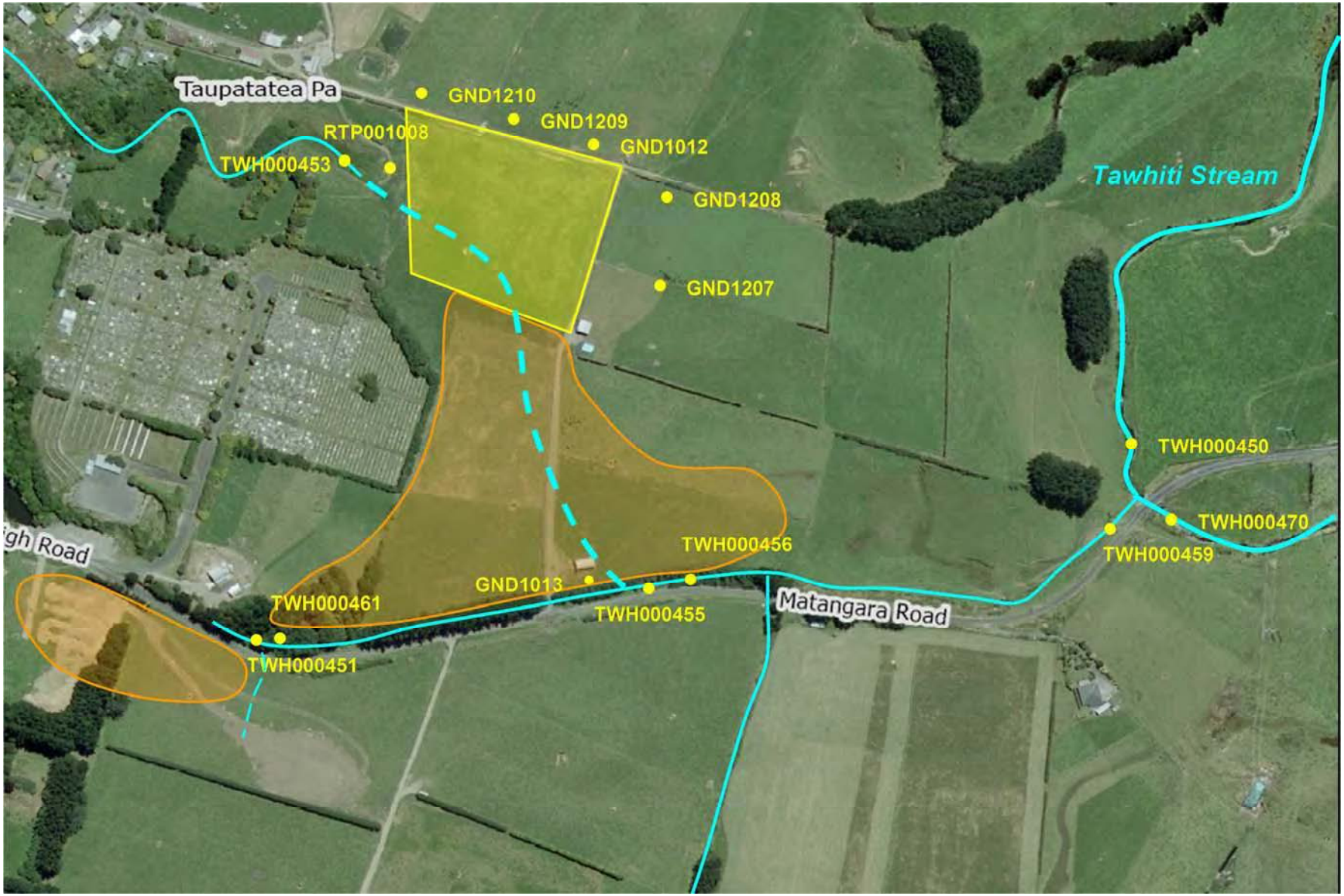

Figure 2 Aerial view of Hawera landfill and sampling sites. The older areas of landfill area shown in orange and the newer areas in yellow

2.2.2 Results of discharge monitoring

Three leachate samples were collected at the leachate sump (site RTP001008) during the 2013-2014 monitoring period. The results are presented in Table 3 and the location of the sampling site is shown in Figure 2.

Table 3 Chemical analysis of Hawera landfill leachate samples collected in 2013-2014

Parameter	Unit	30 Aug 2013	18 Sep 2013	7 Mar 2014	Historical Data (given where N >5)		
					Min	Max	Mean
Alkalinity	g/m^3CaCO_3	130	742	1090	666	1310	1010
Chloride	g/m^3	41	162	325	122	1100	326
Chemical oxygen demand filtered	g/m^3	11	87	130	67	290	148
Conductivity @ 20 C	mS/m	44	176	273	144	319	240
Dissolved chromium	g/m^3	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Dissolved reactive phosphorus	g/m^3	<0.003	0.003	<0.003	<0.003	0.030	0.006
Acid soluble iron	g/m^3	0.38	44.4	21.8	2.3	71.8	39.6
Total mercury	g/m^3	<0.002	<0.002	0.0016	<0.0001	0.0004	<0.0002
Unionised ammonia	g/m^3N	0.00022	-	-	0.091	1.26	0.460
Ammoniacal nitrogen	g/m^3N	0.308	74.2	134	60	176	116
Nitrate/nitrite N	g/m^3N	3.97	0.02	0.03	<0.01	1.13	0.15
pH	pH	6.4	6.7	7.0	6.5	7.6	6.9
Temperature	C	12.9	-	-	15.8	36.2	18.9
Dissolved zinc	g/m^3	<0.005	<0.005	<0.005	<0.005	0.086	0.020

Results indicate that waste in the landfill is still actively degrading and releasing contaminants. High chloride, ammoniacal nitrogen, and chemical oxygen demand concentrations are typical values for landfill leachate, however these contaminants should gradually trend down over time. With the exception of nitrate/nitrite N, all results in the year under review were below maximum values previously recorded, and were generally comparable to the historical means. As most of this leachate is pumped to the Hawera wastewater treatment plant, the majority of the contaminants found in these results have no direct effect on the immediate environment.

2.2.3 Results of groundwater monitoring

Six groundwater samples were collected during the 2013-2014 period. The results of the chemical analyses are set out in Table 4 below.

As with previous monitoring periods the bore GND1012 exhibits elevated levels of landfill contamination indicators such as increased chlorides, COD, alkalinity, iron, unionised ammonia, and ammoniacal nitrogen. This bore is immediately adjacent to, and down gradient of the landfill footprint. Bores GND1013 and GND1207 are farther from the most recently landfilled areas and have far lower levels of landfill indicator species.

Table 4 Chemical analysis of groundwater samples from bores at Hawera landfill

		GND1012		GND1013		GND1207	
Parameter	Unit	18 Sep 13	7 Mar 14	18 Sep 13	7 Mar 14	12 Nov 13	4 Jun 14
Alkalinity	g/m^3 $CaCO_3$	830	648	94	144	120	88
Chloride	g/m^3	172	139	20	25	124	139
Filtered COD	g/m^3	78	46	5	<5	9	7
Conductivity @ 20°C	mS/m	196	162	31	37	56	62
Dissolved reactive phosphorus	g/m^3	0.008	0.004	0.005	0.010	0.011	0.009
Acid soluble iron	m	78.7	59.6	4.1	2.2	0.12	96.6
Level	g/m^3	3.51	3.84	2.74	3.39	4.63	5.15
Unionised ammonia	g/m^3 N	0.1744	0.1476	<0.0001	0.00001	0.00002	0.00001
Ammoniacal nitrogen	g/m^3 N	79.6	65.4	0.006	0.011	0.026	0.013
Nitrite/nitrate nitrogen	g/m^3 N	0.08	11.8	2.86	2.10	1.53	1.09
pH	pH	6.8	6.8	6.4	6.5	6.4	6.3
Temperature	Deg.C	15.7	16.1	14.6	16.0	14.4	14.3
Dissolved zinc	g/m^3	0.006	0.006	<0.005	0.013	1.10	0.052

2.2.4 Results of surface water monitoring

Nine surface water sites (see Figure 2) were sampled on one occasion over the period under review. The results of the chemical analysis of these samples are listed in Table 5.

The discharge from the landfill culvert has elevated levels of ammoniacal nitrogen, iron and alkalinity; this may indicate that some landfill contamination is seeping into the culvert at some point. The culvert discharges into the roadside tributary which flows into the Tawhiti Stream.

The roadside tributary shows moderate levels of contamination (mostly in the form of iron and ammoniacal nitrogen), however the water quality results from the Tawhiti Stream (as given in bold in Table 5) show that inflow from the roadside tributary is having a negligible effect on water quality in the Tawhiti Stream at the compliance point (site THW000470).

Table 5 Results of chemical analysis of surface water at the Hawera landfill 30 August 2013

Parameter	Unit	Sites on unnamed tributary of the Tawhiti							Tawhiti Stream sites	
		TWH000451 Road side drain 20m u/s of SW drain	TWH000452 Road side drain u/s landfill culvert	TWH000453 10 m u/ s of landfill	TWH000455 Discharge from culvert under landfill	TWH000456 Unnamed trib 50m d/s of landfill culvert	TWH000459 Unnamed trib 10 m u/s confluence	TWH000461 SW trib in-flow culvert	TWH000450 u/s of Matangara Rd	TWH000470 d/s of Matangara Rd
Alkalinity	g/m3	105	102	82	113	83	83	62	45	46
BOD	g/m3	2.1	2.5	1.3	3.2	2.1	3.1	<0.5	4.5	4.4
Conductivity	mS/m	31	31	29	36	31	31	24	22	23
Dissolved reactive phosphorus	g/m3	<0.003	0.009	0.010	0018	0.020	0.013	0.004	0.032	0.032
Acid soluble iron	g/m3	4.37	2.02	0.82	4.17	1.74	1.66	0.59	2.59	2.56
Total mercury	g/m3	-	-	-	<0.0002	-	-	-	-	-
Unionised ammonia	g/m3-N	0.00334	0.00269	0.00043	0.00390	0.00420	0.00696	0.00041	0.00090	0.00110
Ammoniacal nitrogen	g/m3-N	1.06	0.854	0.077	2.54	0.711	0.724	0.285	0.170	0.203
Nitrate/nitrite nitrogen	g/m3	1.29	1.50	1.68	2.07	1.50	1.43	1.81	2.13	1.88
pH	pH	7.1	7.1	7.3	6.8	7.4	7.6	6.7	7.4	7.4
Temperature	Deg C	11.3	11.3	12.9	10.9	10.5	10.9	13.0	9.0	9.3
Dissolved zinc	g/m3	0.230	0.029	0.028	0.032	0.014	0.013	<0.005	<0.005	<0.005

2.3 Investigations, interventions, and incidents

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

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

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

In the 2013-2014 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with conditions in resource consents associated with the Hawera landfill, or provisions in Regional Plans.

2.4 Discussion

2.4.1 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. No complaints were recorded by the Council during the monitoring period under review. The culvert remains in good condition at either end and allows unimpeded flow. The final cap appears in good condition and grass growth across the cover was noted as good at the time of the inspection.

2.4.2 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 drain. Despite this, the landfill is having no significant effect on the water quality of the Tawhiti Stream. Groundwater is affected by the presence of the landfill, in the immediate vicinity of the deposited refuse, but no significant effects were detected in the adjacent water ways.

2.5 Evaluation of performance

A tabular summary of STDC's compliance record at Hawera landfill for the year under review is set out in Table 6 and 7.

Table 6 Summary of performance for consent 0444-4 discharge of leachate and stormwater

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. 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
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. The two existing 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 provision for review during monitoring period	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 7 Summary of performance for consent 5831-1 to divert an unnamed tributary to the Tawhiti Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Notification of any maintenance works which may disturb the stream	N/A	N/A
2. Construct structures in accordance with documentation submitted in support of application	N/A	N/A
3. Prevent or minimise any likely adverse effects on the riverbed and water quality due to the discharge of contaminants	Site specific monitoring programme	Yes
4. Minimise the area of riverbed which must be disturbed, and reinstate the areas that have been disturbed	Site specific monitoring programme	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
5. Insure the diversion pipe is clear of any blockages	Site specific monitoring programme – inspection	Yes
6. Prepare a contingency plan re blockages	Site specific monitoring programme	Yes
7. Optional review provision re environmental effects	No provision for review during monitoring period	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 performance and a high level of administrative performance. During the year under review there were no incidents associated with the site and no complaints were received by Council.

2.6 Recommendations from the 2012-2013 Annual Report

In the 2012-2013 Annual Report it was recommended:

THAT monitoring of discharges from Hawera landfill in the 2013-2014 year continue at the same level as in the 2012-2013 period.

The recommendation was subsequently implemented.

2.7 Alterations to monitoring programmes for 2014-2015

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

It is proposed that for 2014-2015, the programme is altered slightly from the 2013-2014 monitoring programme, with the discontinuation of the triennial groundwater sampling at sites GND1207, GND1208 and GND1209 as these extra bores were monitored under agreement with the landowner and the consent holder and this is no longer required.

2.8 Recommendation

THAT monitoring of discharges from Hawera landfill in the 2014-2015 year is altered slightly from the 2013-2014 monitoring programme, with the discontinuation of the triennial groundwater sampling at sites GND1207, GND1208 and GND1209.

3. Otakeho landfill

3.1 Background

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.

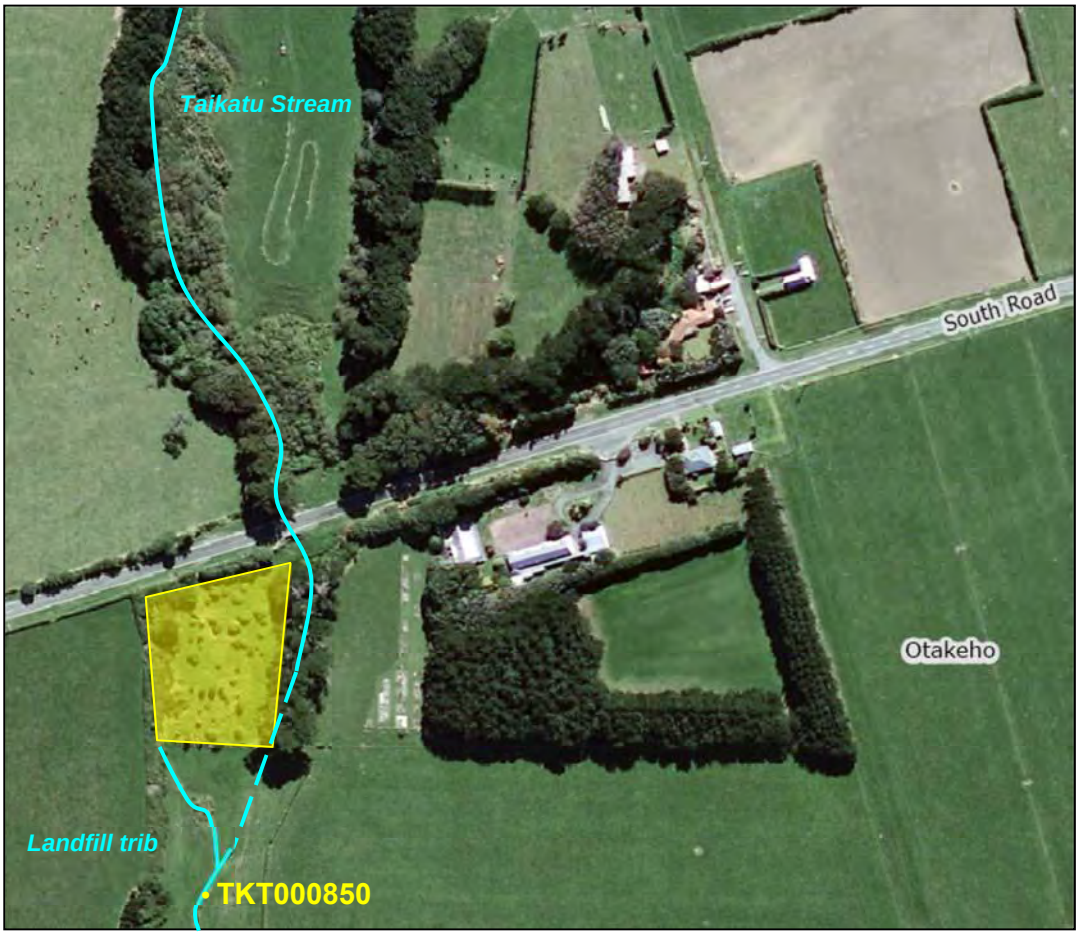

Figure 3 Aerial image of Otakeho landfill and Taikatu stream

3.2 Results

3.2.1 Inspections

A site visit was made to the Otakeho landfill on 18 March 2014 to conduct a compliance monitoring inspection and to collect a water sample.

The cap of the closed landfill was inspected and was found to have a very thick cover of vegetation consisting of long grasses, shrubs and trees. There was one small area of erosion on the eastern side of the cap (Photo 1) and this will need to be monitored. All other areas of the cap appeared stable and sound. During the inspection no exposed refuse or odours were observed.

The channel of the of the unnamed tributary of the Taikatu Stream that runs on the west side of the landfill was inspected and found to be running clear at a moderate flow and

no visual effects of the landfill's presence were noted. The spring at the base of the landfill had a trickle flow and this was flowing into the unnamed tributary just below the culvert. There were no odours noted around the spring, and no effects were noted in the tributary down stream of the spring discharge.

The site manager was contacted about the small area of erosion.

Photo 1 Erosion on the eastern side of the Otakeho landfill

3.2.2 Results of surface water monitoring

A water sample was collected at point 10 metres downstream of the confluence of the spring and the unnamed tributary (Figure 3, Table 8).

Table 8 Results of chemical analysis of surface water at the Otakeho landfill 18 March 2014, and a summary of historical results 1992-2010

	Alkalinity g/m^3	Conductivity mS/m@20ºC	Acid soluble iron g/m^3	Ammoniacal N g/m^3	pH	Temp ºC	Dissolved Zinc g/m^3
18 Mar 2014	107	44	2.09	0.061	7.4	16.0	0.026
Number	11	11	10	11	11	9	7
Range	34 – 110	35 – 55	0.36 – 1.5	0.015 – 0.081	7.4 – 7.7	9.7 – 18.0	<0.005 – 0.006
Average	74	42	0.8	0.038	7.5	13.4	<0.005

Results of alkalinity, conductivity, ammonia, and pH were within the range of previous results and did not indicate significant contamination from the landfill.

Levels of iron and zinc were however considerably higher than found previously at the landfill and this is most likely due to the drought conditions causing concentrations of these landfill indicator species to increase via reduced dilution from freshwater inputs. The concentrations of zinc and iron were however at acceptable levels and not considered high enough to warrant concern.

3.3 Investigations, interventions, and incidents

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

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

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

In the 2013-2014 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with conditions in resource consents relating to Otakeho landfill or provisions in Regional Plans.

3.4 Discussion

3.4.1 Discussion of site performance

In general, the Otakeho landfill was well managed. The consent holder has an up-to-date contingency plan in place for the site. No complaints were recorded by the Council during the monitoring period under review. There was a small amount of erosion identified during the inspection and the site manager was informed of this.

3.4.2 Environmental effects of exercise of consents

Levels of iron and zinc were higher than found previously at the landfill and this is most likely due to the drought conditions causing concentrations of these landfill indicator species to increase via reduced dilution from freshwater inputs. The concentrations of zinc and iron were however at acceptable levels.

The physicochemical monitoring associated with consent 3953 indicates the leachate discharge from the landfill is not having a significant effect on the receiving waters.

3.5 Evaluation of performance

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

Table 9 Summary of performance for consent 3953-3 discharge of leachate and stormwater

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Prevent or minimise any likely adverse effects on the environment	Site specific monitoring programme – inspection and water sampling	Yes
2. Exercise of consent in accordance with application	Site specific monitoring programme – inspection	Yes
3. Prepare and maintain contingency plan	Updated plan for site provided in July 2013	Yes
4. Notice required for changes to contingency plan		Yes
5. Monitoring to satisfaction of Council	Site specific monitoring programme – inspection and water sampling	Yes
6. Discharge not to cause adverse effects	Site specific monitoring programme – water sampling	Yes
7. Review of consent	No further provision 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, STDC demonstrated a high level of environmental performance and a high level of administrative performance. During the year under review there were no incidents associated with the site and no complaints were received by Council.

3.6 Recommendation from the 2012-2013 Annual Report

The 2012-2013 Annual Report recommended;

THAT the Otakeho landfill programme remains in place with monitoring next scheduled for the 2013-2014 period.

3.7 Alterations to monitoring programmes for 2014-2015

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

It is proposed that the programme remain unchanged and that the programme next be implemented in the 2016-2017 period and triennially thereafter.

3.8 Recommendation

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

4. Eltham landfill

4.1 Background

This landfill used to service the township of Eltham and surrounding rural areas but was closed in 1992 due to exhaustion of landfill capacity. The 0.71 ha site is located on Castle Road, just downstream of the Eltham oxidation ponds (Figure 4). The area is generally well rehabilitated, with the majority of the area grassed. The landfill is monitored under the Eltham WWTP/Eltham landfill combined monitoring programme.

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

Now that the WWTP pumps its effluent to the Hawera WWTP, the water quality in the Mangawhero Stream has improved and monitoring has been reduced to biennial biomonitoring.

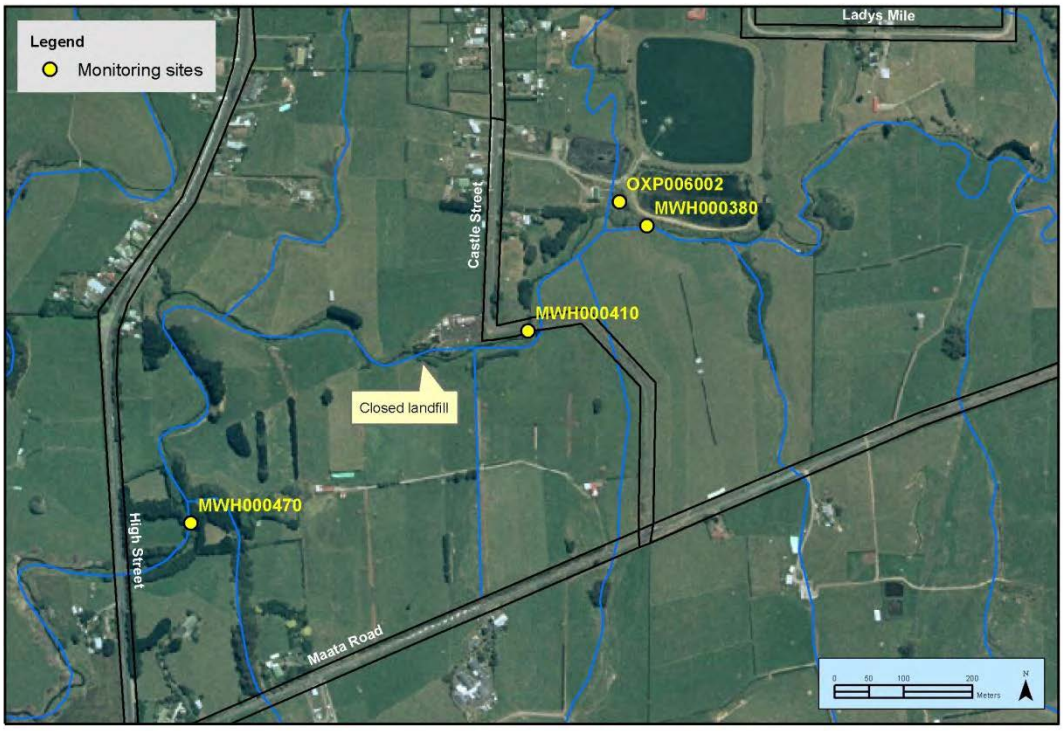

Figure 4 Eltham landfill and sampling sites

4.2 Results

4.2.1 Inspections

A site visit was undertaken around and over the old Eltham landfill on 30 June 2014 following a period of wet weather.

No leachate from the former landfill site was found to be seeping into the Mangawhero Stream. The area around the Eltham sandblasting facility (former landfill site) is sufficiently contoured, allowing stormwater to drain away quickly. Good vegetation growth was covering both sides of the Mangawhero Stream bank.

There was no evidence of any illegal dumping of rubbish which had been noted in the past.

4.2.2 Biomonitoring

Two biomonitoring surveys were undertaken during the period under review and these were conducted on 13 November 2013 and 25 February 2014. These surveys were conducted as part of the monitoring programme for the Eltham wastewater treatment plant and these surveys also include sites up and downstream of the landfill. No impacts on macroinvertebrate communities resulting from the presence of the landfill were indicated by the results of either of the surveys conducted during the period under review.

Full copies of the biomonitoring reports are attached to Appendix II of this report.

4.3 Investigations, interventions, and incidents

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

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

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

In the 2013-2014 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with conditions in resource consents relating to Eltham landfill or provisions in Regional Plans.

4.4 Discussion

4.4.1 Discussion of plant performance

The site has been closed for a reasonable time and no incidents or complaints were logged by Council. The consent holder has a management and contingency plan in place for the site.

4.4.2 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 WWTP plant discharge to Hawera's WWTP are now complete, and the water quality in the Mangawhero Stream now shows improvement. The results of the macroinvertebrate surveys indicate that the presence of the landfill is having very little effect on water quality.

4.5 Evaluation of performance

A tabular summary of STDC's compliance record at Eltham landfill for the year under review is set out in Table 10.

Table 10 Summary of performance for consent 3387-3 to discharge leachate and stormwater

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 provision for review during monitoring period	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 performance and a high level of administrative performance. During the year under review there were no incidents associated with the site and no complaints were received by Council.

4.6 Recommendations from the 2012-2013 Annual Report

In the 2012-2013 Annual Report, it was recommended:

THAT monitoring of discharges from the Eltham landfill for the 2013-2014 period continue at the same level as that of 2012-2013 with the addition of one annual inspection to be undertaken in conjunction with monitoring of the Eltham WWTP.

This recommendation was implemented.

4.7 Alterations to monitoring programmes for 2014-2015

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

Taranaki emitting to the atmosphere/discharging to the environment.

It is proposed for the 2014-2015 period, that the monitoring programme continue at the same level as that of 2013-2014. A recommendation to this effect is attached to this report.

4.8 Recommendation

THAT monitoring of discharges from the Eltham landfill for the 2014-2015 period continue at the same level as that of 2013-2014.

5. Manaia landfill

5.1 Background

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.

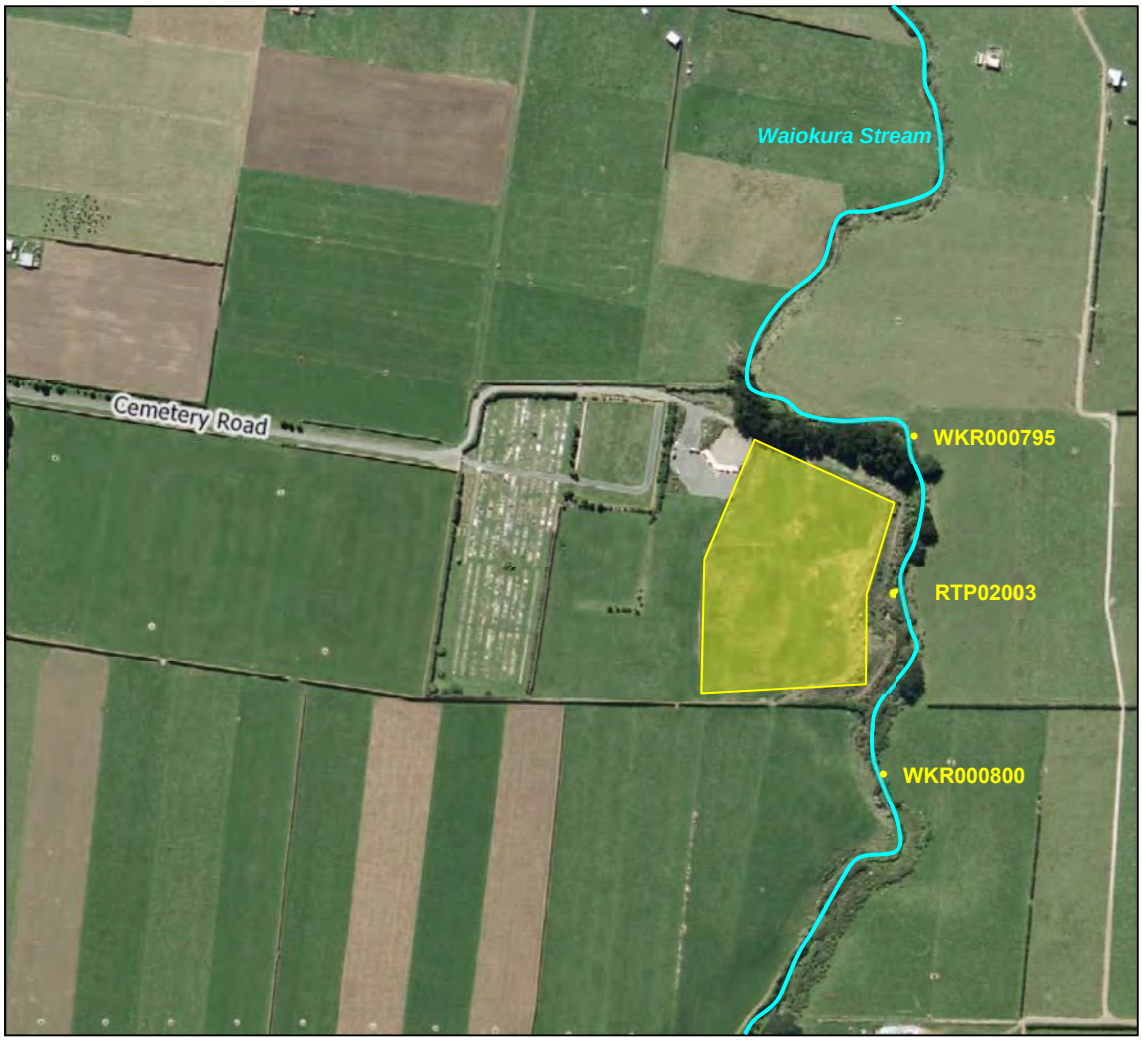

Figure 5 Aerial view of Manaia landfill showing sampling sites and landfill footprint

5.2 Results

5.2.1 Inspections

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

The first inspection was undertaken on 26 February 2014, it was fine at the time of the inspection and there had been no rain over the previous 72 hours. The cap was found to be in good condition with thick pasture and the perimeter drains were clear of debris.

The stormwater pond was low and well below the discharge point.

The inspection on 19 March 2014 was also conducted during fine weather, and there had been no rain during over the preceding 24 hours. The cap was being grazed at the time of the inspection and the grass was closely cropped. The stock had not appeared to have pugged the surface much. No issues were noted.

5.2.2 Results of discharge and receiving environment monitoring

Samples were collected from the Waiokura Stream upstream of the landfill and downstream of the landfill on two occasions during the monitoring period (see Figure 5). Samples were scheduled to be collected from the leachate pond (RTP002003) but the site was inaccessible. The results are presented in Table 11.

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

		2 April 2014		6 June 2014	
Parameter	Unit	WKR000795 u/s landfill	WKR000800 d/s of landfill	WKR000795 u/s landfill	WKR000800 d/s of landfill
Alkalinity	g/m^3 $CaCO_3$	66	66	-	-
BOD	g/m^3	0.9	0.8	-	-
Conductivity @ 20 C	mS/m	25	26	23	23
Dissolved reactive phosphorus	g/m^3 P	0.025	0.024	-	-
Acid soluble iron	g/m^3	0.62	0.60	-	-
Unionised ammonia	g/m^3 N	0.00028	0.00110	0.00013	0.00024
Ammoniacal nitrogen	g/m^3 N	0.009	0.037	0.012	0.021
Nitrite/nitrate nitrogen	g/m^3 N	2.18	2.25	-	-
pH	pH	8.0	8.0	7.7	7.7
Temperature	Deg.C	14.4	13.9	9.9	10.1
Dissolved zinc	g/m^3	<0.005	<0.005	<0.005	<0.005
Suspended solids	g/m^3	10	8	-	-
Turbidity	NTU	-	-	17	17

Access to the leachate/stormwater pond continued to be an issue due to heavy spring growth and gorse on its banks.

On all sampling occasions receiving water results show very 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 or no effect on water quality in the Waiokura Stream.

5.3 Investigations, interventions, and incidents

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

that in the first instance avoids issues occurring is favoured.

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

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

In the 2013-2014 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with the Manaia landfill resource consent conditions or provisions in Regional Plans.

5.4 Discussion

5.4.1 Discussion of plant performance

No significant issues were noted during the year. The site remains well vegetated and is well maintained. In general, the Manaia landfill was well managed and the consent holder has a management and contingency plan is in place for the site.

5.4.2 Environmental effects of exercise of consents

There was very 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.

5.5 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 consent 3952-2 to discharge of leachate and stormwater

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. STDC shall adopt the best practical option	Site specific monitoring programme – programme management	Yes
2. STDC shall prepare a site contingency plan	Site specific monitoring programme – programme management	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 ground and surface water on and near the site	Site specific monitoring programme – water sampling	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
6. Install leachate and stormwater collection, treatment and discharge systems	Site specific monitoring programme – inspection	Yes
7. Discharges from the site shall not cause any adverse environmental effect	Site specific monitoring programme – programme management	Yes
8. Is an optional review provision	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 performance and a high level of administrative performance. During the year under review there were no incidents recorded in regards to the site and no complaints were received.

5.6 Recommendation from the 2012-2013 Annual Report

In the 2012-2013 Annual Report, it was recommended:

THAT for the 2013-2014 period, the monitoring of discharges from the closed landfill at Manaia remain unchanged from that undertaken in the 2012-2013 period.

Two instead of three inspections were carried out at the site, and this reduction of inspections has been recommended into the 2014-2015 period and beyond. Four discharge samples were collected instead of the nine that were scheduled, this was partially due to difficulties in accessing the site. It was recommended in the results section of the 2012-2013 report that the biological inspection be removed from the programme, this was missed in the recommendations section, but was subsequently removed from the programme anyway.

5.7 Alterations to monitoring programmes for 2014-2015

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

It is proposed that for the 2014-2015 period, the monitoring of discharges from the closed landfill at Manaia is altered slightly from that scheduled in the 2013-2014 period, with the reduction in the number of inspections from three to two.

5.8 Recommendation

THAT for the 2014-2015 period, the monitoring of discharges from the closed landfill at Manaia is altered slightly from that scheduled in the 2013-2014 period, with the reduction in the number of inspections from three to two.

6. Opunake landfill

6.1 Background

The Opunake landfill was operational from 1979, closing in 1999 with the expiry of the 20-year lease of the land. The landfill site is located at Whitcombe Road, and was used to service the township of Opunake and the surrounding rural areas. Waste from 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 6 Aerial view of Opunake landfill foot print and sampling sites

6.2 Results

6.2.1 Inspections

Two inspections were carried out at the Opunake landfill in the 2013-2014 period. Details of these inspections are given below.

The first site visit was conducted on 1 November 2013. It was fine at the time of the inspection with no rain over the previous 24 hours. The cap was in sound condition with good grass cover. The stock damage noted in the previous inspection was not evident, and it appeared the cap had not been grazed for some time. No slumping or erosion of the cap was observed. The drain around the toe of the cap was mostly dry and no

discharges were occurring. The perimeter drains were well grassed and free of debris.

A second inspection was undertaken on 18 March 2014. It was fine at the time of the inspection with 11 mm rain over the previous 72 hours. The cap was in sound condition with good grass cover. It appeared to have been recently grazed. No slumping or erosion of the cap was observed. Samples were collected from the Otahi Stream from upstream and downstream of the landfill, and there were no visual effects or odours noted in the sample. Access to the leachate drain was difficult due to a fallen tree and blackberry growth.

6.2.2 Results of discharge and receiving environment monitoring

6.2.2.1 Surface water

Samples were taken from the Otahi Stream at sites above and below the landfill on 18 March 2014 (Figure 6). Samples were unable to be collected from the site adjacent to the landfill (OTH00320) or from the leachate drain (RTP002022) due to access difficulties. The results are presented in Table 13 below.

Table 13 Chemical analysis of receiving water samples taken at Opunake landfill on 18 March 2014

Parameter	Units	OTH000310 u/s of landfill	OTH000340 d/s of landfill
Alkalinity	g/m^3 $CaCO_3$	97	97
Biochemical oxygen demand	g/m^3	0.8	0.8
Conductivity @ 20 C	mS/m	26	26
Dissolved reactive P	g/m^3	0.049	0.047
Acid soluble iron	g/m^3	0.51	0.58
Unionised ammonia	g/m^3 N	0.00038	0.00045
Ammoniacal nitrogen	g/m^3 N	0.016	0.012
pH	pH	7.8	8.0
Temperature	Deg.C	17.0	17.1
Dissolved zinc	g/m^3	0.050	<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 is good. As the leachate discharges at a slow rate, the dilution factor of the Otahi Stream reduces the level of contaminants to an acceptable level.

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

6.2.2.2 Biomonitoring

The closed landfill at Opunake is monitored for macroinvertebrates on a biennial basis. This is next scheduled to be undertaken in the 2014-2015 monitoring period.

6.3 Investigations, interventions, and incidents

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

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

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

In the 2013-2014 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with the Opunake landfill resource consent conditions in or provisions in Regional Plans.

6.4 Discussion

6.4.1 Discussion of plant performance

The landfill has been closed for several years and 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.

6.4.2 Environmental effects of exercise of consents

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

6.4.3 Evaluation of environmental performance

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

Table 14 Summary of performance for consent 0526-3 discharge of leachate and stormwater

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. Prepare and maintain a site contingency plan	Site specific monitoring programme – programme management	Yes
3. STDC shall inform the Council prior to any changes to these plans	Site specific monitoring programme – programme management	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
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		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 performance and compliance with the resource consents. During the year under review there were no adverse environmental issues and no complaints received concerning the landfill.

6.5 Recommendations from the 2012-2013 Annual Report

In the 2012-2013 Annual Report, it was recommended:

THAT monitoring of discharges from Opunake landfill in the 2013-2014 year continue at the same level as in 2012-2013.

This recommendation was implemented.

6.6 Alterations to monitoring programmes for 2014-2015

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

It is proposed that for 2014-2015, the monitoring programme remain unchanged from that implemented in 2013-2014.

6.7 Recommendation

THAT monitoring of discharges from Opunake landfill in the 2014-2015 year continue at the same level as in 2013-2014.

7. Patea landfill

7.1 Background

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

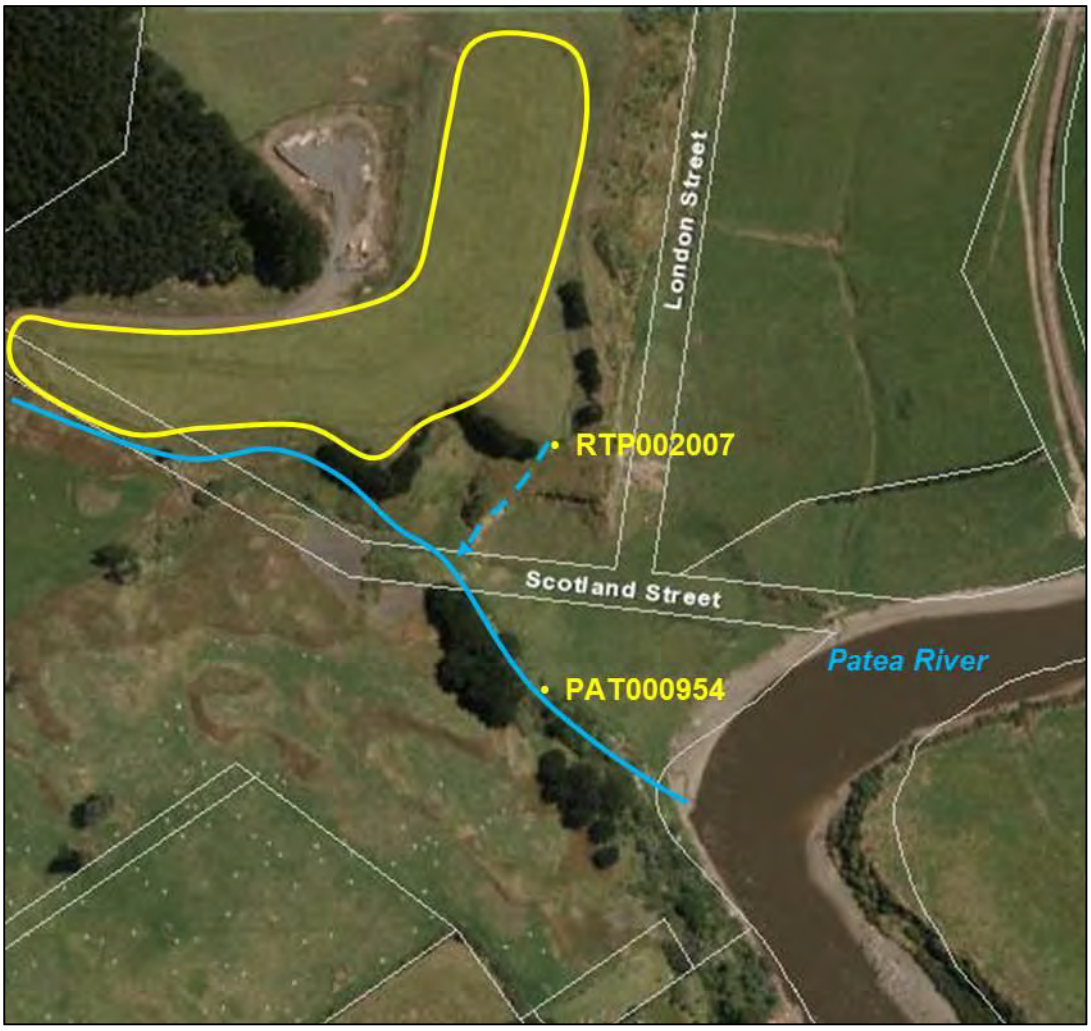

Figure 7 Aerial view of the landfill at Patea showing sampling sites (landfill footprint in yellow)

7.2 Results

7.2.1 Inspections

The Patea landfill site was visited three times during the monitoring period. The first inspection was undertaken on 23 October 2013. Recent earthworks activity had taken place on the access down to the sampling point, several trees had been removed and some waste had been exposed in the process. There was one area on the cap where localised slumping appeared to be occurring and it was recommended that the Council and the consent holder continue to check up on this area. The perimeter drain showed evidence of stock damage and the consent holder/landowner was advised to think

about isolating the drain and bunding it to prevent further damage. The drain itself was fairly dry and there was no discharge into the final pond. A sample was collected from the pond for analysis. It was recommended that the consent holder consider cleaning up and revegetating the access track to the pond.

A site visit was made on 26 February 2014. It was showery at the time of the inspection but there had been no rain over the previous 72 hours. The cap had a thick grass cover and had been recently grazed. As noted in the previous inspection, there was a small area of subsidence on the crown of the cap but this had not worsened. The drains were clear and free of debris, and no discharges were occurring from the site.

It was fine at the time of the final inspection on 30 May 2014. The cap had a thick grass cover and had been recently grazed. All the drains were clear and free of water and debris. The bottom pond was full but not discharging. A sample was collected from the pond. The steep slope on the south side of the landfill had good grass cover and there was no evidence of significant leachate seepage.

7.2.2 Discharge and receiving water monitoring

During the 2013-2014 period four water samples were taken from the site. The results from the chemical analysis of these samples are set out in **Error! Reference source not found.**.

Table 15 Chemical analysis of samples taken at the Patea Landfill site

Parameter	Unit	RTP002007 Main pond			PAT000954*
		23 Oct 2013	30 May2014	26 Jun 2014	26 Jun 2014
BOD	g/m^3	2.4	6.6	3.3	2.1
Conductivity @ 20 C	mS/m	53	38	60	65
Acid soluble iron	g/m^3	0.67	0.39	0.12	4.52
Unionised ammonia	g/m^3 N	0.00062	0.00083	0.00406	0.00017
Ammoniacal nitrogen	g/m^3 N	0.056	0.176	0.559	0.022
pH	g/m^3	7.5	7.3	7.4	7.4
Temperature	C	15.9	10.5	13.3	14.2
Dissolved zinc	g/m^3	<0.005	0.010	<0.005	<0005

* PAT000954 = 3m above confluence with drain to Patea River

Samples were taken from two sites during the period under review. Site RTP002007 is rarely found to be discharging and it was thought the main flow path was to overland soakage, however in this monitoring period sampling it was found that there was a flow path to the unnamed tributary and stream sampling was reinstated.

The results indicate that there is some minor contamination in the collected stormwater in the form of elevated BOD levels and conductivity. There was no discharge from the pond through into the unnamed tributary at the time. The tributary also had a high level of conductivity and this is most likely a result of the high level of iron which may be result of natural inputs and from the adjacent landfill. The tributary enters the main stem of the Patea River and this minor effect would quickly mitigated by the enormous dilution factor.

7.3 Investigations, interventions, and incidents

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

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

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

In the 2013-2014 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with the Patea landfill resource consent conditions or provisions in Regional Plans.

7.4 Discussion

7.4.1 Discussion of plant performance

There was a small area of subsidence on the cap noted in the initial inspection, however this had not worsened in the following two inspections. The stormwater systems were working well, the site remains well vegetated and no issues in regards to site management were noted during the period under review. A management and contingency plan are in place for the site.

7.4.2 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. There were elevated iron levels in the unnamed tributary, but this may not be attributable to the landfill entirely. The iron level would be quickly mitigated by the dilution factor of the Patea River. The information gathered during the period under review indicates that the landfill's presence is not having any significant effect on the environment.

7.5 Evaluation of performance

A tabular summary of STDC's compliance record for the Patea landfill for the year under review is set out in Tables 16-18.

Table 16 Summary of performance for consent 0427-3 discharge of leachate and stormwater

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Prepare and maintain a site contingency plan	Site specific management plan – programme management	Yes
2. Prepare and maintain a landfill management plan	Site specific management plan – programme management	Yes
3. Advise of any changes being made to the management plan or the site contingency plan	Site specific management plan – programme management	Yes
4. Comply with information submitted in support of application	Site specific management plan – programme management	Yes
5. Monitor ground and surface water on and near the site	Site specific management plan – water sampling	Yes
6. Maintain all stormwater and leachate collection systems	Site specific management plan – inspection	Yes
7. No adverse impact on aquatic life	Site specific management plan – inspection and water sampling	Yes
8. Prevent or minimise any likely adverse effects on the environment	Site specific management plan – programme management	Yes
9. 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

Table 17 Summary of performance for consent 4636-2 discharge emissions into the air

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Prepare and maintain a site contingency plan	Site specific monitoring programme – programme management	N/A
2. Prepare and maintain a landfill operations and management plan	Site specific monitoring programme – programme management	Yes
3. Advise of any changes being made to the operations and management plan or the site contingency plan	Site specific monitoring programme – programme management	Yes
4. No material shall be burnt on site	Site specific monitoring programme – inspection	Yes
5. Comply with information submitted in support of application	Site specific monitoring programme – programme management	Yes
6. Prevent or minimise any likely adverse effects on the environment	Site specific monitoring programme – inspection and water sampling	Yes
7. Optional review provision re environmental effects	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

Table 18 Summary of performance for consent 7268-1 to discharge stormwater from landfill closure earthworks

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt best practicable option	Site specific management plan – programme management	N/A
2. Exercise consent in accordance with application	Site specific management plan – programme management	N/A
3. Notify before exercising consent	Programme management	N/A
4. Take reasonable steps to minimise effects	Site specific management plan – programme management	N/A
5. Reinstatement and stabilisation as soon as possible	Site specific management plan – programme management	N/A
6. A lapse condition	N/A	N/A
7. Optional review provision re environmental effects	N/A	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		N/A –consent no longer exercised

N/A = not applicable

STDC demonstrated a high level of environmental performance and a high level of administrative performance in regards to Patea landfill. During the year under review there were no significant effects observed at the site and no complaints were received.

7.6 Recommendations from the 2012-2013 Annual Report

In the 2012-2013 Annual Report, it was recommended:

THAT in the 2013-2014 period the monitoring of the Patea landfill be unchanged from that undertaken in the 2012 -2013 period.

This recommendation was subsequently implemented with the addition of an extra receiving water monitoring site.

7.7 Alterations to monitoring programmes for 2014-2015

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

It is proposed that for the 2014-2015 period, that the monitoring of the Patea landfill be altered slightly from that undertaken in the 2013-2014 period by reducing the number of inspections from four to three and the introduction of two receiving water sites.

7.8 Recommendation

THAT in the 2014-2015 period the monitoring of the Patea landfill be altered slightly from that undertaken in the 2013-2014 period, by reducing the number of inspections from four to three and the introduction of two receiving water sites.

8. Kaponga landfill

8.1 Background

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 8). The site closed as a landfill in 1993 and has been covered by pasture for over a decade, and 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.

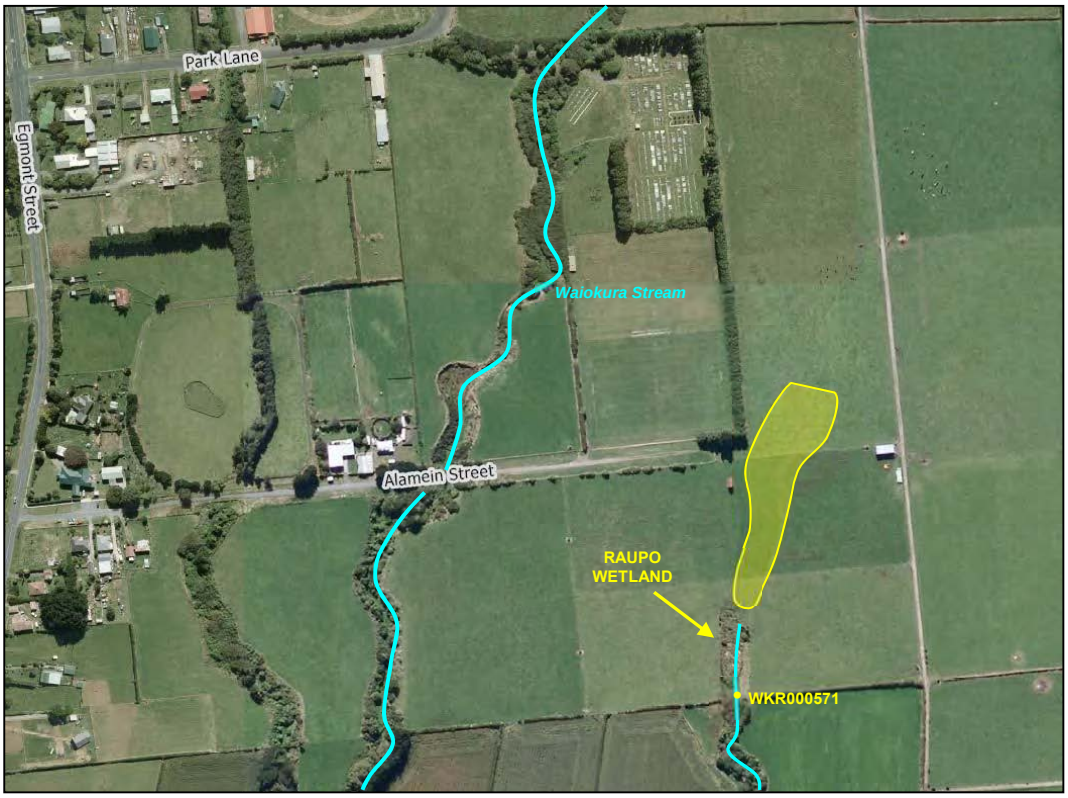

Figure 8 Aerial view of Kaponga landfill

8.2 Results

The closed landfill at Kaponga is monitored on a triennial basis and monitoring is next scheduled for the 2014-2015 period.

8.3 Investigations, interventions, and incidents

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

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

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

In the 2013-2014 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with conditions in resource consents related to the Kaponga landfill, or provisions in Regional Plans.

8.4 Recommendations from the 2012-2013 Annual Report

In the 2012-2013 Annual Report, it was recommended:

THAT the Kaponga landfill triennial monitoring programme remain in place with monitoring next scheduled for the 2014-2015 period.

8.5 Alterations to monitoring programmes for 2014-2015

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

It is proposed that the triennial monitoring programme remain in place with monitoring next scheduled for the 2014-2015 period.

A recommendation to this effect is attached to this report.

8.6 Recommendation

THAT the Kaponga landfill triennial monitoring programme remain in place with monitoring next scheduled for the 2014-2015 period.

9. Summary of recommendations

9.1 Hawera landfill

THAT monitoring of discharges from Hawera landfill in the 2014-2015 year is altered slightly from the 2013-2014 monitoring programme, with the discontinuation of the triennial groundwater sampling at sites GND1207, GND1208 and GND1209.

9.2 Otakeho landfill

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

9.3 Eltham landfill

THAT monitoring of discharges from the Eltham landfill for the 2014-2015 period continue at the same level as that of 2013-2014.

9.4 Manaia landfill

It is proposed that for the 2014-2015 period, the monitoring of discharges from the closed landfill at Manaia is altered slightly from that scheduled in the 2013-2014 period, with the reduction in the number of inspections from three to two.

9.5 Opunake landfill

THAT monitoring of discharges from Opunake landfill in the 2014-2015 year continue at the same level as in 2013-2014.

9.6 Patea landfill

THAT in the 2014-2015 period the monitoring of the Patea landfill be altered slightly from that undertaken in the 2013-2014 period, by reducing the number of inspections from four to three and the introduction of two receiving water sites.

9.7 Kaponga landfill

THAT the Kaponga landfill triennial monitoring programme remain in place with monitoring next scheduled for the 2014-2015 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	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	Grammes per cubic metre, and equivalent to milligrammes per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures.
Incident	An event that is alleged or is found to have occurred that may have actual or potential environmental consequences or may involve non-compliance with a consent or rule in a regional plan. Registration of an incident by the Council does not automatically mean such an outcome had actually occurred.
Intervention	Action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring.
Investigation	Action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident.
MCI	Macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats.
mS/m	Millisiemens per metre.
Mixing zone	The zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to 7 times the width of the stream at the discharge point.
NH_4	Ammonium, normally expressed in terms of the mass of nitrogen (N).
NH_3	Unionised ammonia, normally expressed in terms of the mass of nitrogen (N).
NO_3	Nitrate, normally expressed in terms of the mass of nitrogen (N).
NTU	Nephelometric Turbidity Unit, a measure of the turbidity of water.
pH	A numerical system for measuring acidity in solutions, with 7 as neutral.

	Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5.
Physicochemical	Measurement of both physical properties(e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment.
Resource consent	Refer Section 87 of the RMA. Resource consents include land use consents (Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15).
RMA	Resource Management Act 1991 and subsequent amendments.
SS	Suspended solids.
UI	Unauthorised Incident.
UIR	Unauthorised Incident Register – contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan.

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Appendix I

Resource consents held by STDC
(in alphabetical order)

Consent 0427-3

TARANAKI REGIONAL COUNCIL

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Please quote our file number on all correspondence

Discharge Permit

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

Name of Consent Holder:	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

Director-Resource Management

Consent 0444-4

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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

Director-Resource Management

Consent 3387-3

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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

Director-Resource Management

Consent 3459-3

TARANAKI REGIONAL COUNCIL

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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

Director-Resource Management

Consent 4636-2

TARANAKI REGIONAL COUNCIL

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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

Director-Resource Management

Consent 5831-I

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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
Consent Granted Date:	28 June 2001

Conditions of Consent

Consent Granted:	To divert an unnamed tributary of the Tawhiti Stream in the Tangahoe catchment at or about GR: Q21:214-788
Expity Date:	1 June 2016
Review Date(s):	June 2004, June 2010
Site Location:	Matangara Road, Hawera
Legal Description:	Lot 2 DP 20563 Lot 2 DP 20819 Blk VI Hawera SD
Catchment:	Tangahoe
Tri butaty:	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 notify the Taranaki Regional Council in writing at least 48 hours prior to the upon completion of any subsequent maintenance works which would involve disturbance of or deposition to the riverbed or discharges to water.

2) The structure[s] authorised by this consent shall be constructed generally in accordance with the documentation submitted in support of application 1432 and shall be maintained to ensure the conditions of this consent are met.

3) The consent holder shall adopt the best practicable option, as defined in the Resource Management Act 1991, to avoid or minimise the discharge of silt or other contaminants into water or onto the riverbed and to avoid or minimise the disturbance of the riverbed and any adverse effects on water quality.

4) The consent holder shall ensure that the area and volume of riverbed disturbance shall, so far as is practicable, be minimised and any areas which are disturbed shall, so far as is practicable, be reinstated.

5) The consent holder shall at all times ensure that the diversion pipe is as clear as is practicable of any blockages.

6) That, within three months of the granting of this consent, the consent holder shall prepare a contingency plan to be approved by the Chief Executive, Taranaki Regional Council, outlining measures and procedures to be undertaken to prevent blockage of the diversion pipe and to avoid, remedy or mitigate the environmental effects of a blockage in the diversion pipe.

) 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

Director-Resource Management

Consent 0526-3

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Please quote our file number on all correspondence

Discharge Permit

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

Name of Consent Holder:	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

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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

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

Discharge Permit

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

Name of Consent Holder:	South Taranaki District Council Private Bag 902 HAWERA 4640
Change To Conditions Date:	29 October 2008 [Granted: 20 January 2005]

Conditions of Consent

Consent Granted:	To discharge leachate and stormwater from the closed Manaia landfill and from composting operations into the Waiokura Stream at or about (NZTM) 1697799E-5620638N
Expiry Date:	1 June 2023
Review Date(s):	June 2011, June 2017
Site Location:	Cemetery Road, Manaia
Legal Description:	Pt Sec 23 Blk VII Waimate SD
Catchment:	Waiokura

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

Conditions 1 – 6 [unchanged]

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.

2. Within three months of granting this consent the consent holder shall prepare and maintain a site contingency plan to the satisfaction of the Chief Executive, Taranaki Regional Council, outlining measures and procedures undertaken to prevent spillage or accidental discharge of contaminants and procedures carried out should such a spillage or discharge occur.

3. Within three months of granting this consent the consent holder shall prepare and maintain a landfill management plan to the satisfaction of the Chief Executive, Taranaki Regional Council, and shall adhere to such a plan in so far as it concerns the exercise of this consent at all times.
4. The consent holder shall advise the Taranaki Regional Council one month prior to any changes being made to the landfill management plan and/or the site contingency plan referred to in special conditions 3 and 4. Should the Taranaki Regional Council wish to review either of these plans, one month's notice shall be provided to the consent holder.

5. The consent holder shall monitor the site and adjacent surface water and ground water to the satisfaction of the Chief Executive, Taranaki Regional Council.

6. The consent holder shall install and maintain leachate and stormwater diversion, collection, treatment and discharge systems, to the satisfaction of the Chief Executive, Taranaki Regional Council.

[Condition 7 – changed]

7. That after reasonable mixing, any discharge from the closed landfill or composting operations shall not cause Waiokura Stream to exceed the following parameters;

    - a rise in biochemical oxygen demand of 2.0 g/m^3
    - unionised ammonia of 0.025 g/m^3

[Condition 8-unchanged]

8. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2011 and/or June 2017, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 29 October 2008

For and on behalf of
Taranaki Regional Council

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Director-Resource Management

Appendix II

Biomonitoring reports

To Keith Brodie, Environmental Monitoring Manager
From Chris Fowles, Scientific Officer
Document 1305858
Report CF594
Date 3 February 2014

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 2013

Introduction

This spring survey was the first of two surveys programmed for the 2013-2014 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.

These sites have also been incorporated within the Council's State of the Environment monitoring programme (TRC, 2014).

Method

The standard '400 ml kick sampling' technique was used to collect streambed (benthic) macroinvertebrates and algae from two established sampling sites (sites 1 and 5) in the Mangawhero Stream and one site (site 8) in the Waingongoro River (illustrated in Figure 1) on 13 November 2013.

This survey was the eighteenth 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 three 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.

These sites were:

Site No	Site code	Map reference	Location
1	MWH000380	Q20: 227 952	Mangawhero Stream: upstream of WWTP discharge outfall
5	MWH000490	Q20: 210 946	Mangawhero Stream: approximately 200 m downstream of rail bridge and downstream of the Mangawharawhara Stream confluence
8	WGG000665	Q20: 199 937	Waingongoro River: approximately 2 km downstream of Mangawhero Stream confluence

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).

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

Samples were preserved with Kahle's Fluid for later sorting and identification under a stereomicroscope according to Taranaki Regional Council methodology using protocol P1 of NZMWG protocols for sampling macroinvertebrates in wadeable streams (Stark et al, 2001). Macroinvertebrate taxa found in each sample were recorded as:

R (rare)	= less than 5 individuals;
C (common)	= 5-19 individuals;
A (abundant)	= 20-99 individuals;
VA (very abundant)	= 100-499 individuals;
XA (extremely abundant)	= 500 or more individuals.

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

A semi-quantitative MCI value, SQMCIs (Stark, 1999) has also been calculated for the taxa present at each site by multiplying each taxon score by a loading factor (related to its abundance), totalling these scores, and dividing by the sum of the loading factors. The loading factors were 1 for rare (R), 5 for common (C), 20 for abundant (A), 100 for very abundant (VA) and 500 for extremely abundant (XA).

Where necessary sub-samples of algal and detrital material were also taken from the macroinvertebrate samples at all sites and were scanned under 40-400x magnification to determine the presence or absence of any mats, plumes or dense growths of bacteria, fungi

or protozoa ('undesirable biological growths') at a microscopic level. The presence of masses of the organisms is an indicator of organic enrichment within a stream.

Results and discussion

This spring survey was performed under moderately low recession flow conditions, 12 days after a significant fresh in the Mangawhero Stream and 12 days after a fresh in excess of 3 times and 7 times the median flow in the Waingongoro River. The survey followed a wet early spring period with five significant river freshes recorded over the preceding month. The low flow in the Mangawhero Stream was clear and pale brownish in appearance upstream of the discharge outfall (site 1) and slightly cloudy but uncoloured at the downstream, swifter flowing site 5. Filamentous algae were patchy on the clay substrate site (1) with no periphyton mats but some marginal aquatic weed. Periphyton mats and filamentous algae were patchy on the stony, harder substrate site (5) where there was no moss but some marginal aquatic weed present (unlike the more extensive weed beds prior to wastewater diversion out of the stream). Stream water temperatures ranged from 12.7°C (site 1) to 12.9°C (site 2) during this mid morning survey.

Flow in the Waingongoro River at Eltham Road was 1.44 m^3/sec at the time of the survey, below the average monthly mean flow (2.44 m^3/sec) for November, and well above the minimum monthly mean flow (0.87 m^3/sec). River flow was moderately low, clear, and uncoloured at the sampling site with patchy periphyton mats but no filamentous algal growth, or moss, present on the substrate. Water temperature was 13.6°C at the time of this mid morning survey.

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 1 Summary of macroinvertebrate taxa numbers and MCI values for previous surveys performed between January 1985 and February 2013

Site	Site code	No. of surveys	Taxa numbers		MCI values	
			Range	Median	Range	Median
1	MWH000380	47	10-25	16	58-85	74
5	MWH000490	42	13-29	19	63-102	78
8	WGG000665	38	14-30	20	77-111	94

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

Table 2 Macroinvertebrate fauna of the Mangawhero Stream (sites 1 and 5) in relation to the Eltham WWTP, sampled on 13 November 2013

	Site Number	MCI score	1	5
	Site Code		MWH000380	MWH000490
	Sample Number		FWB13293	FWB13294
COELENTERATA	Coelenterata	3	R	-
NEMERTEA	Nemertea	3	R	-
NEMATODA	Nematoda	3	R	-
ANNELIDA (WORMS)	Oligochaeta	1	XA	XA
MOLLUSCA	*Potamopyrgus*	4	R	A
CRUSTACEA	*Paracalliope*	5	R	VA
	Paraleptamphopidae	5	R	-
EPHEMEROPTERA (MAYFLIES)	*Austroclima*	7	A	C
	Coloburiscus	7	-	R
	Deleatidium	8	-	VA
PLECOPTERA (STONEFLIES)	*Zelandobius*	5	R	A
COLEOPTERA (BEETLES)	Elmidae	6	-	VA
MEGALOPTERA (DOBSONFLIES)	*Archichauliodes*	7	-	C
TRICHOPTERA (CADDISFLIES)	*Aoteapsyche*	4	C	A
	Costachorema	7	-	C
	Hydrobiosis	5	C	C
	Oxyethira	2	R	R
	Pycnocentria	7	-	C
	Pycnocentrodes	5	-	VA
DIPTERA (TRUE FLIES)	*Aphrophila*	5	A	C
	Maoridiamesa	3	C	A
	Orthocladiinae	2	A	A
	Polypedilum	3	R	R
	Tanytarsini	3	-	C
	Empididae	3	-	R
	Austrosimulium	3	R	R
		No of taxa	17	22
		MCI	74	93
		SQMCIs	1.5	3.3
		EPT (taxa)	4	9
		%EPT (taxa)	24	41
'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa		

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

Table 3 Macroinvertebrate fauna of the Waingongoro River at Stuart Road (site 8) in relation to the Eltham WWTP, sampled on 13 November 2013

Taxa List	Site Number	MCI score	8
	Site Code		WGG000665
	Sample Number		FWB13290
MOLLUSCA	*Potamopyrgus*	4	R
EPHEMEROPTERA (MAYFLIES)	*Austroclima*	7	C
	Coloburiscus	7	C
	Deleatidium	8	XA
PLECOPTERA (STONEFLIES)	*Zelandobius*	5	C
COLEOPTERA (BEETLES)	Elmidae	6	A
MEGALOPTERA (DOBSONFLIES)	*Archichauliodes*	7	C
TRICHOPTERA (CADDISFLIES)	*Aoteapsyche*	4	A
	Costachorema	7	C
	Hydrobiosis	5	R
	Beraeoptera	8	A
	Pycnocentrodes	5	VA
DIPTERA (TRUE FLIES)	Tanytarsini	3	R
	Austrosimulium	3	R
	Tabanidae	3	R
		No of taxa	15
		MCI	109
		SQMCIs	7.3
		EPT (taxa)	9
		%EPT (taxa)	60
'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa	

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

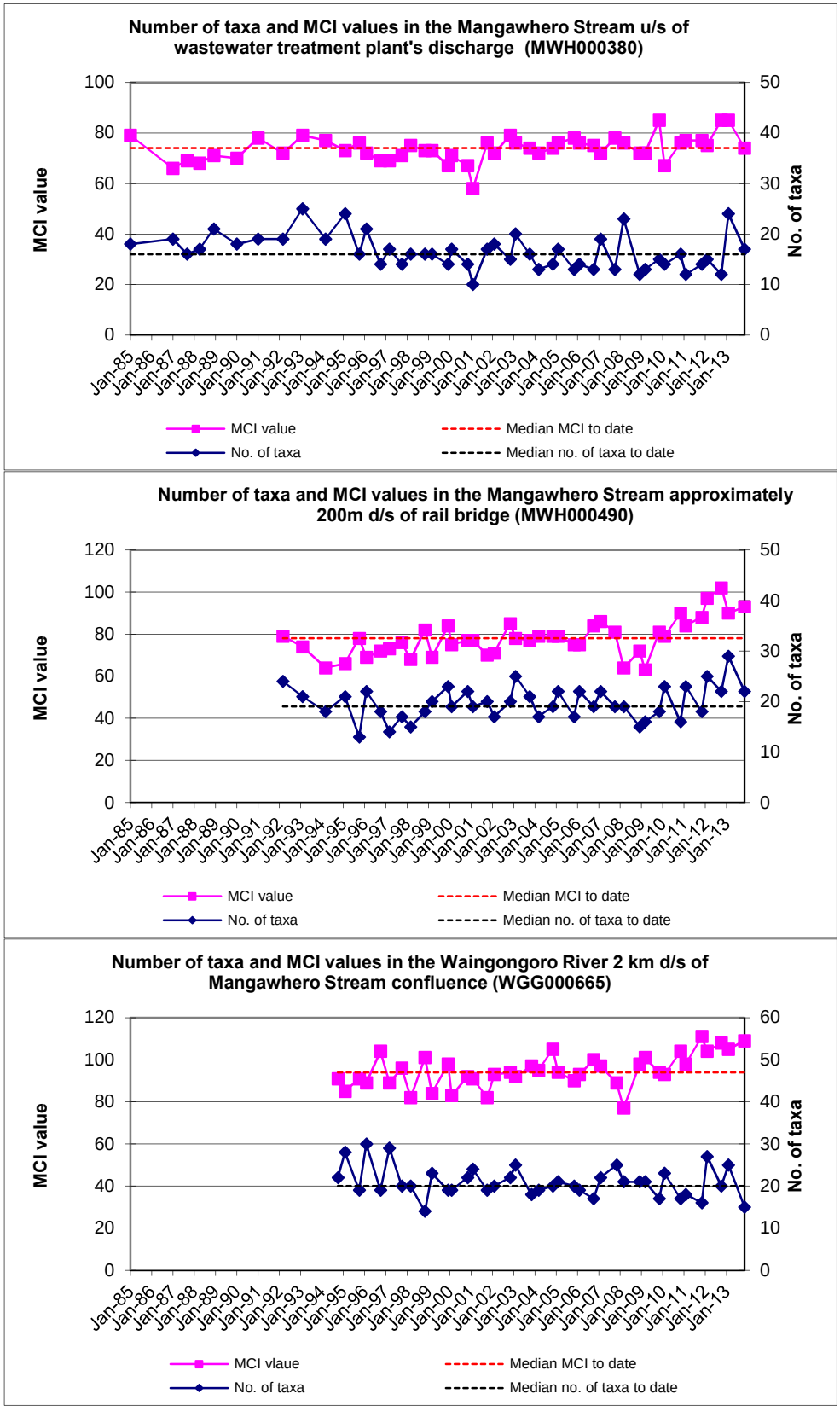


Figure 2 Taxa richness and MCI scores recorded to date

Mangawhero Stream: site 1 (upstream of the WWTP outfall) and site 5 (downstream of Mangawharawhara Stream confluence; approx 3 km below the WWTP outfall and old landfill)

Each of these two sites has a very different habitat and, together with the deterioration in water quality downstream of the Eltham Wastewater Treatment Plant's discharge in the past, these factors have been reflected in the macroinvertebrate communities found at each site on the majority of occasions prior to the current survey (i.e. until mid 2011).

At the time of the current survey this upstream site (1) was dominated by two 'moderately sensitive' taxa [mayfly (*Austroclima*) and cranefly (*Aphrophila*)] and two 'tolerant' taxa [extremely abundant oligochaete worms; and orthoclad midges]. Each of these taxa had also been dominant in a majority of previous spring surveys with the number of characteristic taxa in this survey slightly lower than typical of most past surveys.

Although sections of the stream at this upstream site were slower flowing, swifter velocities were apparent amongst areas where no filamentous algae were attached to the substrate of the stream. Some of the dominant taxa and other components of the fauna found at this site are commonly found in these types of habitat (e.g. amphipods, midges), and the abundances of the mayfly, *Austroclima* and the presence of other 'sensitive' taxa continued to indicate reasonably well oxygenated flow conditions as a component of this habitat. Taxa richness (17) was very similar to the median number recorded from previous surveys (Table 1). The survey recorded a MCI value of 74 units which was equal with the median of all past survey results and relatively typical of a small swamp seepage stream subject to moderate nutrient enrichment from developed farmland drainage. The score reflected the absence of 'highly sensitive' taxa and the presence of a high percentage of 'tolerant' taxa (65% of richness) in the community at this site. This score was slightly lower than the median value (79 units) found by 169 surveys of 'control' sites in similar seepage sourced hill country streams in the region (TRC, 1999 (updated, 2013)) at equivalent altitudes to this site.

The macroinvertebrate fauna community at the downstream site (5) showed a increase in taxa richness (of 5 taxa), a richness which was slightly higher than the median number previously recorded at this site (Table 1). A marked increase in number of dominant taxa included five 'tolerant' taxa [extremely abundant oligochaete worms; snail *(Potamopyrgus),* net-building caddisfly (*Aoteapsyche*), and midges (orthoclads and *Maoridiamesa*)], four 'moderately sensitive' taxa [(amphipod (*Paracalliope*), stonefly *(Zelandobius)*, elmid beetles, and stony-cased caddisfly (*Pycnocentrodes*)], and one 'highly sensitive' taxon [very abundant mayfly (*Deleatidium*)]. This mayfly had never been a dominant taxon at this site prior to wastewater diversion from the stream. A few of these dominant taxa (mainly 'tolerant' taxa) were associated with the periphyton substrate cover. Variation in stream habitat probably accounted for most of the changes in abundances of individual taxa between the two sites, including the significant increases in abundances of 'sensitive' beetles, stoneflies, caddisflies, and one 'highly sensitive' mayfly. The extreme abundance of the 'highly sensitive' mayfly in particular, and increased abundances amongst three 'moderately sensitive' taxa, increased the $SQMCI_s$ score (by 1.8 units) above that recorded at the upstream site.

The MCI value (93) at this site represented a significant increase of 19 units (Stark, 1998) above the score recorded at the upstream ('control') site. Improvement in physical stream habitat conditions, and the removal of WWTP wastes from the Mangawhero Stream, contributed to this increase in MCI score. This score was a very significant 15 units higher than the median value of scores from all past surveys although it was 9 units below the historical maximum

score found by the previous spring survey (Table 1). A large increase (of 20%) in the proportion of 'sensitive' taxa at this site, coincident with the physical substrate improvement at this site in the lower stream, was indicative of improved water quality conditions, as the MCI value for such a habitat in the absence of the discharge has increased to a score significantly higher than recorded by all surveys prior to wastewater diversion from the catchment (Figure 2). For instance, the current survey's MCI score categorised this site as having 'fair' health (TRC, 2014) at the time of this survey (compared with median health categorised as 'poor'). Although it was 11 units lower than the predicted MCI score for a ringplain stream arising outside of the National Park, at a site at an altitude of 190 m asl (Stark & Fowles, 2009), scores at this site have been consistently much lower than this predictive value in pre-wastewater diversion surveys.

The current score reflected the more lowland nature of the headwater catchment stream (with a major ringplain tributary) but particularly the improvement to the physicochemical water quality of the stream since removal of the Eltham municipal WWTP discharge by pipeline diversion to the Hawera WWTP.

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

Thirty-eight surveys have been undertaken previously at this site, approximately 2 km downstream of the Mangawhero Stream confluence (which previously had been the receiving water for the Eltham municipal wastewater treatment system discharge).

The number of taxa found in the present survey (15) was lower than the median and only one taxon above the minimal richness found at this site to date and fewer than typical of macroinvertebrate community richnesses found in the mid-reaches of Taranaki ringplain rivers following several significant river freshes (five) in the four week spring period preceding this survey. The community was characterised by two 'highly sensitive' taxa [extremely abundant mayfly (*Deleatidium*); and flare-cased caddisfly (*Beraeoptera*)]; and two 'moderately sensitive' taxa [stony-cased caddisfly (*Pycnocentrodes*) and elmid beetles]; and only one 'tolerant' taxon [net-building caddisfly (*Aoteapsyche*)] (Table 2). The abundances of the 'highly sensitive' taxa and other 'moderately sensitive' taxa at this river site were indicative of recent good physicochemical water quality. The proportion of characteristic 'sensitive' to 'tolerant' taxa was much higher than found by the majority of previous surveys which had been performed while discharges from the WWTP were occurring into the Mangawhero Stream, upstream of this site.

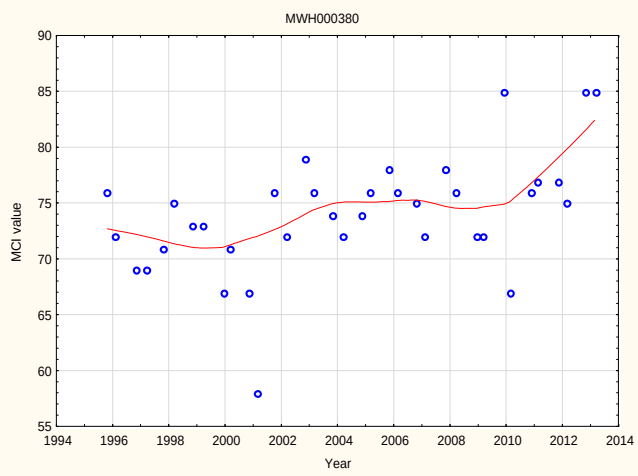
The MCI score (109) indicated limited deterioration in the macroinvertebrate community in comparison with the communities present in the reach in the vicinity of the Riverlands meatworks upstream of the Mangawhero Stream where the MCI scores ranged from 114 to 124 units at the time of the same day monitoring of the meatworks' discharge (CF595). Very few differences in characteristic community taxa resulted in a very similar $SQMCI_s$ score at this site below the confluence. The current MCI score (at site 8) of 109 units was a significant 15 units higher than the median score recorded by past surveys at this site, and was within 2 units of the previous maximum. It categorised this site as having 'good' generic stream health and 'expected' predictive health (TRC, 2014) at the time of this spring survey. It was also six units higher than the predicted MCI score for a National Park-sourced ringplain 'control' site at an altitude of 180 m asl and a significant 15 units higher than the predicted MCI score for this site, 29.6 km downstream of the National Park boundary (Stark and Fowles, 2009), a reflection of the improvement subsequent to the removal of the WWTP discharge from the Mangawhero Stream upstream of this site.

This improvement in MCI value below the Mangawhero Stream confluence was atypical of the trend of downstream decreases recorded by many earlier surveys (since 1994) and was dissimilar to the trends often recorded at the time of past spring surveys. However, it was coincident with the diversion of the Eltham WWTP discharge out of the catchment which had occurred some three years earlier.

Temporal trends in MCI scores (1995-2013)

Non-parametric statistical trend analysis of MCI data (Stark and Fowles, 2006) has been performed on the eighteen years of SEM results collected to summer 2013 from the two sites in the Mangawhero Stream and site in the Waingongoro River at Stuart Road. The MCI has been chosen as the preferable indicator of 'stream/river health' for SEM trend purposes. A graphical presentation of the LOWESS plot of trends in MCI data and the Mann-Kendall test of significance are provided for all sites. The LOWESS (tension 0.4) trend plots of MCI data are presented in Figures 3, 4, and 5.

Site MWH000380

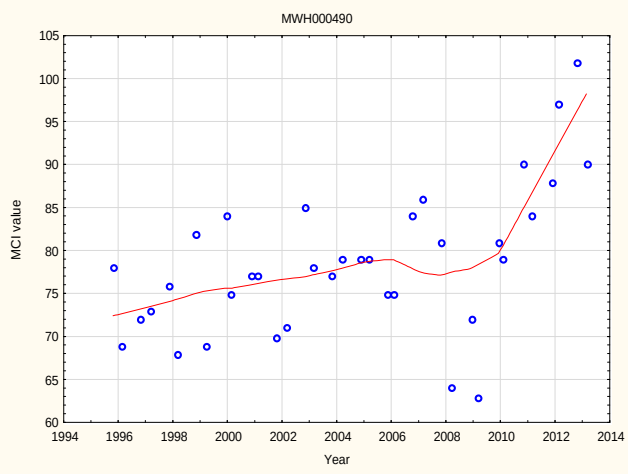


N = 36
Kendall tau = +0.369
p value = 0.002 [>FDR, p = 0.004]
Significant at p <0.05 and p < 0.01 levels; and after FDR application

Figure 3 LOWESS trend plot of MCI data at the site upstream of Eltham WWTP discharge

A positive and statistically significant temporal trend in MCI scores ($p < 0.01$ after FDR) has been found over the eighteen year monitoring period at this site with the early trend of slightly increasing scores having been followed by a plateauing of scores a few units above those recorded early in the programme and a more recent steady increase. However, the narrow range of LOWESS-smoothed scores (5 units) until 2012-2013 had not been of ecological significance but the range has widened to 10 units very recently. LOWESS-smoothed MCI scores consistently have been indicative of 'poor' generic stream health throughout the period until an improvement to 'fair' in the 2012-2013 period.

Site MWH000490



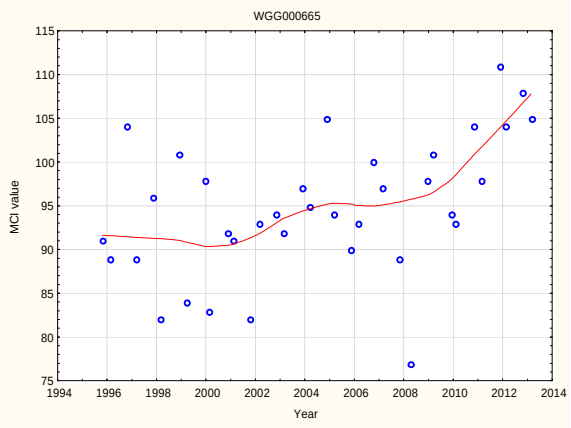
N = 36
Kendall tau = +0.410
p value = 0.0004 [>FDR, p = 0.001]
Significant at p <0.05 and p < 0.01; and significant after FDR

Figure 4 LOWESS trend plot of MCI data at the site downstream of the Mangawharawhara Stream confluence

A moderate and recently much more pronounced, and now statistically significant ($p < 0.01$, after FDR), temporal improvement in MCI scores has been illustrated at this more ringplain-like site in the lower reaches of the stream near its confluence with Waingongoro River. The wide range in LOWESS-smoothed scores (26 units) has more recently become ecologically significant over the eighteen year period. Scores trended downwards for 3 years after a steady improvement between 1995 and 2006 prior to the most recent marked improvement due to improved scores since the diversion of the Eltham WWTP wastes discharge out of the stream in July 2010.

The MCI scores generally have been indicative of 'poor' generic stream health (TRC, 2014) with sporadic incursions into the 'fair' health category prior to 2010. The LOWESS-smoothed scores have remained in the 'poor' category through the period until 2010 and subsequently improved into the 'fair' category and most recently bordered on 'good' health. In terms of predictive relationships (TRC, 2014) for a site in the mid-reaches of a ringplain stream (recognising the partial ringplain component of this catchment and the position of the site in the lower reach of this small stream prior to joining the mid-reaches of a larger ringplain river), stream health has been 'worse than expected' almost throughout the entire eighteen year period, but entered the 'expected' category in the previous 2011-2012 survey period.

Site WGG000665



N = 36
Kendall tau = +0.363
p value = 0.002 [>FDR, p = 0.005]
Significant at p <0.05 and p < 0.01 and after FDR application

Figure 5 LOWESS trend plot of MCI data at the Stuart Road site

A positive statistically significant trend in MCI scores has been found (at the 5% and 1% levels and after FDR application) over the period with a gradual improvement in MCI scores since 2002 (coincident with summer diversion of the treated meatworks wastes discharge (at Eltham) from the river to land irrigation) and particularly most recently (since 2009) following the diversion of treated municipal Eltham wastewater out of the catchment (to the Hawera WWTP and ocean outfall). The LOWESS-smoothed range of scores (17 units) has also been ecologically significant over the eighteen year period. Smoothed MCI scores consistently have been indicative of 'fair' generic river health until more recently when they have been more indicative of 'good' generic health (TRC, 2014). In terms of predictive relationships for a site in the mid reaches of a ringplain river, health has been in the 'expected' category almost throughout the period until approaching the 'better than expected' category in the last two years.

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.

Conclusions

This survey was the nineteenth spring survey performed subsequent to upgrades to the Eltham WWTP and the fourth spring survey since diversion of the wastewater discharge out of the catchment to the Hawera WWTP, with no consented overflow discharges to the stream in the interim. The survey coincided with moderately low recession flows following a number of early spring freshes and limited periphyton substrate cover at both Mangawhero Stream sites and the Waingongoro River downstream of the Mangawhero Stream confluence.

Macroinvertebrate community richnesses were slightly lower or similar to past median taxa numbers at all sites but the MCI scores were much higher than past medians and nearer historical maxima at sites in the lower Mangawhero Stream and in the Waingongoro River. A significant improvement was found in MCI score between the two stream sites in a downstream direction. Greater abundances of certain 'highly and moderately sensitive' taxa, which might be expected to be present at the 'better' physical habitat of site 5, 3 km downstream of the wastewater treatment plant's original discharge outfall were indicative of improved physicochemical water quality conditions at the time of this survey. The MCI and $SQMCI_s$ scores recorded in the Waingongoro River downstream of the Mangawhero Stream confluence were indicative of improved water quality below the confluence which was dissimilar to trends frequently found by previous surveys during wastewater discharges and more often under lower flow conditions. Improvement in physicochemical water quality and the associated macroinvertebrate faunal communities in the Mangawhero Stream and Waingongoro River associated with the diversion of the discharge out of the catchment to the Hawera WWTP have been recorded by this survey some three years after wastewater diversion. No impacts of leachate from the old landfill to the Mangawhero Stream were indicated from the results of this spring survey.

Temporal trends in MCI scores have been indicative of statistically significant improvements in stream and river biological river health at all three sites over an eighteen year period mainly due to markedly higher scores at sites downstream of the original wastewater outfall

discharge point subsequent to the pipeline diversion of wastes to the Hawera WWTP which occurred three years previously.

Summary

The Council's standard 'kick-sampling' technique was used at two established sites to collect streambed macroinvertebrates from the Mangawhero Stream and at one established site in the Waingongoro River. Samples were sorted and identified to provide number of taxa (richness) and MCI and SQMCIs 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 abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities, particularly if non-organic impacts are occurring.
Significant differences in either the MCI or $SQMCI_s$ between sites may indicate the degree of adverse effects (if any) of the discharges being monitored.

This spring macroinvertebrate survey indicated that the diversion of the discharge of treated wastewater from the Eltham WWTP out of the stream to the Hawera WWTP more than three years earlier had resulted in an improvement in the macroinvertebrate community of the downstream site in the Mangawhero Stream. Changes in the macroinvertebrate communities were recorded between the upstream 'control' site and the site nearly 3 km downstream of the original WWT Plant discharge outfall near the confluence with the Waingongoro River where improvements in aesthetic aspects of physicochemical water quality were also noticeable. As a result of diversion of the wastewater discharge out of the catchment, an improvement in MCI score continued to be recorded and there was no microscopic evidence of 'heterotrophic growths' (which more often had been associated with summer, warmer, low flow conditions). Eighteen year temporal trends showed statistically significant stream/river health improvements at all sites, but more significantly at the two sites downstream of the WWTP outfall attributable to pipeline diversion of the wastewater discharge out of the catchment.

The macroinvertebrate communities of the Mangawhero Stream contained relatively higher proportions of 'tolerant' taxa at the upper site, with numerical dominance by numbers of 'highly and moderately sensitive' taxa only at the downstream site when the community was comprised of a higher proportion of 'sensitive' taxa. Taxonomic richness (number of taxa) was moderate at the time of this spring survey coincident with no or patchy periphyton mats, no or patchy filamentous algal cover, but some marginal weed growth.

MCI scores indicated that the Mangawhero Stream communities were of 'poor' health upstream, and 'fair' health at the downstream site, but relatively typical of the condition recorded in equivalent reaches of similar Taranaki streams, sourced outside the National Park and/or in lowland swamps.

The macroinvertebrate community found in the Waingongoro River below the Mangawhero Stream confluence showed very similar $SQMCI_s$ and equivalent MCI scores compared with the surveyed reach of the river (in association with Riverlands meatworks) above the confluence and an improvement on wastewater pre-diversion conditions; atypical of the trend found by many past surveys, but consistent with the removal of the Eltham WWTP wastewater discharge from the Mangawhero Stream.

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

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To Monitoring Manager-Environmental Management, K Brodie
From Scientific Officer, Chris R Fowles
Report No CF607
Doc No 1324894
Date March 2014

Biomonitoring of the Mangawhero Stream and Waingongoro River in relation to South Taranaki District Council's Eltham wastewater treatment plant's discharge and rubbish tip leachate discharge, February 2014

Method

The standard '400 ml kick sampling' technique was used to collect streambed (benthic) macroinvertebrates from two established sampling sites in the Mangawhero Stream on 25 February 2014. Two sites in the Waingongoro River (illustrated in Figure 1) and an additional site, established in the river (site 8) approximately 2 km further downstream for monitoring use in conjunction with the Riverlands Eltham Ltd discharges, and the state of the environment monitoring programme, were also sampled on 25 February 2014.

This survey was performed some three and a half years after commissioning of the pipeline for conveyance of the 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.

The sites sampled were:

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

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

Samples were preserved with Kahle's Fluid for later sorting and identification under a stereomicroscope according to Taranaki Regional Council methodology using protocol P1 of NZMWG protocols for sampling macroinvertebrates in wadeable streams (Stark et al, 2001). Macroinvertebrate taxa found in each sample were recorded as:

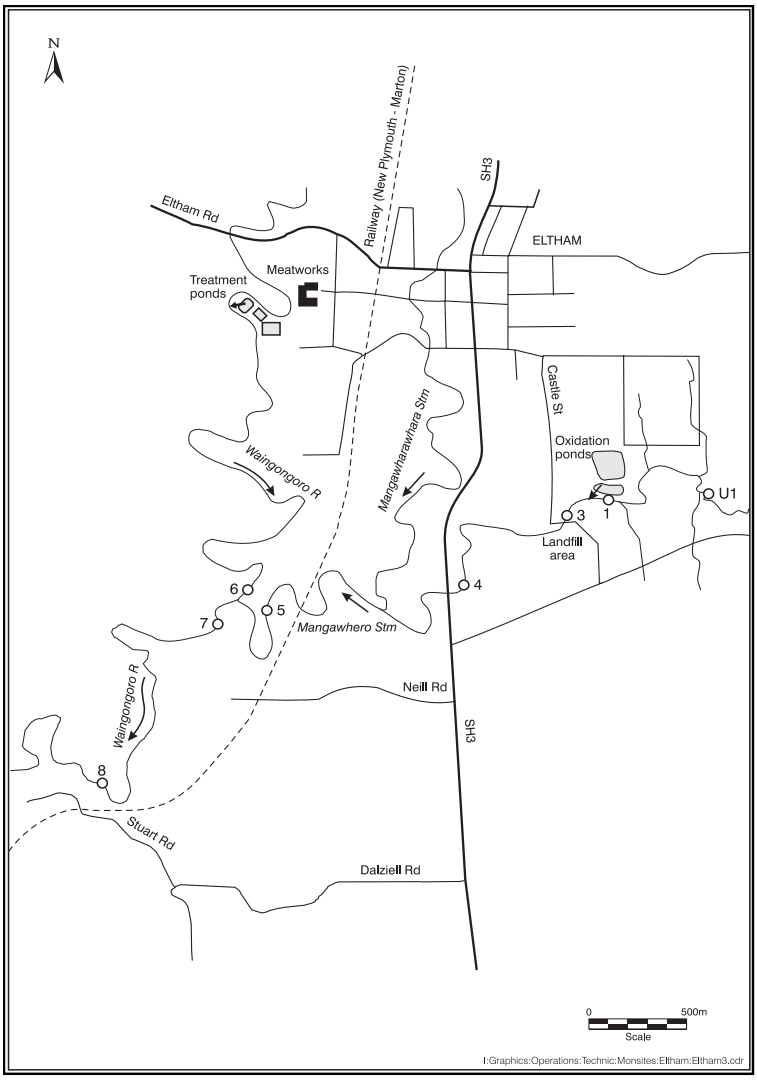


Figure 1 Biomonitoring site locations in the Mangawhero Stream and Waingongoro River in relation to Eltham wastewater treatment plant and landfill [Note: sites 1, 5, 6, 7 and 8 used in current survey]

Figure 2 Location of biomonitoring sites in relation to the Eltham WWTP and landfill

R (rare)	= less than 5 individuals;
C (common)	= 5-19 individuals;
A (abundant)	= 20-99 individuals;
VA (very abundant)	= 100-499 individuals;
XA (extremely abundant)	= 500 or more individuals.

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

A semi-quantitative MCI value, $SQMCI_S$ (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 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 these organisms is an indicator of organic enrichment within a stream.

Results and discussion

This late summer survey was performed under very low flow conditions in the Mangawhero Stream some 35 days after a significant fresh in this stream. The stream was dirty and brownish in appearance upstream of the wastewater treatment plant's outfall, where there was patchy aquatic vegetation at the stream margins. However, in the absence of any wastes discharge the appearance was slightly cloudy but uncoloured at the swifter, low flowing, harder substrate of site 5 below the Mangawharawhara Stream confluence where there were sparse beds of aquatic vegetation only at the margins of the stream channel. Stream water temperatures ranged from 15.4˚C to 15.8˚C during this mid-morning survey. Thin periphyton mats and patchy moss but no filamentous algae were present at site 1 and mats, filamentous green algal growth, and moss were patchy at site 5, with aquatic weed at the edges of sites 1 & 5. No 'sewage fungus' was noticeable on the hard substrate at either of the two sites.

A very low recession flow (0.45 m^3/sec) was recorded in the Waingongoro River at Eltham Road at the time of the survey which occurred 34 days after a fresh in excess of three times median flow and 51 days after a fresh in excess of seven times median flow. The river was clear and uncoloured upstream of the Mangawhero Stream confluence and also downstream of the confluence and at Stuart Road (site 8) during a very dry period. The river flow was much lower than the average mean monthly flow (1.40 m^3/sec) for February but slightly in excess of the minimum mean monthly flow (0.390m^3/sec) for the period 1975 to 2013. River temperatures ranged from 16.4 C to 17.1 C at sites 6, 7, and 8 at the time of this late morning survey. Thin periphyton mats and patchy filamentous algae were recorded at all three sites and patchy moss was found only at site 8.

Macroinvertebrate communities

The results of past biomonitoring surveys performed at the various river and stream sites prior to WWTP wastes diversion and surveys since this diversion are summarised in Table 1 and illustrated in Figures 3 and 4.

Table 1 Summary of macroinvertebrate taxa numbers and MCI values for previous surveys performed between January 1985 and November 2013

Site	Pre-diversion (Jan 1985 to July 2010)					Post-diversion (Nov 2010 to Nov 2013)				
	No. of Surveys	Taxa Numbers		MCI Values		No. of Surveys	Taxa Numbers		MCI Values	
		Range	Median	Range	Median		Range	Median	Range	Median
1	41	10-25	16	58-85	73	7	12-24	15	74-85	77
3	25	6-22	15	47-72	61	1	-	16	-	79
4	23	8-18	14	48-74	60	1	-	19	-	74
5	36	13-25	19	63-86	77	7	16-29	22	84-102	90
6	25	16-35	27	77-105	91	3	19-28	27	96-106	102
7	24	17-35	26	78-100	91	3	21-31	26	105-108	106
8	32	14-30	21	77-105	93	7	15-27	18	98-111	105

The macroinvertebrate fauna recorded at the two Mangawhero Stream sites (1 and 5) and three Waingongoro River sites (6, 7 and 8) are presented in Tables 2 and 3 respectively.

Mangawhero Stream: Site 1 (upstream of wastewater treatment plant's wetlands discharge and upstream of the old rubbish tip)

The flow at this site was very low, dirty, brown, and swift. The relatively channelised habitat was comprised of thin periphyton mats, no filamentous algae, and patchy moss on a mainly hard clay substrate with some silt. The riparian vegetation planting was well established since being undertaken along the stream banks subsequent to the drain clearance work about fifteen years previously and provided partial shading of the stream.

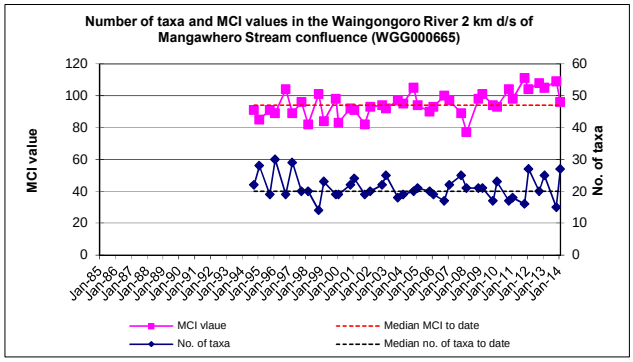
A average taxa richness (17 taxa) was recorded, one taxon more than the median richness recorded by 48 previous surveys at this site (Table 1). No 'highly sensitive' taxa were found at this site, with the fauna characterised by three 'tolerant' taxa [oligochaete worms, net-building caddisfly (*Aoteapsyche*), and sandfly (*Austrosimulium*)]; and two 'moderately sensitive' taxa [extremely abundant amphipod (*Paracalliope*); and mayfly (*Austroclima*)]. Several of these dominant taxa and many of the remainder of the fauna found at this site (Table 2) are generalists and often common inhabitants of weedy, sedimented beds, in slower flowing Taranaki streams which may be characterised by moderate physicochemical water quality, particularly when swamp-fed. All of these dominant taxa have been characteristic of this site on at least 40% of previous survey occasions (TRC, 2014). The MCI score (76) was two units above the median of previous surveys' results at this site (Table 1 and Figure 2). This score was within three units of the median score (79) from 169 surveys of small non-ringplain Taranaki streams at 'control' sites within the altitude range from 200 to 249 m asl (TRC 1999 (updated 2013)) and relatively typical of small, weedy, swamp-fed Taranaki streams draining developed farmland catchment and subject to moderate organic enrichment. It also reflected the absence of 'highly sensitive' taxa, typical components of the fauna of higher quality ring plain streams; and the relatively high proportion of 'tolerant' taxa (53% of total taxa) in the community.

Table 2 Macroinvertebrate fauna of the Mangawhero Stream in relation to Eltham WWTP discharge sampled on 25 February 2014

Taxa List	Site Number	MCI score	1	5
	Site Code		MWH000380	MWH000490
	Sample Number		FWB14162	FWB14163
NEMERTEA	Nemertea	3	R	R
ANNELIDA (WORMS)	Oligochaeta	1	A	VA
	Lumbricidae	5	-	R
MOLLUSCA	*Ferrissia*	3	-	R
	Potamopyrgus	4	C	VA
CRUSTACEA	Ostracoda	1	C	-
	Paracalliope	5	XA	XA
	Talitridae	5	-	VA
	Paranephrops	5	-	R
EPHEMEROPTERA (MAYFLIES)	*Austroclima*	7	A	C
	Coloburiscus	7	-	R
	Deleatidium	8	-	VA
PLECOPTERA (STONEFLIES)	*Zelandobius*	5	-	R
COLEOPTERA (BEETLES)	Elmidae	6	-	VA
	Hydraenidae	8	-	R
	Hydrophilidae	5	R	-
MEGALOPTERA (DOBSONFLIES)	*Archichauliodes*	7	R	A
TRICHOPTERA (CADDISFLIES)	*Aoteapsyche*	4	VA	XA
	Costachorema	7	-	A
	Hydrobiosis	5	C	A
	Oxyethira	2	R	C
	Pycnocentria	7	-	A
	Pycnocentrodes	5	-	A
DIPTERA (TRUE FLIES)	*Aphrophila*	5	R	C
	Maoridiamesa	3	-	A
	Orthocladiinae	2	C	A
	Polypedilum	3	R	A
	Tanytarsini	3	C	C
	Empididae	3	-	R
	Muscidae	3	-	A
	Austrosimulium	3	A	C
	Tanyderidae	4	-	R
ACARINA (MITES)	Acarina	5	R	-
		No of taxa	17	30
		MCI	76	92
		SQMCIs	4.7	4.6
		EPT (taxa)	3	9
		%EPT (taxa)	18	30

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

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



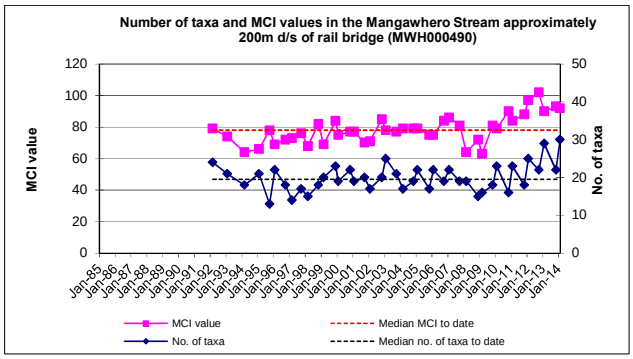
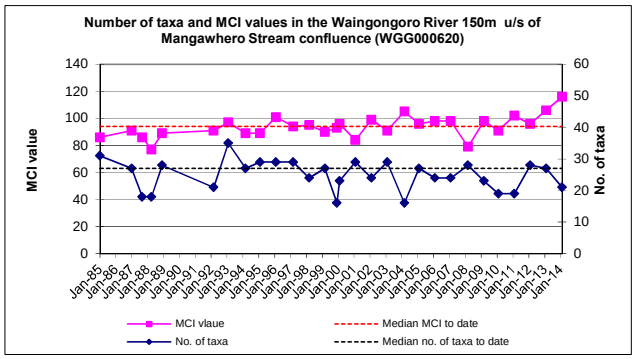
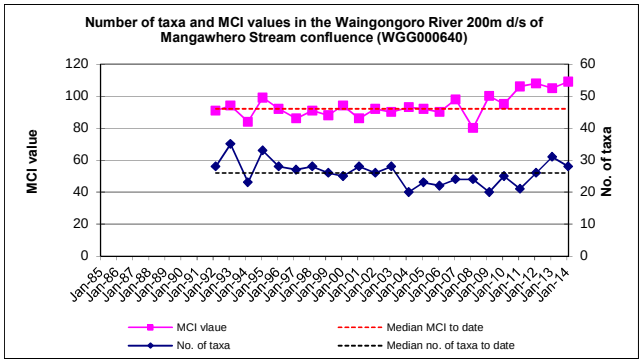


Figure 3 Taxa richness and MCI values for the two Mangawhero Stream sites to date





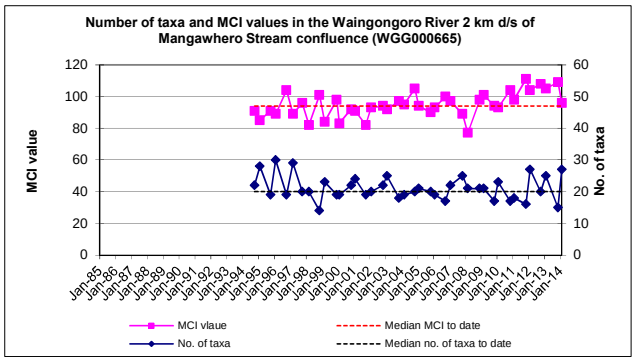


Figure 4 Taxa richness and MCI values for the three Waingongoro River sites to date

Mangawhero Stream: Site 5 (downstream of Mangawharawhara Stream and upstream of Waingongoro River confluences)

The habitat at this site differed significantly from that at the upstream site, with slightly deeper, swifter, open flow over a silt-sandy, gravel, and mainly cobble- boulder substrate, with aquatic weed only present at the margins under summer very low flow conditions. Patchy periphyton mats and filamentous algal growths and moss were present. Some areas of silty, softer sediment were noted in addition to the cobble and boulder substrate. Flow at this site was slightly cloudy but uncoloured in appearance with marked visual improvement compared with conditions recorded prior to Eltham WWTP wastewater diversion from the stream, and partly as a result of the increased dilution by the clearer ringplain Mangawharawhara Stream tributary.

A relatively high taxa richness (30 taxa) was recorded with a much increased richness in comparison with the taxa number at the upstream 'control' site. This taxa number was eleven taxa more than the median number (19 taxa) found from previous surveys prior to wastewater diversion and the highest richness since diversion (Table 1), although rarities contributed 30% of this taxa richness. This richness was also above that recorded by all of the previous surveys (Figure 3) and one higher than the previous maximum recorded (by the summer 2013 survey). A significantly higher MCI value of 92 units was recorded compared to that at the upstream 'control' site. This value was a significant (Stark, 1998) 15 units higher than the median of MCI scores previously surveyed at this downstream site prior to wastewater diversion, reflecting improvement subsequent to wastes diversion out of the reach of the stream below the WWTP outfall. This MCI score (92) was 16 units higher than the score recorded at the 'control' site (1) upstream of the wastewater treatment plant's discharge outfall coincident with very low flow conditions but improved physical habitat conditions and improved physicochemical water quality provided by the Mangawharawhara Stream inflow, sourced on the ringplain. This score categorised the site as having 'fair' stream biological generic health (TRC, 2014) at the time of this survey (compared with a median category of 'poor' health prior to wastewater diversion out of the catchment).

The dominant taxa (Table 2) included seven 'tolerant' taxa [oligochaete worms, snail (*Potamopyrgus*), net-building caddisfly (*Aoteapsyche*), midges (orthoclads, tanytarsids, and *Maoridiamesa*), and muscid flies]; eight 'moderately sensitive' taxa [(amphipods (talitrids and extremely abundant *Paracalliope*), elmid beetles, dobsonfly (*Archichauliodes*), free-living caddisflies (*Hydrobiosis* and *Costachorema*) and stony-cased caddisflies (*Pycnocentrodes* and *Pycnocentria*)]; and one 'highly sensitive' taxon [very abundant mayfly (*Deleatidium*)]. By way of comparison, this was seven more 'sensitive' taxa than were dominant at the time of the summer 2009-2010 survey, which had been preceded by a continuous period of wastewater discharges. The numerical dominance of the community by one 'sensitive' and one 'tolerant' taxa resulted in the moderate $SQMCI_s$ value (4.6 units) which was 1.8 units below the maximum of those recorded by all surveys at this site to date and almost identical to the score recorded upstream at site 1. Certain 'sensitive' taxa, which generally were recorded at this lower stream site in earlier surveys prior to increased loadings on the WWTP, had become more abundant numerically in the macroinvertebrate fauna at the time of this survey. These taxa included two mayfly taxa, dobsonfly (*Archichauliodes*), elmid beetles, and some caddisfly taxa in particular. Conversely, certain 'tolerant' taxa were numerically less abundant or absent when compared with pre-wastes diversion surveys.

Waingongoro River: Sites 6, 7 and 8 (upstream and downstream of the Mangawhero Stream confluence)

All three sites' habitats were characterised by relatively shallow, swift, riffle flows over substrates composed of some silt, sand and gravel, but primarily of cobbles and boulders. Algal mats were thin through the reach surveyed with patchy filamentous green algal growths only at site 8 and patchy moss at site 8.

Table 3 Macroinvertebrate fauna of the Waingongoro River in relation to Eltham WWTP discharge sampled on 25 February 2014

Taxa List	Site Number	MCI score	6	7	8
	Site Code		WGG000620	WGG000640	WGG000665
	Sample Number		FWB14157	FWB14158	FWB14159
ANNELIDA (WORMS)	Oligochaeta	1	-	R	C
MOLLUSCA	*Potamopyrgus*	4	R	R	R
EPHEMEROPTERA (MAYFLIES)	*Ameletopsis*	10	R	-	-
	Austroclima	7	C	A	A
	Coloburiscus	7	A	A	C
	Deleatidium	8	XA	XA	XA
	Nesameletus	9	C	R	-
	Zephlebia group	7	R	R	R
PLECOPTERA (STONEFLIES)	*Megaleptoperla*	9	-	R	-
	Zelandobius	5	-	R	R
	Zelandoperla	8	R	R	-
COLEOPTERA (BEETLES)	Elmidae	6	VA	VA	A
	Ptilodactylidae	8	-	R	-
	Staphylinidae	5	-	-	R
MEGALOPTERA (DOBSONFLIES)	*Archichauliodes*	7	A	A	A
TRICHOPTERA (CADDISFLIES)	*Aoteapsyche*	4	XA	VA	VA
	Costachorema	7	C	A	A
	Hydrobiosis	5	A	VA	A
	Neurochorema	6	-	-	R
	Psilochorema	6	-	R	-
	Confluens	5	-	R	-
	Pycnocentria	7	C	R	C
	Pycnocentrodes	5	R	R	R
DIPTERA (TRUE FLIES)	*Aphrophila*	5	C	A	A
	Eriopterini	5	R	R	R
	Maoridiamesa	3	C	A	A
	Orthocladiinae	2	R	A	A
	Polypedilum	3	R	-	-
	Tanytarsini	3	-	A	A
	Empididae	3	-	R	R
	Ephydridae	4	-	-	R
	Muscidae	3	-	-	R
	Austrosimulium	3	C	R	C
	Tabanidae	3	-	-	C
	Tanyderidae	4	-	R	R
		No of taxa	21	28	27
		MCI	116	109	96
		SQMCIs	6.0	6.6	6.7
		EPT (taxa)	12	15	11
		%EPT (taxa)	57	54	41

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

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

The macroinvertebrate communities recorded at sites 6 and 7 were of relatively good richnesses with a moderate increase in richness in a downstream direction (Table 3) and ranging from 21 to 28 taxa. Sites' taxa numbers near the Mangawhero Stream confluence were below to slightly above median numbers previously recorded (Table 1) and richness at Stuart Road (site 8) was well above historical median richness (Figure 4). MCI values (96 to 116) were significantly higher (two sites) and higher than medians of past surveys' values prior to wastewater diversion out of the catchment (Table 1 and Figure 4) and ten units higher than the historical pre-wastes diversion maximum at site 6 upstream of the Mangawhero Stream confluence and one unit above the historical maximum at site 7 downstream of the confluence despite very low flow conditions preceding the survey. There were very few significant differences in individual taxon abundances between sites, with increases in 'tolerant' midges taxa numbers downstream at site 7 and an increase in a single tolerant' (tabanid) taxon number at site 8. These subtle changes in community composition had minimal influence on the $SQMCI_s$ values which increased by 0.6 unit and 0.7 unit at the sites downstream of the Mangawhero Stream confluence.

No significant changes in MCI scores were recorded between sites immediately adjacent to the Mangawhero Stream confluence with a more typical downstream decrease of 7 units. However, the MCI score found at the Stuart Road site, 2 km further downstream, was a significant 13 units lower than with the score immediately downstream of the Mangawhero Stream confluence. The overall improvement in MCI scores in this reach was typical of the trend found by recent surveys unlike the pre-wastewater diversion surveys which showed decreases downstream of the Mangawhero Stream confluence attributable to deterioration in physicochemical water quality at this site due to the wastewater loadings on this tributary. The current trend was indicative of improvements subsequent to wastes diversion out of the catchment some three and a half years earlier but was somewhat less marked than that found by the two previous summer low flow surveys when river flows were higher.

In general, this 2.5 km reach of the river was characterised by one 'highly sensitive' taxon [extremely abundant mayfly (*Deleatidium*)]; up to seven 'moderately sensitive' taxa [mayflies (*Austroclima* and *Coloburiscus*), elmid beetles, dobsonfly (*Archichauliodes*), caddisflies (*Costachorema* and *Hydrobiosis*), and cranefly (*Aphrophila*)]; and up to four 'tolerant' taxa [net-building caddisfly (*Aoteapsyche*), and midges (orthoclads, tanytarsids, and *Maoridiamesa*)]. These characteristic taxa were typical of those found in the communities in this reach of the river and almost identical in number to those found by the previous summer survey. Comparatively, this summer survey found the same total number of taxa (35) in this reach of the river, of which 17 were recorded at all three sites but with a moderate number (five) of these taxa (one 'highly sensitive', three 'moderately sensitive', and one 'tolerant' taxa) abundant at all sites. All three of the MCI scores recorded over this reach of the river however, were slightly higher than or close to typical scores found during summer flows in the mid-reaches of a river draining developed catchments and receiving point source wastes discharges and agricultural run-off. Taxa richnesses (21 to 28 taxa) were above the median richness (20 taxa) recorded by 358 previous surveys of 'control' sites located between 155 and 199 m asl. in National Park-sourced ringplain streams and rivers (TRC, 1999 (updated 2013)). MCI scores (96 to 116 units) categorised these sites as having 'fair' (site 8) to 'good' generic river health (TRC, 2014) at the time of this late summer survey. These scores ranged from 7 units below to a significant (Stark, 1999) 13 units above predicted MCI scores for National Park-sourced ringplain river 'control' sites at an altitude of 180 m asl and were 2 to a significant 15 to 22 units above predicted scores for such sites between 27 and 30 km downstream of the National Park boundary (Stark and Fowles, 2009).

Microscopic streambed heterotrophic assessment

Mangawhero Stream

No heterotrophic growths were visually apparent in the field at the time of the survey. Where necessary, closer inspection and microscopic analysis of samples from each site showed that there were no mats, plumes or dense growths of heterotrophic organisms at either site in the Mangawhero Stream coincidental with diversion of the wastewater discharge out of the stream.

Waingongoro River

Visual and microscopic analysis of samples from the Waingongoro River showed no evidence of mats, plumes or dense growths of heterotrophic organisms on the river substrate, consistent with diversion of the wastewater treatment plant's discharge out of the Mangawhero Stream (some 4 km upstream of the confluence with the river) three and a half years earlier.

Conclusions

This late summer survey was performed during very low flow conditions in the Mangawhero Stream and in the Waingongoro River coincidental with the diversion of the Wastewater Treatment Plant's wastes out of the Mangawhero Stream by way of the relatively recently constructed pipeline to the Hawera WWTP. This survey was the fourteenth summer survey since the willow removal work had been undertaken in the stream through the reach below the SH3 culvert result which had resulted in some physical stream habitat improvements to the mid-reaches of the stream below the historical wastes discharge.

Macroinvertebrate richness and MCI values found in the lower reaches of the Mangawhero Stream were influenced by the improved physicochemical water quality conditions despite very low flow conditions following removal of the wastewater discharge from the catchment some three and a half years prior to this survey. Aspects of community composition (particularly moderate $SQMCI_s$ value and higher MCI score) emphasised these improvements in physicochemical water quality conditions downstream of the Eltham wastewater treatment system discharge outfall. These improvements were most apparent at the furthest downstream site, where recovery in community composition was also coincident with the improvement in physical habitat and dilution provided by the Mangawharawhara Stream tributary to the extent that the highest taxa richness and the significantly higher than median MCI score was recorded for the twenty-nine years of monitoring to date.

The diversion of the discharge from the Eltham Wastewater Treatment Plant (to the Hawera WWTP) had resulted in improvements in the microfloral streambed communities in the Mangawhero Stream downstream of the discharge outfall in the mid-reaches of the stream where previously, protozoan growths frequently were attached to the harder components of the substrate under conditions of low receiving water dilution rates. At the time of the current survey, no growths of heterotrophic organisms were found at the downstream site in the Mangawhero Stream nor at any of the sites in the Waingongoro River.

Relatively similar biological communities were recorded in the Waingongoro River between the upstream site and the two sites downstream of the Mangawhero Stream confluence under very low, late summer flow conditions. Minimal significant differences in individual taxon abundances occurred in this reach of the main river and $SQMCI_s$ scores showed atypical downstream increases. Improvements in MCI scores, compared with historical data, at the two sites downstream of the Mangawhero Stream confluence, more particularly at the site immediately downstream, were coincident with physicochemical water quality

improvement and consistent with scores recorded since diversion of the Eltham WWTP discharge out of the catchment.

Summary

The Council's standard 'kick-sampling' technique was used at two established sites to collect streambed macroinvertebrates from the Mangawhero Stream and at three established sites in the Waingongoro River. Samples were sorted and identified to provide number of taxa (richness) and MCI and SQMCIs 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 abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities, particularly if non-organic impacts are occurring. Significant differences in either the MCI or $SQMCI_s$ between sites may indicate the degree of adverse effects (if any) of the discharges being monitored.

This late summer macroinvertebrate survey during a period of very low recession flow indicated that the diversion of treated wastewater from the Eltham WWTP out of the stream to the Hawera WWTP had resulted in a marked improvement in the macroinvertebrate community at the downstream site in the lower reaches of the Mangawhero Stream. Changes in the macroinvertebrate communities were recorded between the upstream 'control' site and the site nearly 3 km downstream of the original WWTP discharge outfall near the confluence with the Waingongoro River, coincident with improvements in aesthetic aspects of physicochemical water quality. Macroinvertebrate communities were of better 'health' than prior to wastes diversion. As a result of diversion of the wastewater discharge out of the catchment, a marked improvement in the MCI score was recorded and there was no visual or microscopic evidence of 'heterotrophic growths' on the stream substrate (which have often been associated with summer, warmer, low flow conditions during wastewater discharges).

The macroinvertebrate communities of the Mangawhero Stream contained a relatively high proportion of 'tolerant' taxa at both sites, but with a downstream increase in 'sensitive' taxa since wastes diversion with numerical dominance by a 'highly sensitive' taxon and an increased number of 'moderately sensitive' taxa at the downstream site where the community was also comprised of an increased proportion of more 'sensitive' taxa. Taxonomic richness (number of taxa) was average to high at the time of this summer survey coincident with thin to patchy periphyton mats and limited filamentous algal cover, and a marked decrease in aquatic weed growth at the site downstream of the WWTP outfall where a much higher community richness was present.

MCI scores indicated that the Mangawhero Stream communities were of 'poor' to 'fair' generic health at both the upstream 'control' site and at the furthest downstream site respectively, and more typical of the condition recorded in equivalent reaches of similar Taranaki streams.

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 summer survey in the absence of any wastewater discharge to the stream.

The macroinvertebrate communities found in the Waingongoro River below the Mangawhero Stream confluence showed improved $SQMCI_s$ and MCI scores and generally were consistent with those scores found through the surveyed reach of the river (in association with Riverlands meatworks (CF606)) further upstream of the confluence. Scores were less typical of the deteriorating downstream trend found by most past pre-wastes diversion surveys, and reflected the improvements in physical and physicochemical habitats associated with removal of the Eltham WWTP wastewater discharge from the Mangawhero Stream.

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