New Plymouth District Council
New Plymouth Wastewater Treatment Plant
Marine Outfall and Sludge Lagoon
Monitoring Programme Annual Report
2014-2015

Technical Report 2015-112

ISSN: 1178-1467 (Online)
Document: 1568551 (Word)
Document: 1659291 (Pdf)

Taranaki Regional Council
Private Bag 713
STRATFORD

May 2016

Executive summary

The New Plymouth District Council (NPDC) operates a wastewater treatment plant (NPWWTP) located on Rifle Range Road between New Plymouth and Bell Block. This report for the period July 2014 to June 2015 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess NPDC's environmental performance during the period under review, and the results and environmental effects of NPDC's activities.

In relation to the operation of the NPWWTP, NPDC holds five resource consents, which include a total of 49 conditions setting out the requirements that NPDC must satisfy. NPDC holds a consent to allow it to discharge treated wastewater into the Tasman Sea, one consent to discharge sludge leachate to groundwater, two consents relating to structures and one consent to discharge emissions into the air at the site.

During the monitoring period, NPDC demonstrated an overall 'good' level of environmental performance with the resource consents.

The Council's monitoring programme for the year under review included reviewing data supplied by NPDC, three site inspections, two water samples collected for physicochemical analysis (including inter-laboratory comparison), a marine ecological survey at five sites, summer bacteriological water quality analysis at five sites and also norovirus analysis of mussels at three coastal sites, to compliment the norovirus analysis of treatment plant influent and effluent.

Norovirus were detected at low levels in mussels collected from a site on the Waiwhakaiho Reef close to the NPWWTP outfall. There were no other significant detectable effects in the receiving environment resulting from discharges from the plant during the 2014-2015 monitoring period.

Over the year in review there were 11 incidents directly related to the NPWWTP, 14 incidents associated with sewage pump stations and 14 incidents linked to reticulation overflows. Fourteen day letters were issued in association with two of the incidents (chlorine non-compliances at NPWWTP and the overflow at the Shearer Reserve sewage pump station). In both cases a defence was established under the RMA and no further enforcement action was taken.

For reference, in the 2014-2015 year, 75% 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 22% demonstrated a good level of environmental performance and compliance with their consents.

Table of contents

List of tables

List of figures

List of photographs

1. Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is the annual report for the period July 2014-June 2015 by the Taranaki Regional Council (the Council) on the monitoring programme associated with the New Plymouth wastewater treatment plant (NPWWTP). New Plymouth District Council (NPDC) is the consent holder for the operation which is situated on Rifle Range Road at New Plymouth, in the Waiwhakaiho catchment.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the consents held by NPDC that relate to the discharge of treated wastewater, a marine outfall structure, a permit for a culvert and the air discharge permits held by NPDC to cover emissions to air from the site.

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 NPDC's use of water, land, and air, and the foreshore, and is the twentieth combined report by the Council for NPDC's NPWWTP.

1.1.2 Structure of this report

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

Section 2 presents the results of monitoring during the period under review, including scientific and technical data.

Section 2.3 outlines incidents and the result of the response to these, associated with the NPWWTP.

Section 3 discusses the results, their interpretation, and their significance for the environment.

Section 3.8 presents recommendations to be implemented in the 2015-2016 monitoring year.

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

1.1.3 The Resource Management Act (1991) and monitoring

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

(a) the neighbourhood or the wider community around an activity, and may include cultural and social-economic effects;
(b) physical effects on the locality, including landscape, amenity and visual effects;
(c) ecosystems, including effects on plants, animals, or habitats, whether aquatic or terrestrial;
(d) natural and physical resources having special significance (for example recreational, cultural, or aesthetic); and
(e) risks to the neighbourhood or environment.

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

1.1.4 Evaluation of environmental performance

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

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

Events that were beyond the control of the consent holder and unforeseeable (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, 75% of consent holders in Taranaki monitored through tailored compliance monitoring programmes achieved a high level o f environmental performance and compliance with their consents, while another 22% demonstrated a good level of environmental performance and compliance with their consents.

1.2 Process description

The NPWWTP (Photograph 1) treats the municipal wastewater from the New Plymouth urban area, Bell Block, Oakura and Inglewood, by a process of extended aeration activated sludge. There is also a substantial industrial load, equivalent to approximately 25% of the total biochemical oxygen demand (BOD) load, treated by the plant. The plant was commissioned in 1984, and has had its capacity expanded several times since.

Photograph 1 The New Plymouth Wastewater Treatment Plant

The wastewater enters the plant at the milliscreening building (Figure 1) to remove plastics and solids from the wastewater, followed by the removal of grit. The solids

are collected and removed regularly for land disposal. Following this preliminary treatment, the wastewater enters the aeration basins where micro-organisms, collectively called "activated sludge", breakdown the organic matter in the wastewater. Pathogens and heavy metals stick to the activated sludge, and are removed at a later stage of the process. The mix of wastewater and activated sludge then overflows into clarifiers, which separate the activated sludge from the water. The clear water overflows into the chlorine contact tank for disinfection prior to discharge through a 450 m marine outfall offshore of the mouth of the Waiwhakaiho River.

The activated sludge remaining in the clarifiers is returned to the aeration basins to maintain biological levels, while the surplus is diverted to the thermal drying facility (TDF) for sterilisation and disposal by alternative use (soil conditioner).

Figure 1 Layout of the New Plymouth Wastewater Treatment Plant

Thermal drying of the sludge results in a dry granular solid (biosolid) with a moisture content of 5-10%. The temperatures used in the process are such that there is sterilisation of the micro-organisms and pathogens present in the sludge. The biosolid is registered for sale as *Taranaki Bioboost 6-2-0* fertiliser.

Major construction works were undertaken as part of an upgrade of the NPWWTP between December 2012 and December 2013. The upgrade involved major modification of the plant's two existing aeration basins to make them more efficient.

1.3 Resource consents

1.3.1 Discharge permits

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

NPDC holds coastal permit **0882-4** to cover the discharge of treated municipal wastewater from the NPWWTP through a marine outfall structure into the Tasman Sea.

The recommendations involved with this permit were heard by a panel of independent commissioners, and a decision was reached on 15 November 2011. The permit was issued by the Council on 13 December 2011 under Section 119 of the RMA. It is due to expire on 1 June 2041.

There are 24 special conditions attached to the permit.

Condition 1 requires that the consent holder adopt the best practicable option to minimise adverse environmental effects.

Condition 2 requires that the consent holder maintain a diffuser system to ensure a minimum ratio of dilution of 13:1.

Conditions 3, 4 and 5 stipulate the concentration of various components of the discharge which shall not be exceeded.

Conditions 6 to 9 deal with the eventuality of aeration basins being taken offline.

Condition 10 requires that total available chlorine residual in the effluent is at least 0.3 g/m^3.

Condition 11 deals with screen size the effluent must pass through.

Conditions 12 to 18 relates to monitoring requirements.

Condition 19 requires the consent holder to provide a technology report on two occasions, while Condition 20 requires an annual report. Condition 21 states that the consent holder must maintain a contingency plan for the site.

Conditions 22 and 23 require the consent holder to meet with Council, iwi and interested parties regarding the operation and monitoring of the consent.

Condition 24 is a review provision.

NPDC holds discharge permit **2982-4** to cover the discharge of up to 60 m^3/day of leachate from a sludge stabilisation lagoon to groundwater in the vicinity of the Waiwhakaiho River. This permit was issued by the Council on 17 October 2002 under Section 87(e) of the RMA. It is due to expire on 1 June 2020.

There are five special conditions attached to the permit.

Condition 1 requires that groundwater in the vicinity of the lagoon is monitored, while condition 2 stipulates that the unnamed tributary adjacent to the lagoon be monitored.

Condition 3 stipulates that there be no direct discharge of contaminants to any surface water body.

Condition 4 requires that there be no adverse impacts on ground or surface waters.

Condition 5 deals with review provisions.

1.3.2 Discharge to land

Section 15(1)(b) of the RMA stipulates that no person may discharge any contaminant onto or into land in circumstances which may result in that contaminant (or any other contaminant emanating as a result of natural processes from that contaminant) entering water, unless the activity is expressly allowed for by a resource consent or a rule in a regional plan, or by national regulations.

NPDC held discharge permit **3989-2** to cover the discharge of up to 85 m^3/day of waste dewatered activated sludge or equivalent dry weight of thermally dried activated sludge from the NPWWTP onto land at the New Plymouth Airport. This consent expired on 1 June 2014 and will no longer be included in the NPWWTP monitoring programme.

1.3.3 Air discharge permit

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

NPDC held air discharge permits **4740-1** and **5480-1** to cover the discharge of contaminants into the air from sludge processing activities (relating to different buildings). Both expired on 1 June 2008.

On 29 May 2008, NPDC was granted air discharge permit **4740-2**, a combination of both 4740-1 and 5480-1, to discharge contaminants into the air from sludge drying and processing activities at the NPWWTP. This permit was issued by the Council under section 87(e) of the RMA and is due to expire on 1 June 2026.

There are seven special conditions attached to the permit.

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

Condition 2 requires that the sludge management processes are managed to maintain discharges at a minimum, while condition 3 requires that discharges not give rise to any offensive or objectionable odours beyond the property boundary.

Condition 4 requires the consent holder to supply a statement of how the biofilters are to be maintained and operated.

Condition 5 requires a contingency plan addressing events at the NPWWTP that could give rise to abnormal odour release potential.

Condition 6 deals with removal of sludge from No. 2 lagoon while condition 7 deals with review of the consent.

1.3.4 Coastal permits

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

NPDC holds coastal permit **4593-2** to erect, place, maintain and use a marine outfall within the coastal marine area as part of the NPWWTP system. This permit was issued by the Council on 24 July 1996 under Section 87(c) of the RMA. It was due to expire on 1 June 2014 and was renewed as consent 4593-3 on 10 September 2014 with a new expiry date of 01 June 2041.

There are five special conditions attached to the permit.

Condition 1 requires that the consent holder maintain the structures authorised by the consent.

Condition 2 requires the consent holder to notify Council prior to undertaking maintenance works.

Condition 3 requires that all practicable measures are undertaken to prevent undue disturbance to reefs and marine life during maintenance works.

Condition 4 stipulates that the structure is removed when no longer needed.

Condition 5 deals with review provisions.

1.3.5 Land use consent

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

NPDC holds land use consent **1826-2** to erect, place and maintain a twin box culvert on the Mangaone Stream for road access purposes. This permit was issued by the Council on 16 January 2002 under Section 87(a) of the RMA. It is due to expire on 1 June 2020.

There are eight special conditions attached to the consent.

Condition 1 requires that the structure is maintained.

Condition 2 stipulates that maintenance be undertaken between November and April inclusive.

Condition 3 requires the consent holder to notify the Council prior to maintenance.

Condition 4 requires the consent holder to adopt the best practicable option to avoid or minimise effects on the streambed or water quality during maintenance.

Condition 5 requires that streambed disturbance is kept to a minimum during maintenance.

Condition 6 stipulates that the structure does not obstruct fish passage.

Condition 7 requires that the structure be removed and the area reinstated if and when no longer required.

Condition 8 deals with review provisions.

Copies of the NPWWTP consents are attached to this report in Appendix I.

1.4 Monitoring programme

1.4.1 Introduction

Section 35 of the RMA sets out an obligation for the Council to gather information, monitor, and conduct research on the exercise of resource consents, and the effects arising, within the Taranaki region.

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

The monitoring programme for the NPWWTP consisted of seven primary components during the 2014-2015 monitoring period.

1.4.2 Programme liaison and management

There is generally a significant investment of time and resources by the Council in ongoing liaison with resource consent holders over consent conditions and their interpretation and application:

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

1.4.3 Site inspections

Three scheduled inspections were undertaken at the NPWWTP site during the monitoring period. With regard to consents for the discharge to water, the main points of interest were plant processes with potential or actual discharges to receiving watercourses, including contaminated stormwater and process wastewaters. Air inspections focused on plant processes with associated actual and potential emission sources and characteristics, including potential odour, dust, noxious or offensive emissions. Sources of data being collected by the consent holder were identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. The neighbourhood was surveyed for environmental effects.

1.4.4 Water quality sampling

The final effluent was sampled on two occasions, with the samples analysed for faecal coliforms, enterococci and chlorine (total and free).

Two inter-laboratory comparisons between the Council and NPDC were performed during the 2014-2015 monitoring period. The comparisons were performed to verify the validity of monitoring results reported by NPDC, and to provide an independent check on compliance with consent conditions. Effluent samples were analysed, by both the Council and NPDC, for cadmium, chromium, copper, nickel, lead, mercury, zinc, cyanide, phenolic compounds, free available chlorine, total available chlorine, faecal coliform and enterococci bacteria.

1.4.5 Review of New Plymouth District Council monitoring data

NPDC routinely monitors the discharge effluent for a number of chemical, biochemical and bacteriological parameters.

Effluent composite sampling. Once a month, flow-proportional composite samples were taken over a 24 hour period and are analysed for pH, ammonia, chemical oxygen demand (COD), oxidised nitrogen, reactive phosphorus, cyanide, phenols, cadmium, chromium, copper, nickel, lead, zinc, and mercury. Approximately three times a week, composite samples were collected for the analysis of suspended solids and BOD. Since mid-January 2015, additional composite samples were collected approximately three times a week for the analysis of sulphate and reactive phosphorus.

Influent composite sampling. A number of influent composite samples were collected each month and analysed for pH, suspended solids, alkalinity, BOD, COD, ammonia, nitrate and faecal coliforms. Influent and effluent samples can be compared to provide an indication of plant performance.

Effluent grab sampling. Grab samples were collected and analysed for total available chlorine twice a day. Grab samples were also collected and analysed for faecal coliform bacteria approximately 3 times each week.

Sludge lagoon monitoring. Monitoring of the sludge lagoon is focused on the potential contamination of groundwater and of the drainage channel located next to the lagoon. Three groundwater bores are located around the lagoon. Samples from these

bores were analysed for pH, ammonia, faecal coliform bacteria, total dissolved phosphorus, oxidised nitrogen and COD once a month. The drainage channel was also sampled once a month at two sites, one upstream and the other downstream of the sludge lagoon. The drainage channel samples were analysed for pH, ammonia and faecal coliform bacteria.

The analysis of these samples was performed by NPDC and results were forwarded to the Council on a monthly basis. These results were summarised in section 3.1.3.1 and 3.1.3.2 of this report.

1.4.6 Marine ecological surveys

An annual intertidal ecological survey was carried out at three potential impact sites and two control sites during the 2014-2015 monitoring period. The objective of this survey was to indicate any change in intertidal community structure attributable to discharges from the NPWWTP outfall.

1.4.7 Shoreline bacteriological surveys

A survey of shoreline bacteriological water quality at four seawater sites in the vicinity of the marine outfall is carried out every second year during the summer months. Twelve to thirteen samples were collected from each site under dry weather conditions during 2014-2015. The samples were analysed for enterococci, faecal coliform and *E. coli* bacteria and conductivity. The survey is next due to be undertaken in the summer of 2016-2017.

1.4.8 Metals in mussel tissue

Mussels are collected from three sites around the outfall (Waiwhakaiho Reef, Bell Block and Arakaitai Reef) on a biennial basis and tested for trace metals. This monitoring was not undertaken in the 2014-2015 period. It is next scheduled to be carried out during the 2015-2016 monitoring period.

1.4.9 Mussel flesh norovirus analysis

Following review of the monitoring programme in 2013, norovirus analysis of mussel flesh and influent and effluent from the NPWWTP was added as a new component of the monitoring programme in accordance with condition 14 (e) of consent 0882-4. Mussels were collected once from three sites (Waiwhakaiho Reef, Bell Block and Oakura) and analysed for norovirus GI and GII by ESR. Influent and effluent samples were also collected once by NPDC and analysed for norovirus GI and GII by ESR.

2. Results

2.1 Water

2.1.1 Inspections

Three scheduled site inspections were performed at the plant, on 5 November 2014, 4 February 2015 and 18 May 2015. These inspections involved a visual assessment of the plant effluent and plant processes, a check of the final effluent chlorine data, a brief consultation with operations and/or laboratory staff, and an inspection of the foreshore and seawater adjacent to the outfall. The plant and surrounds were found to be tidy and well managed during each visit. A discussion between the Inspecting Officer and NPWWTP staff on 5 November 2014 revealed that there had recently been issues with high BOD's and hydrocarbons related to the incoming trade waste.

Effluent was typically clear, with a few tiny fat particles evident. The coastal effluent plume was either not visible, or visible as a small clear patch above the diffuser. There was no evidence of contamination of foreshore or shoreline water during the inspections.

2.1.2 Results of the Council's discharge monitoring

2.1.2.1 Grab samples

Grab samples were collected of the final effluent in conjunction with two of the inspections. The samples were analysed for faecal coliform and enterococci, total available chlorine, and free available chlorine (Table 1).

Table 1 Effluent grab samples 2014-2015 (site SWG002002)

Parameter	Unit	Date		Consent Limit
		5 Nov 2014	4 Feb 2015	
Faecal coliform	cfu/100 ml	17	21	-
Enterococci	cfu/100 ml	4	2	-
Total available chlorine	g/m^3	0.4	0.6	**<0.3**
Free available chlorine	g/m^3	<0.1	<0.1	**-**

The results of these grab samples show that the consent condition (which requires the total available chlorine level in the final effluent to be maintained at a level not less than 0.3 g/m^3) was met on both sampling occasions.

Relatively low levels of both faecal coliform and enterococci bacteria were recorded in the final effluent on both occasions.

2.1.2.2 Inter-laboratory comparison

Two grab samples of the final effluent (a 24 hour composite sample) were collected and split in order to perform an inter-laboratory comparison. The samples were analysed for cadmium, chromium, copper, nickel, lead and zinc (all acid soluble), cyanide and mercury (total) and phenols (Table 2).

Table 2 Inter-laboratory effluent grab samples 2014-2015

Parameter	Unit	5 November 2014			4 February 2015			Consent limit
		TRC	NPWWTP	Agree	TRC	NPWWTP	Agree	
Cadmium	g/m³	<0.005	<0.002	√	<0.005	<0.002	√	**0.04**
Chromium	g/m³	<0.03	<0.02	√	<0.03	<0.02	√	**0.15**
Copper	g/m³	<0.01	<0.02	√	<0.01	<0.02	√	**0.1**
Cyanide	g/m³	0.011	0.03	**	0.01	0.02	**	**0.1**
Mercury	g/m³	<0.0002	<0.001	√	<0.0002	<0.001	√	**0.002**
Nickel	g/m³	<0.02	<0.008	√	<0.02	<0.008	√	**0.15**
Lead	g/m³	<0.05	<0.03	√	<0.05	<0.03	√	**0.1**
Phenol	g/m³	<0.02	<0.05	√	<0.02	<0.05	√	**1.0**
Zinc	g/m³	0.028	<0.04	√	0.022	<0.04	√	**0.2**

√ = satisfactory agreement
* = result within 10 -25 % of the mean
** = result > 25 % from mean

The results of the inter-laboratory comparison show that, apart from cyanide, the results obtained were in good agreement, and all results were within levels prescribed by consent conditions. The majority of metals were below detection limits.

2.1.3 NPDC self monitoring

2.1.3.1 Effluent monitoring

Effluent composite samples. A summary of the monthly composite effluent monitoring undertaken by NPDC, from July 2014 to June 2015, is presented in Table 3, along with a summary of previous results (1990 to 2014). During the 2014-2015 monitoring year, all parameters were within their consent limits, and all results were within the range of those previously recorded. A full table of results for the period under review can be found in Appendix II. Results from 1990 onwards are also included in Appendix III.

Table 3 Summary results of monthly effluent composite samples collected by NPDC

Parameter	Unit	Consent limit	2014-2015			1990-2014		
			Median	Max	Number	Median	Max	Number
pH			7.3	7.6	12	7.6	8.1	283
NH_3	g/m³		0.11	0.19	12	0.8	21.8	283
COD	g/m³		23	33	12	22	380	277
NOx	g/m³		5.55	8.4	12	6.4	19	276
Phosphorus	g/m³		0.2	1	11	2.1	6.8	274
Cyanide	g/m³	**0.1**	<0.05	0.04	12	0.03	0.1	274
Phenols	g/m³	**1.0**	<0.05	<0.05	12	<0.05	0.11	271
Zinc	g/m³	**0.2**	<0.04	0.05	12	0.03	0.15	279
Copper	g/m³	**0.1**	<0.02	<0.02	12	<0.01	0.05	279
Chromium	g/m³	**0.15**	<0.02	<0.02	12	<0.05	<0.05	279
Nickel	g/m³	**0.15**	<0.008	0.009	12	<0.02	0.07	279
Cadmium	g/m³	**0.04**	<0.002	<0.002	12	<0.008	<0.008	279
Lead	g/m³	**0.1**	<0.03	<0.03	12	<0.02	0.04	279
Mercury	g/m³	**0.002**	<0.001	<0.001	11	<0.001	<0.001	268

*Additional composite samples were collected and analysed for reactive phosphorus and sulfate (see Appendix II for a summary of this data)

Results from the effluent composite samples analysed for BOD and suspended solids during the year under review are presented in Figures 2 and 3. The concentrations of BOD and suspended solids in the effluent composite samples remained within the consent limits during periods of both normal operation and maintenance.

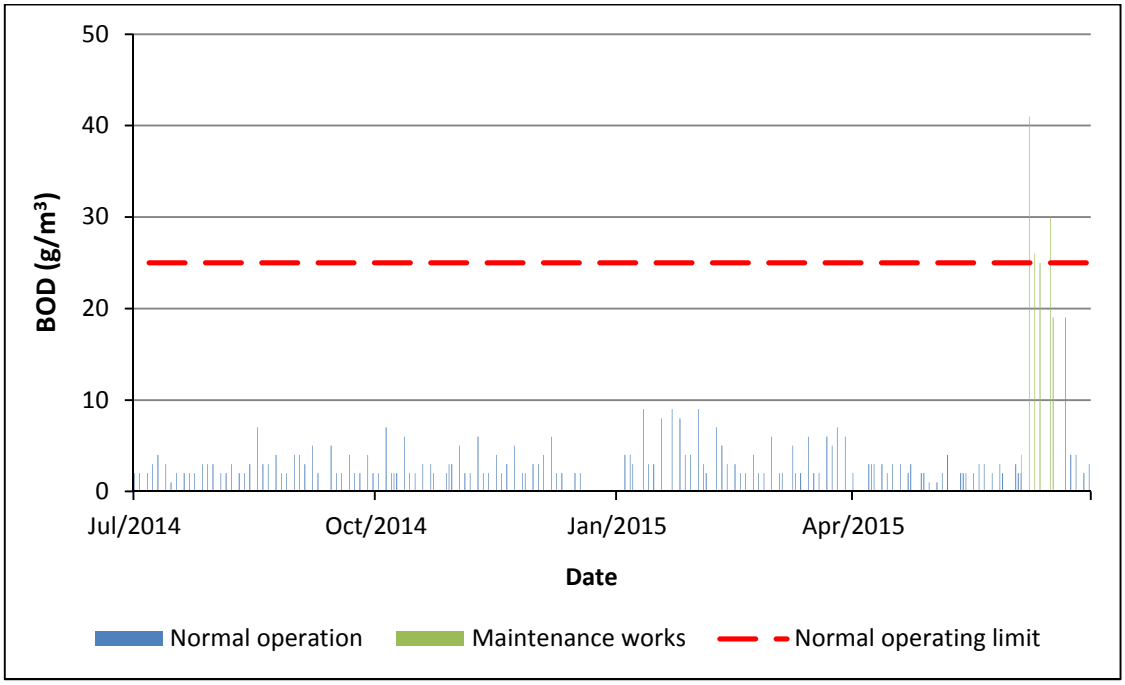


Figure 2 Biochemical oxygen demand in 24-hour effluent composite samples. Note: the consent limit for BOD during plant maintenance is 130 g/m^3

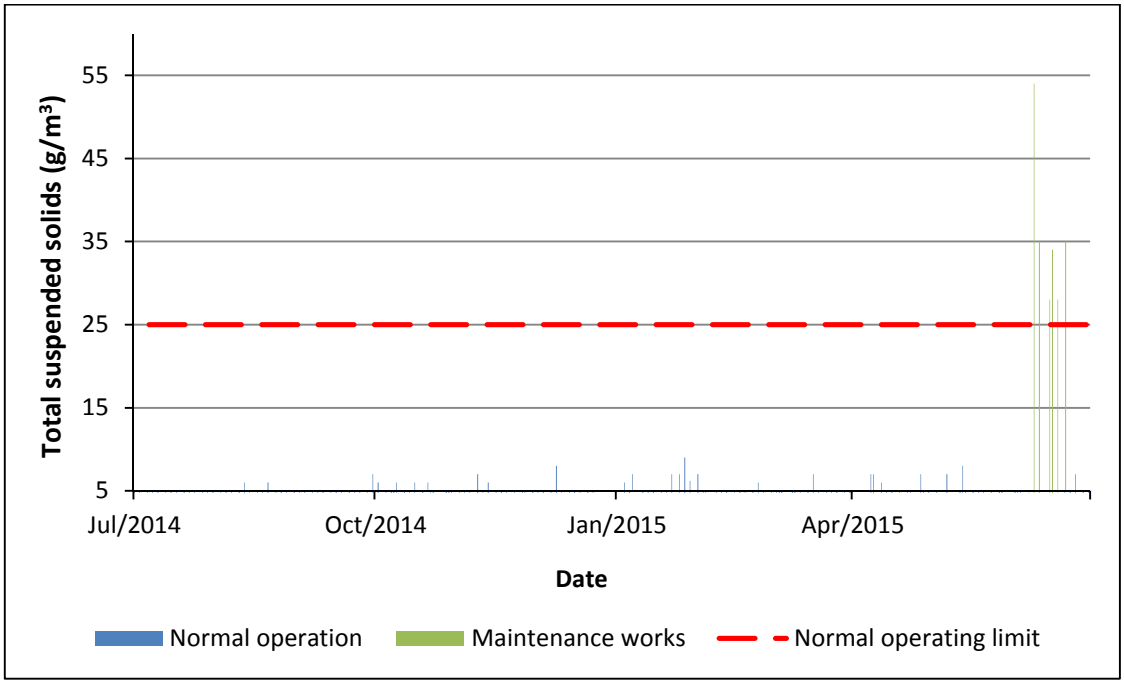


Figure 3 Concentration of total suspended solids in 24-hour effluent composite samples. Note: the consent limit for suspended solids during plant maintenance is 110 g/m^3. The lower detection limit for suspended solids was 5 g/m^3

Effluent grab samples. Condition 5 of consent 0882-4 allows an increase in the levels of suspended solids in the effluent, from 25 to 110 g/m^3, once a year for no longer than

14 days to allow for plant maintenance. Maintenance occurred on the bioreactor between 8 and 22 June 2015. During this period effluent monitoring was supplemented with additional grab samples. These samples were analysed for suspended solids and are presented in Figure 4. Suspended solids were in exceedance of the maintenance limit on one occasion on 10 June 2015 (118 g/m^3).

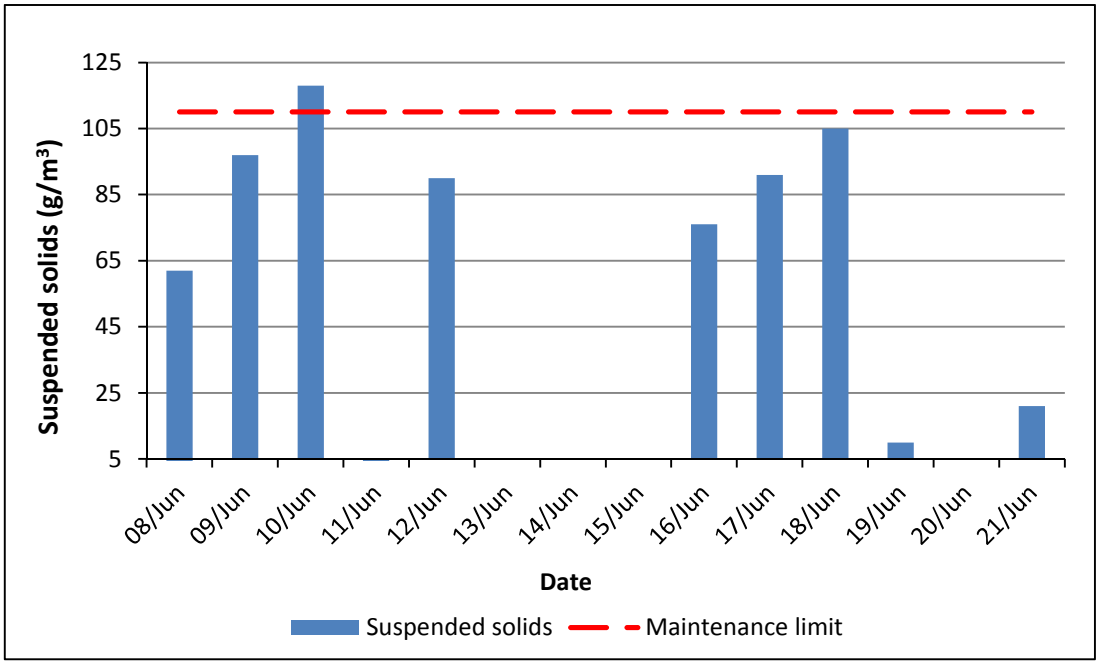


Figure 4 Suspended solids concentrations in effluent grab samples between 8 and 22 June 2015. Note: The lower detection limit for suspended solids was 5 g/ m^3

Condition 10 of consent 0882-4 requires that the concentration of total available chlorine (TAC) in the effluent shall be no less than 0.3 g/m^3. NPDC collected regular grab samples of the effluent to assess this condition. The results are presented in Figure 5. The total available chlorine reported in the final effluent was below 0.3 g/m^3 on three occasions during November, December and March in the monitoring year. Overall, the standard of effluent disinfection was good, with 99.4% of samples achieving compliance with the TAC limit, increasing from 98% in the 2013-2014 period. This was also reflected by the relatively low counts of faecal coliform bacteria found in effluent grab samples throughout the monitoring period (Figure 5).

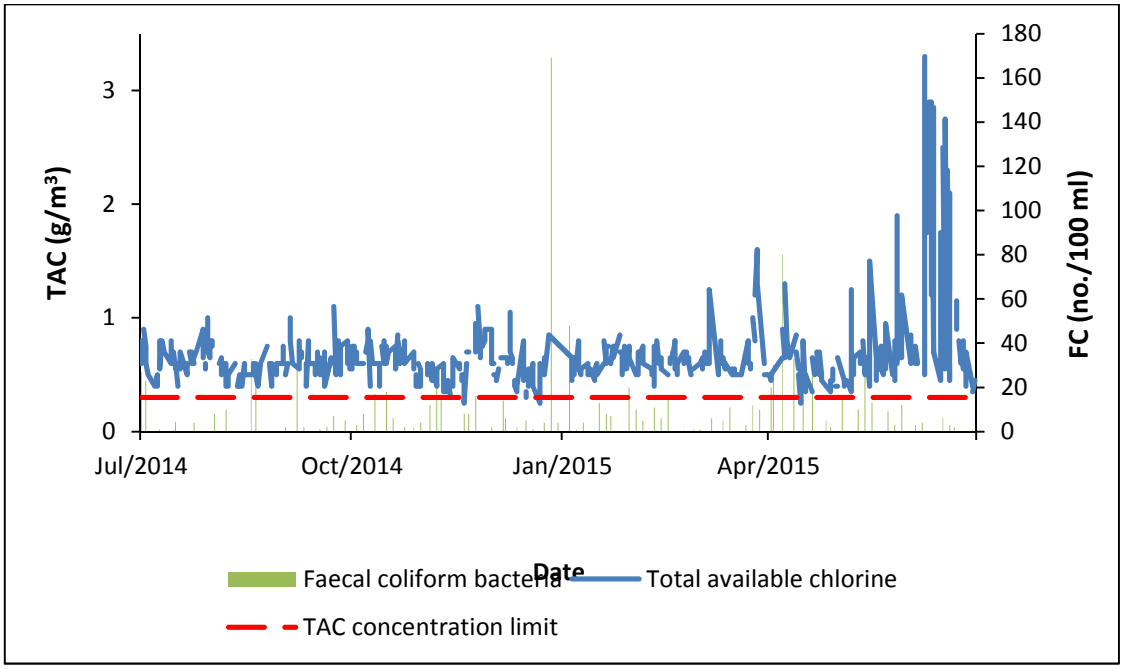


Figure 5 Levels of total available chlorine (TAC) and faecal indicator bacteria (FC) in effluent grab samples

Influent composite samples. NPDC provided the Council with a monthly summary of samples indicative of plant performance. Treatment of influent at the NPWWTP resulted in a reduction in pH, suspended solids, alkalinity, BOD, COD, ammonia, and faecal coliforms in effluent samples (Appendix IV). Nitrate generally increased as the ammonia was converted to nitrate by way of nitrification.

2.1.3.2 Sludge lagoon monitoring

The results of sludge lagoon groundwater and surface water monitoring, undertaken monthly by NPDC, are summarised in Figures 7 to 12, along with a summary of previous results from 1990 to 2014. No data was able to be collected from Bore 3 during March and April 2015 as the bore was dry. All of the results from 2014-2015 are presented in Appendix V. The location of the sampling sites in relation to the lagoon are shown in Figure 6.

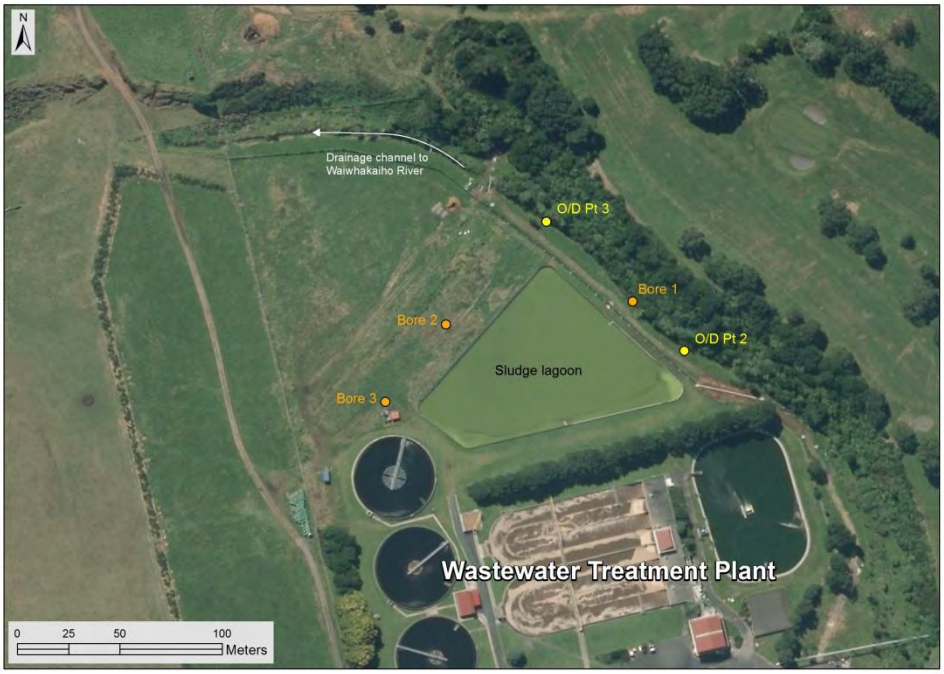


Figure 6 Sludge lagoon showing location of NPDC's groundwater bore and drain sampling sites

The pH levels in Bore 1 during the 2014 - 2015 monitoring period were comparable to previous results. The pH of the open drains did not notably deviate from historical levels either. However, the median pH in Bores 2 (5.8) and 3 (5.95) was notably lower compared with respective historical medians of 6.2 and 6.3 (Figure 7, Appendix V).

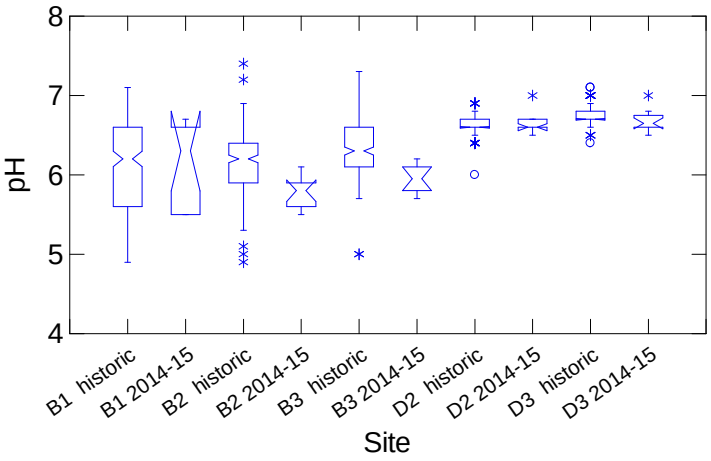


Figure 7 Boxplots of pH data from the three monitoring bores (B1-3) and two drains (D2-3) from between 1990 and 2014 (historic) and the current monitoring period (2014-15)

The process of decomposition of nitrogenous fractions within the sludge biomass generates ammonia. Ammonia concentrations in nearly all sample sites during the period under review were relatively low, compared with historical medians. However, ammonia concentrations in Bore 1 were notably elevated with a median of 11.2 g/m^3, compared with a historical median ammonia concentration of 2.4 g/m^3 (Figure 8, Appendix V).

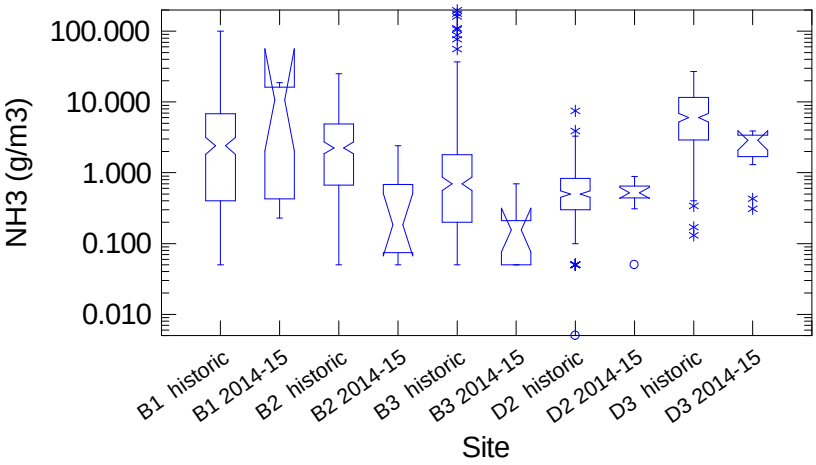


Figure 8 Boxplots of ammonia data from the three monitoring bores (B1-3) and two drains (D2-3) from between 1990 and 2014 (historic) and the current monitoring period (2014-15) presented on a logarithmic scale

The faecal coliform counts recorded at Bore 1 were low, with a median of <10 cfu/100 ml. The median count at Bore 2 was also low (10 cfu/100ml), however occasional high counts were observed. Bore 3 returned high counts, with the median count much higher than the historical median (119 and 5 cfu/100ml, respectively; Figure 9, Appendix V). The two open drain sites also had high counts. However, at these surface water sites, the variation in faecal coliform numbers is affected to a greater extent by fluctuations in drain flow and access by stock and wildlife.

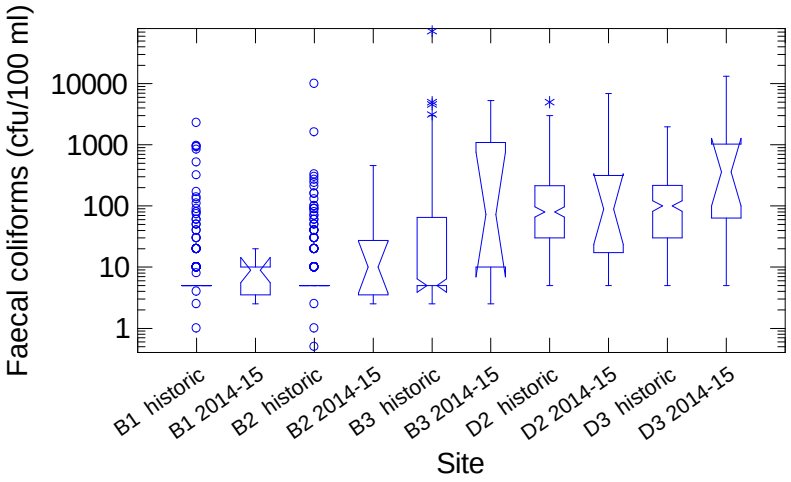


Figure 9 Boxplots of faecal coliform data from the three monitoring bores (B1-3) and two drains (D2-3) from between 1990 and 2014 (historic) and the current monitoring period (2014-15) presented on a logarithmic scale

Soluble phosphate is released from the sludge biomass under anaerobic conditions and therefore is the major contributor to dissolved phosphorus levels. Levels at bores 2 and 3 were low. Relative to the historical median, the median level of total dissolved phosphorus (TDP) in Bore 1 was notably higher during this monitoring period (<0.05 and 0.265 g/m^3, respectively; Figure 10, Appendix V). The generally

low levels of TDP at the bore sites indicate that soluble phosphorus is possibly being absorbed into the ash and clay substrate.

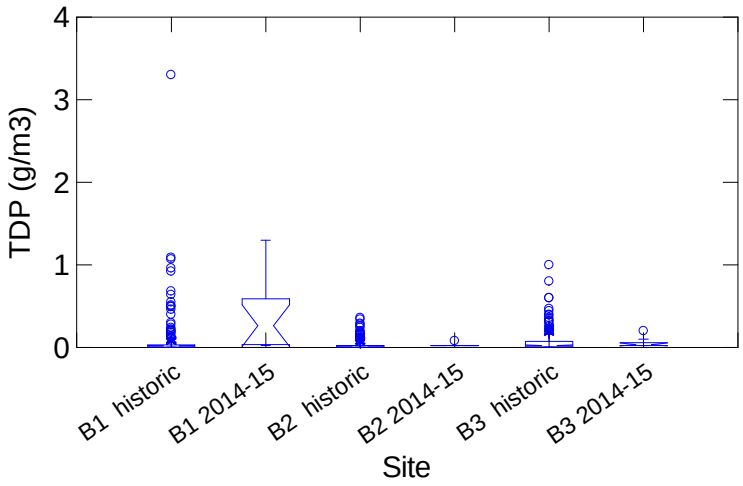


Figure 10 Boxplots of total dissolved phosphorus data from the three monitoring bores (B1-3) between 1990 and 2014 (historic) and the current monitoring period (2014-15)

Oxidised nitrogen levels in Bores 2 and 3 generally remained low throughout the monitoring period. The median level of oxidised nitrogen observed in Bore 1 was 0.95 g/m^3; relatively higher than the historical median of <0.05 g/m^3 (Figure 11, Appendix V).

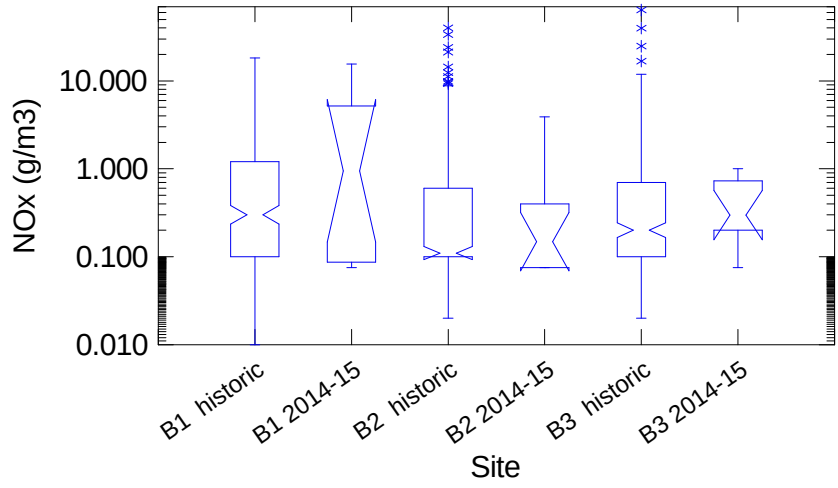


Figure 11 Boxplots of oxidised nitrogen data from the three monitoring bores (B1-3) between 1990 and 2014 (historic) and the current monitoring period (2014-15) presented on a logarithmic scale

Finally, levels of COD increased from Bore 1 to Bore 3 with levels in all three bores above the historical median (Figure 12, Appendix V). These elevated COD levels indicate that seepage from the lagoon was occurring. The construction of the lagoon was so that the sludge would be forced by hydraulic pressure into the fine river silts and ash which underline the lagoon, thus blinding and sealing the bottom of the lagoon. This has in the most part been achieved, although minimal leakage still

occurs as indicated by the monitoring results of groundwater and surface waters in the vicinity of the lagoon.

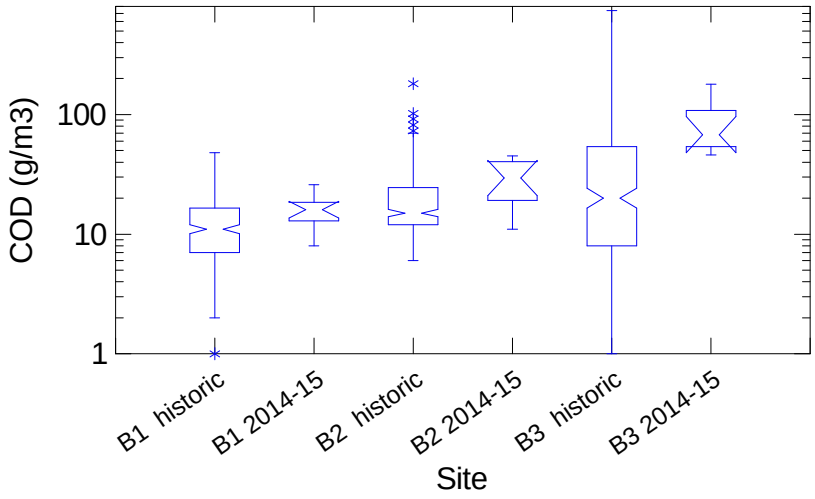


Figure 12 Boxplots of chemical oxygen demand data from the three monitoring bores (B1-3) between 1990 and 2014 (historic) and the current monitoring period (2014-15) presented on a logarithmic scale

2.1.4 Marine ecological surveys

In order to assess the effects of the NPWWTP outfall discharge on the nearby intertidal communities, ecological surveys were conducted in January 2015 at five sites (Figure 13). These surveys included three potential impact sites (SEA902015, SEA902010, SEA902005) and two control sites (SEA903070, SEA901007), north and south of the outfall. Any adverse effects of the NPWWTP outfall discharge on the intertidal communities would have been evident as a significant decline in species diversity at the potential impact sites relative to the control sites.

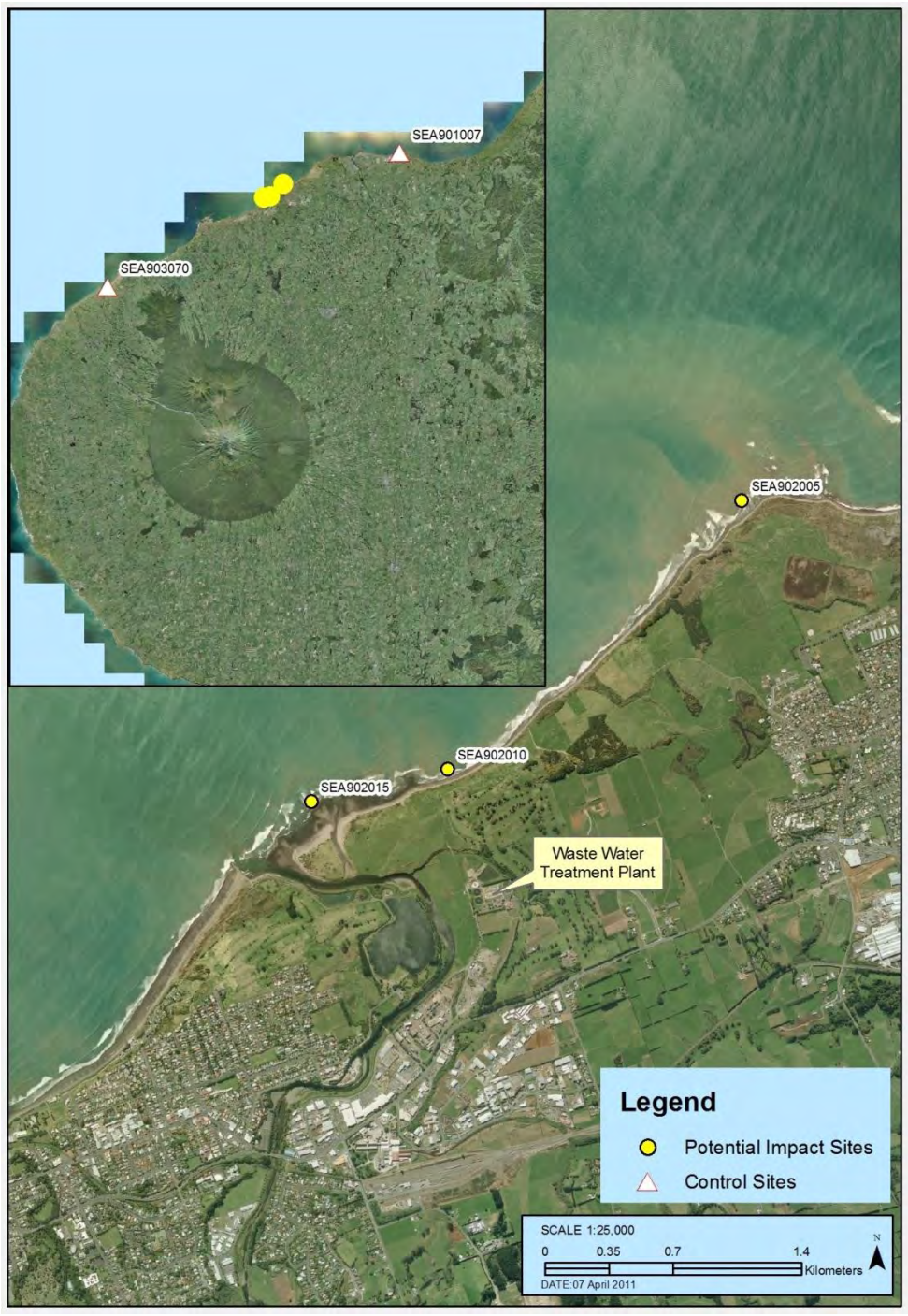


Figure 13 Marine ecological survey sites for NPWWTP

A full copy of the marine ecological survey report, including a comprehensive analysis and interpretation of results, is provided in Appendix VI. This year, the intertidal communities at the sites in this survey were strongly influenced by sand inundation. Three sites were inundated with a substantial volume of sand (65-98% sand cover); two of which were potential impact sites (Figure 16). This high sand cover made it difficult to discern an effect of the wastewater outfall on the rocky shore communities. However, the one potential impact site that was not inundated by sand (500 m south west of the outfall), remained relatively unchanged from the previous survey, in terms of number of species and species diversity at the site. Furthermore, over the long term record, there has been no obvious decline in species

number and Shannon-Weiner index at the potential impact sites relative to the control sites (Figures 14 and 15). In summary, impacts of the NPWWTP outfall discharge on the local intertidal community were not evident from the 2015 survey. Natural environmental factors, in particular sand cover, but also substrate type and substrate mobility, appeared to be the dominant drivers of species diversity at the sites surveyed.

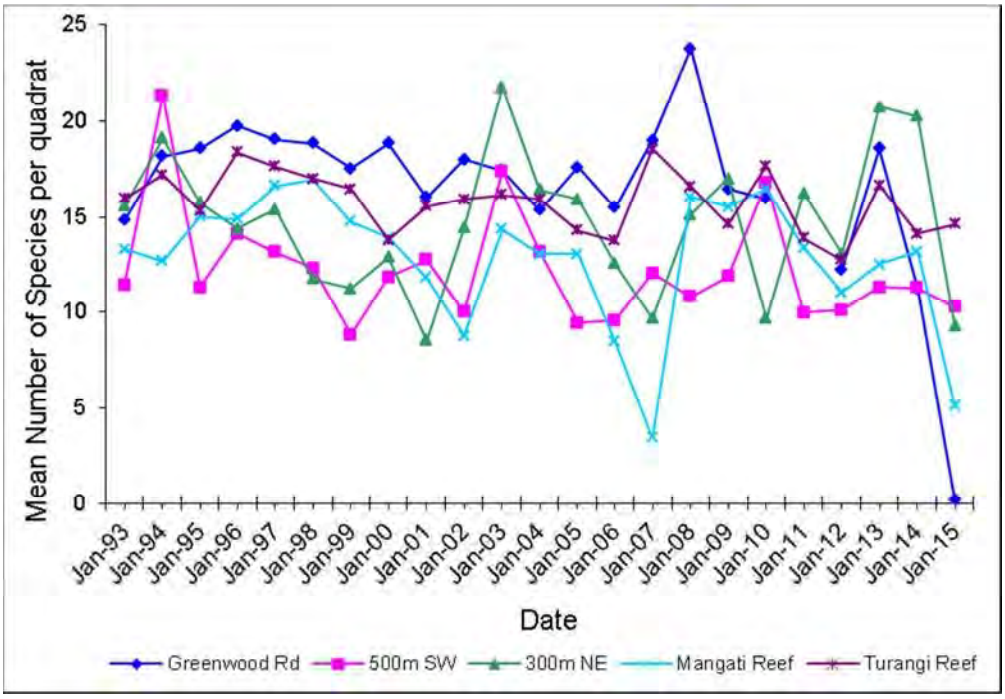


Figure 14 Mean number of total species per quadrat from 1993 to 2015

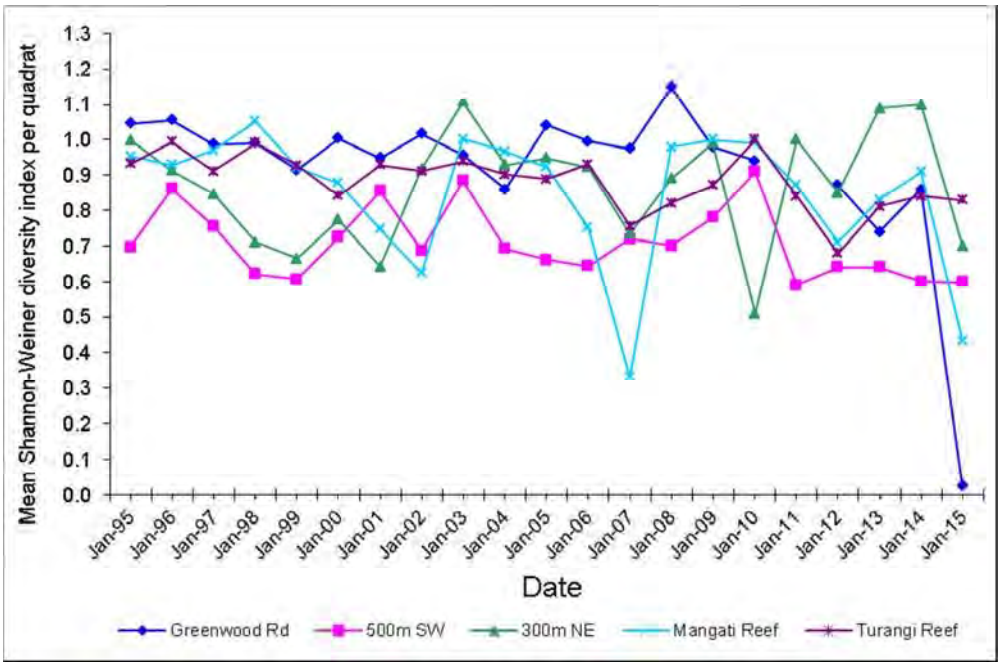


Figure 15 Mean Shannon-Weiner index per quadrat from 1995 to 2015

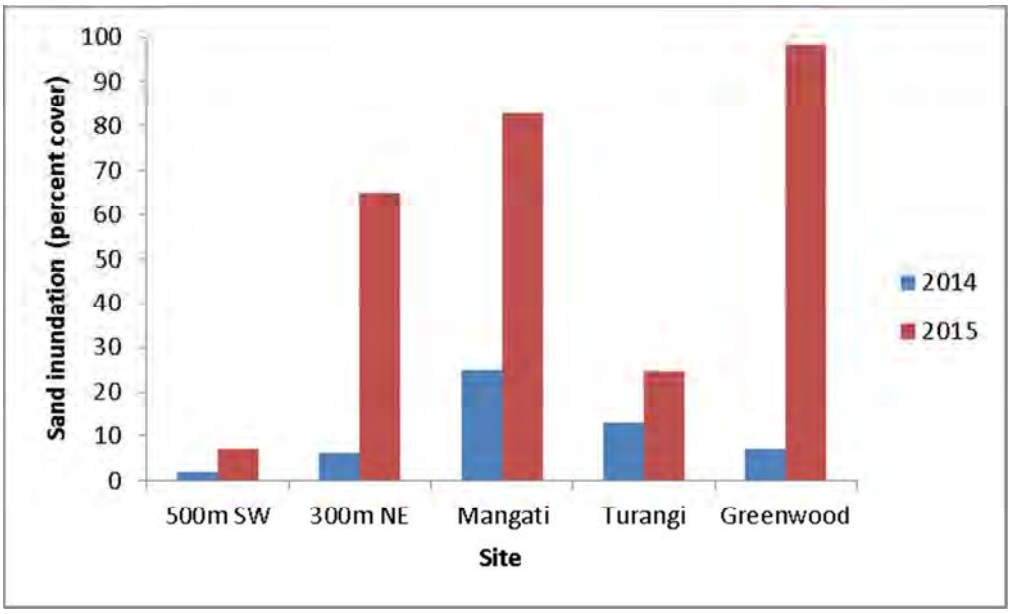


Figure 16 Mean percent sand inundation at the five NPWWTP summer survey sites during 2014 and 2015

2.1.5 Shoreline bacteriological water quality

Bacteriological water quality was monitored at four coastal sites in the vicinity of the marine outfall (Figure 17) during the summer months of 2014-2015 to assess whether the discharge from the marine outfall was having any adverse effects on coastal bathing water quality. A site on the Waiwhakaiho River was also monitored in order to determine any influence of the river on coastal water quality. Twelve to thirteen samples were collected at each site during dry weather conditions and analysed for enterococci, faecal coliforms, *E. coli* and conductivity.

Figure 17 Location of monitoring sites in relation to the NPWWTP

A full copy of the report on shoreline bacteriological water quality is contained in Appendix VII. In summary, during the 2014-2015 summer season bacteriological water quality was generally good at the Fitzroy Beach, Mangati and 300 m NE sites, slightly worse at the 500 m SW site and poor at the Waiwhakaiho River site (Table 4). In relation to MfE water quality guidelines (as set out in Appendix VII), Mangati and Fizroy Beach sites remained in 'Surveillance' mode all summer season. The sites 300 m NE and 500 m SW of the outfall obtained 'Alert' mode in 1 out of 12 samples, and 4 out of 12 samples, respectively. The Waiwhakaiho River site had 11 of 13 samples within 'Action' mode.

Table 4 Summary enterococci results for the NPWWTP sites

Site	Enterococci (cfu/100 ml)			MfE Guideline Modes (2003)		
	No. samples	Median	Maximum	Surveillance	Alert	Action
Mangati	13	<1	60	13	0	0
300m NE	12	25	350	11	1	0
500m SW	12	79	1200	8	4	0
Fitzroy Beach	13	3	11	13	0	0
Waiwhakaiho River	13	1000	7400	1	1	11

* *Guideline limits for Waiwhakaiho River based on E. coli counts*

Gulls are believed to be the main source of faecal contamination at the 500 m SW and Waiwhakaio River sites (Photograph 2). High numbers of gulls have been observed in close proximity to these sites and results from faecal source tracking support these observations.

If the wastewater discharge from the outfall was having a greater influence on water quality, higher faecal indicator bacteria counts would be expected at the East of the Outfall site taking into consideration the north easterly prevailing flow. Such a pattern did not occur.

Photograph 2 Gulls at the mouth of the Waiwhakaiho River

2.1.6 Shellfish microbiology

In waters affected by discharges from wastewater treatment plants the relationship between indicators and pathogens can be altered by the wastewater treatment

process. Currently, it is norovirus that are believed to pose the greatest health risk in seawater containing treated wastewater. Norovirus are the main cause of gastroenteritis associated with shellfish consumption and only low concentrations are required to pose a high risk of infections in humans. Mussels and other filter feeding molluscs are efficient at concentrating norovirus which can be retained in their flesh for up to 8-10 weeks.

As a requirement of condition 13, consent 0882-4, a Quantitative Microbial Risk Assessment (QMRA) was completed which assesses the human health effects associated with norovirus in wastewater discharges from the NPWWTP (McBride, 2012).

In conjunction with the QMRA and as a requirement of condition 14, consent 0882-4, monitoring of microbial contamination within shellfish was implemented within the consent compliance monitoring for the NPWWTP. Mussel flesh has been monitored for norovirus (GI and GII) and faecal coliforms at two potential impact sites (Waiwhakaiho Reef and Bell Block) and one control site (Oakura) since October 2012. Norovirus (GI and GII) concentrations are also measured within the NPWWTP influent and effluent.

The disinfection rate has continued to improve following the upgrade of the wastewater treatment system. The results from the first samples taken following the upgrade (9 June 2014; Table 5) showed that norovirus numbers were being decreased by two orders of magnitude as a result of treatment. Results from this monitoring period (20 April 2015) show that the disinfection is achieving a three order of magnitude reduction in norovirus numbers.

Table 5 Norovirus concentration in the effluent and influent from the NPWWTP

Operation	Date	Influent norovirus (genome copies/L)		Effluent norovirus (genome copies/L)	
		GI	GII	GI	GII
Pre-upgrade	9 October 2012	280,000	470,000	100	13,000
Pre-upgrade	16 October 2012	37,000	1,600,000	180	30,000
Pre-upgrade	23 October 2012	17,000	28,000,000	460	21,000
Upgrade	31 July 2013	35,000	1,200,000	8,200	140,000
Post-upgrade	9 June 2014	67,000	480,000	200	2,300
Post-upgrade	20 April 2015	4,300	3,000,000	0.5	1,300

Following the completion of the upgrade norovirus levels in mussel flesh dropped back to low or below detection levels (on 15 June 2014; Table 6). Results from this monitoring period (20 April 2015) indicate that the levels of norovirus in mussel flesh remain low or below detection levels. However, due to the highly infectious nature of norovirus, with only low concentrations posing a high risk of illness, shellfish warning signs remain in place at the Waiwhakaiho area and Bell Block (Photograph 3).

Table 6 Mussel flesh microbiology results since the NPWWTP upgrade

Operation	Date	Site	Mussel flesh norovirus	
			GI	GII
Normal: Pre-Upgrade	5 October 2012	Waiwhakaiho Reef	Negative	Negative
		Bell Block	Negative	Low
		Oakura	Negative	Negative
Upgrade: Bypass	20 August 2013	Waiwhakaiho Reef	Moderate	Extremely high
		Bell Block	Low	Moderate
		Oakura	Negative	Low
Post-upgrade	15 June 2014	Waiwhakaiho Reef	Low	Negative
		Bell Block	Negative	Low
	20 April 2015	Waiwhakaiho Reef	Negative	Low
		Bell Block	Negative	Negative
		Oakura	Negative	Negative

Photograph 3 Shellfish health warning sign at the Waiwhakaiho River mouth

Photograph 4 Green lipped mussels at Bell Block

2.2 Air

2.2.1 Inspections

Air inspections were undertaken in conjunction with the three scheduled site inspections. Slight odours were noted in the vicinity of the milliscreen building on 5 November 2014 and 4 February 2015. No odours were detected on 18 May 2015. No odours were noted beyond the plant boundary on any occasion.

2.3 Investigations, interventions, and incidents

The monitoring programme was based on what was considered to be an appropriate level of monitoring, review of data, and liaison with the consent holder. 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).
For the purpose of discussion incidents have been separated into those directly associated with the NPWWTP, sewage pump station incidents and reticulation overflows. Although two 14 day letters were issued in relation to incidents over the monitoring period, in both cases a defence was established under the RMA and no further enforcement action was undertaken.

2.3.1 New Plymouth Wastewater Treatment Plant incidents

Eleven incidents were reported from the NPWWTP during the 2014-2015 year (Table 7). Although eleven events were reported, not all of these events resulted in non-compliance with consent conditions. Five incidents related to the maintenance of a minimum of 0.3 g/m^3 of chlorine in the treated water discharged from the plant. Of these, equipment failure led to three non-compliances. These three incidents occurred in short succession during December 2014 (14 day letter issued). The two remaining chlorine level incidents were notified as the level of chlorine fell below the minimum level although dosing equipment was still operating. On one occasion a rapid increase in flow through the plant occurred and the dosing equipment did not respond sufficiently. The final incident related to an issue with makeup concentrations in the day tank (Table 7).

Four incidents relate to the overall quality of the treated water and periods when the suspended solids exceeded the 95%ile value of 25 g/m^3. Three incidents were reported during the high flow events of 19 and 20 June 2015. The forth incident

occurred during wet testing of the Waitara to New Plymouth pumping main when construction debris was flushed from the pipeline during the first operation of the pumps.

There was on odour complaint received from New Plymouth Golf club during January 2015. This incident was due to the operating regime of the sludge lagoon.

The final reported event was associated with the receipt of an illegal discharge of hydrocarbon to the sewer system. The incident was reported to the Council and assistance was provided by the Council by way of the emergency spill response vehicle. The event was contained within the treatment plant and a very minor quantity of hydrocarbon is believed to have left the treatment process to the environment.

Table 7 Summary of incidents directly associated with the NPWWTP during 2014-2015

Date	Incident Type	Incident Details	Corrective Actions	Council Action
5 Sept 2014	Operational incident	A significant load of hydrocarbons was detected at the WWTP at 9am.	Trade Waste Officer investigated source of hydro-carbons. WWTP operated in attempt to control load.	No further action
9 Oct 2014	Unauthorised incident	Wet commissioning of Waitara wastewater pumping station (during WWWTP conversion) and flushing of pipeline through to NPWWTP resulted in dirty water mixing with WWTP discharge to outfall which exceeded consent condition for SS (25g/m^3) for a short period. Sample was taken and SS was 38 g/m^3.	Sample taken. Construction sediments collected in pipeline and any sediment in river water used to test line previously would have been flushed by the commissioning. Treated effluent continued to be treated effectively throughout commissioning. Sediment cleared once line was flushed with potable water.	No further action
5 Nov 2014	Non-compliance	High rainfall event caused high pump flows into plant resulting in a drop in chlorine levels in effluent discharge below consent condition of 0.3 g/m^3 for 30 minutes.	Further refining of control loop to manage change in incoming flow. Regular drawdown tests and checks of chlorine day tank concentration; Work instruction to be prepared for chlorine dosing.	No further action
8 Dec 2014	Non-compliance	Power failure causing shutdown of disinfection pumps; Chlorine less than the 0.3 g/m^3 required.	Technician called in electrical specialist who reinstated the plant. Investigation into the failure ongoing.	14 day letter
11 Dec 2014	Non-compliance	Power failure causing the Chlorine dose pumps to fail. Chlorine less than the 0.3 g/m^3 required.	All pumps restarted manually chlorine returned to compliant level in the WWTP effluent.	14 day letter
15 Dec 2014	Non-compliance	Chlorine analyser failure causing the chlorine to drop below 0.3 g/m^3 in the discharged effluent from the NPWWTP.	Trim pump put onto manual to ensure the effluent discharged was over 0.3 ppm at all times. Normal chorine usage is approximately 500 litres per 24 hours, the usage over the day in question was 300 litres.	No further action
12 Jan 2015	Complaint	Odour complaint from NP golf course.	Incorrect pumping of sludge into the lagoon, pumped into top of lagoon instead of bottom of lagoon. Technician reminded of the correct way to pump sludge into the lagoon and ensure Work Instructions capture this requirement.	No further action

Date	Incident Type	Incident Details	Corrective Actions	Council Action
27 May 2015	Non-compliance	Low strength Sodium Hypochlorite caused chlorine levels to drop.	Investigated and changed over tanks.	No further action
19 Jun 2015	Unauthorised incident	High inflow event while one bioreactor was out of service causing clarifier over wash, which in turn caused high suspended solids in the effluent discharge.	Immediate Actions: The second bioreactor was put into service to reduce the inflow to the clarifiers.	No further action
20 Jun 2015	Unauthorised incident	Very high influent flows	Grit trap bypassed to increase flow through the plant.	No further action
20 Jun 2015	Unauthorised incident	High inflow causing screens and chlorinated effluent to bypass the biological process.	Sample and oxygen level of the discharged effluent to be taken during the overflow event.	No further action

2.3.2 Sewage pump station incidents

There were 20 monitored potential overflow points on pump stations in New Plymouth, Bell Block and Oakura during the period under review. Incidents associated with the Waitara WWTP and sewage pump stations are covered in the Waitara Waste Water Treatment Plant and Marine Outfall monitoring programme report 2014-2015.

An extreme wet weather event on 19 and 20 June 2015 led to a number of overflows. In each case the pumps were operating and where two pumps were installed in the wet well both pumps were operating. However the volume of inflow exceeded the capacity of the pumps and overflows resulted.

In addition, two other significant events occurred during the 2014-2015 period. A failure of computer equipment at Shearer Reserve led to this pump station overflowing for approximately 800 minutes. Although equipment had failed no alarms were raised. This was due to the fact that data was still being received at New Plymouth. However the data had frozen at the last value and so the telemetry systems did not identify a loss of communications. The failure of equipment should have been identified earlier and a 14 day letter was received from the Council. Further clarification was sought around a number of points in the 14 day letter prior to the Council accepting the explanation of an unforeseeable mechanical/technical fault. Once questions and concerns had been addressed and a defence under the RMA established, no further enforcement action was taken by the Council. Measures were put in place by NPDC to avoid repeat occurrence of such an incident.

The second significant incident occurred as a result of third party damage to the Mangati sewer rising main. Rising mains have no redundancy and as a result the pump station had to be stopped in order to make the repair. A considerable effort was made to mitigate the impact of stopping the Mangati pumping station including liaison with major trade waste customers, management of flows where possible, and a media release requesting the public to refrain from discharging wastewater unnecessarily during the time for the repair. The Council and Taranaki District Health Board were consulted and provided feedback prior to the repair being completed. The Council also undertook additional monitoring during the repair on 12 June 2015. The overflow at the pump station identified a second, previously unidentified overflow discharge point (Photograph 5). Although any overflow from

this point would have been recorded by telemetry, the second discharge point also provided another point where stream water could enter the sewer system. Further investigation identified the old Mangati pump station still exists and was still connected to the sewer system. The old wet well has now been disconnected from the sewer and the accumulated solids in the wet well have been removed. A further project will demolish the old pump station.

Table 8 Summary of pump station overflows in the New Plymouth wastewater catchment for the 2014-2015 year

Date	Sewage Pump Station Location	Incident Details	Corrective Actions	Council Action
30 Sep 2014	Bell Block	A power cut caused the pump station to stop, resulting in a short discharge to the Mangati Stream.	Generator taken to site and installed until mains power was restored.	No further action
30 Sep 2014	Connett Road (Bell Block)	A power cut caused the pump station to stop, resulting in a discharge to the Waitaha Stream. The pump station restarted when power was restored.	Telemetry reviewed. Overflow estimated to be 6,000 L of sewage discharged.	No further action
17 Nov 2014	Shearer Reserve (Oakura)	UPS Failure causing PLC to fail. Likely to have been caused by a power event.	Immediate Action: NPDC called in NP Electrical to assist getting the site activated. Other actions in final report.	14 day letter
28 Jan 2015	Mangati (Bell Block)	The failure of a 24 volt power supply caused the control of the pump station to cease operation. The installed duplicate power supply which would normally provide redundancy had a previously unidentified wiring fault which rendered the duplicate power supply unavailable. The combination of both of these faults resulted in the overflow.	Immediate action: NPDC called in electrician who fixed the fault.	No further action
6 Mar 2015	Connett Road (Bell Block)	Wet weather causing power outage caused overflow.	Immediate action: Generator hooked up to pump station by NPDC.	No further action
6 Mar 2015	Glen Avon (New Plymouth)	Wet weather causing power outage & VSD trip causing overflow.	Immediate action: NPDC reset VSD.	No further action
10 Aprl 2015	Bell Block	High rainfall causing sewer pump station overflow.	Immediate action: NPDC checked site and reset pumps.	No further action
10 Aprl 2015	Mangati (Bell Block)	High rainfall causing sewer pump station overflow.	Immediate action: NPDC checked site, unblocked pump 2 and reset both pumps.	No further action
12 May 2015	Ngamotu Beach (New Plymouth)	High rainfall event causing overflow.	Immediate action: NPDC checked pumps and floats were working ok and both pumps running.	No further action
12 Jun 2015	Mangati (Bell Block)	Damaged pipe caused an overflow of undiluted wastewater from Mangati pump station.	Pipe repaired. Sucker trucks used to minimise overflow. Inglewood pump station shut down. Key trade waste customers contacted to reduce discharge, media release to gain cooperation from public to reduce discharge during repair.	No further action

Date	Sewage Pump Station Location	Incident Details	Corrective Actions	Council Action
20 Jun 2015	Connett Road (Bell Block)	High rainfall causing wastewater overflow from the pump station.	Pumps checked by NPDC. Pumps operating at capacity.	No further action
20 Jun 2015	Colson Road (New Plymouth)	High rainfall causing wastewater overflow from the pump station.	Pumps checked by NPDC. Working fine.	No further action
20 Jun 2015	Fitzroy Beach (New Plymouth)	High rainfall causing wastewater overflow from the pump station.	Pumps checked by NPDC. Pump run on manual to lower level.	No further action
20 Jun 2015	Ngamotu Beach (New Plymouth)	High rainfall causing wastewater overflow from the pump station.	NPDC waited for flow to reduce.	No further action

Photograph 5 Sewage discharging from a previously unidentified overflow discharge point into the Mangati Stream on 12 June 2015

2.3.3 Reticulation overflow incidents

Fourteen unauthorised discharges occurred due to blockages or pipe breakage in the Reticulation network (Table 9). Pipe blockages were usually related to a build up of fat in the line, or as a result of tree roots. The overflow incidents occurred during wet weather on 20 June 2015. All incidents were responded to as defined in the Incident Response Plan and no further enforcement action was required by the Council.

Table 9 Summary of reticulation overflows in the New Plymouth wastewater catchment for the 2014-2015 year

Date	Sewage Pump Station Location	Incident Details	Corrective Actions	TRC Action
8 Jul 2014	Kipling Drive (New Plymouth)	Fat blockage caused a wastewater overflow to stormwater and Herekawe Stream.	Citycare cleared the blockage and cleaned up the area. A sucker truck was used to clean out the sumps.	No further action
14 Jul 2014	Rosendale Avenue (New Plymouth)	A large amount of fat and tree roots blocking the main.	Citycare cleared the blockage and cleaned up the area. A sucker truck was used to clean out the sumps.	No further action
30 Jul 2014	Coby Sydney Drive (Bell Block)	A large amount of fat and tree roots blocking the main.	Citycare cleared the blockage and cleaned up the area. This line was last flushed in 2012. It has been placed on a 6-montly cycle.	No further action
12 Aug 2014	Awanui Street (New Plymouth)	A dislodged dropper in the manhole and a child drink bottle created a blockage which caused an overflow to the stormwater sump and then the Te Henui Stream.	Citycare cleared the blockage and cleaned up the area. A sucker truck was used to clean out the sumps. The property was cleaned. Dropper to be repaired.	No further action
15 Sep 2014	Spencer Place (New Plymouth)	Tree roots in the sewer main caused a blockage and discharge of wastewater to Te Henui Stream.	Citycare cleared the blockage and checked sewer main using CCTV.	No further action
25 Dec 2014	Sunnyvale Street (Bell Block)	Sewer main blocked with fat causing overflow.	City Care cleared the blockage and CCTV the main.	No further action
16 Feb 2015	Connett Road (Bell Block)	Root intrusion and fat blocking the line caused manhole to overflow.	City Care water blasted to remove blockage and cleared and disinfected area.	No further action
1 Jun 2015	Parson Street (New Plymouth)	Sewer line blockage from fat caused an overflow of wastewater from a manhole.	Blockage cleared, site cleaned and sanitised.	No further action
20 Jun 2015	Brougham Street (New Plymouth)	High rainfall event causing wastewater overflow from a manhole.	Site cleaned and sanitised.	No further action
20 Jun 2015	Mangorei Road (New Plymouth)	High rainfall event causing wastewater overflow from a manhole.	Site cleaned and sanitised.	No further action

3. Discussion

3.1 Discussion of plant performance

Routine maintenance was carried out at the plant during the 2014-2015 period.

Condition 20 of consent 0882-4 requires that NPDC provide an annual report to the Council by 31 July each year. The report is to detail progress made towards reducing inflow and infiltration reduction; NPDC's target for reduction of inflow and infiltration; and works proposed to meet that target over the coming year. Reports covering the 2014-2015 were received.

Updated contingency plans, as required by condition 21 of the same consent, were provided for the site in August 2013 with minor updates provided as required.

An annual meeting with representatives of the Council, Ngati Tawhirikura Hapu, and interested submitters is required by condition 22 of consent 0882-4. This meeting was held in December 2014. The invitation for the meeting was extended to interested parties (including those specified in consents) for both New Plymouth and Waitara wastewater treatment plant consents. A summary of the monitoring undertaken in relation to all consents and the plant performance was provided.

3.2 Environmental effects of exercise of consents

3.2.1 Effluent discharge to Tasman Sea

Two consents cover the discharge of treated wastewater from the plant to the Tasman Sea via the marine outfall. Consent 0882-4 allows the discharge of the wastewater through the marine outfall and consent 4593-2 licenses the presence of the outfall structure in the coastal marine area.

Monitoring of the wastewater discharge to the Tasman Sea during the 2014-2015 monitoring period consisted of both monitoring of the final wastewater composition prior to discharge, and monitoring of the effects of the discharge on the receiving environment.

Monitoring of the final wastewater prior to discharge was primarily undertaken by NPDC in the form of regular grab samples and monthly 24-hour composite samples. Inter-laboratory comparisons and checks of compliance with consent conditions were also undertaken by the Council. There was 100% compliance regarding contaminants as per condition 3 of consent 0882-4. During normal operation of the plant there were no breaches of BOD or suspended solids concentration limits (condition 4). During routine plant maintenance there was one occasion where the suspended solids concentration breached the extended limit imposed by consent condition 5. Chlorine concentrations were below the consent limit (condition 10) on five occasions (details provided in Section 2.3.1).

Monitoring of effects on the receiving environment consisted of an intertidal marine ecological survey of potentially affected reefs, assessment of shoreline bacteriological water quality and analysis of norovirus in mussel tissue. Norovirus levels in mussels have continued to improve since the completion of the treatment plant upgrade.

There were no significant detectable effects in the receiving environment resulting from wastewater discharges from the plant during the 2014-2015 monitoring period.

3.2.2 Sludge lagoon and sludge disposal monitoring

NPDC holds consent 2982-4 which allows the discharge of leachate from the sludge stabilisation lagoon to groundwater.

Monitoring of the sludge lagoon facility during the 2014-2015 monitoring period consisted of monthly testing of groundwater bores and nearby surface water in an open drain by NPDC, and inspections by the Council.

The groundwater results from the three bores, along with results from the surface water in the two drains indicated that seepage from the lagoon to groundwater and the drainage channel was occurring. The distance travelled before the surface water reaches the Waiwhakaiho River and the dilution that occurs at the river meant the level of contamination in the drainage channel adjacent to the lagoon was not at a level to cause concern. There were no other problems identified in relation to the sludge lagoon.

3.2.3 Air discharge

NPDC holds consent 4740-2 that allows the discharge of contaminants into the air from sludge processing activities. NPDC have provided documentation on the design specifications, operation and maintenance of the biofilter intended for abatement of discharges to air from the sludge management processing facilities.

Assessments of the odour performance of the milliscreen and sludge filter buildings made during inspections at the NPWWTP site noted that odours were either slight, or not detected. No odours were noted beyond the plant boundary on any occasion.

3.3 Evaluation of performance

A summary of NPDC's compliance record for the period under review is provided in Tables 10-14.

Table 10 Summary of performance for Consent 0882-4

Purpose: ***To discharge wastewater to the Tasman Sea***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Consent holder to adopt best practicable option to minimise environmental effects	Inspections, sampling, ecological surveys	Yes
2. Maintenance of multiport diffuser system	Site inspections, NPDC annual report, operated as per design	Yes
3. Concentration limits upon potential contaminants in discharge	Samples collected by both Council and consent holder: 100% compliance achieved	Yes

Purpose: ***To discharge wastewater to the Tasman Sea***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
4. Concentration limits upon suspended solids (SS) and BOD	Samples collected by both Council and consent holder: 95% compliance required, 99% and 100% compliance achieved for SS and BOD respectively	Yes
5. Concentration limits upon SS and BOD when aeration basins off-line	Samples collected by both Council and consent holder	Yes
6. Public notification prior to taking aeration basin off-line	Not exercised during 2014-2015	N/A
7. Minimum duration off-line to achieve purpose	Inspections, consultation with consent holder	Yes
8. Notification to Council prior to taking aeration basins off-line	Notification received to take Bioreactor offline 7 May 2015	Yes
9. Consent holder to erect signage during off-line periods	Signs erected at Fitzroy Beach (two locations), Waiwhakaiho and Bell Block	Yes
10. Total available chlorine at least 0.3 gm^{-3} in effluent	Presence of chlorine in samples collected by both Council and consent holder: >99% compliance achieved	No 5 breaches, however >99% compliance achieved
11. Effluent through 3 mm screen	6 mm screen used during maintenance of milliscreens in 2012-2013 as per condition	No Not fully achieved on 19-20 June 2015 due to extreme rainfall event
12. Consent holder to undertake monitoring	Monitoring undertaken and results supplied	Yes
13. Consent holder to submit a QMRA	Received December 2012	Yes
14. Consent holder to submit a monitoring plan	Received June 2013	Yes
15. Preparation of draft monitoring plan for consultation	Draft issued, consultation undertaken in April and June 2013	Yes
16. Peer review of monitoring plan	Received May 2013	Yes
17. Consent holder to provide comments received during consultation and peer review to Council	Received June 2013	Yes
18. Results of peer review of monitoring programme in 2017, 2022, 2027, 2032 and 2037	Due March 2017	N/A
19. Provide Technology Report in March 2027 and 2037	Due March 2027	N/A
20. Provide Annual Report by 31 July	Reports received for 2014-2015	Yes

Purpose: *To discharge wastewater to the Tasman Sea*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
21. Maintain Contingency Plan	Last comprehensive review of the Incident Response Plan undertaken July 2013, minor updates received on a regular basis	Yes
22. Annual meeting with Council, iwi and others	Meeting held on 4 December 2014	Yes
23. Meeting to include future management of wastewater	Next scheduled in 2027	N/A
24. Review of consent	Next scheduled in June 2017, if required	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		**Good** **High**

N/A = not applicable

Table 11 Summary of performance for Consent 1826-2

Purpose: *To erect, place and maintain a culvert*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Structure maintained to meet consent conditions	Inspections	Yes
2. Instream maintenance work between November and April	No maintenance required	N/A
3. Notification prior to maintenance work	No maintenance required	N/A
4. Best practicable option during maintenance to avoid adverse effects on environments	No maintenance required	N/A
5. Area and volume of streambed disturbance minimised during maintenance	No maintenance required	N/A
6. No obstruction of fish passage	Inspections	Yes
7. Removal and reinstatement	N/A	N/A
8. Review of consent conditions	No further provision for review	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**

N/A = not applicable

Table 12 Summary of performance for Consent 2982-4

Purpose: ***To discharge leachate from a sludge stabilisation lagoon to groundwater***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Monitoring of groundwater adjacent to lagoon	Monitoring undertaken by consent holder	Yes
2. Monitoring of unnamed tributary of the Waiwhakaiho	Monitoring undertaken by consent holder	Yes
3. No direct discharge of contaminants to surface water from sludge lagoons	Inspections and results of monitoring	Yes
4. No adverse effects upon ground or surface waters	Inspections and results of monitoring	Yes
5. Review of consent	No further provision for review	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**
Overall assessment of administrative performance in respect of this consent		**High**

N/A = not applicable

Table 13 Summary of performance for Consent 4593-2

Purpose: ***To erect, place, maintain and use a marine outfall***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Structures maintained	Inspections	Yes
2. Notification prior to maintenance	No maintenance undertaken	N/A
3. Measures to prevent disturbance	No maintenance undertaken	N/A
4. Removal of structures when no longer required	N/A	N/A
5. Review of consent conditions	No further provision for review	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**
Overall assessment of administrative performance in respect of this consent		**High**

N/A = not applicable

Table 14 Summary of performance for Consent 4740-2

Purpose: ***To discharge contaminants to air***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Best practicable option to prevent or minimise adverse effects	Inspections	Yes

Purpose: *To discharge contaminants to air*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
2. Operation and maintenance of sludge management processes	Inspections	Yes
3. No odours beyond property boundary	Inspections	Yes
4. Statement of how biofilters are maintained	Information received	Yes
5. Preparation of contingency plan	Information received	Yes
6. Plan and notification prior to removal of sludge from No. 2 lagoon	Not yet undertaken	N/A
7. Review of consent	Next scheduled for June 2020 if required	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, NPDC demonstrated a good level of environmental and high level of administrative performance with the resource consents as defined in Section 1.1.4.

Over the year in review there were 11 incidents directly related to the NPWWTP, 14 incidents associated with sewage pump stations and 14 incidents linked to reticulation overflows. Fourteen day letters were issued in association with two of the incidents (chlorine non-compliances at NPWWTP and the overflow at the Shearer Reserve sewage pump station). In both cases a defence was established under the RMA and no further enforcement action was taken.

Norovirus were detected at low levels in mussels collected from a site on the Waiwhakaiho Reef close to the NPWWTP outfall. There were no other significant detectable effects in the receiving environment resulting from discharges from the plant.

3.5 Recommendations from the 2012-2014 Biennial Report

In the 2012-2014 Biennial Report, it was recommended:

1. THAT the monitoring programme for the NPWWTP in the 2014-2015 year remains unchanged from that of 2013-2014.

2. THAT bacteriological shoreline water quality monitoring at five sites is included in the 2014-2015 monitoring programme.

3. THAT the Council notes the optional review of consents 1826-2, 2982-4 and 4740-2, in June 2014 were not considered necessary, on the grounds that current conditions are adequate for the protection of the environment.

These recommendations were implemented.

3.6 Alterations to monitoring programmes for 2015-2016

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

The NPWWTP's programme for 2014-2015 was unaltered from that for 2013-2014.

Monitoring of metals in mussel tissue at three sites will be included in the 2015-2016 programme. A recommendation to this effect is attached to this report.

3.7 Exercise of optional review of 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 or grounds to exercise the review option.

3.8 Recommendations

1. THAT the monitoring programme for the NPWWTP in the 2015-2016 year remains unchanged from that of 2014-2015.

2. THAT monitoring of metals in mussel tissue at three sites will be included in the 2015-2016 monitoring programme.

Glossary of common terms and abbreviations

The following abbreviations and terms are used within this report:

BOD	Biochemical oxygen demand. A measure of the presence of degradable organic matter, taking into account the biological conversion of ammonia to nitrate.
Bund	A wall around a tank to contain its contents in the case of a leak.
COD	Chemical oxygen demand. A measure of the oxygen required to oxidise all matter in a sample by chemical reaction.
Enterococci	An indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units (CFU) per 100 millilitre of sample.
FAC	Free available chlorine.
Faecal coliforms	An indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units (CFU) per 100 millilitre sample.
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.
IR	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.
Intervention	Action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring.
Investigation	Action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident.
L/s	Litres per second.
NH_3	Unionised ammonia, normally expressed in terms of the mass of nitrogen (N).
NOx	Oxidised nitrogen.

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.
RDP	Reactive dissolved phosphorous.
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.

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

Bibliography and references

McBride, G. 2012: An assessment of human health effects for a quantitative approach based on Norovirus, prepared for the New Plymouth District Council. NIWA Client Report HAM2012-150

New Plymouth District Council 2013: New Plymouth wastewater discharge consent 0882-4 annual report 1 July 2012 to 30 June 2013.

New Plymouth District Council 2014: New Plymouth wastewater discharge consent 0882-4 annual report 1 July 2013 to 30 June 2014.

Taranaki Regional Council 1993: New Plymouth District Council New Plymouth Wastewater Treatment Plant marine outfall and sludge lagoon annual report 1992/93. TRC Technical Report 93-30.

Taranaki Regional Council 1994: New Plymouth District Council New Plymouth Wastewater Treatment Plant marine outfall and sludge lagoon annual report 1993-94. TRC Technical Report 94-17.

Taranaki Regional Council 1995: New Plymouth District Council New Plymouth Wastewater Treatment Plant marine outfall and sludge lagoon annual report 1994-95. TRC Technical Report 95-42.

Taranaki Regional Council 1996: New Plymouth District Council New Plymouth Wastewater Treatment Plant marine outfall and sludge lagoon annual report 1995-96. TRC Technical Report 96-44.

Taranaki Regional Council 1997: New Plymouth District Council New Plymouth Wastewater Treatment Plant marine outfall and sludge lagoon annual report 1996-97. TRC Technical Report 97-55.

Taranaki Regional Council 1998: New Plymouth District Council New Plymouth Wastewater Treatment Plant marine outfall and sludge lagoon annual report 1997-98. TRC Technical Report 98-23.

Taranaki Regional Council 1999: New Plymouth District Council New Plymouth Wastewater Treatment Plant marine outfall and sludge lagoon annual report 1998-1999. TRC Technical Report 99-67.

Taranaki Regional Council 2000: New Plymouth District Council New Plymouth Wastewater Treatment Plant marine outfall and sludge lagoon annual report 1999-2000. TRC Technical Report 00-35.

Taranaki Regional Council 2001: New Plymouth District Council New Plymouth Wastewater Treatment Plant marine outfall and sludge lagoon annual report 2000-01. TRC Technical Report 01-62.

Taranaki Regional Council 2002: New Plymouth District Council New Plymouth Wastewater Treatment Plant marine outfall and sludge lagoon annual report 2001-02. TRC Technical Report 02-44.

Taranaki Regional Council 2003: New Plymouth District Council New Plymouth Wastewater Treatment Plant marine outfall and sludge lagoon annual report 2002-2003. TRC Technical Report 03-19.

Taranaki Regional Council 2004: New Plymouth District Council New Plymouth Wastewater Treatment Plant marine outfall and sludge lagoon annual report 2003-2004. TRC Technical Report 04-57.

Taranaki Regional Council 2005: New Plymouth District Council New Plymouth Wastewater Treatment Plant marine outfall and sludge lagoon annual report 2004-2005. TRC Technical Report 05-30.

Taranaki Regional Council 2006: New Plymouth District Council New Plymouth Wastewater Treatment Plant marine outfall and sludge lagoon annual report 2005-2006. TRC Technical Report 2006-62.

Taranaki Regional Council 2007: New Plymouth District Council New Plymouth Wastewater Treatment Plant marine outfall and sludge lagoon annual report 2006-2007. TRC Technical Report 2007-41.

Taranaki Regional Council 2008: New Plymouth District Council New Plymouth Wastewater Treatment Plant marine outfall and sludge lagoon annual report 2007-2008. TRC Technical Report 2008-11.

Taranaki Regional Council 2009: New Plymouth District Council New Plymouth Wastewater Treatment Plant marine outfall and sludge lagoon annual report 2008-2009. TRC Technical Report 2009-19.

Taranaki Regional Council 2010: New Plymouth District Council New Plymouth Wastewater Treatment Plant marine outfall and sludge lagoon annual report 2009-2010. TRC Technical Report 2010-84.

Taranaki Regional Council 2011: New Plymouth District Council New Plymouth Wastewater Treatment Plant marine outfall and sludge lagoon annual report 2010-2011. TRC Technical Report 2011-28.

Taranaki Regional Council 2012: New Plymouth District Council New Plymouth Wastewater Treatment Plant marine outfall and sludge lagoon annual report 2011-2012. TRC Technical Report 2012-45.

Taranaki Regional Council 2014: New Plymouth District Council New Plymouth Wastewater Treatment Plant marine outfall and sludge lagoon biennial report 2012-2014. TRC Technical Report 2014-122.

Taranaki Regional Council 2015: New Plymouth District Council Waitara Waste Water Treatment Plant and Marine Outfall monitoring programme report 2014-2015. TRC Technical Report 2015-70

Appendix I

Resource consents held by New Plymouth District Council

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

Coastal Permit

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

Name of Consent Holder:	New Plymouth District Council Private Bag 2025 NEW PLYMOUTH 4342
Decision Date:	15 November 2011
Commencement Date:	13 December 2011

Conditions of Consent

Consent Granted:	To discharge treated municipal wastewater from the New Plymouth wastewater treatment plant through a marine outfall structure into the Tasman Sea at or about (NZTM) 1696211E-5679248N
Expiry Date:	1 June 2041
Review Date(s):	June 2017, June 2022, June 2027, June 2032, June 2037 and/or within three months of the receipt of the Quantitative Microbial Risk Assessment required by condition 13
Site Location:	Waiwhakaiho Marine Outfall, [approximate 450 metres offshore]
Catchment:	Tasman Sea Waiwhakaiho

General condition

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

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 discharge shall occur through a multiport diffuser system that ensures a minimum dilution of 13:1 at the sea surface at chart datum under dry weather discharge flow and calm sea conditions.

3. Constituents in the effluent discharged shall meet the standards shown in the table below.

Constituent	**Standard**
Zinc	Concentration not greater than 0.2 gm^{-3}
Chromium	Concentration not greater than 0.15 gm^{-3}
Cadmium	Concentration not greater than 0.04 gm^{-3}
Lead	Concentration not greater than 0.1 gm^{-3}
Nickel	Concentration not greater than 0.15 gm^{-3}
Copper	Concentration not greater than 0.1 gm^{-3}
Mercury	Concentration not greater than 0.002 gm^{-3}
Cyanide	Concentration not greater than 0.1 gm^{-3}
Phenols[including chlorinated phenols]	Concentration not greater than 1.0 gm^{-3}

4. Subject to condition 5 below, at least 95% of effluent discharge samples shall meet the standards shown in the table below.

Constituent	**Standard**
Suspended solids	Concentration not greater than 25 gm^{-3}
5-day Biochemical oxygen demand	Concentration not greater than 25 gm^{-3}

5. During:

   (a) two periods, occurring before 30 June 2015, during which one of the aeration basins is off-line while being upgraded; and

   (b) periods not exceeding 14 days, occurring no more than once per year, when one of the aeration basins is off-line for planned maintenance purposes;

Condition 4 shall not apply and samples shall instead meet the following standards:

Constituent	**Standard**
Suspended solids	Concentration not greater than 110 gm^{-3}
5-day Biochemical oxygen demand	Concentration not greater than 130 gm^{-3}

6. The consent holder shall publicly notify its intention to exercise condition 5(a) at least five working days prior to taking an aeration basin off-line. The public notice shall detail the health and safety risks, reasons why the basin is being taken off line, and associated potential effects.

7. Notwithstanding any duration specified in condition 5 above, the periods when aeration basins are off-line shall be of the minimum duration necessary to achieve the purpose.

8. The consent holder shall give at least 30 working days notice to the Chief Executive, Taranaki Regional Council of the intention to take an aeration basin off-line. Notice shall be given by email to worknotification@trc.govt.nz and shall include:

   (a) The intended dates that the aeration basin will be offline; and

   (b) Documentation demonstrating the off-line period complies with the requirement to be the minimum necessary.

9. The consent holder shall erect and maintain signs for a period beginning on the date that an aeration basin goes off-line, as described in condition 5(a), and ending 14 days after the date that the off-line period ends. The signs shall advise the public of the discharge of sewage that has not been fully treated and inform them of the potential health risks, and are to be placed in a prominent location at:

   - Fitzroy Beach; and
   - Bell Block Beach.

10. The total available chlorine in the effluent, prior to entering the outfall pipe, shall be no less than 0.3 gm^{-3}.

11. All effluent discharged shall have passed through a screen with an aperture no more than 3 mm, except that during periods when the milli-screen is non-operational for maintenance purposes, effluent may pass through a screen with an aperture no more than 6 mm.

12. The consent holder shall undertake sampling and testing necessary to:

   (a) Determine compliance with the conditions of this consent; and

   (b) Characterise the effluent to the extent necessary to identify the nature and scale of its effects on the environment, during normal operation and at times when all the effluent is not being fully treated. In particular, monitoring must occur at times when an aeration basin is off-line, and be discussed at the annual meeting required by special condition 22.

Until the Monitoring Plan required by condition 14 is submitted to Taranaki Regional Council, monitoring will continue in accordance with the existing monitoring plan prepared under consent 0882-3.

13. Within one year of the commencement of this consent, the consent holder shall submit to the Chief Executive, Taranaki Regional Council a Quantitative Microbial Risk Assessment (QMRA) of the discharge under this consent (focusing primarily on bypass discharges).

14. Within six months of the provision of the QMRA under condition 13, the consent holder shall prepare, and submit to the Chief Executive, Taranaki Regional Council for certification, a 'Monitoring Plan' detailing the sampling, testing and measuring that will be undertaken to achieve compliance with condition 12. The Plan shall include, but not necessarily be limited to:

    (a) Details of the measuring and sampling to be undertaken including: sampling location, frequency and methodology; and

    (b) Documentation of how the measuring and sampling described in 14(a) above, adequately characterises the effluent at all times.

    As a minimum, the Monitoring Plan will require:

    (c) Monitoring of the effluent to determine compliance with conditions 3, 4 and 5;

    (d) Monitoring of ecology in the intertidal zone approximately adjacent to the point of discharge, with appropriate control sites; and

    (e) Monitoring of microbiological contamination within shellfish.

15. In preparing the Monitoring Plan, the consent holder shall issue a draft Monitoring Plan and then carry out reasonable consultation with the Department of Conservation, Ngati Tawhirikura Hapu and interested community groups, allowing at least one month for a response from those groups on the draft Plan.

16. Before submitting the Monitoring Plan to Taranaki Regional Council for certification, the consent holder shall have the Monitoring Plan peer reviewed by an independent, suitably qualified expert.

17. The consent holder shall provide any comments received from the Department of Conservation, Ngati Tawhirikura Hapu and interested community groups under condition 15, and the peer review under condition 16, to the Chief Executive, Taranaki Regional Council, at the time the final Monitoring Plan is submitted for certification under condition 14. In the event that the consent holder declines to adopt any recommendations provided by the peer reviewer under condition 16, the consent holder shall also provide, at the same time, its written reasons for declining to follow those recommendations.

18. By 31 March in the years 2017, 2022, 2027, 2032 and 2037, the consent holder shall provide to the Chief Executive, Taranaki Regional Council the results of a peer review of the Monitoring Plan by an independent, suitably qualified expert to ensure that the monitoring programme is still appropriate. The results of the peer review shall also be made publicly available. In the event that the consent holder declines to adopt any recommendations provided by the peer reviewer under this condition, the consent holder shall also provide, at the same time, its written reasons for declining to follow those recommendations.

19. By 31 March in the years 2027 and 2037, the consent holder shall provide to the Chief Executive, Taranaki Regional Council a Technology Report covering:

    (a) A summary of any improvements made to the reticulation, treatment or disposal system since the granting of this consent;

    (b) An outline of technological changes and advances in relation to wastewater management, treatment, disposal and technologies which may be available to address any residual adverse effects; and

    (c) An assessment of whether any such options or combination of options represent the Best Practicable Option to minimise the effects of the discharge and whether the consent holder intends to incorporate such changes.

    The Technology Report shall also be made publicly available. The Regional Council may obtain an independent peer review of the Technology Report, and may charge the consent holder for the actual and reasonable cost of obtaining this peer review.

20. By 31 July each year, the consent holder shall provide to the Chief Executive, Taranaki Regional Council a report covering:

    (a) details of the progress made towards reducing inflow and infiltration reduction over the past year;

    (b) the consent holder's target for reduction of inflow and infiltration in the coming year; and

    (c) details of the works proposed in order to meet that target.

21. The consent holder shall maintain a Contingency Plan for the wastewater treatment plant site that shall be adhered to in the event of a spill or emergency. The Plan shall be approved by the Chief Executive, Taranaki Regional Council, acting in a certification capacity and shall detail measures and procedures to be undertaken to prevent spillage or accidental discharge of contaminants not authorised by this consent and measures to avoid, remedy or mitigate the environmental effects of such a spillage or discharge.

22. At least once every year, the consent holder shall convene a meeting with representatives of the Taranaki Regional Council, Ngati Tawhirikura Hapu, and interested submitters on application 6803, to discuss any matter relating to the operation or monitoring of this consent.[1]

23. In the years 2027 and 2037, the consent holder shall use the meeting required by condition 22 as a means of collaborating with the community and stakeholders about the strategy for the future management of wastewater in New Plymouth district.

24. 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 within three months of the receipt of the QMRA required by condition 13 and/or during the month of June 2017 and/or June 2022 and/or June 2027 and/or June 2032 and/or June 2037 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. Reviews may also be undertaken at the dates listed above to enable the Taranaki Regional Council to deal with the consequences of the consent holder declining to accept the Peer Reviewer's recommendations under condition 18.

Advice note: The consent holder intends to establish a collaborative approach with Maori to investigate a trial of land-based disposal of treated wastewater. The commencement of such a trial will be subject to the consent holder being satisfied that:

(a) the owner(s) of land which has been offered for that purpose consent to its use for effluent disposal over the period of the trial and appropriate arrangements for its use are able to be satisfactorily resolved; and

(b) the disposal is technically, economically and environmentally feasible (including addressing relevant RMA requirements).

Signed at Stratford on 13 December 2011

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

[1] For the avoidance of doubt, this meeting can be combined with the annual meetings required under consents 7861-1 and 3397-2.

Consent 1826-2

Land Use Consent

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

Name of Consent Holder:	New Plymouth District Council Private Bag 2025 NEW PLYMOUTH
Consent Granted Date:	16 January 2002

Conditions of Consent

Consent Granted:	To erect, place, use and maintain a twin box culvert on the Mangaone Stream for road access purposes at or about GR: P19:069-400
Expiry Date:	1 June 2020
Review Date(s):	June 2008, June 2014
Site Location:	Mangaone Stream, Rifle Range Road, New Plymouth
Legal Description:	Pt Sec 161,138 & Lot 1 DP 12331 Hua Dist
Catchment:	Waiwhakaiho
Tributary:	Mangaone

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

General conditions

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

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

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

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

Special conditions

1. The structure[s] authorised by this consent shall be maintained to ensure the conditions of this consent are met.

2. Any instream maintenance works shall take place only between 1 November and 30 April inclusive, except where this requirement is waived in writing by the Chief Executive, Taranaki Regional Council.

3. The consent holder shall notify the Taranaki Regional Council in writing at least 48 hours prior to and upon completion of any maintenance works which would involve disturbance of or deposition to the streambed or discharges to water.

4. During any maintenance of the structure[s] authorised by this consent, the consent holder shall adopt the best practicable option to avoid or minimise the discharge of silt or other contaminants into water or onto the streambed and to avoid or minimise the disturbance of the streambed and any adverse effects on water quality.

5. During any maintenance of the structure[s] authorised by this consent, the consent holder shall ensure that the area and volume of streambed 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 structure[s], which are the subject of this consent, shall not obstruct fish passage.

7. 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.

8. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2008 and/or June 2014, 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 January 2002

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

Consent 2982-4

Discharge Permit

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

Name of Consent Holder:	New Plymouth District Council Private Bag 2025 NEW PLYMOUTH
Consent Granted Date:	17 October 2002

Conditions of Consent

Consent Granted:	To discharge up to 60 cubic metres/day of leachate from a sludge stabilisation lagoon to groundwater in the vicinity of the Waiwhakaiho River at or about GR: P19:070-402
Expiry Date:	1 June 2020
Review Date(s):	June 2008, June 2014
Site Location:	New Plymouth Wastewater Treatment Plant, Rifle Range Road, New Plymouth
Legal Description:	Pt Sec 224 SO 11937 Hua Dist Blk II Paritiutu SD
Catchment:	Waiwhakaiho

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 (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) 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, in conjunction with the Taranaki Regional Council, shall monitor the groundwater adjacent to the lagoon. The number of monitoring sites, the parameters to be monitored and the frequency of the monitoring shall be to the satisfaction of the Chief Executive, Taranaki Regional Council.

2. The consent holder, in conjunction with the Taranaki Regional Council, shall monitor the surface water in the small open drain [an unnamed tributary of the Waiwhakaiho River] located adjacent to the northern and eastern boundary of the lagoon. The number of sites, the parameters to be monitored and the frequency of the monitoring shall be to the satisfaction of the Chief executive, Taranaki Regional Council.

3. The exercise of this consent shall not lead to a direct discharge of contaminants from the sludge stabilisation lagoon to any other surface water body.

4. That the exercise of this consent shall not result in any adverse impacts to groundwaters and surface waters such that the suitability of those waters for any use is changed as determined by the Chief Executive, Taranaki Regional Council.

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 2008 and/or June 2014, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 17 October 2002

For and on behalf of
Taranaki Regional Council

_____

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:	New Plymouth District Council Private Bag 2025 New Plymouth 4342
Decision Date:	10 September 2014
Commencement Date:	10 September 2014

Conditions of Consent

Consent Granted:	To occupy the Coastal Marine Area with a marine outfall as part of the New Plymouth wastewater treatment system
Expiry Date:	01 June 2041
Review Date(s):	June 2020, June 2026, June 2032, June 2038
Site Location:	115 Rifle Range Road, Waiwakaiho
Legal Description:	Secs 5-6 SO 314271 Pt Sec 224 Hua Dist Blk II Paritutu SD (Site of structure)
Grid Reference (NZTM)	1696272E-5679362N
Catchment:	Tasman Sea

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

General condition

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

Special conditions

1. This consent authorises the occupation of space in the Coastal Marine Area by the structure existing at the time the application for this consent was lodged, and as described in the application. Any change to the nature or scale of the structure may therefore need to be authorised by a formal process in accordance with the Resource Management Act 1991.

2. The consent holder shall maintain the structure in a safe and sound condition such that it continues to function effectively as an outfall and as required in the conditions of any consent to discharge through it.

3. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2020 and/or June 2026 and/or June 2032 and/or June 2038, 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 10 September 2014

For and on behalf of
Taranaki Regional Council

_____

A D McLay
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:	New Plymouth District Council Private Bag 2025 NEW PLYMOUTH 4342
Consent Granted Date:	29 May 2008

Conditions of Consent

Consent Granted:	To discharge contaminants into the air from sludge drying and processing activities at the New Plymouth Wastewater Treatment Plant at or about (NZTM) 1697041E-5678313N
Expiry Date:	1 June 2026
Review Date(s):	June 2014, June 2020
Site Location:	Rifle Range Road, New Plymouth
Legal Description:	Secs 5-6 So 314271 Pt Sec 224 Hua Dist Blk II Paritutu SD

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

General conditions

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

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

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

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

Special conditions

1. Notwithstanding any other condition of this consent, the consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any actual or likely adverse effect on the environment associated with the discharges into air from sludge management processing activities and facilities on the site.

2. That the consent holder shall at all times operate, maintain, supervise, monitor and control all sludge management processes (including but not limited to associated emission treatment processes) so that discharges authorised by this consent are maintained at a practicable minimum.

3. That the discharges authorised by this consent shall not give rise to any odours that are offensive or objectionable at or beyond any boundaries of the property.

4. Without restricting the generality of condition 1, the consent holder shall supply a statement of how the biofilters are maintained, operated, and monitored, to give effect to condition 1. This statement shall be provided to the Chief Executive, Taranaki Regional Council, within six months of the granting of the consent.

5. The consent holder shall prepare a contingency plan addressing events at the New Plymouth Waste Water Treatment Plant that could give rise to abnormal odour release potential, and the procedures the consent holder would adopt to deal with any such event. This contingency plan shall be provided to the Chief Executive, Taranaki Regional Council, within six months of the granting of the consent. The contingency plan shall subsequently be reviewed at intervals not exceeding two years.

6. Prior to undertaking processing of, including removal of, sludge from No. 2 lagoon, the consent holder shall submit a plan, for approval by the Chief Executive, Taranaki Regional Council [such approval not to be unreasonably withheld], describing the methodology proposed for sludge recovery from the lagoon and measures proposed for mitigation of odours and any off-site effects of odours, during the recovery activity, demonstrating the capability to satisfy the conditions of this consent. The consent holder shall notify the Council at least 72 hours prior to any processing/removal activity, including associated recovery of sludge, before undertaking removal. Notification shall be emailed to worknotification@trc.govt.nz.

7. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2014 and/or June 2020, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 29 May 2008

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

Appendix II

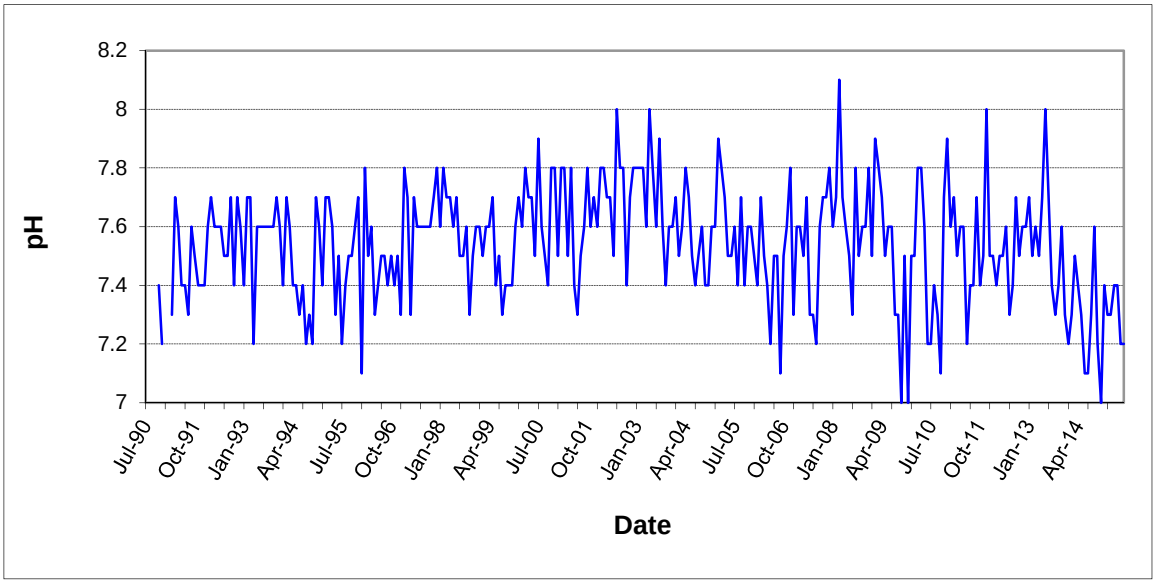
Results of monthly composite effluent monitoring 2014-2015

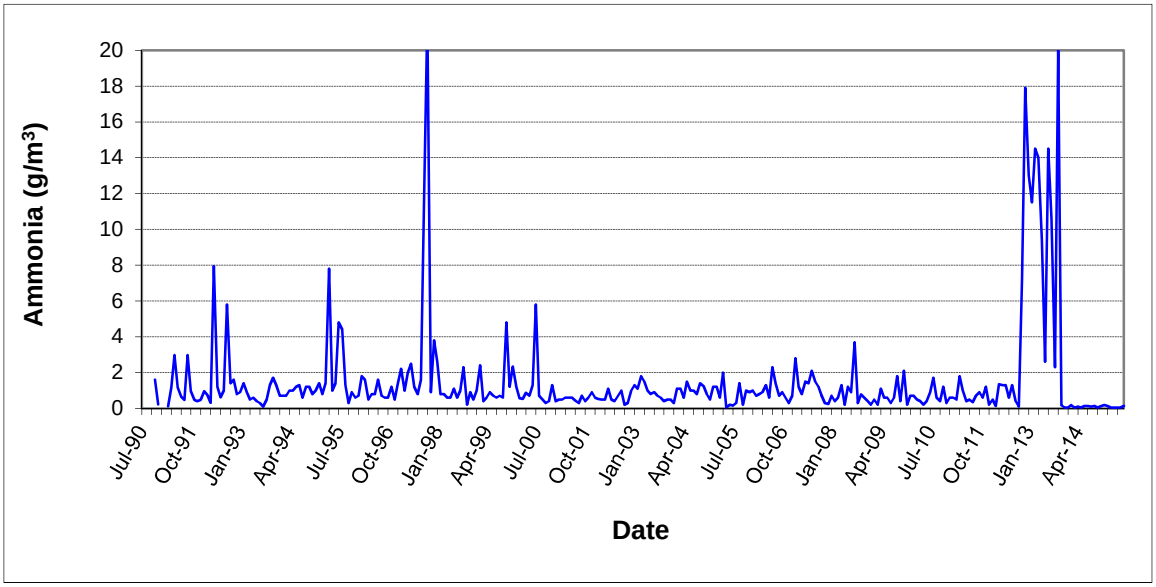
Parameter	Month (2014-2015)											
	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	April	May	June
pH	7.1	7.3	7.6	7.2	7	7.4	7.3	7.3	7.4	7.4	7.2	7.2
NH_3 (g/m^3)	0.13	0.1	0.14	<0.1	0.12	0.19	0.14	<0.1	<0.1	<0.1	<0.1	0.13
COD (g/m^3)	16	26	33	19	24	19	30	25	22	26	10	21
NOx (g/m^3)	4.6	6.8	4.3	5.7	4.3	4.8	6	4.4	5.6	6.7	5.5	8.4
TDP (g/m^3)	0.39	0.3	0.64	<0.05	0.07	0.09	1	0.2	0.08	0.12	*	0.95
Cyanide (g/m^3)	0.02	<0.05	<0.05	<0.05	0.03	0.03	<0.05	0.02	0.01	0.01	0.01	0.04
Phenols (g/m^3)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Zinc (g/m^3)	0.04	0.04	0.05	0.04	<0.04	<0.04	0.04	<0.04	<0.04	<0.04	<0.04	<0.021
Copper (g/m^3)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.011
Chromium (g/m^3)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.011
Nickel (g/m^3)	0.009	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.011
Cadmium (g/m^3)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.011
Lead (g/m^3)	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.021
Mercury (g/m^3)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	*

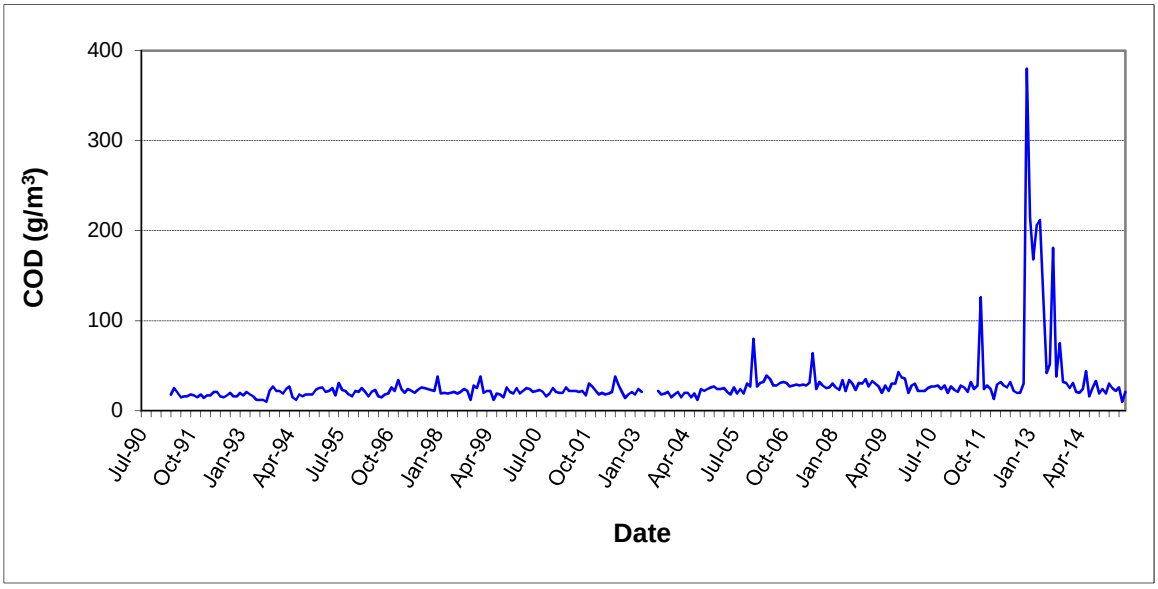
Additional samples collected between January and June 2015		
Parameter	**TDP** (g/m^3)	**Sulphate** (g/m^3)
Number	28	28
Minimum	<0.05	20.3
Maximum	4.7	113
Median	0.125	41

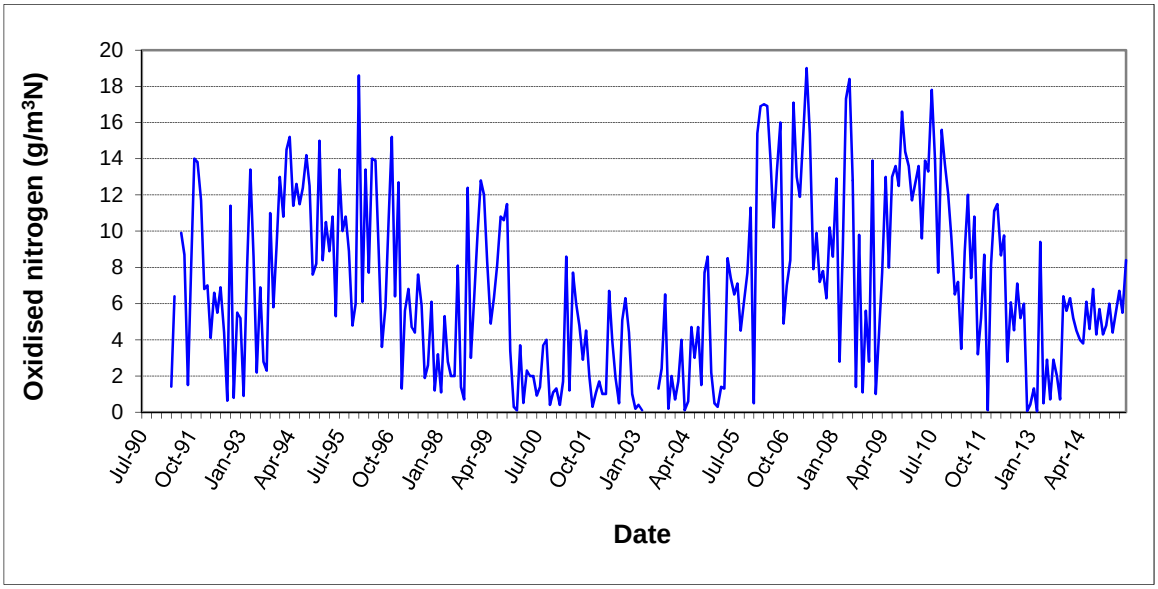
Appendix III

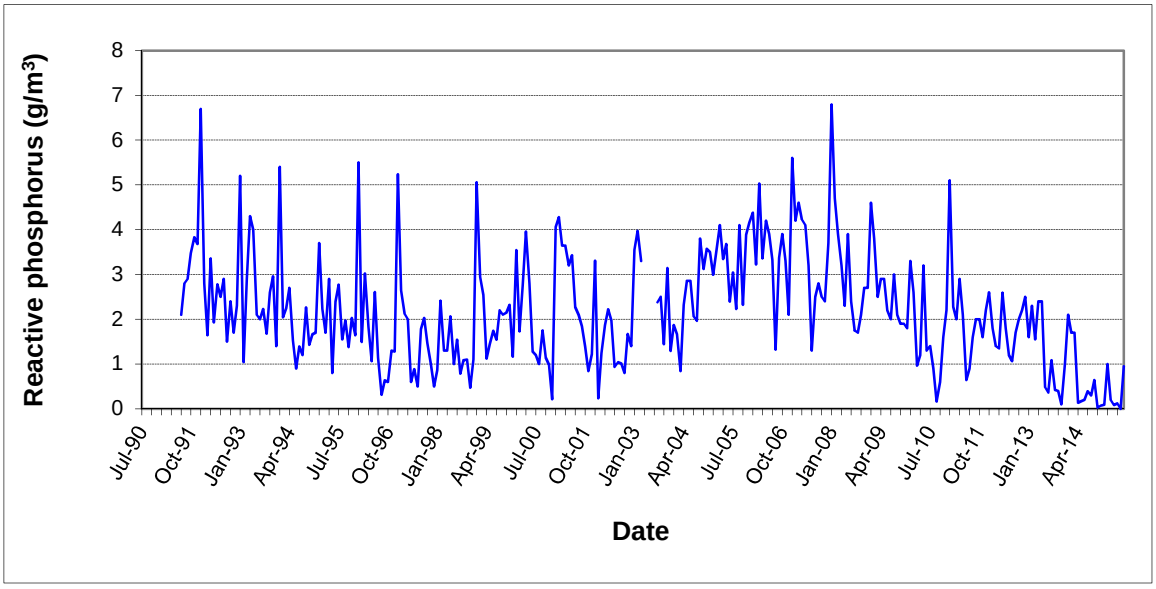
Graphical results of monthly composite effluent monitoring 1990-2015

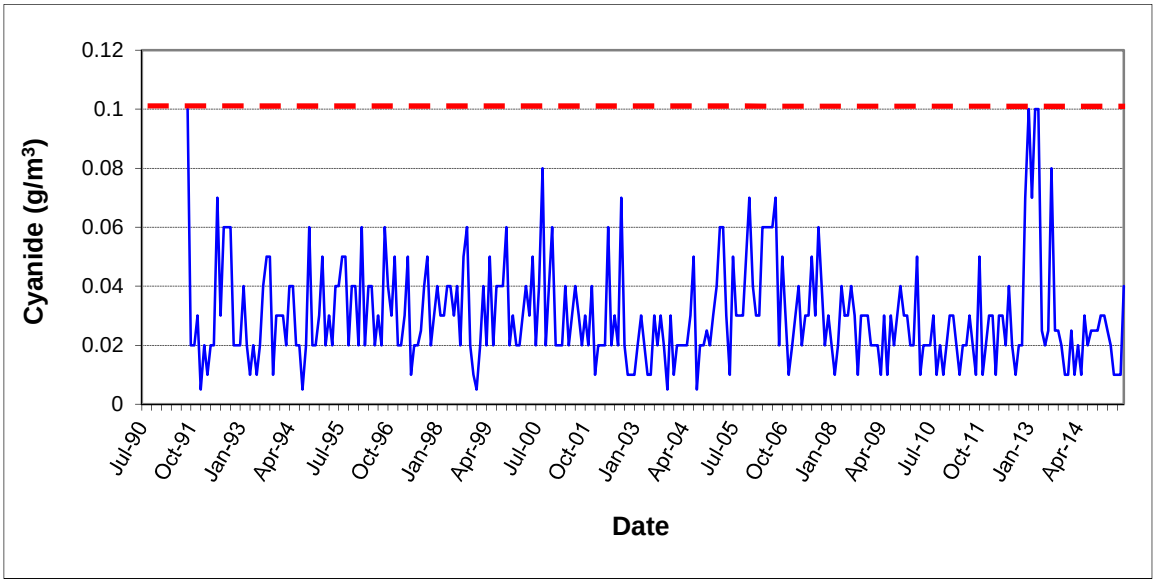

pH
8.2
8
7.8
7.6
7.4
7.2
7
Jul-90
Oct-91
Jan-93
Apr-94
Jul-95
Oct-96
Jan-98
Apr-99
Jul-00
Oct-01
Jan-03
Apr-04
Jul-05
Oct-06
Jan-08
Apr-09
Jul-10
Oct-11
Jan-13
Apr-14
Date


Ammonia (g/m³)
20
18
16
14
12
10
8
6
4
2
0
Jul-90
Oct-91
Jan-93
Apr-94
Jul-95
Oct-96
Jan-98
Apr-99
Jul-00
Oct-01
Jan-03
Apr-04
Jul-05
Oct-06
Jan-08
Apr-09
Jul-10
Oct-11
Jan-13
Apr-14
Date

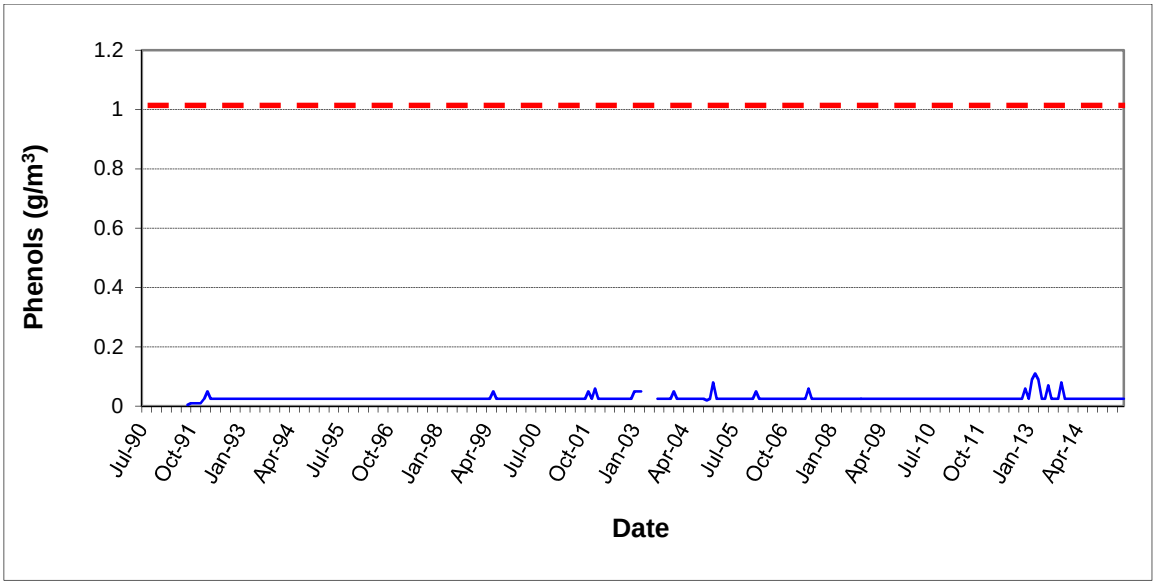

COD (g/m³)
400
300
200
100
0
Jul-90
Oct-91
Jan-93
Apr-94
Jul-95
Oct-96
Jan-98
Apr-99
Jul-00
Oct-01
Jan-03
Apr-04
Jul-05
Oct-06
Jan-08
Apr-09
Jul-10
Oct-11
Jan-13
Apr-14
Date


Oxidised nitrogen (g/m³N)
20
18
16
14
12
10
8
6
4
2
0
Jul-90
Oct-91
Jan-93
Apr-94
Jul-95
Oct-96
Jan-98
Apr-99
Jul-00
Oct-01
Jan-03
Apr-04
Jul-05
Oct-06
Jan-08
Apr-09
Jul-10
Oct-11
Jan-13
Apr-14
Date

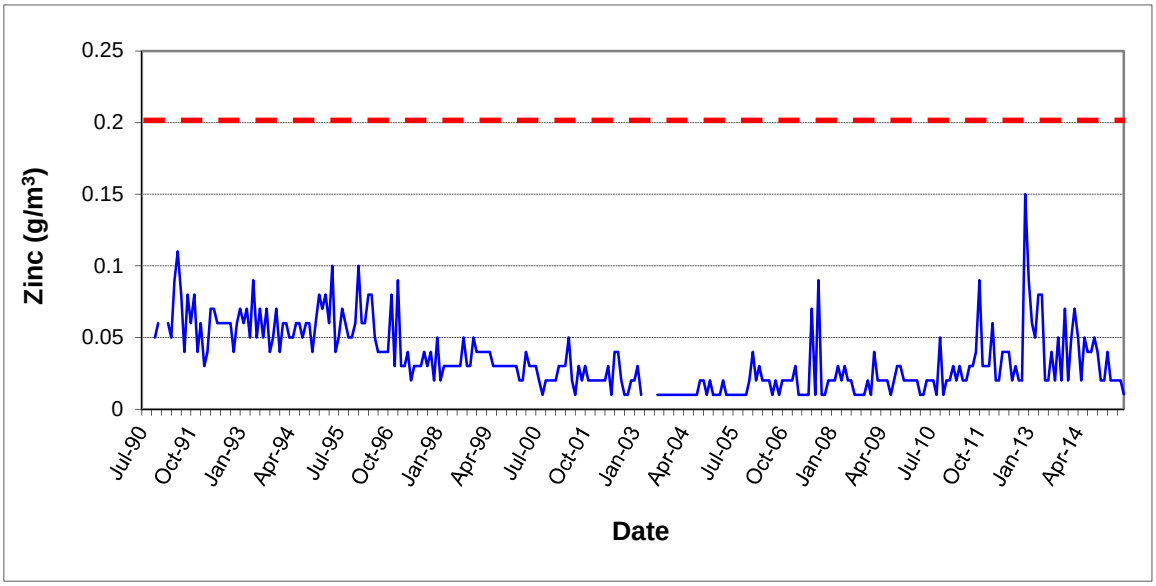




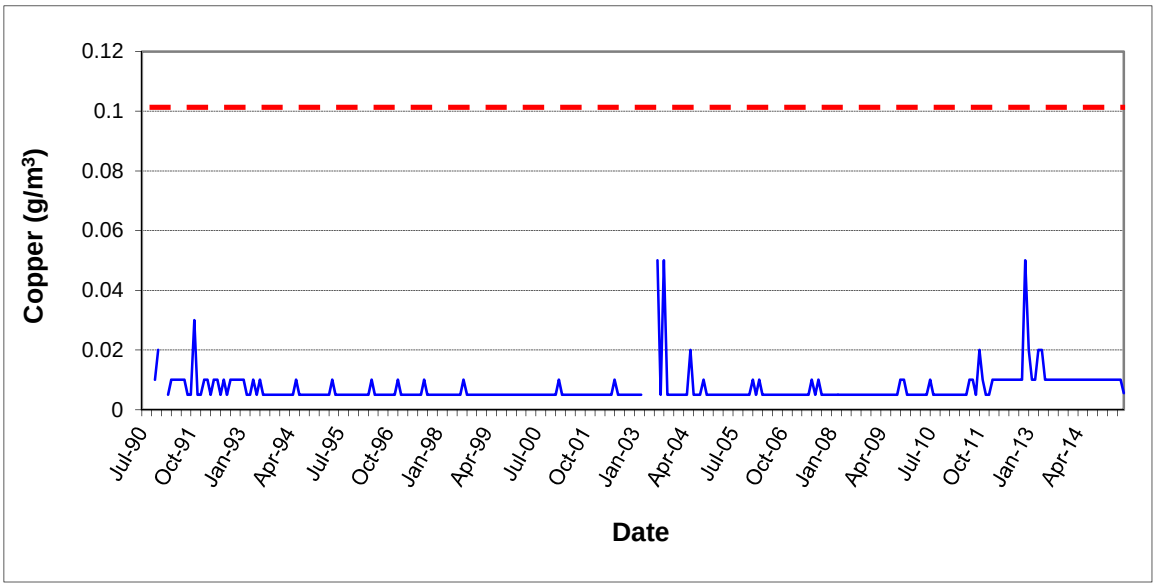
Note: Consent limit indicated by dashed red line



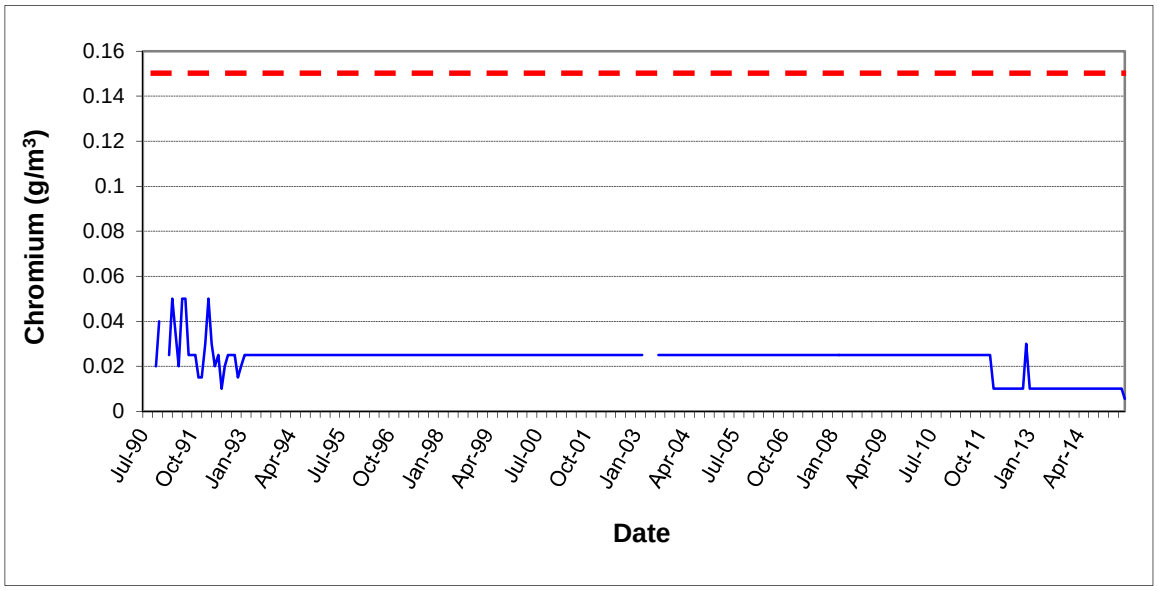
Note: Consent limit indicated by dashed red line



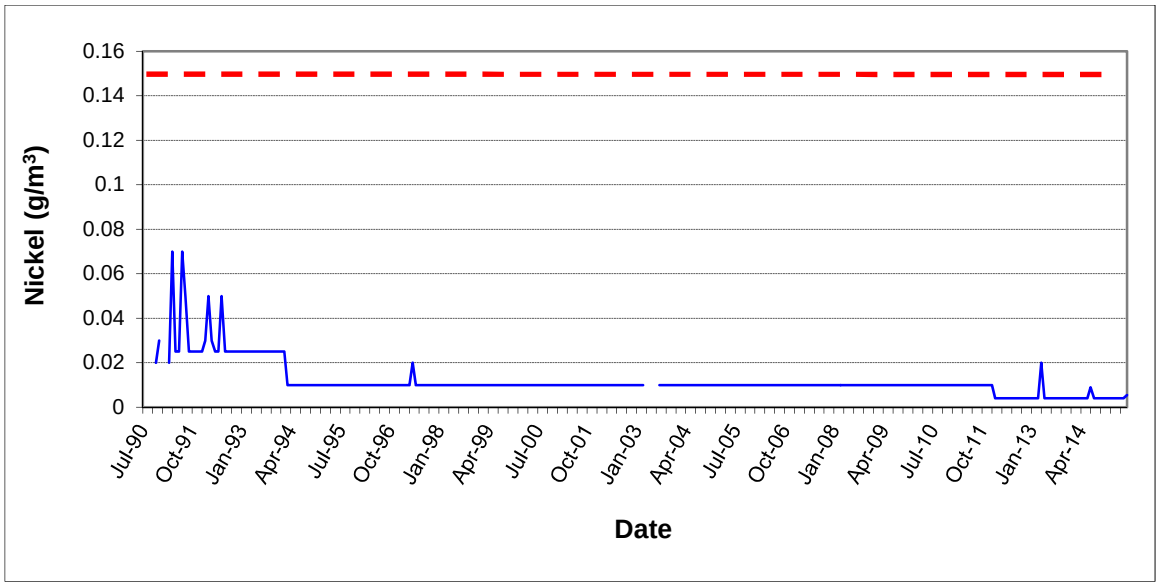
Note: Consent limit indicated by dashed red line



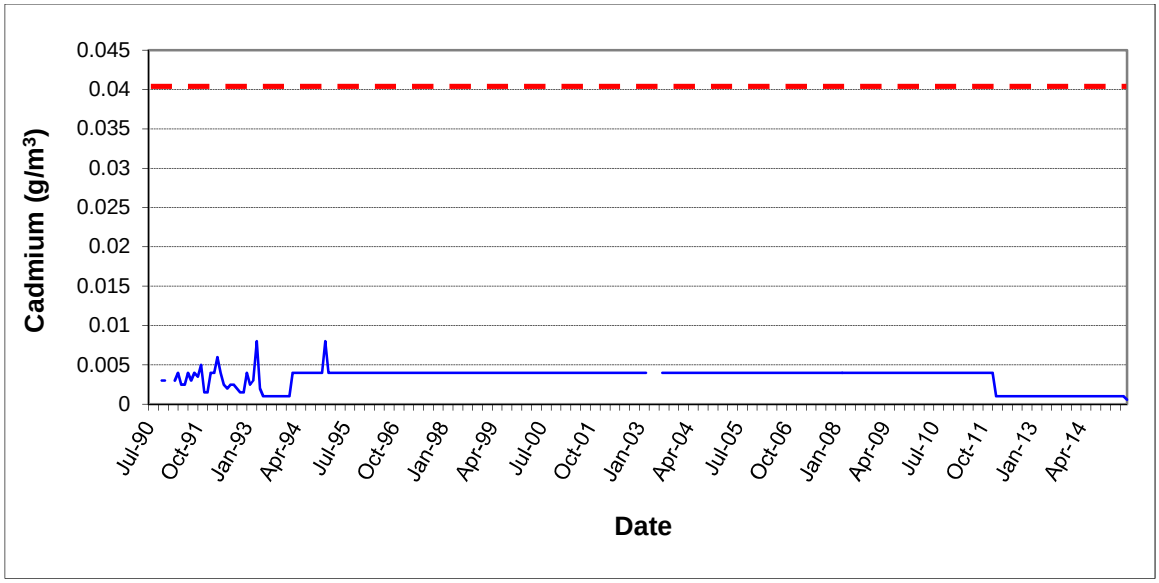
Note: Consent limit indicated by dashed red line



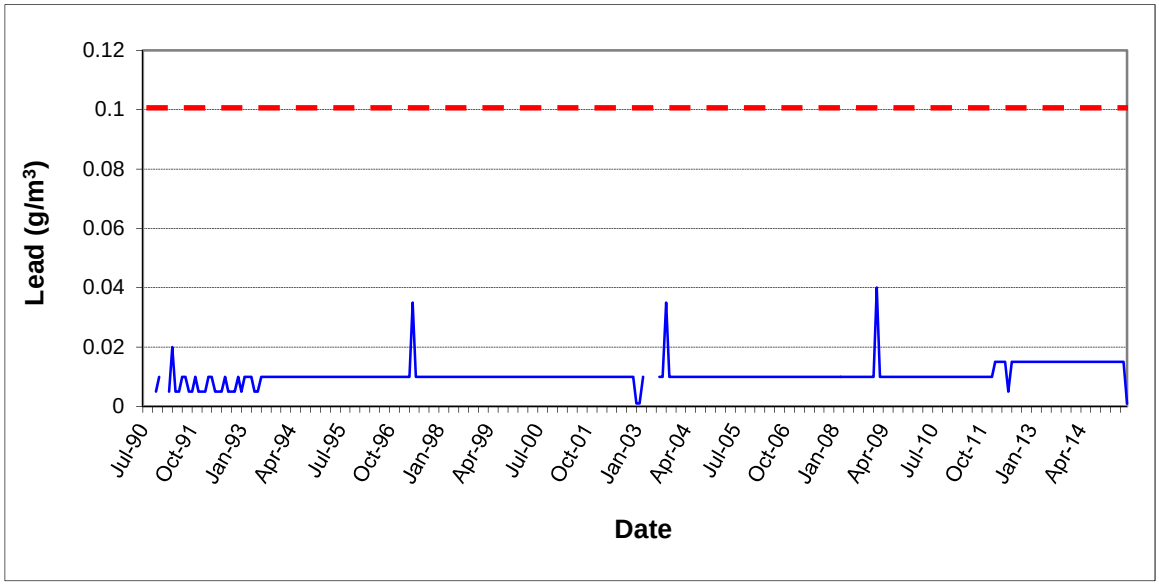
Note: Consent limit indicated by dashed red line



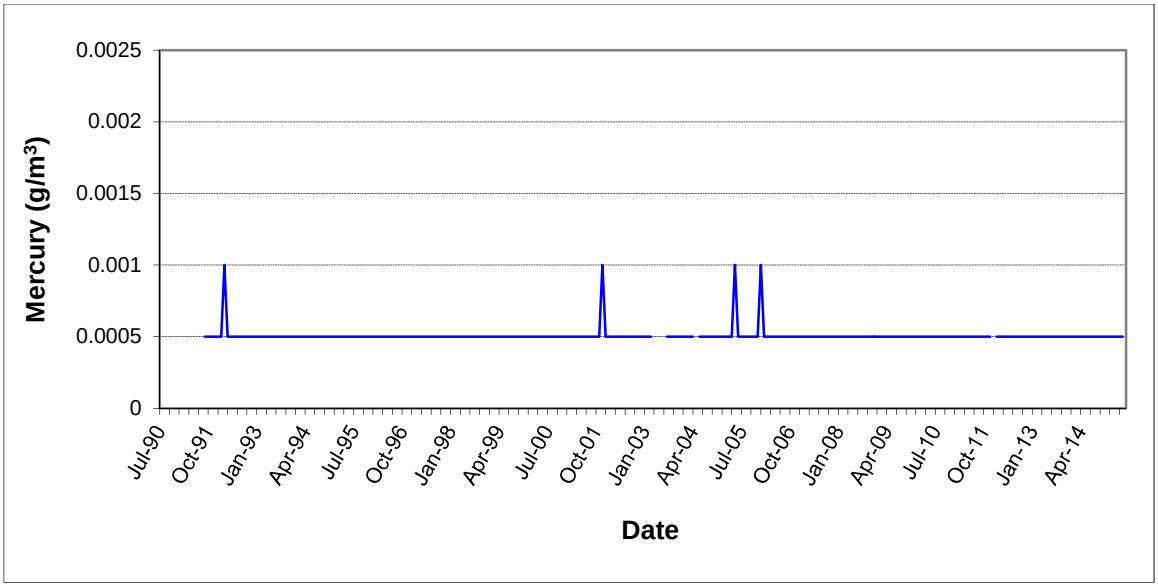
Note: Consent limit indicated by dashed red line



Note: Consent limit indicated by dashed red line



Note: Consent limit indicated by dashed red line


0.0025
0.002
0.0015
0.001
0.0005
0
Mercury (g/m³)
Jul-90
Oct-91
Jan-93
Apr-94
Jul-95
Oct-96
Jan-98
Apr-99
Jul-00
Oct-01
Jan-03
Apr-04
Jul-05
Oct-06
Jan-08
Apr-09
Jul-10
Oct-11
Jan-13
Apr-14
Date

Appendix IV

Plant performance data

Parameter		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
pH	Influent	7.4 (14)	7.4 (13)	7.4 (12)	7.4 (12)	7.4 (15)	7.0 (12)	7.4 (6)	7.4 (6)	7.4 (7)	7.4 (4)	7.4 (4)	7.4 (5)
(pH units)	Effluent	7.2 (2)	7.3 (1)	7.6 (1)	7.2 (1)	7.0 (1)	7.0 (1)	7.3 (1)	7.3 (1)	7.4 (1)	7.4 (1)	7.2 (1)	7.2 (1)
SS	Influent	526 (14)	359 (13)	346 (12)	353 (12)	326 (16)	308 (12)	522 (6)	373 (6)	421 (7)	284 (5)	249 (6)	262 (7)
(g/m^3)	Effluent	3 (13)	4 (13)	3 (13)	4 (14)	3 (13)	3 (10)	5 (12)	3 (12)	3 (15)	4 (13)	4 (12)	17 (14)
BOD	Influent	226 (5)	265 (4)	250 (2)	248 (5)	230 (5)	220 (7)	323 (3)	230 (3)	275 (4)	150 (3)	150 (2)	187 (3)
(g/m^3)	Effluent	2 (14)	3 (13)	3 (12)	3 (14)	3 (13)	3 (7)	5 (11)	4 (12)	4 (13)	2 (13)	2 (12)	12 (15)
COD	Influent	669 (14)	507(12)	511 (10)	485 (11)	452 (11)	456 (8)	802 (6)	510 (7)	633 (8)	350 (7)	289 (6)	351 (7)
(g/m^3)	Effluent	21 (2)	26 (1)	33 (1)	19 (1)	24 (1)	19 (1)	30 (1)	25 (1)	22 (1)	26 (1)	10 (1)	21 (1)
NH_3	Influent	29 (14)	31 (13)	35 (12)	33 (12)	28 (15)	30 (12)	35 (6)	31 (7)	31 (8)	25 (7)	21 (6)	23 (7)
(g/m^3)	Effluent	0.12 (13)	0.10 (1)	0.14 (13)	0.05 (14)	0.12 (13)	0.19 (10)	0.14 (12)	0.05 (12)	0.05 (15)	0.05 (13)	0.05 (12)	0.13 (14)
NNN	Influent	0.40 (1)	0.40 (1)	0.08 (1)	0.10 (1)	0.20 (1)	0.08 (3)	0.18 (6)	0.08 (5)	0.22 (4)	0.12 (4)	0.48 (3)	0.39 (5)
(g/m^3)	Effluent	5.7 (2)	6.8 (1)	4.3 (1)	5.7 (1)	4.3 (1)	4.8 (1)	6.0 (1)	4.4 (1)	5.6 (1)	6.7 (1)	5.5 (1)	8.4 (1)

Note: Data presented as mean (number of samples)

Appendix V

Results of sludge lagoon monitoring 2014-2015

Site	Parameter					
Bore 1	**pH**	**NH_3 g/m³**	**Faecal coliforms No./100ml**	**TDP g/m³**	**NOx g/m³**	**COD g/m³**
Jul-14	5.5	0.33	<5	0.05	7.2	8
Aug-14	5.5	0.55	<10	0.1	3.7	12
Sep-14	6.6	16	10	0.54	<0.2	17
Oct-14	6.6	16	10	1	<0.15	15
Nov-14	6.7	17.7	10	1.3	<0.15	22
Dec-14	6.6	18.8	<5	0.36	<0.15	26
Jan-15	6.5	16.3	<10	0.64	0.15	20
Feb-15	6.4	14.4	8	0.4	1	17
Mar-15	6.2	8	20	0.17	3.6	16
Apr-15	6.2	6.5	10	<0.05	0.9	16
May-15	5.5	0.27	10	<0.05	15.5	14
Jun-15	5.5	0.23	<5	<0.05	15.3	12
Minimum	5.5	0.23	<5	<0.05	<0.15	8
Maximum	6.7	18.8	20	1.3	15.5	26
Median	6.3	11.2	9	0.265	0.95	16
Results until July 2014						
Number	261	261	258	260	261	260
Minimum	4.9	<0.1	<10	<0.05	<0.02	1
Maximum	7.1	100	2300	3.3	18.3	48
Median	6.2	2.4	<10	<0.05	0.3	11
Bore 2	**pH**	**NH_3 g/m³**	**Faecal coliforms No./100ml**	**TDP g/m³**	**NOx g/m³**	**COD g/m³**
Jul-14	5.6	<0.1	10	<0.05	3.9	16
Aug-14	5.8	0.31	10	<0.05	<0.15	29
Sep-14	5.9	0.92	440	<0.05	0.22	30
Oct-14	6.1	1.1	<5	<0.05	<0.15	40
Nov-14	5.6	0.2	30	<0.05	0.4	31
Dec-14	6.1	2.4	25	<0.05	<0.15	41
Jan-15	5.8	0.51	<10	<0.05	<0.15	23
Feb-15	5.6	<0.1	<5	<0.05	0.4	11
Mar-15	5.5	<0.1	<5	<0.05	0.45	15
Apr-15	5.9	0.17	<10	0.08	0.3	27
May-15	5.8	0.11		<0.05	0.1	45
Jun-15	5.8	0.11	460	<0.05	<0.15	42
Minimum	5.5	<0.1	<5	<0.05	<0.15	11
Maximum	6.1	2.4	460	0.08	3.9	45
Median	5.8	0.185	10	0.025	0.16	29.5
Results until July 2014						
Number	261	260	260	260	261	260
Minimum	4.9	<0.1	<10	<0.05	<0.02	6
Maximum	7.4	25	10000	0.36	40	181
Median	6.2	2.25	<10	<0.05	0.11	15
Bore 3	**pH**	**NH_3 g/m³**	**Faecal coliforms No./100ml**	**TDP g/m³**	**NOx g/m³**	**COD g/m³**
Jul-14	5.8	<0.1	212	0.05	0.22	67
Aug-14	5.8	0.16	360	<0.05	0.1	46
Sep-14	5.7	0.19	1100	<0.05	0.9	108
Oct-14	6.1	0.7	<5	<0.05	<0.15	54
Nov-14	6.2	0.23	10	<0.05	0.2	170
Dec-14	5.9	0.21	25	0.1	1	48
Jan-15	5.9	0.15	<10	<0.05	0.73	60
Feb-15	6.1	<0.1	20	0.06	0.2	180
Mar-15						
Apr-15						

May-15	6	<0.1	5280	0.05	0.5	69
Jun-15	6	<0.1	1160	0.2	0.4	106
Minimum	5.7	<0.1	<5	<0.05	<0.15	46
Maximum	6.2	0.7	5280	0.2	1	180
Median	5.95	0.155	118.5	0.0375	0.31	68
Results until July 2014						
Number	254	254	254	251	252	253
Minimum	5	<0.1	<10	<0.05	<0.02	1
Maximum	7.3	198	72000	1	64	740
Median	6.3	0.7	<10	<0.05	0.2	20

Open Drain	**pH**		**NH_3**		**Faecal coliforms**	
	Pt 2	**Pt 3**	**Pt 2**	**Pt 3**	**Pt 2**	**Pt 3**
Jul-14	6.5	6.5	0.31	1.3	<10	<10
Aug-14	7	7	<0.1	0.31	<10	<10
Sep-14	6.5	6.6	0.52	0.43	6960	13280
Oct-14	6.6	6.7	0.81	3.9	350	360
Nov-14	6.6	6.8	0.46	2.8	865	3600
Dec-14	6.6	6.6	0.45	2.2	285	460
Jan-15	6.7	6.8	0.43	3.5	260	165
Feb-15	6.6	6.6	0.52	2.7	100	2320
Mar-15	6.6	6.6	0.7	3.4	30	135
Apr-15	6.7	6.7	0.89	3.4	10	30
May-15	6.7	6.7	0.6	3.2	60	360
Jun-15	6.6	6.6	0.52	2.95	80	450
Minimum	6.5	6.5	<0.1	0.31	<10	<10
Maximum	7	7	0.89	3.9	6960	13280
Median	6.6	6.65	0.52	2.875	90	360
Results until July 2014						
Number	256	255	256	256	255	255
Minimum	6	6.4	<0.1	0.13	<10	<10
Maximum	6.9	7.1	7.5	27	5000	1970
Median	6.6	6.7	0.5	6	80	100

Appendix VI

Marine ecological survey report

Memorandum

To: Science Manager – Hydrology/Biology, Regan Phipps
From: Scientific Officer, Emily Roberts and Technical Officer, Thomas McElroy
File: #1492732
Date: 17 July 2015

New Plymouth Wastewater Treatment Plant Marine Outfall - Marine Ecological Survey January 2015

1. Introduction

The New Plymouth District Council (NPDC) operates the New Plymouth Wastewater Treatment Plant. The plant receives and treats the municipal wastewater from a large proportion of North Taranaki; the major inputs are New Plymouth, Inglewood, Bell Block, Waitara and Oakura. The treated wastewater then discharges through a 450 m long marine outfall offshore of the Waiwhakaiho River mouth. NPDC hold coastal permit 0882-4 to discharge treated effluent into the Tasman Sea. Special condition 1 of the consent requires that the consent holder prevents or minimises any adverse environmental effects. Accordingly, a survey at coastal sites in the vicinity of the outfall is undertaken each year to assess any adverse effects on intertidal communities.

The survey was carried out at five sites between 19 and 24 January 2015 as part of the 2014-2015 monitoring programme. The objective of the survey was to assess any change in intertidal diversity attributable to the wastewater discharge.

2. Methods

2.1 Field Work

The survey was conducted at five sites: 500 m south west of the outfall on the Waiwhakaiho Reef (SEA902015), 300 m north east of the outfall on the Waiwhakaiho Reef (SEA902010), the Mangati Reef (SEA902005) approximately 2.2 km north east of the outfall and the two control sites at Turangi Reef (SEA900095) approximately 16 km north east of the outfall, and Greenwood Road (SEA903070) approximately 22 km south west of the outfall (Photographs 1-5).

Photograph 1 Potential impact site at 500 m south west of the outfall (SEA902015)

Photograph 2 Potential impact site at 300 m north east of the outfall (SEA902010)

Photograph 3 Potential impact site at the Mangati Reef (SEA 902005)

Photograph 4 Control site at Greenwood Road (SEA903070)

Photograph 5 Control site at Turangi Reef (SEA900095)

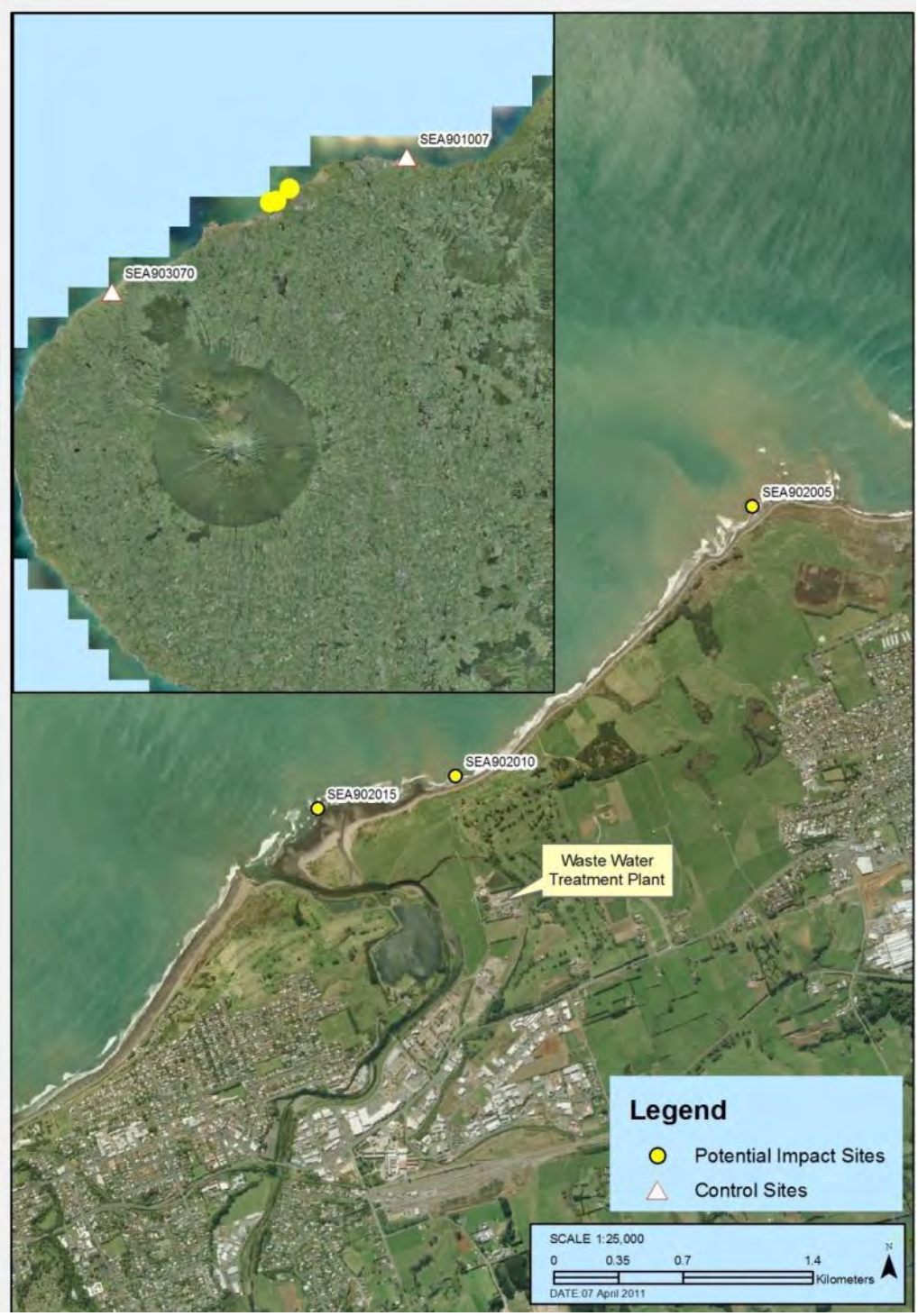


Figure 1 Location of the intertidal survey sites

At each site, a 50 m transect was laid parallel to the shore, approximately 0.6 m above chart datum. This transect was used to establish five 5 m x 3 m blocks. Within each block, 5 random 0.25 m² quadrats were laid giving a total of 25 random quadrats. For each quadrat the percentage cover of algae and encrusting animal species was estimated using a grid. For all other animal species, individuals larger than 3 mm were counted. Under boulder biota was counted where rocks and cobbles were easily overturned.

3. Results

Summary statistics, including the number of species per quadrat and Shannon Weiner indices are presented in Table 1.

Table 1 Summary statistics – January 2015

Site	Number of quadrats	Mean number of species per quadrat			Mean Shannon-Weiner index per quadrat		
		Algae	Animals	Total Species	Algae	Animals	Total Species
500 m SW	25	1.24	9.04	10.28	0.142	0.566	0.598
300 m NE	25	3.00	6.28	9.28	0.435	0.493	0.700
Mangati Reef	25	1.40	3.72	5.12	0.192	0.356	0.435
Turangi Reef	25	5.48	9.16	14.64	0.589	0.613	0.828
Greenwood Road	25	0.00	0.16	0.16	0.000	0.024	0.024

3.1 Number of Species per Quadrat Data

Figure 2 shows the total number of species per quadrat at each site as a box and whisker plot. The notched area of the box represents the median plus and minus the 95% confidence interval. This form of graphical representation allows a quick comparison to be made between sites. Generally, if the notched areas of the boxes do not overlap you would expect to obtain a significantly different result with ANOVA.

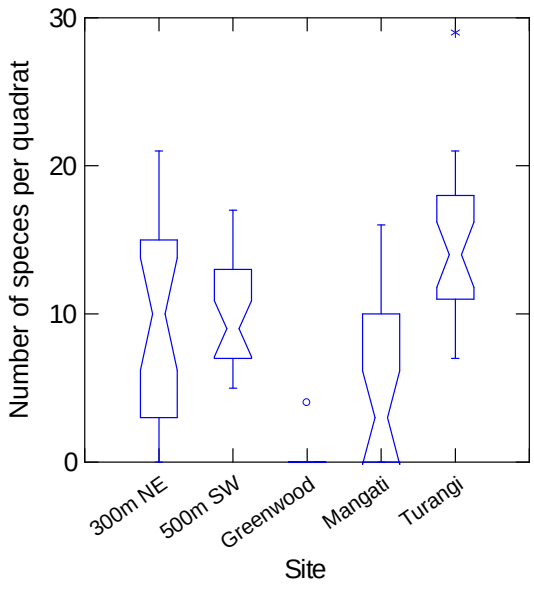


Figure 2 Box and whisker plot of total number of species per quadrat

Two sites (Greenwood Road and Mangati) showed a significant deviation from normal distribution at the 95% confidence level (Lilliefors test, n=25, P <0.05).

The ANOVA assumptions of even variance and normal distribution were not met following a natural log transformation of the data. Accordingly, further analysis was performed using non-parametric tests.

There was a significant difference in the mean number of species per quadrat between sites (Kruskal-Wallis, H = 69.9, P < 0.001).

Significant differences between sites were determined using the Wilcoxon signed-ranks test (Table 2). The mean number of species per quadrat at each site increased in the following order: Greenwood Road, Mangati, 300 m NE, 500 m SW, Turangi. There was a significant difference between all sites, with the exception of 300 m NE and 500 m SW, which were not significantly different from one another.

Table 2 Wilcoxon signed ranks test of number of species per quadrat

Site	Greenwood Road	500 m SW	300 m NE	Mangati Reef
500 m SW	SIG			
300 m NE	SIG	NS		
Mangati Reef	SIG	SIG	SIG	
Turangi Reef	SIG	SIG	SIG	SIG

Key: SIG = significant difference at 95% confidence level
NS = no significant difference

3.2 Shannon-Weiner Diversity Index Data

Figure 4 shows the Shannon-Weiner index (SW index) per quadrat at each site as a box and whisker plot.

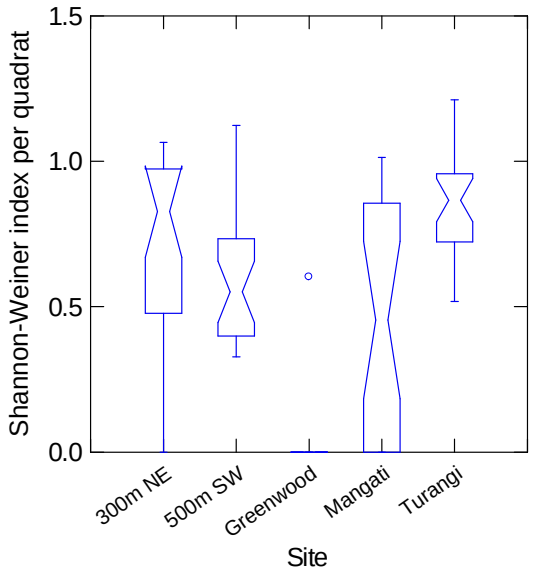


Figure 3 Box and whisker plot of Shannon-Wiener index per quadrat

Three of the sites (500 m SW, Greenwood Road and Mangati Reef) showed a significant deviation from normal distribution at the 95% confidence level (Lilliefors test, n=25, $P < 0.05$).

The ANOVA assumptions of even variance and normal distribution were not met following a natural log transformation of the data. Accordingly, further analysis was performed using non-parametric tests.

There was a significant difference in the mean SW index per quadrat between sites (Kruskal-Wallis, $H = 56.9$, $P < 0.001$).

Significant differences between sites were determined using the Wilcoxon signed-ranks test (Table 3). The mean SW index at Greenwood Road was significantly lower than that at any other site. Of the remaining sites, the mean SW index was significantly greater at 300 m NE than at Mangati Reef. Turangi's mean SW index was significantly greater than that at 500 m SW and Mangati Reef.

Table 3 Wilcoxon signed ranks test of Shannon-Weiner diversity indices

Site	Greenwood Road	500 m SW	300 m NE	Mangati Reef
500 m SW	SIG			
300 m NE	SIG	NS		
Mangati Reef	SIG	NS	SIG	
Turangi Reef	SIG	SIG	NS	SIG

Key: SIG = significant difference at 95% confidence level
NS = no significant difference

3.3 Sand Cover

The percentage cover of sand was recorded (Table 4) because high sand levels can significantly impact marine communities.

Table 4 Mean percentage sand cover per quadrat at each site

Site	Mean coverage per quadrat (%)
500 m SW	7
300 m NE	65
Mangati Reef	83
Turangi Reef	25
Greenwood Road	98

There was a very high cover of sand at the Greenwood Road, Mangati Reef and 300 m NE sites (98%, 82% and 65%, respectively). This year's results marked an unprecedented increase in sand cover at Greenwood Road. Historically, this site has been subjected to a consistent, low level of sand. Spikes in sand cover observed at the Mangati Reef and 300 m NE sites during the current survey are similar to results from the 2007 survey. Previous studies on intertidal reefs in Taranaki have demonstrated that at 30% cover, sand begins to negatively influence hard shore communities.

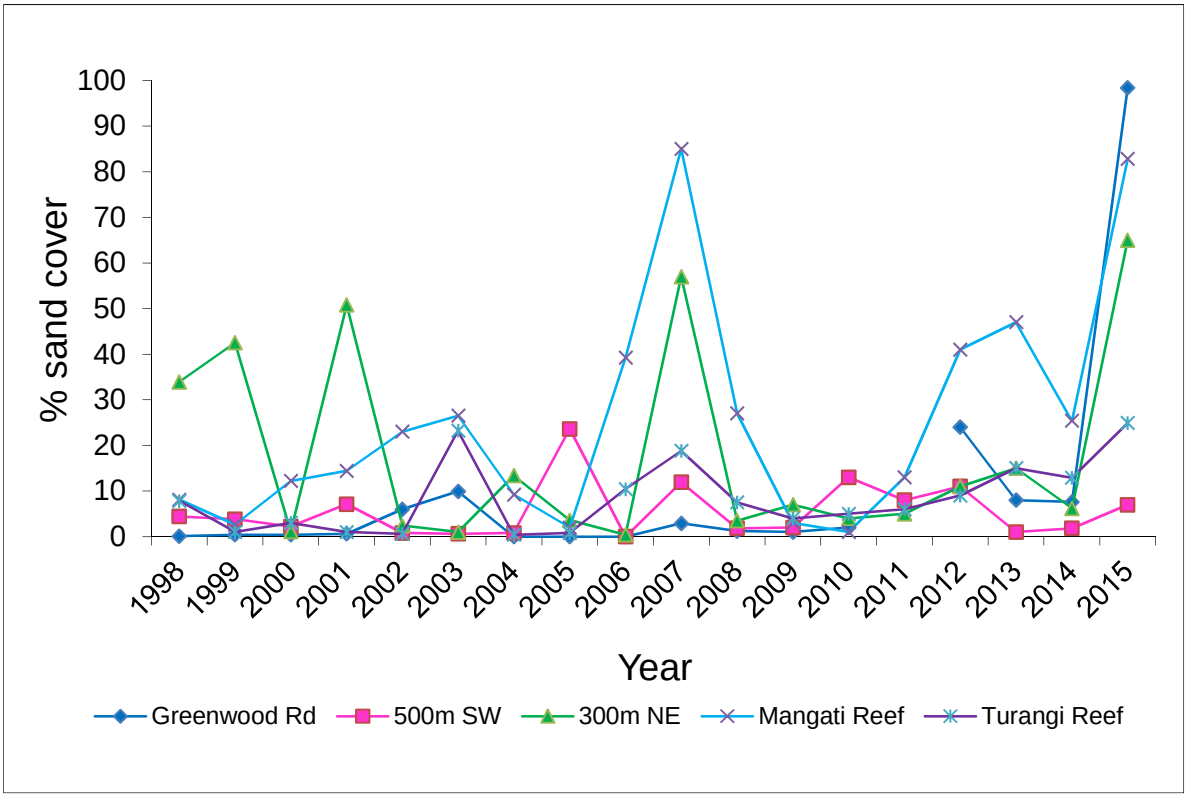


Figure 4 Percentage sand cover at the five reef sites from 1998 to 2015

3.4 Trends over time

Comparisons of the mean number of species per quadrat and the mean Shannon-Weiner index at the five sites surveyed from 1993 to 2015 are shown in Figures 7 and 8, respectively. Species richness and diversity show high interannual variability, with no obvious long term trends in diversity evident at the three impact sites over time (Figures 7 and 8). For the 2015 season, mean number of species had decreased at all sites except for Turangi Reef, which has shown a slight increase since 2014. There was a decrease in SW index at all sites across the same time period. There were prominent decreases in species number and SW index at Greenwood Road, Mangati Reef and 300 m NE. On the other hand, the changes in species number and SW index at Turangi Reef and 500 m SW were less prominent. It is difficult to discern a trend over time in either species number or SW index at any of these sites. The decrease in both ecological parameters at Greenwood Road, Mangati Reef and 300 m NE appears to be more representative of a stochastic fluctuation than a long term trend.

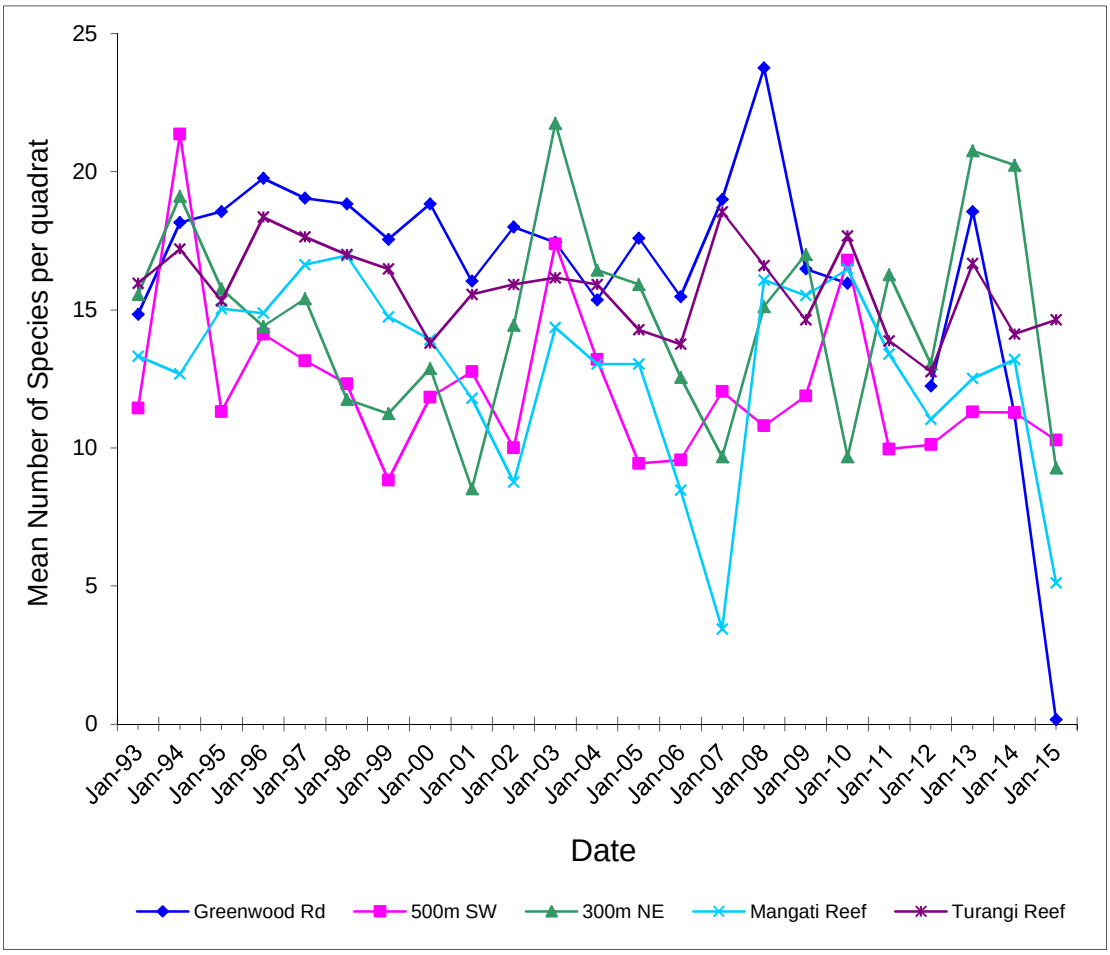


Figure 5 Mean number of total species per quadrat from 1993 to 2015

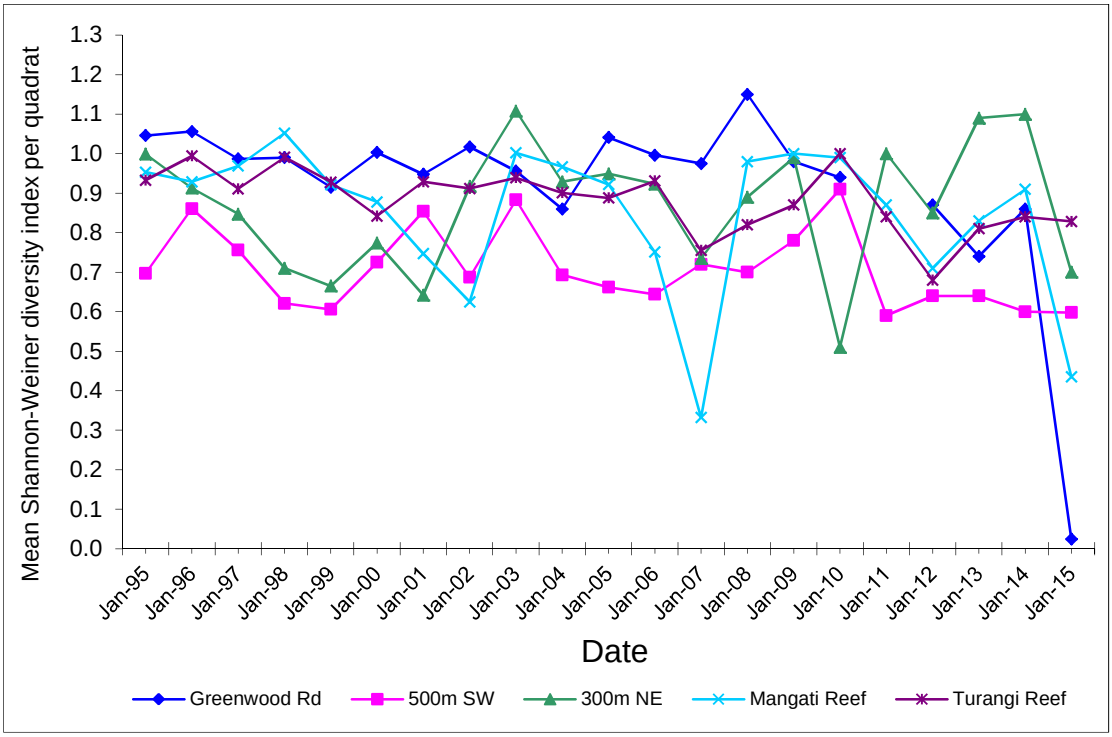


Figure 6 Mean Shannon-Weiner index per quadrat from 1995 to 2015

4. Discussion

An intertidal survey was conducted at five sites between 19 and 24 of January 2015 as part of the 2014-2015 monitoring programme. Potential impact of the New Plymouth Wastewater Treatment Plant (NPWWTP) outfall discharge on the intertidal community was assessed through comparison of results from potential impact sites and control sites within the same year in addition to the analysis of trends over time. The data analysed in this report covers over a twenty year record of species diversity from January 1993 to January 2015.

Impacts of the NPWWTP outfall discharge on the local intertidal community were not evident from the 2015 survey. Of all the sites, species richness and diversity was lowest at Greenwood Road; one of the two control sites (see figure 7 and 8). The other control site, Turangi Reef, was the most species rich and diverse site. However, the diversity at Turangi Reef was not significantly different from a potential impact site (300 m NE; see table 3, figure 8). In addition, over the long term record, there has been no obvious decline in species richness or diversity at the potential impact sites relative to the control sites.

Spatial and temporal variability in the intertidal communities surveyed could be largely attributed to natural changes in physical characteristics of the habitats. In particular sand cover, substrate type and substrate mobility have typically been classified as major drivers of diversity. Historically, the Mangati Reef site has been prone to sand accumulation. Years of high sand accumulation at this site have resulted in reduced diversity within the intertidal community (e.g. 2006, 2007, 2012

and 2013). This year Mangati Reef, along with Greenwood Road and 300 m NE were subjected to extensive sand inundation (Figures 9 and 10, Photographs 6, 7 and 8). The increase in sand resulted in a marked decline in species richness and diversity at each of these sites from the previous year. This response is not surprising given that sand deposition has been shown to have a profound effect on under-rock colonisation on intertidal hard-shore environments in Taranaki (Walsby, 1982). Sand cover can also result in reduced diversity due to sand scour of the biota, reduced water movement between rocks and temporary burial.

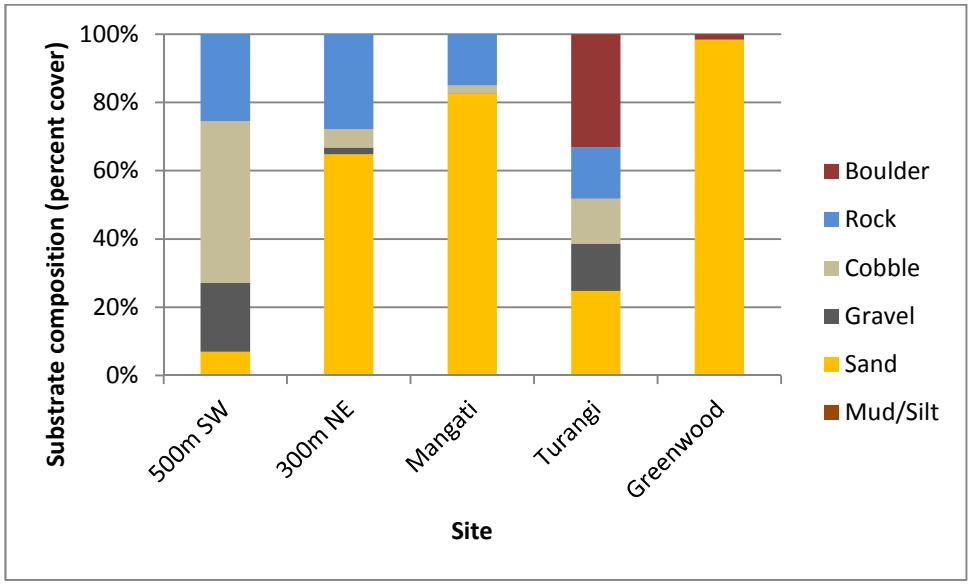


Figure 7 Percentage cover of substrate type at the five sites during the January 2015 survey

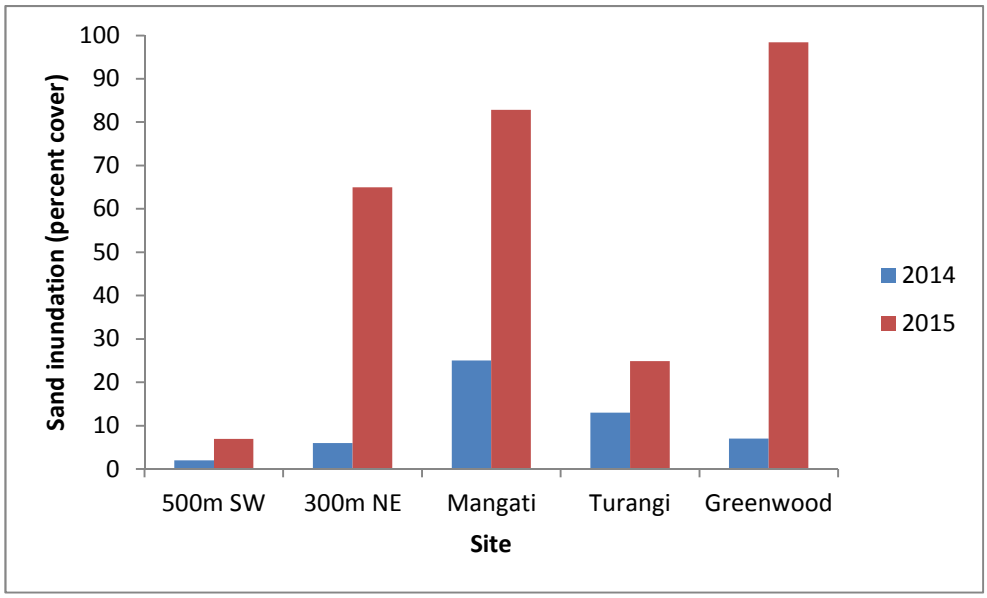
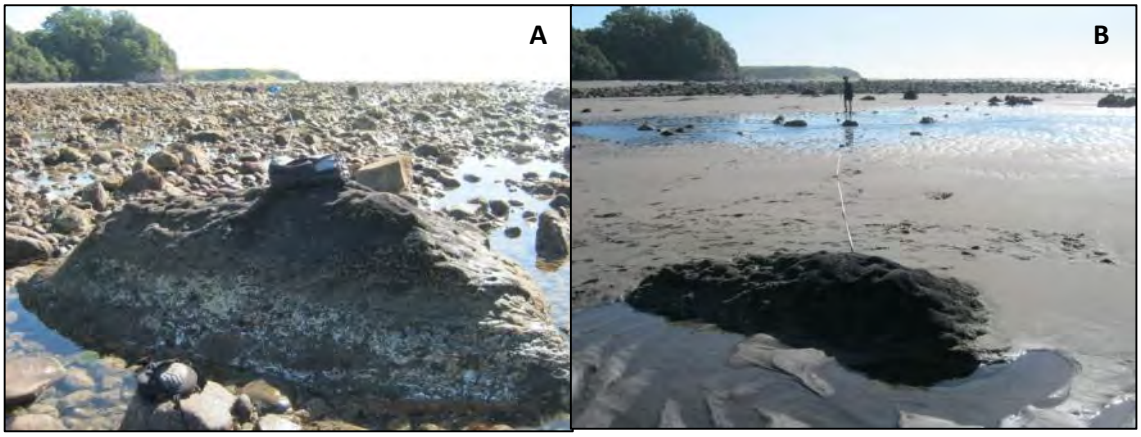
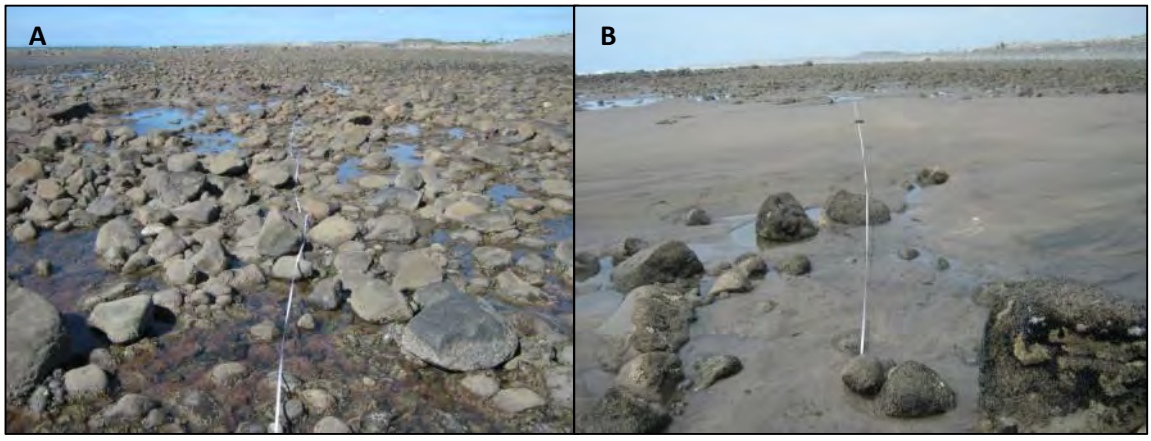


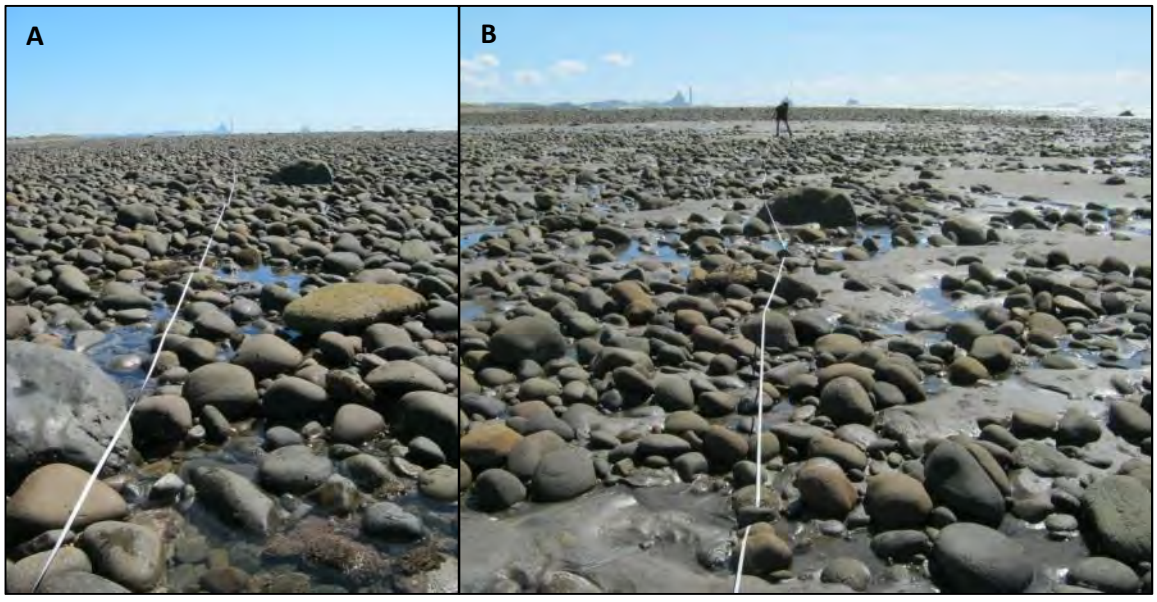
Figure 8 Mean sand cover at the five survey sites in 2014 and 2015



Photograph 6 Greenwood Road site. A) 2 February 2014, B) 23 January 2015



Photograph 7 Mangati Reef site. A) 1 February 2014, B) 19 January 2015



Photograph 8 300 m NE site. A) 21 January 2014, B) 19 January 2015

Historically, Mangati Reef has supported the growth of coralline turf algae more so than the other two impact sites (Figure 11). Although this reef has been periodically inundated with sand, the sheltered conditions have proved more favourable for coralline algae growth. In turn, the relatively high percentage cover of coralline turf can provide an ideal habitat for juvenile cat's-eyes *Turbo smaragdus* (Figure 12), which are known to feed on the small epiphytes present on the calcified surface of the coralline algae (Morton, 2004). However, in 2015, the extent of sand inundation at the Mangati Reef resulted in extremely low coralline turf cover and *T.smaragdus* densities at the site. A similar result, albeit at a smaller scale, was observed at the 300 m NE site (Figure 11 and 12).

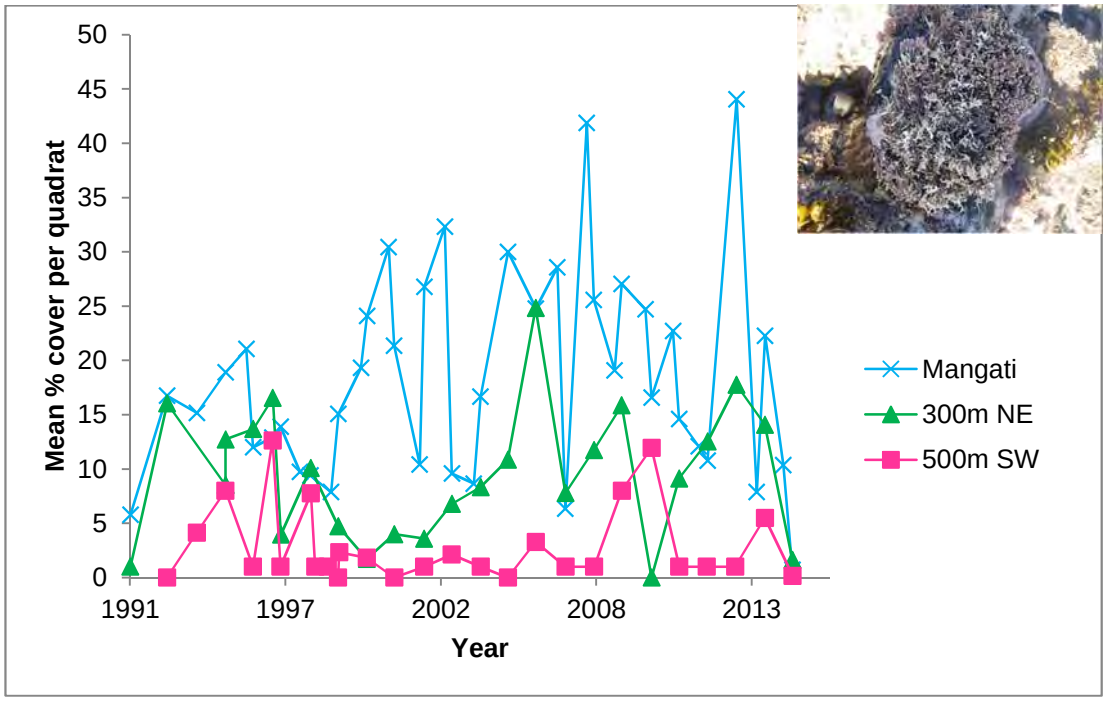


Figure 9 Percentage cover of coralline turf *Corallina officinalis* at the three potential impact sites from 1991 to 2015

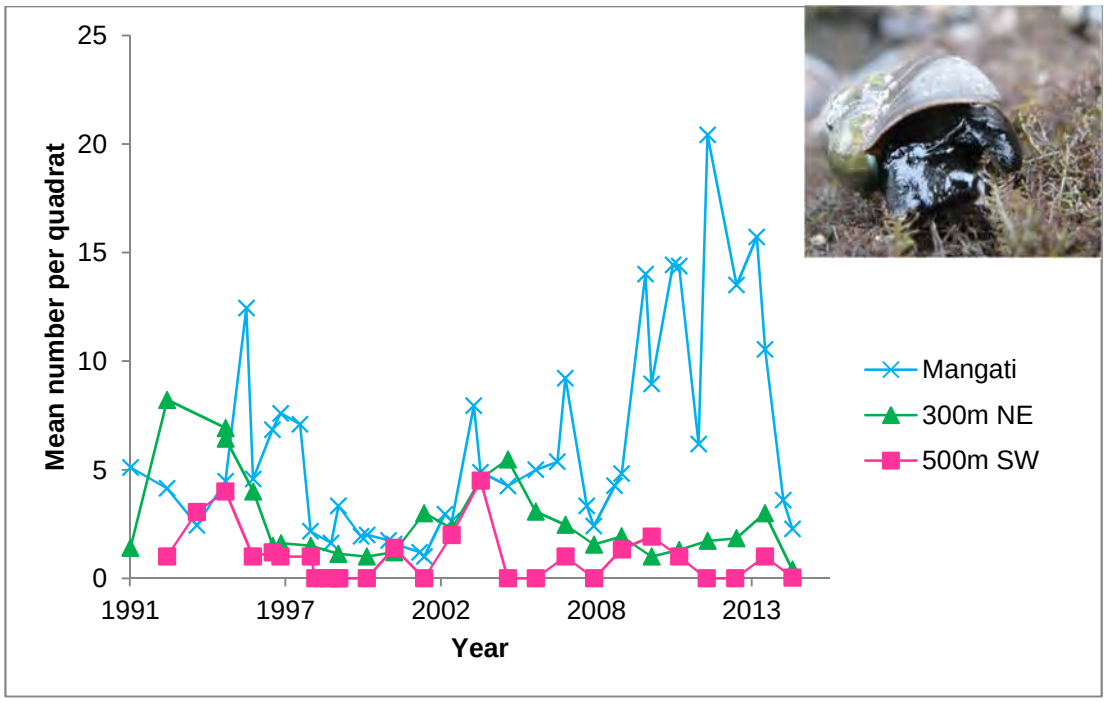


Figure 10 Abundance of cat's-eye *Turbo smaragdus* at the three potential impact sites from 1991 to 2015

The site 500 m SW of the outfall is a unique in its substrate composition, whilst also a characteristic example of Taranaki's dynamic coastline. The reef is predominantly composed of relatively uniform, small, rounded rocks/cobbles (Photograph 1). It has been previously noted that the movement of these rocks/cobbles is influenced by the close proximity of the Waiwhakaiho River, with the formation of cobble banks which regularly shift and vary in height. The mobile nature of the substrate prevents many species, in particular macroalgae, from establishing (Table 1). This may explain the low cover of coralline turf relative to the other two impact sites over the past 20 years (Figure 11). The porcelain crab *Petrolisthes elongates* is one of the few animals able to thrive at this site (Figure 13). A high abundance of *P.elongatesis* was recorded at this site during the January 2015 survey. This highly mobile, small species of crab is well adapted to such harsh, transient environments, being able to scuttle and filter feed between the rounded rocks (Morton, 2004).

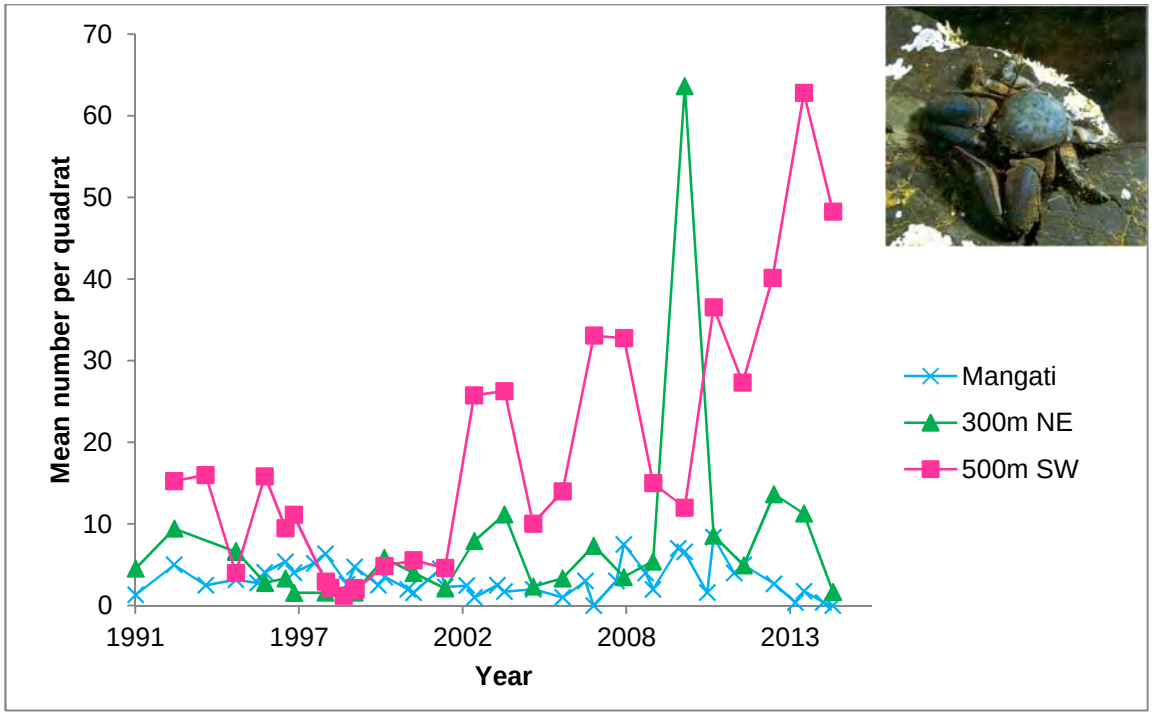


Figure 11 Abundance of Porcelain crab *Petrolisthes elongates* at the three potential impact sites from 1991 to 2014

The site 300 m NE of the outfall provides an intermediate substrate cover relative to the two other potential impact sites (Figure 9), offering more shelter/stability than 500 m SW and less sand accumulation than Mangati Reef. The substrate complexity provides a range of habitats/ecological niches. Consequently, 300 m NE had the highest Shannon Weiner Index of the impact sites for the January 2015 survey.

The control sites at Turangi Reef and Greenwood Road have typically had a high level of species abundance and diversity. Variation at these sites (lower abundance and diversity) has previously been attributed to sand inundation. Species number and diversity have tended to recover quickly once the sand has been removed. Sand inundation at Greenwood Road was unprecedented during the January 2015 survey (Figure 6). Sand cover at Turangi Reef was relatively high when compared to previous years at that site, yet it was very low when compared to the other sites in this years survey (Figure 6).

Finally, it must be noted that the high energy receiving environment combined with the effects of suspended sediments from rivers and streams prevent the development of stable biological communities along the Taranaki coastline (Clark et al., 2012). Such conditions could potentially mask any subtle ecological effects from the NPWWTP outfall discharge. However, in spite of these limitations, intertidal surveys are useful in detecting more noticeable effects from wastewater, as clearly identified in the TRC Fonterra Whareroa Annual Report 2012-2013 (13-24).

5. Conclusions

In order to assess the effects of the NPWWTP outfall discharge on the nearby intertidal communities, surveys were conducted in January 2015 at five sites. These surveys included three potential impact sites and two control sites, north and south of the outfall. It was expected that adverse effects of the NPWWTP outfall discharge on the intertidal communities would have been evident as a significant decline in species diversity at the potential impact sites relative to the control sites.

There was no distinguishable shift in species richness or diversity at the potential impact sites compared with the control sites in this year's survey. In addition, over the long term record, there has been no obvious decline in species number and Shannon-Weiner index at the potential impact sites relative to the control sites. The results indicate that the outfall discharge was not having detectable adverse effects on the intertidal reef communities of North Taranaki. Natural environmental factors, in particular sand cover, substrate type and substrate mobility, appeared to be the dominant drivers of species diversity at the sites surveyed.

Emily Roberts
Scientific Officer – Marine Ecologist

Thomas McElroy
Technical Officer

References

Clark, D., Barter, P., Clement, D., Tremblay, L., Forrest, R. (2013) Whareroa Marine Outfall ecological investigation 2012. Cawthron Report No. 2348

Morton, J. (2004) Seashore ecology of New Zealand and the Pacific.

Taranaki Regional Council, 2013: Fonterra Whareroa Compliance Monitoring Programme Annual Report 2012-2013. Technical Report 2013-24.

Walsby, J.R. (1982) Marine ecological baseline programme NZSFC Synthetic Petrol Plant Motunui.

Appendix VII

Shoreline bacteriological water quality report 2014-2015

Memorandum

To: Science Manager – Hydrology/Biology, Regan Phipps
From: Scientific Officer Emily Roberts and Technical Officer Thomas McElroy
Document: **#1565752**
Date: 18 March 2016

Bathing beach water quality survey: New Plymouth Wastewater Treatment Plant marine discharge monitoring – November 2014 to March 2015

Introduction

Faecal indicator bacteria (FIB) have been monitored every second spring/summer since 1996-1997 at five shoreline sites around the New Plymouth Waste Water Treatment Plant (NPWWTP) outfall. This report presents the results of the tenth survey to monitor shoreline FIB in relation to this discharge.

Microbiological water quality guidelines (2003)

In 2003, the Ministry for the Environment (MfE) developed the *Guidelines for Recreational Water Quality* to assess the safety of water for contact recreation. The coastal guidelines focus on enterococci as this indicator provides the closest correlation with health effects in New Zealand coastal waters. 'Alert' and 'Action' guideline levels are summarized in Table 1 and are based on keeping illness risk associated with recreational use to less than approximately 2%. For freshwater, the MfE 2003 guidelines use *E. coli* as the preferred indicator (Table 1).

Table 1 Recreational bathing guidelines (MfE 2003)

	Indicator	Mode		
		Surveillance	Alert	Action
Marine	Enterococci (cfu/100ml)	No single sample >140	Single sample >140	Two consecutive single samples >280
Freshwater	*E. coli* (cfu/100ml)	No single sample >260	Single sample >260	Single sample >550

Monitoring methodology

1.1 Sample collection

Sample collection, field measurements and analyses were undertaken according to documented Taranaki Regional Council procedures. Sampling was undertaken under dry weather flow conditions (therefore not within three days of a fresh). Bathing water samples were taken between 0900 and 1800 hours (NZDT). Samples were collected immediately beneath the water surface and at a minimum of calf depth. Thirteen samples were collected from three of the sites, while twelve samples were collected from the remaining two sites.

1.2 Sample analysis

Samples were analysed for enterococci, *E. coli* and faecal coliform bacteria and conductivity. Both *E. coli* and faecal coliform numbers were assessed using mTec agar method #9213-d of the Standard Methods for the Examination of Waters and Wastewaters (APHA, 2005). Enterococci numbers were assessed using the EPA modified method #1600 on mEI agar.

1.3 Site locations

The locations of the five sites sampled in the 2014-2015 monitoring programme are shown in Figure 1 and Table 2.

Figure 1 Location of monitoring sites in relation to the New Plymouth Wastewater Treatment Plant

Table 2 Location of sampling sites

Site Name	Location	GPS	Site code
Mangati	Approximately 1.5km NE of NPWWTP outfall	1697609E- 5679749N	SEA902008
300m NE	300m NE NPWWTP outfall	1696721E-5679002N	SEA902010
500m SW	500m SW NPWWTP outfall	1696132E-5678755N	SEA902015
Fitzroy Beach	Opposite surf lifesaving club	1694948E-5677598N	SEA902025
Waiwhakaiho River	Downstream of Lake Rotomanu	1696587E-5678336N	WKH000950

Results

1.4 Mangati

1.4.1 Monitoring programme

The Mangati site (Photograph 1) is accessed through a farm via the Mangati walking track. This site does not have a high recreational bathing use.

The data for this site are presented in Table 3 and Figure 2, with a statistical summary provided in Table 4.

Table 3 Bacteriological results for the Mangati site

Date	Time (NZST)	Conductivity @ 20°C (mS/m)	Bacteria			Temp (°C)
			E . coli (cfu/100ml)	Enterococci (cfu/100ml)	Faecal coliforms (cfu/100ml)	
10 Nov 2014	12:50	4540	<1	<1	<1	16.8
09 Dec 2014	12:35	4750	<1	<1	<1	18.2
05 Jan 2015	12:05	4720	<1	<1	<1	21.6
08 Jan 2015	12:30	4820	<1	<1	<1	18.7
12 Jan 2015	14:35	4740	<1	3	<1	21.1
20 Jan 2015	10:15	4680	24	60	29	20.4
23 Jan 2015	13:10	4690	0.5	<1	0.5	21.1
26 Jan 2015	14:55	4710	0.5	<1	0.5	20.9
09 Feb 2015	13:30	4520	1	<1	1	19.6
19 Feb 2015	11:35	4690	5	1	5	20.9
04 Mar 2015	10:25	4700	<1	<1	<1	21.8
12 Mar 2015	14:10	4760	1	7	1	21.5
20 Mar 2015	08:05	4730	<1	3	<1	17.7

Table 4 Statistical summary for the Mangati site

Parameter	Conductivity @ 20°C (mS/m)	*E. coli* (cfu/100ml)	Enterococci (cfu/100ml)	Faecal coliforms (cfu/100ml)	Temperature (°C)
Number of samples	13	13	13	13	13
Minimum	4520	<1	<1	<1	16.8
Maximum	4820	24	60	29	21.8
Median	4710	<1	<1	<1	20.9

No high individual enterococci counts were recorded throughout the season (all counts •60 cfu / 100ml) and the median enterococci count was less than one cfu / 100ml (Table 4).

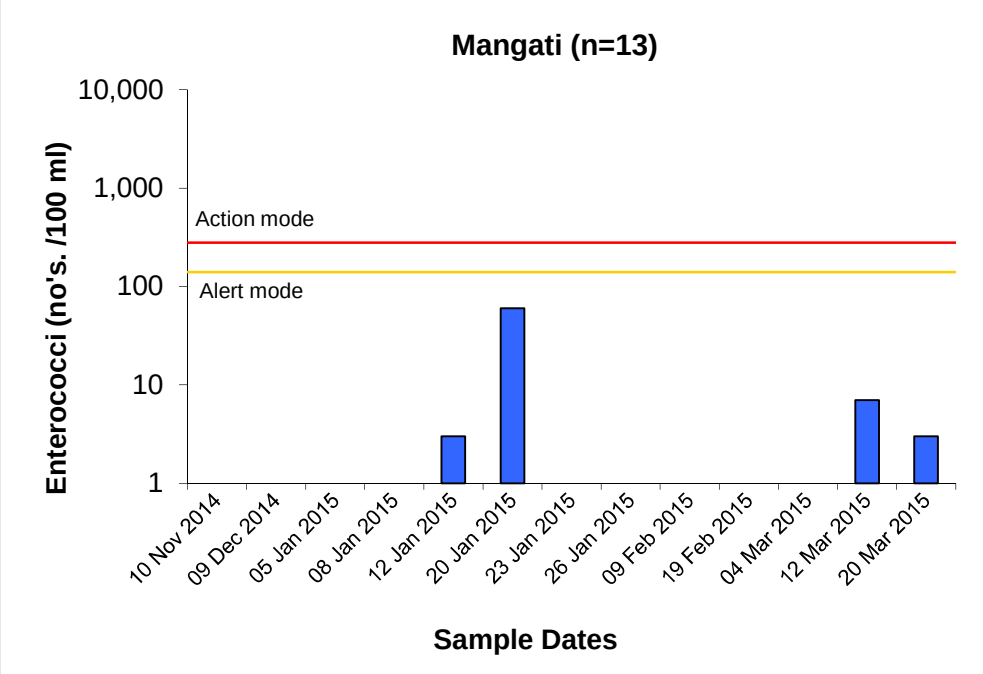


Figure 2 Enterococci counts at Mangati site during the 2014-2015 survey season

1.4.2 Compliance with guidelines

Compliance with the 2003 guidelines for marine contact usage is summarised in Table 5. All samples were below guideline 'Alert' levels.

Table 5 Bacterial guidelines performance at Mangati Beach

Parameter	Number of exceedances of enterococci guidelines [% of 13 samples]	
	ALERT Single sample >140/100ml	ACTION Two consecutive samples >280/100 ml
Enterococci	0 [0]	0 [0]

1.4.3 Comparison with previous summer surveys

Previous summer data for the Mangati site are summarised in Table 6 and Figure 3.

Table 6 Summary enterococci data (cfu/100 ml) for summer surveys at Mangati site

Summer	96-97	98-99	00-01	02-03	04-05	06-07	08-09	10-11	12-13	14-15
Minimum	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Maximum	110	16	40	7	21	20	120	19	36	60
Median	4	3	3	1	1	1	1	<1	5	<1

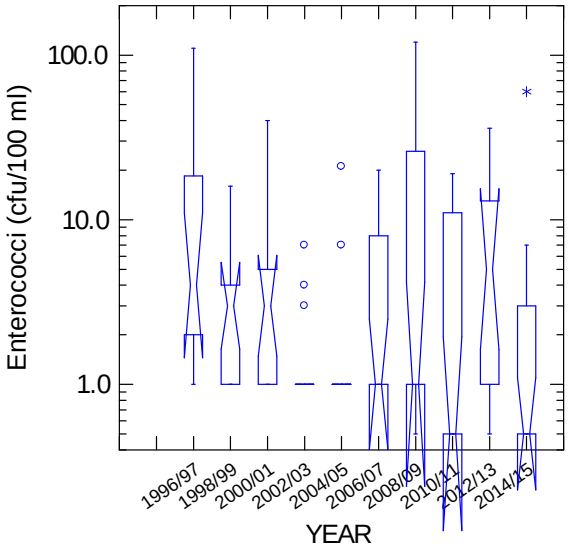


Figure 3 Box and whisker plots for all summer SEM surveys at Mangati site

Water quality was good during the 2014-2015 summer period; a large number of the counts, including the median, were below the detectable limit for enterococci using the methodology employed by this survey (<1 cfu/100ml).

Photograph 1 The Mangati site, looking SW towards the outfall

1.5 East of the outfall

1.5.1 Monitoring programme

The 300 m NE site is located in line with the prevailing north-easterly current and is potentially a high impact site with regards to discharges from the outfall. This site is not a recreational bathing site due to poor public access.

Data from the site are presented in Table 7 and Figure 4, with a statistical summary provided in Table 8.

Table 7 Bacteriological results for the 300m NE site

Date	Time (NZST)	Conductivity @ 20°C (mS/m)	Bacteria			Temp (°C)
			E. coli (cfu/100ml)	Enterococci (cfu/100ml)	Faecal coliforms (cfu/100ml)	
10 Nov 2014	13:10	4410	1	5	1	18.2
09 Dec 2014	07:45	4410	1	4	1	17.5
05 Jan 2015	12:20	4690	3	4	4	22
12 Jan 2015	11:40	4720	13	28	13	21.3
20 Jan 2015	07:10	4620	37	43	37	19.1
23 Jan 2015	09:40	4670	<1	3	0.5	19.2
26 Jan 2015	12:10	4660	16	13	16	20.8
09 Feb 2015	10:20	4490	7	21	7	19.1
19 Feb 2015	07:10	4710	20	51	21	17.5
04 Mar 2015	07:35	4700	88	350	99	20.3
12 Mar 2015	10:55	4560	27	36	31	20.8
20 Mar 2015	07:20	4710	13	97	15	16.5

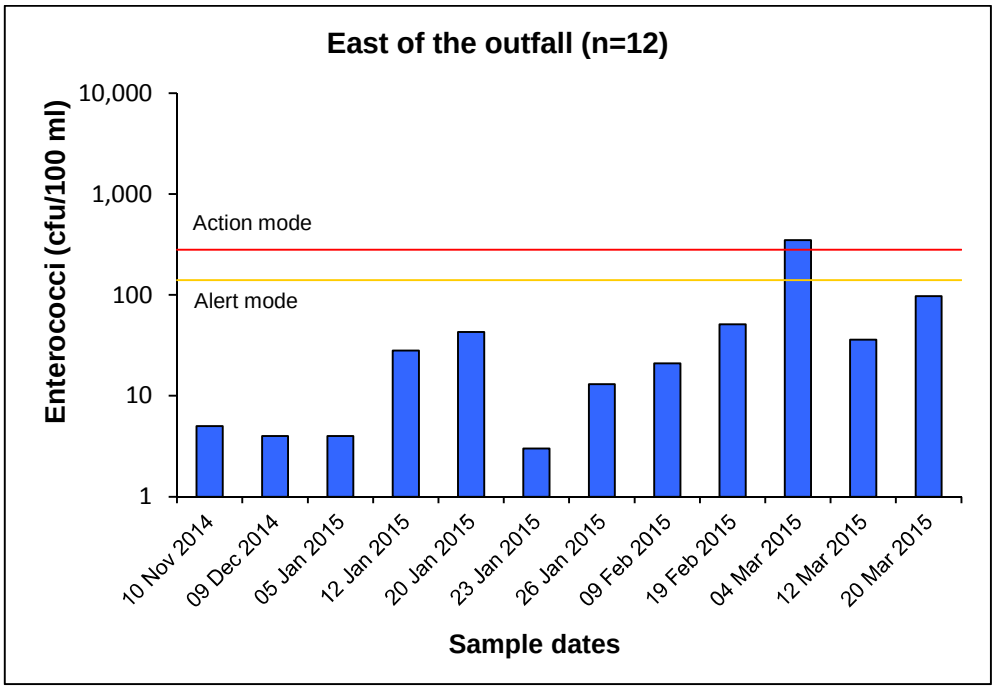


Figure 4 Enterococci counts for 300 m NE during the 2014-2015 survey season

Table 8 Statistical summary for 300 m NE site

Parameter	Conductivity @ 20°C (mS/m)	*E. coli* (cfu/100ml)	Enterococci (cfu/100ml)	Faecal coliforms (cfu/100ml)	Temperature (°C)
Number of samples	12	12	12	12	12
Minimum	4410	0.5	3	0.5	16.5
Maximum	4720	88	350	99	22
Median	4665	13	24.5	14	19.15

Concentrations of all three indicator bacteria were occasionally high over the season, however, enterococci was the only indicator to exceed the limits; exceeding the alert guideline on one occasion. Median counts of all three indicators were moderate - between 13 and 24.5 cfu/100ml. Elevated enterococci counts could not be explained by significant rainfall prior to the sampling dates, nor was there elevated flow in the Waiwhakaiho River (Figure 12).

1.5.2 Compliance with guidelines

Compliance with the 2003 guidelines for marine contact usage is summarised in Table 9. One of the samples collected at the 300 m NE site exceeded 'Alert' levels.

Table 9 Bacterial guidelines performance at the 300 m NE site

Parameter	Number of exceedances of enterococci guidelines [% of 13 samples]	
	ALERT Single sample >140/100ml	ACTION Two consecutive samples >280/100 ml
Enterococci	1 [8]	0 [0]

1.5.3 Comparison with previous summer surveys

Summary statistics for enterococci data collected at the 300 m NE site are presented in Table 10 and Figure 5.

Table 10 Summary enterococci data (cfu/100 ml) for summer surveys at the 300m NE site

Summer	96-97	98-99	00-01	02-03	04-05	06-07	08-09	10-11	12-13	14-15
Minimum	1	<1	<1	<1	<1	<1	<1	<1	1	3
Maximum	82	110	240	160	60	180	250	250	230	350
Median	9	3	3	6	8	20	38	9	27	24.5

The median value of 24.5 cfu/100ml was within the range of previous results. The maximum count of 350 cfu/100ml exceeded all historical maximums recorded at this site.

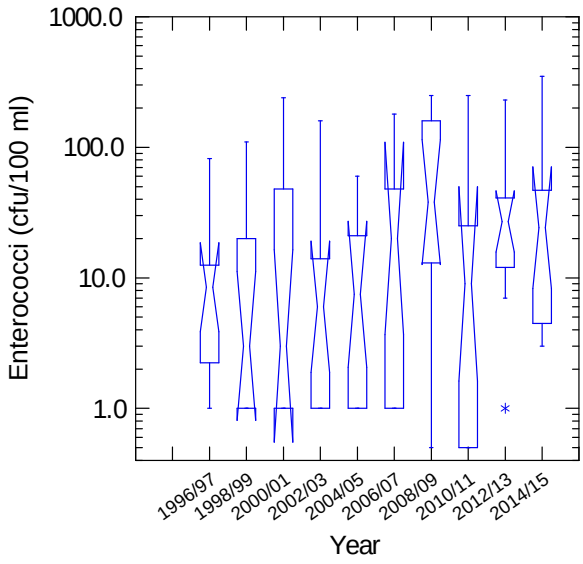


Figure 5 Box & whisker plots of enterococci for all surveys at 300 m NE

1.6 West of the outfall

1.6.1 Monitoring programme

The 500 m SW site (Photograph 2) is not used for recreational bathing, as there is public access by foot/bike only. However, surfing at Waiwhakaiho Reef is very popular year round, with surfers paddling across the Waiwhakaiho River to access the reef break situated a few hundred meters from the site. The close proximity of the site to the Waiwhakaiho River means bacterial contamination from freshwater may occur, especially after floods.

Data from the site are presented in Table 11 and Figure 6, with a statistical summary provided in Table 12.

Table 11 Bacteriological results for 500 m SW

Date	Time (NZST)	Conductivity @ 20°C (mS/m)	Bacteria			Temp (°C)
			E. coli (cfu/100ml)	Enterococci (cfu/100ml)	Faecal coliforms (cfu/100ml)	
10 Nov 2014	13:25	3660	35	39	35	19.1
09 Dec 2014	08:00	3980	26	42	30	17.3
05 Jan 2015	12:10	4620	35	81	35	22.2
12 Jan 2015	11:40	4610	68	36	68	23
20 Jan 2015	07:20	4570	200	880	200	19.1
23 Jan 2015	09:30	4670	120	94	130	21.7
26 Jan 2015	12:00	4630	12	36	12	22.5
09 Feb 2015	10:10	4190	26	56	32	21.8
19 Feb 2015	07:00	4400	120	300	130	14.6
04 Mar 2015	07:25	4700	150	250	150	19.6
12 Mar 2015	10:40	4500	92	76	96	21.1
20 Mar 2015	07:05	4600	270	1200	270	10.2

Photograph 2 The 500 m SW site

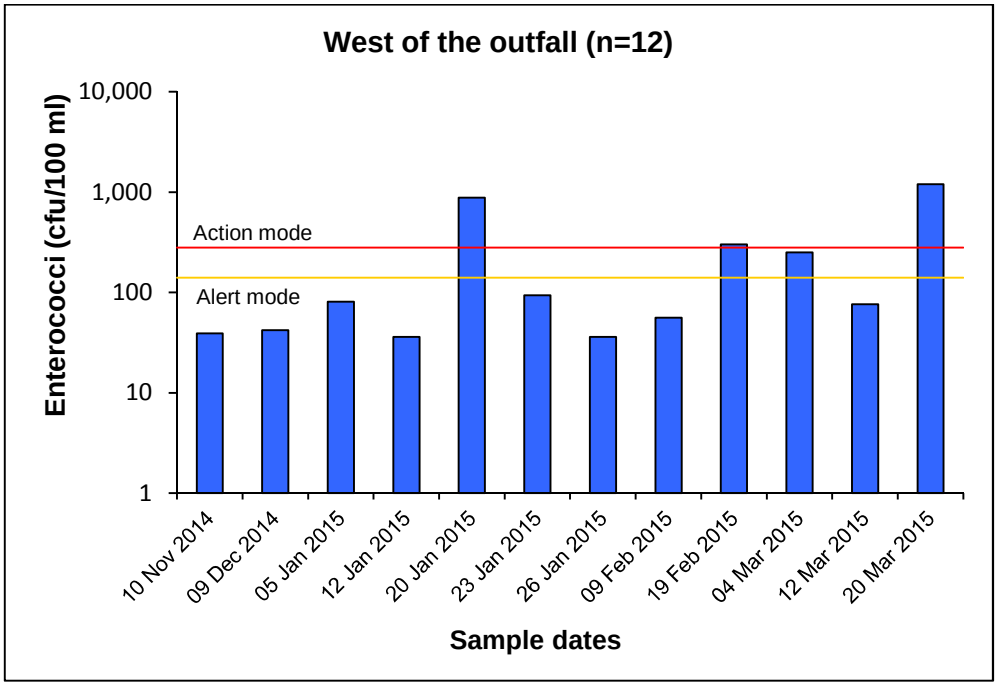


Figure 6 Enterococci counts 500 m SW during the 2014-2015 survey season

Table 12 Statistical summary for 500 m SW

Parameter	Conductivity @ 20°C (mS/m)	*E. coli* (cfu/100ml)	Enterococci (cfu/100ml)	Faecal coliforms (cfu/100ml)	Temperature (°C)
Number of samples	12	12	12	12	12
Minimum	3660	12	36	12	10.2
Maximum	4700	270	1200	270	23
Median	4585	80	78.5	82	20.35

Faecal indicator bacteria medians and maxima were high, indicating poor water quality at this site. Faecal indicator bacteria counts from the 300 m NE site were lower than at the 500 m SW site. This would not be expected if discharge from the outfall was the main source of faecal contamination, taking into consideration the predominant north easterly flow.

As seen in previous surveys, high bacterial counts in the Waiwhakaiho River can influence the 500 m SW site. However, conductivity data indicates that only minor freshwater influence occurred at the 500 m SW site during the 2014-2015 summer season (Table 11). Gulls have been observed in high numbers on the cobbles and sand banks of the Waiwhakaiho Reef (Photograph 3), at the Waiwhakaiho River mouth and immediately upstream of the Waiwhakaiho River site (Photograph 4). Results from faecal source tracking indicate that gulls are likely to be the primary source of faecal contamination at these sites.

Photograph 3 Gulls at site 500 m SW (west of the outfall)

1.6.2 Compliance with guidelines

Compliance with the 2003 guidelines for marine contact usage is summarised in Table 13. In terms of contact recreational usage guidelines, bacteriological water quality at

this site had shown substantial improvement from that of the previous survey, with just four of 12 samples exceeding guideline levels (compared with 11 of 13 samples in the 2012/13 survey). Four (33%) of the samples were within the 'Alert' mode. The 'Action' mode guideline was not exceeded during this survey.

Table 13 Bacterial guidelines performance at the 500 m SW site

Parameter	Number of exceedances of enterococci guidelines [% of 12 samples]	
	ALERT Single sample >140/100ml	ACTION Two consecutive samples >280/100 ml
Enterococci	4 [33]	0 [0]

1.6.3 Comparison with previous summers' surveys

Summary statistics for enterococci data collected at 500 m SW are presented in Table 14 and Figure 7.

Table 14 Summary enterococci data (cfu/100ml) for summer surveys at the 500 m SW site

Summer	96-97	98-99	00-01	02-03	04-05	06-07	08-09	10-11	12-13	14-15
Minimum	1	<1	4	4	3	84	160	6	80	36
Maximum	2400	140	1400	700	10000	4300	4500	3000	5600	1200
Median	27	11	120	91	275	400	100	320	340	78.5

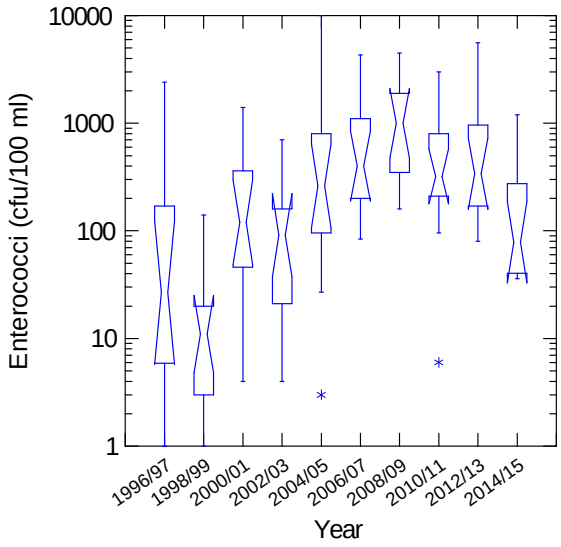


Figure 7 Box & whisker plots of enterococci for all summer surveys 500 m SW

Since the surveys began, water quality has appeared to be in a steady decline at this site. However, the trend of decline has levelled off in recent years, with results from this year showing a notable improvement in enterococci counts (Figure 7). Median and maximum enterococci counts were among the lowest ever recorded at this site.

1.7 Fitzroy Beach

1.7.1 Monitoring programme

Fitzroy Beach is situated in New Plymouth and is one of the most popular bathing beaches in Taranaki. It is also a popular year-round surfing beach, especially for young surfers, due to its central location and generally smaller waves. The mouth of the Waiwhakaiho River enters the sea at the eastern end of the beach, approximately 800 m from the sample site, which on rare occasions can contribute significant amounts of freshwater during floods.

The data for this site are presented in Table 15 and Figure 8, with a statistical summary provided in Table 16.

Table 15 Bacteriological results for Fitzroy Beach

Date	Time (NZST)	Conductivity @ 20°C (mS/m)	Bacteria			Temp (°C)
			E . coli (cfu/100ml)	Enterococci (cfu/100ml)	Faecal coliforms (cfu/100ml)	
10 Nov 2014	11:50	4540	11	11	11	16.6
09 Dec 2014	09:30	4650	3	3	3	17.3
05 Jan 2015	11:25	4640	<1	1	<1	19.8
08 Jan 2015	13:05	4860	1	<1	<1	18.2
12 Jan 2015	15:15	4710	0.5	1	<1	20.5
20 Jan 2015	08:45	4710	24	9	24	19.4
23 Jan 2015	10:10	4700	3	3	3	19.1
26 Jan 2015	12:35	4610	<1	5	0.5	21.1
09 Feb 2015	10:55	4540	1	5	1	18.3
19 Feb 2015	08:40	4700	0.5	1	<1	18.7
04 Mar 2015	08:35	4720	5	3	5	21.1
12 Mar 2015	11:45	4710	3	5	3	20.9
20 Mar 2015	08:15	4750	<1	1	<1	17.3

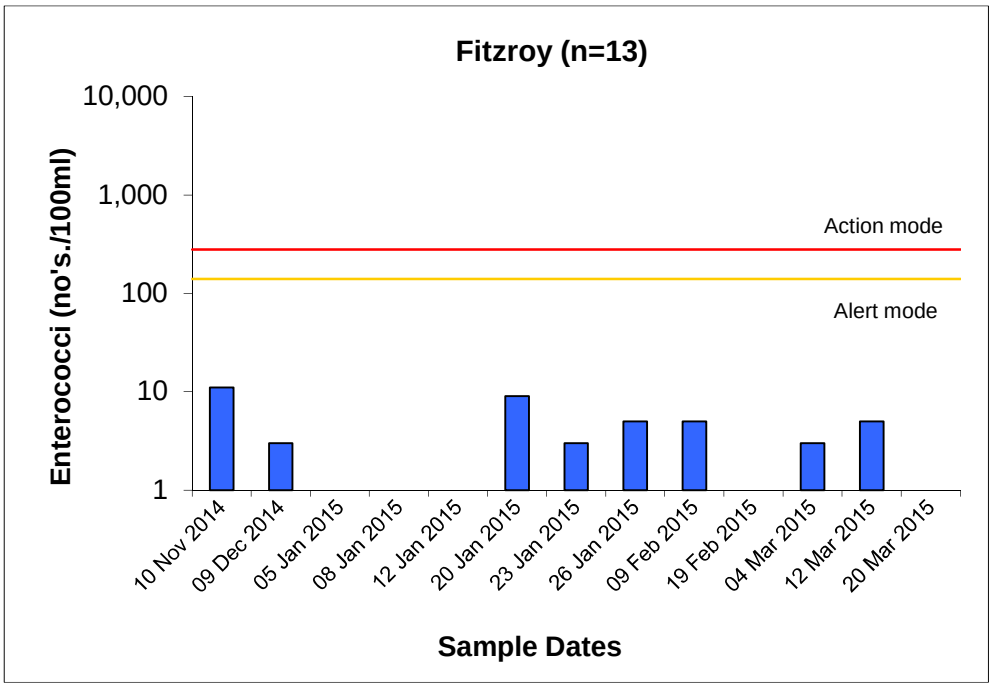


Figure 8 Enterococci counts at Fitzroy Beach during the 2014-2015 survey season

Table 16 Statistical summary for Fitzroy Beach

Parameter	Conductivity @ 20°C (mS/m)	*E. coli* (cfu/100ml)	Enterococci (cfu/100ml)	Faecal coliforms (cfu/100ml)	Temperature (°C)
Number of samples	13	13	13	13	13
Minimum	4540	<1	<1	<1	16.6
Maximum	4860	24	11	24	21.1
Median	4700	1	3	1	19.1

Bacteriological water quality was good throughout the season, with low median counts for all faecal indicator bacteria.

1.7.2 Compliance with guidelines

Compliance with the 2003 guidelines for marine contact usage is summarised in Table 17. Enterococci counts in all samples were below both Alert and Action guideline levels.

Table 17 Bacterial guidelines performance at Fitzroy Beach

Parameter	Number of exceedances of enterococci guidelines [% of 13 samples]	
	ALERT Single sample >140/100ml	ACTION Two consecutive samples >280/100 ml
Enterococci	0 [0]	0 [0]

1.7.3 Comparison with previous summer surveys

Summary statistics for enterococci data collected at Fitzroy Beach during previous summer bathing seasons are presented in Table 18 and Figure 9. The median enterococci count (3 cfu / 100ml) obtained for the 2014-2015 summer season at Fitzroy Beach was one of the lowest to date.

Table 18 Summary enterococci data (cfu/100 ml) for summer surveys at Fitzroy Beach

Summer	96-97	98-99	00-01	02-03	04-05	06-07	08-09	10-11	12-13	14-15
Minimum	1	<1	<1	<1	<1	<1	<1	1	<1	<1
Maximum	280	79	98	580	52	33	110	43	36	11
Median	15	7	7	5	4	3	10	4	3	3

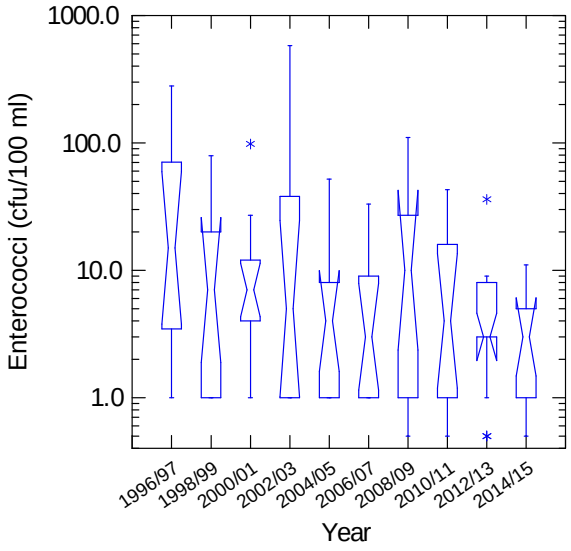


Figure 9 Box and whisker plots of enterococci at Fitzroy Beach

1.8 Waiwhakaiho River

1.8.1 Monitoring programme

The main purpose for including this lower Waiwhakaiho River site is to provide an indication of bacterial contamination from the river entering the sea and influencing the coastal sites.

The data for this site are presented in Table 19 and Figure 10, with a statistical summary provided in Table 20.

Table 19 Bacteriological results for the Waiwhakaiho River site

Date	Time (NZST)	Conductivity @ 20°C (mS/m)	Bacteria			Temp (°C)
			E . coli (cfu/100ml)	Enterococci (cfu/100ml)	Faecal coliforms (cfu/100ml)	
10 Nov 2014	12:15	10.4	46	500	69	16.8
09 Dec 2014	08:15	12.1	400	830	420	17.8
05 Jan 2015	11:45	11.5	1600	2000	1600	22.1
08 Jan 2015	13:25	12.4	1200	1100	1800	23.8
12 Jan 2015	12:10	15.8	670	1100	880	23.1
20 Jan 2015	08:00	14.1	1200	670	1300	20.2
23 Jan 2015	09:15	14.6	950	900	1000	21.5
26 Jan 2015	11:45	14.8	1600	3700	1700	23.7
09 Feb 2015	10:00	11.4	640	1100	640	18.8
19 Feb 2015	08:00	14.4	830	620	930	18.3
04 Mar 2015	08:00	16.1	2700	3400	3200	20
12 Mar 2015	11:15	12.6	7400	7500	8000	19.3
20 Mar 2015	08:00	14.5	1000	730	1100	13.5

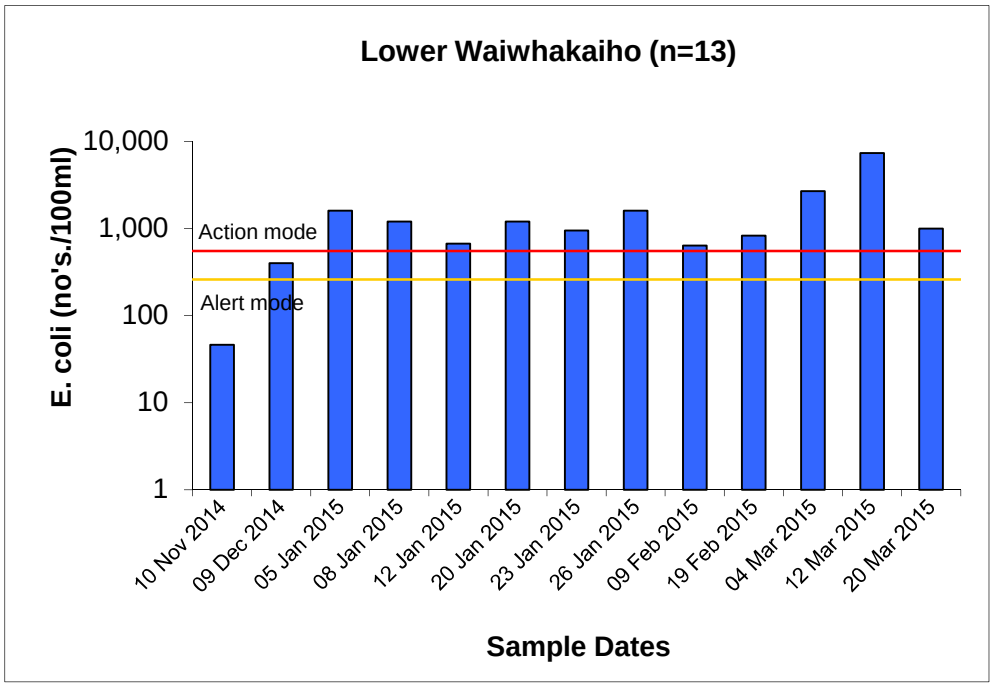


Figure 10 *E. coli* counts in the Waiwhakaiho River during the 2014-2015 survey season

Table 20 Statistical results summary for the Waiwhakaiho River site

Parameter	Conductivity @ 20°C (mS/m)	*E. coli* (cfu/100ml)	Enterococci (cfu/100ml)	Faecal coliforms (cfu/100ml)	Temperature (°C)
Number of samples	13	13	13	13	13
Minimum	10.4	46	500	69	13.5
Maximum	16.1	7400	7500	8000	23.8
Median	14.1	1000	1100	1100	20

Minima, maxima and medians for all faecal indicator bacteria were very high, indicating poor water quality at this site. Faecal source tracking results indicate that gulls are the main source of contamination (Photograph 4). Faecal contamination at this site can affect nearby coastal sites surrounding the river mouth- in particular the 500 m SW site.

Photograph 4 Gulls upstream of the Waiwhakaiho River site

1.8.2 Compliance with guidelines

Compliance with the 2003 guidelines for freshwater contact usage is summarised in Table 21. *E. coli* is used as the FIB in relation to recreational guidelines in freshwater.

Table 21 Bacterial guidelines performance at Waiwhakaiho River

Parameter	Number of exceedances of *E. coli* guidelines [% of 13 samples]	
	ALERT Single sample >260/100ml	ACTION Single samples >550/100 ml
E. coli	1 [8]	11 [85]

Samples exceeded the 'Alert' level once and exceeded the 'Action' level on 11 out of 13 sampling occasions (8% and 85%, respectively). This indicates very poor water quality in the Waiwhakaiho River at this site.

1.8.3 Comparison with previous summer surveys

Previous summer data for the Waiwhakaiho River are presented in Table 22 and Figure 11.

Table 22 Summary *E. coli* data (cfu/100 ml) for summer surveys at the Waiwhakaiho River site

Summer	96-97	98-99	00-01	02-03	04-05	06-07	08-09	10-11	12-13	14-15
Minimum	9	52	26	54	46	71	160	220	230	46
Maximum	740	510	870	470	1000	1600	2600	3400	5000	7400
Median	72	120	110	210	270	320	490	800	1100	1000

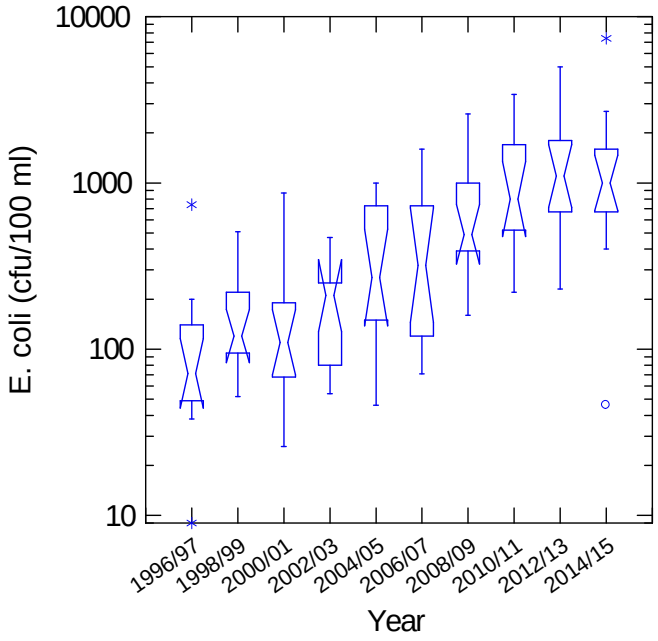


Figure 11 Box and whisker plots of *E. coli* in the Waiwhakaiho River

The maximum *E. coli* count was the highest recorded to date at this site (Table 22). The median *E. coli* count was comparable to that of the last survey, and the minimum was among the lowest recorded counts. These results indicate water quality in the lower reaches of the Waiwhakaiho River remains poor, compared with previous results (Figure 11).

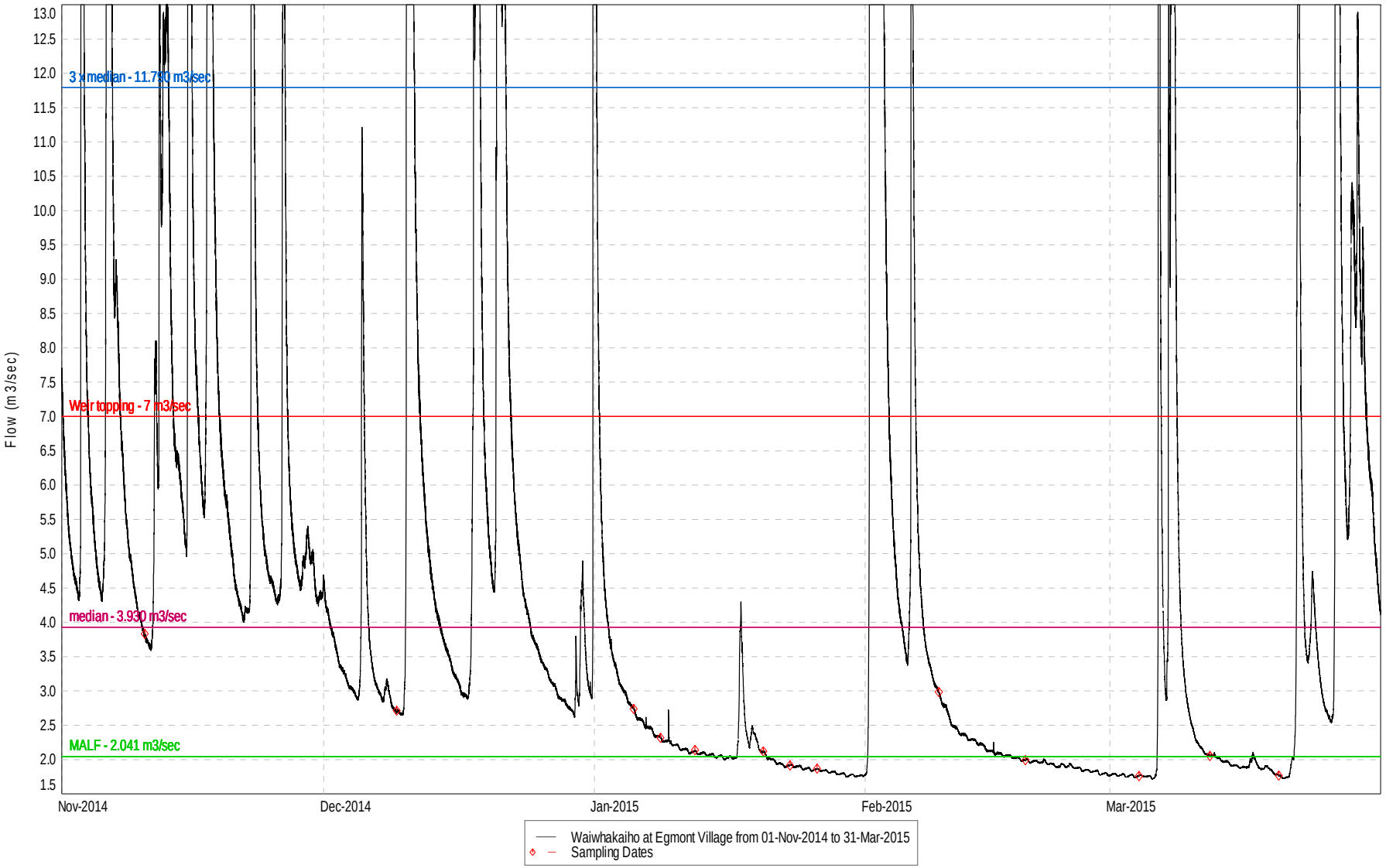


Figure 12 Hydrograph showing flow in the Waiwhakaiho River over the survey period

Summary

During the 2014-2015 summer season bacteriological water quality was generally good at the Fitzroy Beach, Mangati and 300 m NE sites, but it was comparatively worse at the 500 m SW site and poor at the Waiwhakaiho River site. However, considerable improvement from the previous survey was shown at the 500 m SW site (67% of samples obtained surveillance mode compared with 16% in the 2012-13 survey) (Table 23). Mangati and Fitzroy Beach sites remained in surveillance mode all summer season. Of the 12 samples at each site, the 300 m NE and 500 m SW sites obtained 'Alert' mode on one and four occasions, respectively. The Waiwhakaiho River site had 11 out of 13 samples within 'Action' mode.

Table 23 Summary enterococci results for the NPWWTP sites

Site	Enterococci (cfu/100ml)			MfE Guideline Modes (2003)		
	No. samples	Median	Maximum	Surveillance	Alert	Action
Mangati	13	<1	60	13	0	0
300m NE	12	24.5	350	11	1	0
500m SW	12	78.5	1200	8	4	0
Fitzroy Beach	13	3	11	13	0	0
Waiwhakaiho River	13	1000	7400	1	1	11

* *Guideline limits for Waiwhakaiho River based on E. coli counts*

In general, enterococci counts have been higher at the 500 m SW site relative to the other coastal sites since monitoring began in 1996 (Figure 13a, 13b). Although this year's survey still returned high enterococci counts, water quality at this site showed a notable improvement from that of the preceding surveys (Figure 7, 13a). Gulls are believed to be the main source of faecal contamination at this site, with bird faeces entering the site from both the Waiwhakaiho River and the Waiwhakaiho Reef (Photographs 3 and 4). High numbers of gulls have been observed and results from faecal source tracking support these observations.

If the wastewater discharge from the outfall was having a greater influence on water quality, higher faecal indicator bacteria counts would be expected at the 300 m NE site given the north easterly prevailing flow. Such a pattern did not occur.

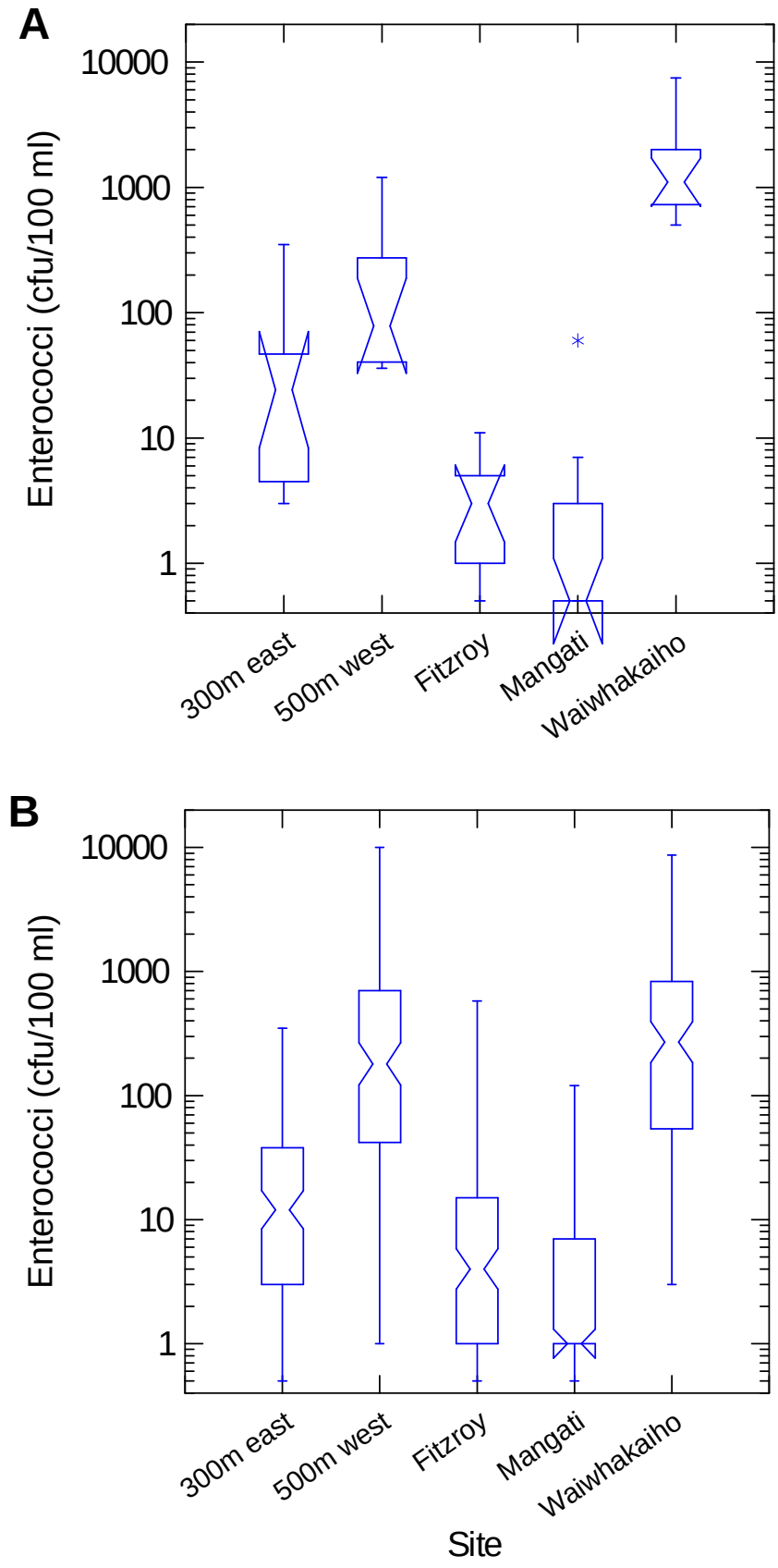


Figure 13 Box and whisker plots comparing **A**. enterococci data at all sites for the 2014-2015 period and **B**. enterococci data collected at all sites from 1996-2015

Recommendations

As a result of the 2014-2015 summer marine contact recreation bacteriological survey it is recommended that:

1. THAT the 2016-2017 summer survey be performed at five sites continuing with the existing sampling protocol.
2. THAT follow-up sampling be performed as deemed necessary by TRC staff.
3. THAT reporting of results be performed as appropriate during the season, and in an Annual Report upon completion of the season's programme.