South Taranaki District Council
Kaponga, Manaia, Patea, and Waverley WWTPs Monitoring Programme
Annual Report
2016-2017

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Executive summary

The South Taranaki District Council (STDC) operates eight wastewater treatment plant (WWTP) systems within the district of South Taranaki. This report addresses performances of four of these systems, located in the Kaponga, Manaia, Patea and Waverley townships[1].

This report for the period July 2016 to June 2017 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess STDC's environmental performance during the period under review. The report also details the results of the monitoring undertaken and assesses the environmental effects of STDC's activities.

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

STDC holds seven resource consents for the Waverley, Kaponga, Manaia and Patea treatment plants, which include a total of 81 conditions setting out the requirements that they must satisfy. Four consents allow STDC to discharge treated wastewater from the various municipal oxidation ponds sewage treatment systems, one consent is held to discharge treated stock truck effluent (Waverley), one consent covers the discharge of untreated municipal sewage in emergencies (Patea), and one consent allows for the placement and use of a discharge structure in the Patea coastal marine area (Patea).

Monitoring was performed to ensure continued maintenance and efficient operation of all treatment systems plus compliance with discharge permits' conditions.

No significant impacts of the Waverley, Manaia, Kaponga, or Patea treatment systems on adjacent receiving waters were recorded in summer-autumn under low flow conditions during the monitoring period. The increased frequency of bacteriological receiving water surveys in the lower Patea River that was implemented following upgrades to the Patea WWTP effluent and emergency sewage outfall discharges has continued since 2008.

Localised impacts of the Manaia pond's discharge have reduced markedly following the incorporation of wetlands into the treatment system as a component of the upgrade. However, the receiving stream may still require investigations associated with upstream water quality and receiving waters' and bacterial marker source tracking is proposed. There was one minor overflow event related to surcharging from the Manaia WWTP reticulation following a wet weather event.

Liaison with the Council is used as a method for evaluating, and thus managing and controlling the introduction of industrial wastes into each of the WWTPs. No significant additional wastes connections were made to any of the systems during the year, and the Waverley system no longer received stock truck wastes from the nearby SH3 roadside facility as these have been directed to an on-site pond treatment system.

There was a single wet weather-related overflow of partially treated wastewater from the Patea emergency pump station into the Patea River. Monitoring showed no effect on the receiving environment as a result of this. Recent upgrades to this pump station, including measures taken to reduce the frequency and duration of overflows, have been very successful in reducing overflows, during or subsequent to, wet weather events in recent monitoring years.

Additional biomonitoring of plant performance utilising regular semi-quantitative assessments of ponds' microflora has provided long-term performance information for each system. Generally, diverse algal populations have indicated relatively healthy pond systems with the dominant algal taxa varying both with

[1] The Eltham, Hawera, and Opunake Wastewater Treatment Systems are the subject of separate reports by the Taranaki Regional Council.

the location of the pond and the loading on the system. With the establishment of a lengthy historical pond microfloral record for each treatment system, this monitoring has been replaced with chlorophyll-a measurements as a component of inspectorial visits. These measurements indicated good microfloral populations in all pond systems coincidental with positive dissolved oxygen saturation levels with seasonal variability often influenced by stormwater infiltration flushing and/or cooler temperatures.

Overall, high levels of environmental performance and compliance with resource consents were achieved by STDC at each of the four WWTP systems during the monitoring period, with continued improvement in respect of environmental compliance matters at the recently upgraded Manaia treatment system. No impacts of the re-configured Patea WWTP discharge on the bacteriological quality of the lower Patea River and at the more popular Mana Bay (adjacent to the river mouth) were detected, in terms of compliance with contact recreational standards, and these standards were achieved throughout the summer-autumn period.

This report also addresses monitoring of the use of STDC stock truck wastewater disposal system near Waverley, where the consent allows for on-site land discharge of anaerobic-aerobic ponds' treated stock truck effluent. No re-occurrences of past dumping of human wastes into the system were recorded in 2016-2017, and previous issues with maintenance of the roadside facilities had been well addressed. The presence of appropriate signage and surveillance by the consent holder have been effective in maintaining compliance at the facility. Increased monitoring of this facility was instigated by the Council nine years previously and will continue in conjunction with the programme for the Waverley municipal oxidation ponds system (where the stock truck wastes were disposed of originally).

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

In terms of overall environmental and compliance performance by the consent holder over the last several years, this report shows that the consent holder's performance remains at a generally high level for all consents. This report includes recommendations for the 2017-2018 year.

Table of contents

			Page
1	Introduction		1
1.1	Compliance monitoring programme reports and the Resource Management Act 1991		1
	1.1.1	Introduction	1
	1.1.2	Structure of this report	1
	1.1.3	The Resource Management Act 1991 and monitoring	1
	1.1.4	Evaluation of environmental and administrative performance	2
1.2	Resource consents		3
	1.2.1	Water discharge permits	3
	1.2.2	Discharges of wastes to land	6
	1.2.3	Coastal permit (structure)	6
1.3	Monitoring programme		7
	1.3.1	Introduction	7
	1.3.2	Programme liaison and management	7
	1.3.3	Kaponga WWTP	7
	1.3.4	Manaia WWTP	8
	1.3.5	Patea WWTP and emergency outfall	8
	1.3.6	Waverley WWTP and stock truck wastes disposal	9
2	Kaponga WWTP		10
2.1	Inspections		10
2.2	Results of effluent monitoring		12
	2.2.1	Dissolved oxygen levels	13
	2.2.2	Microfloral component	13
2.3	Results of receiving environment monitoring		14
	2.3.1	Receiving water surveys of September 2016 and May 2017	15
	2.3.2	Low flow receiving water survey of February 2017	16
	2.3.3	Biological monitoring survey	17
2.4	Investigations, interventions, and incidents		18
2.5	Discussion		19
	2.5.1	Discussion of site performance	19
	2.5.2	Environmental effects of exercise of consents	19
	2.5.3	Evaluation of performance	20
	2.5.4	Recommendations from the 2015-2016 Annual Report	21

2.5.5 Alterations to monitoring programmes for 2017-2018 21
2.5.6 Recommendations 21

3 Manaia WWTP 22
3.1 Background 22
3.2 Inspections 23
3.3 Results of effluent monitoring 25
3.3.1 Dissolved oxygen levels 27
3.3.2 Microfloral component 28
3.4 Results of receiving environment monitoring 29
3.4.1 Receiving water surveys 29
3.4.2 Biological inspection 31
3.5 Investigations, interventions, and incidents 32
3.6 Discussion 33
3.6.1 Discussion of site performance 33
3.6.2 Environmental effects of exercise of consents 33
3.6.3 Evaluation of performance 34
3.6.4 Recommendations from the 2015-2016 Annual Report 35
3.6.5 Alterations to monitoring programmes for 2017-2018 35
3.6.6 Recommendations 35

4 Patea WWTP and emergency outfall 36
4.1 Background 36
4.2 Inspections 37
4.2.1 Pumping station and emergency outfall 38
4.3 Results of effluent monitoring 38
4.3.1 Dissolved oxygen levels 39
4.3.2 Microfloral component 40
4.4 Results of receiving environment monitoring 41
4.4.1 Lower Patea receiving water surveys 41
4.4.2 Contact recreational bacteriological monitoring 44
4.5 Investigations, interventions, and incidents 47
4.6 Discussion 47
4.6.1 Discussion of site performance 47
4.6.2 Environmental effects of exercise of consents 47
4.6.3 Evaluation of performance 48
4.6.4 Recommendations from the 2015-2016 Annual Report 50

4.6.5 Alterations to monitoring programmes for 2017-2018 51
4.6.6 Recommendations 51

5 Waverley WWTP and stock truck wastes disposal 52
5.1 Inspections 52
5.2 Results of effluent monitoring 54
5.2.1 Dissolved oxygen levels 55
5.2.2 Microfloral component 55
5.3 Results of receiving environment monitoring 56
5.3.1 Low flow receiving water survey of February 2017 57
5.4 Investigations, interventions, and incidents 59
5.5 Discussion 59
5.5.1 Discussion of site performance 59
5.5.2 Environmental effects of exercise of consents 59
5.5.3 Evaluation of performance 60
5.5.4 Recommendations from the 2015-2016 Annual Report 61
5.5.5 Alterations to monitoring programmes for 2017-2018 61
5.5.6 Recommendations 61

6 Summary of recommendations 62
6.1 Kaponga WWTP 62
6.2 Manaia WWTP 62
6.3 Patea WWTP and emergency outfall 62
6.4 Waverley WWTP and stock truck wastes disposal 62

Glossary of common terms and abbreviations 63

Bibliography and references 65

Appendix I Resource consents held by STDC (For a copy of the signed resource consent please contact the TRC Consents department)

Appendix II Biomonitoring reports

List of photos

Photo 1 Kaponga WWTP, February 2017 10
Photo 2 Algal bloom on the surface of the pond caused by high microfloral levels. 14
Photo 3 Manaia WWTP showing view of wetlands 22
Photo 4 The small discharge channel from the oxidation ponds prior to the Manaia Creek 31
Photo 5 View of Patea WWTP 36
Photo 6 View of Patea boat ramp sampling site 44

Photo 7 Waverley WWTP, August 2016 52

List of tables

Table 1 Results of summer effluent monitoring for the Kaponga WWTP 12
Table 2 Dissolved oxygen measurements from the Kaponga WWTP 13
Table 3 Chlorophyll-a levels and primary pond appearance 14
Table 4 Sampling sites for Kaponga WWTP 15
Table 5 Receiving water results September 2016 and May 2017 16
Table 6 Low flow receiving water results February 2017 17
Table 7 Results for February 2017 survey and comparison with data from March 1987 to February 2016 18
Table 8 Summary of performance for consent 0861-3 20
Table 9 Sampling site locations for the Manaia WWTP 25
Table 10 Wetland effluent discharge results September 2016 and April 2017 26
Table 11 Results of summer effluent monitoring for the Manaia WWTP 26
Table 12 Dissolved oxygen measurements from the Manaia WWTP 28
Table 13 Chlorophyll-a levels and primary pond appearance 28
Table 14 Receiving water results for Manaia Creek 29
Table 15 Receiving water results for Tasman Sea either side of Manaia Creek mouth 30
Table 16 Summary of performance for consent 1204-4 34
Table 17 Results of effluent monitoring for the Patea WWTP 39
Table 18 Dissolved oxygen measurements from the Patea WWTP 40
Table 19 Chlorophyll-a levels and primary pond appearance 40
Table 20 Sampling site locations for the Patea WWTP 41
Table 21 Receiving water results for the lower Patea River 43
Table 22 Summary of results for lower Patea River at boat ramp 45
Table 23 Summary of results for Mana Bay 46
Table 24 Summary of performance for consent 0067-3 48
Table 25 Summary of performance for consent 0145-2 49
Table 26 Summary of performance for consent 4576-2 50
Table 27 Results of summer effluent monitoring for the Waverley WWTP 54
Table 28 Dissolved oxygen measurements from the Waverley WWTP 55
Table 29 Chlorophyll-a levels and primary pond appearance 56
Table 30 Sampling sites for Waverley WWTP 56

Table 31 Low flow receiving water results February 2017 57
Table 32 Summary of performance for consent 0072-2 60
Table 33 Summary of performance for consent 6621-1 60

List of figures

Figure 1 Aerial location map of sampling sites in relation to Kaponga WWTP 15
Figure 2 Aerial location map of sampling sites in relation to Manaia WWTP 25
Figure 3 Map showing sampling sites in relation to Patea WWTP 42
Figure 4 *E. coli* numbers for lower Patea River at the boat ramp 45
Figure 5 Enterococci numbers for Mana Bay 46
Figure 6 Aerial location map of sampling sites in relation to Waverley WWTP 57

1 Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

South Taranaki District Council (STDC) operates eight wastewater treatment systems within its district. This report is the Annual Report for the period July 2016 to June 2017 by the Taranaki Regional Council (the Council) on the monitoring programme associated with resource consents held by STDC for four of these wastewater treatment plants (WWTPs), located at Kaponga, Manaia, Patea, and Waverley. The Waverley programme also included the consent held for the discharge of treated stock truck effluent from the SH3 system to land in the Waitotara catchment. The municipal systems located at Wai-inu Beach, Eltham, Hawera and Opunake are reported on separately by the Council.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the consents held by the STDC that relate to discharges of wastewater in the Kaupokonui (Kaponga), Waiokura/Motumate (Manaia), Patea (Patea), and Wairoa (Waverley) and Waitotara (Waverley Stock Truck) catchments. This is the 22nd annual report to be prepared by the Council for STDC.

1.1.2 Structure of this report

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

- consent compliance monitoring under the RMA and the Council's obligations;
- the Council's approach to monitoring sites though annual programmes;
- the resource consents held by the STDC in the six catchments;
- the nature of the monitoring programmes in place for the period under review; and
- a description of the activities and operations conducted at STDC's sites.

Section 2 presents the Kaponga WWTP monitoring results, and discusses their significance and presents recommendations for the next monitoring year.

Section 3 presents the Manaia WWTP monitoring results, and discusses their significance and presents recommendations for the next monitoring year.

Section 4 presents the Patea WWTP and emergency outfall monitoring results, and discusses their significance and presents recommendations for the next monitoring year.

Section 5 presents the Waverley WWTP and stock truck wastes disposal monitoring results, and discusses their significance and presents recommendations for the next monitoring year.

Section 6 presents a summary of the recommendations for each WWTP to be implemented in the 2017-2018 monitoring year.

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

1.1.3 The Resource Management Act 1991 and monitoring

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

a. the neighbourhood or the wider community around an activity, and may include cultural and social-economic effects;

b. physical effects on the locality, including landscape, amenity and visual effects;

c. ecosystems, including effects on plants, animals, or habitats, whether aquatic or terrestrial;

d. natural and physical resources having special significance (for example recreational, cultural, or aesthetic); and

e. risks to the neighbourhood or environment.

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

1.1.4 Evaluation of environmental and administrative performance

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

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

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

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

Environmental Performance

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

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

For example:

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

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

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

Administrative performance

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

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

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

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

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

1.2 Resource consents

1.2.1 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.

STDC holds water discharge permits **0861-3**(Kaponga WWTP), **1204-4** (Manaia WWTP), **0067-3** and **0145-2** (Patea WWTP and emergency outfall), and **0072-2** (Waverley WWTP) to cover the discharge of treated wastewater to a nearby waterway, or the untreated discharge of wastewater in emergencies only. These permits were issued by the Council under Section 87(e) of the RMA and are discussed in more detail below.

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

1.2.1.1 Kaponga WWTP

STDC holds water discharge permit **0861-3** to discharge up to 500 cubic metres per day of treated wastewater from the Kaponga WWTP into the Kaupokonui Stream. This permit was issued by the Council on 6 June 2007. It is due to expire on 1 June 2029.

Conditions 1 and 2 detail requirements of upgrades to, and operation of, the WWTP.

Condition 3 requires the consent holder to adopt the best practicable option.

Condition 4 sets limits on the daily discharge volume.

Condition 5 details requirements of the management plan.

Condition 6 requires the use of a suitably trained operator.

Condition 7 requires the ponds to be maintained in an aerobic condition during daylight hours.

Condition 8 details requirements around new trade wastes connections to the system.

Condition 9 sets limits on effects on the receiving waters.

Condition 10 details monitoring requirements.

Conditions 11 and 12 set limits on physicochemical effects in the receiving waters.

Conditions 13 and 14 provide for lapse and review.

The permit is attached to this report in Appendix I.

1.2.1.2 Manaia WWTP

STDC holds water discharge permit **1204-4** to discharge up to 600 cubic metres per day of treated municipal wastewater from the Manaia WWTP into an unnamed coastal stream between the Waiokura Stream and the Motumate Stream. This permit was issued by the Council on 6 June 2007. It is due to expire on 1 June 2029.

Conditions 1 to 3 detail requirements of upgrades to and operation of the WWTP.

Condition 4 requires the consent holder to adopt the best practicable option.

Condition 5 sets limits on the daily discharge volume.

Condition 6 details requirements of the management plan.

Condition 7 requires the use of a suitably trained operator.

Condition 8 requires the ponds to be maintained in an aerobic condition during daylight hours.

Condition 9 details requirements around new trade wastes connections to the system.

Condition 10 sets limits on effects on the receiving waters.

Condition 11 details monitoring requirements.

Condition 12 details requirements of the infiltration reduction programme.

Conditions 13 and 14 provide for lapse and review.

The permit is attached to this report in Appendix I.

1.2.1.3 Patea WWTP

STDC holds coastal discharge permit **0067-3** to discharge up to 455 cubic metres per day of treated municipal wastewater from the Patea WWTP into the Coastal Marine Area of the Patea River. This permit was issued by the Council on 9 July 2007. It is due to expire on 1 June 2028.

Conditions 1 to 3 detail requirements of upgrades to, and operation, of the WWTP.

Condition 4 requires the consent holder to adopt the best practicable option.

Condition 5 sets limits on the daily discharge volume.

Condition 6 details requirements of the management plan.

Condition 7 requires the use of a suitably trained operator.

Condition 8 requires the ponds to be maintained in an aerobic condition during daylight hours.

Condition 9 details requirements around new trade wastes connections to the system.

Condition 10 sets limits on effects on the receiving waters.

Condition 11 details monitoring requirements.

Condition 12 details requirements of bacteriological monitoring of receiving water.

Conditions 13 and 14 provide for lapse and review.

The permit is attached to this report in Appendix I.

1.2.1.4 Patea Emergency Overflow

STDC holds coastal discharge permit **0145-2** to discharge untreated municipal sewage in emergencies only into the Coastal Marine Area of the Patea River. This permit was issued by the Council on 9 July 2007. It is due to expire on 1 June 2028.

Conditions 1 to 4 detail requirements of the exercise of this consent and associated contingency plans and structures.

Condition 5 sets limits on overflow frequency and details works required if this limit is exceeded.

Conditions 6 to 8 set limits on the timing and duration of overflows.

Conditions 9 and 10 require the consent holder to install and maintain an overflow alarm system.

Condition 11 relates to overflow notification requirements.

Condition 12 details overflow reporting requirements.

Condition 13 details public signage requirements following overflow events.

Condition 14 details reporting requirements to Taranaki Healthcare following overflows.

Condition 15 sets out requirements for 3-yearly meetings.

Condition 16 details monitoring requirements.

Conditions 17 and 18 provide for lapse and review.

The permit is attached to this report in Appendix I.

1.2.1.5 Waverley WWTP

STDC holds water discharge permit **0072-2** to discharge up to 450 cubic metres per day of treated municipal wastewater from the Waverley municipal oxidation ponds system into an unnamed tributary of

the Wairoa Stream. This permit was issued by the Council on 20 January 1998. It expired on 1 June 2016, and an application for renewal was received prior to this date.

Condition 1 requires the ponds to be maintained in an aerobic condition.

Condition 2 details requirements around new trade wastes connections to the system.

Condition 3 sets limits on effects on the receiving waters.

Condition 4 provides for review.

The permit is attached to this report in Appendix I.

1.2.2 Discharges of wastes to land

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

STDC holds discharge permit **6621-1** to discharge treated stock truck effluent from an oxidation pond treatment system onto and into land in the vicinity of the Waiau Stream in the Waitotara catchment. This permit was issued by the Council on 19 September 2005 under Section 87(c) of the RMA. It is due to expire on 1 June 2022.

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

Conditions 2 and 3 set limits on effects on the receiving waters.

Condition 4 details requirements of the management plan.

Condition 5 provides for review.

The permit is attached to this report in Appendix I.

1.2.3 Coastal permit (structure)

Section 12(1)(b) of the RMA stipulates that no person may erect, reconstruct, place, alter, extend, remove, or demolish any structure that is fixed in, on, under, or over any foreshore or seabed, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations.

STDC holds coastal permit **4576-2** to erect, place and maintain an oxidation pond discharge structure and an emergency overflow discharge structure as part of the Patea WWTP within the coastal marine area of the Patea River. This permit was issued by the Council on 16 November 2005 under Section 87(c) of the RMA. It is due to expire on 1 June 2028.

Condition 1 details requirements for notification prior to maintenance works.

Conditions 2 and 3 detail requirements around construction, maintenance, and upgrades to the structures.

Conditions 4 and 5 detail requirements around minimising disturbance from maintenance works.

Condition 6 provides for public access to and along the coastal marine area.

Condition 7 sets limits on the timing of maintenance.

Condition 8 provides for fish passage.

Condition 9 sets limits around signage requirements during maintenance works.

Condition 10 details removal and reinstatement requirements.

Conditions 11 and 12 provide for lapse and review.

The permit is attached to this report in Appendix I.

1.3 Monitoring programme

1.3.1 Introduction

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

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

1.3.2 Programme liaison and management

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

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

1.3.3 Kaponga WWTP

1.3.3.1 Site inspections

The Kaponga WWTP was visited three times during the monitoring period, with each inspection conducted during early to mid-morning. With regard to consents for the discharge to water, the main points of interest were maintenance and operating condition of the WWTP, and the discharge of treated wastewater. Air quality surveys for odours associated with the system were included with each inspection. Inspections provided for the operation, internal monitoring, and supervision of the plant to be reviewed by the Council. Sources of data being collected by STDC were identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. The neighbourhood was surveyed for environmental effects.

1.3.3.2 Chemical sampling

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

The primary oxidation pond was sampled for dissolved oxygen and microfloral component on three occasions.

Water quality samples were collected from upstream and downstream sites in the Kaupokonui Stream during the spring and autumn inspections. Samples were analysed for filtered uninhibited biochemical oxygen demand (filtered BOD), pH, turbidity, temperature, unionised ammonia (NH_3), and ammonia-N (NH_4).

The treated pond effluent and two sites on the Kaupokonui Stream were sampled on one occasion in late summer under low river flow conditions. The samples were analysed for total and filtered BOD, chloride, conductivity, dissolved oxygen, faecal coliform bacteria, pH, suspended solids (SS), turbidity, temperature,

dissolved reactive phosphorus (DRP), unionised ammonia (NH_3), ammonia-N (NH_4), and nitrate-nitrite nitrogen (NNN).

1.3.3.3 Biomonitoring surveys

A biological survey was performed on one occasion at three sites in the Kaupokonui Stream to determine whether or not the discharge of treated effluent from the Kaponga WWTP has had a detrimental effect upon the communities of the stream.

1.3.4 Manaia WWTP

1.3.4.1 Site inspections

The Manaia WWTP was visited three times during the monitoring period, with each inspection conducted during early to mid-morning. With regard to consents for the discharge to water, the main points of interest were maintenance and operating condition of the WWTP and associated wetlands, and the discharge of treated wastewater. Air quality surveys for odours associated with the system were included with each inspection. Inspections provided for the operation, internal monitoring, and supervision of the plant to be reviewed by the Council. Sources of data being collected by STDC were identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. The neighbourhood was surveyed for environmental effects.

1.3.4.2 Chemical sampling

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

The primary oxidation pond was sampled for dissolved oxygen and microfloral component during each of three inspections. During these occasions, water quality samples were also collected from upstream and downstream sites in the Manaia Creek, and either side of the mixing zone in the Tasman Sea. The freshwater samples were analysed for chloride, conductivity, faecal coliform bacteria, turbidity, and temperature. The sea samples were analysed for conductivity, faecal coliform bacteria, and temperature.

The primary pond and the treated wetlands effluents were sampled on one occasion in early summer during low river flow conditions. The samples were analysed for total and filtered BOD, chloride, conductivity, dissolved oxygen, faecal coliform bacteria, pH, suspended solids, turbidity, temperature, unionised ammonia (NH_3), and ammonia-N (NH_4).

1.3.4.3 Biological inspection

A low tide beach ecological inspection was performed on one occasion in early winter 2017 to assess the impact of the discharge on the marine environment.

1.3.5 Patea WWTP and emergency outfall

1.3.5.1 Site inspections

The Patea WWTP and Emergency Overflow were visited three times during the monitoring period, with each inspection conducted during mid-morning. With regard to consents for the discharge to water, the main points of interest were maintenance and operating condition of the WWTP, and usage and maintenance of the emergency overflow system. Air quality surveys for odours associated with the system were included with each inspection. Inspections provided for the operation, internal monitoring, and supervision of the plant to be reviewed by the Council. Sources of data being collected by STDC were identified and accessed,

so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. The neighbourhood was surveyed for environmental effects.

1.3.5.2 Chemical sampling

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

The primary oxidation pond was sampled for dissolved oxygen, microfloral component, total and filtered BOD, chloride, conductivity, dissolved oxygen, faecal coliform bacteria, pH, suspended solids, turbidity, temperature, unionised ammonia (NH_3), and ammonia-N (NH_4) during two of three inspections. During each of these occasions, water quality samples were also collected from upstream and downstream sites in the Patea River. The freshwater samples were analysed for conductivity, E. coli, Enterococci, faecal coliform bacteria, turbidity, and temperature.

Contact recreational bacteriological water quality at Patea Boat Ramp and at Mana Bay was monitored by the Council on 24 and 13 separate occasions respectively between early November 2016 and early April 2017. The sea samples were analysed for conductivity, faecal coliform bacteria, and temperature.

1.3.6 Waverley WWTP and stock truck wastes disposal

1.3.6.1 Site inspections

The Waverley WWTP was visited three times during the monitoring period. These inspections were conducted during mid-morning, and focused on the maintenance and operation of the treatment plant and any effects on the receiving environment. Air quality surveys associated with the operation of the plant were included with each inspection.

The nearby stock truck effluent disposal was inspected three times throughout the year, in conjunction with each WWTP visit.

1.3.6.2 Chemical sampling

The second cell of the oxidation pond was sampled for dissolved oxygen, temperature, and microfloral component during each of the three inspections.

The Council undertook sampling of the discharge from the site and water quality upstream and downstream of the discharge during low flow conditions on one occasion in late summer, in conjunction with sampling from the oxidation pond. The discharge and receiving water samples were analysed for ammonia (NH_3 and NH_4), total and filtered BOD, chloride, conductivity, dissolved oxygen, DRP, faecal coliform bacteria, pH, suspended solids, temperature, and turbidity.

2 Kaponga WWTP

The Kaponga WWTP is a single oxidation pond system (constructed in 1971) that has been separated into two sections by a wooden dividing barrier. The pond is gravity fed mainly domestic wastes from a population of about 370 people although it was designed for a population of 650. A sludge survey performed by consultants for the consent holder (MWH, 2005) found that there had been a slow rate of sludge accumulation and at such a rate, it was estimated that the system would not require desludging for another 17 years. Sludge surveys will be repeated at five-yearly intervals (STDC, 2015). Issues of stormwater infiltration, improved mixing within the ponds' system, and reduction of the microfloral component of the treated wastewater discharge, were identified in consideration of upgrading the treatment system during the consent renewal process in the 2007-2008 period (CH2M Beca Ltd, 2006). Upgrades to the system were completed by late May 2008. Infiltration remedial work has a lesser priority for the Kaponga system than elsewhere in South Taranaki although 121 m of pipeline was re-lined during the 2014-2015 period (STDC, 2015).

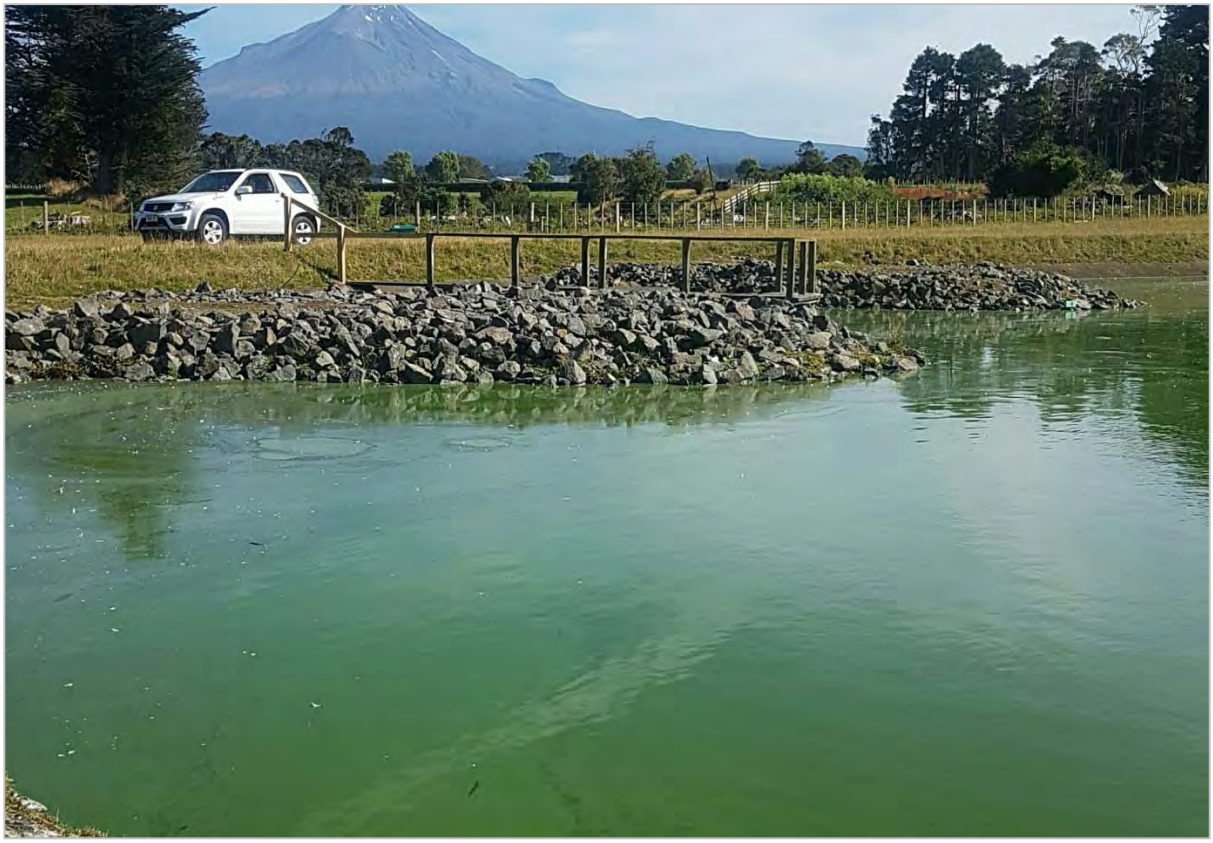

Photo 1 Kaponga WWTP, February 2017

Riparian fencing and planting of the river margin adjacent to the ponds system has also been undertaken. The installation of a mechanical step-screen at the inlet was undertaken during the latter months of the 2012-2013 monitoring period. This screen system has telemetry alarming.

2.1 Inspections

7 September 2016

An inspection was conducted in overcast weather with rain showers and north westerly wind conditions.

The influent screen was tidy and wastes were fully contained. The primary pond influent flow was reasonably clear with an estimated flow rate of 3 L/s. the pond was a turbid, light green brown colour with a rippled surface.

The secondary pond was slightly turbid and a light green brown colour with a rippled surface. An algal sample was collected for chlorophyll – a analysis. Two mallard ducks were observed on the ponds.

The secondary pond was discharging to the Kaupokonui River with an estimated flow rate of 4 L/s, and showed no visual environmental effect on the receiving waters.

Samples were collected at receiving water monitoring sites upstream and downstream of the WWTP discharge. The Kaupokonui River was running at a moderately swift flow at the time, with a clear and uncoloured appearance. The flow rate at the Glenn Road telemetry site at the time of sampling was 2.829 m^3/s.

The WWTP surrounds were inspected and found to be in a satisfactory condition, with sheep grazing at the time. The fenced riparian margin along the Kaupokonui River had been recently planted.

23 February 2017

An inspection was conducted in fine weather with light wind conditions.

The step screen was operating and wastes were fully contained. The influent flow rate on the primary pond was estimated at 2.0 L/s. The pond was a normal level, and a turbid dark green colour.

The secondary pond was a turbid, dark green-yellow colour. The surface was mainly flat and pond level was normal.

Discharge effluent grab samples were collected at the pond outlet, away from a concentrated algal scum that had collected near the outlet. An algal sample was collected for chlorophyll-a analysis. Sixty paradise ducks were observed on the pond's surface.

The treated effluent discharge flow rate into the Kaupokonui River was estimated a 1 L/s, showing no environmental effect on the receiving waters. The Kaupokonui Stream was flow gauged at the Eltham Road site, with a measured flow rate of 535 L/s.

The Kaponga WWTP surrounds were found to be satisfactory - sheep were grazing the surrounding paddocks. The fenced riparian margin downstream of the pond system required replanting in some areas. Water quality sampling of three river sites plus the oxidation pond effluent under low river flow conditions was undertaken in conjunction with the inspection.

17 May 2017

An inspection was conducted in showery weather with westerly wind conditions.

The step screen was operating and wastes were fully contained. The primary pond influent flow was reasonably clear, with an estimated flow rate of 15 L/s. The pond was a slightly turbid, light brown colour, with a rippled surface.

The secondary pond was a slight turbid, light green brown colour, with a rippled surface. An algal sample was collected for chlorophyll – a analysis. Two mallard ducks were observed on the pond surface.

The discharge flow rate into the Kaupokonui River was estimated at 12 L/s, and showed no noticeable environmental effect on the receiving waters. The river was running at a moderately steady flow, and appeared to be relatively clear and uncoloured. Samples were collected from the two receiving water monitoring sites upstream and downstream of the WWTP discharge, just prior to a fresh in the river. The flow rate at the Glenn Road telemetry site at the time of sampling was 2.804 m^3/s.

The WWTP surrounds were found to be satisfactory, and sheep were grazing the surrounds at the time of inspection.

2.2 Results of effluent monitoring

Effluent monitoring was carried out in the second section of the oxidation pond, adjacent to the outlet, for the purpose of monitoring the effectiveness of the WWTP up to that point. Along with a visual survey of each component of the system; dissolved oxygen levels (DO) and the microfloral component of the pond were measured during each inspection. These are discussed in Sections 2.2.1 and 2.2.2 respectively.

The primary pond was sampled for total and filtered BOD, chloride, conductivity, dissolved oxygen, faecal coliform bacteria, pH, suspended solids, turbidity, temperature, dissolved reactive phosphorus (DRP), unionised ammonia (NH_3), ammonia-N (NH_4), and nitrate-nitrite nitrogen (NNN), on one occasion during the summer inspection. The results of this survey are presented in Table 1 and compared with the results from the sample collected during the 2015-2016 monitoring year.

Table 1 Results of summer effluent monitoring for the Kaponga WWTP

Site		**OXP002004**	
Date		**23 Feb 2017**	**2015-2016**
Time		**0915**	
Parameter	**Unit**		
Flow	L/s	1.0	0.25
BOD	g/m³	20	26
BODF	g/m³	1.0	2.3
Chloride	g/m³	31.6	29.1
Conductivity	mS/m@20°C	21	21.4
DO (concentration)	g/m³	12.7	8.6
DO (saturation)	%	150	98
Faecal coliform bacteria	/100ml	1,300	3,500
pH	pH	10.2	9.9
SS	g/m³	<140	120
Turbidity	NTU	306	240
Temp	°C	21.1	20.5
Nutrient Analyses			
NH_3	g/m³	0.016	0.031
NH_4	g/m³ N	0.015	0.033
NNN	g/m³ N	<0.01	-
NO_3^-	g/m³ N	0.003	<0.01
NO_4^-	g/m³ N	0.002	-
DRP	g/m³ P	6.38	0.234

2.2.1 Dissolved oxygen levels

The dissolved oxygen concentration in WWTPs varies both seasonally and during the day as a result of a combination of factors. The photosynthetic activity of the pond's microflora together with fluctuations in influent waste loadings on the system are the major influencing factors. Minimum dissolved oxygen concentrations are generally recorded in the early hours of daylight, and therefore pond performance has been evaluated by standardising sampling times toward mid-morning for all regular inspection visits during the monitoring period.

The Kaponga WWTP effluent was analysed for dissolved oxygen and temperature, and the results are displayed in Table 2.

Table 2 Dissolved oxygen measurements from the Kaponga WWTP

Date	Time (NZST)	Temperature (°C)	Dissolved Oxygen	
			Concentration (g/m^3)	Saturation (%)
7 September 2016	1025	12.1	3.1	30
23 February 2017	0915	21.1	12.7	150
17 May 2017	1000	12.3	9.5	86

Results in Table 2 indicated a relatively wide range of dissolved oxygen concentrations (between 30% and 150% saturation) in the surface layer of the primary pond near the outlet. The occurrence of the supersaturation event in February (150% saturation) is relatively atypical of this oxidation pond (recorded DO readings are typically at their lowest during the summer period). This result is likely attributed to a high level of microbiological activity in the pond due to the under-loaded nature of the WWTP. No mechanical aeration of the pond occurs.

2.2.2 Microfloral component

Pond microflora are very important for the stability of the symbiotic relation between aerobic bacteria in the primary pond. These phytoplankton may be used as a bio-indicator of pond conditions, for example cyanobacteria are often present in under-loaded conditions and chlorophyceae are present in overloaded conditions. To maintain facultative conditions in a pond system there must be an algal community present in the surface layer.

The principal function of algae is the production of oxygen which maintains aerobic conditions while the main nutrients are reduced by biomass consumption. Elevated pH (due to algal photosynthetic activity) and solar radiation combine to reduce faecal bacteria numbers significantly.

Samples of the primary pond effluent were collected on all inspections for chlorophyll-a analyses. Chlorophyll-a concentration can be a useful indicator of the algal population present in the system. Pearson (1996) suggested that a minimum in-pond chlorophyll-a concentration of 300 mg/m^3 was necessary to maintain stable facultative conditions). However, seasonal change in algal populations and also dilution by stormwater infiltration might be expected to occur in any WWTP which, together with fluctuations in waste loadings, would result in chlorophyll-a variability.

The results of primary pond effluent analyses are provided in Table 3 together with field observations of pond appearance.

Table 3 Chlorophyll-a levels and primary pond appearance

Date	Time (NZST)	Appearance	Chlorophyll-a (mg/m^3)	Range for the period 2013-mid 2016	
				Range	Median
7 September 2016	1025	Turbid, light green brown	33	11-941	394
23 February 2017	0915	Turbid, dark green	1,100		
17 May 2017	1000	Slightly turbid, light brown	653		

Despite the wide range of concentrations of chlorophyll-a in the primary pond, the majority of samples showed high concentrations, indicative of a significant phytoplanktonic component. The lowest measured DO level (3.1 g/m^3) was associated with the lowest algal concentrations in the pond, which is indicative of the organic wastes' loadings on this system. The highest levels, recorded during the summer survey, were related to a thick green layer noted on the surface of the pond at the time of the visit (Photo 2).

Photo 2 Algal bloom on the surface of the pond caused by high microfloral levels.

2.3 Results of receiving environment monitoring

Monitoring of the impacts of the Kaponga WWTP on the receiving waters was measured using both chemical analyses of the receiving waters of the Kaupokonui River beyond the boundary of the mixing zone, and biological monitoring surveys at the same locations. Chemical sampling was carried out on three occasions during the 2016-2017 period (Section 2.1.3.1). One biomonitoring survey was conducted during

summer 2017 (Section 2.1.3.2). The locations of sampling sites are listed in Table 4 and displayed in Figure 1 below.

Table 4 Sampling sites for Kaponga WWTP

No.	Location	Description	GPS Reference	Site Code
U	Kaupokonui River	Approximately 250 m upstream of the WWTP discharge	1698609 E 5634423 N	KPK 000500
OP	Effluent	Adjacent to outlet of second section of the oxidation pond	1698629 E 5634266 N	OXP 002004
D1	Kaupokonui River	50 m downstream of the WWTP discharge	1698548 E 5634263 N	KPK 000520
D2	Kaupokonui River	Approximately 1 km downstream of the WWTP discharge	1698497 E 5633456 N	KPK 000550

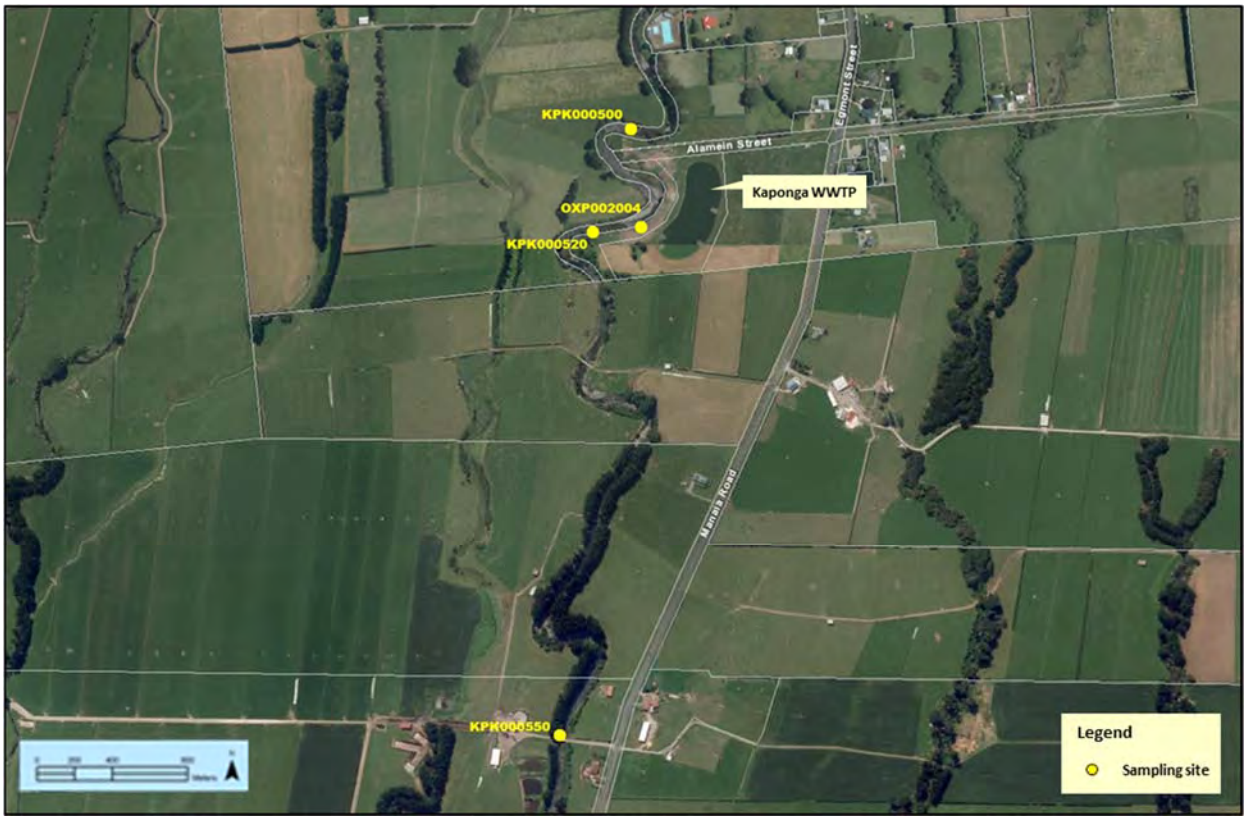

Figure 1 Aerial location map of sampling sites in relation to Kaponga WWTP

2.3.1 Receiving water surveys of September 2016 and May 2017

Receiving water samples were collected on the 7 September 2016 and 17 May 2017 at two sites in the Kaupokonui River, upstream and downstream of the Kaponga WWTP discharge point. The results of these surveys are displayed in Table 5.

Table 5 Receiving water results September 2016 and May 2017

Site		KPK000500		KPK000520	
Date		7 Sept 2016	17 May 2017	7 Sept 2016	17 May 2017
Time		1005	0915	1045	0930
Parameter	Unit				
BODF	g/m^3	<0.5	<0.5	<0.5	<0.5
pH	pH	7.6	7.6	7.6	7.6
Turbidity	NTU	0.74	1	0.72	1.4
Temp	°C	9.0	11.2	9.4	11.2
NH_3	g/m^3 N	0.00005	0.00012	0.00009	0.00013
NH_4	g/m^3 N	0.006	0.012	0.01	0.013

These results show that there were no significant effects noted in the Kaupokonui River as a result of the WWTP discharge. Filtered BOD_5 concentration was well within the 2.0 gm^2 limit imposed by Special Condition 11, as was unionised ammonia (NH_3). There were slight increases in turbidity between the two sites on both sampling occasions, but these were negligible and compliant with consent conditions.

2.3.2 Low flow receiving water survey of February 2017

A late summer low flow assessment of the impact of the WWTP's effluent discharge on the receiving waters of the Kaupokonui River was performed on 23 February 2017, 20 days after a significant river fresh. Results of the survey are displayed in Table 6. There was a very low rate of discharge from the ponds system (estimated at approximately 0.25 L/s) at the time of the survey. The river flow was gauged at 0.54 m^3/s upstream of the discharge. This would have provided an estimated dilution ratio of at least 2000:1 at the time of sampling. The flow of 0.90 m^3/s recorded in the lower reaches of the river (TRC Glenn Road recorder) was well below the average February mean monthly flow (1.56 m^3/s) and only slightly above the minimum February mean monthly flow (0.48 m^3/s) for the period 1978 to 2016.

As a result of the large dilution afforded to the discharge, there was only a small decrease in clarity of the stream downstream of the discharge point as emphasised by the 2.2% decrease in black disc clarity and minimal change in turbidity between sites U and D1. No significant impacts on the river were recorded for all other parameters measured (Table 6) with minimal or no increases in measured levels of pH, conductivity, suspended solids, bacteria, BOD5, and nutrients (including un-ionised ammonia). These results were indicative of compliance with Special Conditions 9, 11, and 12 of the consent as the reduced algal component of the wastewater caused no discolouration and minimal change in turbidity beyond the mixing zone in the river.

The river appearance was clear and uncoloured along the reach surveyed, with high aesthetic water quality in the reaches near Kaponga township and 1 km downstream of the oxidation pond discharge. Dissolved oxygen concentrations exceeded 100% saturation at all sites upstream and downstream of the discharge.

Table 6 Low flow receiving water results February 2017

Site		KPK000500		KPK000520		KPK000550	
Date		23 Feb 2017	2015-2016 Range	23 Feb 2017	2015-2016 Range	23 Feb 2017	2015-2016 Range
Time		0845		0940		1010	
Parameter	**Unit**						
Flow	L/s	535	524	-	-	-	-
Black disc	m	4.05	4.18	3.96	4.11	3.96	3.71
BOD	g/m^3	<0.5	<0.5	0.6	<0.5	<0.5	<0.5
BODF	g/m^3	<0.5	<0.5-0.6	<0.5	<0.5	<0.5	0.5
Chloride	g/m^3	7.3	7.6	7.2	7.9	7.8	8.1
Conductivity	mS/m@20°C	8.2	7.9	8.2	7.8	8.2	7.8
DO (concentration)	g/m^3	10.2	10.0	10.0	10.1	10.2	10.0
DO (saturation)	%	105	104	103	105	105	104
Faecal coliform bacteria	/100ml	220	280	210	360	200	260
pH	pH	8	7.6-8.0	8.1	7.6-8.0	8.1	7.9
SS	g/m^3	4	<2	<2	<2	<2	<2
Turbidity	NTU	0.74	0.34-0.78	0.92	0.53-0.85	0.84	0.67
Temp	°C	15.3	9.5-15.9	15.9	10.1-16.1	15.9	16.1
Nutrient Analyses							
NH_3	g/m^3 N	0.00013	0.00012-0.0004	0.00006	0.00014-0.00027	0.00013	0.00017
NH_4	g/m^3 N	0.004	0.005-0.007	<0.003	0.006-0.015	0.003	0.006
NNN	g/m^3 N	0.12	-	0.1	-	0.11	-
NO_3^-	g/m^3 N	0.12	0.07	0.1	0.07	0.11	0.06
NO_4^-	g/m^3 N	<0.001	-	<0.001	-	<0.001	-
DRP	g/m^3 P	0.014	0.009	0.016	0.007	0.014	0.006

2.3.3 Biological monitoring survey

The biomonitoring survey associated with the receiving waters of the Kaupokonui River was undertaken under low, recession flow conditions on 10 February 2017, at identical sites to the physicochemical survey (Figure 2) of 23 February 2017. Results of the biomonitoring survey are summarised in Table 7 and compared to data obtained from previous biomonitoring surveys between March 1987 and February 2016. The full report is presented in Appendix II.

Table 7 Results for February 2017 survey and comparison with data from March 1987 to February 2016

Site No.	No of taxa			MCI value			$SQMCI_s$ value		
	Median	Range	Feb 2017	Median	Range	Feb 2017	Median	Range	Feb 2017
U	26	18-33	27	116	98-133	113	6.5	2.6-7.8	5.4
D1	25	22-34	22	109	93-128	116	5.5	3.6-7.7	6.9
D2	26	15-32	25	111	92-126	108	5.6	3.1-7.5	7.1

The Council's standard 'kick-sampling' technique was used to collect streambed macroinvertebrates from the Kaupokonui River at three established sites. Each sample was processed to provide number of taxa (richness), MCI score, $SQMCI_S$ score, and %EPT taxa.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects or 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. It may also provide more relevant information in relation to non-organic impacts. Differences in either the MCI or the $SQMCI_S$ between sites indicate the degree of adverse effects (if any) of the discharges being monitored.

Taxa numbers recorded by the present survey tended to be very similar to those found at the previous summer's survey and were very similar to their respective historical median. MCI scores indicated that the stream communities were of 'good' generic health, and 'expected' predictive conditions to those recorded in similar Taranaki ringplain streams at equivalent altitudes. There were no significant differences among sites for MCI scores and the two 'impact' sites had significantly higher $SQMCI_S$ scores compared with the 'control' site which indicated that both 'impact' sites had 'excellent' water quality. There was no visual sign or microscopic evidence of any unusual heterotrophic growths present or forming on the substrate at any site.

This summer macroinvertebrate survey indicated that the discharge of treated oxidation ponds wastes from the Kaponga wastewater treatment plant site had not had any detrimental effect on the macroinvertebrate communities of the Kaupokonui River. No significant decreases in macroinvertebrate community health were found at the two sites downstream of the discharge.

2.4 Investigations, interventions, and incidents

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

The Council operates and maintains a register of all complaints or reported and discovered excursions from acceptable limits and practices, including non-compliance with consents, which may damage the environment. The incident register includes events where STDC 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 2016-2017 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with STDC's conditions in resource consents or provisions in Regional Plans for the Kaponga WWTP.

2.5 Discussion

2.5.1 Discussion of site performance

The Kaponga WWTP was well maintained and operated, and performed satisfactorily throughout the monitoring period. The refurbished wavebands, dividing wall, and replacement outlet grid have functioned successfully since the 1998-1999 monitoring period and continued to do so throughout the current period. The fenced riparian margin downstream of the ponds system required replanting in some areas after pine tree removal.

The effluent quality data was indicative of a well treated wastewater with parameters typical of a municipal oxidation pond system receiving minimal industrial waste loadings, with the measured parameters within the ranges of median values monitored to date for this system. Moderate turbidity and suspended solids levels during the summer period were coincidental with a seasonal increase in abundance of microfloral taxa within the pond (as indicated by a high chlorophyll-a level). Monitoring of the microfloral component of the second pond by means of chlorophyll-a measurements indicated effective pond performance with good microfloral populations, coincident with moderately high dissolved oxygen saturation levels on two occasions, but a low microfloral population (and reduction in dissolved oxygen saturation) in winter following colder, wetter weather conditions.

2.5.2 Environmental effects of exercise of consents

No significant impacts on the Kaupokonui River were recorded from the physicochemical parameters analysed during the late summer survey conducted in February 2017, when a very low discharge rate of well-treated wastewater characterised this system. There were no significant changes in the measured concentrations of almost all parameters downstream under low receiving water flow conditions, mainly due to the very high effluent dilution occurring at the time. Both this survey and two other receiving water surveys found compliance with all limits set by special conditions at all times.

The Kaupokonui River continued to have high aesthetic water quality in the reaches near the Kaponga township and for 1 km downstream of the oxidation pond discharge under summer low flow conditions.

Moderate, but typical macroinvertebrate community richnesses were found in the Kaupokonui River upstream and downstream of the oxidation pond effluent discharge during a late summer, low flow period. MCI scores were similar to scores typical of those recorded for mid-reaches of developed ringplain catchments and rivers, indicative of 'good' generic biological health. No significant impacts of the effluent discharge were indicated by MCI scores through the reach of the river surveyed. The absence of heterotrophic growths on the river bed was consistent with these findings.

2.5.3 Evaluation of performance

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

Table 8 Summary of performance for consent 0861-3

Purpose: To *discharge treated municipal wastewater from the Kaponga Wastewater Treatment Plant into the Kaupokonui Stream*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Upgrade to plant within one year	Reporting by consent holder; upgrade completed	Yes
2. Exercise in accordance with documentation	Liaison with consent holder and inspections	Yes
3. Minimisation of effects	Inspections and sampling	Yes
4. Limits on volume	Reporting by consent holder and inspections	Yes
5. Implementation of a management plan	Provision by consent holder	Yes
6. Provision of operator	Liaison with consent holder	Yes
7. Maintenance of aerobic ponds conditions	Inspections and sampling	Yes
8. Trade wastes connections	Liaison with consent holder	N/A
9. Limits on receiving water effects	Inspections and physicochemical sampling and biomonitoring	Yes
10. Monitoring provisions	Performance of tailored programme	Yes
11. Limits on receiving water effects for ammonia and filtered BOD_5	Performance of tailored programme	Yes
12. Limits on aesthetic water effects	Performance of tailored programme	Yes
13. Provision for lapse of consent	Consent holder liaison	N/A
14. Optional review provision re environment effects	Option for review in June 2017, recommendation attached	Yes
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**
Overall assessment of administrative performance in respect of this consent		**High**

N/A = not applicable

During the year, STDC demonstrated a high level of environmental and high level of administrative performance with the resource consents as defined in Section 1.1.4.

2.5.4 Recommendations from the 2015-2016 Annual Report

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

1. THAT monitoring of the Kaponga WWTP in the 2016-2017 year continue at the same level as in 2015-2016.
2. THAT the option for a review of resource consent 0861-3 in June 2017, as set out in condition 14 of the consent, not be exercised, on the grounds that the current conditions are adequate.

Both recommendations were subsequently implemented and all aspects of the 2016-2017 programme were performed as required.

2.5.5 Alterations to monitoring programmes for 2017-2018

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

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

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

It is proposed that for 2017-2018, monitoring of the Kaponga WWTP continues at the same level as in 2016-2017.

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

2.5.6 Recommendations

1. THAT in the first instance, monitoring of consented activities at Kaponga WWTP in the 2017-2018 year continue at the same level as in 2016-2017.
2. THAT should there be issues with environmental or administrative performance in 2017-2018, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.

3 Manaia WWTP

The Manaia WWTP is a single treatment oxidation pond (constructed in 1984), followed by twin wetlands (in parallel) receiving mainly domestic sewage together with trade wastes from the bakery industry. These trade wastes are currently un-regulated but with the proposed introduction of a planned trade waste by-law, restrictions and standards are intended to be imposed by the consent holder (STDC, 2013).

Photo 3 Manaia WWTP showing view of wetlands

3.1 Background

Issues relating to the historical operation and performance of the reticulation and treatment system have been presented in previous annual reports (see TRC, 2004 and TRC, 2007 in particular).

Consent renewal (1999) issues relating to the upgrade of the treatment plant are also summarised in previous reports and the final design of the required upgrade was addressed by the consent renewal in 2007. An assessment of the wastes loadings to the pond system was also included in this process. The upgrade now provides additional screening of the influent and wetlands polishing of the final effluent principally to improve the bacteriological quality of the treated wastewater prior to discharge. Desludging of the oxidation pond was also a component of the upgrade, and was completed in November 2007 with the last of the de-watered sludge used onsite as a base for the constructed wetlands.

The installation of the mechanical screening at the plant was completed by June 2009. The wetlands installation was completed by early summer 2009 with the planting of 24,000 reeds followed by filling with water. The northern wetland was lined with water treatment plant sludge to prevent seepage. Hedging was planted along the northern and eastern boundary of the WWTP.

Both wetlands have been in use since the 2010-2011 period. The consent holder constructed an emergency high level overflow pipe between the oxidation pond and the northern wetland in August 2010 (see TRC, 2011) to prevent overtopping of the pond onto neighbouring farmland. This pipe has been used only occasionally following heavy rainfall periods (e.g. September, 2010 and August, 2011) with a gate-valve installed to provide greater pond storage before use.

The consent holder had advised that no stormwater infiltration/inflow work was performed on the Manaia sewerage reticulation in the 2007-2014 period (mainly due to the greater priorities at Hawera and also because there had been no issues with manholes surcharging in recent years). However, during the 2016-2017 period, 272 m of pipeline had been re-lined (STDC, pers.comm.).

The Manaia WWTP is located adjacent to an eroding coastal cliff face, and regular cliff erosion topographical surveys are carried out by STDC's consultant, the most recent occurring in 2014. The coastal access track also requires regular checks and maintenance.

3.2 Inspections

13 September 2016

An inspection was conducted in overcast weather with moderate wind conditions.

The influent screen on the primary pond was not operating, and had been bypassed as the screen has been removed for maintenance. Wastes were fully contained. The influent flow rate was estimated at 8 L/s. The pond was a slightly turbid, dark green colour, with a rippled surface and a normal operating level. No scum or debris was noted on the pond surface, and an algal sample was collected for chlorophyll-a analysis. Twenty-five mallard ducks and black swans were observed on the pond.

The water level in the northern pond was measured at 1.62 m, while the southern pond was stable at 1.00 m. The southern pond had been isolated in relation to an ongoing seepage investigation by STDC, and no discharge was occurring from that outlet. The pond effluent was relatively clear and light pale green in colour. Several pukeko were noted throughout the wetlands.

Effluent grab samples were collected for waste analyses from the final discharge to Manaia Creek. The discharge flow rate was estimated at 7 L/s, showing only a slight visual impact on the colour of the receiving water.

Coastal seawater samples either side of the tributary discharge were collected in conjunction with the inspection. The Manaia coastal access track was in reasonable repair. Any required maintenance was scheduled to be actioned in 2017. The WWTP ponds and surrounds were found to satisfactory and in tidy condition.

7 December 2016

An inspection was carried out in fine weather with light north westerly wind conditions.

The influent screen on the primary pond was operating and wastes were fully contained. The influent flow rate was estimated at 3 L/s. The pond surface was mainly flat and at a normal operating level, and no scum or debris was observed. The pond was a turbid, dark green colour, with a slightly noticeable amine-type odour. An algal sample was collected for chlorophyll-a analysis. Ten black swans and three mallard ducks were observed on the pond surface.

The wetlands were inspected, and the level in the northern pond was measured at 1.55 m, while the southern pond was 0.75 m. Only the north wetland pond was discharging. The pond effluent was a slightly turbid, green brown colour. Six ducks were observed on the wetland surface. An effluent grab sample was collected for full waste analyses from the final discharge to Manaia Creek.

The treated wastewater discharge flow was estimated at 1 L/s, and no significant visual environmental impact on the receiving water was observed.

Coastal seawater samples either side of the tributary discharge were collected on this occasion, and a receiving water survey of Manaia Creek was undertaken. Programmed maintenance was required to be completed along the Manaia coastal track.

A survey of the cliffs below the wetland ponds showed that there had not been any significant erosion since the previous survey was carried out on 27 January 2016.

The ponds and WWTP surrounds were found to be tidy and well-maintained.

27 April 2017

The final inspection for the year was conducted in fine weather with calm wind conditions.

The influent screen on the primary pond was operating and wastes were fully contained. The influent flow rate was estimated at 12 L/s. It was noted that works had been carried out on the step screen preventing high influent flow from backing up, this was in relation to the incident investigation on 7 April 2017.

The pond surface was flat and had a normal operating level. A quantity of grey scum was floating on the pond surface near the pond outlet. The pond was a very turbid dark green colour. A sample was collected for chlorophyll-a analysis. Five black swans and six mallard ducks were observed on the pond surface.

The pond level in the northern wetland pond was measured at 1.60 m, and the southern pond at 0.75 m. Only the north wetland pond was discharging. The pond effluent was a slightly turbid pale green colour. Several pukeko were observed in the wetlands area. Effluent grab samples were collected for partial waste analyses from the final discharge to Manaia Creek.

The treated wastewater discharge flow was estimated at 12 L/s, and showed no significant visual environmental impact on the receiving water.

Coastal seawater samples either side of the tributary discharge were collected at mid tide including receiving water samples of Manaia Creek.

Programmed maintenance was due to be completed along the Manaia coastal track. A recent slippage had covered part of the track and stairway. A survey of the cliffs below the wetland ponds showed that there has been significant coastal erosion since the last survey carried out on 27 Jan 2016.

The ponds and surrounds were found to be tidy and well-managed.

3.3 Results of effluent monitoring

Effluent monitoring was carried out from both the primary oxidation pond, adjacent to the outlet, and the final discharge from the wetlands for the purpose of monitoring the effectiveness of the treatment plant. Sampling sites for both effluent monitoring and receiving water monitoring are described in Table 9 and displayed in Figure 2. Measurements of dissolved oxygen levels (DO) and the microfloral component of the primary pond (Sections 3.3.1 and 3.3.2 respectively); and measurements of chloride, conductivity, faecal coliform bacteria, temperature, and turbidity of the wetland discharge (Table 10) were taken during two of the three inspection visits.

Table 9 Sampling site locations for the Manaia WWTP

No	Site	Location	GPS Reference	Site code
U	Manaia Creek	5 m upstream of the WWTP discharge	1696373 E 5618563 N	MNA000090
OP	Effluent	WWTP oxidation pond effluent at outfall	1696197 E 5618609 N	OXP003001
WET	Outlet	WWTP wetland at outfall	1696368 E 5618551 N	OXP006005
D1	Manaia Creek	10 m downstream of the WWTP discharge	1696369 E 5618539 N	MNA000093
SE	Tasman Sea	200 m east of mouth of Manaia Creek	1696641 E 5618404 N	SEA905086
SW	Tasman Sea	200 m west of mouth of Manaia Creek	1696255 E 5618419 N	SEA905080

Figure 2 Aerial location map of sampling sites in relation to Manaia WWTP

Table 10 Wetland effluent discharge results September 2016 and April 2017

Site		OXP006005		
Date		13 Sept 2016	27 Apr 2017	1987-2015 Range
Time		1000	0945	
Parameter	Unit			
Chloride	g/m³	39.5	38.3	37.0-53.5
Conductivity	mS/m@20°C	27.7	27.4	27.5-42.6
Faecal coliform bacteria	/100ml	20	190	7-9,500
Turbidity	NTU	8.4	6.4	2.0-81
Temp	°C	11.6	14.7	8.4-18.6

Wetland effluent quality was good on both survey occasions, with very low faecal coliforms and turbidity recorded. All parameters measured were within the range of previous monitoring results, and were consistently similar except where seasonal variation, in particular faecal coliform levels and temperature, accounted for a moderate variation.

The primary pond and wetland discharge were sampled for total and filtered BOD, chloride, conductivity, dissolved oxygen, faecal coliform bacteria, pH, suspended solids, turbidity, temperature, dissolved reactive phosphorus (DRP), and ammonia-N (NH_4) on one occasion during the summer inspection. The results of this survey are presented in Table 11.

Table 11 Results of summer effluent monitoring for the Manaia WWTP

Site		OXP003001		OXP006005	
Date		7 Dec 2016	1987-2015 Range	7 Dec 2016	1987-2015 Range
Time		0935		1005	
Parameter	Unit				
BOD	g/m³	75	11.0-90	16	4.0-34
BODF	g/m³	54	1.4-23	9.9	3.1-13
Chloride	g/m³	44	27.0-66.4	42.5	37.0-53.25
Conductivity	mS/m@20°C	40.5	25.9-56.8	36.9	27.5-42.6
DO (concentration)	g/m³	0.4	<0.1-23	4.3	0.7-2.0
DO (saturation)	%	2.8	2.0-292	46.6	3.7-46.6
Faecal coliform bacteria	/100ml	150,000	1,200-500,000	16,000	7-9,500
pH	pH	6.8	7.2-9.0	6.8	6.9-7.6

Site		OXP003001		OXP006005	
Date		7 Dec 2016	1987-2015 Range	7 Dec 2016	1987-2015 Range
Time		0935		1005	
SS	g/m³	23	8.0-420	11	3.0-20
Turbidity	NTU	30	4.3-540	28	2.0-81
Temp	°C	21.6	7.4-27.5	19.5	8.4-20.1
Nutrient Analyses					
NH_4	g/m³ N	16.1	1.8-17.8	11.3	3.3-10.0
DRP	g/m³ P	2.4	0.45-4.89	1.87	0.59-2.28

Results of effluent monitoring from show that the primary pond effluent quality was typical of a municipal single oxidation pond system receiving a relatively low industrial waste component coincidental with variable pond microfloral populations and a relatively typical bacterial level.

In comparison with past data (Table 11), early summer pond effluent quality was similar to previous median parameters' values in terms of, suspended solids, dissolved reactive phosphorus and faecal coliform bacteria. Filtered BOD was markedly higher, more than twice the previous recorded maximum, while pH was the lowest recorded since the start of monitoring.

The treated wetland discharge showed high dissolved oxygen, faecal coliform bacteria, and ammonia-N concentrations on this occasion. There was a marked improvement in faecal coliform numbers in comparison with the oxidation pond effluent; however these were significantly higher than the historical maximum. Ammonia-N was also higher than the previous maximum, although it is noted that this is based on just five previous samples of this parameter. The combined system will require more time before valid comparative assessments with historical oxidation pond performance can be provided.

Variability in the pond's microfloral population has contributed to differences in effluent quality over the period since monitoring commenced.

3.3.1 Dissolved oxygen levels

The dissolved oxygen concentration in WWTPs varies both seasonally and during the day as a result of a combination of factors. The photosynthetic activity of the pond's microflora together with fluctuations in influent waste loadings on the system are the major influencing factors. Minimum dissolved oxygen concentrations are generally recorded in the early hours of daylight, and therefore pond performance has been evaluated by standardising sampling times toward mid-morning for all regular inspection visits during the monitoring period.

The Manaia WWTP effluent was analysed for dissolved oxygen and temperature, and the results are displayed in Table 12.

Table 12 Dissolved oxygen measurements from the Manaia WWTP

Date	Time (NZST)	Temperature (°C)	Dissolved Oxygen	
			Concentration (g/m^3)	Saturation (%)
13 Sept 2016	0935	12.5	13.6	125
7 Dec 2016	0825	21.6	0.4	2.8
27 Apr 2017	1015	15.9	14.1	142

Results in Table 12 indicate a wide range of dissolved oxygen concentrations (between 2.8% and 142% saturation) in the surface layer of the primary pond near the outlet. The occurrence of two supersaturation events are atypical of the results generally recorded in this oxidation pond (i.e. supersaturation is seldom recorded), and no mechanical aeration of the pond occurs. The lowest DO readings were recorded in the summer period, which is consistent with previous results.

3.3.2 Microfloral component

Pond microflora are very important for the stability of the symbiotic relation between aerobic bacteria in the primary pond. These phytoplankton may be used as a bio-indicator of pond conditions, for example cyanobacteria are often present in under-loaded conditions and chlorophyceae are present in overloaded conditions. To maintain facultative conditions in a pond system there must be an algal community present in the surface layer.

The principal function of algae is the production of oxygen which maintains aerobic conditions while the main nutrients are reduced by biomass consumption. Elevated pH (due to algal photosynthetic activity) and solar radiation combine to reduce faecal bacteria numbers significantly.

Samples of the primary pond effluent were collected on all inspections for chlorophyll-a analyses. Chlorophyll-a concentration can be a useful indicator of the algal population present in the system. Pearson (1996) suggested that a minimum in-pond chlorophyll-a concentration of 300 mg/m^3 was necessary to maintain stable facultative conditions. However, seasonal change in algal populations and also dilution by stormwater infiltration might be expected to occur in any WWTP which, together with fluctuations in waste loadings, would result in chlorophyll-a variability.

The results of primary pond effluent analyses are provided in Table 13 together with field observations of pond appearance.

Table 13 Chlorophyll-a levels and primary pond appearance

Date	Time (NZST)	Appearance	Chlorophyll-a (mg/m^3)	Range for the period 2013-mid 2016	
				Range	Median
13 September 2016	0935	Slightly turbid, dark green	373	33-2,850	413
7 December 2016	0825	Turbid, dark green	30		
27 April 2017	1015	Very turbid, dark green	622		

Despite the relatively narrow range of concentrations of chlorophyll-a in the primary pond, the majority of samples showed high concentrations, indicative of a significant phytoplanktonic component. The lowest measured DO level (0.4 g/m^3) was associated with the lowest algal concentrations in the pond, which is indicative of the organic wastes' loadings on this system.

3.4 Results of receiving environment monitoring

Monitoring of the impacts of the Manaia WWTP on receiving waters is measured using chemical analyses of the Manaia Creek upstream and downstream of the final wetlands discharge, and beyond the boundary of the mixing zone with the receiving waters of the Tasman Sea. An annual biological inspection is also carried out on the intertidal zone at the boundary of the mixing zone. Chemical sampling was carried out on three occasions during the 2016-2017 period (Section 2.1.3.1). One biomonitoring inspection was conducted during winter 2017 (Section 2.1.3.2). The locations of sampling sites are listed in the previous section, in Table 9 and Figure 2.

3.4.1 Receiving water surveys

Receiving water samples were collected on 7 September 2016, 7 December 2016, and 17 May 2017 at two sites in the Manaia Creek upstream and downstream of the Manaia WWTP discharge point, and two coastal sites in the Tasman Sea, either side of the boundary with the mixing zone The results of these surveys are displayed in Tables 14 and 15.

Table 14 Receiving water results for Manaia Creek

Site		MNA000090				MNA000093			
Date		13 Sept 2016	7 Dec 2016	27 Apr 2017	1987-2015 Range	13 Sept 2016	7 Dec 2016	27 Apr 2017	1987-2015 Range
Time		1000	1000	0945		1010	1025	1000	
Parameter	Unit								
Chloride	g/m³	62	63.5	64.5	29.1-142.0	56	61.6	59.1	31.8-85.1
Conductivity	mS/m @20°C	40.7	41.7	40.4	29.1-70.4	37.6	41.6	37.8	31.1-64.4
Faecal coliform bacteria	/100ml	450	1,600	320	50-33,000	290	1,700	7,400	68-260,000
Turbidity	NTU	4	12	1.6	3.0-70	4.5	6	2.8	4.7-30.0
Temp	°C	12.7	18.0	14.7	8.2-18.2	12.6	17.9	14.8	8.0-19.2

These results show that the WWTP discharge was not having a significant effect on the Manaia Creek, with only a slight increase in turbidity on two of the three sampling occasions. The one exception was the faecal coliform counts in April 2017, which showed a twenty-fold increase in concentration downstream compared to upstream, which was likely caused by the high level of bacteria as measured in both the primary pond and wetland effluents. However, this sample was taken from within the mixing zone and therefore compliant with consent conditions.

Table 15 Receiving water results for Tasman Sea either side of Manaia Creek mouth

Site		SEA905080				SEA905086			
Date		13 Sept 2016	7 Dec 2016	27 Apr 2017	1987-2015 Range	13 Sept 2016	7 Dec 2016	27 Apr 2017	1987-2015 Range
Time		1005	1045	0920		1030	1030	0910	
Parameter	**Unit**								
Conductivity	mS/m @20°C	4,440	4,500	4,550	849-4,740	4,200	4,590	4,370	858-4,720
Faecal coliform bacteria	/100ml	<1.8	<1	2	1-1,300	4.5	<1	6.8	1-400
Temp	°C	13.3	20.0	16.2	7.5-21.3	13.3	19.5	16.1	7.6-21.6

These results show consistently good water quality was achieved in the Tasman Sea, either side of the boundary of the mixing zone at the mouth of the Manaia Creek. Slightly elevated levels of faecal coliform bacteria were found at the two sites either side of the mouth of the stream, but all samples collected throughout the monitoring period were within consent conditions. No significant adverse effects were observed in the coastal waters.

3.4.1.1 Summary of impact monitoring on receiving waters

There was minimal effect of the wetlands' discharges on the receiving waters of the Manaia Creek and the coastal waters of the Tasman Sea on two of the three occasions in the monitoring period, with low numbers of faecal coliform bacteria in the discharge and no increase in turbidity downstream. A slight noticeable impact was measured in April 2017, with increased turbidity and increased faecal coliforms downstream of the discharge point resulting in slightly elevated levels of faecal coliform bacteria being found at the two sites either side of the mouth of the stream. No 'sewage fungus' was recorded on the streambed on either occasion.

The Ministry for the Environment and Ministry of Health (MfE/MoH, 1998) 'Bacteriological Water Quality Guidelines for Marine and Fresh Water' (subsequently reviewed in 2003) are consistent with international practice and are based on the application of 'maximum acceptable' levels of bacteria for bathing in marine and fresh water and for recreational shellfish-gathering. Special condition 7 of consent 1204 has adopted the guideline levels for recreational shellfish as a standard for measuring whether compliance of the consent has occurred. The guidelines use 'faecal coliform' indicator bacteria numbers to denote the potential presence of pathogenic bacteria, viruses and protozoa. The prescribed values for recreational shellfish-gathering waters establish a median faecal coliform not in excess of 14 per 100 ml or not more than 10% of samples in exceedance of 43 per 100 ml. The guideline levels themselves do not guarantee that shellfish living in waters of this microbiological quality will be 'safe', rather they are intended as a management tool to measure any changes from those conditions prevailing at the time of assessment. They provide an assessment of the level of risk associated with timing of shellfish-gathering from waters being surveyed.

At the times of the two coastal receiving water surveys, all samples were within both the ≤14 per 100 ml median guideline and the <43 per 100 ml exceedance guideline value. Whilst past results of bacterial monitoring conducted at the two coastal sites either side of the mouth of the Manaia Creek to date have indicated that this particular element of compliance has not always been achieved, care needs to be exercised in drawing too many inferences from the data gathered to date. It should be noted that natural

run-off from freshwater catchments may also impact upon coastal seawater bacteriological quality from time-to-time.

3.4.2 Biological inspection

During the monitoring period under review, one beach ecological inspection was performed. This survey was performed in June 2017, and provided a qualitative assessment of the intertidal area for species present and also to assess the general 'ecological health' of the area. The results of the inspection are presented in Appendix II, and discussed below.

16 June 2017

A marine ecological inspection of the foreshore in the vicinity of the discharge from the Manaia oxidation pond system was attempted on 16 June 2017 commencing at 10:30 NZST. Low tide at Port Taranaki on this day was at 08:12 NZST at a height of 0.9 m above chart datum. At the time of the inspection the weather was fine and it had been dry the proceeding few days.

At the time of the inspection the effluent from the oxidation pond-wetland system was discharging at a high rate (Photo 4). The discharge was clear and had a faint but detectable sewage odour. Small patches of foam were visible. No sewage fungus was present after or before the Manaia Creek stream confluence.

Photo 4 The small discharge channel from the oxidation ponds prior to the Manaia Creek

The intertidal inspection consisted of a qualitative assessment of the species present. The inspection covered the area where the stream flowed across the reef and an area up to approximately 50 m northwest of the stream, and included high, middle and low shore. The stream was approximately 10 m wide at the coast. Over the high to mid shore, the stream had a brown coloration and strong sewage odour, with surface foam present. Freshwater input was likely to have had a significant impact on the surrounding intertidal communities, particularly on the higher sections of the shore.

Unfortunately there had been a slip at the base of the cliff used to access the coast. There was a >1.5 m drop before the start of the tyre ladder making it unsafe to access the beach. As a consequence this intertidal inspection consisted of a qualitative assessment of green macroalgae cover/extent (Ulva spp.) made from the top of the access point.

The stream appeared to have a significant effect on intertidal algae nearby to the stream, most likely a result of freshwater influence. Ulva spp. was evident along the length of the stream, with dense cover higher up on

the shore. Prolific growth of this species is typical of nutrient enrichment, however, this species was not abundant beyond the 50 m mixing zone extending either side of the stream.

3.5 Investigations, interventions, and incidents

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

The Council operates and maintains a register of all complaints or reported and discovered excursions from acceptable limits and practices, including non-compliance with consents, which may damage the environment. The incident register includes events where STDC 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 2016-2017 period, the Council was required to undertake one additional investigation in association with the STDC's conditions in resource consent 1204-4. On 6 April 2017, an inspection was undertaken after a complaint was received about a possible sewage overflow in a roadside drain on Sutherland Road, Manaia. The inspection found that there was a discharge occurring beside a manhole cover at the lower end of Sutherland Road, and another discharge occurring at a manhole cover approximately 300 m further north up Sutherland Road towards Manaia township. The discharge from the southern-most overflow was running down a roadside drain to the unnamed stream that enters the Manaia Creek. The discharge from the northern-most overflow went to a private property where it went underground. There appeared to be sewage fungus around both discharge sites and photos/video and samples were taken.

A letter of explanation was received from STDC on 10 April 2017, which gave information around the events that had lead to the surcharge, namely a high-rainfall storm event during the previous three days, and an accumulation of fat deposits in the incoming sewer line that had been previously undetected. The report also detailed the corrective actions that had been taken including:

- Overflow signage erected at the manholes on 6th April.
- The mechanical screen at the wastewater pond inlet was lifted out of the incoming flow path so as to ease restriction. Two sections of the incoming sewer line upstream of the pond were jetted and fat deposits removed from the pipe.
- TRC officers were informed of actions and cessation of surcharge.
- Surface water had dissipated by Friday 7th April and the affected area was disinfected by application of hydrated lime.

Further works planned also included:

- Installing a bypass pipe at the inlet of the plant so the inlet screen can be readily bypassed and prevent backup in the incoming sewer line.
- Lower the bypass weir on the inlet channel to cater for excessive flows.
- Investigate sources and reduce stormwater inflow to sewers, as well as set up an alarm in the pond inlet channels to indicate an excess influent and possibility of surcharge.

Following the completion of all of the above works, and based on the results of surface water sampling carried out during the initial investigation, it was determined that there had not been a significant impact on the receiving environment of the Manaia Creek, and no further action was deemed necessary.

3.6 Discussion

3.6.1 Discussion of site performance

The Manaia WWTP was generally well maintained and operated, and performed satisfactorily throughout the monitoring period. The performance of the oxidation pond showed typical seasonal variability, with aerobic conditions occurring throughout the monitoring period with variable dissolved oxygen levels, including two instances of supersaturation.

Wetlands effluent surveys, which have been conducted since completion of the upgrade, have shown wastewater parameter concentrations indicative of a well-treated effluent. It can be concluded that the pond continues to perform adequately and that the addition of the wetlands has improved wastewater quality in the interim in terms of bacteriological numbers, BOD_5, suspended solids, and turbidity levels.

Semi-quantitative biomonitoring of the microflora component of the oxidation pond prior to current period has found communities typical of other well-performing pond systems elsewhere in the region. Chlorophyll-a measurements and officer observations indicated good microfloral health in the primary oxidation pond on all occasions. The overall performance of the wastewater system was considered typical of a single pond system (with a relatively low industrial loading component) followed by wetland tertiary treatment.

3.6.2 Environmental effects of exercise of consents

Minimal impacts of the wetlands discharge were recorded on aspects of the water quality of the Manaia Creek into which the effluent discharged earlier in the monitoring period, apparent only near the end of the monitoring period. More recent receiving water monitoring, after incorporation of the wetlands into the system, has identified marked improvements in the aesthetic water quality of the Manaia Creek. However, the poor water quality often recorded upstream of the discharge warrants some investigation as this may have contributed to past 'sewage fungus' outbreaks and the potential for elevated coastal water bacteria levels on occasions. It is proposed that additional work be conducted in the 2017-2018 monitoring period to investigate the poor water quality upstream of the discharge. Notwithstanding this factor, monitoring over the 2016-2017 period continued to illustrate that there was minimal impact on the bacterial levels measured in the nearby coastal receiving waters of the Tasman Sea adjacent to the inflowing stream, although slightly elevated numbers were found in early summer.

The 1998 MfE/MoH Bacteriological Water Quality Guidelines for Marine and Fresh Water guidelines (subsequently updated in 2003) are used as the basis for determining compliance with special condition 7(iii) of consent 1204 for recreational shellfish-gathering purposes. Results of bacteriological monitoring conducted at the two coastal sites showed standards were met in all samples in regard to both the maximum number of bacteria, as well as the median guideline for shellfish gathering, at both of the sites either side of the stream mouth. However, care needs to be exercised in drawing too many inferences from the data gathered to date, because there is currently limited information available on which to analyse the significance of variations in numbers observed in terms of wastewater impacts and/or in relation to natural background coastal seawater bacteriological levels.

An ecological beach survey (conducted in June 2017) found that whilst there were localised, significant effects on marine species within the vicinity of the stream, these effects appeared to be contained within the 50 m mixing zone either side of the Manaia Creek discharge.

3.6.3 Evaluation of performance

A tabular summary of STDC's compliance record for the year under review is set out in Table 16.

Table 16 Summary of performance for consent 1204-4

Purpose: ***To discharge treated municipal wastewater from the Manaia Wastewater Treatment Plant into the Unnamed Stream***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Upgrade to plant within two years	Reporting by consent holder; upgrade commenced and completed	Yes
2. Provision of annual progress reports	Reporting completed by consent holder	Yes
3. Exercise in accordance with documentation	Liaison with consent holder and inspections	Yes
4. Minimisation of effects	Inspections and sampling	Yes
5. Limits on volume	Reporting by consent holder and inspections	Yes
6. Implementation of a management plan	Provision by consent holder	Yes
7. Provision of operator	Liaison with consent holder	Yes
8. Maintenance of aerobic ponds conditions	Inspections and sampling	Yes
9. Trade wastes connections	Liaison with consent holder	Yes
10. Limits on receiving water effects	Inspections and physicochemical sampling and biomonitoring (when discharging)	Yes – minor effects noted on one occasion
11. Monitoring provisions	Performance of tailored programme	Yes
12. Implementation of infiltration programme	Reporting by consent holder	Yes – one minor surcharge event following high rainfall event
13. Provision for lapse of consent		N/A
14. Optional review provision re environmental effects	Optional review scheduled in June 2017, recommendation attached in section 4.10	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**
Overall assessment of administrative performance in respect of this consent		**High**

N/A = not applicable

During the year, STDC demonstrated a high level of environmental and high level of administrative performance with the resource consents as defined in Section 1.1.4.

3.6.4 Recommendations from the 2015-2016 Annual Report

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

1. THAT monitoring of the Manaia WWTP be continued for the 2016-2017 period by formulation of an appropriate monitoring programme similar in format to the programme undertaken during the 2015-2016 period.
2. THAT the reporting required by Special Condition 12 of consent 1204 shall be supplied to the Council by 30 June 2017.
3. THAT the Council investigates aspects of the water quality of Manaia Creek upstream of the WWTP in terms of the source of bacteria in both the stream and coastal waters, during the 2016-2017 period.

Recommendations 1 and 2 were subsequently implemented and the relevant aspects of the 2016-2017 programme were performed as required. Recommendation 3 was not undertaken in this monitoring year, and it proposed that it be carried forward to the 2017-2018 year.

3.6.5 Alterations to monitoring programmes for 2017-2018

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

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

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

It is proposed that for 2017-2018, monitoring of the Manaia WWTP continues at the same level as in 2016-2017, with the addition of water quality investigations upstream of the WWTP discharge in the Manaia Creek to be determined based on results of water quality surveys.

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

3.6.6 Recommendations

1. THAT in the first instance monitoring of consented activities at Manaia WWTP in the 2017-2018 year continue at the same level as in 2016-2017.
2. THAT should there be issues with environmental or administrative performance in 2017-2018, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.
3. THAT the reporting required by Special Condition 12 of consent 1204 shall be supplied to the Council by 30 June 2018.
4. THAT the Council investigates aspects of the water quality of Manaia Creek upstream of the WWTP in terms of the source of bacteria in both the stream and coastal waters, during the 2017-2018 period, subject to appropriate flow conditions.

4 Patea WWTP and emergency outfall

The Patea WWTP (constructed in 1973 for a population of 2,400) was originally comprised of a single large oxidation pond which was upgraded to a three cell system in 2008 (Photo 5). There are currently no significant industrial wastes being discharged into this pond. The population serviced by the system was 1,098 in 2013. The nearby York Street pumping station has provision for river overflow via a separate outfall in the event of emergencies.

Photo 5 View of Patea WWTP

4.1 Background

Historical information relating to the operation of the WWTP, particularly the consented York Street pumping station overflow, is presented in several earlier annual reports (see TRC, 2004). Upgrades to the pump station and reticulation have significantly reduced raw sewage overflows to the river in recent years to the extent that relatively few (seven), mainly short duration (less than 2 hours), overflows occurred during the six year period from mid 2004 to mid 2010. No overflows were recorded for the period mid 2010 to mid 2016.

Upgrades to the reticulation and treatment system were addressed by the consent holder and consultant in the consents' renewal process associated with the oxidation pond system and pump station. These consents were renewed in February 2006 (see section 1.1.2.4), with a minor variation granted in July 2007 to extend the date for completion of the upgrade modifications. The upgrading of all facilities was complete by June 2008 (TRC, 2008 & 2015).

Inspections of the WWTP system by the Council have also incorporated inspections of the pump station and emergency outfall area in the annual monitoring programmes since 1996 and the frequency of bacteriological receiving water quality surveys of the Patea River has increased since the 1997-1998 year and more recently since the renewal of consents in 2006. Recreational bacteriological water quality of two sites (lower river and Mana Bay) is now also monitored as a requirement of the renewed consents and is also monitored at nearby Patea beach at three-yearly intervals as a component of the coastal state of the environment programme. The latter was last monitored in the 2015-2016 period.

4.2 Inspections

25 August 2016

An inspection was conducted in overcast weather with light north westerly wind conditions. It was noted that there had been significant heavy rainfall prior to the inspection.

The pond 1 influent flow rate was estimated at 25 L/s, and the lower pump was operating at time of inspection. A slight odour was detected near the influent end of the pond. The surface on ponds 1 and 2 was flat, and they were a relatively clear pale green colour. No debris was observed on the ponds' surfaces, which were occupied by 80+ mallard ducks and several black swans.

The final pond was a relatively clear, pale green colour, with a mainly flat surface. An algal sample was collected for chlorophyll –a analysis. Five ducks were observed on the pond.

The treated discharge flow rate was estimated at 10 L/s at the outlet, and showed no visual environmental impact on the Patea River.

The WWTP surrounds and facilities were in a satisfactory condition, and no offsite odour issues were noted.

There was no evidence of any recent overflow discharge into the Patea River from the emergency outfall and pump station. The lower pump station was operating to pump wastewater to the WWTP.

7 February 2017

An inspection was conducted in overcast, drizzly weather with light westerly wind conditions.

Ponds 1 and 2 were mainly flat, and a slightly turbid, green brown colour. The pond influent was flowing at the time of inspection. No debris was noted on the ponds' surface, which were occupied by 200+ mallard ducks and several black swans. No odour was detected onsite.

The final pond was a slightly turbid, dark green brown colour with a rippled surface. The pond level was normal. Samples were collected from the pond and discharge sump for full wastewater analysis, including dissolved oxygen, bacterial and algal (as chlorophyll-a) samples.

The treated discharge flow rate into the Patea River was estimated at 5 L/s, showing no visual environmental impact at the outlet.

Summer low flow water quality samples were collected from four river monitoring sites including the pond effluent during low tide conditions.

The WWTP surrounds and facilities were in a satisfactory condition.

15 May 2017

An inspection was conducted in overcast, calm weather conditions.

Ponds 1 and 2 were mainly flat, and a slightly turbid, green brown colour. The pond influent was flowing at the time of inspection. No debris was observed on the pond surface, which was occupied by approximately 175 mallard ducks. A slightly noticeable odour was detected adjacent to the pond inlet.

The final pond was a slightly turbid, green colour. The surface was mainly flat and pond level was normal. DO and algal samples were collected from the pond.

The treated discharge flow rate into the Patea River was estimated at 10 L/s, showing no significant visual environmental impact at the outlet.

Water quality samples were collected from four river monitoring sites including the pond effluent during low tide conditions.

The WWTP surrounds and facilities, including the emergency outfall and pump station were all in a satisfactory condition.

4.2.1 Pumping station and emergency outfall

Additional pre-screening of the raw wastewater prior to the pump station, called the York St screening facility, was added to the system during the 2007-2008 upgrades. A new emergency outlet and rock rip-rap was installed at the same time, to provide for discharge of untreated municipal sewage in emergencies only into the coastal marine area of the Patea River as per consent 0145.

Inspections in the area of the flume shed, pump station, and outfall to the Patea River were made by the Council in conjunction with each inspection occasion.

No evidence of discharges to the river was found during the inspections and the visual alarm system appeared to have remained in working order. STDC advised that regular checking of the system was performed. The area was maintained in tidy condition throughout the period.

A history of recent overflows is contained in the 2014-2015 Annual Report (TRC, 2015), and the issues pertaining to these events have been satisfactorily addressed by the consent holder.

A single overflow event occurred during the 2016-2017 monitoring year, on 13 April 2017. This was self-notified by STDC on 14 April, and was the result of extremely high rainfall and river flows, resulting in an estimated 2.8 m^3 of dilute, partially treated wastewater being bypassed through the emergency outfall. The discharge duration was approximately 1 hr 6 minutes.

The Patea River was in high flood at the time of the overflow, and no downstream effects were noted as a result. Notification and an incident report was provided to all affected parties in an appropriate timeframe, as per consent conditions, and no further action was required by TRC. It was noted in the incident report that overflow notification signs had not been displayed due to miscommunication between STDC and the network contractor, which was non-compliant with condition 13 of resource consent 0145-2. Corrective action taken by STDC following the incident included implement new communication protocol to ensure the correct response was being taken following overflow events.

4.3 Results of effluent monitoring

Effluent analysis was carried out at the outlet of the final treatment cell on two of the three inspection occasions. Samples were analysed for dissolved oxygen (Section 4.3.1) and microfloral component (Section 4.3.2), as well as total and filtered BOD, chloride, conductivity, dissolved oxygen, faecal coliform bacteria, pH, suspended solids, turbidity, temperature, unionised ammonia (NH_3), and ammonia-N (NH_4). The results of these surveys are presented in Table 17.

Table 17 Results of effluent monitoring for the Patea WWTP

Site		OXP008001		
Date		7 Feb 2017	15 May 2017	2008-2016 Range
Time		0925	1015	
Parameter	**Unit**			
BOD	g/m³	17	9.1	9.1-31.0
BODF	g/m³	2	1.4	1.0-15.0
Conductivity	mS/m @20°C	56.2	48.9	47.1-73.2
DO (concentration)	g/m³	8.2	9.2	1.1-14.8
DO (saturation)	%	94	85	12.0-165
E.coli	/100ml	1200	1600	16-6,700
Ent	/100ml	77	90	8-1,500
Faecal coliform bacteria	/100ml	1700	2200	10-10,000
pH	pH	8.8	8.1	8.1-10.1
SS	g/m³	35	18	18-150
Turbidity	NTU	19	11	6.5-240
Temp	°C	22	12.1	10.4-25.8
Nutrient Analyses				
NH_4	g/m³ N	1.12	4.09	0.025-4.09
DRP	g/m³ P	1.36	0.49	0.005-4.98

Effluent results indicate a relatively high effluent quality, typical of a municipal pond treatment system receiving mainly domestic wastes. The faecal coliform bacteria numbers were lower compared to the effluent quality from a single pond treatment system. This is most likely related to improved retention and circulation in the upgraded, modified system.

Comparison with past data shows that effluent quality was similar to previous values in terms of suspended solids, DRP, faecal coliform bacteria, BOD, and E.coli and Enterococci bacteria. Variability in the pond's microfloral population contributes to variation in effluent bacterial quality over the period.

4.3.1 Dissolved oxygen levels

The dissolved oxygen concentration in WWTPs varies both seasonally and during the day as a result of a combination of factors. The photosynthetic activity of the pond's microflora together with fluctuations in influent waste loadings on the system are the major influencing factors. Minimum dissolved oxygen concentrations are generally recorded in the early hours of daylight, and therefore pond performance has been evaluated by standardising sampling times toward mid-morning for all regular inspection visits during the monitoring period.

The Patea WWTP effluent was analysed for dissolved oxygen and temperature, and the results are displayed in Table 18.

Table 18 Dissolved oxygen measurements from the Patea WWTP

Date	Time (NZST)	Temperature (°C)	Dissolved Oxygen	
			Concentration (g/m^3)	Saturation (%)
25 August 2016	1010	12.0	1.4	13
7 February 2017	0925	22.0	8.2	94
15 May 2017	1015	12.1	9.2	84

Results indicate a moderately wide range of dissolved oxygen concentrations (between 13% and 94% saturation) in the surface layer of the final cell near the outlet. This was typical of the results generally recorded in this oxidation pond (i.e. supersaturation is seldom recorded), and no mechanical aeration of the pond occurs. The lowest DO readings were recorded in early spring period, following cool, wet weather conditions.

4.3.2 Microfloral component

Pond microflora are very important for the stability of the symbiotic relation between aerobic bacteria in the primary pond. These phytoplankton may be used as a bio-indicator of pond conditions, for example cyanobacteria are often present in under-loaded conditions and chlorophyceae are present in overloaded conditions. To maintain facultative conditions in a pond system there must be an algal community present in the surface layer.

The principal function of algae is the production of oxygen which maintains aerobic conditions while the main nutrients are reduced by biomass consumption. Elevated pH (due to algal photosynthetic activity) and solar radiation combine to reduce faecal bacteria numbers significantly.

Samples of the primary pond effluent were collected on all inspections for chlorophyll-a analyses. Chlorophyll-a concentration can be a useful indicator of the algal population present in the system. Pearson (1996) suggested that a minimum in-pond chlorophyll-a concentration of 300 mg/m^3 was necessary to maintain stable facultative conditions. However, seasonal change in algal populations and also dilution by stormwater infiltration might be expected to occur in any WWTP which, together with fluctuations in waste loadings, would result in chlorophyll-a variability.

The results of primary pond effluent analyses are provided in Table 19 together with field observations of pond appearance.

Table 19 Chlorophyll-a levels and primary pond appearance

Date	Time (NZST)	Appearance	Chlorophyll-a (mg/m^3)	Range for the period 2013-mid 2016	
				Range	Median
25 August 2016	1010	Slightly turbid, dark green	3.4	33-2,850	413
7 February 2017	0925	Turbid, dark green	330		
15 May 2017	1015	Very turbid, dark green	170		

Very low chlorophyll-a levels were recorded in the winter sample in 2016, coinciding with a low saturation of 13%. The levels increased into summer and late autumn, which was indicative of good microfloral

populations in the final pond, consistent with visual observations, and coincident with the well-saturated dissolved oxygen levels recorded during the February and May inspections (94 and 84% respectively) in this under-loaded system.

4.4 Results of receiving environment monitoring

Monitoring of the impacts on receiving waters is measured using both chemical analyses of the lower Patea River, and contact recreational bacteriological quality surveys of the coastal marine area at the Patea Boat Ramp and the Tasman Sea at Mana Bay (Figure 3). Chemical sampling was carried out on two occasions during the 2016-2017 period (Section 4.4.1). Contact recreational bacteriological water quality monitoring at the Patea Boat Ramp and Mana Bay was carried out by the Council on 24 and 13 separate occasions respectively between early November 2016 and mid April 2017 (TRC, 2017). The sampling sites are detailed in Table 20.

Table 20 Sampling site locations for the Patea WWTP

No.	Site	Location	GPS reference	Site code
1	Patea River	SH3 bridge, approx. 1 km upstream of WWTP	1727126E 5598189N	PAT000970
2	Patea River	Approx. 500 m downstream of SH3 bridge; downstream of emergency overflow	1727127E 5597688N	PAT000975
OP	Effluent	Outlet of the Patea WWTP final cell	1727268E 5597296N	OXP008001
3	Patea River	Approx. 200 m downstream of WWTP discharge	1727268E 5597296N	PAT000985
4	Patea River	Boat ramp (approx. 0.6 km downstream of WWTP discharge)	1727433E 5596784N	PAT000995
S_{MB}	Tasman Sea	Mana Bay	1727532E 5596415N	SEA907022
S_{PB}	Tasman Sea	Patea Beach	1727220E 5596442N	SEA907020

4.4.1 Lower Patea receiving water surveys

Receiving water samples were collected on the 7 February 2017 and 15 May 2017 at four sites in the Lower Patea River, upstream and downstream of the Patea WWTP discharge point and emergency overflow structure. The surveys were timed towards low tide on each occasion, and results are displayed in Table 21.

The February survey was carried out under summer low flow (well below median) conditions (as measured at McColl's bridge). The discharge from the outfall was estimated at 1 L/s at the time. High conductivity values indicated saline penetration, most obvious at the lower river sites. A relatively narrow range of faecal coliform, E. coli, and enterococci bacteria numbers were recorded at all four sites, consistent with no impacts from a high standard of bacterial effluent quality discharged from the re-configured ponds system. The increase in turbidity at the river mouth (site 4) was unexplained as the discharge itself had a low turbidity.

The May 2017 survey was carried under high winter flows (above three times median) (as measured at McColl's bridge). These results indicated no saltwater penetration under high flow and low tide conditions. Bacterial water quality was relatively good in the river, and comparable to past results from a similar time of year. There was no significant increase in bacterial levels in the downstream sites, and minimal change in turbidity, which was consistent with the high quality of the wastewater discharge.

No additional monitoring of the lower reaches of the Patea River in relation to the operation of the emergency overflow system was required, due to no overflows occurring during the contact recreational period between November 2016 and March 2017.

Figure 3 Map showing sampling sites in relation to Patea WWTP

Table 21 Receiving water results for the lower Patea River

Site		PAT000970			PAT000975			PAT000985			PAT000995		
Date		7 Feb 2017	15 May 2017	2015-2016	7 Feb 2017	15 May 2017	2015-2016	7 Feb 2017	15 May 2017	2015-2016	7 Feb 2017	15 May 2017	2015-2016
Time		0840	0930	Range	0850	0945	Range	0950	1030	Range	1035	1110	Range
Parameter	**Unit**												
Conductivity	mS/m@20°C	2070	13.8	17.5-519	2200	15.7	187-776	2510	32.4	233-1,600	3940	74.5	176-2,940
E.coli	/100ml	180	84	68-110	120	84	88-130	150	81	84-96	66	120	88-130
Ent	/100ml	35	20	46-100	46	20	34-100	48	14	31-57	<2	14	62-66
Faecal coliform bacteria	/100ml	180	84	71-110	120	110	86-6,700	150	84	96	66	120	96-130
Turbidity	NTU	7	14	13-16	7.1	14	16-18	7.1	19	16-80	26	15	20-32
Temp	°C	20.7	13.4	11.6-24.3	20.7	13.6	11.6-24.6	20.7	13.8	11.7-24.9	20.2	13.6	11.8-22.9

4.4.2 Contact recreational bacteriological monitoring

The 1998 MfE/MoH Guidelines for Bacteriological Water Quality for Marine and Fresh Waters (revised in 2003), recommend *E. coli* as the indicator bacteria for freshwater sites with a single sample 'Alert' limit of 260 *E. coli* per 100 ml, and an 'Action' limit of 550 *E. coli* per 100 ml (MfE, 2003). For marine waters, the recommended indicator is enterococci, with a single sample 'Alert' limit of 140 cfu per 100 ml, and an 'Action' limit of 280 cfu per 100 ml. There are two areas nearby the WWTP discharge commonly used for contact recreational purposes, one in the lower river at the Patea boat ramp (PAT000995, Photo 6) and the other in the nearby coastal waters at Mana Bay (SEA907022), and more intensive contact recreational monitoring at these sites was programmed in relation to conditions on the renewed consents. This was also integrated with the Council's state of the environment contact recreational bacteriological monitoring programme. Another site at Patea Beach (SEA907020) is also included at three-yearly intervals in the Council's recreational monitoring programme and was last surveyed in the 2015-2016 monitoring period.

Sampling at the first two sites during the summer monitoring period occurred between early November 2016 and mid April 2017. It was concentrated on high tide conditions (13 samples), but also included low tidal conditions on seven other occasions. The results are summarised in Tables 22 and 23, and illustrated in Figures 5 and 6.

Photo 6 View of Patea boat ramp sampling site

Table 22 Summary of results for lower Patea River at boat ramp

Parameter	Unit	Number of samples	Minimum	Maximum	Median	Medians	
						HT	LT
Conductivity	mS/m@20°C	21	22.4	4,780	2,190	4,575	1,300
E.coli	/100ml	21	1	280	42.5	26	80
Ent	/100ml	21	1	51	18.5	15	23
Faecal coliform bacteria	/100ml	21	1	280	43.5	31	80
Turbidity	NTU	21	6	89	14	17	11
Temp	°C	21	13.6	21.1	18.7	18.4	19.4

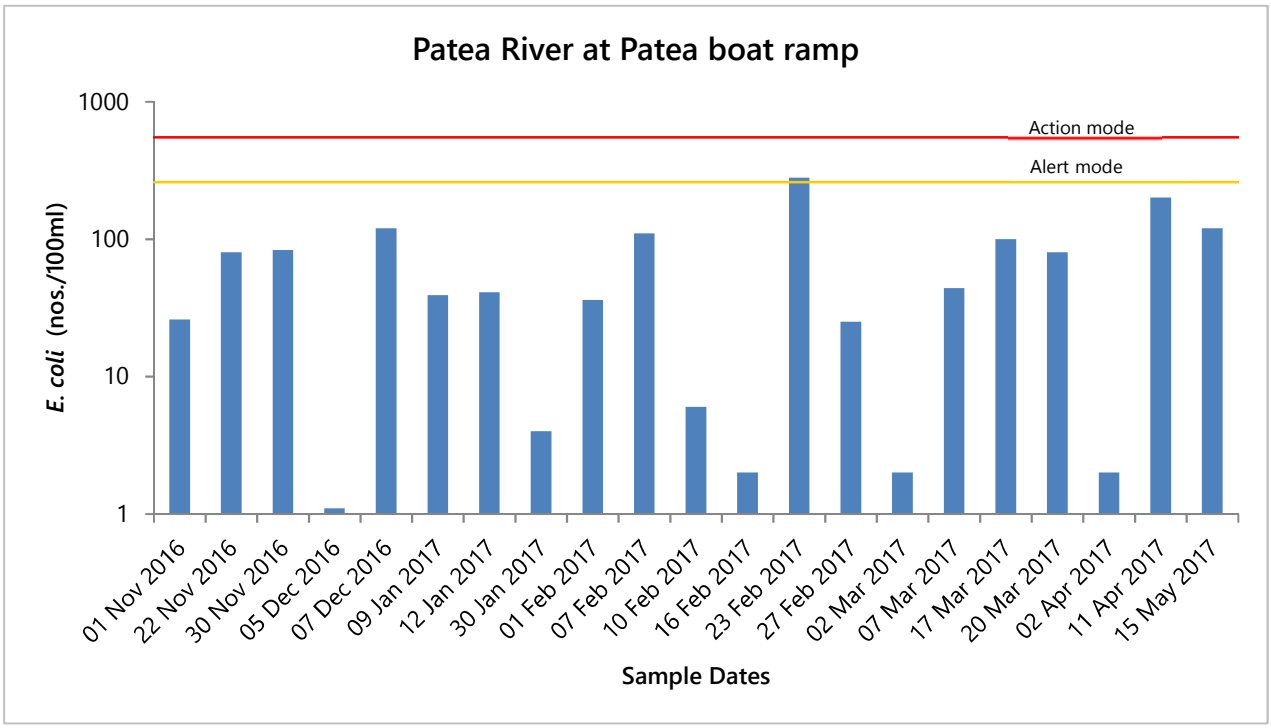

Figure 4 *E. coli* numbers for lower Patea River at the boat ramp

Bacteriological water quality was typical of the lower reaches of a large ringplain-eastern hill country catchment, with moderate numbers under river (freshwater) dominated conditions and fewer when influenced by saline penetration of the coastal seawater. Numbers of E. coli exceeded the 'Alert' limit on one occasion, but did not exceed the 'Action' limit for all 21 sampling occasions. These data were indicative of good bacteriological water quality conditions coincident with an improved effluent quality discharged upstream from the upgraded wastewater treatment system. Some bathing activity was noted during the 2016-2017 period at this site which was used mainly for boating access and occasionally for fishing and walking. The Council had undertaken microbial source tracking (MST) using DNA marker techniques over the 2011-2012 period at this site and at the upstream site at SH3 bridge on two occasions (high and low tides) (see TRC, 2012). Faecal coliform bacteria were found to have been sourced predominantly from cattle on both occasions at the two sites while gulls contributed to populations at the boat ramp site under both tidal conditions. A faint trace of human source derivation was found (downstream of the Patea WWTP treated discharge) at the boat ramp site only under low tidal flow conditions.

Table 23 Summary of results for Mana Bay

Parameter	Unit	Number of samples	Minimum	Maximum	Median	Medians	
						HT	LT
Conductivity	mS/m@20°C	20	872	4730	4575	4630	2530
E.coli	/100ml	20	<2	180	14	8	56
Ent	/100ml	20	1	20	6	4	16.5
Faecal coliform bacteria	/100ml	20	<2	180	14	8	56
Turbidity	NTU	20	10	110	26	31	15
Temp	°C	20	15.6	21.1	19.0	19.1	19.0

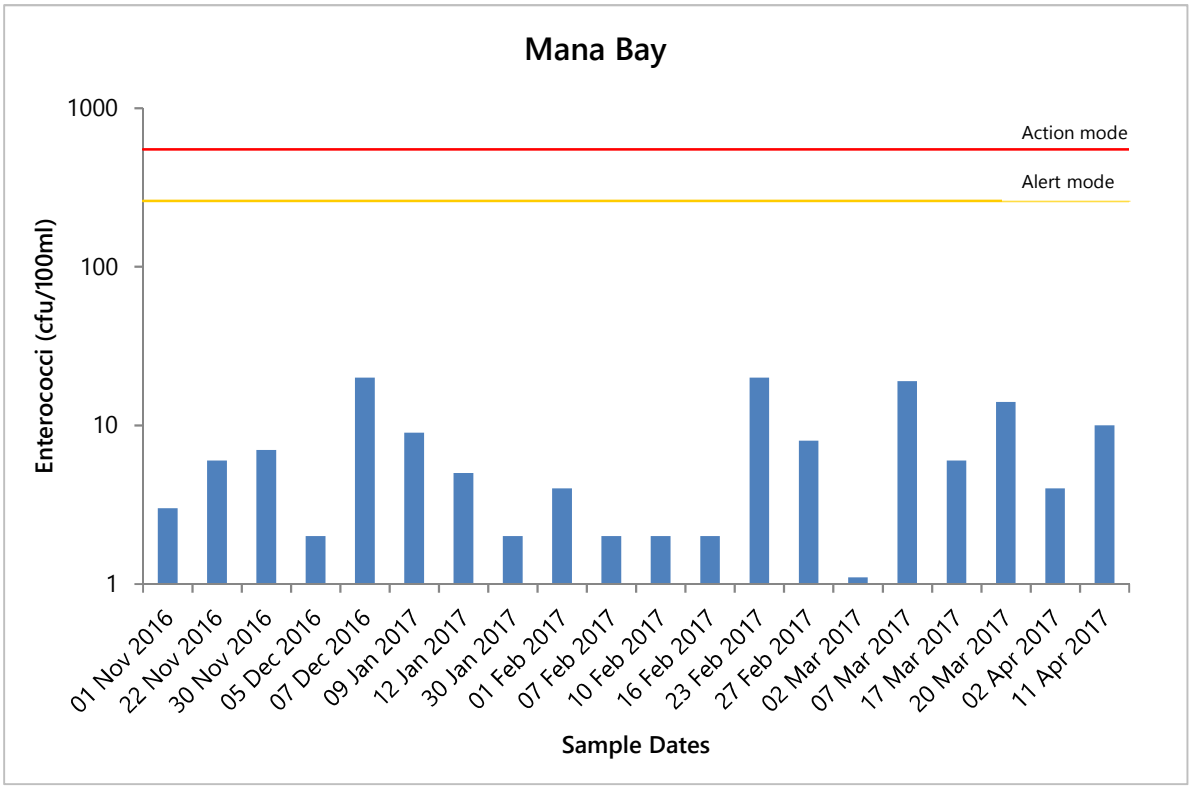

Figure 5 Enterococci numbers for Mana Bay

Water quality at Mana Bay remained high throughout the season, with low median values for all faecal indicator bacteria (Figure 5).

In general, high water quality was found at both contact recreation sites during the annual recreational periods extending from November 2003 to April 2017. Only one single sample from the Patea River at the boat ramp entered the 'Alert' mode during this period, and there were no exceedances of the 'Action' level.

The sampling programme followed previous formats and was similar to those of previous years which included 13 high tide samples and an additional 11 low tide samples at both sites. Monitoring extended from early November 2016 until mid April 2017 and covered a wet spring-summer period. There was no additional sampling required during the period as there was no usage of the emergency outfall discharge.

4.5 Investigations, interventions, and incidents

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

The Council operates and maintains a register of all complaints or reported and discovered excursions from acceptable limits and practices, including non-compliance with consents, which may damage the environment. The incident register includes events where STDC 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 2016-2017 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with STDC's conditions in resource consents or provisions in Regional Plans in relation to the Patea WWTP.

4.6 Discussion

4.6.1 Discussion of site performance

The Patea WWTP and emergency overflow was well maintained and operated, and performed satisfactorily throughout the monitoring period. Since the upgrade to the system and the pumping station, the discharge effluent quality has shown marked improvement over the quality typical of the previous single pond treatment system receiving minimal industrial waste loadings.

The pond has typically supported good algal communities, however, chlorophyll-a concentrations were very low at the beginning of the monitoring period, this may be attributed to seasonal variability with good microfloral communities present near the end of the monitoring year.

Only one short-duration overflow discharge of sewage was recorded during the monitoring period, following a period of very wet weather. The relatively recent upgrades to the pump station alarm system in conjunction with increased storage facilities has reduced the frequency and duration of overflow events, with no overflows recorded during or following wet weather conditions during six of the twelve monitoring periods (mid 2004 to 2016) and the remainder mainly of very short duration since these upgrades.

4.6.2 Environmental effects of exercise of consents

No significant impacts associated with the discharges were measured on the bacteriological quality of the lower reaches of the Patea River. The effect of the WWTP's effluent discharge generally has been limited to occasional small rises in bacteria numbers the right bank Patea River site immediately upstream or downstream of the discharge (dependant on tide conditions) with bacterial water quality measured a further 600 m downstream usually similar to that measured upstream of the discharge at SH3 bridge. Minimal impacts were measured during the 2016-2017 monitoring period, continuing the good performance shown during the previous period.

More intensive monitoring of the lower river and two adjacent coastal water sites during the summer contact recreational period found that, with the exception of one sample, bacterial numbers were below the MfE/MoH's 2003 Recreational Water Quality Guidelines.

In the absence of any usage of the pump station emergency outfall during the recreational period, no impacts of the upgraded WWTP's discharges were discernible on these contact recreation water standards at the estuary or the coastal sites between November 2016 and mid April 2017.

4.6.3 Evaluation of performance

A tabular summary of STDC's compliance record for the year under review is set out in Tables 24, 25, and 26.

Table 24 Summary of performance for consent 0067-3

Purpose: ***To discharge treated municipal wastewater from the Patea WWTP into the Coastal Marine Area of the Patea River***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Provision for upgrade	Upgrade completed	N/A
2. Exercise in accordance with documentation	Liaison with consent holder	Yes
3. Progress reports of upgrade	Reporting by consent holder; upgrade completed	N/A
4. Minimisation of effects	Inspections and sampling	Yes
5. Limits on volume	Reporting by consent holder (after plant upgraded)	Yes
6. Implementation of management plan	Provision by consent holder after plant upgraded (updated)	Yes
7. Provision of operator	Liaison with consent holder	Yes
8. Maintenance of aerobic pond condition	Inspections, sampling and reporting	Yes
9. Trade wastes connections	Liaison with consent holder	Yes
10. Limits on receiving water effects	Inspections and physicochemical/bacteriological assessments	Yes
11. Monitoring provisions	Performance of tailored monitoring programme	Yes
12. Contact recreational monitoring provisions	Performance of tailored monitoring programme	Yes
13. Provision for lapse of consent	Consent exercised	N/A
14. Optional review provisions	Next optional review scheduled in June 2022	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 25 Summary of performance for consent 0145-2

Purpose: *To discharge untreated municipal sewage in emergencies only into the Coastal Marine Area of the Patea River*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Adopt best practicable option	Inspection and chemical sampling	Yes
2. Exercise in accordance with documentation	Liaison with consent holder	Yes
3. Provision of contingency plan	Reporting by consent holder	Yes
4. Rip rap upgrade requirements	Inspections	Yes
5. Provision for mitigation works with excessive overflow events	Only one overflow reported	N/A
6. Limits upon reasons for discharge	Liaison with consent holder	Yes
7. Discharge shall not occur during pump station maintenance	Discharge occurred during high rainfall event only	Yes
8. Discharge shall not exceed 4 hrs duration when practicable	Discharge limited to approx. 1 hr`	Yes
9. Requirements for alarm system	Liaison with consent holder, inspection	Yes
10. Maintenance requirements for alarm system	Inspections, reporting by consent holder	Yes
11. Overflow notification requirements	Notification received	Yes
12. Overflow recording requirements	Records supplied by STDC	Yes
13. Provision of signage following overflow discharge events	Reporting by STDC	No – signage not displayed
14. Notification to Taranaki Healthcare following discharge	Notification received	Yes
15. Triennial meetings	Liaison with consent holder and submitters	Yes
16. Receiving water monitoring	Bacteriological sampling as required	N/A
17. Lapse condition	Consent renewed	N/A
18. Optional review of consent	Next review June 2022	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**
Overall assessment of administrative performance in respect of this consent		**Good**

N/A = not applicable

Table 26 Summary of performance for consent 4576-2

Purpose: *To erect, place and maintain an oxidation pond discharge structure and an emergency overflow discharge structure as part of the Patea WWTP within the Coastal Marine Area of the Patea River*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Notification of works	No recent works undertaken	N/A
2. Construction and maintenance in accordance with documentation	Works completed	N/A
3. Upgrade oxidation pond discharge in accordance with documentation	Upgrade completed	N/A
4. Adopt best practicable option	Inspections and liaison with consent holder	Yes
5. Minimise riverbed disturbance	No recent works undertaken	N/A
6. Maintain public access	Public walkway maintained	Yes
7. Riverbed disturbance to coincide with dry weather periods	No recent works undertaken	N/A
8. Requirement for fish passage	Inspection	Yes
9. Requirements for signage during work	No recent works undertaken	N/A
10. Removal and reinstatement requirements	Structures still in use	N/A
11. Lapse condition	Consent renewed	N/A
12. Optional review of consent	Next review June 2022	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**
Overall assessment of administrative performance in respect of this consent		**High**

N/A = not applicable

During the year, STDC demonstrated a high level of environmental and high level of administrative performance with the resource consents as defined in Section 1.1.4.

4.6.4 Recommendations from the 2015-2016 Annual Report

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

1. THAT monitoring of the Patea WWTP be continued for the 2016-2017 period by formulation of a programme similar in format to the programme undertaken during the 2015-2016 period.

This recommendation was implemented and all aspects of the 2016-2017 programme were performed as required.

4.6.5 Alterations to monitoring programmes for 2017-2018

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

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

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

It is proposed that for 2017-2018, monitoring of the Patea WWTP and emergency outfall continues at the same level as in 2016-2017.

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

4.6.6 Recommendations

1. THAT in the first instance, monitoring of consented activities at Patea WWTP and emergency outfall in the 2017-2018 year continue at the same level as in 2016-2017.
2. THAT should there be issues with environmental or administrative performance in 2017-2018, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.

5 Waverley WWTP and stock truck wastes disposal

The Waverley WWTP is a single oxidation pond system that is divided into two sections by a wooden/asbestos wall which has been operative since 1973. It receives mainly domestic wastes (population 900 in 2013) with a small industrial waste (sawmill) component.

It previously received wastes from the stock truck facility on SH3 sited approximately 2 km south of the township. However, the stock truck wastes disposal was changed to a self-contained anaerobic-aerobic pond system, with on-site discharge to adjacent land during the 2006-2007 period.

The WWTP system was reconfigured during the 2008-2009 period with the existing outfall abandoned, the secondary pond converted to a primary pond with a new inlet design, repairs made to the dividing wall, and the primary pond converted to a secondary pond with a repositioned outlet connected into the original outfall to the Wairoa Stream (Photo 7). 'Sludge-bugs' were introduced into the system for the purpose of microbial sludge digestion in September 2013 and this was completed by December 2014 with more than 5000 cubic metres of sludge removed (STDC, 2015). Inlet flow monitoring was added in 2010. Mechanical screening of the incoming wastes was installed at the inlet during the latter half of the 2012-2013 period, which has associated telemetry alarming.

Photo 7 Waverley WWTP, August 2016

5.1 Inspections

8 August 2016

An inspection was conducted in fine weather with light north easterly wind conditions.

The step screen was operating and wastes were fully contained. The influent flow rate into Pond 1 was estimated at 5 L/s. The pond was a turbid, green brown colour with a mainly flat surface. Occasional intermittent odours were encountered near the pond inlet and step screen.

Pond 2 was a turbid, green brown colour with a normal operating level. No noticeable odour was detected around the pond perimeter. An algal sample was collected for chlorophyll-a analysis. The pond surface was rippled, and occupied by approximately 50 mallard and scaup ducks.

The WWTP outlet discharge flow rate was estimated at 1.5 L/s, and no visual environmental impact on the Wairoa Stream was observed.

The stock truck wastes disposal facility was inspected, and the unloading sump was partially full of effluent. The road frontage area in general was tidy with no sign of recent use. The first pond was near-full but not discharging. The final pond was not discharging to land at the time of inspection.

4 February 2017

An inspection was conducted in overcast weather with light wind conditions. Higher than normal rainfall had been recorded during the past month, compared to previous years.

The step screen wastes were fully contained and no noticeable odour was found to be emanating around this area as it appeared that the bins had been recently emptied. The influent flow into Pond 1 was estimated at 3 L/s, and the pond was a turbid, dark green colour. Slightly noticeable odours were detected at the influent end of the pond.

Pond 2 was a dark green colour with a slightly rippled surface, and both ponds were occupied by a combination of ducks and black swans. Dissolved oxygen and algal samples were collected from the pond, and effluent grab samples were collected from the downstream discharge for full wastewater analysis during the summer low flow period. The pond discharge was volumetrically measured at 1.25 L/s.

Water quality samples were collected upstream and downstream of discharge into the unnamed tributary of the Wairoa Stream, including the Wairoa Stream (the outlet of the Ihupuku swamp wetlands at Beach Road). A further water quality sample was collected from a small tributary upstream from the WWTP discharge. This investigation was undertaken in relation to the pending WWTP consent renewal.

No visual environmental effects were observed at any of the monitoring sites.

Hydrological gaugings were also performed at two monitoring sites, upstream and downstream of the WWTP discharge along the Wairoa Stream, as well as an additional gauging at the site on the upstream tributary (as part of the consent renewal investigation).

The stock truck disposal site was inspected, and the unloading sump was tidy and relatively clear of cattle effluent. Fulton Hogan staff were onsite carrying out repairs to the road frontage fence, which had recently been damaged by a motor vehicle accident.

All three ponds had relatively high levels with no discharge occurring between ponds or to land. Pond 1 had some floatables (debris from the damaged fence) which required removal. There were no significant odour issues noted during the inspection.

18 May 2017

The final inspection for the monitoring period was carried out in wet weather with westerly wind conditions.

The step screen was operating and wastes were fully contained. The influent flow rate into Pond 1 was estimated at 12 L/s. The pond was rippled, and a turbid, pale green brown colour. Slightly noticeable odour was detected near the pond inlet and step screen.

Pond 2 was operating at a normal level with a rippled surface. It was a slightly turbid, dark green colour. No significant odour was detected around the pond perimeter. An algal sample was collected for chlorophyll-a analysis. Forty teal ducks and three black swans were observed on the pond surface.

The WWTP outlet discharge flow rate was estimated at 12 L/s, and a slight visual environmental impact on the Wairoa Stream was observed within the mixing zone.

The stock truck wastes disposal area was inspected. The unloading sump was partially full of effluent and the road frontage area was in need of a clean up. A stock truck had recently unloaded effluent prior to the inspection and it appeared that some truck operators were not cleaning up satisfactorily after they finished

unloading. The first pond was nearly full but not discharging. The final pond was not discharging to land at the time of inspection. The bulk of floatables noted on Pond 1 during the previous inspection had been removed, although a small amount remained.

There were noticeable odour issues around the unloading sump due to effluent that had not been washed down.

5.2 Results of effluent monitoring

Effluent monitoring was carried out in the second cell of the oxidation pond, adjacent to the outlet. Along with a visual survey of each component of the system; dissolved oxygen levels (DO) and the microfloral component of the pond were measured during each inspection. These are discussed in Sections 5.2.1 and 5.2.2 respectively.

A full suite of chemical analyses was carried out on the pond effluent on one occasion in late summer, with samples analysed for ammonia (NH_3 and NH_4), total and filtered BOD, chloride, conductivity, dissolved oxygen, DRP, faecal coliform bacteria, pH, suspended solids, temperature, and turbidity. The results of this survey are presented in Table 27.

Table 27 Results of summer effluent monitoring for the Waverley WWTP

Site		**OXP002005**	
Date		**14 Feb 2017**	**1987-2016 Range**
Time		**0850**	
Parameter	**Unit**		
Flow	L/s	1.25	0.14-8.0
Black disc	m	-	-
BOD	g/m^3	40	11-66
BODCF	g/m^3	14	3.9-12
Chloride	g/m^3	57.2	47.9-75.6
Conductivity	mS/m@20°C	45.6	43.3-68.7
DO (concentration)	g/m^3	2.9	0.9-21
DO (saturation)	%	32	10-227
Faecal coliform bacteria	/100ml	26,000	11,000-82,000
pH	pH	9.1	7.7-9.5
SS	g/m^3	95	11-220
Turbidity	NTU	48	9.4-210
Temp	°C	19.7	8.2-26.0
Nutrient Analyses			
NH_3	g/m^3 N	0.22506	0.01141-0.54555
NH_4	g/m^3 N	0.567	0.100-26.2
DRP	g/m^3 P	4.17	1.52-7.98

The effluent from the reconfigured pond was relatively typical of the range expected from municipal oxidation pond wastes. On this occasion quality was very similar to or slightly better than previous DRP level, conductivity, and total BOD_5. The BOD_5 concentration measured was moderately higher than the previously recorded maximum, however the total number of samples for this time range was relatively small, so care should be taken when making inferences. Turbidity and suspended solids levels were higher than previous results or in the higher end of the range, which was coincident with a high microfloral population density in the pond during the summer period. The quality was typical to the effluent from a biological treatment system receiving essentially domestic wastes, as emphasised by the moderately low filtered BOD_5 concentration, and in the absence of the disposal of stock truck or any other significant industrial wastes to the system.

Faecal coliform bacteria were very high in the sample, although well within the range of previous samples.

5.2.1 Dissolved oxygen levels

The dissolved oxygen concentration in WWTPs varies both seasonally and during the day as a result of a combination of factors. The photosynthetic activity of the pond's microflora together with fluctuations in influent waste loadings on the system are the major influencing factors. Minimum dissolved oxygen concentrations are generally recorded in the early hours of daylight, and therefore pond performance has been evaluated by standardising sampling times toward mid-morning for all regular inspection visits during the monitoring period.

The Waverley WWTP effluent was analysed for dissolved oxygen and temperature, and the results are displayed in Table 28.

Table 28 Dissolved oxygen measurements from the Waverley WWTP

Date	Time (NZST)	Temperature (°C)	Dissolved Oxygen	
			Concentration (g/m^3)	Saturation (%)
8 August 2016	1000	7.9	14.0	120
14 February 2017	0930	19.7	2.9	32
18 May 2017	1015	14.2	12.0	120

Results indicated a relatively wide range of dissolved oxygen concentrations (between 32% and 120% saturation) in the surface layer of the primary pond near the outlet. These were typical of the levels generally recorded in this oxidation pond (i.e. supersaturation is seldom recorded). No mechanical aeration of the pond occurs, and the lowest DO readings were recorded in the summer period, which is consistent with previous results.

5.2.2 Microfloral component

Pond microflora are very important for the stability of the symbiotic relation between aerobic bacteria in the primary pond. These phytoplankton may be used as a bio-indicator of pond conditions, for example cyanobacteria are often present in under-loaded conditions and chlorophyceae are present in overloaded conditions. To maintain facultative conditions in a pond system there must be an algal community present in the surface layer.

The principal function of algae is the production of oxygen which maintains aerobic conditions while the main nutrients are reduced by biomass consumption. Elevated pH (due to algal photosynthetic activity) and solar radiation combine to reduce faecal bacteria numbers significantly.

Samples of the primary pond effluent were collected on all inspections for chlorophyll-a analyses. Chlorophyll-a concentration can be a useful indicator of the algal population present in the system. Pearson (1996) suggested that a minimum in-pond chlorophyll-a concentration of 300 mg/m^3 was necessary to maintain stable facultative conditions. However, seasonal change in algal populations and also dilution by stormwater infiltration might be expected to occur in any WWTP which, together with fluctuations in waste loadings, would result in chlorophyll-a variability.

The results of primary pond effluent analyses are provided in Table 29 together with field observations of pond appearance.

Table 29 Chlorophyll-a levels and primary pond appearance

Date	Time (NZST)	Appearance	Chlorophyll-a (mg/m^3)	Range for the period 2013-mid 2016	
				Range	Median
8 August 2016	1000	Turbid, green brown	401	33-2,850	413
14 February 2017	0930	Turbid, dark green	948		
18 May 2017	1015	Turbid, pale green brown	1,100		

Despite the narrow range of concentrations of chlorophyll-a in the primary pond, the samples showed relatively high concentrations, indicative of a significant phytoplanktonic component. The colder, wetter winter sampling period was associated with the lowest algal concentrations in the pond, which is likely related to the reduced sunlight hours.

5.3 Results of receiving environment monitoring

Monitoring of the impacts of the Waverley WWTP on the receiving waters was measured using chemical analyses of the receiving waters of the unnamed tributary of the Wairoa Stream. Sampling was carried out on one occasion during the summer period, when stream flows were at a seasonal low. The locations of sampling sites are listed in Table 30 and displayed in Figure67 below.

Table 30 Sampling sites for Waverley WWTP

No.	Site	Location	GPS reference	Site code
2	Unnamed trib. of Wairoa Stream	Upstream of confluence with WWTP discharge	1739148E 5596620N	WRO000069
OP	Effluent	At outfall to stream	1739140E 5596588N	OXP002005
4	Unnamed trib. of Wairoa Stream	Approx. 400 m downstream of WWTP discharge (Waverley Beach Rd)	1739367E 5596322N	WRO000077
5	Wairoa Stream	Outlet of Ihupuku Swap, approx. 3 km d/s of WWTP discharge (Beach Rd)	1739402E 5593780N	WRO000150

Figure 6 Aerial location map of sampling sites in relation to Waverley WWTP

5.3.1 Low flow receiving water survey of February 2017

A midsummer low flow assessment of the impact of the WWTP's effluent discharge on the receiving waters of the unnamed tributary of the Wairoa Stream was performed on 14 February 2017. Results of the survey are displayed in Table 31.

Table 31 Low flow receiving water results February 2017

Site		WRO000069		WRO000077		WRO000150	
Date		14 Feb 2017	1987-2016 Range	14 Feb 2017	1987-2016 Range	14 Feb 2017	1987-2016 Range
Time		0840		0950		1110	
Parameter	**Unit**						
Flow	L/s	13	3.0-23	19	9.0-34	-	-
Black disc	m	0.87	0.46-1.66	0.41	0.49-1.30	0.88	0.74-1.45
BOD	g/m³	0.8	0.1-2.8	2.9	0.7-10	1.3	<0.5-5.2
BODCF	g/m³	<0.5	<0.5-0.8	<0.5	<0.5-0.5	<0.5	<0.5-0.6
Chloride	g/m³	37.2	26.4-39.2	41.7	27.7-41.5	52.7	29.8-40.8
Conductivity	mS/m@20°C	30.4	24.0-30.8	34.1	25.7-37.1	29.8	24.3-30.7
DO (concentration)	g/m³	9.0	9.0-9.9	7.8	4.0-9.0	2.3	3.1-5.0

Site		WRO000069		WRO000077		WRO000150	
Date		14 Feb 2017	1987-2016 Range	14 Feb 2017	1987-2016 Range	14 Feb 2017	1987-2016 Range
Time		0840		0950		1110	
DO (saturation)	%	93	91-98	81	40-92	25	33-50
Faecal coliform bacteria	/100ml	1,500	160-8,100	1,700	100-5,500	190	52-9,000
pH	pH	7.7	7.3-8.0	7.6	7.2-8.6	7.2	7.2-7.4
SS	g/m^3	9.0	4.0-35	23	4.0-43	13	5.0-56
Turbidity	NTU	5.2	2.9-20	15	3.6-21	8.2	4.3-15
Temp	°C	16.4	13.0-17.4	16.4	13.1-17.1	17.3	13.3-19.1
Nutrient Analyses							
NH_3	g/m^3 N	0.000186	0.00044-0.00697	0.00068	0.00032-0.00218	0.00009	0.00007-0.00023
NH_4	g/m^3 N	0.103	<0.003-0.314	0.047	0.019-0.859	0.015	0.003-0.030
DRP	g/m^3 P	0.024	<0.003-0.049	0.159	0.054-1.65	0.056	0.022-0.067

A moderate discharge rate of 1.25 L/s (4,500 L/hr) was measured at the time of the survey. The receiving water flow measured upstream of the discharge in the adjacent contributing watercourse was also fairly low at 13 L/s. Flow measurements at the time of the survey indicated an instantaneous effluent dilution ratio of around 10:1 in the receiving waters.

Upstream water quality (at site 2) was generally relatively good, with a dissolved oxygen saturation of 93%, and relatively low level of dissolved reactive phosphorus and filtered BOD_5, although there was a moderately high level of ammonia-N nutrients. There was also an elevated faecal coliform bacteria count upstream, indicative of possible stock and/or wildlife access upstream.

Due to the moderate dilution ratio, impacts of the discharge on the stream (downstream of the effluent discharge at site 4) were less pronounced and included mainly small increases in chloride, DRP, turbidity, suspended solids, and biochemical oxygen demand; but not in ammonia concentrations, There was also a small decrease (of 12%) in dissolved oxygen saturation. Faecal coliform bacteria did not increase significantly despite the very high level in the discharge. The relatively small variation in water quality was a consequence of the dilution factor, and settlement and filtration by the dense weed growth and slower flow present through the reach of the stream between the outfall and site 4. There were no visible impacts on stream appearance at this site.

The water quality measured at the furthest downstream site (site 5), after approximately 3 km of the Ihupuku Swamp wetlands, continued to record a relatively low dissolved oxygen concentration and small decrease in pH, similar trends to those found by all previous years' surveys. However, relatively low dissolved oxygen levels are typical of outflows from extensive wetland areas, in which more stagnant, less aerated reducing conditions and lower pH are typical. Water quality of the stream improved, when compared with upstream conditions (at site 4), in terms of decreases in suspended solids, turbidity, nutrient concentrations (particularly ammoniacal nitrogen) and faecal coliform bacteria levels following filtration and nutrient uptake by wetland vegetation. The faecal coliform bacteria number at site 5 was lower by a factor of approximately

10 when compared to the number at the upstream 'control' site 2 while ammonia concentration was 85% lower. Black disc visibility was similar to the equivalent value at the upstream 'control' site.

5.4 Investigations, interventions, and incidents

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

The Council operates and maintains a register of all complaints or reported and discovered excursions from acceptable limits and practices, including non-compliance with consents, which may damage the environment. The incident register includes events where STDC 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 2016-2017 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with STDC's conditions in resource consents or provisions in Regional Plans in relation to the Waverley WWTP.

5.5 Discussion

5.5.1 Discussion of site performance

The Waverley WWTP was well maintained and operated, and performed satisfactorily throughout the monitoring period following the reconfiguration of the divided pond, to the extent that the performance of the system was considered to be typical of a biological treatment system receiving essentially domestic wastes with some improvements compared to historical treated wastewater quality. There were no instances of large areas of scum development recorded or reported as had occasionally been the case in the past.

The annual summer physicochemical survey, performed under a period of low receiving water flow conditions and a low rate of wastewater discharge, recorded a good effluent quality with low nutrients, suspended solids and BOD_5 concentrations discharged to the receiving waters of the Wairoa Stream. Faecal coliform bacteria numbers were very high in the discharge and, although significantly reduced, were still high at the site 400 m downstream of the ponds. Numbers found at the final downstream site were ten-fold lower than upstream levels.

Chlorophyll-a concentrations were indicative of moderate microfloral richnesses attributable to relatively low pond loadings and zooplankton grazing from time-to-time within the system.

5.5.2 Environmental effects of exercise of consents

There were no 'sewage fungal' growths observed by inspections performed under varying flow conditions in the short section of the receiving tributary immediately downstream of the effluent outfall, and there was no localised foaming within the mixing zone of the receiving waters.

The discharge rate recorded during the summer receiving water survey was low, which ensured that sufficient dilution with the receiving waters, even during low flow conditions. This survey recorded minor impacts of the discharge on the water quality of the Wairoa Stream tributary, with small increases in turbidity, biochemical oxygen demand, and dissolved reactive phosphorus levels, and a small reduction in percentage dissolved oxygen saturation. However, these and other effects were readily assimilated, first by

the aquatic weed growth in the tributary, and then in the extensive Ihupuku wetland area located downstream of Beach Road. There was a significant increase in bacterial numbers immediately below the discharge outfall, however numbers found at the final downstream site were similar to upstream levels. Lowered pH, nutrient, dissolved oxygen levels and bacterial numbers further downstream below the wetland were consistent with past monitoring results and typical of wetland drainage streams.

5.5.3 Evaluation of performance

A tabular summary of STDC's compliance record for the year under review is set out in Table 32 and 33.

Table 32 Summary of performance for consent 0072-2

Purpose: ***To discharge treated wastewater from the Waverley municipal oxidation ponds system into an unnamed tributary of the Wairoa Stream***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Maintenance of aerobic ponds conditions	Inspections and sampling	Yes
2. Trade wastes connections	Liaison with consent holder	Yes
3. Limits on receiving water effects	Inspections and sampling	Yes
4. Optional review provision	No further reviews scheduled	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 33 Summary of performance for consent 6621-1

Purpose: ***To discharge treated stock truck effluent from an oxidation pond treatment system onto and into land in the vicinity of the Waiau Stream in the Waitotara catchment***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Adopt best practicable option	Inspections	Yes
2. Limits on receiving water effects	Inspections and sampling	Yes
3. Minimisation of effects	Inspections and sampling	Yes
4. Operation and maintenance requirements	Inspections	Yes
5. Optional review provision	No further reviews scheduled	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**
Overall assessment of administrative performance in respect of this consent		**High**

N/A = not applicable

During the year, STDC demonstrated a high level of environmental and high level of administrative performance with the resource consents as defined in Section 1.1.4.

5.5.4 Recommendations from the 2015-2016 Annual Report

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

1. THAT monitoring of the consented activities at the Waverley WWTP and stock truck wastewater treatment disposal systems in the 2016-2017 year continue at the same level as in 2015-2016.

This recommendation was subsequently implemented and all aspects of the 2016-2017 programme were performed as required.

5.5.5 Alterations to monitoring programmes for 2017-2018

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

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

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

It is proposed that for 2017-2018, monitoring of the Waverley WWTP and stock truck wastes disposal continues at the same level as in 2016-2017.

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

5.5.6 Recommendations

1. THAT in the first instance monitoring of consented activities at Waverley WWTP and stock truck wastes disposal in the 2017-2018 year continue at the same level as in 2016-2017.
2. THAT should there be issues with environmental or administrative performance in 2017-2018, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.

6 Summary of recommendations

The following is a summary of the recommendations for each WWTP system as presented in the individual sections of this report.

6.1 Kaponga WWTP

1. THAT in the first instance, monitoring of consented activities at Kaponga WWTP in the 2017-2018 year continue at the same level as in 2016-2017.
2. THAT should there be issues with environmental or administrative performance in 2017-2018, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.

6.2 Manaia WWTP

1. THAT in the first instance monitoring of consented activities at Manaia WWTP in the 2017-2018 year continue at the same level as in 2016-2017.
2. THAT should there be issues with environmental or administrative performance in 2017-2018, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.
3. THAT the reporting required by Special Condition 12 of consent 1204 shall be supplied to the Council by 30 June 2018.
4. THAT the Council investigates aspects of the water quality of Manaia Creek upstream of the WWTP in terms of the source of bacteria in both the stream and coastal waters, during the 2017-2018 period, subject to appropriate flow conditions.

6.3 Patea WWTP and emergency outfall

1. THAT in the first instance, monitoring of consented activities at Patea WWTP and emergency outfall in the 2017-2018 year continue at the same level as in 2016-2017
2. THAT should there be issues with environmental or administrative performance in 2017-2018, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.

6.4 Waverley WWTP and stock truck wastes disposal

1. THAT in the first instance monitoring of consented activities at Waverley WWTP and stock truck wastes disposal in the 2017-2018 year continue at the same level as in 2016-2017.
2. THAT should there be issues with environmental or administrative performance in 2017-2018, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.

Glossary of common terms and abbreviations

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

Biomonitoring	Assessing the health of the environment using aquatic organisms.
BOD	Biochemical oxygen demand. A measure of the presence of degradable organic matter, taking into account the biological conversion of ammonia to nitrate.
BODF	Biochemical oxygen demand of a filtered sample.
cfu	Colony forming units. A measure of the concentration of bacteria usually expressed as per 100 millilitre sample.
Conductivity	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m.
DO	Dissolved oxygen.
DRP	Dissolved reactive phosphorus.
E.coli	Escherichia coli, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample.
Ent	Enterococci, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre of sample.
FC	Faecal coliforms, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample.
Fresh	Elevated flow in a stream, such as after heavy rainfall.
g/m^3	Grams per cubic metre, and equivalent to milligrams per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures.
Incident	An event that is alleged or is found to have occurred that may have actual or potential environmental consequences or may involve non-compliance with a consent or rule in a regional plan. Registration of an incident by the Council does not automatically mean such an outcome had actually occurred.
Intervention	Action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring.
Investigation	Action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident.
Incident Register	The Incident Register contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan.
L/s	Litres per second.
m^2	Square Metres.
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).
NNN	Nitrate-nitrite nitrogen.
NO_3^-	Nitrate, normally expressed in terms of the mass of nitrogen (N).
NO_2^-	Nitrite, 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 (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15).
RMA	*Resource Management Act 1991* and including all subsequent amendments.
SS	Suspended solids.
SQMCI	Semi quantitative macroinvertebrate community index.
Temp	Temperature, measured in °C (degrees Celsius).
Turb	Turbidity, expressed in NTU.
WWTP	Wastewater Treatment Plant

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

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

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Appendix I

Resource consents held by STDC

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

Coastal 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:	9 July 2007 [Granted: 7 February 2006]

Conditions of Consent

Consent Granted:	To discharge treated municipal wastewater from the Patea Wastewater Treatment Plant into the Coastal Marine Area of the Patea River at or about 2637404E-6159017N
Expiry Date:	1 June 2028
Review Date(s):	June 2010, June 2016, June 2022
Site Location:	Beach Road, Patea
Legal Description:	Lot 1 DP 9100 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

Condition 1 – changed

1. The wastewater treatment system shall be upgraded in accordance with drawing number 77031, entitled *Patea Wastewater Treatment Plant: Pond General Arrangement and Bund Details* (dated 10.10.06) provided with application number 4617. Implementation of this upgrade shall be completed before 31 March 2008.

Conditions 2 to 14 – unchanged

2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of application 2752. In the case of any contradiction between the documentation submitted in support of application 2752 and the conditions of this consent, the conditions of this consent shall prevail.

3. The consent holder shall supply progress reports on implementation of the upgrade referred to under special condition 1, by June 2006 and June 2007 to the Chief Executive, Taranaki Regional Council.

4. Notwithstanding any conditions within this consent, the consent holder shall at all times adopt the best practicable option or options, 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 the exercise of this consent.

5. The volume of treated wastewater discharge shall not exceed 455 cubic metres per day, unless there has been rain on any of the previous three days [as measured at the Taranaki Regional Council rain gauge on Durham Street, Patea], in which case the instantaneous treated wastewater discharge flow rate shall not exceed 20 litres per second.

6. The consent holder shall implement and maintain a management plan which shall include operating procedures to avoid , remedy or mitigate against potential adverse effects arising from:

   i) operation of the wastewater treatment plant; and
   ii) plant failure.

7. The consent holder shall use a suitably trained operator to ensure proper and efficient operation and maintenance of the wastewater treatment system to the satisfaction of the Chief Executive, Taranaki Regional Council.

8. The oxidation pond shall be maintained in an aerobic condition at all times during daylight hours.

9. The consent holder shall undertake to advise and consult with the Taranaki Regional Council prior to accepting new trade wastes, which may contain toxic or hazardous wastes, into the consent holder's wastewater system.

10. After allowing for reasonable mixing, being a mixing zone extending 200 metres downstream and 200 metres upstream of the discharge point, the discharge shall not give rise to any of the following effects in any surface water body:

    a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
    b) any conspicuous change in the colour or visual clarity;
    c) any emission of objectionable odour;
    d) any significant adverse effects on aquatic life.

11. The consent holder shall, in conjunction with the Taranaki Regional Council, undertake additional chemical, bacteriological and ecological monitoring of the oxidation pond and Patea River as deemed necessary by the Chief Executive, Taranaki Regional Council subject to Section 35 (2)(d) and Section 36 of the Resource Management Act 1991.

12. As a component of the monitoring required by Special Condition 11, the consent holder shall undertake bacteriological monitoring of the receiving waters of the Patea River and at 'Mana Bay' for contact recreational purposes. The monitoring programme shall be consistent with the provisions of the 'Microbiological Water Quality Guidelines for Marine and Freshwater recreational area' [Ministry for the Environment and Ministry of Health, 2003].

13. 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.

14. 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 and/or June 2022, for the purpose of ensuring that the conditions are adequate to deal with an adverse effects on the environment arising from the exercise of this resource consent, which were not either foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 9 July 2007

For and on behalf of
Taranaki Regional Council

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Director-Resource Management

Discharge Permit

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

Name of Consent Holder:	South Taranaki District Council Private Bag 902 HAWERA 4640
Consent Granted Date:	6 June 2007

Conditions of Consent

Consent Granted:	To discharge treated municipal wastewater from the Kaponga Wastewater Treatment Plant into the Kaupokonui Stream at or about GR: P20:087-961
Expiry Date:	1 June 2029
Review Date(s):	June 2011, June 2017, June 2023
Site Location:	Egmont Street, Kaponga
Legal Description:	Pt Sec 69 Blk XI Kaupokonui SD
Catchment:	Kaupokonui

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 1 year of the commencement of this consent, the wastewater treatment system shall be upgraded by:

a) the installation of stub baffles in accordance with drawing no. 6511929-CK02 provided in the *'Assessment of Environmental Effects for the Kaponga Wastewater Treatment Plant'* [CH2M Beca], March 2006.
b) Lower the discharge pipe so that all effluent if discharged at least 400mm below water level at all times.

2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of application 3423. In the case of any contradiction between the documentation submitted in support of application 3423 and the conditions of this consent, the conditions of this consent shall prevail.

3. Notwithstanding any conditions within this consent, the consent holder shall at all times adopt the best practicable option or options, 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 the exercise of this consent.

4. The volume of treated wastewater discharge shall not exceed 500 cubic metres per day, unless there has been rain on any of the previous three days [as measured at Taungatara, Te Kiri], in which case the instantaneous treated wastewater discharge flow rate shall not exceed 15 litres per second.

5. The consent holder shall implement and maintain a management plan which shall include operating procedures to avoid, remedy or mitigate against potential adverse effects arising from:

i) the operation of the wastewater treatment plant;
ii) the build up of sludge in the pond system; and
iii) stormwater and groundwater infiltration into the sewerage system.

6. The consent holder shall use a suitably trained operator to ensure proper and efficient operation and maintenance of the wastewater treatment system.

7. The oxidation pond shall be maintained in an aerobic condition at all times during daylight hours.

8. The consent holder shall advise and consult with the Taranaki Regional Council prior to accepting new trade wastes, which may contain toxic or hazardous wastes, into the consent holder's wastewater system.

9. After allowing for reasonable mixing, being a mixing zone extending from the discharge point, to a point 50 metres downstream of the discharge point, the discharge shall not give rise to any of the following effects in any surface water body:

   a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
   b) any conspicuous change in the colour or visual clarity;
   c) any emission of objectionable odour;
   d) any significant adverse effects on aquatic life.

10. The consent holder shall, in conjunction with the Taranaki Regional Council, undertake chemical, bacteriological and ecological monitoring of the oxidation pond and Kaupokonui Stream as deemed necessary by the Chief Executive, Taranaki Regional Council subject to Section 35 (2)(d) and Section 36 of the Resource Management Act 1991.

11. After allowing for reasonable mixing, being a mixing zone extending from the discharge point, to a point 50 meters downstream of the discharge point, the discharge shall not cause the receiving waters of the Kaupokonui Stream to exceed the following concentrations:

Contaminant	**Concentration**
Unionised ammonia	$0.025 gm^{-3}$
Filtered carbonaceous BOD_5	$2.0\ gm^{-3}$

12. After for allowing for reasonable mixing within a mixing zone extending 50 meters downstream of the discharge point, the discharge shall not give rise to an increase in turbidity of more than 50% [as determined using NTU (nephelometric turbidity units)] in the Kaupokonui Stream.

13. 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.

14. 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, and/or June 2023 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 6 June 2007

For and on behalf of
Taranaki Regional Council

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Director-Resource Management

Discharge Permit

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

Name of Consent Holder:	South Taranaki District Council Private Bag 902 HAWERA 4640
Consent Granted Date:	6 June 2007

Conditions of Consent

Consent Granted:	To discharge treated municipal wastewater from the Manaia Wastewater Treatment Plant into the Unnamed Stream 27 at or about GR: P21:062-803
Expiry Date:	1 June 2029
Review Date(s):	June 2011, June 2017, June 2023
Site Location:	Sutherland Road, Manaia
Legal Description:	Lot 1 DP 20670 Blk VII Waimate SD
Catchment:	Unnamed Stream 27

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. From 6 June 2009, the wastewater treatment plant shall comprise of:

(a) the existing 1ha oxidation pond with inlet screen; and
(b) two wetlands operating in parallel, each of 4800 m^2 ;

in accordance with recommended Option 3C and drawing no. 6513417/CK008 contained in the document supporting the application entitled *'Manaia Wastewater Treatment Plant Application for Discharge Permit and Assessment of Environmental Effects'* [CH2M Beca], Feb 2007.

2. The consent hold shall supply progress reports on implementation of the upgrade referred to under special condition 1, by 30 June 2008 and 30 June 2009, to the Chief Executive, Taranaki Regional Council.

3. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of application 4068. In the case of any contradiction between the documentation submitted in support of application 4068 and the conditions of this consent, the conditions of this consent shall prevail.

4. Notwithstanding any conditions within this consent, the consent holder shall at all times adopt the best practicable option or options, 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 the exercise of this consent.

5. The volume of treated wastewater discharge shall not exceed 600 cubic metres per day, unless there has been rain on any of the previous three days [as measured at the Kaupokonui, Glenn Road rain gauge station].

6. The consent holder shall implement and maintain a management plan which shall include operating procedures to avoid, remedy or mitigate against potential adverse effects arising from:

   i) the operation of the wastewater treatment plant;
   ii) the build up of sludge in the pond system; and
   iii) stormwater and groundwater infiltration into the sewerage system.

7. The consent holder shall use a suitably trained operator to ensure proper and efficient operation and maintenance of the wastewater treatment system.

8. The oxidation pond shall be maintained in an aerobic condition at all times during daylight hours.

9. The consent holder shall advise and consult with the Taranaki Regional Council prior to accepting new trade wastes, which may contain toxic waste or hazardous wastes or any significant additional organic loading, into the consent holder's wastewater system.

10. Allowing for a mixing zone of 50 metres extending either side of the mouth of the receiving stream the discharge shall not give rise to all or any of the following effects in the coastal waters of the Tasman Sea:

    i) any conspicuous change in the colour or visual clarity; and
    ii) any significant adverse effects on aquatic life, habitats, or marine ecology; and
    iii) exceedance of the guideline for shellfish gathering waters, as specified in the document 'Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas' [Ministry for the Environment, 2002].

11. The consent holder shall, in conjunction with the Taranaki Regional Council, undertake chemical, bacteriological and ecological monitoring of the wastewater treatment system, Manaia Creek and coastal receiving waters, as deemed necessary by the Chief Executive, Taranaki Regional Council, subject to Section 35 (2)(d) and Section 36 of the Resource Management Act 1991.

12. The consent holder shall implement a stormwater/groundwater infiltration reduction programme, and shall carry out all practicable actions to ensure that all unauthorised stormwater connections to the sewage reticulation system are removed and remain disconnected. The consent holder shall report on progress under this condition to the Chief Executive, Taranaki Regional Council, by 30 June 2008 and each subsequent year.

13. 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.

14. 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, and/ or June 2023 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 6 June 2007

For and on behalf of
Taranaki Regional Council

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Director-Resource Management

Coastal 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 4800
Consent Granted Date:	16 November 2005

Conditions of Consent

Consent Granted:	To erect, place and maintain an oxidation pond discharge structure and an emergency overflow discharge structure as part of the Patea Wastewater Treatment System within the coastal marine area of the Patea River at or about GR: Q22:374-590
Expiry Date:	1 June 2028
Review Date(s):	June 2010, June 2016, June 2022
Site Location:	Beach Road, Patea
Legal Description:	Lot 1 DP 9100 Beach Road Whenuakura Dist 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. The consent holder shall notify the Chief Executive, Taranaki Regional Council, at least 48 hours prior to the commencement and upon completion of the initial construction and again at least 48 hours prior to and upon completion of any subsequent maintenance works which would involve disturbance of or deposition to the riverbed or discharge to water.

2. The structures authorised by this consent shall be constructed and maintained generally in accordance with the documentation submitted in support of application 2754 and shall be maintained to ensure the conditions of this consent are met. In the case of any contradiction between documentation submitted in support of application 2754 and the conditions of this consent, the conditions of this consent shall prevail.

3. The consent holder shall upgrade the oxidation pond discharge structure, substantially in accordance with recommended Option C [rock diffuser] contained in the document supporting the application entitled *'Assessment of Environmental Effects for the Upgraded Wastewater Treatment Plant'* [CH2M Beca], May 2004. Implementation of this upgrade shall be completed no later than two years from the date of issue of the consent.

4. The consent holder shall at all times during construction and maintenance works, adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to avoid or minimise the discharge of silt or other contaminants into water or onto the riverbed and to avoid or minimise the disturbance of the coastal marine area and any adverse effects on water quality from the exercise of this consent.

5. 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.

6. The exercise of this consent shall not restrict public access to and along the coastal marine area.

7. Any disturbance of parts of the riverbed covered by water and/or works which may result in downstream discolouration of water shall be timed to coincide, as far as possible, with dry weather periods.

8. The structures which are the subject of this consent shall not obstruct fish passage.

9. The consent holder shall install and maintain suitable signage advising the public during construction of the structure[s] or any significant maintenance works.

10. The structure[s] authorised by this consent shall be removed and the area reinstated, if and when the structure[s] are no longer required. The consent holder shall notify the Taranaki Regional Council at least 48 hours prior to structure[s] removal and reinstatement.

11. 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.

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 2010 and/or June 2016 and/or June 2022, 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 November 2005

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
Consent Granted Date:	19 September 2005

Conditions of Consent

Consent Granted:	To discharge treated stock truck effluent from an oxidation pond treatment system onto and into land in the vicinity of the Waiau [2] Stream in the Waitotara catchment at or about GR: R22:525-580
Expiry Date:	1 June 2022
Review Date(s):	June 2010, June 2016
Site Location:	State Highway 3, RP352-5.070, 150 m south of State Highway 3/Waiau Road intersection, Road Reserve, Waverley
Legal Description:	Lot 2 DP 7820 Pt Lot 2 DP 84280 Blk VIII Wairoa SD
Catchment:	Waitotara
Tributary:	Waiau [2]

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

General conditions

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

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

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

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in Section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects of the discharge.

2. After allowing for reasonable mixing, within a mixing zone extending 50 metres below the discharge point, the discharge shall not cause the concentration of the following constituents to be exceeded in the receiving water:

Constituent	**Concentration**
Unionised ammonia	0.025 gm^{-3}
Filtered carbonaceous BOD_5	2.0 gm^{-3}

3. After allowing for reasonable mixing, within a mixing zone extending 50 metres below the discharge point, the discharge shall not give rise to any of the following effects in the receiving waters of the Waiau [2] Stream in the Waitotara catchment:

a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
b) any conspicuous change in the colour or visual clarity;
c) any emission of objectionable odour;
d) the rendering of fresh water unsuitable for consumption by farm animals;
e) any significant adverse effects on aquatic life.

4. The treatment and discharge system shall be designed, managed, operated and regularly maintained to ensure that the conditions of this consent are met.

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 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 19 September 2005

For and on behalf of
Taranaki Regional Council

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Director-Resource Management

Appendix II

Biomonitoring reports

To	Job manager, Rae West
From	Scientific Officer, Darin Sutherland
Doc No	1834374
Report No	DS060
Date	March 2017

Biomonitoring of the Kaupokonui River in relation to the South Taranaki District Council's Kaponga oxidation ponds system discharge, February 2017

Introduction

This biomonitoring survey was the summer survey for the 2016-2017 monitoring period relating to the discharge from the Kaponga Municipal Wastewater Treatment System into the Kaupokonui River, downstream of the Kaponga township. Special Condition 9d of Consent 0861-3 requires that:

"after allowing for reasonable mixing over 50 metres downstream of the discharge point there shall be no significant adverse effects on aquatic life"

This survey also complemented the state of the environment biomonitoring programme within the Kaupokonui catchment (TRC, 2016a).

Method

The standard '400 ml kick sampling' technique was used to collect streambed (benthic) macroinvertebrates from three established sampling sites in the Kaupokonui River in the vicinity of the Kaponga oxidation ponds' system (illustrated in Figure 1), on 10 February 2017.

These sites were:

Site number	Site code	Grid reference (NZTM)	Location
1	KPK000500	E1698609 N5634423	approximately 250 m upstream of oxidation ponds
2	KPK000520	E1698548 N5634263	50 m downstream of oxidation ponds
3a	KPK000550	E1698497 N5633456	approximately 1 km downstream of oxidation ponds

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 stereomicroscopic 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:

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

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

A semi-quantitative MCI value, $SQMCI_S$ (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).

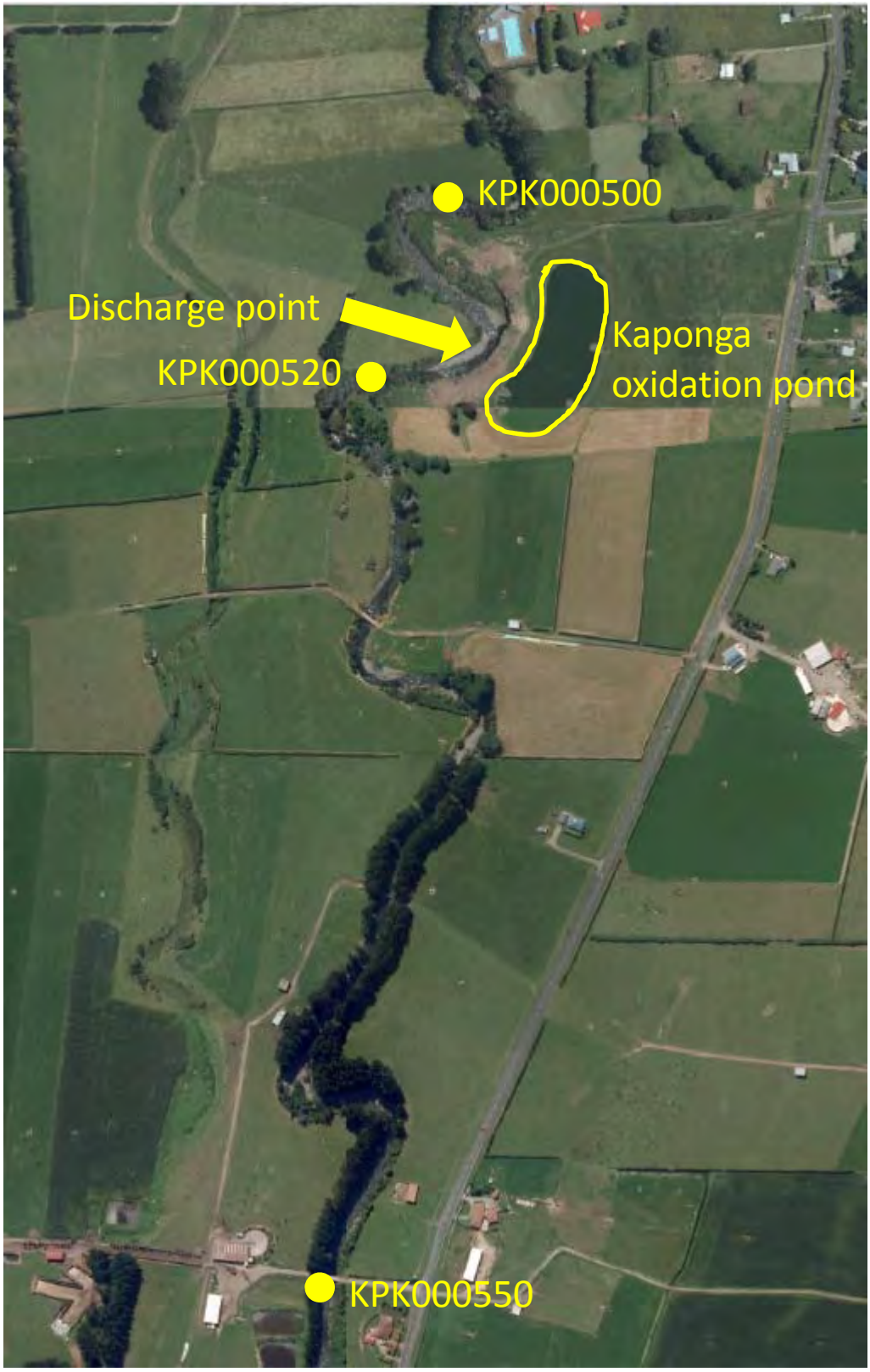


Figure 1 Biomonitoring sites in the Kaupokonui River in relation to Kaponga oxidation ponds system

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

Results

Site habitat characteristics and hydrology

This summer survey was performed under very low flow conditions, 18 days after a fresh in excess of both 3 and 7 times median flow (flow gauging at the Kaupokonui Stream at Glenn Road). The survey followed a wet spring period though there was only one significant river fresh recorded over the preceding month and one minor fresh recorded seven days prior to surveying.

The water temperatures during the survey were in the range 12.7-14.2 °C. Water levels were moderate and water speed was swift. The water was uncoloured and clear. The substrate at sites 1 and 3a comprised cobble/boulder while site 2 was predominately cobble with fewer boulders.

All three sites had patchy mats and filamentous algae with patchy leaves on the streambed. Site 3a had partial shading from overhanging vegetation while the other sites did not have any shading.

Macroinvertebrate communities

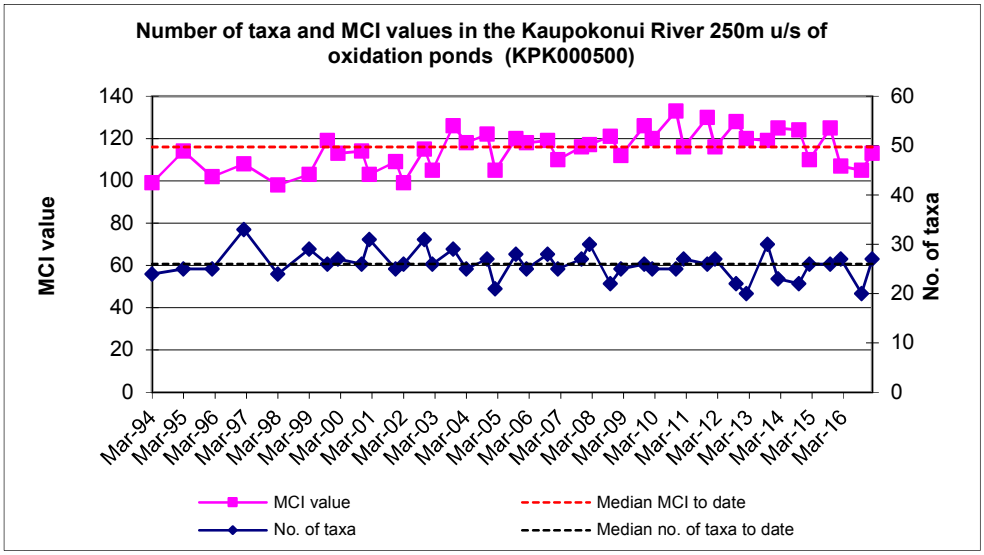
Data have been collected from various past surveys of the Kaupokonui Stream immediately upstream of Kaponga township, and 1.3 km downstream of the oxidation ponds' discharge near the more recently established site 3a.

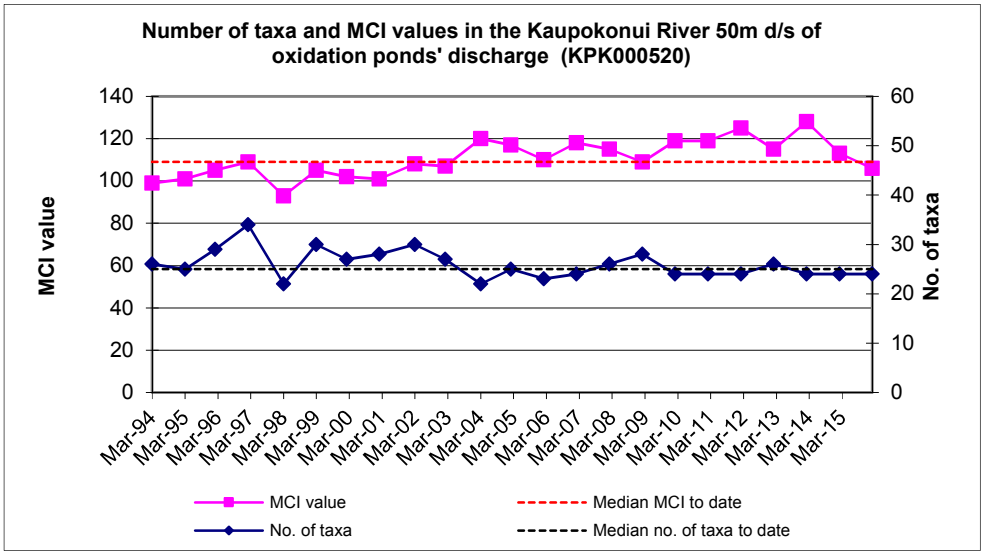
Data obtained from previous biomonitoring surveys are summarised in Table 1 and illustrated in Figure 2.

Table 1 Summary of macroinvertebrate taxa numbers and MCI values for previous surveys performed between March 1987 and February 2016

Site No.	No of surveys	No of taxa			MCI value			$SQMCI_s$ value		
		Median	Range	Feb 2017	Median	Range	Feb 2017	Median	Range	Feb 2017
1	42	26	18-33	27	116	98-133	113	6.5	2.6-7.8	5.4
2	23	25	22-34	22	109	93-128	116	5.5	3.6-7.7	6.9
3a	25	26	92-126	25	111	92-126	108	5.6	3.1-7.5	7.1

The results of the current survey are presented in Table 2 and illustrated in Figure 2.





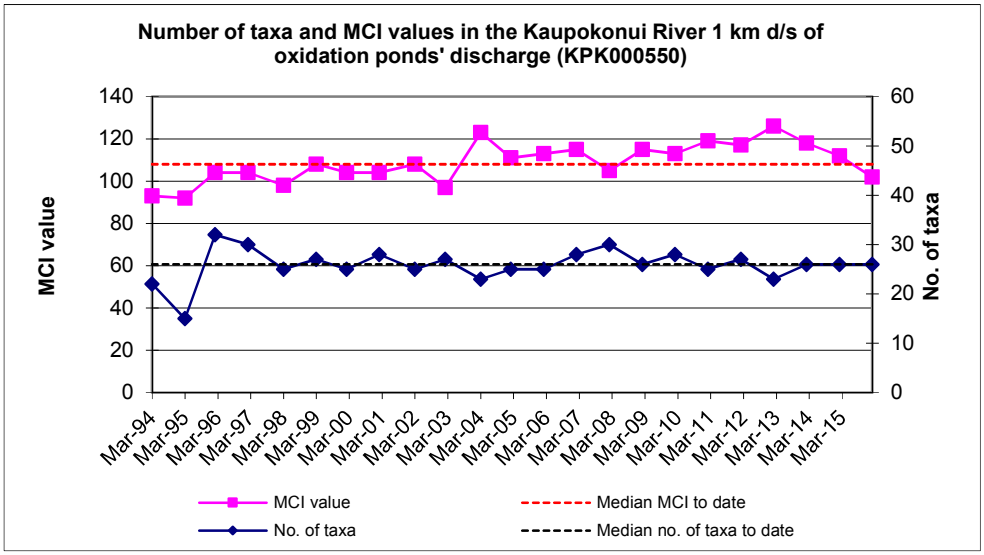


Figure 2 Taxa richness and MCI values at the three sampling sites to date

Table 2 Macroinvertebrate fauna of the Kaupokonui River in relatiton to the Kaponga oxidation ponds discharge sampled on 10 February 2017

Taxa List	Site Number	MCI score	1	2	3a
	Site Code		KPK000500	KPK000520	KPK000550
	Sample Number		FWB17028	FWB17029	FWB17030
ANNELIDA (WORMS)	Oligochaeta	1	R	R	C
MOLLUSCA	*Potamopyrgus*	4	C	R	R
EPHEMEROPTERA (MAYFLIES)	*Austroclima*	7	R	R	R
	Coloburiscus	7	A	A	A
	Deleatidium	8	XA	XA	XA
	Nesameletus	9	A	A	C
	Zephlebia group	7	R	-	-
PLECOPTERA (STONEFLIES)	*Austroperla*	9	R	-	R
	Megaleptoperla	9	R	R	-
	Zelandoperla	8	C	R	-
COLEOPTERA (BEETLES)	Elmidae	6	C	A	C
	Hydraenidae	8	R	C	C
MEGALOPTERA (DOBSONFLIES)	*Archichauliodes*	7	C	C	A
TRICHOPTERA (CADDISFLIES)	*Hydropsyche (Aoteapsyche)*	4	VA	A	VA
	Costachorema	7	A	C	C
	Hydrobiosis	5	A	C	C
	Neurochorema	6	R	R	R
	Psilochorema	6	-	R	-
	Beraeoptera	8	-	R	-
	Olinga	9	C	-	A
	Pycnocentrodes	5	C	R	C
DIPTERA (TRUE FLIES)	*Aphrophila*	5	C	C	C
	Eriopterini	5	R	-	R
	Maoridiamesa	3	XA	VA	A
	Orthocladiinae	2	A	A	R
	Polypedilum	3	-	-	R
	Tanypodinae	5	-	-	R
	Tanytarsini	3	R	R	R
	Empididae	3	-	-	R
	Muscidae	3	R	-	-
	Austrosimulium	3	R	-	-
	Tabanidae	3	R	-	-
	Tanyderidae	4	-	-	R
	No of taxa		27	22	25
	MCI		113	116	108
	SQMCIs		5.4	6.9	7.1
	EPT (taxa)		14	13	11
	%EPT (taxa)		52	59	44

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

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

Site 1 (approximately 250 m upstream of oxidation ponds)

A moderately high macroinvertebrate community richness of 27 taxa was found at site 1 ('control' site) at the time of the summer survey (Table 1).

The MCI score of 113 units indicated a community of 'good' biological health which was not significantly different (Stark, 1998) to the median MCI score of 116 units. Using the equation MCI=79.12 + 0.116A where A is altitude (recorded as 260m m asl for site 1) for streams arising inside Egmont National Park (Stark and Fowles, 2009) the expected MCI score was 109 units which was not significantly different to the current survey score. The $SQMCI_S$ score of 5.4 units was significantly lower than the median $SQMCI_S$ score of 6.5 units (Table 1).

The community was characterised by three 'tolerant' taxa [caddisfly (*Hydropsyche-Aoteapsyche*), three moderately sensitive taxa (mayfly (*Coloburiscus*) and caddisflies (*Costachorema* and *Hydrobiosis*), and midges (*Maoridiamesa* and Orthocladiinae)] and two highly sensitive taxa [mayflies (*Deleatidium* and *Nesameletus*)] (Table 2).

Site 2 (50 m downstream of oxidation ponds)

A moderate macroinvertebrate community richness of 22 taxa was found at site 2 ('primary impact' site) at the time of the summer survey (Table 1).

The MCI score of 116 units indicated a community of 'good' biological health which was not significantly different (Stark, 1998) to the median MCI score of 109 units. Using the equation MCI=79.12 + 0.116A where A is altitude (recorded as 250m m asl for site 2) for streams arising inside Egmont National Park (Stark and Fowles, 2009) the expected MCI score was 108 units which was not significantly different to the current survey score. The $SQMCI_S$ score of 6.9 units was significantly higher than the median $SQMCI_S$ score of 5.5 units (Table 1).

The community was characterised by three 'tolerant' taxa [caddisfly (*Hydropsyche-Aoteapsyche*) and midges (*Maoridiamesa* and Orthocladiinae)], two moderately sensitive taxa [mayfly (*Coloburiscus*) and elmid beetles], and two highly sensitive taxa [mayflies (*Deleatidium* and *Nesameletus*)] (Table 2).

Site 3a (approximately 1 km downstream of oxidation ponds)

A moderately high macroinvertebrate community richness of 25 taxa was found at site 3a ('secondary impact' site) at the time of the early summer survey (Table 1).

The MCI score of 108 units indicated a community of 'good' biological health which was the same as the median MCI score of 108 units. Using the equation MCI=79.12 + 0.116A where A is altitude (recorded as 230m m asl for site 3a) for streams arising inside Egmont National Park (Stark and Fowles, 2009) the expected MCI score was 105 units which was not significantly different to the current survey score. The $SQMCI_S$ score of 7.1 units was similar to the median $SQMCI_S$ score of 5.6 units (Table 1).

The community was characterised by two 'tolerant' taxa [caddisfly (*Hydropsyche-Aoteapsyche*) and midge (*Maoridiamesa*)], two moderately sensitive taxa [mayfly (*Coloburiscus*) and dobson fly (*Archichauliodes*)] and two highly sensitive taxa [mayflies (*Deleatidium*) and caddisfly (*Olinga*)] (Table 2).

Discussion and conclusions

Taxa numbers (22 to 27) collected from the three river sites during this survey were indicative of good community richnesses typical of sites at an altitude range of 230 to 260 m asl in the mid-reaches of a river draining a developed catchment. Taxa richnesses recorded from 372 past surveys of Taranaki ringplain National Park-sourced streams and rivers at 'control' sites in the altitude range of 200 to 250 m asl have found a median richness of 23 taxa (TRC 2016). Taxa numbers recorded by the present survey tended to be very similar to those found at the time of the previous summer's survey (DS043) and were similar to the historical median from previous surveys (Figure 2).

The MCI scores were indicative of 'good' stream biological health. The results for all three sites were not significantly different compared with historical medians (within 3-7 MCI units) and predicted scores (plus 1-8 MCI units) (Stark, 1998). MCI results at all three sites were higher than that of the previous survey (by 6-10 units) coincident with less periphyton cover compared with the previous survey. Periphyton is an indicator of nutrient enrichment and is often associated with lower scoring macroinvertebrate taxa. The previous

survey recorded widespread mats and filamentous algae at all three sites. There were also no significant differences among sites. The 'primary impact' site had a higher MCI score (by three units) compared with the 'control' site while the 'secondary impact' site was a non-significant five units lower than the 'control' site indicating that there was no significant eutrophication occurring from discharges from the Kaponga WWTP.

The $SQMCI_S$ values at the two 'impact' sites were very similar to each other and both were significantly higher than the 'control' site score (by 1.5-1.7 $SQMCI_S$ units). This result was in contrast to previous surveys as the historical medians for the 'impact' sites were both significantly lower than the 'control' site score (by 0.9-1.0 units). The reason for the significantly higher $SQMCI_S$ scores during the current survey for the two 'impact' sites was the lower number of 'tolerant' midges, *Maoridiamesa* and Orthocladiinae compared with the 'control' site. The two 'impact' sites scores of 6.9 and 7.1 indicated 'excellent' water quality.

There was no visual sign or microscopic evidence of any unusual heterotrophic growths present or forming on the substrate at any site, indicating that the Kaponga oxidation pond system discharge had had no recent impact on the riverbed microflora.

Overall, the community richnesses, compositions, and MCI scores were indicative of no recent impacts of the oxidation ponds system's treated wastes discharge on the macroinvertebrate fauna of the surveyed reach of the Kaupokonui River. The absence of heterotrophic growths on the river's substrate was further confirmation of no impacts of the discharge on the biological communities of the river.

Summary

The Council's standard 'kick-sampling' technique was used to collect streambed macroinvertebrates from the Kaupokonui River at three established sites. Each sample was processed to provide number of taxa (richness), MCI score, $SQMCI_S$ score, and %EPT taxa.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects or 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. It may also provide more relevant information in relation to non-organic impacts. Differences in either the MCI or the $SQMCI_S$ between sites indicate the degree of adverse effects (if any) of the discharges being monitored.

Taxa numbers recorded by the present survey tended to be very similar to those found at the previous summer's survey and were very similar to their respective historical median. MCI scores indicated that the stream communities were of 'good' generic health, and 'expected' predictive conditions to those recorded in similar Taranaki ringplain streams at equivalent altitudes. There were no significant differences among sites for MCI scores and the two 'impact' sites had significantly higher $SQMCI_S$ scores compared with the 'control' site which indicated that both 'impact' sites had 'excellent' water quality. There was no visual sign or microscopic evidence of any unusual heterotrophic growths present or forming on the substrate at any site.

This summer macroinvertebrate survey indicated that the discharge of treated oxidation ponds wastes from the Kaponga wastewater treatment plant site had not had any detrimental effect on the macroinvertebrate communities of the Kaupokonui River. No significant decreases in macroinvertebrate community health were found at the two sites downstream of the discharge.

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Memorandum

To Rae West, Job Manager
From Emily Roberts, Marine Ecologist
Document #1882974
Date 16 June 2017

Manaia Oxidation Ponds Marine Ecological Inspection June 2017

A marine ecological inspection of the foreshore in the vicinity of the discharge from the Manaia oxidation pond system was attempted on 16 June 2017 commencing at 10:30 NZST. Low tide at Port Taranaki on this day was at 08:12 NZST at a height of 0.9 m above chart datum. At the time of the inspection the weather was fine and it had been dry the proceeding few days. This was the first and only intertidal inspection undertaken for the Manaia oxidation pond programme (Spordmon 3) during the 2016/2017 monitoring period.

At the time of the inspection the effluent from the oxidation pond-wetland system was discharging at a high rate (Photograph 1). The discharge was clear and had a faint but detectable sewage odour. Small patches of foam were visible. No sewage fungus was present after or before the Manaia Creek stream confluence. The discharge channel below the pipe was fenced (Photograph 2). Rocks had been placed in the channel in order to reduce the risk of sewage fungus growth. The Manaia Creek (Unnamed Stream 27, Consent 1204-4) was in high flow during the inspection (Photograph 3).

Photograph 1 The small discharge channel from the oxidation ponds prior to the Manaia Creek

Photograph 2 Fencing around the discharge channel from the oxidation ponds

Photograph 3 The Manaia Creek in high flow

Unfortunately there had been a slip at the base of the cliff used to access the coast. There was a >1.5 m drop before the start of the tyre ladder making it unsafe to access the beach (Photograph 5). As a consequence this intertidal inspection consisted of a qualitative assessment of green macroalgae cover/extent (*Ulva* spp.) made from the top of the access point.

The stream was approximately 10 m wide at the coast. The stream appeared clear with small patches of foam (Photograph 6). There was no detectable odour from the top of the access point.

Photograph 4 Tyre ladder 2015

Photograph 5 Tyre ladder following slip June 2017

Photograph 6 The Manaia Creek flowing over the intertidal reef at Manaia

Green macroalgal species (*Ulva* spp.) stretched along the high tide mark ~20m either side of the stream. These algal species are typical of freshwater influence and thrive under nutrient rich conditions.

Photograph 7 Green algae evident along the high water mark

In summary, the stream appeared to have a significant effect on intertidal algae nearby to the stream, most likely a result of freshwater influence. *Ulva* spp. was evident along the length of the stream, with dense cover higher up on the shore. Prolific growth of this species is typical of nutrient enrichment, however, this species was not abundant beyond the 50 m mixing zone extending either side of the stream.

Emily Roberts
Marine Ecologist