South Taranaki District Council
Waverley, Kaponga, Manaia and Patea
Municipal Wastewater Treatment Plant Systems
Monitoring Programmes
Annual Report
2015-2016

Technical Report 2016-30

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Taranaki Regional Council
Private Bag 713
STRATFORD

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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 Waverley, Kaponga, Manaia and Patea townships[1].

This report for the period July 2015 to June 2016 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 six resource consents for the Waverley, Kaponga, Manaia and Patea treatment plants, which include a total of 76 conditions setting out the requirements that STDC must satisfy. Five consents allow STDC to discharge of treated wastewater from the various municipal oxidation ponds sewage treatment systems, one consent is held to discharge treated stock truck effluent (Waverley), and one consent covers the discharge of untreated municipal sewage in emergencies (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 late summer-autumn under low flow conditions during the monitoring period. This monitoring continued the increased frequency of bacteriological receiving water surveys in the lower Patea River in relation to the upgraded oxidation pond system effluent and emergency sewage outfall discharges. 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.

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 were no wet weather-related overflows of emergency pump station raw sewage from the Patea reticulation into the Patea River. 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.

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

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 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, upgraded 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 which 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 (with five conditions) 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 2015-2016, although some improvement in management of the pre-treatment waste reception area (roadside) needs to be addressed. The presence of appropriate signage and surveillance by the consent holder have been effective in maintaining compliance at the facility. No discharges to land or nearby natural water occurred at this site where the three pond system was de-sludged and ponds levels lowered in the 2013-2014 period. 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 2015-2016 year, 71% of consent holders in Taranaki monitored through tailored compliance monitoring programmes achieved a high level of environmental performance and compliance with their consents, while another 24% demonstrated a good level of environmental performance and compliance with their consents.

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

This report includes recommendations for the 2016-2017 year, including a recommendation relating to an optional review of consent 0861-3.

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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 2015 to June 2016 by the Taranaki Regional Council (the Council) on the monitoring programme associated with resource consents held by STDC for the wastewater treatment plants (WWTPs) located at Waverley, Kaponga, Manaia and Patea. The programme also included the consent held for the discharge of treated stock truck effluent from the SH3 system to land (in a Waitotara catchment) near Waverley. 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 Wairoa (Waverley) and Waiau (Waitotara), Kaupokonui (Kaponga), Waiokura/Motumate (Manaia) and Patea (Patea) catchments.

One of the intents of the *Resource Management Act 1991* (RMA) is that environmental management should be integrated across all media, so that a consent holder's use of water, air, and land should be considered from a single comprehensive environmental perspective. Accordingly, the Council generally implements integrated environmental monitoring programmes and reports the results of the programmes jointly. This report discusses the environmental effects of STDC's use of water, and is the 21st annual report by the Council for STDC.

1.1.2. Resource consents

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

Each of the permits held by the STDC in relation to the Waverley, Kaponga, Manaia and Patea WWTP systems was issued by the Council as a resource consent under Section 87(e) of the RMA.

1.1.2.1. Waverley WWTP discharge consent and stock truck effluent discharge consent

STDC held discharge consent **0072-2** to discharge up to 450 cubic metres per day of treated wastewater from the Waverley WWTP into an unnamed tributary of the Wairoa Stream. It expired on 1 June 2016 and is currently in the process of being renewed as **0072-3**. The special conditions described within the permit related to a requirement to maintain the WWTP system in an aerobic condition, a requirement to notify Council in the event that trade wastes are to be disposed of through the system, a requirement to minimise impacts on receiving waters, and two review periods (June 2004 and June 2010) for the purpose of ensuring that the conditions adequately deal with the environmental effects arising from the exercise of the consent. The options for

the reviews in June 2004 and June 2010 were not exercised as the consent conditions adequately dealt with the environmental effects arising from the consented discharge.

STDC also holds discharge consent **6621-1** (granted on 19 September 2005) to discharge treated stock truck effluent onto and into land in the vicinity of the Waiau Stream. It has an expiry date of 1 June 2022 and two review dates of June 2010 and June 2016. The special conditions described within the permit relate to requirements to minimise impacts on a nearby watercourse, maintenance of the system and provision for two reviews. The option for the reviews in June 2010 and 2016 were not exercised as the consent conditions adequately dealt with the environmental effects arising from the consented discharge.

Copies of the consents are included in Appendix 1.

1.1.2.2. Kaponga WWTP discharge consent

STDC holds discharge consent **0861-3** (first granted on 12 August 1981) to discharge up to 500 cubic metres per day of treated wastewater from the Kaponga WWTP into the Kaupokonui Stream. The consent holder was granted a change to consent conditions on 4 March 1997. It expired on 1 June 2005 and was renewed on 6 June 2007. The special conditions described within the current permit relate to requirements for upgrading the system, monitoring, maintenance of the WWTP system in an aerobic condition, notification to Council in the event that trade wastes are to be disposed of through the system, minimisation of impacts on receiving waters; and provided three review dates (June 2011, June 2017 and June 2023) for the purpose of ensuring that the conditions adequately deal with the environmental effects arising from the exercise of the consent, with an expiry date of June 2029. The option for review in June 2011 was not exercised as the consent conditions had dealt adequately with the environmental effect arising from the consented discharge.

A copy of the renewed consent is included in Appendix 1.

1.1.2.3. Manaia WWTP discharge consent

STDC holds discharge consent **1204-4** (first granted on 14 December 1983) to discharge up to 600 cubic metres per day of treated sewage effluent from the Manaia WWTP into an unnamed coastal stream between the Waiokura Stream and the Motumate Stream. The consent has subsequently been granted renewals on 16 June 1993, 21 July 1999 and 6 June 2007. The special conditions described within the permit relate to requirements for monitoring, upgrading of the system, maintenance of the WWTP system in an aerobic condition and provision of a management plan, notification to Council in the event that trade wastes are to be disposed of through the system, minimisation of impacts on coastal receiving waters, and implementation of a stormwater and groundwater infiltration reduction programme. The consent provides for three review periods (June 2011, June 2017 and/or June 2023) for the purpose of ensuring that the conditions adequately deal with the environmental effects arising from the exercise of the consent. Reporting has proceeded according to timeframes and the appropriate upgrade to the system was completed in late 2009. The option for review in June 2011 was not exercised as the consent conditions had dealt adequately with the environmental effects arising from the consented discharge.

A copy of the renewed consent is included in Appendix 1.

1.1.2.4. Patea WWTP discharge consent

STDC holds discharge consent **0067-3** (first issued on 11 February 1987) for the discharge of up to 455 cubic metres per day of treated municipal sewage from the Patea WWTP into the Patea River. The consent was subsequently granted a renewal on 29 July 1992. It expired on 1 June 2004 and was renewed as a coastal permit on 7 February 2006 by the Minister of Conservation. The special conditions described within the permit relate to requirements for monitoring, to maintain the oxidation ponds system in an aerobic condition, to notify the Council in the event that trade wastes are to be disposed of through the system, and to minimise any impacts on the receiving waters. They also required that the system be upgraded within two years of the renewal date, with progress reports in June 2006 and June 2007. A variation was granted in February 2006 to allow for a short-term delay to the upgrade which subsequently has been completed.

STDC also holds discharge consent **0145-2** (first issued on 13 November 1985) for the discharge of untreated municipal sewage only in emergencies into the Patea River. The original consent expired on 1 June 2005 and was renewed as a coastal permit in conjunction with consent **0067**. The special conditions described within the permit relate to the prescription of what constitutes an emergency (i.e. under what circumstances the consent may be exercised), notification, alarm requirements, duration of exercise, review, monitoring, contingency planning and inspection and record keeping by the applicant and an upgrade of the outfall.

A consent (**4576-2**) is also held for both the WWTP outfall and emergency outfall structures with conditions relating to upgrades, maintenance and review provisions.

This consent is for a duration of 23 years and was granted in November 2005.

Copies of the consents are included in Appendix 1.

1.1.3. The Resource Management Act 1991 and monitoring

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

(a) the neighbourhood or the wider community around a discharger, and may include cultural and 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 discharge source. Monitoring programmes are not only based on exiting permit conditions, but also on the obligations of the RMA to assess the effects of the exercise of consents. In accordance with Section 35 of the RMA, the Council undertakes compliance monitoring for consents and rules in

regional plans; and maintains an overview of performance of resource users against regional plans and consents. Compliance monitoring, (covering both activity and impact) monitoring, also enables the Council to continuously assess its own performance in resource management as well as that of resource users particularly consent holders. It further enables the Council to continually re-evaluate its approach and that of consent holders to resource management, and, ultimately, through the refinement of methods, 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 the consent holder's approach to demonstrating consent compliance in site operations and management including the timely provision of information to Council (such as contingency plans and water take data) in accordance with consent conditions.

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

The categories used by the Council for this monitoring period, and their 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 2014-2015 year, 71% of consent holders in Taranaki monitored through tailored compliance monitoring programmes achieved a high level of environmental performance and compliance with their consents, while another 24% demonstrated a good level of environmental performance and compliance with their consents.

1.2. Monitoring programme: water

1.2.1. 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.

1.2.2. Programme liaison and management

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

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

1.2.3. Waverley WWTP and stock truck wastes treatment system

The monitoring programme for the Waverley WWTP consisted of three main components: site inspections, biological monitoring of the oxidation ponds, and a physicochemical survey of the effluent and receiving waters. The stock truck wastes treatment system was also inspected within this programme. Where appropriate, sources of data or information being collected by the consent holder were also identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. Results and observations are discussed within Section 2 of this report.

Site inspections

The Waverley WWTP system was scheduled for three inspections during the monitoring period. These inspections were conducted during mid-morning and focused on the maintenance, operation and refurbishment of the oxidation ponds system and the condition of the receiving waters. The stock truck wastewater treatment system was inspected four times during the period.

Physicochemical sampling

The Council undertook a physicochemical sampling survey of the receiving water quality upstream and downstream of the oxidation ponds, and of the effluent from the oxidation ponds during late summer under very low flow conditions. The sampling sites are shown in Figure 1 (section 2), of this report. The samples were analysed for

temperature, pH, conductivity, chloride, dissolved oxygen, total and filtered uninhibited biochemical oxygen demand, turbidity, suspended solids, dissolved reactive phosphorus, ammonia and faecal coliform bacteria by the Council laboratory.

In addition samples were taken from the second section of the oxidation ponds (i.e. adjacent to the pond outlet) during the three site inspections and analysed for temperature and dissolved oxygen.

Biological monitoring

The Council collected samples of effluent from the surface of the second section of the ponds system (adjacent to the outlet) on all three inspection occasions for the purpose of monitoring the oxidation ponds performance by way of evaluation of the microfloral chlorophyll-a concentrations.

1.2.4. Kaponga WWTP

The monitoring programme for the Kaponga WWTP system consisted of four main components: three site inspections and biological monitoring of the oxidation pond system, a physicochemical effluent survey, three receiving water physicochemical surveys, and a biological survey of the receiving waters. Where appropriate, sources of data or information being collected by the consent holder were also identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. Results and observations are discussed separately within section 3 of this report.

Site inspections

The Kaponga WWTP was scheduled for three inspections during the monitoring period. These inspections were conducted during early to mid-morning and focused on the maintenance and operating condition of the oxidation pond system.

Physicochemical sampling

The Council undertook a physicochemical sampling survey of the receiving water quality upstream and downstream of the oxidation ponds, and of the effluent from the oxidation ponds during early autumn under low river flow conditions. The sampling sites are shown in Figure 3 (Section 3) of this report. The samples were analysed for temperature, pH, conductivity, chloride, dissolved oxygen, total and filtered uninhibited biochemical oxygen demand, turbidity, suspended solids, dissolved reactive phosphorus, ammonia and faecal coliform bacteria by the Council laboratory. Further receiving water physicochemical sampling, required by the renewed consent conditions, was undertaken at two sites at the time of the other two inspections.

In addition, samples were also taken from the second section of the oxidation ponds system (i.e. adjacent to the pond outlet) during the three site inspections and analysed for temperature and dissolved oxygen.

Biological sampling

One late summer biomonitoring survey was conducted in the Kaupokonui River at three sites to assess the impact of the WWTP discharge on the receiving water.

Biological surveys are used to assist in the determination of what effects discharges may be having on the environment over a period of time, as distinct from physicochemical surveys which give detailed information upon the constituents of the discharge and receiving waters at the time of sampling but cannot give information upon previous discharge characteristics or effects.

Biological surveys also directly indicate whether any significant adverse effects of discharges upon in-stream flora and fauna have occurred, so that cause-effect relationships do not have to be established as is the case with critical levels of individual physicochemical parameters.

In addition, the Council collected samples of effluent from the pond surface (adjacent to the outlet) on the three inspection occasions for the purpose of monitoring the WWTP's performance by way of evaluation of the microfloral chlorophyll-a concentrations.

1.2.5. Manaia WWTP

The monitoring programme for the Manaia WWTP consisted of five main components: site inspections, physicochemical effluent monitoring, biological monitoring of the oxidation pond, bacteriological monitoring of the receiving waters (stream and coastal), and low tide ecological inspections of the beach. Where appropriate, sources of data or information being collected by the consent holder were also identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. The neighbourhood was also surveyed for environmental effects. Results and observations are discussed separately within section 4 of this report.

Site inspections

The Manaia WWTP system was visited four times during the monitoring period. These inspections were conducted during mid-morning and focused on the maintenance and operating condition of the oxidation pond and wetlands and specific areas of the reticulation.

Physicochemical sampling

The Council undertook the programmed comparative physicochemical sampling of the effluents from the oxidation pond and wetlands during late autumn under moderately low flow conditions and delayed from summer when the very dry conditions resulted in minimal flow into the wetlands and no discharge to the stream. These samples were analysed for temperature, pH, conductivity, chloride, dissolved oxygen, total and filtered uninhibited biochemical oxygen demand, turbidity, suspended solids, dissolved reactive phosphorus, ammonia and faecal coliform bacteria. A sample was taken from the wetlands outlet on one other site inspection occasion during the period. This was analysed for temperature, dissolved oxygen, conductivity and faecal coliform bacteria.

In addition, on two inspection occasions, samples were collected upstream and downstream of the effluent discharge to the Manaia Creek and also at two sites in the nearby coastal waters of the Tasman Sea (Figure 5, Section 4). All samples were analysed for conductivity and faecal coliform bacteria by the Council laboratory.

Biological monitoring

A low tide beach ecological inspection was performed to assess the impact of the discharge from the oxidation pond and the additional wetlands, on the marine environment. This occurred in early winter 2016.

Biological surveys are used to assist in the determination of what effects discharges may be having on the environment over a period of time, as distinct from physicochemical surveys which give detailed information upon the constituents of the discharge and receiving waters at the time of sampling but cannot give information upon previous discharge characteristics or effects. Biological surveys also directly indicate whether any significant adverse effects of discharges upon in-stream flora and fauna have occurred, so that cause-effect relationships do not have to be established as is the case with critical levels of individual physicochemical parameters.

In addition, the Council collected samples of effluent from the pond's surface (adjacent to the outlet) on the three inspection occasions for the purpose of monitoring the performance of the WWTP by way of evaluation of the microfloral chlorophyll-a concentrations.

1.2.6. Patea WWTP

The monitoring programme for the Patea WWTP consisted of four main components: site inspections, physicochemical surveys, biological monitoring of the final cell of the oxidation pond and bacteriological monitoring of the receiving waters upstream and downstream of the emergency discharge and pond effluent discharge. Where appropriate, sources of data or information being collected by the consent holder were also 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. Results and observations are discussed separately within Section 5 of this report.

Site inspections

The Patea WWTP system was scheduled for three inspections during the monitoring period. These inspections were conducted during mid-morning and focused on the maintenance and operating condition of the oxidation pond and its upgrade and the usage and maintenance of the emergency outfall system.

Physicochemical sampling

The Council undertook a physicochemical sampling survey of the effluent from the WWTP during summer. The sample was analysed for temperature, pH, conductivity, dissolved oxygen, BOD_5, BOD_5 filtered, dissolved reactive phosphorus, Ammonia-N, turbidity, suspended solids, and enterococci and faecal coliform bacteria by the Council laboratory.

In addition, on each inspection occasion, samples were taken from the final cell of the pond near the outlet during the site inspections and analysed for temperature and dissolved oxygen.

Bacteriological surveys were conducted on two inspection occasions at four river monitoring sites during low tide conditions to assess the impact of the oxidation pond discharge on the receiving water, and also with respect to possible intermittent usage of the emergency outfall. Samples were analysed for temperature, conductivity and faecal coliform and enterococci bacteria.

Recreational bacteriological water quality monitoring was undertaken at one lower river and two coastal sites (Mana Bay and Patea Beach), during the 2015-2016 bathing season.

Biological sampling

In addition, the Council collected samples of effluent from the final cell of the pond's surface (adjacent to the outlet) on each inspection occasion for the purpose of monitoring the performance of the WWTP by way of evaluation of the microfloral chlorophyll-a concentrations.

2. Waverley WWTP

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 an 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. '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.

2.1. Inspections

2.1.1. Oxidation pond

In accordance with the monitoring programme, three inspections were performed, on 4 August 2015, and 29 February and 24 May 2016. The physical features of the pond system were recorded and the dissolved oxygen concentration of the second section of the pond was measured from the pond's surface adjacent to the effluent outlet. The results are presented in Table 1. In addition, a sample was collected during each inspection for chlorophyll-a analysis as an assessment of microfloral 'health'. These results are discussed in Section 2.3.

Table 1 Dissolved oxygen measurements from the surface of the second section of the Waverley oxidation pond adjacent to the outfall

Date	Time	Temperature	Dissolved Oxygen	
			Concentration	Saturation
	NZST	°C	g/m³	%
4 August 2015	0935	12.4	12.4	117
29 February 2016	0915	21.9	2.4	28
24 May 2016	1010	10.8	10.9	93

As dissolved oxygen can vary seasonally and on a daily basis (with minimum concentrations generally recorded in early daylight hours), sampling times were standardised toward early to mid-morning for comparative purposes.

Aerobic conditions were recorded on all monitored occasions with dissolved oxygen levels within the typical range expected for this type of biological treatment system. One instance of supersaturation was recorded in mid winter (117%) and there were no instances of very low saturation. Minimal wave action on the ponds (i.e. flat to slight rippling) was noted coincident with light wind to calm conditions at the times of these inspections.

The pond appearance varied from turbid dark green to pale green to pale green-grey on inspection occasions, with effluent appearance varying from relatively clear, to dark green-brown and turbid at the discharge outfall where the estimated discharge rate ranged from 0.25 L/s (late summer) to 5 L/s (winter). The ponds' surrounds generally were maintained in a tidy condition (mown) and the ponds' surfaces were clear of debris.

The wavebands were generally in good condition. There was a slightly noticeable odour at the influent end of Pond 1 and around the step-screen during the inspections in February and May. No foaming in the receiving waters of the tributary stream was observed near the outfall to the stream and/or within the mixing zone permitted by the consent, with no 'sewage fungus' growths apparent in the receiving waters on any of the three inspection occasions.

A moderate number of wildlife were recorded on the ponds, mainly mallard ducks, with a small number of black swans and scaup ducks also noted.

2.1.2. Stock truck wastes treatment system

Stock truck wastewater that is discharged into the facility adjacent to SH3 is treated onsite in an anaerobic pond followed by two lined aerobic ponds prior to discharge on to land at the head of a steep gully in the vicinity of the Waiau Stream.

Inspections of the new on-site disposal system initially found it to be operating adequately, until September 2006 when the consent holder advised that illegal dumping of human domestic wastes had occurred. The source of this disposal was uncertain.

No problems have been found with the system since the 2008-2009 period, and no overflows to land were recorded or apparent during this time. Desludging of the anaerobic pond was last performed during the 2013-2014 season.

Four inspections of the system were performed during the monitoring period; on 4 August and 9 December 2015, and 29 February, 13 April and 24 May 2016.

During most visits the stock truck unloading sump was relatively clear of effluent, but it was noted that the area was in need of a clean up in August 2015 and February 2016. On 24 May 2016 the inspection officer noted that the sump was partially full of effluent and the road frontage area in general was in need of a clean up. A stock truck had just recently unloaded effluent prior to inspection and it appeared that some truck operators were not cleaning up after unloading.

Pond levels varied between low (February and April 2016) to moderate (December 2015) to relatively high (August 2015 and May 2016). No discharge was observed between ponds, or to land during any of the inspections.

It was noted in the February inspection that Pond 1 had some floatables (such as plastic bottles) on the surface which needed to be removed (Photo 1), this was undertaken immediately by the consent holder.

There were no significant odours noted during most of the inspections, however noticeable odours were noted around the unloading sump in the final inspection due to effluent not washed/hosed down.

Photo 1 Floatables on the Waverley stock truck wastes Pond 1, February 2016

2.2. Physical, chemical and bacteriological sampling

A late summer assessment of the impact of the WWTP's effluent discharge on the receiving waters of an unnamed tributary of the Wairoa Stream was performed on 29 February 2016 during overcast, calm weather, and low flow conditions after a dry summer period. The sampling sites' locations are shown in Figure 1 and listed in Table 2.

Table 2 Sampling site locations for the Waverley oxidation ponds system

No.	Site	Location	GPS reference	Site code
2	Unnamed tributary of the Wairoa Stream	Upstream of confluence with the WWTP discharge receiving waters	1739148 E 5596620 N	WRO 000069
OP	Oxidation pond effluent	At outfall to stream	1739140 E 5596588 N	OXP 002005
4	Unnamed tributary of the Wairoa Stream	Approximately 400 m downstream of the WWTP discharge (Waverley Beach Road)	1739367 E 5596322 N	WRO 000077
5	Wairoa Stream	Outlet of Ihupuku Swamp approximately 3 km d/s of discharge (Beach Road)	1739402 E 5593780 N	WRO 000150

Site 2 is located upstream and site 4 downstream of the WWTP discharge.
Site 5 has been established to provide an indication of the overall impact of the discharge on the Wairoa Stream in its mid reaches after seepage through the extensive wetlands (i.e. the 9 hectare Ihupuku Swamp) which characterises this drainage system.

Figure 1 Aerial location map of sites in relation to Waverley WWTP

The results of the survey are summarised in Table 3. All analyses were performed in the Council's laboratory using standard methods.

Table 3 Results of the sampling survey of 29 February 2016

Site		2	OP	4	5
Location		Upstream	Discharge	Downstream	
Parameter	Unit	WRO000069	OXP002005	WRO000077	WRO000150
Time	NZST	0905	0915	0945	1005
Flow	l/s	12	0.25	21	-
Temperature	°C	17.4	21.9	17.1	19.1
Dissolved oxygen	g/m^3	9.0	2.4	7.9	3.1
DO saturation	%	95	28	83	34
BOD_5	g/m^3	1.9	23	2.5	1.4
BOD_5 (filtered carbonaceous)	g/m^3	<0.5	5	<0.5	0.5
pH	pH	7.7	8.8	7.6	7.3
Conductivity @ 20°C	mS/m	29.4	54.6	32.6	30.7
Chloride	g/m^3	35.8	69.4	40.2	39.9
Dissolved reactive phosphorus	g/m^3 P	0.013	3.57	0.087	0.053
Ammonia-N	g/m^3 N	0.075	0.528	0.056	0.008
Un-ionized ammonia	g/m^3 N	0.00146	0.00025	0.00085	0.00007
Suspended solids	g/m^3	35	67	32	27
Turbidity	NTU	20	59	21	15
Black disc	m	0.46	-	0.49	0.74
Faecal coliform bacteria	nos/100 ml	700	31,000	4,200	680

The flow rate in the small tributary receiving the oxidation pond's effluent upstream of the WWTP discharge was gauged at 12 L/s.

2.2.1. Effluent quality

The results of the effluent quality analytical survey performed in late February 2016 are summarised and compared with historical data from past surveys in Table 4.

Table 4 Results from the survey in the 2015-2016 period and data from Waverley WWTP (second section) effluent analyses recorded for the period 1987 to 30 June 2015

Parameter	Unit	2015-2016 Survey	Past data (1987-2015)		
		29 Feb 2016	No of samples	Range	Median
Dissolved oxygen	g/m^3	2.4	86	0.9-21.0	6.8
DO saturation	%	28	80	10-227	68
BOD_5 (total)	g/m^3	23	26	11-66	29
BOD_5 (filtered)	g/m^3	5.0	22	2.2-11	5.3
pH	pH	8.8	27	7.7-9.5	8.2
Conductivity @ 20°C	mS/m	54.6	28	43.3-68.7	58.8
Ammonia-N	g/m^3 N	0.528	28	0.10-26.2	4.69
Dissolved reactive phosphorus	g/m^3 P	3.57	27	1.52-7.98	5.93
Suspended solids	g/m^3	67	26	11-220	62
Turbidity	NTU	59	23	5 -210	28
Faecal coliform bacteria	nos/100 ml	31,000	28	100-91,000	6,950

Note: With the exception of DO results, historical data were recorded mainly from summer surveys.

The effluent quality (Table 4) from the reconfigured pond system was relatively typical of the range expected from municipal oxidation pond wastes. On this occasion quality was very similar to or slightly better than median DRP level, pH, conductivity, and total and filtered BOD_5. Turbidity and suspended solids levels were slightly higher than the previous median and this was coincident with a high microfloral population density in late summer in the pond. The quality was typical to better than typical of the effluent from a biological treatment system receiving essentially domestic wastes, as emphasised by the relatively 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.

2.2.2. Impacts on receiving waters

A low discharge rate of 0.25 L/s (900 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 12 L/s. Flow measurements at the time of the survey indicated an instantaneous effluent dilution ratio of around 48:1 in the receiving waters.

Upstream water quality (at site 2) was generally relatively good, with a dissolved oxygen saturation of 95%, moderate level of dissolved reactive phosphorus and ammonia-N nutrients and a low filtered BOD_5, although there were slightly elevated turbidity and suspended solids, and low black disc clarity as a result of easily disturbed fine sediment amongst the vegetation on the stream bed. However, there was an elevated faecal coliform bacteria count, indicative of possible stock and/or wildlife access upstream.

Due to the moderately high 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 dissolved reactive phosphorus, turbidity, and biochemical oxygen demand but not in suspended solids or ammonia concentrations, There was also a small decrease (of 13%) in dissolved oxygen saturation. Faecal coliform bacteria increased quite significantly due to the very high level in the discharge on this occasion. The relatively small variation in water quality was a consequence of a high dilution ratio, 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 similar to the number at the upstream 'control' site 2. The BOD_5 concentration, suspended solids and turbidity were reduced to slightly lower levels than those recorded at the upstream 'control' site while ammonia concentration was 90% lower. Black disc visibility was better than the equivalent value at the upstream 'control' site.

2.3. Biological monitoring

2.3.1. Microflora of the pond system

Pond microflora are very important for the stability of the symbiotic relation with aerobic bacteria within the facultative pond. These phytoplankton may be used as a bio-indicator of pond conditions (e.g. 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.

The microflora present in the secondary oxidation pond have been summarised and discussed in recent annual reports and historical data have been provided in a previous annual report (TRC, 2009).

Samples of the secondary pond effluent were collected on all three inspection occasions for chlorophyll-a analyses. Chlorophyll-a concentration can be used as 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 changes in algal populations

and also dilution by stormwater infiltration might be expected to occur in any wastewater treatment system which together with fluctuations in waste loading would result in chlorophyll-a variability.

The results of secondary pond effluent chlorophyll-a analyses and historical data are provided in Table 5 together with field observations of pond appearance.

Table 5 Chlorophyll-a measurements from the surface of the Waverley secondary oxidation pond at the perimeter adjacent to the outlet

Date	Time NZST	Appearance	Chlorophyll-a (mg/m^3)	Chlorophyll-a (mg/m^3) data for period 2013-mid 2015		
4 August 2015	0935	clear, pale green	540	N	Range	Median
29 February 2016	0915	turbid, dark green	568	6	144-1,100	235
24 May 2016	1010	turbid, dark green-brown	383			

Moderate to high concentrations were recorded on all sampling occasions. These did not seem to relate to dissolved oxygen saturation levels (117, 28, and 93% respectively).

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 the consent holder. During the year matters may arise which require additional activity by the Council, for example provision of advice and information, or investigation of potential or actual courses of non-compliance or failure to maintain good practices. A pro-active approach that in the first instance avoids issues occurring is favoured.

The Council operates and maintains a register of all complaints or reported and discovered excursions from acceptable limits and practices, including non-compliance with consents, which may damage the environment. The incident register includes events where the consent holder 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 2015-2016 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.

2.5. Discussion

2.5.1. Discussion of performance

The Waverley WWTP was well maintained and operated, and performed satisfactorily throughout the monitoring period following the relatively recent 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 (late 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 similar to upstream levels.

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

2.5.2. Environmental effects of exercise of water permit

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.

Under low receiving water flow conditions, dilution of the low discharge rate was more than adequate at the time of the summer receiving water survey. 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.

2.6. Evaluation of performance

A tabular summary of STDC's compliance record for the year under review is set out in Table 6 for the WWTP system and Table 7 for the stock truck effluent disposal system.

Table 6 Summary of performance for consent 0072-2

Purpose: ***Discharge of treated municipal wastewater to water***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Operational and maintenance requirements	Inspections and sampling of system	Yes
2. Trade wastes connections	Liaison with consent holder	Yes
3. Limits on receiving water effects	Inspections and physicochemical sampling	Yes
4. Optional review provision re environmental effects	Consent expired in June 2016	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**
Overall assessment of administrative performance in respect of this consent		**High**

N/A = not applicable

During the year, STDC demonstrated a high level of environmental and administrative performance with the resource consent for the municipal wastewater treatment system.

Table 7 Summary of performance for consent 6621-1

Purpose: ***Discharge of treated stock truck wastewater to land***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Best practicable option	Inspections	Yes
2. Limits on receiving water quality	Inspections	N/A (no discharge)
3. Limits on receiving water effects	Inspections	N/A (no discharge)
4. Design and maintenance	Inspections	Yes
5. Optional review provision	No further option for review prior to expiry	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**
Overall assessment of administrative performance in respect of this consent		**High**

N/A = not applicable

During the year, STDC demonstrated a high level of environmental and administrative performance with the resource consent for the stock truck wastewater disposal system. Maintenance was required in relation to windblown refuse on the ponds, but this was addressed in a timely and satisfactory manner by STDC.

2.7. Recommendations from the 2014-2015 Annual Report

In the 2014-2015 Annual Report, it was recommended:

1. That monitoring of the Waverley oxidation pond and stock truck wastewater treatment disposal systems be performed for the 2015-2016 period by continuation of an appropriate monitoring programme similar in format to the programme undertaken during the 2014-2015 period.

This recommendation was subsequently adopted and all aspects of the 2015-2016 programme were performed as formulated for both consents.

2.8. Alterations to the monitoring programme for 2016-2017

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

- the extent of information made available by previous authorities;
- its relevance under the RMA;
- its obligations to monitor emissions/discharges and effects under the RMA; and
- to report 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 emitting to the atmosphere/discharging to the environment.

It is proposed that for 2016-2017 the programme remains unchanged from that of 2015-2016.

2.9. Recommendation

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.

3. 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). 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). Upgrades to the system were completed by late May 2008.

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.

3.1. Inspections

In accordance with the monitoring programme for the Kaponga WWTP system, three inspections were performed on 17 September 2015, 1 March and 16 May 2016. The physical features of the system were recorded and the surface dissolved oxygen concentration in the second section of the pond was measured adjacent to the effluent outlet grid. The results are presented in Table 8. Chlorophyll-a samples were also collected from the same site on each inspection visit for on-going assessments of system performance. These results are discussed in section 3.3.2.

Table 8 Dissolved oxygen measurements from the surface of the second section of the Kaponga oxidation pond adjacent to the outfall

Date	Time	Temperature	Dissolved Oxygen	
			Concentration	Saturation
	NZST	°C	g/m^3	%
17 September 2015	0925	13.4	4.3	43
1 March 2016	0830	20.5	8.6	98
16 May 2016	0945	14.6	7.9	80

As dissolved oxygen can vary seasonally, but also on a daily basis (with minimum concentrations recorded in early daylight hours), sampling times have been standardised toward early to mid-morning for comparative purposes. Marked variability in dissolved oxygen levels is typical of biological treatment pond systems. Aerobic conditions were recorded on all sampling occasions. High, often supersaturated, dissolved oxygen levels have been a feature of this WWTP in the past reflecting the photosynthetic contribution of the system's (often extensive) algal populations. The cyanobacteria algal taxon, *Microcystis* has been very abundant in the pond system in the past during these periods. This was emphasised by moderate to high saturation recorded on the three inspection occasions (although supersaturation was not recorded) despite the relatively early time of day. The appearance of the ponds

was noted as being turbid on all occasions, with variations in colour from brown to bright green in summer then a light green-brown in autumn.

No significant odours were recorded adjacent to the ponds during the monitoring period. All inspections were conducted during light wind conditions, with both ponds' surfaces flat or only slightly disturbed (rippling) by the wind. Large numbers of ducks were recorded on both ponds on all occasions.

The surrounds were maintained in a tidy condition (by grazing sheep) and the wavebands were always tidy. The effluent grill outlet was clear of debris on all monitoring inspections and effective at preventing surface algal bloom accumulations being discharged in the effluent. The estimated effluent discharge rate to the Kaupokonui River varied from 0.25 L/s to 2.0 L/s, with no visual impact observed on the receiving waters of the river on any occasion. It was noted in the inspection undertaken in March that the fenced riparian margin downstream of the ponds system required replanting in some areas.

3.2. Physical, chemical and bacteriological monitoring

3.2.1. Summer receiving water quality survey

An early autumn low flow assessment of the impact of the WWTP's effluent discharge on the receiving waters of the Kaupokonui River was performed on 1 March 2016, eight days after a significant river fresh. 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 524 L/s upstream of the discharge. The flow of 809 L/s recorded in the lower reaches of the river (TRC Glenn Road recorder) was well below the average February mean monthly flow (1,550 L/s) and only slightly above the minimum February mean monthly flow (683 L/s) for the period 1978 to 2015. This sampled flow was toward the lowest of the range of the flows recorded at the times of the previous twenty years' low flow surveys. The sampling sites' locations are listed in Table 9 and shown in Figure 2.

Table 9 Sampling site locations for Kaponga WWTP

No.	Location	Location	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 2 Aerial location map of sites in relation to Kaponga WWTP

The results of the low flow survey are summarised in Table 10. All analyses were performed in the Council's laboratory using standard methods.

Table 10 Results of the Kaupokonui River receiving water sampling survey 1 March 2016

	Site	U	OP	D1	D2
	Location	Upstream	Discharge	Downstream	
Parameter	Unit	KPK000500	OXP002004	KPK000520	KPK000550
Time	NZST	0815	0830	0850	-
Flow	l/s	524	0.25*	-	-
Temperature	^{o}C	15.9	20.5	16.1	16.1
Dissolved oxygen	g/m^3	10.0	8.6	10.1	10.0
DO saturation	%	104	98	105	104
BOD_5	g/m^3	<0.5	26	<0.5	<0.5
BOD_5 (filtered)	g/m^3	<0.5	2.3	<0.5	0.5
pH	pH	8.0	9.9	8.0	7.9
Conductivity @ 20^{o}C	mS/m	7.9	21.4	7.8	7.8
Chloride	g/m^3	7.6	29.1	7.9	8.1
Dissolved reactive phosphorus	g/m^3 P	0.009	0.234	0.008	0.007
Ammonia-N	g/m^3 N	0.006	0.033	0.006	0.006
Un-ionised ammonia	g/m^3N	0.00021	0.03065	0.00021	0.00017
Nitrate-N	g/m^3N	0.07	<0.01	0.07	0.06
Turbidity	NTU	0.34	240	0.56	0.67
Suspended solids	g/m^3	<2	120	<2	<2
Black disc	m	4.18	-	4.11	3.71
Faecal coliform bacteria	nos/100 ml	280	3,500	360	260
Appearance		clear, tannin brown	turbid, bright green	clear, tannin brown	-

Note: * = flow estimate

3.2.1.1. Effluent quality

The effluent quality (Table 10) was relatively typical of a well-performing municipal oxidation pond system for this time of the year and receiving minimal industrial waste loadings with low BOD_5 and nutrient levels coincident with a high microfloral population density in the pond typical of late summer conditions. This contributed to the colour and moderate turbidity and suspended solids concentration, with elevated pH due to algal photosynthetic activity as evidenced by the relatively high dissolved oxygen level which was 98% saturated. Nutrient levels were lower than typical of a treatment system of this nature. There was a low filtered BOD_5 level in the treated wastewater and the faecal coliform bacterial number was relatively low coincident with the moderate algal population in the pond.

Table 11 Ranges of selected results of Kaponga WWTP (second section) effluent analyses recorded for the period 1987 to 30 June 2015

Parameter	Unit	No of samples	Range	Median
Flow	L/s	38	<1-50	2.0
Dissolved oxygen	g/m^3	85	1.4 -19.2	10.3
DO saturation	%	82	17 -228	104
BOD_5	g/m^3	27	12 -140	24
BOD_5 (filtered)	g/m^3	23	<1-5.8	1.8
pH	pH	28	7.4-10.6	9.6
Conductivity @ 20°C	mS/m	31	15.5-30.3	20.4
Ammonia-N	g/m^3 N	27	0.005-2.09	0.023
Dissolved reactive phosphorus	g/m^3 P	27	<0.003-2.81	1.10
Suspended solids	g/m^3	27	38-680	130
Turbidity	NTU	24	24-860	93
Faecal coliform bacteria	nos/100 ml	32	21 – 44,000	5600

Note: With the exception of DO results, data were recorded principally from summer surveys.

In comparison with past survey results (Table 11) this late summer effluent quality for most parameters was within past ranges with similar results to historical median values. There were slightly elevated pH, turbidity, and suspended solids levels, due to the high algal population. The effluent quality was considered typical of municipal oxidation pond treated wastes under late summer conditions.

3.2.1.2. Impacts on receiving waters

A very low effluent discharge rate was recorded at the discharge point into the Kaupokonui River, which was in low flow at the time of the survey. A river flow of 524 L/s gauged upstream of the outfall (with an estimated discharge of 0. 25 L/s) would have provided an estimated dilution ratio of at least 2000:1 at the time of sampling. 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 1.7% 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 10) with minimal or no increases in measured levels of pH, conductivity, suspended solids, bacteria, BOD_5, 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 only minor discolouration and minimal change in turbidity beyond the mixing zone in the river.

The river appearance was clean and clear with a tannin brown colour along the reach surveyed (Table 10), 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.

3.2.2. Receiving water compliance surveys

Special conditions 11 and 12 of the consent require receiving water physicochemical monitoring of compliance with specified limits set on the Kaupokonui River at the boundary of the (50 m) mixing zone. This aspect of receiving water sampling was performed on two additional inspection occasions to that of the low flow survey.

3.2.2.1. Survey of 17 September 2015

Sampling was performed under steady recession river flow conditions (2.98 m^3/s at Glenn Road recorder) five days after the most recent river fresh (three times median flow). Results of this survey are presented in Table 12.

Table 12 Results of the Kaupokonui River receiving water compliance survey of 17 September 2015

	Site	U	D1	Consent limits
	Location	Upstream	Downstream	
Parameter	Unit	KPK000500	KPK000520	
Time	NZST	0915	0955	
Temperature	˚C	9.5	10.1	
BOD_5 (carbonaceous filtered)	g/m^3	0.6	<0.5	>2.0
pH	pH	7.6	7.6	
Ammonia-N	g/m^3N	0.005	0.015	
Unionised ammonia	g/m^3 N	0.0004	0.00014	>0.025
Turbidity	NTU	0.78	0.85	Increase <50%
Appearance		clear, no colour	clear, no colour	

N/A = not analysed

The discharge of relatively clear, light brown effluent, estimated at 2.0 L/s, was observed to have no visual impact on the Kaupokonui River at the boundary of the permitted mixing zone in compliance with Special Condition 9. Carbonaceous filtered BOD_5 concentration was well within the limits imposed by Special Condition 11, while there was an insignificant increase in turbidity, complying with Special Condition 12 at the downstream site. Dilution of the discharge was estimated to have been at least 1500:1 in the receiving waters at the time of the survey.

3.2.2.2. Survey of 16 May 2016

Sampling was performed under low river flow conditions (0.82 m^3/s at Glenn Road recorder: minimum June monthly mean flow – 2.227 m^3/s), 34 days after the most recent river fresh (3 times median flow). The results are presented in Table 13.

Table 13 Results of the Kaupokonui River receiving water compliance survey of 16 May 2016

	Site	U	D1	Consent limits
	Location	Upstream	Downstream	
Parameter	Unit	KPK000500	KPK000520	
Time	NZST	0930	1005	
Temperature	˚C	12.6	12.6	
BOD_5 (carbonaceous filtered)	g/m³pH	<0.5	<0.5	>2.0
pH	mS/m	7.8	8.0	
Ammonia-N	g/m³ N	0.007	0.010	
Unionised ammonia	g/m³	0.00012	0.00027	>0.025
Turbidity	NTU	0.36	0.53	Increase <50%
Appearance		Clear, uncoloured	Clear, uncoloured	

The discharge of pale green-brown, slightly turbid effluent, estimated at 1.5 L/s, was observed to have no visual impact on the Kaupokonui River at the boundary of the permitted mixing zone in compliance with Special Condition 9. Carbonaceous filtered BOD_5 and un-ionised ammonia concentrations were well within the limits imposed by Special Condition 11. Turbidity was relatively low, however the increase from 0.36 upstream to 0.53 at the downstream site was just within the 50% increase allowed by Special Condition 12. Dilution of the discharges was estimated to have been in excess of 500:1 in the receiving waters at the time of the survey.

3.3. Biological monitoring

3.3.1. Biomonitoring survey

The biomonitoring survey associated with the receiving waters of the Kaupokonui River was undertaken under very low, steady recession flow conditions on 9 February 2016, at identical sites to the physicochemical survey (Figure 2). The survey was performed under very low flow conditions. Results of the biomonitoring survey are summarised in Table 14 and the report is presented in Appendix II.

Table 14 Biomonitoring results from the survey of 9 February 2016

Site	Macroinvertebrate fauna	
	Taxa numbers	MCI value
U	27	107
D1	24	106
D2	26	102

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 survey tended to be very similar to those found at the previous summer's survey and were very similar to the historical median. MCI scores indicated that the stream communities were of 'good' generic health, and 'expected' predictive conditions to those recorded in similar Taranaki ring-plain streams at equivalent altitudes from the National Park boundary. There were no significant differences among sites for MCI score. There was no visual sign or microscopic evidence of any unusual heterotrophic growths present or forming on the substrate at any site.

The survey indicated that the discharge of treated oxidation ponds wastes from the Kaponga WWTP 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.

3.3.2. Microflora of the ponds' system

Pond microflora are very important for the stability of the symbiotic relation with aerobic bacteria within the facultative pond. These phytoplankton may be used as a bio-indicator of pond conditions (e.g. cyanobacteria are often present in under-loaded conditions and chlorophyceae are present in overloaded conditions). To maintain factitive 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 secondary pond final effluent had been collected at the time of most inspections of the Kaponga WWTP for semi-quantitative microfloral assessment prior to curtailment of this component of the programme during the 2012-2013 period. The microflora present in the secondary oxidation pond have been summarised and discussed in recent annual reports and historical data have been provided in a previous annual report (TRC, 2009).

Samples of the secondary pond effluent were collected on all three inspection occasions over the 2015-2016 period for chlorophyll-a analyses. Chlorophyll-a concentration can be used as 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 changes in algal populations and also dilution by stormwater infiltration might be expected to occur in any wastewater treatment system which together with fluctuations in waste loading would result in chlorophyll-a variability.

The results of secondary pond effluent chlorophyll-a analyses and historical data are provided in Table 15 together with field observations of pond appearance.

Table 15 Chlorophyll-a measurements from the surface of the Kaponga secondary oxidation pond at the perimeter adjacent to the outlet

Date	Time NZST	Appearance	Chlorophyll-a (mg/m^3)	Chlorophyll-a (mg/m^3) data for period 2013-mid 2015		
				N	Range	Median
17 September 2015	0925	turbid, opaque brown	57	6	11-648	362
1 March 2016	0830	turbid, bright green	883			
16 May 2016	0945	turbid, green-brown	941			

Good microfloral populations were indicated by very high chlorophyll-a concentrations (the highest recorded since the completion of upgrades to the pond) in late summer and autumn, coincident with a dissolved oxygen saturation of 98% in summer. A very low concentration was found in spring following a wet weather period coincident with a moderate dissolved oxygen saturation level of 43%.

3.4. Investigations, interventions, and incidents

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

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

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

In the 2015-2016 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.

3.5. Discussion

3.5.1. Discussion of plant performance

The upgraded 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 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 high dissolved oxygen saturation levels on two occasions, but a low microfloral population (and reduction in dissolved oxygen saturation) in spring following cooler, wetter weather conditions.

3.5.2. Environmental effects of exercise of water permit

No significant impacts on the Kaupokonui River were recorded from the physicochemical parameters analysed during the early autumn survey conducted in March 2016, 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 autumn 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.

3.6. 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 0861-3

Purpose: ***To discharge treated wastewater to water***		
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 performance and compliance with the resource consent conditions.

3.7. Recommendation from the 2014-2015 Annual Report

In the 2014-2015 Annual Report, it was recommended:

1. THAT monitoring of the Kaponga oxidation pond system be continued for the 2015-2016 period by formulation of a monitoring programme similar in format to the programme undertaken during the 2014-2015 period.

This recommendation was subsequently adopted and all aspects of the 2015-2016 programme were performed as required.

3.8. Alterations to the monitoring programme for 2016-2017

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

- the extent of information made available by previous authorities;
- its relevance under the RMA;
- its obligations to monitor emissions/discharges and effects under the RMA; and
- to report 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 emitting to the atmosphere/discharging to the environment.

It is proposed that for 2016-2017, the programme remains unchanged from that of 2015-2016.

3.9. Exercise of optional review of consent

Resource consent **0861-3** provides for an optional review of the consent in June 2017. Condition 14 allows the Council to review the consent, 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.

Based on the results of monitoring in the year under review, and in previous years as set out in earlier annual compliance monitoring reports, it is considered that there are no grounds that require a review to be pursued.

3.10. Recommendation

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.

4. 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).

4.1. Background to historical performance and most recent consent renewal

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), but 230 m of pipeline had been re-lined during the 2014-2015 period (STDC, pers.comm.).

This work had been prioritised throughout the District with the Manaia component to be performed and completed by 2012. However, since the necessity for the emergency overflow pipe installation, the consent holder recognised that there was a requirement to undertake a house to house survey for stormwater faults and/or illegal cross connections into the sewerage reticulation in Manaia. This was completed and the consent holder found about a dozen properties where remedial gully trap work will be

required (STDC pers. comm., August, 2012). The property owners have been requested to remedy defects and STDC has yet to complete the follow-up inspections. No surcharging from reticulation manholes has occurred in recent years (STDC, 2013).

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.

4.2. Inspections

Four inspections of the Manaia WWTP were performed during the 2015-2016 period, on 8 September 2015, 27 January, 31 March and 30 May 2016.

During each inspection, the physical features of the pond system were recorded and the dissolved oxygen concentration was measured from the pond's surface adjacent to the effluent outlet. The results are presented in Table 17. A sample was collected during each inspection for chlorophyll-a analysis as an assessment of microfloral 'health'. The results are discussed separately in section 4.4.1.

Table 17 Dissolved oxygen measurements from the surface of the Manaia oxidation pond adjacent to the outfall

Date	Time NZST	Temperature °C	Dissolved Oxygen	
			Concentration g/m^3	Saturation %
8 September 2015	0910	11.9	2.2	21
27 January 2016	0900	24.2	0.22	2.4
31 March 2016	0830	17.3	5.0	52
30 May 2016	1045	12.7	2.0	20

As dissolved oxygen can vary seasonally, but also on a daily basis (with minimum concentrations recorded in early daylight hours), sampling times were standardised toward early to mid-morning for comparative purposes. The step screen on the influent line was operative on all inspection occasions, with wastes fully contained.

Although aerobic conditions were recorded in the pond on all sampling occasions, all surveys found low to moderate saturation, and a relatively narrow range in dissolved oxygen levels despite a wide range of pond microfloral populations (as indicated by chlorophyll-a concentrations (Section 4.4.1)). Variations in dissolved oxygen concentrations are typical of biological treatment systems in which levels may vary on both a daily and seasonal basis.

Nil to very slight odours were noted at the time of the inspections. Small patches of scum were observed on the pond surface during three of the four inspections.

Light winds to calm conditions coincided with the time of inspections, and flat to rippled surface conditions were recorded on the pond at these times.

The appearance of the pond was turbid and varied between green, grey and brown in colour. Wildlife were present during three of the four inspections, consisting of mallard and paradise ducks, black swans, and gulls.

The pond wave bands were tidy during the monitoring period and the pond surrounds generally were maintained in a tidy condition by mowing or sheep grazing.

The wetlands component was discharging to Manaia Creek during two of the four inspections. Effluent appearance was relatively clear and pale green in colour with an estimated discharge rate ranging from nil (summer and autumn) to 5 L/sec (late Autumn) and 7 L/sec (spring). Wildlife consisted of few of pukeko present on one occasion.

No visual environmental impact on the receiving water was noted during the spring inspection, however there was a noticeable visual environmental impact on the receiving water at the time of the late Autumn inspection.

No sewage fungal growths were noted in the discharge channel. No 'sewage fungus' was recorded on the streambed or amongst stream vegetation through the short distance of the stream within the mixing zone below the oxidation pond-wetland system outfall prior to discharging over the cliff to the coastal waters of the Tasman Sea.

4.3. Physical, chemical and bacteriological sampling

4.3.1. Effluent quality

A full analysis of the oxidation pond and wetlands effluent was performed on 30 May 2016; partial analyses of the wetlands effluent was performed on 8 September 2015. No wetlands analyses were performed at the time of the inspections on 27 January and 31 March 2016 as the final ponds were dry following a lengthy dry period. These results are summarised in Table 18. All analyses were performed in the Council laboratory using standard methods.

Table 18 Results of the sampling survey of the Manaia oxidation pond and wetland effluents during the 2015-2016 period

Date		8 September 2015	30 May 2016	
Site		Wetlands effluent	Oxidation pond effluent	Wetlands effluent
Parameter	**Unit**			
Time	NZST	0935	1045	1035
Temperature	°C	10.5	12.7	12.3
Dissolved oxygen	g/m^3	-	2.04	0.55
DO saturation	%	-	20	3.7
BOD_5	g/m^3	-	36	26
pH	pH	-	7.3	7.3
Conductivity @ 20°C	mS/m	30.4	42.9	47.8
Chloride	g/m^3	21.1	45.2	50.4
Ammonia –N	g/m^3 N	-	16.3	19.5
Dissolved reactive phosphorus	g/m^3 P	-	2.36	3.06
Suspended solids	g/m^3	-	54	36
Turbidity	NTU	2.2	44	40
Faecal coliform bacteria	nos/100 ml	21	21,000	1,300
Appearance		pale green	Turbid Green-brown	Slightly turbid pale green

The oxidation 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 19), late autumn oxidation pond effluent quality was similar to previous median parameters' values in terms of BOD_5, suspended solids, dissolved reactive phosphorus and faecal coliform bacteria. Ammonia-N was quite high on this occasion, well above the historical median and close to the maximum recorded. Variability in the pond's microfloral population has contributed to differences in effluent quality over the period since monitoring commenced.

Table 19 Ranges of results of Manaia WWTP effluent analyses recorded for the period 1987 to June 2015[2]

Parameter	Unit	Oxidation pond			Wetlands		
		No of samples	Range	Median	No of samples	Range	Median
Flow	L/s	34	2-50	5	13	0.3-13	6
Dissolved oxygen	g/m^3	100	<0.1-23	5.6	4	0.7-2.0	1.2
BOD_5	g/m^3	27	11-90	40	7	4-34	12
BOD_5 (filtered)	g/m^3	25	1.4-23	10	4	3.1-13	4
pH	pH	30	7.2-9.0	7.5	4	6.9-7.6	7.4
Conductivity @ 20°C	mS/m	52	25.9-56.8	32.7	14	27.5-42.6	30.6
Chloride	g/m^3	44	27.0-66.4	45.8	14	37.0-53.5	44.1
Suspended solids	g/m^3	31	8-420	86	4	3-20	10
Turbidity	NTU	45	4.3-540	20	14	2-81	8
Faecal coliform bacteria	nos/100ml	53	1200-500000	22000	14	7-9500	140
Ammonia N	g/m^3N	26	1.8-17.8	9.3	4	3.3-10.0	5.9
Dissolved reactive phosphorus	g/m^3P	27	0.45-4.89	3.02	4	0.59-2.28	1.04

Wetland effluent quality was good on 8 September 2015, with very low faecal coliforms and turbidity recorded. In the full sample analysis undertaken in May 2016, there was a marked improvement in faecal coliform numbers in comparison with the oxidation pond effluent, however these were significantly higher than the historical median. Also higher than previous medians were suspended solids, turbidity, and BOD. Both ammonia-N and dissolved reactive phosphorus were higher than the previous maximums, although it is noted that this is based on just four previous samples of each. The combined system will require more time before valid comparative assessments with historical oxidation pond performance can be provided.

4.3.2. Impacts on receiving waters

Assessments of the impact of the oxidation pond-wetlands effluent discharges on the bacteriological quality of the receiving waters of the small Manaia Creek and the nearby coastal waters of the Tasman Sea under mid-to-low tide conditions, were performed on two of the inspection visits. The sampling sites are listed in Table 20 and illustrated in Figure 3.

[2] It should be noted that the database includes a limited amount of oxidation pond effluent quality data recorded during a period (1991-1992) when problems occurred with the disposal of drilling mud wastes into the system. Seasonal and climatic conditions also account for variability in effluent quality.

Table 20 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 3 Aerial location map of sites in relation to Manaia WWTP

Sampling was performed under moderate to low stream flow conditions. Coastal sampling was timed around mid tide conditions on all of the three inspection occasions. Results are presented and discussed as follows for each of the receiving water surveys.

8 September 2015

An effluent flow of 7 L/s from the Manaia WWTP was estimated at the time of this mid tide survey under fine weather conditions. Relatively clear, uncoloured conditions were observed in the moderate flow of the receiving waters above the discharge outfall prior to the pale green flow below the outfall dispersing across the rocky shore and entering the clear, light grey coastal seawater. No 'sewage fungus' was observed on the

stream bed over the short distance below the outfall prior to the cliffs under moderate flow conditions.

Table 21 Results of the receiving waters survey of 8 September 2015 (high tide: 5:37 NZST)

Site		U	Wetlands	D1	SE	SW
		Upstream	Discharge	Downstream	Coastal	
Parameter	**Unit**					
Time	NZST	0930	0935	0940	1000	1000
Temperature	^{o}C	11.8	10.5	11.6	12.2	12.3
Conductivity @ 20^{0} C	mS/m	42.0	30.4	40.2	4,510	4,480
Chloride	g/m^{3}	34.0	21.1	31.8	-	-
Turbidity	NTU	2.0	2.2	1.8	-	-
Faecal coliform bacteria	nos/100ml	310	21	430	<2	2
Appearance		clear, uncoloured	clear, pale green	clear, pale green	clear, light grey	clear, light grey

Wetland effluent quality had good bacteriological quality (Table 21) when compared to the median and the range of oxidation pond effluent quality previously measured (Table 19) and was clearer in terms of median turbidity as might be expected of a wetlands polished wastewater. Bacteria numbers were relatively high (for a stream) upstream of the discharge and the effluent, with good bacteriological quality, was probably not entirely responsible for the increase in bacteria numbers found 10 m downstream of the outfall. The pale green effluent resulted in pale green colouring of the stream downstream of the discharge.

No impact on seawater faecal coliform bacterial quality was found at either coastal site, with very low levels of faecal coliforms detected. Both sites' bacterial numbers were well within the guidelines for recreational shellfish-gathering (median of 14 per 100 ml and 90% of samples < 43 per 100 ml (MfE/MoH, 2003)) at the time of this survey.

27 January and 31 March 2016

No assessment of the impact of the wetlands effluent discharge on the receiving waters was able to be performed on 27 January or 31 March 2016, due to very low wetlands levels and therefore no discharge to the Manaia Creek (see earlier).

30 May 2016

A further assessment of the impact of the wetlands effluent discharge (estimated at 5 L/s) on the receiving waters was performed on 30 May 2016, following recent wet weather. There was a noticeable visual impact of the turbid discharge entering the previously clear receiving waters prior to the stream dispersing across the rocky shore and into the turbid, grey coastal seawater near low-tide. No 'sewage fungus' was observed on the stream bed over the short distance below the outfall. Results from this survey are presented in Table 22.

Table 22 Results of the receiving waters survey of 30 May 2016 (low tide: 9:58 NZST)

Site		U	Wetlands	D1	SE	SW
		Upstream	Discharge	Downstream	Coastal	
Parameter	**Unit**					
Time	NZST	0940	1035	0950	1020	1015
Temperature	^{o}C	11.8	12.3	12.0	14.8	14.3
Conductivity @ 20^{0} C	mS/m	36.1	47.8	41.9	4,320	4,270
Chloride	g/m^{3}	46.8	50.4	47.5	-	-
Turbidity	NTU	2.5	40	21	-	-
Faecal coliform bacteria	nos/100ml	490	1,300	860	33	22
Appearance		clear, uncoloured	slightly turbid, pale green	turbid	turbid, grey	turbid, grey

Wetland effluent quality, in terms of the parameters analysed, was poor in relation to bacteriological quality and turbidity when compared to the median and the range of oxidation pond effluent quality previously measured (Table 19). There was a large increase in bacteria number found 10 metres downstream of the outfall as a result of the poor effluent bacterial quality. The relatively turbid effluent caused a notable visual deterioration, with a moderate increase in the turbidity of the stream downstream of the discharge.

Slightly elevated levels of faecal coliform bacteria were found at the two sites either side of the mouth of the stream. No significant adverse effects were observed in the coastal waters, and it is possible that any localised impact in the discharge could also have been attributed to the existing high bacteriological levels upstream of the discharge point, which were likely related to recent wet weather and high flow in the stream.

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 the first of the two occasions in the monitoring period when a discharge was monitored, with low numbers of faecal coliform bacteria in the discharge and no increase in turbidity downstream. A noticeable visual impact was observed in May, 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' 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 performed in the monitoring period all samples were within the < 43 per 100 ml exceedance guideline value, while the median guideline for shellfish gathering was exceeded at both of the sites either side of the stream mouth during the late autumn survey. Whilst 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. A summary of the seawater bacteriological water quality monitoring data gathered during the period prior to the upgrade of the Manaia WWTP is provided in Table 23. Data collected since the addition of the wetlands component of the system are also summarised in this table.

Table 23 Summary of faecal coliform bacteria data for the two Tasman Sea sites for the period June 1999 to June 2016 in relation to the discharge of Manaia WWTP treated wastewater

Period	Site	No of samples	Range (nos/100 ml)	Median (nos/100 ml)	% of samples > 43/100 mls
Pre-upgrade (to July 2009)	SEA905086 (SE) SEA905080 (SW)	32 32	<2-400 <2-1,300	19 8	34 28
Post upgrade (since January 2010)	SEA905086 (SE) SEA905080 (SW)	16 16	<2-240 <2-23	8 2	6 0
All data	SEA905086 (SE) SEA905080 (SW)	48 48	<2-400 <2-1,300	11 6	25 19

The sampling frequency has been relatively limited to date and does not consider other relevant information such as the frequency of usage of these sites for food gathering purposes and natural background seawater bacteriological water quality in the vicinity. Both sites' bacteriological quality for the 17 year period are within the median guideline. However, more than 10% of samples (19 to 25%) have exceeded the upper limit to date. Some of these results could be expected to have resulted from the impacts of preceding wet-weather run off from nearby catchments (including the Waiokura Stream) entering coastal waters, while others could be due to poor Manaia Creek bacteriological water quality in general. Longer term compliance with the relevant guidelines will continue to be addressed by the receiving water bacteriological component of the monitoring programme. The upgrade of the system (addition of wetlands) has also focused on issues required for a marked improvement in the bacteriological quality of the treated wastewater discharge and subsequent coastal receiving water monitoring will continue to asses this performance. To date, only one exceedance of the upper limit and much reduced exceedances of the median limit at both sites have occurred since the wetlands tertiary waste treatment component has been operative.

4.4. Biological monitoring

4.4.1. Microflora of the pond system

Pond microflora are very important for the stability of the symbiotic relation with aerobic bacteria within the facultative pond. These phytoplankton may be used as a bio-indicator of pond conditions e.g. 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 pond effluent had been collected at the time of most inspections of the oxidation pond system for semi-quantitative microfloral assessment prior to curtailment of this component of the programme during the 2012-2013 period. The microflora present in the final cell of the secondary oxidation pond have been summarised and discussed in recent annual reports and historical data have been provided in a previous annual report (TRC, 2009).

Samples of the primary pond effluent were collected on all three inspection occasions in the 2015-2016 period for chlorophyll-a analyses. Chlorophyll-a concentration can be used as 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 changes in algal populations and also dilution by stormwater infiltration might be expected to occur in any wastewater treatment system which together with fluctuations in waste loading would result in chlorophyll-a variability.

The results of primary pond effluent chlorophyll-a analyses and historical data are provided in Table 24 together with field observations of pond appearance.

Table 24 Chlorophyll-a measurements from the surface of Manaia oxidation pond at the perimeter adjacent to the outlet

Date	Time NZST	Appearance	Chlorophyll-a (mg/m^3)	Chlorophyll-a (mg/m^3) data for period 2013-mid 2015		
				N	Range	Median
8 September 2015	0910	turbid, light green-grey	33	6	46 – 1,460	361
27 January 2016	0900	turbid, grey	493			
31 March 2016	0830	turbid, dark green	2,850			
30 May 2016	1045	turbid, green-brown	404			

The early spring 2015 level was very low following colder, wet weather conditions. However, the presence of good microfloral pond population was indicated by relatively high chlorophyll-a concentrations on two occasions (404 and 493 mg/m^3) and an extremely high level recorded in autumn 2016.

4.4.2. Beach ecological inspections

The monitoring programme for the 2015-2016 period required one beach ecological inspection to be performed. This survey was performed in June 2016. The inspection was conducted to provide qualitative assessments 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 III, and discussed below.

June 2016 survey

A marine ecological inspection of the foreshore in the vicinity of the discharge from the Manaia oxidation pond-wetland system was performed on 9 June 2015 commencing at 1115 NZST. Low tide on this day was at 1143 NZST at a height of 0.7 m above chart datum.

At the time of the inspection it was not possible to view the discharge point from the oxidation pond-wetland system due to high winds creating excessive spray from the waterfall. The area surrounding the discharge channel had been fenced, and the Manaia Creek was in high flow during the inspection.

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.

Enteromorpha intestinalis was evident along the length of the stream, although the cover was notably less dense than observed during previous surveys. 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. The diversity and abundance of intertidal communities away from the influence of the stream was typical of that found at other reef sites around Taranaki

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 the consent holder. During the year matters may arise which require additional activity by the Council, for example provision of advice and information, or investigation of potential or actual courses of non-compliance or failure to maintain good practices. A pro-active approach that in the first instance avoids issues occurring is favoured.

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

Complaints may be alleged to be associated with a particular site. If there is potentially an issue of legal liability, the Council must be able to prove by investigation that the

identified company is indeed the source of the incident (or that the allegation cannot be proven).

In the 2015-2016 period, the Council was required to undertake an additional investigation in association with STDC's conditions in resource consents or provisions in Regional Plans.

Early in 2016, following several months of lower than expected effluent levels and the absence of a discharge, the wetlands at the Manaia plant were discovered to be leaking. Seepage was observed during an inspection of the coastal area by Council staff (Photo 2). Samples were collected at three sites along the shoreline parallel to the wetland location (Figure 4), and the results of bacteriological analyses are presented in Table 25. The cliff side wetland was then taken out of service and an investigation for remedial actions was carried out by STDC to determine if any physical works were required.

In July 2016, STDC advised the Council that lining of the cliff side wetland would be carried out in the upcoming year, based on the results of an investigation into available options that is still ongoing. Following this work, the wetland will be reinstated back into the treatment plant.

Table 25 Bacterial analysis of cliff seepage from below the Manaia wetlands

Date	Site	Time NZST	Temperature °C	Faecal coliforms /100ml
27 January 2016	Site A	1010	20.1	1,100
	Site B	0945	20.1	78
	Site C	1000	19.7	730

Figure 4 Sample sites in relation to wetland seepage at the Manaia oxidation ponds

Photo 2 Collecting samples of the cliff seepage in January 2016

4.6. Discussion

4.6.1. Discussion of performance

The Manaia WWTP was generally well maintained and operated throughout the monitoring period. The wetlands were found to be leaking during 2015-2106 with seepage apparent on the cliffs below. Follow up investigations found low-moderate bacteriological levels in the seepage, and work was undertaken by STDC to repair the wetland.

The performance of the oxidation pond showed typical seasonal variability, with aerobic conditions occurring throughout the monitoring period although dissolved oxygen levels were on the low side (in comparison with the historical median).

Wetlands effluent surveys which have been conducted since completion of the upgrade, have shown wastewater parameter concentrations far lower than historical median oxidation pond values. In terms of the extensive previous monitoring data, it can be concluded that the pond continues to perform adequately and that the addition of the wetlands has markedly 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 during the current season have indicated good microfloral health in the aerobic oxidation pond on all but one occasion (following wet and cold winter weather). 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.

4.6.2. Environmental effects of exercise of water permit

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, while some impacts were apparent 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. (Note: Background investigations of the upstream water quality of Manaia Creek have been delayed by drought conditions over the 2012-2013, 2014-2015 and 2015-2016 summer-autumn periods). Notwithstanding this factor, monitoring over the 2015-2016 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 late autumn.

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 maximum number of

bacteria, while the median guideline for shellfish gathering was exceeded at both of the sites either side of the stream mouth during the late autumn survey. 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 2016) found that whilst there were localised, significant effects on marine species within the vicinity of the stream, the diversity and abundance of intertidal communities away from the influence of the stream was typical of that found at other reef sites around Taranaki.

4.7. Evaluation of performance

A tabular summary of STDC's compliance record for the year under review is set out in Table 26 for the recently renewed consent.

Table 26 Summary of performance for consent 1204-4

Purpose: ***To discharge treated wastewater to water***		
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)	Majority of times
11. Monitoring provisions	Performance of tailored programme	Yes
12. Implementation of infiltration programme	Reporting by consent holder	Yes
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 Overall assessment of administrative performance in respect of this consent		**High** **High**

[Note: N/A = not applicable]

During the year, STDC demonstrated a high level of environmental and administrative performance with the resource consent conditions.

There was a continuation of the improvement in the level of environmental performance in terms of localised impacts on the receiving waters of the Manaia Creek and the coastal waters of the Tasman Sea. In particular bacteriological issues have been addressed by the conditions of the renewed consent and the requisite upgrade of the wastewater treatment plant, although some investigations into the water quality of the Manaia Creek may be warranted upstream of the wetlands discharge in relation to other possible issues. The discovery of a leak in the cliff side wetland was followed up by the consent holder, who addressed the matter in an appropriate and timely manner.

4.8. Recommendations from the 2014-2015 Annual Report

The recommendations from the 2014-2015 Annual Report for the Manaia wastewater treatment system monitoring programme were:

1. THAT monitoring of the Manaia wastewater treatment system be continued for the 2015-2016 period by formulation of an appropriate monitoring programme similar in format to the programme undertaken during the 2014-2015 period.

2. THAT the consent holder liaise with the Council with respect to any proposed industrial waste discharges to the system in order that potential impacts may be assessed and if necessary, additional monitoring requirements formulated.

3. THAT the consent holder liaise with the Council should overloading of the sewerage reticulation occur in such a manner that there may be a likelihood of an unauthorised discharge to natural water.

4. THAT the reporting required by Special Condition 12 of consent 1204 shall be supplied to the Council by 30 June 2016.

5. 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 2015-2016 period.

Recommendation 1 was subsequently adopted and most aspects of the programme were performed. Recommendations 2 to 4 were satisfied and the investigations in Recommendation 5 were deferred for further consideration of usage of DNA marker investigations to the 2017-2018 period.

4.9. Alterations to the monitoring programme for 2016-2017

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

- the extent of information made available by previous authorities;
- its relevance under the RMA;
- its obligations to monitor emissions/discharges and effects under the RMA; and
- to report 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 emitting to the atmosphere/discharging to the environment.

It is proposed that for 2016-2017 the programme remains similar to that of 2015-2016. The frequency of beach ecological surveys is to be reduced from a spring and summer survey to the summer survey only. The recommendation from the previous annual report regarding water quality of the Manaia Creek and/or the usage of DNA marker investigations is proposed to be carried out in the 2016-2017 year, although this work will be reliant on the availability of sufficient flow in both the stream and discharge from the wetland, to be carried out.

4.10. Exercise of optional review of consent

Resource consent **1204-4** provides for an optional review of the consent in June 2017. Condition 14 allows the Council to review the consent, 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.

Based on the results of monitoring in the year under review, and in previous years as set out in earlier annual compliance monitoring reports, it is considered that there are no grounds that require a review to be pursued.

4.11. Recommendations

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.

5. Patea WWTP

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. 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.

5.1. 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.

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 monitored in the 2015-2016 period.

5.1.1. Upgrade of the system

The WWTP upgrade (required by Special Condition 1 of the renewed consent) comprised the division of the single pond into three partitions, (one of which required lining), repair of the pond wavebands, desludging of the main pond, upgrading of both the pond and emergency outfalls with rock diffusers, and provision of a new step screen on the main influent line to the pump station.

The upgrade commenced in early 2007 with lowering of the pond wastewater level by removal of the outlet weir. The proposed configuration of the pond was altered as a consequence of geotechnical investigations into the integrity of the principal section of the pond. This also required the relocation of the (pumped) inlet to the system, and a delay in the completion date, necessitating a variation to the consent which subsequently was granted toward the end of the 2006-2007 period.

By June 2007 the pond had been partitioned, the inlet relocated and the pond diffuser outlet upgraded but the normal pond level had not been reinstated. Desludging of the pond was also delayed by the issue of community concerns with the location of the disposal site. Desludging was subsequently performed in the 2007-2008 period, with the sludge pumped to a lined bunded area within the first section of the pond and covered with polythene. Consent for removal of this sludge to a suitable land disposal site was granted late in the 2012-2013 period, with sludge disposal planned for later in 2013 (STDC, 2013). By the end of April 2008 the pond system upgrade was complete with the exception of the lining of the first pond which remained empty. A geotextile liner was used in this pond as not all the sludge was dried out on the base of the pond as intended by the time the liner was installed (July 2008). Flow metering at the outlet weir was installed in July 2007.

All other upgrade work (York Street screening facility, wave band repairs, flow meter on the outlet weir, pond outlet diffuser and rock rip-rap, and new emergency outlet and rock rip-rap) was completed by May 2008 at which time the final pond was filling to operational level.

Infiltration/inflow pipe rehabilitation work was undertaken on the reticulation, following investigations that were performed in 2013-2014. The resultant faults were incorporated into repair worked programmed over the next three years with 372m of pipeline re-lined during the 2014-2015 period (STDC; pers.comm)

No alteration has been made to the capacity of the rising main from the York Street pump station to the WWTP but there is provision for a new or duplicate main should emergency overflows exceed consent conditions (STDC, 2013).

5.1.2. Stakeholders' meeting

Special condition 15 of consent 0145 requires a meeting to be held with interested submitters to the consent at least every three years.. The most recent meeting was scheduled for the 2015-2016 period, however this was cancelled due to no interest from submitters following notification by STDC.

5.2. Inspections

5.2.1. Pond system

In accordance with the monitoring programme for the Patea WWTP, three inspections were performed during the monitoring period, on 26 August 2015, and 26 January and 2 June 2016. The physical features of the three pond cells (Photo 3) were recorded and the dissolved oxygen concentration was measured from the final cell's surface adjacent to the effluent outlet. The results are presented in Table 27. In addition, a sample was collected from the final cell during each inspection for chlorophyll-a analyses with these results discussed in section 5.4.

Table 27 Dissolved oxygen measurements from the surface of the Patea oxidation pond tertiary cell adjacent to the outlet

Date	Time NZST	Temperature °C	Dissolved Oxygen	
			Concentration g/m^3	Saturation %
26 August 2015	0930	11.1	3.9	35
26 January 2016	0800	25.8	7.1	87
2 June 2016	1130	10.4	13.6	122

As dissolved oxygen can vary seasonally, but also on a daily basis (with minimum concentrations recorded in early daylight hours), sampling times have been standardised toward early to mid-morning for comparative purposes.

Aerobic conditions were recorded on all occasions with dissolved oxygen levels within the range expected for this type of biological treatment system. During the current monitoring period considerable variability (35 to 122% saturation) was recorded for dissolved oxygen. This variation was typical of ranges recorded in previous monitoring years (although much narrower ranges have been recorded in the previous few years). A super-saturated concentration was recorded on one occasion in early winter, with the lowest concentration recorded in late winter/early spring. The pond cells operated at normal levels during the year after completion of the upgrade of the wastewater treatment system some seven years earlier (Photo 15).

5.2.1.1. First and second cells

Surface conditions in the first and second cells were flat to rippling due to light to moderate wind conditions at inspection times. The cell wastewater appearance varied from pale green and relatively clear (late winter) to turbid green-brown (summer and early winter). There were only slight odours recorded on any occasion adjacent to or downwind of this cell. The surrounds were maintained in tidy condition by mowing and weeds were sprayed. The cell's surface was free of debris/floatables with no floating scum around the perimeter. Wildlife comprised moderate to high numbers of mallard or paradise ducks on each occasion along with several black swans. Teal and scaup ducks were noted in the June inspection.

5.2.1.2. Final (tertiary) cell

Surface conditions on this, the final of the three re-configured cells, ranged from flat to light rippling under light wind conditions on inspection occasions. The cell wastewater appearance varied from pale green and relatively clear (late winter/early spring), to turbid dark green-brown (summer), to dark green (late autumn/early winter). There were no odours recorded on any occasion adjacent to this cell. The surrounds and wavebands were maintained in tidy conditions. No wildlife were present on this cell on two inspection occasions, a feature of this cell to date, with 14 ducks present in late winter/early spring.

The estimated discharge rate from this final cell via the rock riprap outfall to the river varied from 8 to 10 L/sec (late autumn/early winter and late winter/early spring) to 0.15 L/sec (in summer). There was no visual impact of the discharge on the receiving waters of the Patea River in the immediate vicinity of the outfall.

Photo 3 General view of three cell system November 2014

5.2.2. Pumping station system and overflows

Additional pre-screening of the raw wastewater (prior to the pump station) and improvements to the physical outfall structure (rock riprap placement) were components of the upgrade to the wastewater treatment system required by the renewed consents with construction of these components completed in the 2007-2008 period.

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 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. It was noted in the August inspection that some larger rocks at the outlet required moving as any discharge flow would be restricted.

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.

No overflows occurred during the 2015-2016 monitoring period.

5.3. Physical, chemical and bacteriological sampling

Effluent analyses and Patea River receiving water quality surveys were performed on two of the three inspection occasions. No overflow event surveys were required in the lower river due to the absence of any significant events (see above). Recreational bacteriological monitoring of two sites (lower river and Mana Bay) was performed as required by consent conditions. The site at Patea Beach, a component of the Council's

state of the environment programme, is monitored on a three-yearly cycle and this was undertaken during the 2015-2016 monitoring period.

5.3.1. Effluent quality

One full analyses of the effluent from the oxidation ponds final tertiary cell was performed on 26 January 2016. A receiving water survey was performed in conjunction with the sample collection (section 5.3.2.1). The effluent was dark green and slightly turbid in appearance and discharging at a steady trickle. The results are presented in Table 28. All analyses were performed in the Council's laboratory using standard methods.

Table 28 Results of the sampling survey of the Patea WWTP final (tertiary) cell effluent on 26 January 2016

Site Date	Unit	Third cell discharge 26 January 2016
Parameter		
Time	NZST	0800
Temperature	^{o}C	25.8
Dissolved oxygen	g/m^3	7.1
DO saturation	%	87
BOD_5	g/m^3	10
BOD_5 (filtered)	g/m^3	1.2
pH	pH	9.1
Conductivity @ 20^{o}C	mS/m	68.9
Dissolved reactive phosphorus	g/m^3 P	4.98
Ammonia-N	g/m^3 N	0.07
Suspended solids	g/m^3	37
Turbidity	NTU	19
E.coli bacteria	nos/1-- ml	86
Faecal coliform bacteria	nos/100 ml	86
Enterococci bacteria	nos/100 ml	28

Effluent quality results indicated a relatively high effluent quality, typical of a municipal pond treatment system receiving mainly domestic wastes for the time of the year sampled. The faecal coliform bacteria number was lower than typical of the effluent quality from the previous single pond treatment system. This was probably related to improved retention and circulation in the upgraded, modified system.

The historical wastewater quality data for the Patea single oxidation pond system (prior to the 2008 upgrade to a three-cell system) and post upgrade are presented in Table 29 for comparative purposes.

Table 29 Ranges of selected results of Patea WWTP effluent analyses recorded for the period 1987 to 30 June 2008 (ie prior to upgrade) and tertiary cell effluent analyses (post upgrade to 30 June 2015)

		Pre upgrade			Post upgrade		
Parameter	**Unit**	**No of samples**	**Range**	**Median**	**No of samples**	**Range**	**Median**
Dissolved oxygen	g/m^3	66	0.3-25	8.1	21	1.1-14.8	7.9
BOD_5	g/m^3	20	15-66	29	8	13-31	25
BOD_5 (filtered)	g/m^3	17	1.8-21	4.7	8	1.11	1.8
pH		21	8.1-9.6	8.6	8	8.5-10.1	9.7
Conductivity @ 20^{o}C	mS/m	36	57-154	79	15	47.1-73.2	59.8
Chloride	g/m^3	18	57.0-276	71.6	5	66-78	75.7
Ammonia-N	g/m^3 N	21	0.027-9.2	2.62	8	0.025-1.44	0.041
Dissolved reactive phosphorus	g/m^3 P	21	1.48-6.87	3.77	8	0.005-1.91	0.70
Suspended solids	g/m^3	22	27-140	74	8	35-150	93
Turbidity	NTU	25	7.8-113	27	15	7-240	62
Faecal coliform bacteria	nos/100 ml	38	360-190,000	26,500	15	10-10,000	71
Enterococci bacteria	nos/100 ml	26	300-20,000	2,700	14	8-1,200	76

[Note: With the exception of DO results, the majority of the data was recorded from summer-autumn surveys.]

The survey of effluent quality indicated that the upgraded ponds three cell system's effluent was very good in comparison with the results from past surveys (Table 28) of the original single pond effluent and within or better than historical ranges for the majority of parameters. Several parameters' results were better than past median values, and the faecal coliform bacterial level was similar to the median previously recorded. Depending upon the time of the year, changes in pond microfloral populations also contribute to variability in effluent quality which must be taken into account for comparative purposes. Wastewater quality appears to have improved in terms of median and/or ranges of BOD_5, nutrients, and particularly bacteria levels, but not in terms of suspended solids (and turbidity) as this component often is comprised principally of algae. However, as more survey data are recorded, comparisons of the upgraded system with the historical data will become more valid.

5.3.2. Impacts on receiving waters

Assessments of the impact of the pond's effluent discharge on the bacteriological quality of the receiving waters of the lower tidal reaches of the Patea River were undertaken on two of the three inspection occasions toward low tide conditions. The sampling sites for these surveys are listed in Table 30 and sampling sites' locations in relation to the pond system are illustrated in Figure 5. Sampling sites associated with the bacteriological recreational monitoring programme (SEA 907022 and SEA 907020) are also listed in Table 30.

Table 30 Sampling site locations for the Patea WWTP

No.	Site	Location	GPS reference	Site code
1	Patea River	At SH3 bridge approximately 1 km upstream of the WWTP (right bank)	1727126 E 5598189 N	PAT 000970
2	Patea River	Approximately 500 m downstream of SH3 bridge; downstream of emergency discharge	1727127 E 5597688 N	PAT 000975
OP	Effluent	From the outlet of the Patea WWTPfinal cell	1727268 E 5597296 N	OXP 008001
3	Patea River	Approximately 200 m downstream of the WWTP discharge (right bank)	1727433 E 5597119 N	PAT 000985

No.	Site	Location	GPS reference	Site code
4	Patea River	At Motor Camp boat ramp (approximately 0.6 km downstream of the WWTP discharge; right bank)	1727517 E 5596784 N	PAT 000995
SMB	Tasman Sea	Mana Bay	1727532 E 5596415 N	SEA 907022
SPB	Tasman Sea	Patea Beach	1727220 E 5596442 N	SEA 907020

Figure 5 Aerial location map of sampling sites in relation to the Patea WWTP

Site 2 was added to the programme as a consequence of raw sewage overflow discharges during the 1995-96 monitoring period (see section 5.1) and has been retained as a necessary component of receiving water surveys in relation to the renewed consents.

Additional monitoring of the river at site 4, and Mana Bay are required by a specific condition (Special Condition 11) included on the renewed discharge consent, while Patea Beach is monitored every third year by the Council's state of the environment recreational bacteriological programme. This monitoring was undertaken in the 2015-2016 period.

5.3.2.1. Lower river impacts

Sampling was undertaken under low to moderate river flow conditions (well below median (summer), and around three times median (winter) flows at McColl's bridge recorder site), and timed toward low tide on the two survey occasions. Results are presented and discussed as follows for each of these receiving water surveys.

26 January 2016

The effluent discharge from the tertiary cell of the re-configured Patea WWTP system was a steady trickle at the time of this summer sampling occasion. The survey was performed around mid-tide under turbid, grey-brown, low river flow conditions during fine weather. The river was flowing slowly in a downstream direction at all sites. Results are presented in Table 31.

Table 31 Results of the sampling survey of 26 January 2016 (low tide: 0456 NZST)

Site		1	2	OP	3	4
Location		**Upstream**		**Discharge**	**Downstream**	
Parameter	**Unit**					
Time	NZST	0750	0805	0800	0845	0815
Temperature	°C	24.3	24.6	25.8	24.9	22.9
Conductivity @ 20°C	mS/m	519	776	68.9	1600	2940
Turbidity	NTU	13	18	19	80	20
E. coli bacteria	nos/100 ml	110	130	86	96	130
Faecal coliform bacteria	nos/100 ml	110	140	86	96	130
Enterococci bacteria	nos/100 ml	100	100	28	57	62
Appearance		turbid, light brown; slow, d/s flow	turbid, light brown; slow, d/s flow	slightly turbid, dark green	turbid, light grey-brown; slow d/s flow	turbid, light grey-brown; very slow d/s flow

High conductivity levels indicated saline penetration at the lower river sites. A narrow range of faecal coliform, *E.coli,* and enterococci bacteria numbers were recorded at all four sites (Table 30) consistent with no impacts from a high standard of bacterial effluent quality discharged from the re-configured oxidation ponds system outfall. The increase in turbidity at site 3 downstream of the discharge was unexplained as the discharge itself had a low turbidity consistent with the high quality of wastewater discharge (Table 30). This had reduced to levels similar to upstream after additional mixing at site 4.

2 June 2016

The discharge from the final cell of the Patea WWTP was estimated at 8 L/s at the time of this winter sampling survey which was performed under moderately high flow conditions, in fine weather, following wet weather and a few days since a significant fresh. The sampling survey was performed just before low tide when a steady downstream river flow was recorded at the sites. Results from the survey are presented in Table 32.

Table 32 Results of the sampling survey of 2 June 2016 (low tide: 1159 NZST)

Site		1	2	OP	3	4
Location		**Upstream**		**Discharge**	**Downstream**	
Parameter	**Unit**					
Time	NZST	1000	1020	1130	1105	1130
Temperature	°C	11.6	11.6	10.4	11.7	11.8
Conductivity @ 20°C	mS/m	17.5	186.9	59.3	233.1	176.1
Turbidity	NTU	16	16	20	16	32
E.coli	nos/100 ml	68	88	6,700	84	88
Faecal coliform bacteria	nos/100 ml	71	88	6,700	96	96
Enterococci bacteria	nos/100 ml	46	34	1,500	31	66
Appearance		slightly turbid, light brown; swift d/s flow	turbid, light brown; swift d/s flow	Slightly turbid, dark green	slightly turbid brown; steady d/s flow	Slightly turbid, brown; steady d/s flow

(Note: N/A = not analysed)

These results indicated no saltwater penetration under moderately high flow and low tide conditions. Faecal coliform and enterococci bacteriological water quality was fairly

good in the river and there was no significant increase in bacteria at the downstream sites despite the high numbers of bacteria in the wastewater. There was minimal change in turbidity downstream of the discharge which was consistent with the high quality of wastewater discharge (Table 31).

5.3.3. Impacts of overflow events on receiving waters

No additional monitoring of the lower reaches of the Patea River was required as there were no overflow events during the contact recreational period between November 2015 and April 2016 (see Section 5.2.2).

5.3.4. Summary of impact monitoring of the receiving waters of the river

There were no significant impacts of the moderate to good bacteriological quality discharge from the upgraded WWTP recorded by two monitoring surveys of bacteria numbers in the Patea River. Bacterial water quality measured through the tidal lower reaches of the river in summer and winter was typical of the lower reaches of a developed farmland catchment following periods of wet-weather and was relatively uniform throughout the reach upstream and downstream of the emergency overflow and wastewater treatment system outfalls. Poorer bacteriological water quality is usually correlated with the absence of saltwater penetration in this reach of the river under low tide and higher flow conditions, however this was not noted during the period under review.

The 1998 MfE/MoH Guidelines for Bacteriological Water Quality for Marine and Fresh Waters (revised in 2003), recommend enterococci as the indicator bacteria for marine beach sites whilst for freshwater the recommended indicator is *E. coli*. It is noted that on both occasions the bacterial numbers at the downstream site (4) near the river mouth (assuming that all faecal coliform bacteria were *E. coli* which is generally the case in ringplain surface waters) were well below the single sample 'Alert' limit (260 *E. coli* per 100 ml), and above the 'Action' limit (550 *E. coli* per 100 ml) for contact recreational waters (MfE, 2003).

Areas nearby are commonly used for contact recreational purposes (e.g., lower river boat ramp, Mana Bay (adjacent to the river mouth), and Patea Beach) and more intensive contact recreational monitoring at two of these sites was programmed in relation to conditions on the renewed consents (see Section 5.3). This was also integrated with the Council's state of the environment contact recreational bacteriological monitoring programme (which specifically includes Patea Beach on a three-yearly rotation frequency), the results of which are presented in Section 5.3.5.

5.3.5. Contact recreational bacteriological water quality monitoring

Two sites were included in the consent monitoring programme (see Table 29 and Figure 7), one in the lower river at the Motor Camp boat ramp (PAT000995) and the other in the nearby coastal waters at Mana Bay (SEA907022). Another site at Patea Beach (SEA 907020) is included at three-yearly intervals in the Council's recreational monitoring programme and was also surveyed during the current monitoring period. Sampling at these sites during the Council's defined recreational monitoring period occurred between mid November 2015 and early April 2016 (TRC, 2016b), and although concentrated on high tide conditions (13 samples), also included low tidal

conditions at these sites on nine other occasions at the site in the lower river and eight occasions at Mana Bay. The results are summarised in Tables 33, 34 and 35 and illustrated in Figures 8, 9 and 10.

5.3.5.1. Lower Patea River at the boat ramp

This site was sampled on 22 occasions (13 high tide and nine low tide), none of which were immediately related to consented usage of the emergency outfall (as no use was made of this outfall during the current monitoring period). These results are summarised in Table 33 and illustrated in Figure 6.

Table 33 Statistical results summary for the lower Patea River at the boat ramp (PAT000995) from November 2015 to April 2016

Parameter	Unit	Number of samples	Minimum	Maximum	Median	Medians	
						HT	LT
Conductivity @ 20°C	mS/m	22	1,150	4,750	4,625	4,680	1,820
E.coli	nos/100ml	22	2	180	34	8	77
Enterococci	nos/100ml	22	<2	100	17	4	43
Faecal coliforms	nos/100ml	22	2	180	34	8	80
Temperature	°C	22	15.3	24.5	20.7	20.0	214
Turbidity	NTU	22	7	29	21	21	16

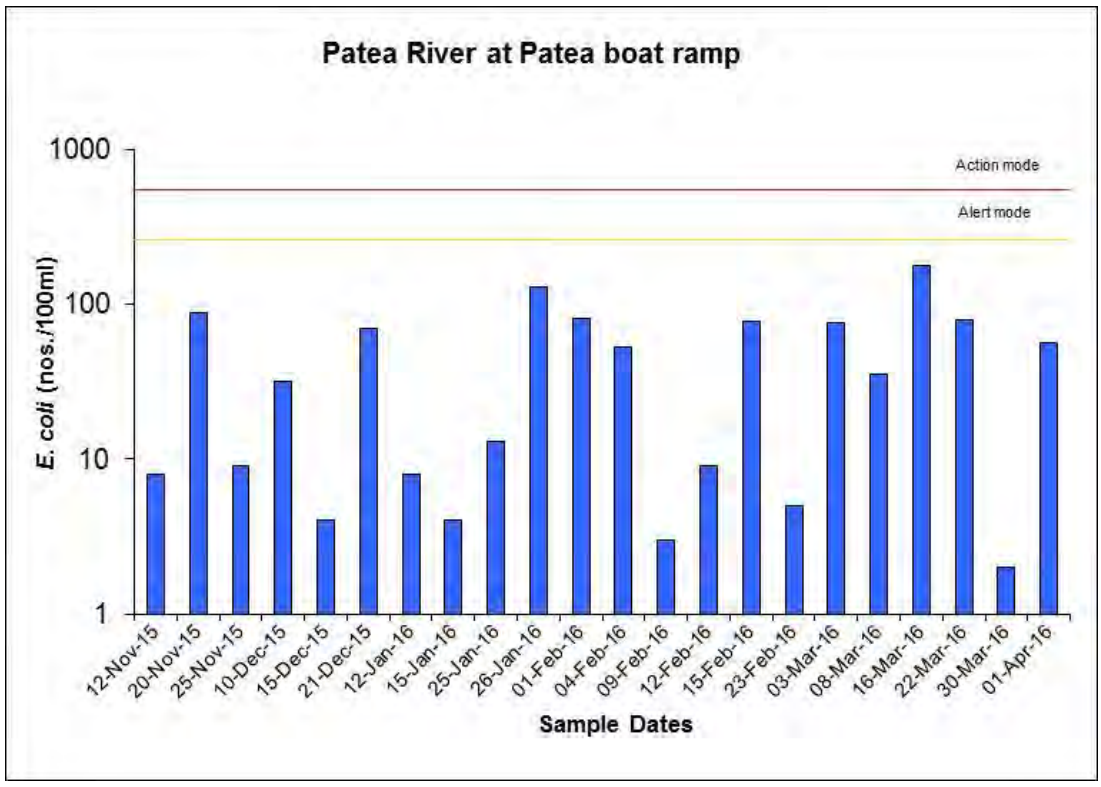

Figure 6 *E.coli* numbers for the lower Patea River at the boat ramp during the survey period

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 but improved bacteriological quality when influenced by saline penetration of the coastal seawater. Numbers of *E. coli* were below 'Alert' and 'Action limits on all 22 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 2015-2016 period at this site which was used mainly for boating access and occasionally for fishing, kayaking, jet skiing, 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 boatramp site only under low tidal flow conditions.

5.3.5.2. Mana Bay

Sampling was performed 13 times under high tide conditions and eight times under low tide conditions at this relatively sheltered coastal site, inside the western mole adjacent to the river mouth. Results are summarised in Table 34 and illustrated in Figure 7.

Table 34 Statistical results summary for Mana Bay, Patea (SEA 907022) from November 2015 to March 2016

Parameter	Unit	Number of samples	Minimum	Maximum	Median	Medians	
						HT	LT
Conductivity @ 20°C	mS/m	21	1,700	4,760	4,610	4,670	2,640
E.coli	nos/100ml	21	<2	840	15	4	50
Enterococci	nos/100ml	21	<1	380	12	6	28
Faecal coliforms	nos/100ml	21	<1	840	15	6	50
Temperature	°C	21	15.2	24.6	20.3	20.1	20.8
Turbidity	NTU	11	4.9	40	15	38	12

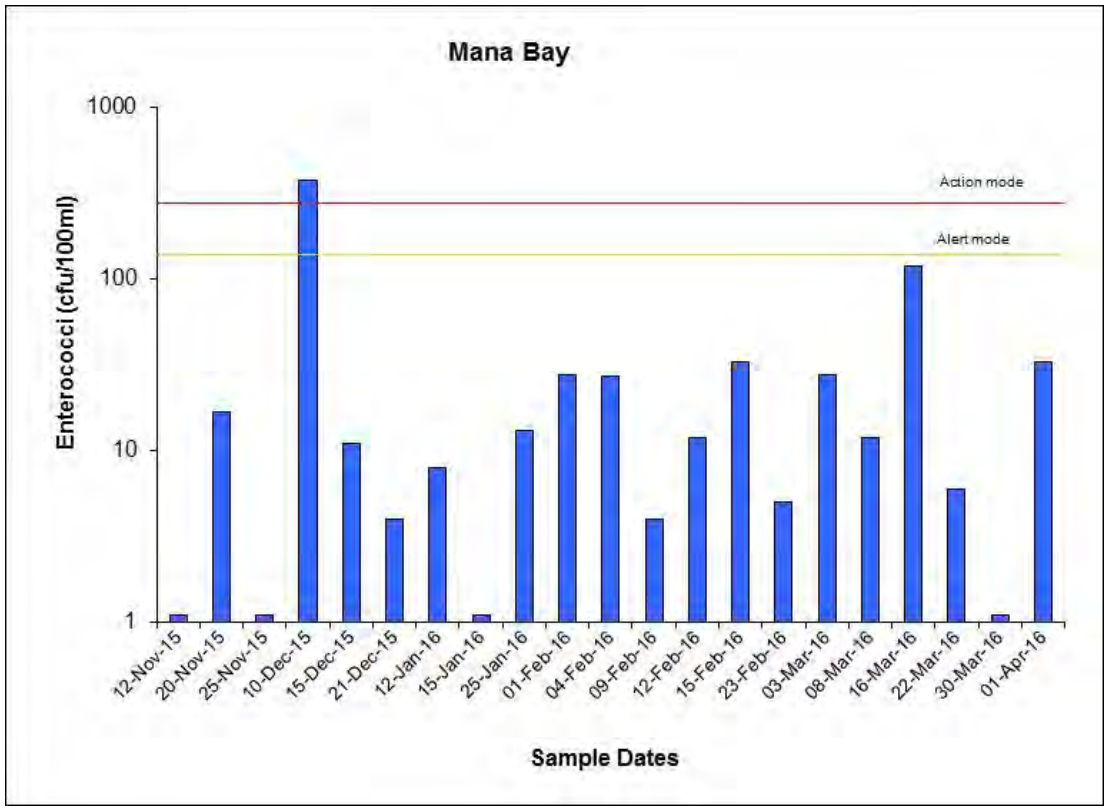

Figure 7 Enterococci numbers for Mana Bay during the survey period

With the exception of the sample collected on 10 December 2016, water quality at Mana Bay remained high throughout the season, with low median values for all faecal indicator bacteria (Figure 9). The high enterococci count obtained on 10 December 2015 remains unexplained, with high conductivity (4,690 mS/m) measured for that sample.

5.3.5.3. Patea Beach

This site was sampled on 13 occasions (all near high tide conditions) at this exposed beach site approximately 300 metres to the west of the Patea River mouth and moles. No bathing usage of this site was noted during the bathing season. These results are summarised in Table 35 and illustrated in Figure 8.

Table 35 Statistical results summary for Patea Beach (SEA907020) from November 2015 to April 2016

Parameter	Unit	Number of samples	Minimum	Maximum	Median
Conductivity @ 20°C	mS/m	13	4,570	4,760	4,670
E.coli	nos/100ml	13	<2	48	5
Enterococci	nos/100ml	13	<1	48	4
Faecal coliforms	nos/100ml	13	<2	52	5
Temperature	°C	13	14.9	22.6	20.4

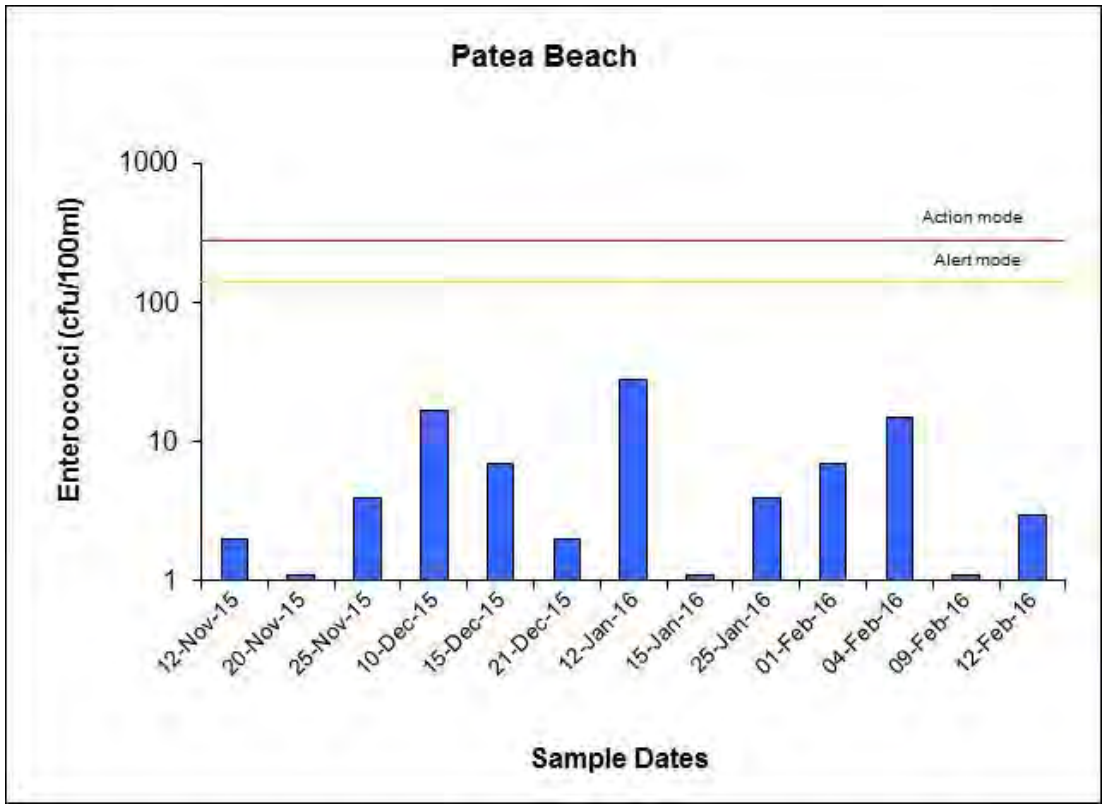

Figure 8 Enterococci numbers for Patea Beach during the survey period

The bacterial water quality of this coastal beach site was very good throughout the entire period under high tide conditions. No incursion into the 'Alert' or 'Action' mode occurred on any sampling occasion. Previous annual recreational monitoring surveys, performed at three-yearly intervals since 1997-1998, have recorded similarly very good bacteriological water quality (medians ranging from 3 to 8 enterococci/100 ml) with minimal incursions into either 'Alert' or 'Action' modes of the MfE contact recreational guidelines (TRC, 2016b).

5.3.5.4. Summary of impact monitoring of recreational monitoring receiving water sites

No incursions into the 'Alert' mode nor into the 'Action' mode of the MfE guidelines (2003) occurred during the contact recreational period at the Boat ramp or Patea Beach sites The site at Mana Bay exceeded guidelines on one occasion, this remains unexplained.

5.4. Biological monitoring

5.4.1. Microflora of the pond system

Pond microflora are very important for the stability of the symbiotic relation with aerobic bacteria within the facultative pond. These phytoplankton may be used as a bio-indicator of pond conditions e.g. 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 original pond and the final (tertiary) pond effluent had been collected at the time of most inspections of the WWTP for semi-quantitative microfloral assessment prior to curtailment of this component of the programme during the 2012-2013 period. The microflora present have been summarised and discussed in recent annual reports and historical data have been provided in a previous annual report (TRC, 2009).

Samples of the final tertiary pond effluent were collected on all three inspection occasions for chlorophyll-a analyses. Chlorophyll-a concentration can be used as 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 changes in algal populations and also dilution by stormwater infiltration might be expected to occur in any wastewater treatment system which together with fluctuations in waste loading would result in chlorophyll-a variability.

The results of final pond effluent chlorophyll-a analyses and historical data are provided in Table 36 together with field observations of pond appearance.

Table 36 Chlorophyll-a measurements from the surface of the tertiary pond of the upgraded Patea WWTP at the perimeter adjacent to the outlet

Date	Time (NZST)	Appearance	Chlorophyll-a (mg/m^3)	Chlorophyll-a (mg/m^3) data for period 2013 to mid 2015		
26 August 2015	0930	relatively clear, pale green	1.7	N	Range	Median
26 January 2016	0800	turbid, dark green-brown	102	6	88-628	416
2 June 2016	1130	dark green	609			

Very low chlorophyll-a levels were recorded in the late winter sample in 2015, coinciding with a low saturation of 35%. The levels increased into summer and then increased significantly in the late autumn/early winter sample. The higher chlorophyll-a concentrations were 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 January and June inspections (87 and 122% respectively) in this under-loaded system.

5.5. 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 the consent holder. During the year matters may arise which require additional activity by the Council, for example provision of advice and information, or investigation of potential or actual courses of non-compliance or failure to maintain good practices. A pro-active approach that in the first instance avoids issues occurring is favoured.

The Council operates and maintains a register of all complaints or reported and discovered excursions from acceptable limits and practices, including non-compliance

with consents, which may damage the environment. The incident register includes events where the Company concerned has itself notified the Council. The register contains details of any investigation and corrective action taken.

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

In the 2015-2016 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with the Company's conditions in resource consents or provisions in Regional Plans.

5.6. Discussion

5.6.1. Discussion of performance

The re-configured Patea WWTP 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.

Prior to the 2015-2016 period, semi-quantitative microfloral biomonitoring had confirmed satisfactory long-term pond performance before being curtailed for replacement with an alternative monitoring (chlorophyll-a measurement) component. The pond had typically supported good algal communities, which was reflected in relatively high average microflora community index pond scores. 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.

No overflow discharges of sewage were recorded during the monitoring period. 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.

5.6.2. Environmental effects of exercise of water permits

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 2015-2016 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 2015 and early April 2016.

5.7. Evaluation of performance

A tabular summary of STDC's compliance record for the year under review is presented in Tables 37, 38, and 39.

Table 37 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**

Table 38 Summary of performance for consent 0145-2

Purpose: ***Emergency discharge of untreated wastewater to water***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Minimisation of adverse effects	Inspections and liaison with consent holder	Yes
2. Exercise in accordance with documentation	Liaison with consent holder	Yes
3. Provision of contingency plan	Reporting by consent holder	Yes
4. Outfall upgrade within two years	Upgrade completed by 2008	N/A
5. Restriction on frequency of overflows	No overflows during monitoring period	Yes
6. Limitations on causes of overflows	No overflows during monitoring period	Yes
7. Restriction on overflows	Reporting by consent holder	Yes
8. Limit on duration	No overflows during monitoring period	Yes
9. Provision of alarm system	Liaison with consent holder	Yes
10. Maintenance of alarm system	Liaison with consent holder and reporting	Yes
11. Notification and recording of overflows	No overflows during monitoring period	Yes
12. Provision of records	No overflows during monitoring period	Yes
13. Provision of signage	No overflows during monitoring period	Yes
14. Notification to Taranaki Healthcare	No overflows during monitoring period	Yes
15. Meetings with submitters	Liaison with consent holder (3-yearly); not required by submitters in 2015-2016	Yes
16. Monitoring provisions	Performance of monitoring programme tailored to overflow events	Yes
17. Provision for lapse of consent	Consent exercised	N/A
18. Optional review provisions	Next optional review June 2022	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

Table 39 Summary of performance for consent 4576-2

Purpose: ***Erect, place and maintain oxidation pond and emergency overflow discharges structures***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Notification of construction	Upgrade completed	N/A
2. Exercise and maintenance in accordance with documentation	Liaison with consent holder and inspections	Yes
3. Timing and exercise of upgrade to oxidation pond outfall	Upgrade completed	N/A
4. Minimisation of effects	Inspections; upgrade completed	N/A
5. Minimisation of riverbed disturbance, and reinstatement	Upgrade completed	N/A
6. Public access provision	Inspections	Yes
7. Restriction on timing of riverbed disturbances	Upgrade completed	N/A
8. Provision for fish passage	Liaison with consent holder and inspections	Yes
9. Provision of signage	Upgrade completed	N/A
10. Provision for removal and reinstatement	Structures still in use	N/A
11. Provision for lapse of consent	Consent exercised	N/A
12. Optional review provisions	Next optional 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**

During the year, STDC demonstrated a high level of environmental and administrative performance with resource consent conditions. Some aspects of conditions of the consents do not apply now that the upgrade of the system has been completed.

5.8. Recommendations from the 2014-2015 Annual Report

The recommendations from the 2014-2015 Annual Report for the Patea oxidation pond monitoring programme were:

1. THAT monitoring of the reconfigured Patea oxidation pond system be continued for the 2015-2016 period by formulation of a programme similar in format to the programme undertaken during the 2014-2015 period.

This recommendation was adopted and the appropriate monitoring programme was performed.

5.9. Alterations to the monitoring programme for 2016-2017

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

- the extent of information made available by previous authorities;
- its relevance under the RMA;
- its obligations to monitor emissions/discharges and effects under the RMA; and
- to report 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 emitting to the atmosphere/discharging to the environment.

It is proposed that for 2016-2017 that monitoring is carried out at the same level as in the 2015-2016 period.

5.10. Recommendation

As a result of the 2015-2016 monitoring programme the following recommendation is made:

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.

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.

Waverley WWTP

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.

Kaponga WWTP

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.

Manaia WWTP

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.

Patea WWTP

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.

Glossary of common terms and abbreviations

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

Biomonitoring	Assessing the health of the environment using aquatic organisms.
BOD	Biochemical oxygen demand. A measure of the presence of degradable organic matter, taking into account the biological conversion of ammonia to nitrate.
BODF	Biochemical oxygen demand of a filtered sample.
Bund	A wall around a tank to contain its contents in the case of a leak.
condy	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m.
Cumec	Volumetric flow measure-1 cubic metre per second ($m^3 s^{-1}$).
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 the number of colonies per 100 ml.
Ent	Enterococci, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as the number of colonies per 100 ml.
FC	Faecal coliforms, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as the number of colonies per 100 ml.
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.
Investigation	Action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident.
Incident Register	The Incident Register contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan.
L/s	Litres per second.
MCI	Macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats.
MfCI	Microflora community index; a numerical indication of the state of treatment pond biological life which takes into account the sensitivity of floral taxa to wastewater quality.
MOW 'rock' test	Observations of the plume associated with a solid object lobbed in to the pond.
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	Ammoniacal nitrogen, normally expressed in terms of the mass of nitrogen (N).
NH_3	Unionised ammonia nitrogen, normally expressed in terms of the mass of nitrogen (N).
NO_3	Nitrate, normally expressed in terms of the mass of nitrogen (N).
NTU	Nephelometric Turbidity Unit, a measure of the turbidity of water.
pH	A numerical system for measuring acidity in solutions, with 7 as neutral. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5.
Physicochemical	Measurement of both physical properties (e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment.
Resource consent	Refer Section 87 of the RMA. Resource consents include land use consents (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 subsequent amendments.
$SQMCI_s$	Semi quantitative macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the numerical abundances and sensitivities of the taxa present to organic pollution in stony habitats.
SS	Suspended solids.
Temp	Temperature, measured in °C.
Turb	Turbidity, expressed in NTU.
WWTP	Wastewater Treatment Plant.

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Appendix I

Resource consents held by the STDC for discharges from Waverley, Kaponga, Manaia and Patea municipal WWTPs and the Waitotara stock truck wastewater system

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

COASTAL PERMIT

TRC – Applications: 2752
2753

Pursuant to the provisions of section 119 of the Resource Management Act 1991, I Chris Carter, Minister of Conservation, hereby grant South Taranaki District Council a coastal permit (No. SAR-05-49-04-03) to (i) discharge up to 455 cubic metres per day of treated wastewater; and (ii) discharge untreated wastewater only in emergency situations, to the Patea River, within the coastal marine area, generally in accordance with the application and subject to the attached conditions of consent.

Dated at Wellington this 7th day of February 2006

Hon Chris Carter

Minister of Conservation

63-01-011/01

139518

Office of Hon Chris Carter
MP for Te Atatu
Minister of Conservation
Minister of Housing
Minister for Ethnic Affairs

- 7 FEB 2006

Peter Canvin
Consents Manager
Taranaki Regional Council
Private Bag 713
Stratford

Dear Mr Canvin

Attached for your information is a copy of the coastal permit that I have recently granted to South Taranaki District Council to discharge treated and untreated wastewater to the Patea River.

I have made the permit subject to the conditions recommended to me by the Hearing Committee.

My reasons for the decision are that:

- the upgrades are an improvement on the existing treatment system, resulting in a higher quality of effluent, and
- it meets the requirements of the: New Zealand Coastal Policy Statement; Regional Coastal Plan for Taranaki; Regional Policy Statement for Taranaki; relevant provisions of the RMA, including section 104 and Part 2.

Please note that I have advised the applicant and my appointee on the Hearing Committee, Mr Richard Heerdegen, of my decision. I understand you will be notifying other interested parties of my decision in line with the provisions of section 119A(b) and section 114 of the Resource Management Act 1991.

Yours sincerely

Hon Chris Carter MP
Minister of Conservation

Encl.

Parliament Buildings, Wellington, New Zealand Telephone: 64 4 470 6568, Facsimile: 64 4 472 8034
Email: ccarter@ministers.govt.nz Website: www.beehive.govt.nz

Marine Area, in respect of the matters considered under section 104 of the Resource Management Act 1991 as follows:

- *Application 2752 [to renew and change consent 0067]: To discharge treated municipal wastewater from the Patea Wastewater Treatment Plant into the coastal marine area of the Patea River;*
- *Application 2753 [to renew and change consent 0145]: To discharge untreated municipal sewage in emergencies only into the coastal marine area of the Patea River.*

10. The Hearing Committee resolved to recommend to the Minister of Conservation that the consents be granted and all members of the Committee supported the recommendations.

11. Pursuant to section 118 of the Resource Management Act 1991, the Committee's reasons for its recommendations are that:

    a) It accepts the assessment of the application given in the Taranaki Regional Council's officer's report; and

    b) Monitoring will continue to be undertaken by the Taranaki Regional Council to ensure that there are no significant adverse effects on the environment as a result of the exercise of this consent, should it be granted.

Recommendation of the Hearing Committee

13. The Hearing Committee recommends that the Minister of Conservation approves application 2752, to discharge treated municipal wastewater from the Patea Wastewater Treatment Plant into the coastal marine area of the Patea River, be submitted to the Minister of Conservation for approval for a period to 1 June 2028, with provision for review in June 2010 and/or June 2016 and/or June 2022, subject to the policies and conditions of the Taranaki Regional Council, including the following general conditions and special conditions:

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 wastewater treatment systems shall be upgraded, substantially in accordance with recommended Option 3 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 two years from the date of grant of this consent.

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.

14. The Hearing Committee recommends that application 2753, to discharge untreated municipal sewage in emergencies only into the coastal marine area of the Patea River, be submitted to the Minister of Conservation for approval for a period to 1 June 2028, with provision for review in June 2010 and/or June 2016 and/or June 2022, subject to the policies and conditions of the Taranaki Regional Council, including the following general conditions and special conditions:

General conditions

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

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

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

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

Special conditions

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

2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of application 2753. In the case of any contradiction between the documentation submitted in support of application 2753 and the conditions of this consent, the conditions of this consent shall prevail.

3. The consent holder shall prepare and maintain a contingency plan, to the satisfaction of the Chief Executive, Taranaki Regional Council, detailing action to be taken in the event of accidental spillage or discharge of contaminants, the initial plan to be provided no later than three months prior to the exercise of this consent.

4. In addition to the existing outfall, rip rap shall be installed adjacent to the river bank which shall be adequately maintained and cleared following any discharge authorised under this permit. The outfall upgrade shall be completed no later than two years from the date of issue of this consent.

5. If the frequency of overflows exceeds one per year, the consent holder shall implement works for reducing the frequency and mitigate the effects of such overflows by way of:

   - increasing the capacity of the pipe leading from the pump[s] to the rising main;
   - duplication of the rising main between the pump station and the oxidation pond system; and/or
   - additional storage available for treated wastewater.

6. The intermittent discharge of wastewater into the Patea River shall only occur when:

   i. storm and groundwater inflows to the system is such that the capacity of the wastewater treated system pump station is exceeded; and/or
   ii. pump or power failure at the pump station occurs.

7. The intermittent discharge of wastewater into the Patea River shall not occur during routine maintenance of the pump station.

8. The consent holder shall ensure that, whenever practicable, the duration of the discharge authorised by this consent shall not exceed four hours.

9. The consent holder shall install and constantly monitor an alarm system to the satisfaction of the Chief Executive, Taranaki Regional Council. The alarm shall operate when the duty pump fails to cope with the inflow.

10. The consent holder shall inspect the installation regularly and at least once per week shall check that the alarm is operative and the electrical equipment is in good working order.

11. The consent holder shall immediately notify the Chief Executive, Taranaki Regional Council, following any discharge under this permit, including the time, reason[s], and duration of wastewater discharged and remedial measures implemented by the consent holder.

12. The consent holder shall forward a summary of records referred to in special condition 11 no later than 31 July of each year to the Chief Executive, Taranaki Regional Council.

13. The consent holder shall install and maintain suitable signage advising the public of the health risk on each and every occasion that a discharge occurs in terms of this consent. Signage shall be sited at appropriate positions upstream and downstream of the discharge point and at the river mouth, to warn the public of the presence of contaminants in the river.

14. The consent holder shall immediately notify Taranaki Healthcare following any discharge under this permit, in order to enable any measures necessary for the protection of public health to be undertaken.

15. The consent holder and staff of the Taranaki Regional Council shall meet as appropriate, and at least every three years with interested submitters to the consent to discuss any matter relating to the exercise of this consent.

16. The consent holder shall, in junction with the Taranaki Regional Council, undertake additional chemical, bacteriological and ecological monitoring of the 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.

17. 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.

18. 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.

Approved:
D L Lean
Chairperson
Taranaki Regional Council
Consents and Regulatory Committee and
Chairperson of the Hearing Committee

Date: 28/11/2005.

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

_____

Director-Resource Management

TRK980072

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

Renewal Granted Date: 20 January 1998

CONDITIONS OF CONSENT

Consent Granted: TO DISCHARGE UP TO 450 CUBIC METRES/DAY OF TREATED WASTEWATER FROM THE WAVERLEY MUNICIPAL OXIDATION PONDS SYSTEM INTO AN UNNAMED TRIBUTARY OF THE WAIROA STREAM AT OR ABOUT GR: Q22:492-581

Expiry Date: 1 June 2016

Review Date[s]: June 2004 and June 2010

Site Location: MAIN ROAD WAVERLEY
[PROPERTY OWNER: R J BREMNER]

Legal Description: PT SEC 336 BLK VII WAIROA SD

Catchment: WAIROA 340.000

Tributary: UNNAMED TRIBUTARY

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

TRK980072

General conditions

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

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

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

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

Special conditions

1. THAT the consent holder shall properly and efficiently maintain and operate the oxidation ponds system which shall be regularly maintained in an aerobic condition.

2. THAT the consent holder shall undertake to advise and consult with the Taranaki Regional Council if trade wastes are accepted from any trade premises into the consent holder's wastewater system, for which it may be appropriate or necessary to place limits on the concentrations in the final discharge of any toxic or hazardous compounds which may be contained in that trade waste. If such limits are considered necessary, the General Manager, Taranaki Regional Council, shall require a review of the consent conditions in accordance with section 128 of the Resource Management Act 1991.

3. THAT after allowing for a mixing zone of 200 metres downstream of the discharge, these wastes shall not give rise to any of the following effects in the tributary of the Wairoa Stream:

    i) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
    ii) any conspicuous change in the colour or visual clarity;
    iii) any emission of objectionable odour;
    iv) the rendering of fresh water unsuitable for consumption by farm animals; and
    v) any significant adverse effects on aquatic life.

4. THAT the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during the month of June 2004 and/or June 2010, for the purpose of ensuring that the conditions adequately deal with the environmental effects arising from the exercise of this consent, which were not foreseen at the time the application was considered and which it was not appropriate to deal with at that time.

Signed at Stratford on 20 January 1998

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

_____

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 associated with the Kaponga WWTP

To Job manager, Rae West
From Scientific Officer, Darin Sutherland
Doc No 1667379
Report No DS043
Date April 2016

Biomonitoring of the Kaupokonui River in relation to the South Taranaki District Council's Kaponga oxidation ponds system discharge, February 2016

Introduction

This biomonitoring survey was the summer survey for the 2015-2016 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, 2015a).

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 9 February 2016.

These sites were:

Site No.	Site code	GPS reference	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:

R (rare) = less than 5 individuals;
C (common) = 5-19 individuals;
A (abundant) = 20-99 individuals;

VA (very abundant) = 100-499 individuals;
XA (extremely abundant) = 500 or more individuals.

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

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

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 and discussion

Site habitat characteristics and hydrology

This summer survey was performed under very low flow conditions, 21 days after a fresh in excess of 3 times median flow and 138 days after a fresh in excess of 7 times median flow (flow gauging at the Kaupokonui Stream at Glenn Road). The survey followed a dry late spring period with only one significant river fresh recorded over the preceding month.

The water temperatures during the survey were in the range 17.9-18.9 °C. Water levels were low 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.

All three sites had widespread 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

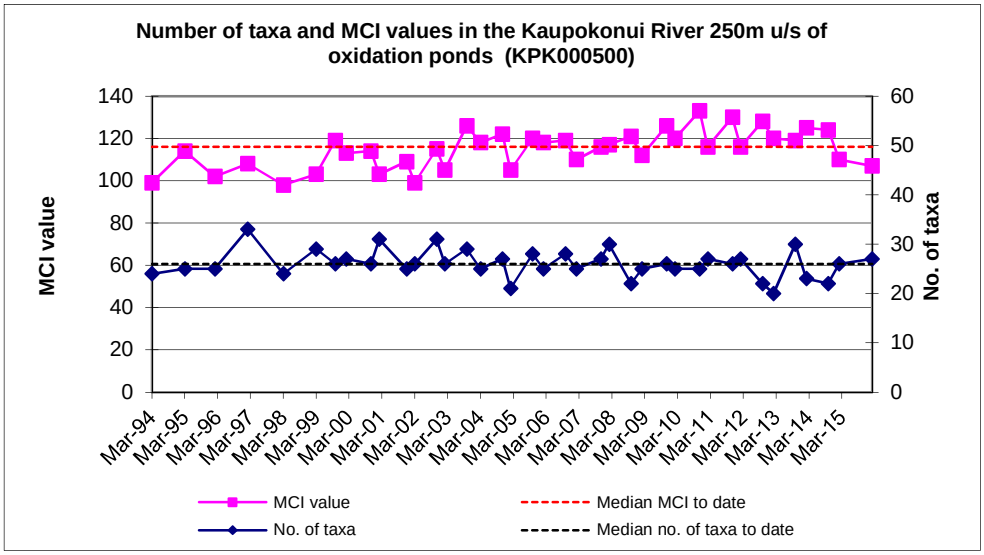
Data have been collected from various past surveys of the Kaupokonui Stream immediately upstream of Kaponga township, and 1.3 km downstream of the oxidation ponds' discharge near the more recently established site 3a.

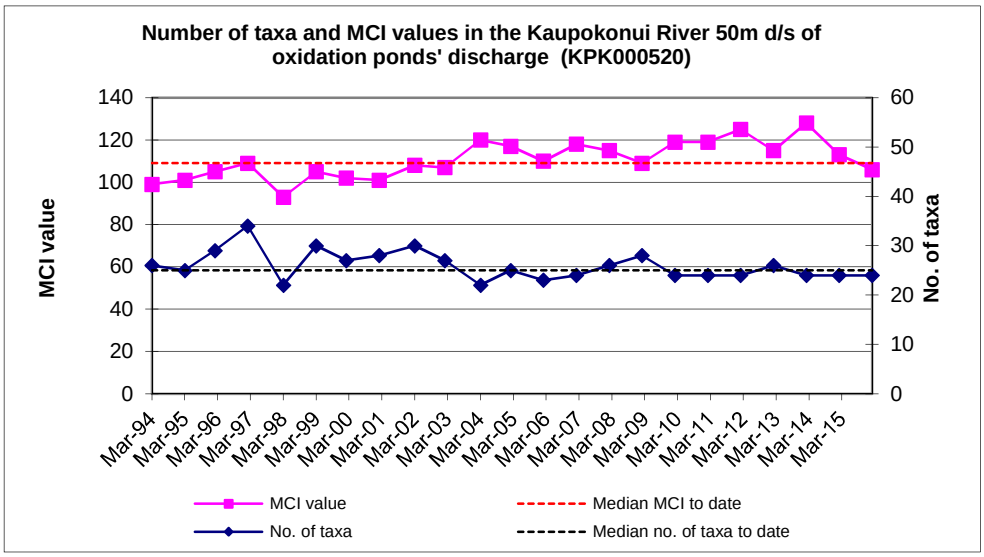
Data obtained from previous biomonitoring surveys are summarised in Table 1 and illustrated in Figure 2.

Table 1 Summary of macroinvertebrate taxa numbers and MCI values for previous surveys performed between March 1987 and February 2015

Site No.	No of surveys	No of taxa			MCI value			$SQMCI_s$ value		
		Median	Range	Feb 2016	Median	Range	Feb 2016	Median	Range	Feb 2016
1	40	26	19-33	27	116	98-133	107	6.5	2.6-7.8	4.1
2	22	26	22-34	24	110	93-128	106	5.7	3.6-7.7	4.0
3a	24	26	92-126	26	112	92-126	102	5.5	3.1-7.5	5.7

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





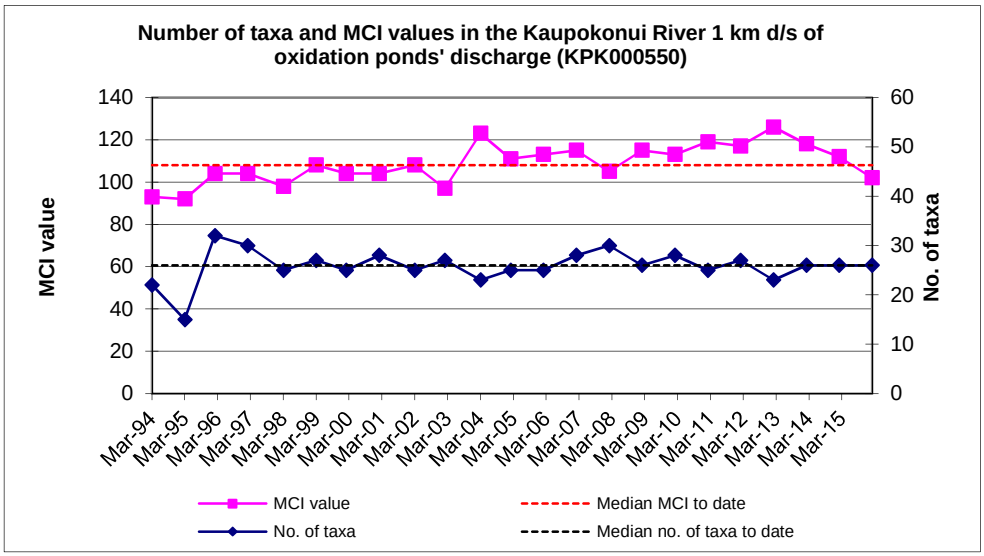


Figure 2 Taxa richness and MCI values at the three sampling sites to date

Table 2 Macroinvertebrate fauna of the Kaupokonui River in relatiton to the Kaponga oxidation ponds discharge sampled on 9 February 2016

Taxa List	Site Number	MCI score	1	2	3a
	Site Code		KPK000500	KPK000520	KPK000550
	Sample Number		FWB16040	FWB16041	FWB16042
PLATYHELMINTHES (FLATWORMS)	*Cura*	3	R	-	-
NEMATODA	Nematoda	3	-	R	R
ANNELIDA (WORMS)	Oligochaeta	1	C	R	C
MOLLUSCA	*Potamopyrgus*	4	C	A	R
EPHEMEROPTERA (MAYFLIES)	*Austroclima*	7	C	C	VA
	Coloburiscus	7	C	C	A
	Deleatidium	8	A	A	VA
	Nesameletus	9	A	C	C
PLECOPTERA (STONEFLIES)	*Megaleptoperla*	9	R	-	-
	Zelandoperla	8	R	R	R
HEMIPTERA (BUGS)	*Saldula*	5	R	-	-
COLEOPTERA (BEETLES)	Elmidae	6	A	A	A
	Hydraenidae	8	R	R	-
MEGALOPTERA (DOBSONFLIES)	*Archichauliodes*	7	C	A	C
TRICHOPTERA (CADDISFLIES)	*Hydropsyche (Aoteapsyche)*	4	A	VA	VA
	Costachorema	7	R	R	R
	Hydrobiosis	5	A	C	A
	Neurochorema	6	C	C	C
	Beraeoptera	8	C	-	C
	Olinga	9	-	R	R
	Oxyethira	2	R	R	C
	Pycnocentrodes	5	A	C	A
DIPTERA (TRUE FLIES)	*Aphrophila*	5	A	A	VA
	Eriopterini	5	-	-	R
	Maoridiamesa	3	VA	VA	C
	Orthocladiinae	2	VA	VA	A
	Tanypodinae	5	R	-	-
	Tanytarsini	3	C	-	C
	Empididae	3	-	R	R
	Ephydridae	4	R	-	-
	Muscidae	3	R	R	R
	Tabanidae	3	-	-	R
ACARINA (MITES)	Acarina	5	-	R	-
		No of taxa	27	24	26
		MCI	107	106	102
		SQMCIs	4.1	4.0	5.7
		EPT (taxa)	12	11	12
		%EPT (taxa)	44	46	46

'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 107 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. The $SQMCI_s$ score of 4.1 units was substantially lower than the median $SQMCI_s$ score of 6.5 units (Table 1).

The community was characterised by two 'tolerant' taxa [midges (*Maoridiamesa*) and (Orthocladiinae)] (Table 2).

Site 2 (50 m downstream of oxidation ponds)

A moderate macroinvertebrate community richness of 24 taxa was found at site 2 ('primary impacted' site) at the time of the summer survey (Table 1).

The MCI score of 106 units indicated a community of 'good' biological health which was not significantly different (Stark, 1998) to the median MCI score of 110 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. The $SQMCI_s$ score of 4.0 units was higher than the median $SQMCI_s$ score of 5.7 units (Table 1).

The community was characterised by three 'tolerant' taxa [caddisfly (*Hydropsyche / Aoteapsyche*), midges (*Maoridiamesa*) and (Orthocladiinae)] (Table 2).

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

A moderately high macroinvertebrate community richness of 26 taxa was found at site 3a ('secondary impacted' site) at the time of the early summer survey (Table 1).

The MCI score of 102 units indicated a community of 'good' biological health which was not significantly different (Stark, 1998) to the median MCI score of 112 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. The $SQMCI_s$ score of 5.7 units was similar to the median $SQMCI_s$ score of 5.5 units (Table 1).

The community was characterised by one 'tolerant' taxon [caddisfly (*Hydropsyche / Aoteapsyche*], one 'moderately senstive' taxon [mayfly (*Austroclima*)], and one 'highly sensitive' taxon [mayfly (*Deleatidium*)] (Table 2).

Discussion and conclusions

Taxa numbers (24 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 350 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 2015). Taxa numbers recorded by the present survey tended to be very similar to those found at the time of the previous summer's survey (CF642) and were very similar to the historical median from previous surveys.

The MCI scores were indicative of 'good' stream biological health. The results were lower for all three sites compared with the historical median, though not significantly different. All three observed MCI scores were within 2-3 units of expected scores and therefore there was no significant differences between observed versus expected results (Stark, 1998). There were widespread algal mats and filamentous algae at all three sites and the significant periphyton cover was probably the main reason for the small decreases in MCI score found in the current survey 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 patchy mats and filamentous algae at all three sites. As the small non-significant decrease was across all three sites and there was no significant differences among sites this result was not related to discharges from the Kaponga WWTP.

The $SQMCI_S$ values were very similar between the 'control' site and the 'primary impact' site which reflected the very similar macroinvertebrate community composition between the two sites. The 'secondary impact' site had a substantially higher score which reflected a greater abundance of more higher scoring mayfly taxa and less lower scoring chironomid midges which would generally indicate better quality water and less periphyton cover. Though periphyton was recorded as being widespread for the site it may not have been quite as abundant as the two upstream sites. Overhanging vegetation and a steep sided bank provided some shading at the site which would limit periphyton growth.

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 the 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 from the National Park boundary. There were no significant differences among sites for MCI score. 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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Appendix II

Ecological inspection associated with the Manaia WWTP

Memorandum

To Rae West, Job Manager
From Emily Roberts, Marine Ecologist
Document #1709972
Date 5 July 2016

Manaia Oxidation Ponds Marine Ecological Inspection June 2016

A marine ecological inspection of the foreshore in the vicinity of the discharge from the Manaia oxidation pond system was performed on 9 June 2015 commencing at 11:15 NZST. Low tide on this day was at 11:43 NZST at a height of 0.7 m above chart datum. At the time of the inspection there was a south easterly gale force wind and heavy localised rainfall within the catchment of the creek. This was the first and only intertidal inspection undertaken for the Manaia oxidation pond programme (Spordmon 3) during the 2015/2016 monitoring period. The inspection was later than usual, following a long dry period during summer and autumn when there was no discharge from the wetlands.

At the time of the inspection it was not possible to view the discharge point from the oxidation pond-wetland system due to high winds creating excessive spray from the waterfall (Photograph 1). The area surrounding the discharge channel had been fenced (Photograph 2). The Manaia Creek (Unnamed Stream 27, Consent 1204-4) was in high flow during the inspection.

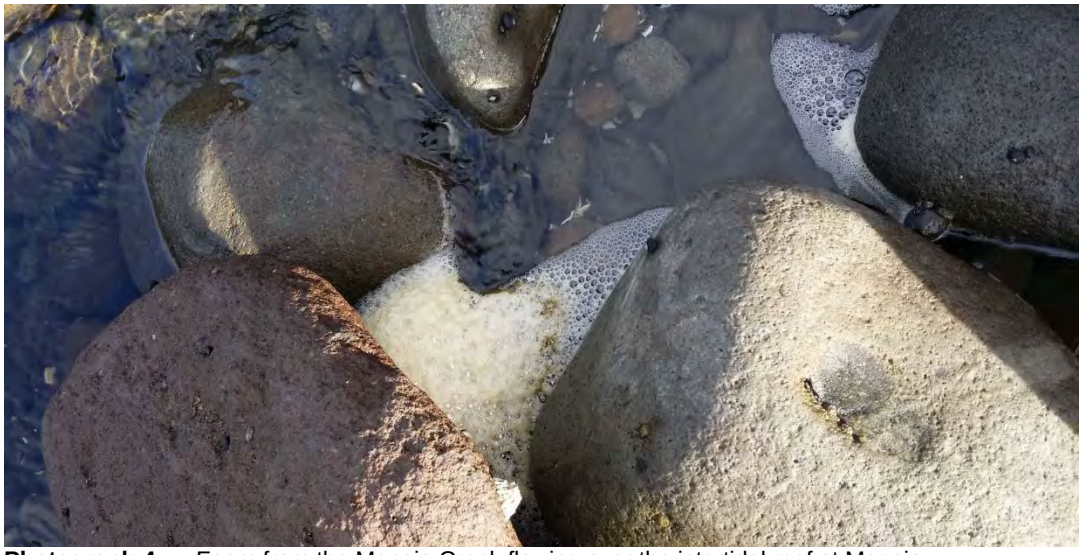
Photograph 1 Waterfall from the Manaia Creek showing spray formed by the gale force SE wind

The intertidal inspection consisted of a qualitative assessment of the species present. The inspection covered the area where the stream flowed across the reef (Photograph 3) 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

(Photograph 4). Freshwater input was likely to have had a significant impact on the surrounding intertidal communities, particularly on the higher sections of the shore.

Photograph 2 Fencing around the discharge channel from the oxidation ponds

Photograph 3 Manaia Creek flowing over the intertidal reef at Manaia



Photograph 4 Foam from the Manaia Creek flowing over the intertidal reef at Manaia

Green macroalgal species *Enteromorpha intestinalis* and *Ulva lactuca* stretched along the high tide mark ~20m either side of the stream, however, the cover was sparse relative to the December 2014 inspection. These algal species are typical of freshwater influence and thrive under nutrient rich conditions. At the top of the intertidal region within the vicinity of the stream, the gastropods *Austrolittorina cincta* and *Diloma* spp. were abundant. Other species became more abundant further away from the stream, including the limpet *Cellana radians*, the gastropods *Haustrum scobina* and *Melagraphia aeithiops*, and the barnacle *Austrominius modestus*.

Photograph 5 Snails: *Haustrum haustorium* consuming *Melagraphia aeithiops*, midshore

A greater diversity of algal and animal species occurred at the mid and low tidal regions, as typical of intertidal marine communities, and expected with the diminishing influence of the stream. At the mid and low shore elevations, 15 animal and algal species occurred within the vicinity of the stream. *Enteromorpha intestinalis* was present within the direct influence of the stream. The algal species *Corallina officinalis,* encrusting *Corallina* spp., *Geledium caulacantheum*

Ralfsia sp. and *Hormosira banksii* were present on boulders within the stream, becoming more abundant lower down the shore (Photograph 6).

Twenty species were found more than 50 m to the north west of the stream in the mid and low shore regions, with an obvious change in the appearance of the reef and the diversity of species. Species only found away from the influence of the stream included: the seaweed *Echinothamnion* sp. and kina *Evechinus chloroticus* (Photograph 7). The green lipped mussel *Perna canaliculus* was abundant at low shore both within and away from the influence of the stream (Photograph 8)

Photograph 6 Macroalgal species at low shore, more abundant away from the influence of the stream

Photograph 7 Kina *Evechinus chloroticus* present on the low shore away from the influence of the stream

Photograph 8 Green lipped mussel *Perna canaliculus* abundant on the lower shore

In summary, the stream appeared to have a significant effect on nearby intertidal organisms, most likely a result of freshwater influence. *Enteromorpha intestinalis* was evident along the length of the stream, although the cover was notably less dense than observed during previous surveys. 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. The diversity and abundance of intertidal communities away from the influence of the stream was typical of that found at other reef sites around Taranaki.

Emily Roberts
Marine Ecologist