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Waitara Waste Water Treatment Plant and Marine Outfall
Monitoring Programme
Annual Report
2014-2015

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Executive summary

The New Plymouth District Council (NPDC) manages the Waitara Marine Outfall which, up until the end of 2014, discharged wastewater from the Waitara municipal sewage reticulation system to approximately 1,250 m offshore from the mouth of the Waitara River into the Tasman Sea. During this reporting period major work has been undertaken to convert the Waitara Waste Water Treatment Plant (WWWTP) to a pump station. The Waitara Pump Station was commissioned on 15 October 2014 at which point pumping of Waitara municipal sewage to the New Plymouth Watewater Treatment Plant (NPWWTP) commenced, and treatment and discharge of municipal sewage to the Tasman Sea via the Waitara Marine Outfall ceased. This report for the period January 2014 to June 2015 describes effluent processed in relation to the WWWTP. This is the combined final report for activities relating to the WWWTP. Methanex continues to use the Waitara Marine Outfall for industrial wastewater discharge. Results from monitoring of the Methanex discharge have been reported separately.

NPDC holds four resource consents, which include 61 conditions setting out the requirements that the consent holders must satisfy. Three consents allow for the discharge of effluent into the Tasman Sea and one consent deals with the structure which conveys the effluent (this consent is now jointly held with Methanex Motunui Limited). The performance of the Methanex Waitara Valley and Motunui plants in relation to their consents is discussed in a separate report (14-112).

During the monitoring period, NPDC demonstrated an overall high level of environmental performance and compliance with the resource consents.

The Council's monitoring programme for the year and a half under review included one water sample collected for physicochemical analysis, one marine ecological survey conducted at five sites, and 52 water samples collected for bacteriological analysis. In addition, during the conversion works, 12 samples were collected for faecal indicator bacteria analysis. Following the diversion of municipal wastewater from Waitara to New Plymouth, green-lipped mussels from three reef sites were analysed for norovirus.

The monitoring showed that activities at the WWWTP complied with consent limits on daily discharge rate and various parameters in the discharge.

Marine ecology survey results showed no detectable impact of the Waitara Marine Outfall discharge on the local intertidal community over the last twenty years in terms of species diversity. Both control and potential impact sites showed interannual variability and there were no obvious declining trends in potential impact sites relative to control sites.

Bacteriological water quality at the four coastal sites was generally good during the sampling period, with occasional higher counts (>100 cfu/100 ml) of faecal indicator bacteria recorded. Of the 52 samples collected during the summer period, 94% of the samples were below the MfE 'Alert' level of 140 cfu/100 ml. There was no evidence of failure in the disinfection at the WWWTP on the few occasions when higher faecal indicator bacteria counts were obtained.

Additional monitoring of faecal indicator bacteria during the conversion works indicated that any influence of the outfall discharge on coastal water quality would have been minimal. Only one of eight samples entered Alert mode (180 enterococci cfu/100 ml) with results indicating that the Waitara River was more likely to have been the source of faecal contamination.

Norovirus was not detected in the mussels taken from three reef sites (Orapa, Airedale and Oakura) post diversion of Waitara sewage to New Plymouth.

There was one unauthorised incident relating to equipment failure during the monitoring period. NPDC responded immediately to this and actioned the necessary repair.

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.

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1. Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is for the period January 2014 to June 2015 by the Taranaki Regional Council (the Council) on the monitoring programme associated with resource consents held by New Plymouth District Council (NPDC), Methanex Motunui Limited, and Methanex Waitara Valley Limited (Methanex). The Waitara Marine Outfall was previously managed by Waitara Outfall Management Board (WOMB) to oversee the refurbishment and maintenance of the outfall, which was made up of NPDC, Methanex and Anzco Foods Waitara Limited. In 2010 NPDC took over sole management of the outfall, and has a contract with Methanex to allow the continued use of the outfall for their discharge. In July 2009, Anzco Foods Waitara Limited ceased being part of WOMB, and instead discharges to the sewer under a trade waste agreement with NPDC.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the consents held by NPDC and Methanex that relate to discharges from the Waitara Waste Water Treatment Plant (WWWTP) and to the associated outfall structure.

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 covers the results and findings of the monitoring programme implemented by the Council in respect of the consents held by NPDC and Methanex that relate to discharges from the Waitara Waste Water Treatment Plant (WWWTP) and to the associated outfall structure. This is the twentieth Annual Report to be prepared by the Council to cover the WWWTP water discharges and their effects. Results from monitoring specific to the Methanex discharge have been addressed in a separate report (see TRC, 2014).

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 though 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 in the WWWTP outfall catchment.

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

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

Section 4 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 *Resource Management Act 1991* (RMA) primarily addresses environmental 'effects' which are defined as positive or adverse, temporary or permanent, past, present or future, or cumulative. Effects may arise in relation to:

(a) the neighbourhood or the wider community around 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 (eg, recreational, cultural, or aesthetic);
(e) risks to the neighbourhood or environment.

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

1.1.4 Evaluation of environmental and administrative performance

Besides discussing the various details of the performance and extent of compliance by the consent holder 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 Company's approach to demonstrating consent compliance in site operations and management including the timely provision of information to Council (such as contingency plans and water take data) in accordance with consent conditions.

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

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

Environmental Performance

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

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

  For example:

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

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

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

Administrative compliance

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

- **Good** Perhaps some administrative requirements of the resource consents were not met at a particular time, however this was addressed without repeated

interventions from the Council staff. Alternatively adequate reason was provided for matters such as the no or late provision of information, interpretation of 'best practical option' for avoiding potential effects, etc.

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

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

For reference, in the 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.

1.2 Process description

The Waitara Marine Outfall discharges into the Waitara embayment approximately 1,250 m offshore from the mouth of the Waitara River in approximately 10 m of water. This outfall provided for the disposal of wastewater from the Waitara municipal sewage reticulation system, ANZCO Foods Waitara Limited (currently a trade customer to the WWWTP and now not discharging directly to the outfall) and the Methanex Waitara Valley and Motunui methanol plants (excluding sewage from the Waitara Valley plant).

During 1991, WOMB undertook a refurbishment of the outfall to provide a 25 year life period and to improve the initial dilution. This process involved an impervious plastic liner inserted through the pipeline, improvement of the stability of the pipeline on the seabed, and installation of a new diffuser.

In 1991 and 1992 NPDC and AFFCO (a meat-works company which used the outfall until 1997) constructed a wastewater treatment plant for the combined domestic and meat-works effluent which had previously been discharged through the outfall with minimal treatment. Up until July 2014, the treatment comprised of screening wastewater to 0.5 mm particle diameter, followed by disinfection through the elevation of pH with lime to pH 11 and holding for a minimum of four hours. Treated wastewater was then discharged through the outfall in batches at a constant rate, the frequency depending on influent flow rates.

As of October 2014, municipal sewage from the Waitara township has been pumped to the New Plymouth Wastewater Treatment Plant (NPWWTP) for treatment. The work involved a stepwise process, first requiring the conversion of the WWWTP to a pump station prior to pumping Waitara municipal sewage to the NPWWTP. The physical conversion work commenced on 24 July 2014. Consent 7862-1 was exercised with effluent screened to 0.5 mm (as previous), and treated with sodium hypochlorite (rather than lime). The Waitara pump station was commissioned on 15 October 2014 at which point pumping of sewage to the NPWWTP commenced and treated discharge

of municipal sewage to the Tasman Sea via the Waitara Marine Outfall ceased. Since the new pump station has been commissioned the only time municipal sewage will be discharged through the Waitara Marine Outfall will be during extreme high flow events under consent 7861-1.

Methanex continues to discharge industrial wastewater out of the Waitara Marine Outfall. The Methanex wastewater enters the outfall system downstream of the pump station.

1.3 Resource consents

1.3.1 Water discharge permit

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 held water discharge permit **3397-1** to discharge up to 7,258 m^3/day of treated municipal wastes generated in the Waitara township, excluding meat-works wastes, and 51 L/s of stormwater via a marine outfall pipeline into the Tasman Sea. This permit was issued by the Council on 11 October 1989 under Section 87(c) of the RMA. It expired on 12 March 2008.

Renewal of consent **3397-2** was completed on 15 November 2011 and commenced on 13 December 2011. This consent was issued by the Council under Section 87(c) of the RMA and allows NPDC to discharge up to 11,950 m^3/day of treated wastewater from the WWWTP into the Tasman Sea via the Waitara Marine Outfall. This consent was surrendered on 6 August 2015.

There are 16 special conditions attached to the consent relating to effluent quality and standards, monitoring and reporting requirements, overflow contingency plan, inflow and infiltration, transfer pipeline construction, trade waste agreements, signage, complaints, community liaison, virus monitoring and a review.

Methanex Waitara Valley held water discharge permit **3399-1** to discharge up to 5,000 m^3/day of treated wastes including process and water treatment wastes and domestic sewage and contaminated stormwater from a methanol plant at Waitara into the Tasman Sea via a marine outfall pipeline. This permit was first issued by the Council on 11 October 1989 under Section 87(e) of the RMA and expired on 28 May 2008. Consent **3399-2**, to discharge treated wastewater and stormwater from the Waitara Valley methanol plant into the Tasman Sea via the Waitara Marine Outfall, was granted on 29 April 2008. There are 20 conditions attached to the consent relating to the outfall, effluent volume, dilution and composition, contingency plans and annual reports, and review of conditions. Sewage at the Waitara Valley plant is now treated and dispersed to land (on-site). Conditions of this consent were varied on 29 July 2013 to allow for the use of biocide in the cooling water treatment programme.

Methanex Motunui Limited hold consent **3400-2**, to discharge treated wastewater and stormwater from the Motunui methanol plant into the Tasman Sea via the Waitara Marine Outfall. This consent was granted on 29 April 2008.

The consent was varied on 18 July 2012 following problems that year with maintaining levels of the bacterium *Legionella* at safe numbers. The variation included a new condition to allow the maximum daily limit of the water treatment chemical 'Spectrus CT1300' to be increased to 40kg/day if a spike in the numbers of the bacteria *Legionella* is detected.

There are 22 conditions attached to the consent relating to effluent volume, dilution and composition, contingency plans and annual reports, and review of conditions.

Copies of these permits are attached to this report in Appendix I.

1.3.2 Coastal permit

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 a national environmental standard.

NPDC and Methanex, as joint consent holders, renewed coastal permit **4599-2** to erect, place and maintain a structure (the Waitara Marine Outfall) and to occupy the associated space in the coastal marine area. This permit was issued by the Council on 14 September 2007 under Section 87(c) of the RMA. It is due to expire on 1 June 2021.

There are three special conditions attached to the consent, these deal with maintenance of the structure and review of the consent.

The permit is attached to this report in Appendix I.

1.4 Monitoring programme

1.4.1 Introduction

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

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

The monitoring programme for the WWWTP site consisted of four primary components.

1.4.2 Programme liaison and management

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

- ongoing liaison with resource consent holders over consent conditions and their interpretation and application;
- in discussion over monitoring requirements;
- preparation for any reviews;
- renewals;

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

1.4.3 Chemical sampling

NPDC monitored both the incoming wastewater and the treated wastewater discharged from the WWWTP, for both chemical and microbiological parameters, and analyses for various parameters at both weekly and monthly intervals.

The Council undertook sampling of the composite influent and effluent on one occasion in order to check compliance with consent conditions.

1.4.4 Marine ecological surveys

Marine ecological surveys were performed at five sites – three potential impact sites and two control sites.

1.4.5 Bacteriological sampling

Thirteen samples were collected from five sites during the bathing season (November 2013 to April 2014) and analysed for enterococci, *E. coli*, faecal coliforms and conductivity.

2. Results

2.1 WWWTP monitoring

2.1.1 Results of abstraction and discharge monitoring

Note: Data in this section relates to 1 January – 30 June 2014. NPDC discontinued routine sampling during conversion of the WWWTP pump station and commissioning of the new pipeline to NPWWTP (see Section 2.4).

NPDC monitored both the incoming wastewater to the WWWTP and the effluent from the WWWTP. The incoming wastewater volume, and the discharged effluent flow rate and pH were recorded continuously. Incoming wastewater composition was monitored by analysis of 24-hour flow proportional composite samples taken monthly. Effluent composition was monitored by analysis of grab samples taken weekly from the line to the pH probe, in addition to the automated measurements. Grab samples were deemed to be representative of the discharge owing to the mixing and detention within the WWWTP.

NPDC sent the Council a monthly report, which comprised the following;

- Maximum flow rate and volumes of discharged effluent;
- Maximum and minimum pH;
- Daily values for total incoming wastewater volume;
- Weekly effluent chemical and microbiological analysis results; and
- Monthly incoming wastewater chemical and microbiological analysis.

Routine sampling of influent and effluent was discontinued from July 2014 during the conversion of the WWWTP to a pump station. Results presented below are for 1 January to 30 June 2014 only.

Table 1 summarises the results for the WWWTP incoming wastewater analysis (influent). Table 2 summarises the results for the WWWTP discharge (effluent).

The parameters of the influent that were unaffected by the treatment at the WWWTP are chemical oxygen demand (COD), oil and grease, and ammonia. Hence, analysis of the influent serves to determine compliance of the discharged effluent in terms of these parameters.

Levels of contaminants in the six influent samples taken during the 2014 monitoring period were all well within the consent limits.

Table 1 Monthly influent analysis from January to June 2014

Parameter	Unit	Treatment plant incoming wastewater					Consent limit	Consent exceedances
		N	Minimum	Maximum	Median	Average		
Conductivity	mS/m	6	42.5	259	52.7	86.0	-	
pH	-	6	7.2	7.5	7.5	7.4	-	
Suspended solids	g/m^3	6	132	189	155	160	-	
COD	g/m^3	6	220	293	255	257	800	0
Oil & grease	g/m^3	6	27	44	41	39	200	0
Ammonia	g/m^3	6	13.2	28.0	22.9	21.3	50	0
Copper	g/m^3	6	<0.02	0.04	0.03	0.03	-	

Parameter	Unit	Treatment plant incoming wastewater					Consent limit	Consent exceedances
		N	Minimum	Maximum	Median	Average		
Zinc	g/m^3	6	0.07	0.18	0.12	0.12	-	
Faecal coliforms	cfu/100 mL	6	5,500,000	17,500,000	10,500,000	11,104,000	-	
Enterococci	cfu/100 mL	6	900,000	14,000,000	2,200,000	4,177,000	-	

Table 2 Weekly treated discharge (effluent) results from January to June 2014

Parameter	Unit	Treatment plant effluent					Consent limit	Consent exceedances
		N	Minimum	Maximum	Median	Average		
Discharge volume	m^3/day	181	2,486	7,288	4,128	4,234	11,950	0
Conductivity	mS/m	25	44.2	258	60.9	71.0	-	
pH	-	25	11.0	11.8	11.3	11.3	6.0 – 12	0
Suspended solids	g/m^3	25	130	794	380	409	1,000	0
Faecal coliforms	cfu/100mL	25	5	2,580	45	255	50,000	0

According to the consent limit, the total discharge volume over a 24 hour period should not exceed 11,950 m^3 and the rate of discharge should not exceed 138 L/s. This limit was complied with during the monitoring period (Figure 1).

In the 2014 monitoring period all weekly pH analytical results were within consent limits for effective disinfection (Figure 2). Daily pH analytical results are discussed in section 2.1.2.

Microbiological analysis of the incoming waste and discharged treated waste indicates that the method of disinfection used (elevation of pH using lime) was usually effective for the indicator group faecal coliforms. All of the microbiological results were within consent limits from 1 January to 30 June 2014 (Figure 3).

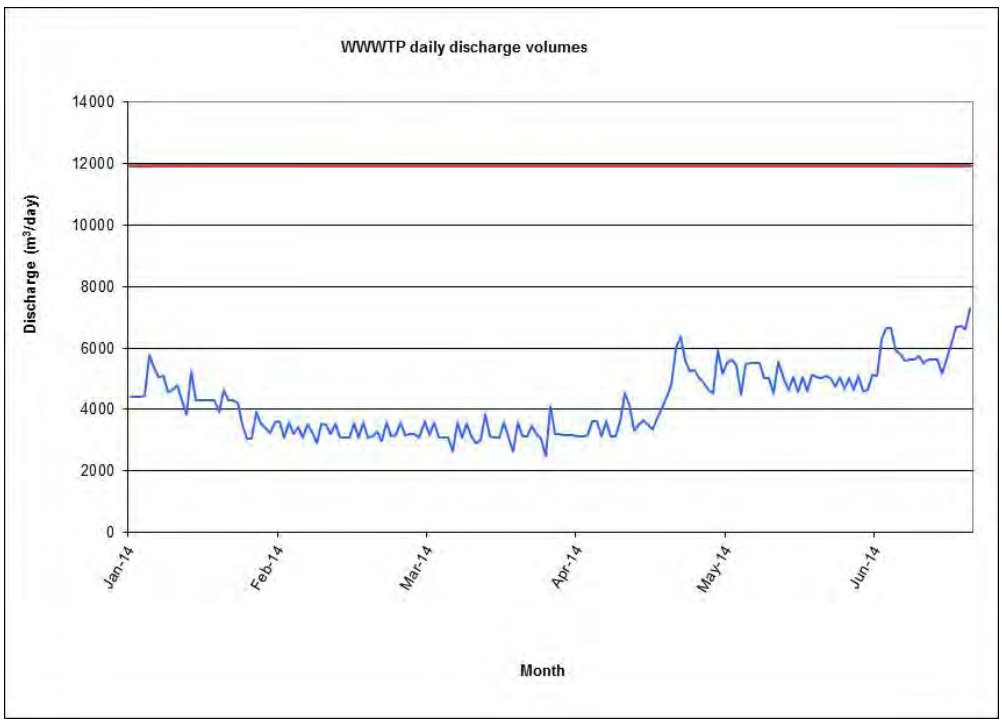


Figure 1 Total discharge volume per day from WWWTP during 2014 (consent limit shown in red)

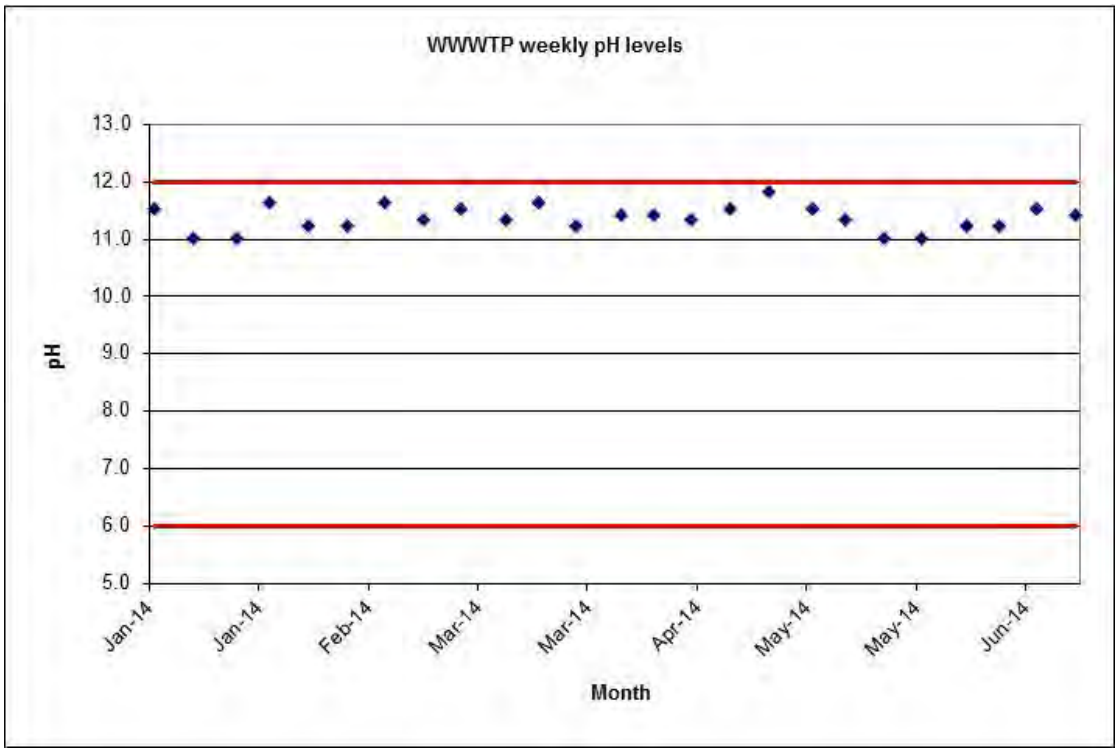


Figure 2 Weekly pH in WWWTP discharge during 2014 (upper and lower consent limits shown in red)

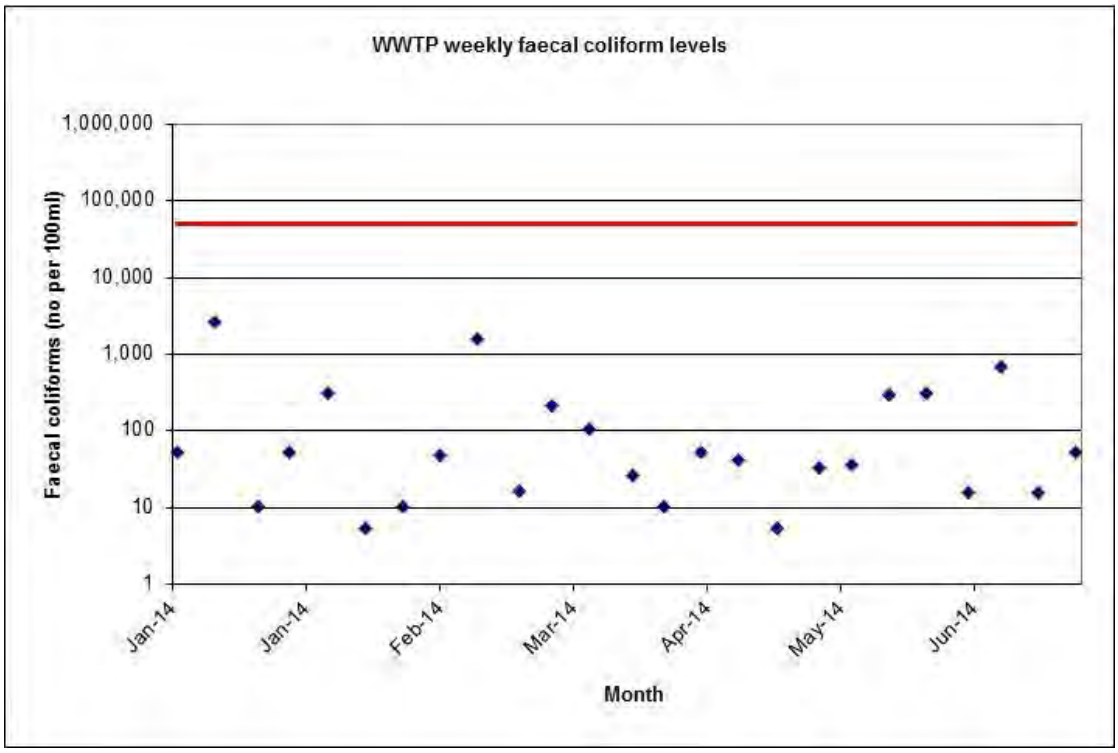


Figure 3 Weekly faecal coliform counts in WWWTP discharge during 2014 (consent limit shown in red)

2.1.2 Process control

Disinfection of bacteria at the WWWTP was achieved by elevation of pH via lime dosing. Consent **3397-2** has a minimum limit of pH 6 and a maximum limit of pH 12

(this is to be maintained in at least 98% of the samples over a 12 month period). However, there is a *process control limit* in place at the plant where the effluent must not be less than pH 10.8. The WWWTP strived to achieve a pH band between 10.8 and 12, with a target of better than 95% within process limits. Table 3 summarises the daily grab sample pH values recorded by the monitoring probe for the WWWTP during 2014.

Table 3 Summary of daily pH values for WWWTP effluent from January to June 2014

Month	% pH >12	% pH = 10.8-12	% pH <10.8
January	0	70	30
February	0	71	29
March	0	66	34
April	2	81	17
May	2	66	32
June	2	94	4
Average %	1	75	24

All daily pH readings were above the consent condition limit of 6.

A very small number of samples (average of 1%) exceeded the upper limit of 12. Condition 3 of consent 3397 was complied with as it requires at least 98% of pH values fall in this range. The high pH discharges were clustered around the time of heavy rainfall, with the inflow and infiltration altering the composition of the sewage and therefore the lime demand.

There was some difficultly maintaining the pH within the process control limit with an average of 24% of samples falling below a pH of 10.8.

2.1.3 Council compliance monitoring check

The Council carried out a compliance monitoring check on 2 July 2014. The results of the compliance monitoring are shown in Table 4.

Table 4 Results of Council WWWTP influent and effluent analysis during 2014

Parameter	Unit	Influent SWG001003	Effluent SWG001004	Effluent Consent limit
Conductivity @20˚C	mS/m	22.9	63.8	
pH	-	7.6	11.6	6 - 12
Alkalinity total	g/m^3	56	476	
Suspended solids	g/m^3	62	1000	1000
COD	g/m^3	90	110	800
BOD	g/m^3	33	-	
Oil & grease	g/m^3	-	-	200
Total grease	g/m^3	9	22	
Floatable grease	g/m^3	-	<5	
Hydrocarbons	g/m^3	-	-	
Ammoniacal nitrogen	g/m^3	3.44	2.18	50

Parameter	Unit	Influent SWG001003	Effluent SWG001004	Effluent Consent limit
Arsenic	g/m^3	<0.001	-	
Copper	g/m^3	0.02	0.03	
Chromium	g/m^3	<0.03	-	
Nickel	g/m^3	<0.02	0.02	
Silver	g/m^3	<0.01	-	
Zinc	g/m^3	0.050	0.203	
Lead	g/m^3	<0.05	-	
Cyanide	g/m^3	<0.02	-	
Cadmium	g/m^3	<0.005	-	
Phenol	g/m^3	<0.02	-	
Faecal coliform	cfu/100mL	3,200,000	140	50,000
Enterococci	cfu/100mL	110,000	26,000	
E. coli	cfu/100mL	2,000,000	140	

- = no analysis undertaken

All parameters tested for complied with consent limits.

2.2 Marine ecology

A marine ecological survey was conducted at five sites between 8 and 23 September 2014. The potential impact sites were Orapa B, approximately 1.5 km south west of the outfall (SEA901043); Orapa A, approximately 1.1 km south west of the outfall (SEA901040); and Airedale Reef, approximately 1.1 km north east of the outfall (SEA901030). The two control sites were Turangi Reef, 7.25 km north east of the outfall (SEA 900095); and Greenwood Road (SEA 903070), approximately 32.5 km south west of the outfall. These monitoring sites are shown in Figure 4 and Figure 5.

At each site a 50 m transect laid parallel to the shore was used to establish five 5 m x 3 m blocks. Within each block, five random 0.25 m^2 quadrats were laid giving a total of 25 random quadrats. For each quadrat the percentage cover of algal and encrusting animal species was estimated using a grid. For all other animal species, individuals larger than 3 mm were counted. Under boulder biota were counted where rocks and cobbles were easily overturned.

Figure 4 Location of potential impact sites relative to the Waitara Marine Outfall

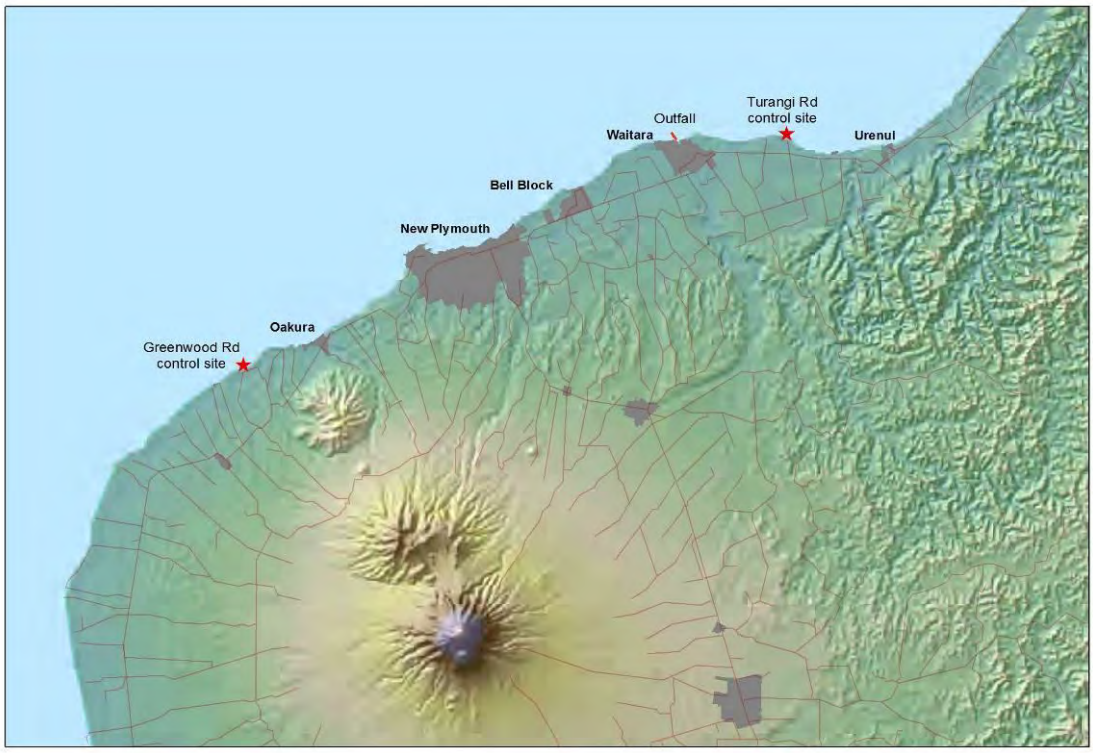


Figure 5 Location of the control sites relative to the Waitara Marine Outfall

2.2.1 Summary statistics

Summary statistics for 2014 including the mean number of species per quadrat and the mean Shannon-Wiener diversity index per quadrat are shown in Table 5. In September 2014, Orapa A and Orapa B (both potential impact) had the highest number

of species, followed by Turangi Reef (control) and Greenwood Road (control). Airedale Reef (potential impact) had the lowest number of species. Orapa A and B also had the highest diversity, with the other three sites all similar.

Summary statistics of spring surveys from 1985 to 2014 are available in Appendix II.

Table 5 September 2014 survey

Site	No. of Quadrats	Mean number of species per quadrat			Mean Shannon Weiner Index per quadrat		
		Algae	Animals	Total Species (Algae & Animals)	Algae	Animals	Total Species (Algae & Animals)
Greenwood Road	25	7.64	6.16	13.80	0.81	0.55	0.88
Orapa B	25	6.20	9.44	15.64	0.68	0.75	0.97
Orapa A	25	4.72	10.76	15.48	0.57	0.80	0.95
Airedale Reef	25	3.44	9.20	12.64	0.47	0.75	0.88
Turangi Reef	25	3.28	10.76	14.04	0.41	0.77	0.87

The Shannon-Weiner diversity index incorporates the abundance of individual species in addition to the number of species present, providing a measure of diversity.

2.2.1.1 Number of species

Figure 6 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 for the different sites do not overlap you would expect to obtain a significantly different result with ANOVA.

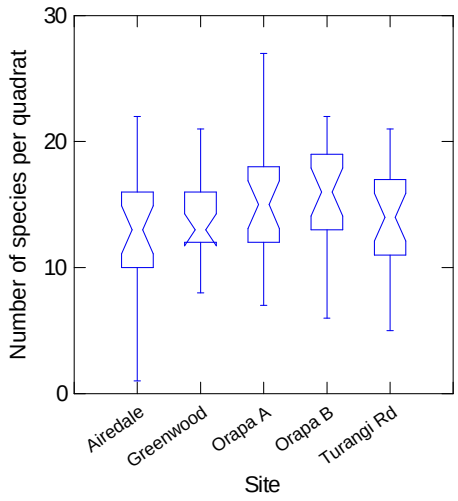


Figure 6 Box and whisker plot of total number of species per quadrat

There was a significant deviation from normal distribution at the Orapa A site (Lilliefors test, n = 25, P <0.05). There was not a significant difference in species number per quadrat between sites (ANOVA, n = 25, F = 1.97, P = 0.103).

2.2.1.2 Shannon-Wiener Diversity Index

Figure 7 shows the Shannon-Wiener index per quadrat at each site as a box and whisker plot.

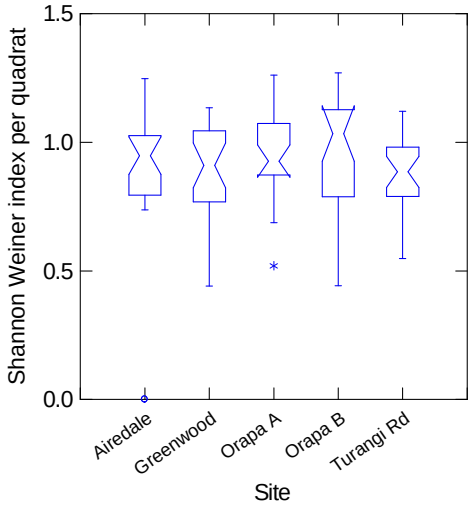


Figure 7 Box and whisker plots of mean Shannon-Wiener index per quadrat

At the 95% confidence level, there was a significant deviation from normal distribution at the Airedale site only (Lilliefors test, n = 25, P = 0.001). There was not a significant difference in the Shannon-Weiner index per quadrat between sites (ANOVA, n = 25, F = 1.81, P 0.323).

2.2.2 Sand cover

High sand cover, in excess of 50%, has previously been recorded at all sites during certain surveys with the exception of Turangi Reef (Figure 8). In order to determine the extent to which sand cover impacts on intertidal communities at the sites studied, Pearson Correlation Coefficients (R values) were calculated using survey data collected between 1994 and 2014 (

Table **6**). Sand cover was found to be strongly negatively correlated with both species number and Shannon-Weiner index at Airedale, Orapa A and Greenwood Road ($P < 0.001$, Table 6, Figure 9). At Orapa B, there was a significant negative correlation of sand cover with species number ($R = -0.44$, $P = 0.044$) but not Shannon-Weiner index ($R = -0.27$, $P = 0.231$). Correlations between sand cover and species diversity indicators were not significant at Turangi Reef ($P > 0.05$, Table 6), potentially linked to the low sand cover typical at this site (Figures 8 and 9).

Table 6 Correlations between species number, Shannon-Weiner index and sand cover

Site	Species number - % sand cover		Shannon-Weiner index - % sand cover	
	R	P	R	P
Greenwood Rd	-0.76	<0.001	-0.78	<0.001
Orapa B	-0.44	0.044	-0.27	0.231
Orapa A	-0.90	<0.001	-0.96	<0.001
Airedale Reef	-0.79	<0.001	-0.86	<0.001
Turangi Reef	0.07	0.760	0.02	0.919
All sites	-0.73	<0.001	-0.77	<0.001

R values vary between 1 and -1 with positive values indicating a positive correlation and negative values indicating a negative correlation.
Yellow = significant correlation at the 95% confidence level (P <0.05)
Blue = correlation not significant at the 95% confidence level (P >0.05)

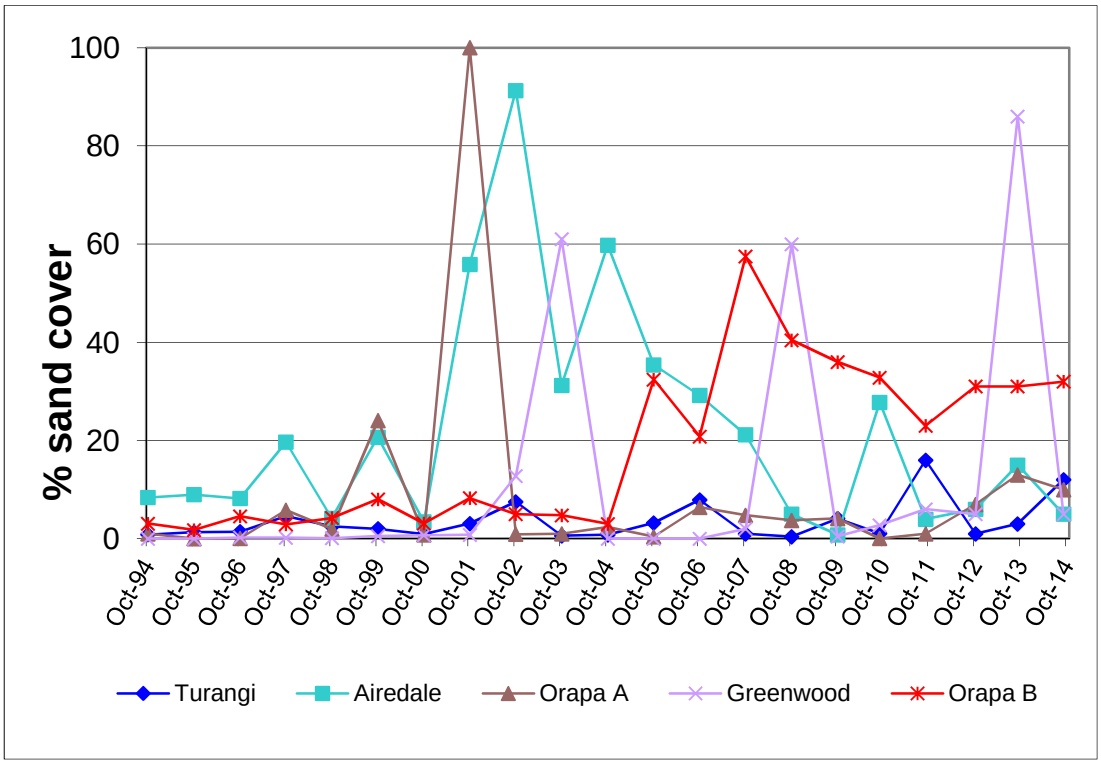
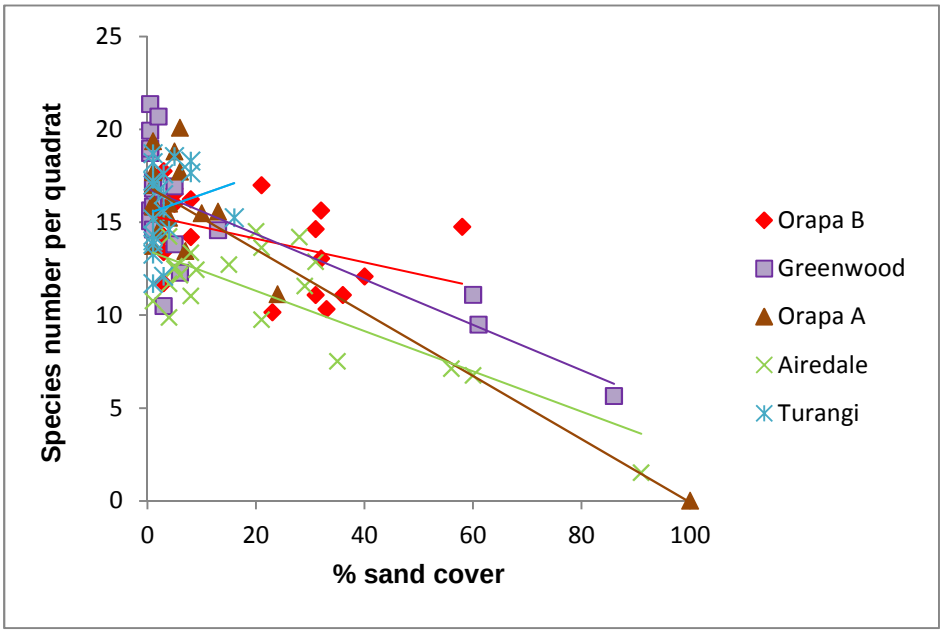


Figure 8 Percentage sand cover at the five reef sites October 1994 to September 2014



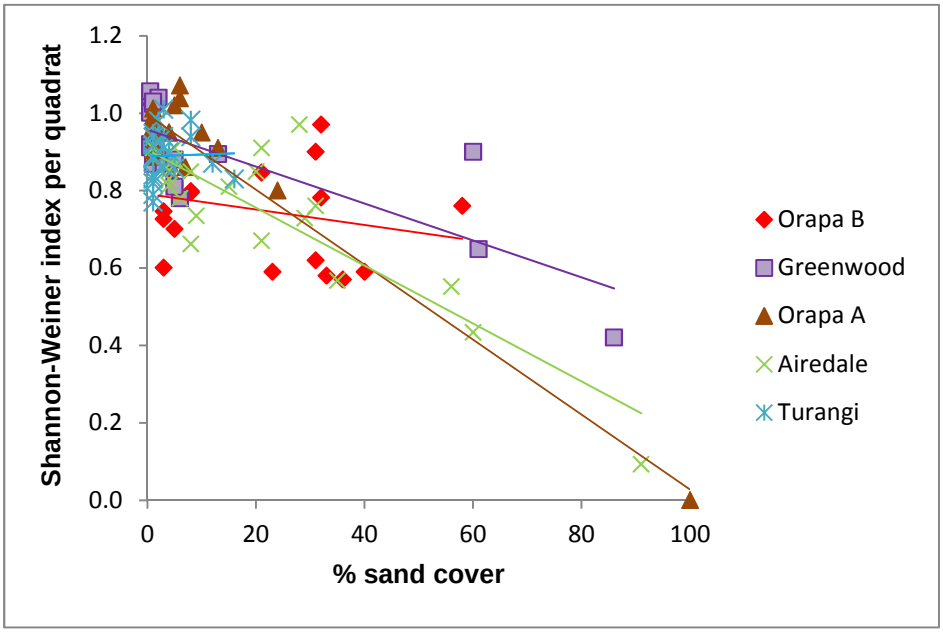


Figure 9 Relationship between species number, Shannon-Weiner index and percentage sand cover between 1994-2014

Table 7 Mean percentage cover of sand per quadrat

Site	% sand cover per quadrat
	2014
Greenwood Rd	5
Orapa B	32
Orapa A	10
Airedale Reef	5
Turangi Reef	12

Sand coverage >30% can significantly impact marine communities

The sites at Greenwood Road, Orapa A, Airedale Reef and Turangi Reef all had relatively low sand levels, which would not have significantly impacted the marine communities at these sites. Sand cover was high at Orapa B, and has been consistently high at this site since 2005 (Figure 8).

2.2.3 Comparison of 2014 results with previous spring surveys

Table 8 provides a comparison of 2014 results with the historic records from intertidal surveys conducted between 1985 and 2013. The average number of species per quadrat and the average Shannon-Weiner index recorded for the 2014 surveys were within the range of results collected during previous (1985-2013) surveys.

Table 8 Summary of spring Waitara Marine Outfall ecological surveys 1985-2013 compared with 2014 results

Site	Parameter (per quadrat)	1985-2013 Mean	1985-2013 Max	1985-2013 Min	2014 Mean
Greenwood Road (No. of surveys = 23)	Number of species	15.59	21.36	5.64	13.80
	SW index	0.92	1.11	0.42	0.88
Orapa B (No. of surveys = 29)	Number of species	15.45	21.04	10.16	15.64
	SW index	0.92	1.11	0.59	0.97
Orapa A (No. of surveys = 29)	Number of species	16.23	21.76	0.00	15.48
	SW index	0.94	1.12	0.00	0.95
Airedale Reef (No. of surveys = 29)	Number of species	12.14	20.68	1.52	12.64
	SW index	0.80	1.13	0.09	0.88
Turangi Reef (No. of surveys = 24)	Number of species	15.89	18.68	11.68	14.04
	SW index	0.91	1.09	0.77	0.87

The survey results obtained at each of the sites between 1985 and 2014 are shown in Figure 10. With the exception of years associated with heavy sand inundation there has been no obvious trend in mean number of species and mean Shannon-Wiener index at Greenwood Road, Orapa A, Airedale Reef and Turangi Reef over the twenty eight year period examined. At Orapa B, a general decline in both mean number of species and

mean Shannon-Weiner index occurred between 2006 and 2011. Since 2011 species diversity has recovered at this site (Figure 10b).

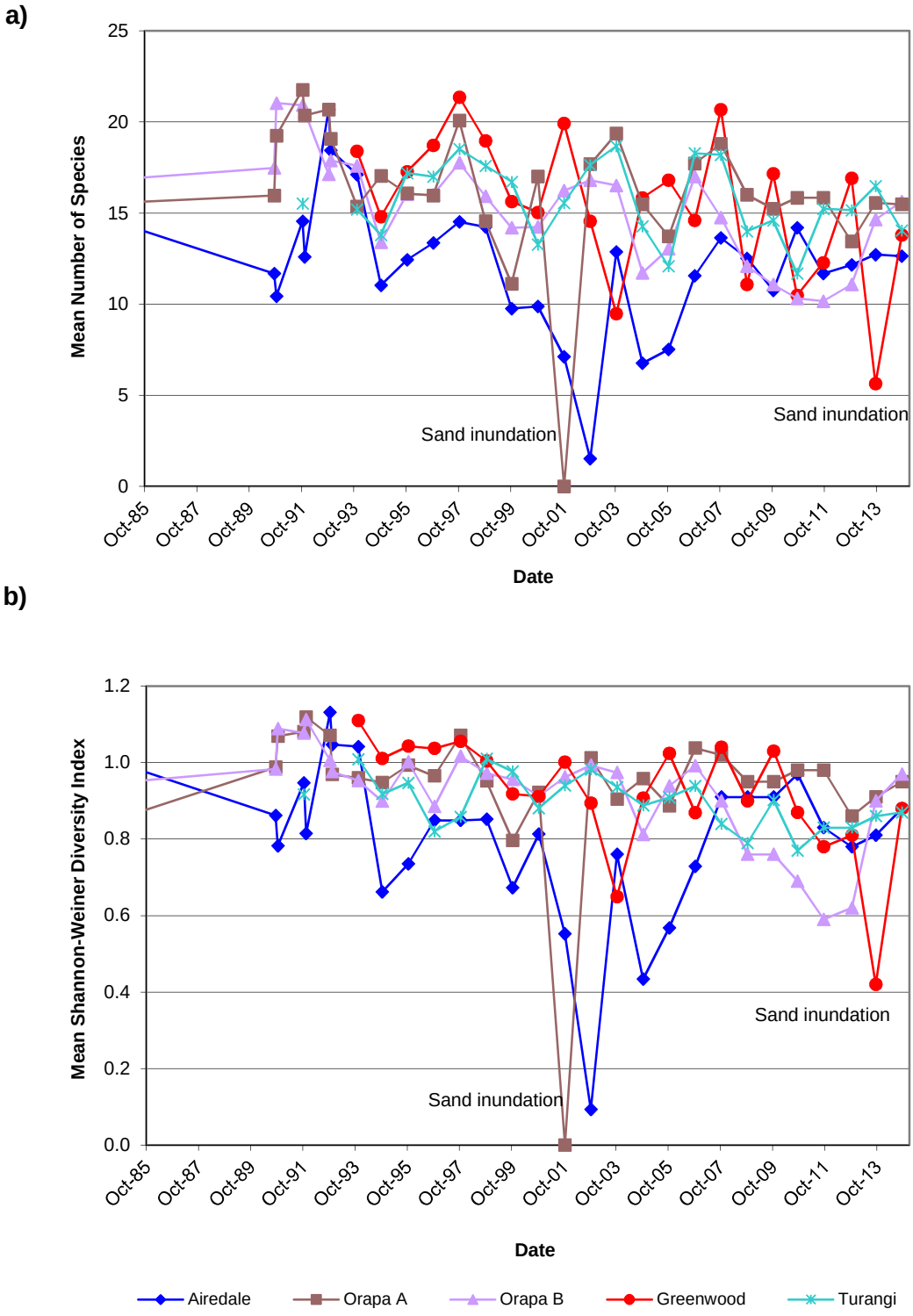


Figure 10 Comparison over time of a) mean number of species per quadrat and b) mean Shannon-Wiener diversity index per quadrat - spring 1985-2014

2.3 Bacteriological monitoring

A minimum of twelve samples were collected from each of the five sites (Table 11, Figure 11), undertaken according to documented Council procedures. Samples were collected from each of the sites during the bathing season (November to April) when hydrological flow conditions of the Waitara River allowed, within two hours of high tide, and no less than three days after river fresh conditions. Samples were collected between 0900 and 1800 (NZDT), in line with the Ministry for the Environment (MfE) guidelines (refer to section 2.3.1).

Samples were analysed for enterococci, *E. coli*, faecal coliforms and conductivity. At each site, the following was recorded: time, water temperature, weather condition, wind condition, surf condition, colour/appearance of the water and number of bathers/other users.

Although the sites monitored within the Waitara embayment are not popular summer bathing beaches, the bacteriological results were assessed in relation to suitability for contact recreation guidelines. The use of the beaches, particularly for surfing and windsurfing, is noted.

Table 9 Waitara bacteriological monitoring sites

Location	Description	Site number
Airedale Reef	Shoreline 1,000 m east of Waitara River mouth	SEA901030
East Beach	Shoreline 200 m east of Waitara River mouth	SEA901033
West Beach	Shoreline 200 m west of Waitara River mouth	SEA901037
Tuaranga Reef	Shoreline 2,000 m west of Waitara River mouth	SEA901052
Bertrand Road	Waitara River at Bertrand Road bridge	WTR000800

2.3.1 Guidelines for Recreational Water Quality 2003

Guidelines for microbiological water quality of marine recreational areas have been prepared by the Ministry for the Environment in conjunction with the Ministry of Health (MfE, 2003). The guidelines use a combination of a qualitative risk grading of the catchment, together with direct measurements of appropriate faecal indicators to assess the suitability of a site for recreation.

In addition, 'Alert' and 'Action' guideline levels are used for surveillance throughout the bathing season. These guideline levels are summarised in Table 10 and are based on keeping illness risk associated with recreational water use to less than approximately 2%. Levels are based on enterococci counts as these bacteria are the preferred indicators for marine waters. In coastal waters, faecal coliforms and *E. coli* are not as well correlated with health risks, but can be used as indicators of faecal contamination, in addition to enterococci, where enterococci levels alone may be misleading.

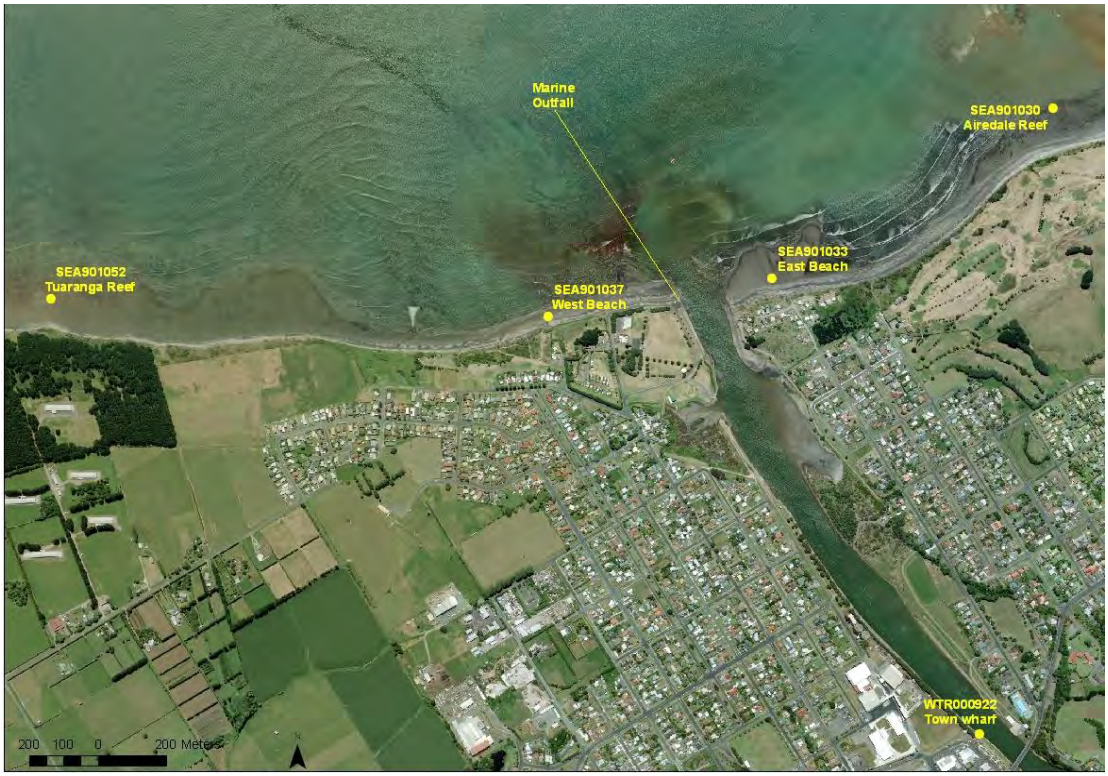


Figure 11 Waitara bacteriological monitoring sites

Photo 1 Waitara East Beach

Table 10 Recreational water quality guidelines 2003

	Mode		
	Surveillance	Alert	Action
Enterococci (cfu/100 ml)	No single sample >140	Single sample >140	Two consecutive single samples >280
Procedure	• Continue routine monitoring	• Increase sample to daily • Undertake sanitary survey • Identify sources of contamination • Consult CAC to assist in identifying possible source	• Increase sample to daily • Undertake sanitary survey • Identify sources of contamination • Consult CAC to assist in identifying possible source • Erect warning signs • Inform the public through the media that a public health problem exists

CAC = Catchment Assessment Checklist

2.3.2 Summer 2013-2014 monitoring

Samples were collected on 13 occasions between 5 November 2013 and 3 April 2014.

Summary statistics for the 2013-2014 summer period are shown in Table 11. The raw data for this period are presented in Appendix III.

The hydrograph presented in Figure 17 shows the flow rate in the Waitara River during the sampling period. Sampling dates have been superimposed to indicate the level of discharge from the Waitara River during each sampling run.

Table 11 Summary statistics for the 2013-2014 summer sampling period

Site	Parameter	Units	Minimum	Maximum	Median
Airedale Reef	Conductivity	mS/m	4280	4740	4540
	E. coli	cfu/100 ml	<1	120	3
	Enterococci	cfu/100 ml	<1	28	5
	Faecal coliforms	cfu/100 ml	<1	120	3
	Temperature	˚C	16.7	20.9	17.9
Waitara East Beach	Conductivity	mS/m	2840	4730	4570
	E. coli	cfu/100 ml	<1	430	3
	Enterococci	cfu/100 ml	<1	220	7
	Faecal coliforms	cfu/100 ml	<1	430	3
	Temperature	˚C	16.1	21.6	17.8
Waitara West Beach	Conductivity	mS/m	3960	4740	4660
	E. coli	cfu/100 ml	<1	100	6
	Enterococci	cfu/100 ml	<1	110	8
	Faecal coliforms	cfu/100 ml	<1	100	6
	Temperature	˚C	16.6	21.1	19.8
Tuaranga Reef	Conductivity	mS/m	3810	4750	4690
	E. coli	cfu/100 ml	<1	52	<1
	Enterococci	cfu/100 ml	<1	490	3
	Faecal coliforms	cfu/100 ml	<1	54	<1
	Temperature	˚C	16.5	23.8	17.6
Waitara River at Bertrand Road	Conductivity	mS/m	7.8	12.4	10.4
	E. coli	cfu/100 ml	9	320	44
	Enterococci	cfu/100 ml	3	81	20
	Faecal coliforms	cfu/100 ml	9	320	44
	Temperature	˚C	15.1	23.4	19.3

The 2013-2014 faecal coliform, *E.coli* and enterococci counts at each site are shown in Figures 12 to 16. Conductivity is also provided to indicate the extent of the freshwater influence at each site (the lower the conductivity, the greater the freshwater component – the conductivity of seawater at 20°C without freshwater influence is approximately 4,750 mS/m).

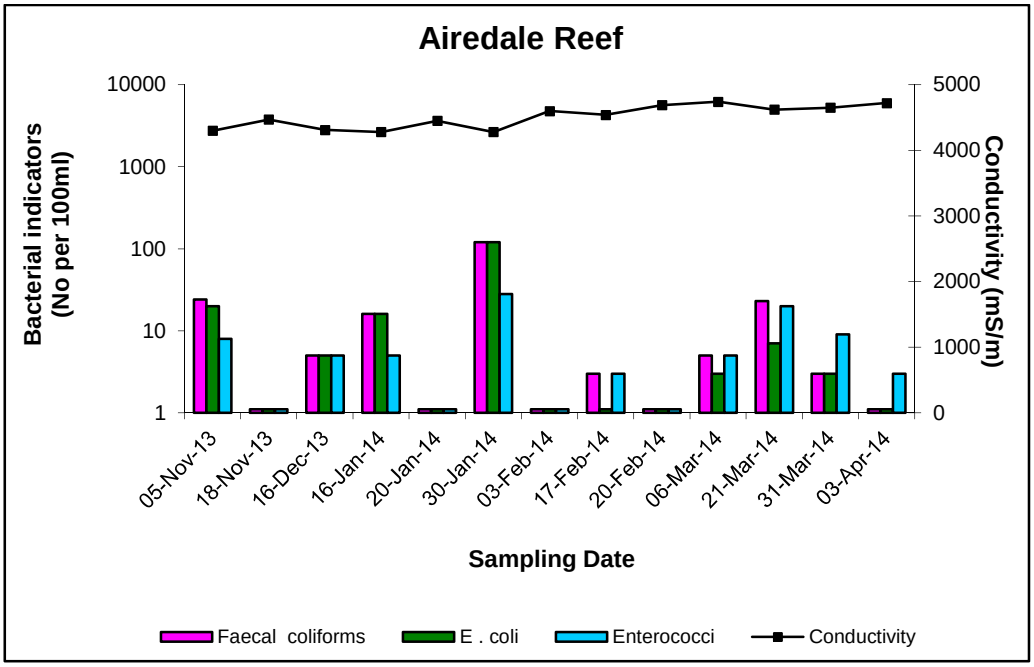


Figure 12 Bacteriological results at Airedale Reef

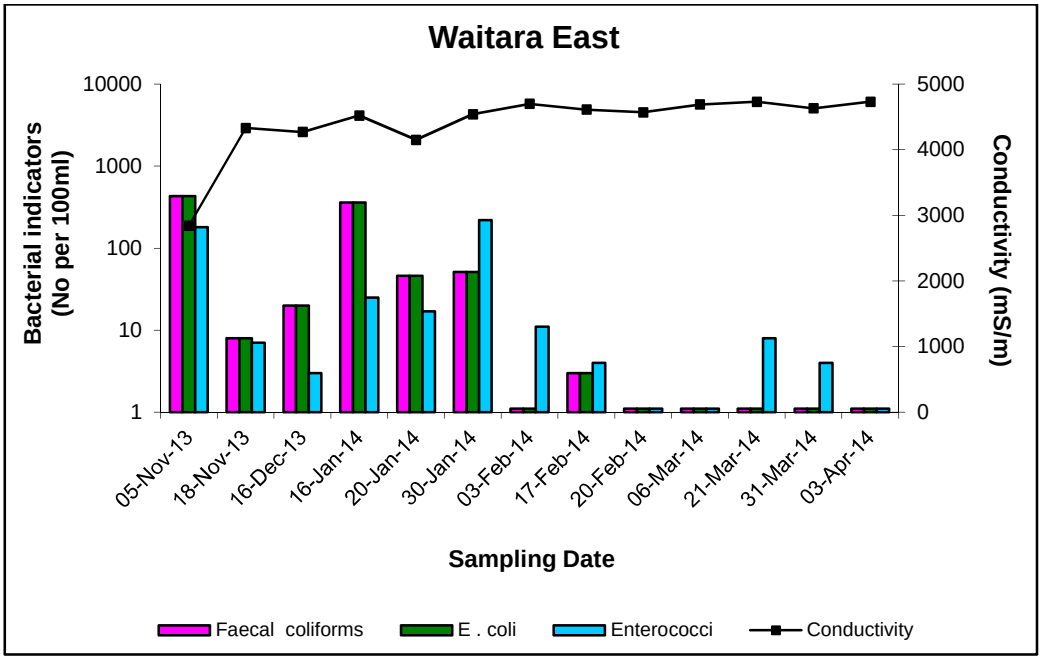


Figure 13 Bacteriological results at Waitara East Beach

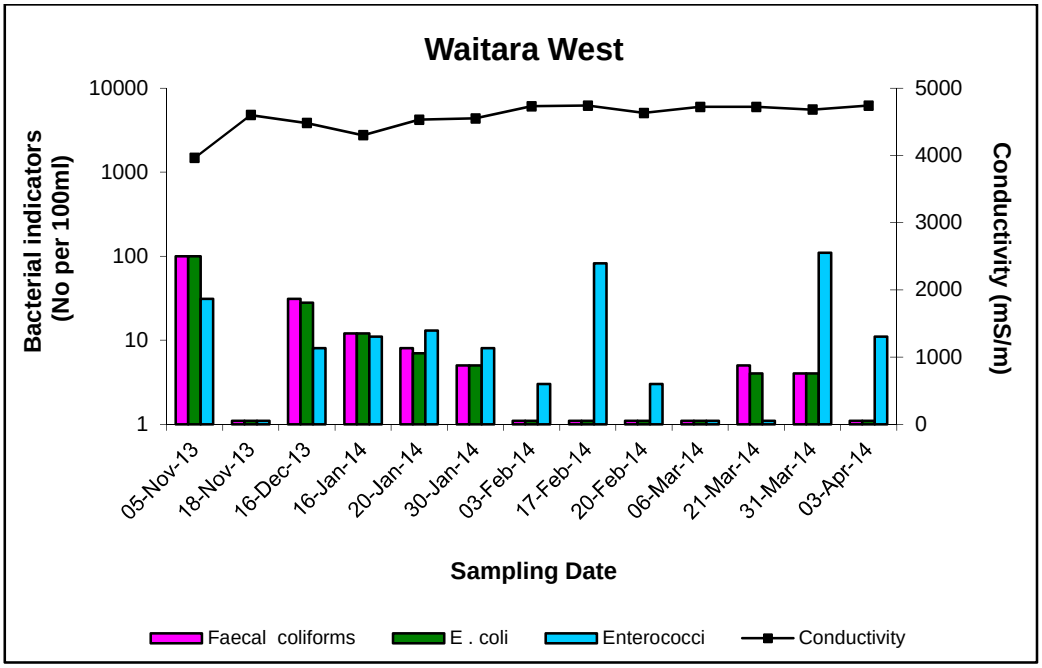


Figure 14 Bacteriological results at Waitara West Beach

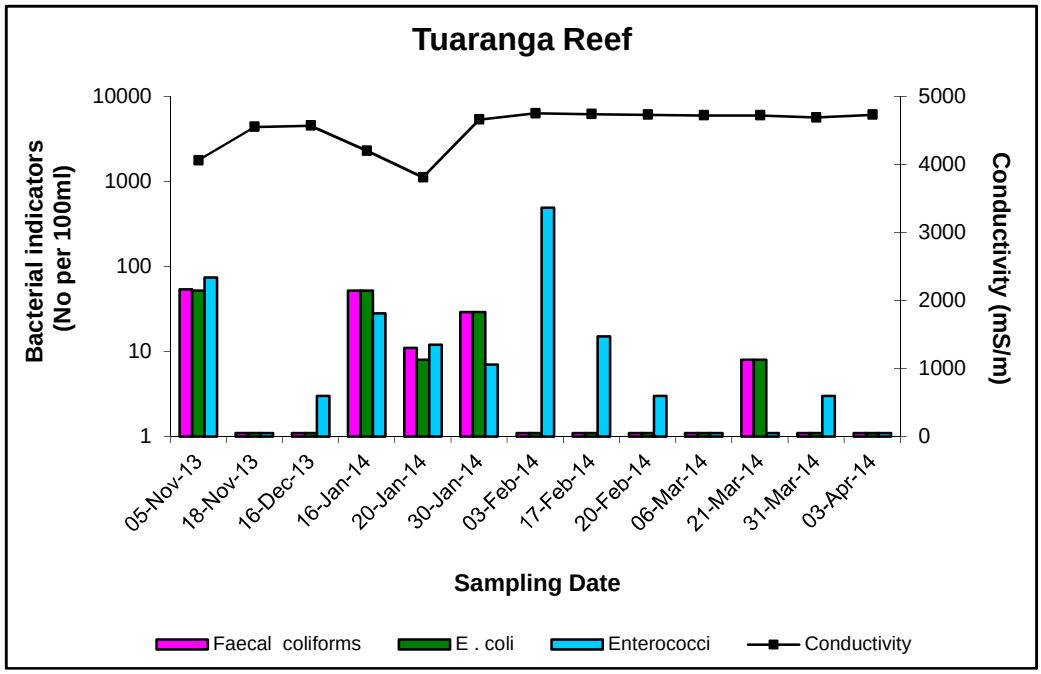


Figure 15 Bacteriological results at Tuaranga Reef

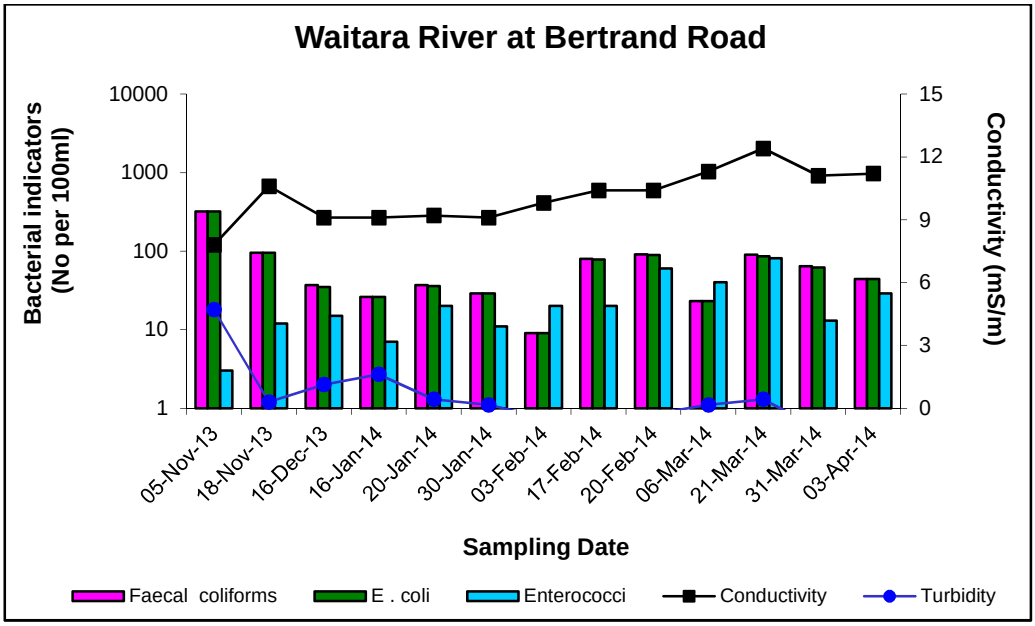


Figure 16 Bacteriological results at Bertrand Road, Waitara River

The Airdale, Waitara West and Tuaranga Reef sites (Figures 12, 14 and 15) had occasional higher counts (>100 cfu/100 ml) of faecal indicator bacteria, these higher counts did not correlate with lowered conductivity/freshwater influence. Levels of bacteria were moderate to high in samples collected from Waitara East Beach until the end of January 2014, after which they were very low (Figure 13), associated with a prolonged dry period (Figure 17). Although counts at the Waitara River, Bertrand Road site only exceeded 100 cfu/100 ml on one occasion (after a fresh), all three bacterial indicators were present at relatively consistent levels in all samples collected (Figure 16).

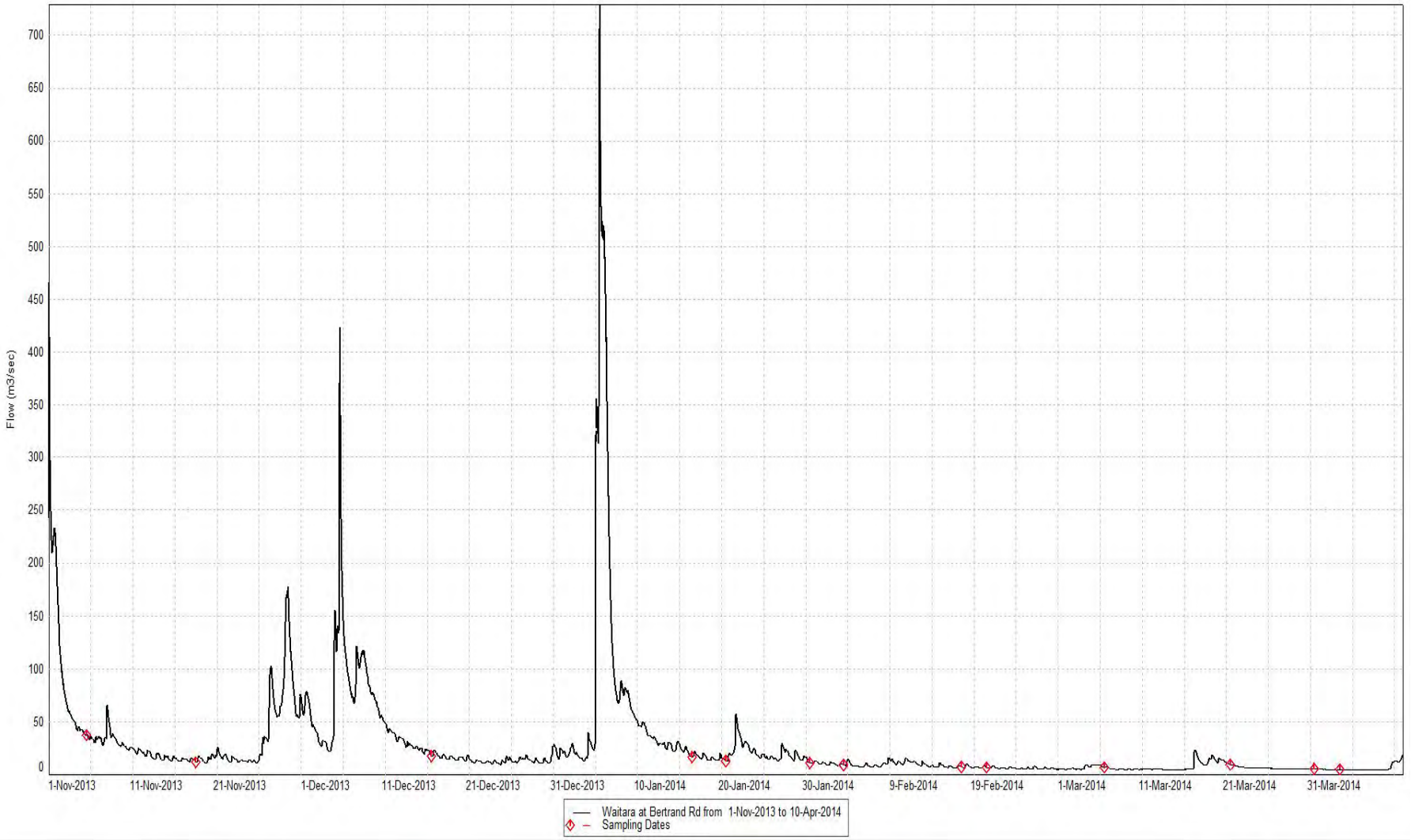


Figure 17 Waitara River flow at Bertrand Road (1 November 2013 – 10 April 2014)

2.3.3 Influence of Waitara River on shoreline bacteriological results

Linear regression analysis was used to assess the influence of the Waitara River on shoreline bacteriological counts. Regression analysis was performed on the 'rate faecal indicator bacteria were discharged from the Waitara River at the Bertrand Road site' (river flow x faecal indicator bacteria count) against the 'faecal indicator bacteria counts at the shoreline sites'. Both parameters were log_{10} transformed because bacteriological data are generally not normally distributed.

Table 12 provides the coefficient of determination (r^2) values for each regression analysis performed. This value indicates the strength of the linear relationship between the two values (i.e. an r^2 value close to 1 implies a strong relationship).

Table 12 R^2 values for linear regression analyses of 'faecal indicator bacteria rate of discharge from the Waitara River' against 'coastal faecal indicator bacteria counts' for 2013-2014 summer

FIB rate of discharge from Waitara River log_{10} (flow rate x bacterial count)	Coastal Site log_{10}(FIB count)			
	Airedale Reef	East Beach	West Beach	Tuaranga Reef
Faecal coliforms	0.1008	0.3137	0.0010	0.0064
E. coli	0.0859	0.3187	0.4266	0.2276
Enterococci	0.0072	0.1149	0.4380	0.0183

Note: R^2 values are expressed as % values below, e.g. 0.3402 = 34%

In previous monitoring reports, the results from bacteriological monitoring conducted between 1990 and 1995 were pooled to perform a regression analysis. These analyses demonstrated that the Waitara River had a major influence on faecal indicator bacteria at all of the coastal sites sampled during periods of high flow. As a result, the sampling programme was revised in the 1996-1997 monitoring period to exclude wet weather conditions and high river flows in the Waitara River.

The regression analyses performed using the summer 2013-2014 data indicated that under dry weather conditions, the influence of the Waitara River bacterial discharge on the Waitara embayment bacterial counts was generally low. Out of the four coastal sites, the influence from the Waitara River was most evident at the East and West Beach sites (Table 12), the two sites closest to the river mouth, however this was not evident for all three groups of bacteria. The weakest overall influence occurred at Airedale Reef (between <1 – 10%), the site to the east of the Waitara River mouth. In general, the results indicate that although bacterial discharge from the Waitara River accounted for some of the variability in bacterial counts at the coastal sites (between 0.1- 44%), there were other factors influencing faecal contamination, particularly at the sites further away from the river mouth. In order to assess the level of this contamination, it is useful to interpret faecal indicator counts in relation to existing water quality guidelines (MfE 2003).

2.3.4 Comparison with 2003 MfE water quality guidelines

Bacteriological results from the Waitara embayment, collected during the 2013-2014 monitoring period, were assessed for compliance with the 2003 MfE microbiological water quality guidelines (Figures 18 to 21).

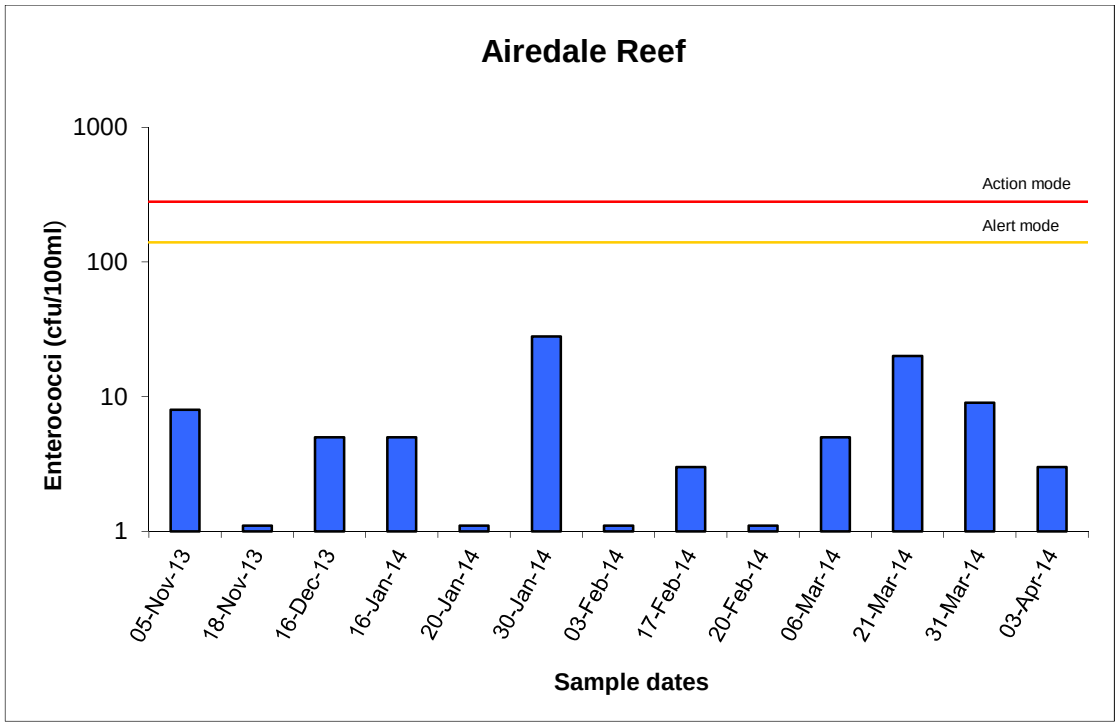


Figure 18 Enterococci counts at Airedale Reef

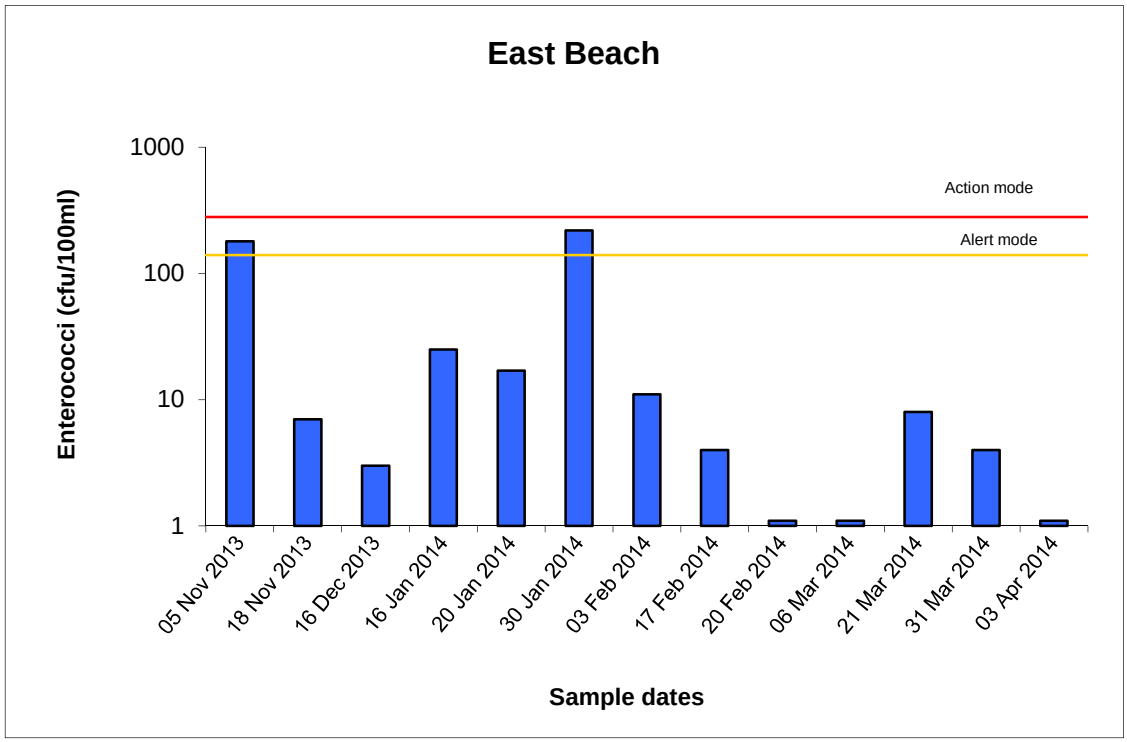


Figure 19 Enterococci counts at Waitara East Beach

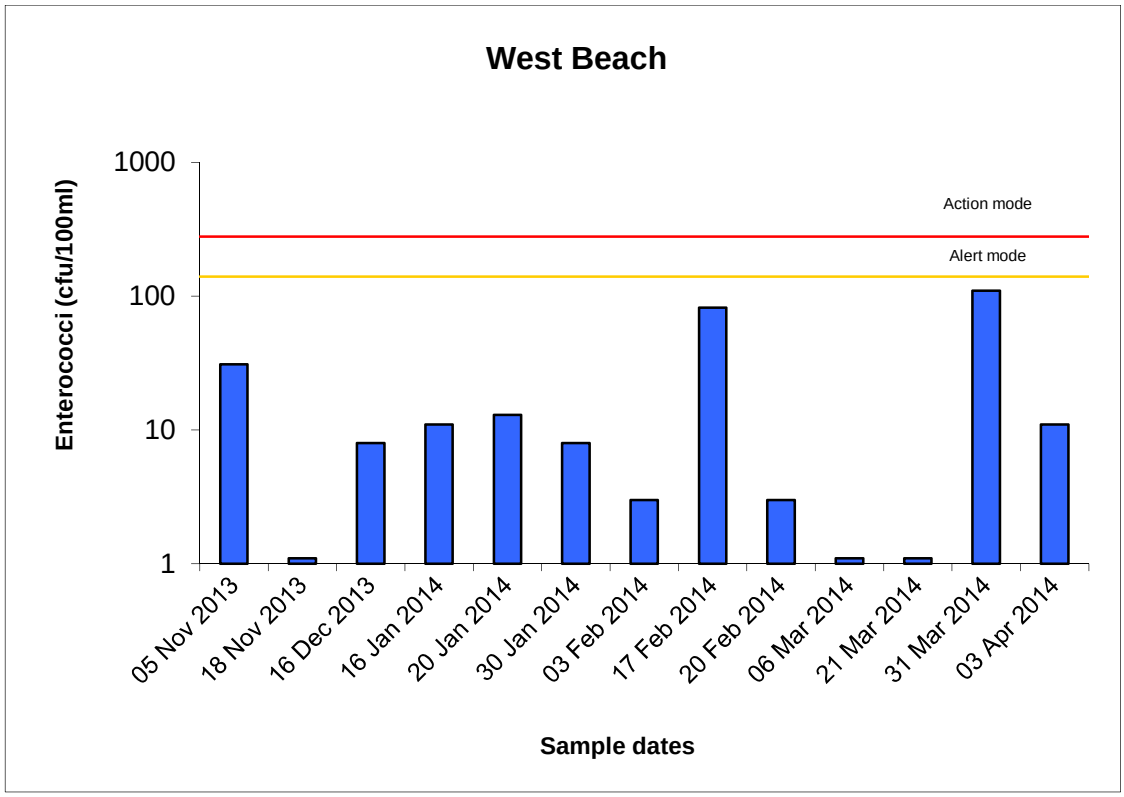


Figure 20 Enterococci counts at Waitara West Beach

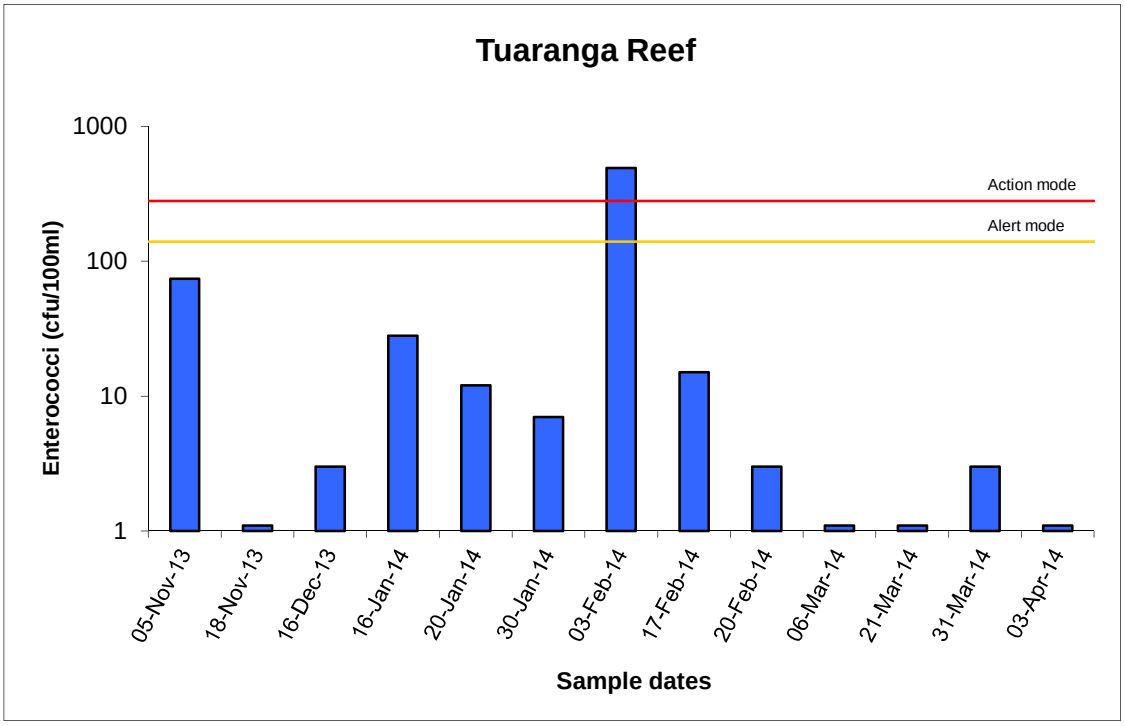


Figure 21 Enterococci counts at Tuaranga Reef

Enterococci counts at Airedale Reef and West Beach remained below the guideline levels throughout the 2013-2014 season (Figures 18 and 20).
At East Beach, although enterococci counts were generally low throughout the season (Figure 19); 'Alert' mode was reached on 5 November 2013 (180 cfu/100ml) and 30

January 2014 (220 cfu/100ml). Conductivity results were very low at the time of sampling on 5 November, with high rainfall and river flows over the previous few days indicating freshwater influence (Figure 17). The results on 30 January were unexplained as there was negligible rainfall prior to sampling.

At Tuaranga Reef, 'Alert' mode was reached on 3 February (490 cfu/100ml, Figure 21); again this result was unexplained and did not coincide with any elevated Waitara River flows during the days preceding (Figure 17). *Note: Although above 280 cfu/100ml, this was not 'Action' mode as it was a single sample not two consecutive samples (Table 10).*

2.3.5 Comparison of 2013-2014 results with previous summer surveys

Seasonal median faecal indicator bacteria counts from 1990-1991 to 2013-2014 are presented in Figures 22 to 24. It must be noted that the sampling methodology has changed significantly during the 21 year period, as the result of changes in national standards and guidelines for microbiological water quality, and to reduce the confounding effect of the Waitara River on shoreline water quality monitoring.

Prior to the 1996-1997 summer season, the sampling methodology involved taking sets of five samples over a period of not more than 30 days, irrespective of weather conditions or tide. This was to enable direct comparison with 30-day median values for faecal coliforms, as required under the previous Water and Soil Conservation Act (1967) SB standard, of which a large database had been compiled.

It was found that the resultant seasonal median bacterial counts were influenced largely by the Waitara River during periods of high river flow, and that these events masked any effects of the outfall on faecal indicator bacteria counts. There were elevated shoreline coliform counts in summer 1991-1992 (Figure 22), when partially treated municipal wastewater was diverted to the river while the marine outfall was refurbished.

In 1996-1997, the sampling programme was revised to bring it into line with the regional state of the environment monitoring (SEM) programme for marine bathing beaches, which had commenced the previous year. Wet weather conditions and high river flows were excluded by not sampling within two days of river freshes. This period has been extended to three days since 1998-1999.

Since 1996-1997, the median values of faecal coliforms, *E coli*, and enterococci have been relatively low, with two exceptions. In 1999-2000, enterococci and coliform counts at the Airedale Reef site and enterococci at East Beach site were elevated in comparison to previous results. Additional sampling was undertaken at three sites in the lower river throughout the following summer in an effort to establish the cause, but the high counts did not reoccur. A similar event happened in February/March 2009, when elevated enterococci and coliform counts were returned for West Beach – the event did not reoccur in 2010.

The 2013-2014 median bacterial results were low at the four coastal and Waitara River sites.

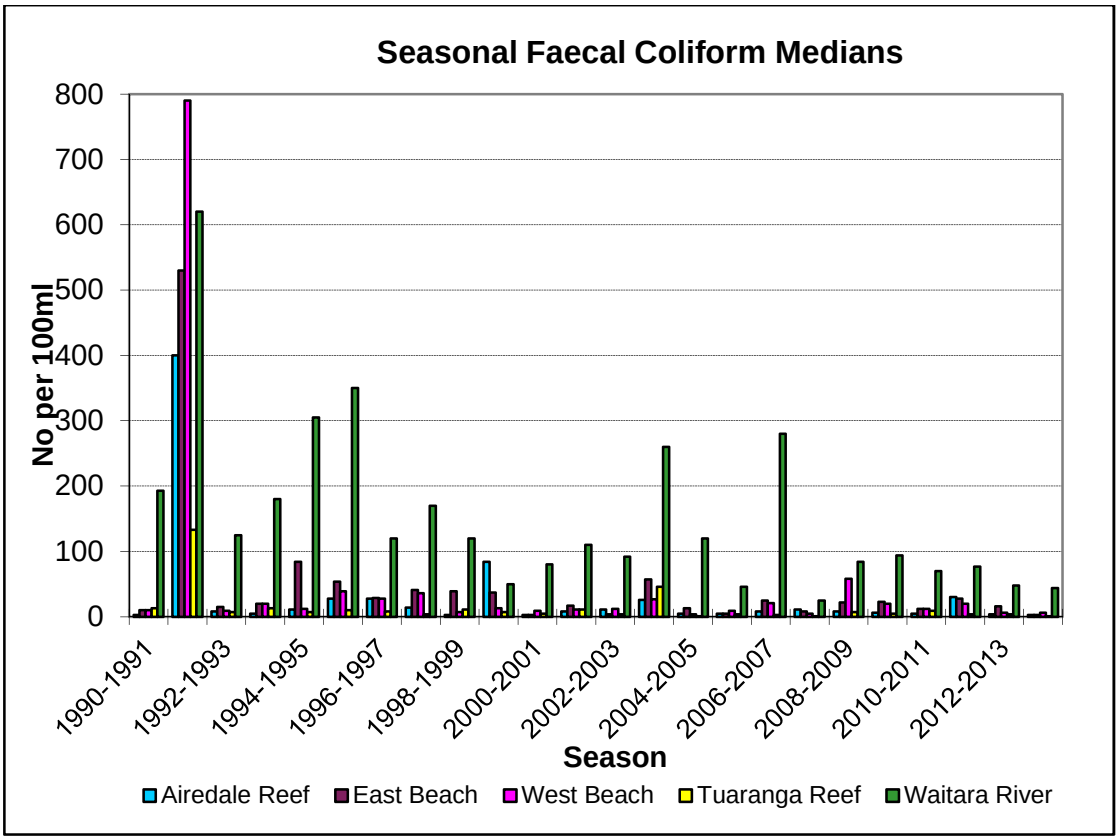


Figure 22 Seasonal median faecal coliform counts within the Waitara embayment and the Waitara River (Bertrand Road site)

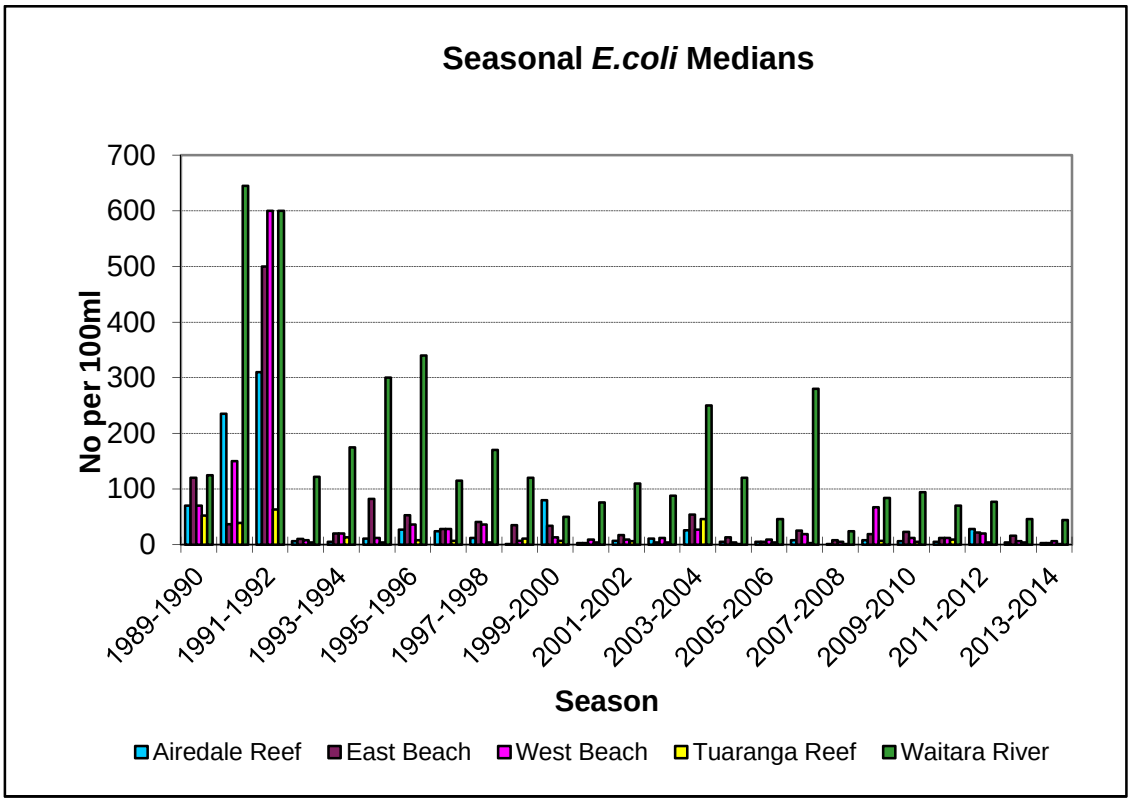


Figure 23 Seasonal median *E. coli* counts within the Waitara embayment and Waitara River (Bertrand Road site)

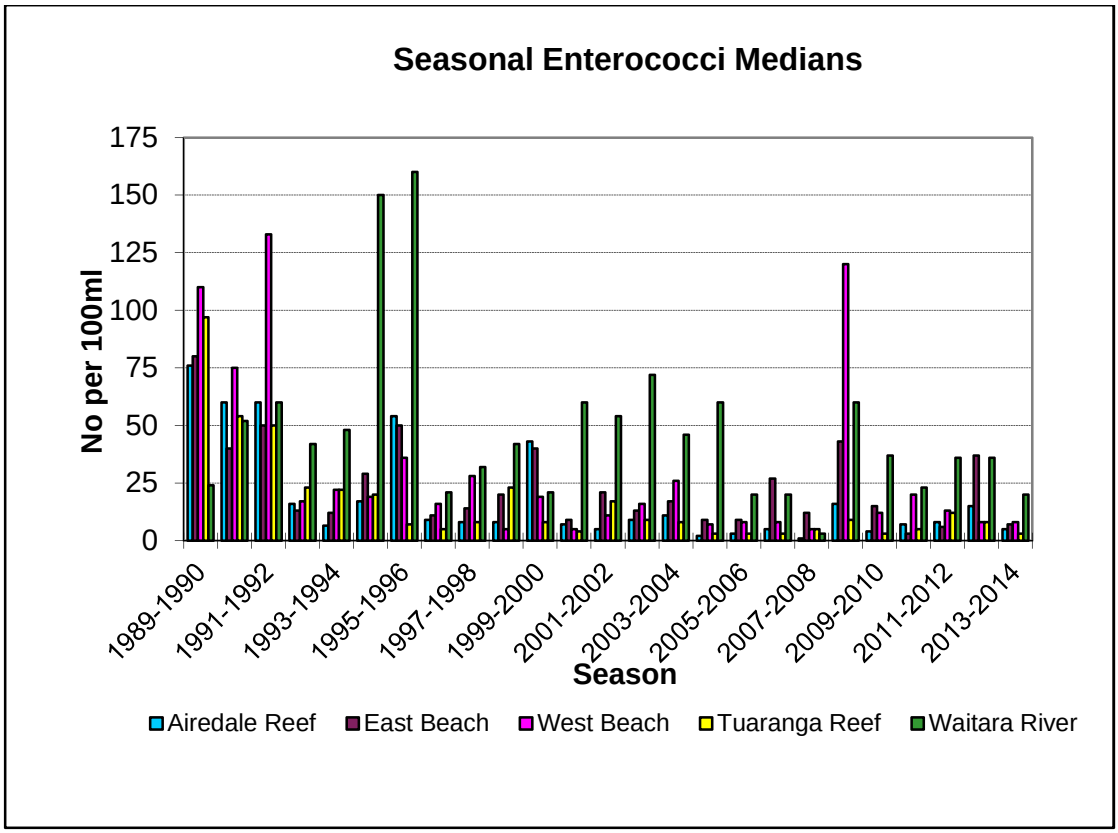


Figure 24 Seasonal median enterococci counts within the Waitara embayment and the Waitara River (Bertrand Road site)

2.4 Additional monitoring post July 2014

2.4.1 Receiving environment faecal indicator bacteria: WWTP-pump station conversion

In order for municipal wastewater to be pumped from Waitara to New Plymouth, the WWWTP first needed to be converted to a pump station. The physical conversion work commenced on 24 July 2014 and was completed by 15 October 2014 when the pump station was commission. Over the period of the conversion works consent 7862-1 was exercised with effluent screened to 0.5 mm (as previous) and treated with Sodium Hypochlorite (rather than lime).

In accordance with special condition 5 consent 7862-1 additional monitoring was undertaken by NPDC and the Council during the conversion period, which included sampling for faecal indicator bacteria in the receiving coastal environment (Waitara East Beach SEA901033 and Waitara West Beach SEA901037, Figure 11), in the discharge from the outfall and other potential sources of faceal contamination (Waitara River Town Wharf WTR000922). Shoreline samples were taken on four occasions during the WWTP to pump station conversion.

Raw faecal indicator bacteria and physicochemical data for the Waitara coastal and river sites are presented in Appendix IV.

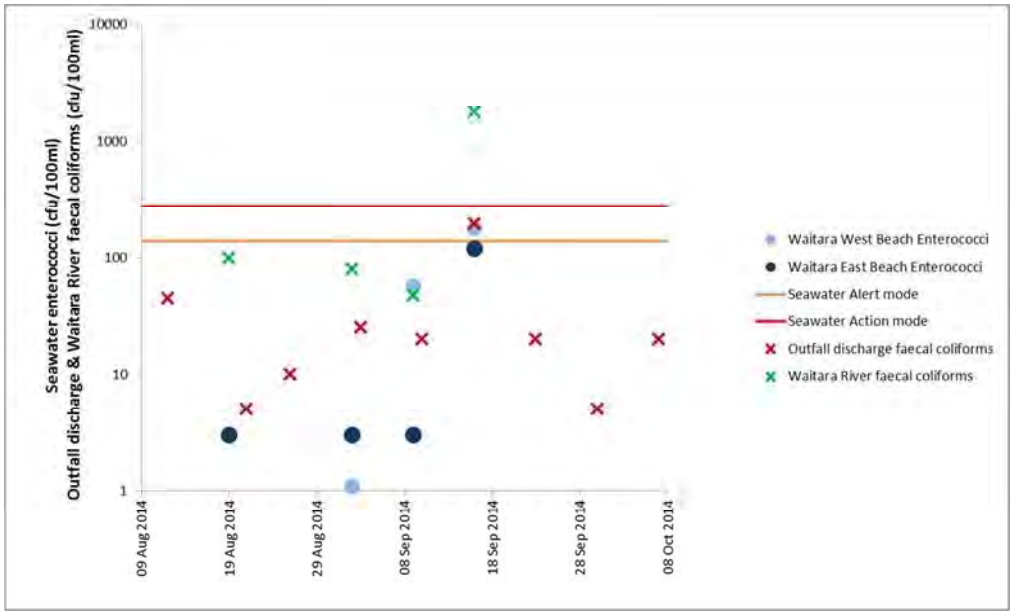


Figure 25 Faecal Indicator Bacteria concentrations in the outfall discharge and the receiving environment during the conversion period

With the exception of one sample, all seawater samples were below the MfE guideline Alert level i.e. <140 enterococci cfu/100 ml (Figure 25). The sample taken from Waitara West Beach on 16 September 2014 had an enterococci count of 180 cfu/100 ml which falls within the Alert mode. Faecal coliform counts from the Waitara River Town Wharf (1,800 cfu/100 ml) and the outfall discharge (195 cfu/100 ml) on 16 September 2014 indicate that the Waitara River was more likely to have been a source of faecal contamination to coastal waters than the outfall discharge (Figure 25). Low conductivity (3360 mS/m@20^{o}C) of the Waitara West Beach sample on 16 September 2014 also indicates fresh water influence from the River.

2.4.2 Shellfish flesh norovirus monitoring

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 infection 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.

Monitoring was undertaken by the Council in order to assess levels of norovirus in mussel flesh following diversion of municipal wastewater from Waitara to New Plymouth. As a requirement of special condition 15 consent 3397-2, mussels were collected from two impact sites (Orapa Reef SEA901040 and Airedale Reef SEA901030) and one control site (Oakura SEA903020) for norovirus analysis on 20 April 2015 (a few months following diversion of wastewater).

Figure 26 Location of the two potential impact sites used for green-lipped mussel collection

Table 13 shows the results of mussel flesh analysis from the survey undertaken in April 2015 and from three previous surveys undertaken at the same sites in 2010. For the 2010 surveys Norovirus GII was detected in five of the six samples tested, indicating the presence of human faecal contamination. For the 2015 survey, Norovirus GI and GII were not detected in the mussels from all three sites (both control and potential impact), indicating an improvement in water quality post wastewater diversion.

Table 13 Mussel flesh norovirus analysis

Waitara marine outfall	Date	Site	Closest site code	Mussel flesh: Norovirus GI	Mussel flesh: Norovirus GII
Discharging	10/8/2010	Orapa Reef	SEA901040	Low	Moderate
	10/8/2010	Airedale Reef	SEA901030	Negative	Low
Discharging	24/8/2010	Orapa Reef	SEA901040	Negative	Low
	24/8/2010	Airedale Reef	SEA901030	Negative	Low
Discharging	6/12/2010	Orapa Reef	SEA901040	Negative	Negative
	6/12/2010	Airedale Reef	SEA901030	Negative	Low
Post diversion	20/4/2015	Orapa Reef	SEA901040	Negative	Negative
	20/4/2015	Airedale Reef	SEA901030	Negative	Negative
	20/4/2015	Oakura (control)	SEA903020	Negative	Negative

2.5 Investigations, interventions, and incidents

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

The Council operates and maintains a register of all complaints or reported and discovered excursions from acceptable limits and practices, including non-compliance with consents, which may damage the environment. The Incident Register (IR) includes

events where the company concerned has itself notified the Council. The register contains details of any investigation and corrective action taken.

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

In the 2014 period, the Council was required to record an incident in association with NPDC's conditions in resource consents or provisions in Regional Plans.

On 4 May 2014 NPDC advised Council that pH dosing equipment had failed, causing the subsequent discharge, which occurred through the night, to contravene resource consent conditions. The contingency plan was actioned and the equipment repaired. An explanation was received and accepted, and no further action was considered necessary.

3. Discussion

3.1 Discussion of site performance

Variations in flow and quality of the WWWTP influent streams have been reduced through the continued reduction of stormwater infiltration and ingress into the sewerage system.

An annual report was submitted by NPDC (July 2014). The WWWTP contingency plan was reviewed, updated and incorporated as part of the Incident Response Plan.

3.2 Environmental effects of exercise of consents

3.2.1 WWWTP and discharge

Records of daily discharge volumes through the WWWTP demonstrated the consent limit was not breached during the monitoring period.

Consent conditions require that the pH of the effluent is maintained between 6 and 12 at least 98% of the time and this was complied with during the monitoring period. However, as disinfection at the WWWTP was achieved by elevation of pH via lime dosing, NPDC has a process control limit in place to maintain the pH between 10.8 and 12 to ensure that correct dosing occurs. During 2014 daily testing of pH limits showed that the pH was in compliance with the process controls for 75% of the readings. One % of the readings were above both the consent and process limits (excessive use of lime), while 24% of the readings were low (but not below consent limits).

There was 100% compliance within the microbiological limits within the consent, across all measurements. All other parameters complied with consent conditions during the monitoring period.

3.2.2 Marine ecological

Potential impact of the Waitara Marine Outfall discharge on the local intertidal communities can be 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 a 24 year continuous record of species diversity from September 1990 to September 2014. Data collected during 1985 and 1986 was also included as this data was collected using comparable methods.

Impacts of the Waitara Marine Outfall discharge on the local intertidal communities were not evident from the 2014 survey results. Diversity indicators were not consistently significantly higher at the control sites relative to the potential impact sites. The historical record of survey results showed no detectable impact of the Waitara Marine Outfall discharge on the local intertidal communities over the last 24 years. Both control and potential impact sites showed interannual variability and there were no obvious declining trends in potential impact sites relative to control sites.

Photo 2 Varying levels of sand inundation at the Greenwood Road starting rock a) Sept 2013, b) Oct 2010, c) Oct 2007, d) Oct 2007

Note: the 2010 image was taken one month after the Sept 2010 WWWTP survey

Spatial and interannual variability could mainly be attributed to natural changes in physical characteristics of the habitats. In particular, sand cover was a major driver of diversity, as indicated by the strong negative correlations between number of species and Shannon-Weiner index with sand cover at Greenwood Road, Orapa A and Airedale (Figure 9). This strong negative correlation between intertidal diversity and sand cover 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 result in reduced diversity due to sand scour of the biota, reduced water movement between rocks and temporary sand burial. In common with Airedale and Orapa A, the site at Greenwood Road is susceptible to sporadic heavy sand inundation (Photograph 2).

At Orapa B, sand percentage coverage has remained >20% since 2005 (Figure 8). From 2005 up until 2011, both mean number of species per quadrat and mean Shannon-Weiner index per quadrat steadily declined, reaching the lowest values recorded for over 20 years in 2011 (Figure 10). Over this period, the Orapa B site became increasingly dominated by the colonial tube worm *Neosabellaria kaiparaensis* (Figure 8, Photograph 3). Although generally uncommon in New Zealand, large colonies of this endemic polychaete occur around the Taranaki coastline. *Neosabellaria kaiparaensis* thrives in sand rich environments, and domination of this species can prevent other rock dwelling organisms from colonising the area. In September 2012, although *N. kaiparaensis* cover remained relatively high (42%), it was noted that colonies were in poor condition with eroded tubes, enabling establishment of other species. In 2013 and 2014, mean percentage cover of *N. kaiparaensis* had dropped to <10% enabling establishment of

more diverse intertidal communities. Overall, it should be noted that there is no evidence that the changes in sand cover and species diversity at this site is in anyway related to the Waitara Marine Outfall.

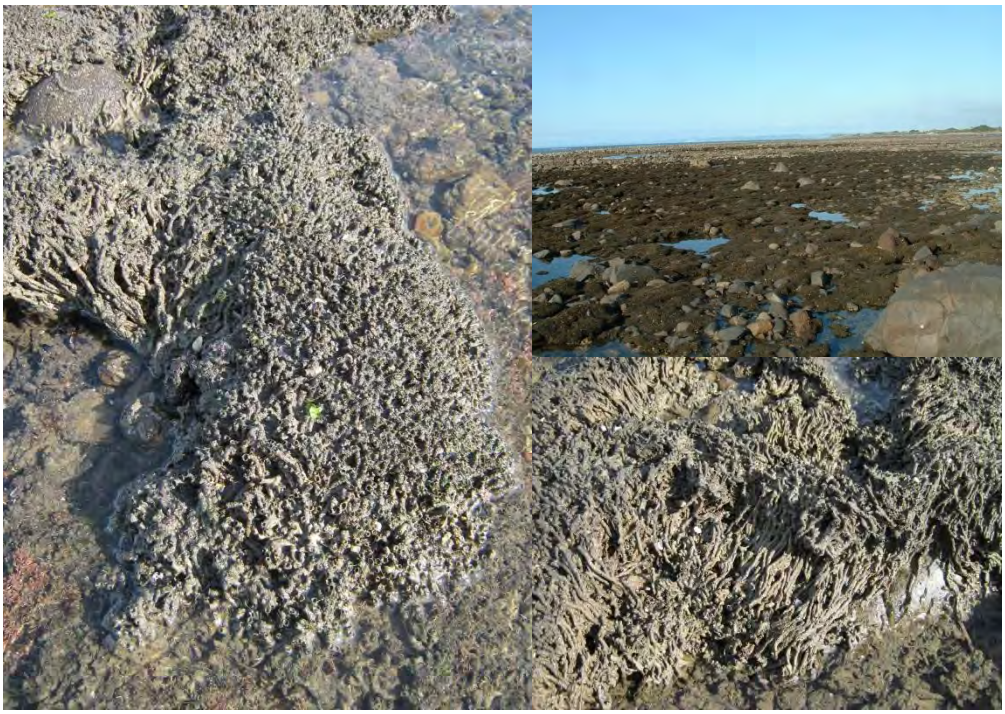


Photo 3 *Neosabellaria kaiparaensis* at the Orapa B site

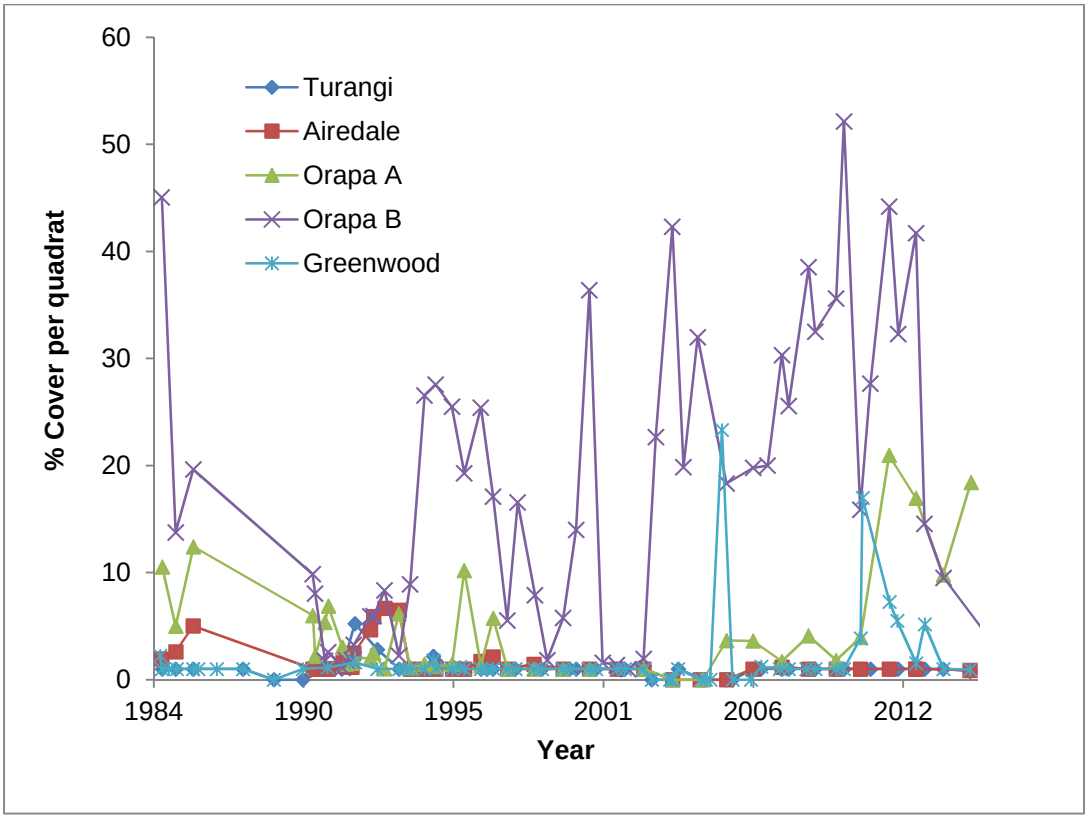


Figure 27 Mean percentage cover of *Neosabellaria kaiparaensis* per quadrat 1985-2014

3.2.3 Bacteriological

The Waitara Marine Outfall bacteriological monitoring programme was undertaken to assess the effect of the Waitara Outfall discharge on shoreline bacteriological water quality. The nearby Waitara River can be a significant potential source of shoreline bacteriological contamination, and therefore sampling of the Waitara River was undertaken.

Due to its large size, the Waitara River has been found to influence shore line bacterial counts for several days after fresh events. The Waitara River is the largest river in north Taranaki and drains not only the eastern slopes of Mount Taranaki but also the eastern hill country. As a consequence, the river can carry high sediment loads that take several days to subside. Oceanographic studies performed within the Waitara embayment during the early 1980's found that the embayment extends for several kilometres offshore, where a complex circulation pattern exists. The marine outfall effluent plume can be affected by stratification and onshore current patterns, indicating poor freshwater flushing within the embayment.

Bacteriological water quality at the four coastal sites was generally good during the sampling period, with occasional higher counts (>100 cfu/100 ml) of faecal indicator bacteria recorded. Results of regression analysis indicated that although bacterial discharge from the Waitara River accounted for some of the variability in bacterial counts at the coastal sites (contributing between ~1- 44%), there were other factors influencing faecal contamination. In order to assess the level of this contamination, enterococci counts were assessed in relation to existing water quality guidelines (MfE 2003). Of the 52 samples collected during the summer period, 94% of the samples were below the MfE 'Alert' level of 140 cfu/100 ml.

There was no evidence of failure in the disinfection at the WWWTP on the few occasions when higher faecal indicator bacteria counts were obtained. The results of DNA marker tracking investigations during the 2010-2011 monitoring period did provide evidence of intermittent human faecal contamination in the lower Waitara River. Positive results for human markers were obtained under dry conditions at low tide, indicating contamination was likely derived from a source within the lower river and not the outfall. On the basis of the results presented within this report, the Council finds no evidence to indicate that the discharge through the Waitara Marine Outfall resulted in any significant adverse effects on water quality within the Waitara embayment.

3.3 Evaluation of performance

A summary of the consent holder's compliance record for the year under review is set out in Tables 14-17. An evaluation of the environmental and administrative performance of Methanex in relation to resource consents 3399-2 and 3400-2 has been reported separately (see TRC, 2014).

Table 14 Performance for Consent 3397-2 to discharge up to 11,950 m^3/day of treated municipal wastes generated in Waitara township via a marine outfall

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Discharge volume < 11,950 per 24 hours and <138 l/sec	Monthly reports forwarded to Council	Yes
2. Discharge to cease once Waitara to New Plymouth pipeline is commissioned	Discharge ceased in October 2014	Yes
3. pH of discharge 6-12 in 98% samples over 12 month period	Data submitted to Council in monthly and annual reports by NPDC	Yes
4. Suspended Solids, COD, Oil & Grease and Ammoniacal Nitrogen not to exceed maximum concentrations	Data submitted to Council in monthly and annual reports by NPDC	Yes
5. Feacal coliforms in discharge not to exceed 50,000 cfu/100ml	Data submitted to Council in monthly and annual reports by NPDC	Yes
6. Discharge not to give rise to effects in Tasman Sea beyond 200 m mixing zone	Monitored as part of Council Beach Bathing Programme	Yes
7. Consent holder to forward monitoring results monthly	Monthly electronic reports provided by NPDC, including a comprehensive explanation of results	Yes
8. Annual report due by 31 July each year	Report received July 2014	Yes
9. Consent holder to update Contingency Plan	Plan updated and incorporated as part of Incident Response Plan	Yes
10. Reports on inflow and infiltration and construction of the Waitara to New Plymouth pipeline update	Reports received	Yes
11. Notification of new or modified trade waste agreements	No new Trade Waste Consents granted and no modifications to existing consents	N/A
12. Placement and maintenance of four signs on or near the Waitara shoreline	Signs erected. Wording agreed with TDHB	Yes
13. Record of complaints	NPDC kept a record of complaints	Yes
14. Annual meeting of submitters and interested parties	4 December 2014 & 8 December 2015	Yes
15. Survey of microbiological contamination in mussels after commissioning of Waitara to New Plymouth pipeline	Shellfish flesh norovirus monitoring undertaken April 2015	Yes
16. Optional review of consent	No further option 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

Table 15 Performance for consent 3399-2 to discharge treated wastewater and stormwater from the Waitara Valley methanol plant into the Tasman Sea via the Waitara Marine Outfall

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Consent holder to adopt best practicable option to prevent or minimise adverse effects	Inspections (separate programme)	Yes
2. Consent holder to maintain a record of the volume of effluent discharged each day	Monthly reports received	Yes
3. Maximum daily discharge 5,000 m^3 day, 60 L/sec	Monthly reports received	Yes
4. Minimum initial dilution of effluent 100:1	Outfall designed to specific design and physical modelling was undertaken. Review of effluent data and volumes discharged was also undertaken	Yes
5. Maximum daily discharge of suspended solids 500 kg	Monthly reports	Yes
6. pH not to exceed range of 6 to 9	Monthly reports	Yes
7. Limits on concentration of COD, hydrocarbons, methanol, ammonia, copper, nickel, zinc	Monthly reports	Yes
8. Allowable water treatment chemicals and volumes	Inspection and liaison with consent holder	Yes
9. Approval from Council required to discharge 'equivalent' chemical	Not requested during period	N/A
10. Definition of 'equivalent'		N/A
11. Discharge of equivalent chemical requires written request	Not requested during period	N/A
12. Conditions 5,6,7 and 8 apply to effluent prior to entry into outfall line		N/A
13. Limits in conditions 7 and 8 apply unless Council has given approval for a short term change	No approval given	N/A
14. Effects on receiving waters	Marine ecological surveys	Yes
15. Consent holder to maintain contingency plan	Contingency plan received September 2014	Yes
16. No domestic sewage in discharge after closure of Waitara Municipal Treatment Plant	Domestic sewage discharged to land	Yes
17. Consent holder to certify the structural integrity and dilution performance of outfall at least every five years	Report received February 2014. A commercial diver survey was undertaken to inspect the integrity of the outfall in November 2013. The dilution performance was analysed through a modelling exercise	Yes
18. Consent holder to supply an annual report by 31 March each year	Reports received monthly and reviewed as satisfactory	Yes
19. Lapse of consent		N/A
20. Review of consent	No further provision for review prior to expiry	N/A

Condition requirement	Means of monitoring during period under review	Compliance achieved?
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 16 Summary of consent 3400-2 to discharge treated wastewater and stormwater from the Motunui methanol plant into the Tasman Sea via the Waitara Marine Outfall

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Consent holder to adopt best practicable option to prevent or minimise adverse effects	Inspections liaison and review of reported data	Yes
2. Consent holder to maintain a record of the volume of effluent discharged each day	Monthly reports provided	Yes
3. Maximum daily discharge 12,096 m^3 day, 140 L/sec	Monthly reports received	Yes
4. Minimum initial dilution of effluent 100:1	Outfall designed to specific design. Modelling exercise was undertaken and reported with the five-yearly marine outfall report received in February 2014	Yes
5. Maximum daily discharge of suspended solids 500 kg	Review of analytical information provided in self-monitoring data and inter-laboratory comparison	Yes
6. pH not to exceed range of 6 to 9	Review of analytical information provided in self-monitoring data and inter-laboratory comparison. One occasions in 2014 when pH was outside consented range. Satisfactory explanations received from consent holder and accepted by the council	Yes
7. Limits on concentration of COD, hydrocarbons, methanol, ammonia, copper, nickel, zinc	Review of analytical information provided in self-monitoring data and inter-laboratory comparison	Yes
8. Allowable water treatment chemicals and volumes	Liaison with consent holder and inspections	Yes
9. Maximum daily limit of treatment with Spectrus CT1300 in response to *Legionella*	Liaison with consent holder and consent holder reports. Variation granted July 2012 for increase in 'Spectrus CT1300' chemical. This condition was not exercised	N/A
10. Approval from Council required to discharge 'equivalent' chemical	Permission for approval to replace two chemicals applied for 18 October 2012 and granted 1 November 2012	Yes
11. Definition of 'equivalent'	Discussed between Council and NPDC	Yes
12. Discharge of equivalent chemical requires written request	Not required	N/A
13. Conditions 5,6,7 and 8 apply to effluent prior to entry into outfall line		N/A
14. Limits in conditions 7 and 8 apply unless Council has given approval for a short term change	Not required	N/A
15. Effects on receiving waters	Marine ecological surveys	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
16. Consent holder to maintain contingency plan	Contingency plan received September 2014	Yes
17. No domestic sewage in discharge	Liaison with consent-holder domestic sewage is routed to the Waitara Wastewater Treatment Plant, not directly to the outfall	Yes
18. Consent holder to notify Council at least seven days before consent is first exercised	Notification on file	Yes
19. Consent holder to certify the structural integrity and dilution performance of outfall at least every five years	Report received February 2014. A commercial diver survey was undertaken to inspect the integrity of the outfall in November 2013. The dilution performance was analysed through a modelling exercise	Yes
20. Consent holder to supply an annual effluent report by 31 March each year	Reports received monthly and reviewed as satisfactory	Yes
21. Lapse of consent		N/A
22. Review of consent	No further provision for review prior to expiry	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 17 Summary of consent 4599-2 to erect, place and maintain a marine outfall structure and to occupy the associated coastal space

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Maintain outfall structure to satisfaction of Council	A commercial diver survey was undertaken to inspect the integrity of the outfall in 2011 – maintenance of the pipeline was also carried out at this time. A number of dives were undertaken during 2012-2013 to repair the outfall pipeline anchorages	Yes
2. Notification prior to maintenance work	No maintenance work during period under review	N/A
3. Optional review of consent	Next scheduled in June 2015, 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

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

3.4 Recommendations from the 2012-2013 Report

In the 2012-2013 Report, it was recommended:

1. THAT monitoring of discharges from the WWWTP in the 2014 year continues at the same level as in 2012 and 2013.

2. THAT the microbiological monitoring programme in relation to the Waitara Marine Outfall in the 2013-2014 year continues at the same level as in 2012-2013.

This recommendation was implemented.

3.5 Alterations to monitoring programmes for 2015

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

It is proposed that beyond June 2015 that the programme is discontinued, and no further monitoring is undertaken in relation to the WWWTP as effluent is now pumped to the NPWWTP for processing. A recommendation to this effect is attached to this report.

3.6 Exercise of optional review of consent

Resource consents 3399-2, 3400-2 and 4599-2 provide for an optional review of the consent in June 2015. Conditions of the consents allow the Council to review the consent, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of the 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.

A recommendation to this effect is presented in Section 4 of this report.

4. Recommendations

1. THAT monitoring of the WWWTP is discontinued, and no further monitoring is undertaken in relation to the WWWTP as effluent is now pumped to the NPWWTP for processing.

2. THAT the option for a review of resource consents 3399-2, 3400-2 and 4599-2 in June 2015, as set out in conditions of the consents, not be exercised, on the grounds that the current conditions are adequate to deal with any adverse effects on the environment arising from the exercise of the consents.

Glossary of common terms and abbreviations

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

As*	Arsenic.
cfu	Colony forming units. A measure of the concentration of bacteria usually expressed as per 100 millilitre sample.
COD	Chemical oxygen demand. A measure of the oxygen required to oxidise all matter in a sample by chemical reaction.
Condy	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m.
Cu*	Copper.
E.coli	Escherichia coli, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample.
Ent	Enterococci, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre of sample.
FC	Faecal coliforms, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample.
Fresh	Elevated flow in a stream, such as after heavy rainfall.
g/m^3	Grams per cubic metre, and equivalent to milligrams per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures.
Incident	An event that is alleged or is found to have occurred that may have actual or potential environmental consequences or may involve non-compliance with a consent or rule in a regional plan. Registration of an incident by the Council does not automatically mean such an outcome had actually occurred.
Intervention	Action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring.
Investigation	Action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident.
IR	The Incident Register contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan.
L/s	Litres per second.
mS/m	Millisiemens per metre.
Mixing zone	The zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to 7 times the width of the stream at the discharge point.
NH_4	Ammonium, normally expressed in terms of the mass of nitrogen (N).
NTU	Nephelometric Turbidity Unit, a measure of the turbidity of water.

O&G	Oil and grease, defined as anything that will dissolve into a particular organic solvent (e.g. hexane). May include both animal material (fats) and mineral matter (hydrocarbons).
pH	A numerical system for measuring acidity in solutions, with 7 as neutral. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5.
Physicochemical	Measurement of both physical properties (e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment.
Resource consent	Refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15).
RMA	*Resource Management Act* 1991 and including all subsequent amendments.
SS	Suspended solids.
Temp	Temperature, measured in °C (degrees Celsius).
Turb	Turbidity, expressed in NTU.
UI	Unauthorised Incident.
Zn*	Zinc.

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

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

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Appendix I

Resource consents held by NPDC and Methanex Motunui

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 up to 11,950 m^3/day (138 litres/second) of treated wastewater from the Waitara Wastewater Treatment Plant into the Tasman Sea via the Waitara Marine Outfall at or about (NZTM) 1705938E-5685058N
Expiry Date:	1 June 2017
Review Date(s):	Within one month of receiving notification of a new and/or modified trade waste agreement required under condition 11
Site Location:	Waitara Marine Outfall - At Or Beyond 1250 Metres off-shore from the Waitara River Mouth
Catchment:	Tasman Sea Waitara River

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 to section 36 of the Resource Management Act.

Special conditions

Effluent quality and standards

1. The discharge volume over any 24-hour period shall not exceed 11,950m^3 and the rate of discharge shall not exceed 138 litres/second.

2. The consent holder shall cease the discharge authorised by this consent as soon as practicable after the Waitara to New Plymouth pipeline is commissioned to pump Waitara wastewater to the New Plymouth Wastewater Treatment Plant for treatment, bearing in mind the requirements of condition 15.

3. The pH of the discharge shall be within the range of pH 6 to pH 12 in at least 98% of the monitoring samples undertaken over any 12 month period ending 30 June.

4. On the basis of 24-hour flow proportioned composite samples, constituents of the discharge shall not exceed the following concentrations:

Constituent	**Maximum concentration (g/m^3)**
Suspended solids	1000
Chemical oxygen demand	800
Oil and grease	200
Ammoniacal nitrogen	50

5. On the basis of grab samples taken, the concentration of faecal coliforms in the discharge shall not exceed 50,000 per 100 millilitres.

6. The discharge authorised by this consent shall not give rise to any of the following effects in the Tasman Sea beyond a mixing zone of 200 metres from the centre line of the outfall diffuser:

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

Monitoring and reporting requirements

7. The consent holder shall monitor and record the parameters of the discharge to demonstrate that the conditions of this consent are being complied with. This record shall be in an electronic format and submitted to the Taranaki Regional Council on a monthly basis. The consent holder is to consult with the Taranaki Regional Council as to the record format. Following this consultation, the record format is to be undertaken as advised by the Chief Executive, Taranaki Regional Council.

8. The consent holder shall prepare and submit an Annual Report to the Chief Executive, Taranaki Regional Council, by 31 July each year that includes, but is not necessarily limited to, the following information:

   (a) details of any plant maintenance undertaken and an overview of the plant performance;
   (b) details of any outfall or pump station(s) maintenance undertaken and an overview of the performance of the outfall and pump stations;
   (c) details of any overflow events and/or system failures which result in untreated or partially treated wastewater discharges at the plant and/or pump stations; and
   (d) details of any complaints received in accordance with condition 13.

Overflow contingency plan

9. The consent holder shall review and update the *NPDC Sewer System Emergency Contingency Plan* (dated August 2008) in consultation with the Taranaki District Health Board. The updated Plan shall detail measures and procedures to be undertaken to prevent the discharge of partially or untreated wastewater from the Waitara wastewater reticulation network or treatment plant not authorised by this consent and measures to avoid, remedy or mitigate the environmental effects of such a discharge. The plan shall be submitted for approval to the Chief Executive, Taranaki Regional Council, acting within a certification capacity, within three months of the date of commencement of this consent.

   The consent holder shall operate in accordance with the approved Plan.

Inflow and Infiltration, and transfer pipeline construction

10. The consent holder shall prepare and submit a report (annually for the information required by subconditions (a) and (b), and quarterly for the information required by subconditions (c) and (d)) that includes, but is not necessarily limited to, the following information:

    (a) details of the proposed works, staging and a timeline for reducing inflow and infiltration to a level where the 'Waitara to New Plymouth sewer pipeline' will continue to meet the design specifications in achieving an overflow frequency discharge occurrence of <1% per year, averaged over a five year period;
    (b) in relation to a) above, details of the progress undertaken towards achieving the specified works;

(c) details of the proposed works, staging and a timeline for constructing and commissioning the 'Waitara to New Plymouth sewer pipeline'; and
(d) in relation to c) above, details of the progress undertaken towards achieving the specified works.

The report in (a) and (b) shall be submitted to the Chief Executive, Taranaki Regional Council, by 15 December of each year.

The report in (c) and (d) shall be submitted to the Chief Executive, Taranaki Regional Council, by 31 March, 30 June, 30 September, and 15 December of each year until implementation is complete.

Trade waste agreements

11. The consent holder shall notify and consult with the Taranaki Regional Council if any new trade waste agreements are formed and/or any existing trade waste agreements are modified, for which it may be appropriate or necessary to place limits on the concentrations of the treated wastewater of any toxic or hazardous contaminants which may be contained in that trade waste. If such limits are considered necessary, a review of the consent conditions may be undertaken in accordance with condition 16 of this consent.

Signage

12. The consent holder shall maintain four signs placed on or near the shoreline in the following areas:

(a) Waitara West Beach – Marine Park and Battiscombe Terrace Reserve; and

(b) Waitara East Beach – near the Waitara Swimming and Surf Life Saving Club and the termination of the access walkway by the Waitara Golf Club;

The consent holder shall consult with Taranaki District Health Board regarding the wording of the signs to ensure that the signs advise the public of the discharge of untreated sewage and appropriately inform the community of the potential health risks.

Complaints

13. The consent holder shall keep a record of any complaints that are received. The record shall contain the following details, where practicable:

(a) name and address of the complainant;
(b) identification of the nature of the complaint;
(c) date and time of the complaint and of the alleged event;
(d) weather conditions at the time of the complaint; and
(e) any measures taken to address the cause of the complaint.

The consent holder shall notify the Taranaki Regional Council of any complaints relating to the exercise of this consent, and forward on any details recorded in relation to any complaint[s] received, as soon as practicable.

The consent holder shall also provide details of any complaints received in the Annual Report required by condition 8.

Note: For notification purposes, at the grant date of this consent, the Taranaki Regional Council's phone number is 0800 736 222 [24 hour service].

Community liaison

14. At least once a year the consent holder shall convene a meeting of representatives of Taranaki Regional Council, Otaraua, Manukorihi, Ngati Rahiri, and other interested submitters on application 5011, to discuss any matter relating to the operation or monitoring of this consent.[1]

Virus monitoring

15. The consent holder shall survey for microbiological contamination within mussel shellfish from two impact sites and one control site on one occasion and as soon as practicable following the commissioning of the 'Waitara to New Plymouth sewer pipeline'. The results of the survey shall be provided to the Taranaki Regional Council and the Taranaki District Health Board. The consent holder shall consult with the Taranaki Regional Council in regards to the survey methodology, timing of the survey and reporting requirements.

    The consent holder shall not surrender this consent prior to the requirements of this condition being fulfilled.

Review

16. In accordance with sections 128 and 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 within one month of receiving notification of a new and/or modified trade waste agreement required under condition 11 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, and in particular to address any more than minor adverse effects relating to coastal water quality.

Signed at Stratford on 13 December 2011

For and on behalf of
Taranaki Regional Council

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Director-Resource Management

[1] For the avoidance of doubt, this meeting can be combined with the annual meetings required under consents 0882-4 and 7861-1.

Coastal Permit

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

Name of Consent Holder:	Methanex Motunui Limited Private Bag 2011 NEW PLYMOUTH 4342
Decision Date (Change):	29 July 2013
Commencement Date (Change):	29 July 2013 (Granted: 29 April 2008)

Conditions of Consent

Consent Granted:	To discharge treated wastewater and stormwater from the Waitara Valley Methanol Plant into the Tasman Sea via the Waitara marine outfall
Expiry Date:	1 June 2021
Review Date(s):	June 2015 and/or within 3 months of notification under special condition 11
Site Location:	At or beyond 1250 metre offshore from Waitara Rivermouth
Grid Reference (NZTM)	1705615E-5684951N
Catchment:	Tasman Sea

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

General conditions

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

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

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

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

Special Conditions

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

2. The consent holder shall maintain a record of the volume of effluent discharged each day to an accuracy of ±5% and make these records available to the Chief Executive, Taranaki Regional Council in a digital format compatible with Council software, no later than 20th of the following month.

3. The maximum daily discharge shall be 5000 cubic metres per day at a maximum rate of 60 litres per second.

4. The consent holder shall ensure that the minimum initial dilution of the effluent above the outfall diffuser shall be 100:1.

5. The maximum daily discharge of suspended solids shall be 500 kilograms.

6. The consent holder shall ensure that the pH of the effluent shall not exceed the range of pH6 to pH 9 unless it is to be combine with the line treated wastewater from the Waitara Wastewater Treatment Plant, in which case, it shall not exceed the range pH 6 to pH 11.

7. On the basis of 24-hour flow proportioned composite samples, constituents of the discharge shall meet the standards shown below:

Constituent	Standard
Chemical oxygen demand	concentration no greater than 200 gm^{-3}
Hydrocarbons	concentration no greater than 10 gm^{-3}
Methanol	concentration no greater than 15 gm^{-3}
Ammonia	concentration no greater than 200 gm^{-3}
Copper	concentration no greater than 0.5 gm^{-3}
Nickel	concentration no greater than 1.0 gm^{-3}
Zinc	concentration no greater than 2.0 gm^{-3}

8. Subject to condition 9, only the water treatment chemicals listed in Table 1 shall be discharged, and the daily quantity discharged shall not exceed the limits given Table 1 below.

Table 1: List of water treatment chemicals

Purpose	Trade name	Maximum Daily discharge (kg)
Corrosion control in high pressure boiler	Optisperse HTP 73301 & 73611	50
Corrosion control in medium pressure boiler	Optisperse PO5211A	15
Oxygen removal from boiler feed water	Cortrol OS7780	300
pH control of steam/condensate to prevent corrosion.	Steamate NA0880	25
Corrosion control of re-circulating cooling water.	Gengard GN8020 Flogard MS6209	70 20
Biocidal dispersant	Spectrus BD1500	50
Corrosion control of re-circulating cooling water	Inhibitor AZ8104	30
Reduce foam formation of cooling water	Foamtrol AF2290	2
Coagulant	Klaraid PC 1192	150
Secondary biocide	Spectrus CT1300	5

9. In addition to the water treatment chemical listed in Table 1 (condition 8), water treatment chemicals considered to be 'equivalents' may be discharged as an alternative to those listed in Table 1, provided approval for the equivalent chemical has been given by the Chief Executive of Taranaki Regional Council in accordance with condition 11.

10. For the purpose of this consent an 'equivalent' is defined as a chemical that, when compared the chemical listed in Table 1, the Chief Executive of Taranaki Regional Council has determined that:

    a) it is of a similar nature and used for a similar purpose;
    b) it has similar breakdown products; and
    c) it has potential environmental effects that are similar.

11. Any discharge of an equivalent chemical in accordance with condition 9, shall only occur after a written request to discharge an equivalent chemical has been approved by Chief Executive Taranaki Regional Council. Any such request shall include:

    a) name of equivalent chemical;
    a) proposed concentration of equivalent in the discharge; and
    b) details of the nature of the chemical including its breakdown products; and
    c) an assessment of the potential effects of the change on the receiving environment.

    Note that the Chief Executive of Taranaki Regional Council may take up to 20 days to consider the request.

12. Special conditions 5, 6, 7 and 8 apply to effluent prior to entry into the outfall line, at a designated sampling point approved by the Chief Executive of Taranaki Regional Council.

13. The limits in special conditions 7 and 8 apply unless the Chief Executive of Taranaki Regional Council has given approval for a short term change for the purpose of routine maintenance including physical and chemical cleaning and catalyst changeouts, as per condition 11.

14. After allowing for reasonable mixing, being outside of a zone of 200 metres from the centreline of the outfall diffuser, the discharge shall not give rise to any of the following effects in the receiving waters:

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

15. The consent holder shall maintain a comprehensive contingency plan, to be put into operation to prevent unauthorised discharge resulting from spillages, accidental discharges or pipeline failure. The plan shall be provided to the Chief Executive, Taranaki Regional Council no more than thirty (30) days after this consent is first exercised and thereafter reviewed at two yearly intervals.

16. There shall be no domestic sewage (human effluent) in the discharge authorised by this consent following the closure of the Waitara municipal wastewater treatment plant.

17. At the request of the Chief Executive, Taranaki Regional Council, but at intervals of no less than five years, the consent holder shall certify the structural integrity and dilution performance of the outfall.

18. The consent holder shall provide to the Chief Executive, Taranaki Regional Council, an annual report on its waste treatment system discharges. The annual report shall include:

    a) daily volumes;
    b) results of any and all analyses undertaken by or on behalf of the consent holder; and
    c) compliance with the consent.

    This report shall be provided by the 31st March each year and covering the previous calendar year period.

19. This consent shall lapse on the expiry of five years after the date of issue of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

20. 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 2015 or within 3 months of receipt of notification under condition 11, 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 July 2013

For and on behalf of
Taranaki Regional Council

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Director-Resource Management

Coastal Permit

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

Name of Consent Holder:	Methanex Motunui Limited Private Bag 2011 NEW PLYMOUTH 4342
Decision Date [change]:	18 July 2012
Commencement Date [change]:	18 July 2012 [Granted: 29 April 2008]

Conditions of Consent

Consent Granted:	To discharge treated wastewater and stormwater from the Motunui methanol plant into the Tasman Sea via the Waitara marine outfall at or about (NZTM) 1705615E-5684951N
Expiry Date:	1 June 2021
Review Date(s):	June 2015 and/or within 3 months of receiving notification under special condition 12
Site Location:	At or beyond 1250 metres offshore from Waitara River mouth
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 [the Council] all the administration, monitoring and supervision costs of this consent, fixed in accordance with 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 consent holder shall maintain a record of the volume of effluent discharged each day to an accuracy of ±5% and make these records available to the Chief Executive, Taranaki Regional Council in a digital format compatible with Council software, no later than 20th of the following month

3. The maximum daily discharge shall be 12,096 cubic metres per day at a maximum rate of 140 litres per second.

4. The consent holder shall ensure that the minimum initial dilution of the effluent above the outfall diffuser shall be 100:1.

5. The maximum daily discharge of suspended solids shall be 500 kilograms.

6. The consent holder shall ensure that the pH of the effluent shall at all times be within the range of pH 6 to pH 9.

7. On the basis of 24-hour flow proportioned composite samples, constituents of the discharge shall meet the standards shown below.

Constituent	**Standard**
Chemical oxygen demand	concentration no greater than 200 gm^{-3}
Hydrocarbons	concentration no greater than 10gm^{-3}
Methanol	concentration no greater than 15 gm^{-3}
Copper	concentration no greater than 0.5 gm^{-3}
Nickel	concentration no greater than 1.0 gm^{-3}
Zinc	concentration no greater than 1.0 gm^{-3}

8. Subject to condition 10, only the water treatment chemicals listed in Table 1 shall be discharged, and the daily quantity discharged shall not exceed the limits given in Table 1.

Table 1: List of water treatment chemicals

Purpose	Trade name	Maximum Daily discharge (kg)
Corrosion control in high pressure boiler	Optisperse HTP 7330 & 73611	120
Corrosion control in medium pressure boiler	Optisperse PO5211A	20
Oxygen removal from boiler feed water	Cortrol OS7780	400
pH control of steam/condensate to prevent corrosion.	Steamate NA0880	40
Corrosion control of recirculating cooling water.	Continuum AEC3109	300
Control biological activity in cooling water	Spectrus BD1500	200
Corrosion control of recirculating cooling water	Inhibitor AZ8104	300
Control biological activity in cooling water	Spectrus NX1100	50
Control biological activity in cooling water	Spectrus CT1300	20
Corrosion control of recirculating cooling water	Flogard MS6207	40
Reduce foam formation of cooling water	Foamtrol AF2290	40
Coagulant	Klaraid PC 1190P	600
Flocculant	Betzdearborn AE1115	60

9. The maximum daily limit of the water treatment chemical 'Spectrus CT1300' may be increased to 40kg/day in response to increased levels of the bacteria Legionella if detected by the consent holder, to minimise the risk to human health. The Consent holder must notify the Council within 24 hours if this increased dose is utilized.

10. In addition to the water treatment chemicals listed in Table 1, water treatment chemicals determined to be 'equivalents' may be discharged as an alternative to those listed in Table 1, provided approval for the equivalent chemical has been given by the Chief Executive of Taranaki Regional Council in accordance with condition 12.

11. For the purpose of this consent an 'equivalent' is defined as a chemical that, when compared the chemical listed in Table 1, the Chief Executive of Taranaki Regional Council has determined that:

    a) it is of a similar nature and used for a similar purpose;
    b) it has similar breakdown products; and
    c) it has potential environmental effects that are similar.

12. Any discharge of an equivalent chemical in accordance with condition 10, shall only occur after a written request to discharge an equivalent chemical has been approved by Chief Executive Taranaki Regional Council. Any such request shall include:

    a) name of equivalent chemical;
    b) proposed concentration of equivalent in the discharge; and
    c) details of the nature of the chemical including its breakdown products; and
    d) an assessment of the potential effects of the change on the receiving environment.

    Note that the Chief Executive of Taranaki Regional Council may take up to 20 days to consider the request.

13. Special conditions 5, 6, 7 and 8, apply to effluent prior to entry into the outfall line, at a designated sampling point approved by the Chief Executive of Taranaki Regional Council.

14. The limits in special conditions 7 and 8 apply unless the Chief Executive of Taranaki Regional Council has given approval for a short term change for the purpose of routine maintenance including physical and chemical cleaning and catalyst changeouts, as per special condition 12.

15. After allowing for reasonable mixing, being outside of a zone of 200 metres from the centreline of the outfall diffuser, the discharge shall not give rise to any of the following effects in the receiving waters:

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

16. The consent holder shall maintain a comprehensive contingency plan, to be put into operation to prevent unauthorised discharge resulting from spillages, accidental discharges or pipeline failure. The plan shall be provided to the Chief Executive, Taranaki Regional Council no more than 30 days after this consent is first exercised and thereafter reviewed two yearly intervals.

17. No discharge of domestic sewage [human effluent] shall be permitted under the exercise of this consent.

18. The consent holder shall notify the Chief Executive, Taranaki Regional Council at least seven days before this consent is first exercised.

19. The consent holder shall on request by the Chief Executive, Taranaki Regional Council, but at intervals of no less than five years, certify the structural integrity and dilution performance of the outfall.

20. The consent holder shall provide to the Chief Executive, Taranaki Regional Council, an annual report on its waste treatment system discharges. The annual report shall include:

    a) daily volumes;
    b) results of any and all analyses undertaken by or on behalf of the consent holder;
    c) compliance with the consent.

    This report shall be provided by the 31st March each year and covering the previous calendar year period.

21. This consent shall lapse on the expiry of five years after the date of issue of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

22. 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 2015 or within 3 months of receipt of notification under special condition 12, 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 18 July 2012

For and on behalf of
Taranaki Regional Council

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Director-Resource Management

Appendix II

Summary of marine ecological spring survey results 1985 - 2014

Greenwood Road	No. of Quadrats	No. algae	No. animals	No. total species	SW index: algae	SW index: animals	SW index: total species	Sand % cover
September 1985	40	4.90	12.52	17.42	0.537	0.895	1.030	-
November 1993	10	5.40	13.00	18.40	0.628	0.964	1.110	-
October 1994	25	3.72	11.08	14.80	0.494	0.874	1.011	-
October 1995	25	4.28	13.00	17.27	0.470	0.926	1.043	-
October 1996	25	5.56	13.16	18.72	0.680	0.875	1.037	<1
October 1997	25	5.32	16.04	21.36	0.587	0.954	1.056	<1
October 1998	25	3.88	15.08	18.96	0.450	0.909	1.004	<1
October 1999	25	3.60	12.04	15.64	0.333	0.861	0.920	<1
October 2000	25	4.76	10.28	15.04	0.470	0.789	0.912	<1
October 2001	25	5.64	14.28	19.92	0.579	0.881	1.001	<1
October 2002	25	4.92	9.64	14.56	0.495	0.786	0.894	13
October 2003	25	4.44	5.04	9.48	0.53	0.395	0.649	61
October 2004	25	7.84	8.00	15.84	0.72	0.62	0.91	<1
October 2005	25	6.84	9.96	16.80	0.69	0.80	1.02	<1
September 2006	25	5.04	9.56	14.60	0.50	0.66	0.87	<1
September 2007	25	7.8	12.88	20.68	0.64	0.83	1.04	2
September 2008	25	5.12	5.96	11.08	0.60	0.61	0.90	60
October 2009	25	6.00	11.16	17.16	0.56	0.85	1.03	<1
September 2010	25	4.56	5.92	10.48	0.51	0.62	0.87	3
September 2011	25	4.36	7.92	12.28	0.60	0.60	0.78	6
September 2012	25	7.20	9.70	16.92	0.69	0.61	0.81	5
September 2013	25	2.24	3.40	5.64	0.26	0.29	0.42	86
September 2014	25	7.64	6.16	14.04	0.81	0.55	0.88	5

Orapa B	No. of Quadrats	No. algae	No. animals	No. total species	SW index: algae	SW index: animals	SW index: total species	Sand % cover
September 1985	40	4.35	12.60	16.95	0.495	0.847	0.954	-
September 1990	25	3.76	13.72	17.48	0.492	0.880	0.983	-
October 1990	25	5.64	15.40	21.04	0.667	0.971	1.089	-
October 1991	25	6.16	14.76	20.92	0.695	0.924	1.077	-
November 1991	25	5.84	14.72	20.56	0.667	0.979	1.112	-
October 1992	15	4.46	12.66	17.13	0.548	0.878	1.006	-
November 1992	25	4.64	13.24	17.88	0.562	0.869	0.976	-
October 1993	25	4.92	12.68	17.60	0.611	0.840	0.953	-
October 1994	25	4.52	8.87	13.40	0.505	0.746	0.899	3
October 1995	25	3.80	12.24	16.04	0.437	0.906	1.002	2
October 1996	25	5.60	10.40	16.00	0.577	0.701	0.885	5
October 1997	25	5.16	12.60	17.76	0.575	0.881	1.017	3
October 1998	25	3.72	12.20	15.92	0.426	0.853	0.972	4
October 1999	25	4.32	9.88	14.20	0.477	0.795	0.960	8
October 2000	25	5.40	8.84	14.24	0.589	0.726	0.913	3
October 2001	25	5.28	10.96	16.23	0.538	0.798	0.962	8
October 2002	25	5.68	11.12	16.8	0.586	0.813	0.993	5
October 2003	25	5.40	11.12	16.52	0.686	0.820	0.974	5
October 2004	25	4.76	6.96	11.72	0.569	0.601	0.812	3
October 2005	25	4.84	8.19	13.04	0.507	0.782	0.939	32
October 2006	25	6.28	10.72	17.00	0.646	0.846	0.992	21
October 2007	25	4.88	9.88	14.76	0.540	0.760	0.900	58

Orapa B	No. of Quadrats	No. algae	No. animals	No. total species	SW index: algae	SW index: animals	SW index: total species	Sand % cover
October 2008	25	4.52	7.56	12.08	0.46	0.59	0.76	40
October 2009	25	4.48	6.60	11.08	0.50	0.57	0.76	36
September 2010	25	2.36	7.96	10.32	0.20	0.58	0.69	33
September 2011	25	3.12	7.04	10.16	0.35	0.59	0.73	23
September 2012	25	4.28	6.80	11.08	0.50	0.62	0.77	31
September 2013	25	4.80	9.84	14.64	0.52	0.76	0.90	31
September 2014	25	6.20	9.44	15.64	0.68	0.75	0.97	32

Orapa A	No. of Quadrats	No. algae	No. animals	No. total species	SW index: algae	SW index: animals	SW index: total species	Sand % cover
September 1985	40	3.77	11.85	15.62	0.513	0.774	0.876	0.5
September 1990	25	3.92	12.04	15.96	0.486	0.876	0.988	-
October 1990	25	5.88	13.36	19.24	0.622	0.929	1.069	-
October 1991	25	6.24	15.52	21.76	0.714	0.947	1.081	-
November 1991	25	5.28	15.08	20.36	0.678	0.989	1.119	-
October 1992	25	5.04	15.64	20.68	0.641	0.951	1.071	-
November 1992	25	4.96	14.12	19.08	0.625	0.847	0.969	-
October 1993	25	4.88	10.48	15.36	0.525	0.801	0.960	-
October 1994	25	3.96	13.08	17.04	0.452	0.847	0.948	1
October 1995	25	3.52	12.56	16.08	0.383	0.896	0.993	<1
October 1996	25	5.36	10.60	15.96	0.589	0.804	0.965	<1
October 1997	25	4.92	15.16	20.07	0.595	0.950	1.071	6
October 1998	25	4.24	10.32	14.56	0.452	0.809	0.952	2
October 1999	25	3.12	8.00	11.12	0.374	0.666	0.800	24
October 2000	25	4.92	12.08	17.00	0.526	0.801	0.922	<1
October 2001	25	0	0	0	0	0	0	100
October 2002	25	4.88	12.8	17.68	0.51	0.886	1.012	<1
October 2003	25	6.60	12.76	19.36	0.792	0.741	0.904	1
October 2004	25	5.08	10.40	15.48	0.539	0.797	0.958	2
October 2005	25	4.72	9.00	13.72	0.534	0.731	0.887	<1
October 2006	25	6.12	11.60	17.72	0.703	0.872	1.038	6
October 2007	25	5.08	13.72	18.80	0.570	0.880	1.020	5
October 2008	25	4.04	11.96	16.00	0.40	0.83	0.95	4
October 2009	25	5.08	10.16	15.24	0.49	0.82	0.95	4
September 2010	25	3.28	12.56	15.84	0.40	0.87	0.98	<1
September 2011	25	3.40	9.12	12.52	0.42	0.75	0.88	-
September 2012	25	4.16	9.28	13.44	0.45	0.72	0.86	7
September 2013	25	4.60	10.96	15.56	0.53	0.79	0.91	13
September 2014	25	4.72	10.76	15.48	0.57	0.80	0.95	10

Airedale Reef	No. of Quadrats	No. algae	No. animals	No. total species	SW index: algae	SW index: animals	SW index: total species	Sand % cover
September 1985	40	3.27	10.75	14.02	0.373	0.874	0.976	3.6
September 1990	25	2.92	8.76	11.68	0.443	0.729	0.862	-
October 1990	25	3.12	7.32	10.44	0.437	0.633	0.782	-
October 1991	25	3.32	11.24	14.56	0.380	0.850	0.947	-
November 1991	25	3.72	8.87	12.60	0.460	0.667	0.815	-
October 1992	25	4.60	16.08	20.68	0.578	1.025	1.131	-
November 1992	25	4.88	13.56	18.44	0.586	0.920	1.047	-
November 1993	25	4.68	12.44	17.12	0.478	0.917	1.042	-
October 1994	25	3.00	8.04	11.04	0.400	0.503	0.662	8
October 1995	25	3.60	8.84	12.44	0.425	0.579	0.735	9
October 1996	25	3.76	9.60	13.36	0.462	0.716	0.849	8
October 1997	25	4.59	9.92	14.52	0.517	0.678	0.849	20
October 1998	25	2.76	11.48	14.24	0.371	0.771	0.852	4
October 1999	25	2.36	7.40	9.76	0.288	0.564	0.670	21
October 2000	25	3.00	6.88	9.88	0.370	0.674	0.813	4
October 2001	25	2.16	4.96	7.12	0.287	0.428	0.552	56
October 2002	25	0.52	1	1.52	0.067	0.063	0.093	91
October 2003	25	4.68	8.19	12.88	0.591	0.565	0.760	31
October 2004	25	2.27	4.48	6.76	0.309	0.309	0.434	60
October 2005	25	1.36	6.16	7.52	0.113	0.478	0.568	35
October 2006	25	2.52	9.03	11.56	0.239	0.614	0.729	29
October 2007	25	2.56	11.08	13.64	0.310	0.830	0.910	21
October 2008	25	2.20	10.32	12.52	0.24	0.84	0.91	5
October 2009	25	1.96	8.80	10.76	0.22	0.85	0.91	<1
September 2010	25	2.20	12.00	14.20	0.26	0.89	0.97	28
September 2011	25	2.04	9.64	11.68	0.21	0.75	0.83	4
September 2012	25	3.16	9.00	12.16	0.41	0.64	0.78	6
September 2013	25	3.52	9.20	12.72	0.38	0.69	0.81	15
September 2014	25	3.44	9.20	12.64	0.47	0.75	0.88	5

Turangi Road	No. of Quadrats	No. algae	No. animals	No. total species	SW index: algae	SW index: animals	SW index: total species	Sand % cover
September 1985	40	6.62	12.05	18.67	0.628	0.930	1.093	-
September 1991	25	3.84	11.68	15.52	0.522	0.802	0.917	-
November 1993	15	4.40	10.80	15.20	0.461	0.888	1.009	-
October 1994	25	3.76	10.04	13.80	0.405	0.797	0.918	<1
October 1995	25	5.07	12.12	17.20	0.493	0.779	0.947	1
October 1996	25	4.80	12.20	17.00	0.585	0.693	0.820	1
October 1997	25	6.32	12.20	18.52	0.630	0.677	0.858	5
October 1998	25	3.68	13.92	17.60	0.411	0.931	1.010	3
October 1999	25	3.88	12.84	16.72	0.437	0.878	0.980	2
October 2000	25	3.88	9.40	13.28	0.431	0.765	0.881	1
October 2001	25	5.04	10.52	15.56	0.485	0.819	0.940	3
October 2002	25	5.96	11.68	17.64	0.52	0.852	0.982	8
October 2003	25	6.48	12.20	18.68	0.748	0.776	0.938	<1
October 2004	25	4.8	9.48	14.28	0.519	0.738	0.888	<1
October 2005	25	5.28	6.80	12.08	0.563	0.696	0.909	3
October 2006	25	5.36	12.92	18.28	0.556	0.793	0.939	8
October 2007	25	5.88	12.32	18.2	0.55	0.65	0.84	1

Turangi Road	No. of Quadrats	No. algae	No. animals	No. total species	SW index: algae	SW index: animals	SW index: total species	Sand % cover
October 2008	25	3.52	10.48	14.00	0.43	0.64	0.79	<1
October 2009	25	4.72	9.88	14.60	0.49	0.73	0.90	4
September 2010	25	2.56	9.12	11.68	0.32	0.66	0.77	1
September 2011	25	3.84	11.40	15.24	0.38	0.73	0.83	16
October 2012	25	4.20	10.96	15.16	0.47	0.70	0.83	1
September 2013	25	4.40	12.08	16.48	0.40	0.70	0.86	3
September 2014	25	3.28	10.76	14.04	0.41	0.77	0.87	12

Appendix III

Microbiological monitoring data 2013-2014

Airedale

Date	Time (NZST)	Conductivity @ 20°C (mS/m)	Bacteria			Temp (°C)
			E . coli (nos/100ml)	Enterococci (nos/100ml)	Faecal coliforms (nos/100ml)	
05 Nov 2013	10:05	4300	20	8	24	16.7
18 Nov 2013	09:25	4470	<1	1	1	17.8
16 Dec 2013	09:20	4310	5	5	5	20.0
16 Jan 2014	10:05	4280	16	5	16	17.9
20 Jan 2014	11:00	4450	1	1	1	17.3
30 Jan 2014	09:20	4280	120	28	120	17.3
03 Feb 2014	11:00	4600	<1	<1	<1	18.3
17 Feb 2014	09:45	4540	1	3	3	17.9
20 Feb 2014	11:30	4690	<1	<1	<1	20.9
06 Mar 2014	14:00	4740	3	5	5	17.7
21 Mar 2014	11:10	4620	7	20	23	19.2
31 Mar 2014	09:45	4650	3	9	3	18.3
03 Apr 2014	11:00	4720	1	3	1	19.7

Waitara East Beach

Date	Time (NZST)	Conductivity @ 20°C (mS/m)	Bacteria			Temp (°C)
			E . coli (nos/100ml)	Enterococci (nos/100ml)	Faecal coliforms (nos/100ml)	
05 Nov 2013	10:20	2840	430	180	430	16.1
18 Nov 2013	09:15	4330	8	7	8	17.3
16 Dec 2013	09:05	4270	20	3	20	19.8
16 Jan 2014	09:30	4520	360	25	360	17.8
20 Jan 2014	11:05	4150	46	17	46	17.4
30 Jan 2014	09:05	4540	51	220	51	17.2
03 Feb 2014	11:10	4700	<1	11	<1	18.3
17 Feb 2014	10:00	4610	3	4	3	17.5
20 Feb 2014	12:05	4570	1	1	1	21.6
06 Mar 2014	12:10	4690	<1	<1	<1	17.2
21 Mar 2014	11:30	4730	<1	8	1	19.2
31 Mar 2014	09:30	4630	1	4	1	18.0
03 Apr 2014	11:20	4730	<1	<1	<1	19.4

Waitara West Beach

Date	Time (NZST)	Conductivity @ 20°C (mS/m)	Bacteria			Temp (°C)
			E . coli (nos/100ml)	Enterococci (nos/100ml)	Faecal coliforms (nos/100ml)	
05 Nov 2013	10:45	3960	100	31	100	16.6
18 Nov 2013	08:50	4600	1	1	1	17.8
16 Dec 2013	08:40	4480	28	8	31	19.7
16 Jan 2014	09:55	4300	12	11	12	17.6
20 Jan 2014	11:20	4530	7	13	8	17.2

Date	Time (NZST)	Conductivity @ 20°C (mS/m)	Bacteria			Temp (°C)
			E . coli (nos/100ml)	Enterococci (nos/100ml)	Faecal coliforms (nos/100ml)	
30 Jan 2014	08:45	4550	5	8	5	16.9
03 Feb 2014	11:40	4730	1	3	1	18.8
17 Feb 2014	10:15	4740	1	82	1	17.9
20 Feb 2014	11:40	4630	1	3	1	21.1
06 Mar 2014	12:35	4720	<1	<1	1	17.1
21 Mar 2014	11:55	4720	4	<1	5	19.2
31 Mar 2014	09:00	4680	4	110	4	18.2
03 Apr 2014	11:40	4740	<1	11	<1	19.5

Tuaranga Reef

Date	Time (NZST)	Conductivity @ 20°C (mS/m)	Bacteria			Temp (°C)
			E . coli (nos/100ml)	Enterococci (nos/100ml)	Faecal coliforms (nos/100ml)	
05 Nov 2013	11:05	4060	52	74	54	16.7
18 Nov 2013	08:20	4550	<1	1	<1	17.3
16 Dec 2013	09:15	4570	<1	3	<1	19.3
16 Jan 2014	08:35	4200	52	28	52	17.6
20 Jan 2014	11:40	3810	8	12	11	17.4
30 Jan 2014	08:25	4660	29	7	29	16.5
03 Feb 2014	11:55	4750	<1	490	<1	19.8
17 Feb 2014	10:35	4740	<1	15	<1	19.4
20 Feb 2014	12:25	4730	<1	3	<1	23.8
06 Mar 2014	13:00	4720	<1	<1	<1	17.5
21 Mar 2014	12:15	4720	8	1	8	19.0
31 Mar 2014	08:30	4690	<1	3	<1	16.6
03 Apr 2014	12:00	4730	<1	<1	<1	19.1

Bertrand Road

Date	Time (NZST)	Conductivity @ 20°C (mS/m)	Bacteria			Temp (°C)
			E . coli (nos/100ml)	Enterococci (nos/100ml)	Faecal coliforms (nos/100ml)	
05 Nov 2013	08:55	7.8	320	3	320	15.1
18 Nov 2013	10:42	10.6	95	12	95	19.3
16 Dec 2013	10:50	9.1	35	15	37	20.4
16 Jan 2014	11:45	9.1	26	7	26	21.3
20 Jan 2014	09:40	9.2	36	20	37	19.3
30 Jan 2014	10:45	9.1	29	11	29	20.8
03 Feb 2014	09:50	9.8	9	20	9	21.3
17 Feb 2014	08:40	10.4	78	20	80	21.3
20 Feb 2014	09:25	10.4	89	60	91	23.4
06 Mar 2014	11:00	11.3	23	40	23	18.4
21 Mar 2014	09:35	12.4	86	81	90	18.1
31 Mar 2014	11:00	11.1	62	13	64	17.8
03 Apr 2014	09:50	11.2	44	29	44	17.3

Appendix IV

Receiving Environment Faecal Indicator Bacteria: Conversion Work Additional Monitoring

Waitara East Beach

Date	Time	CONDY	ECOL	ENT	FC	TEMP
		mS/m@20C	/100ml	/100ml	/100ml	Deg.C
19 Aug 2014	12:45	2690	12	3	12	12.4
02 Sep 2014	10:35	3280	3	3	3	14.4
09 Sep 2014	09:05	4440	<1	3	<1	13.4
16 Sep 2014	09:55	3020	800	120	800	15.4
10 Nov 2014	12:00	4570	11	1.1	11	16.4

Waitara West Beach

Date	Time	CONDY	ECOL	ENT	FC	TEMP
		mS/m@20C	/100ml	/100ml	/100ml	Deg.C
19 Aug 2014	12:15	2920	16	3	17	13.1
02 Sep 2014	10:00	4140	<1	1.1	<1	14.2
09 Sep 2014	08:30	4610	3	58	3	13.2
16 Sep 2014	09:25	3360	590	180	600	14.3
10 Nov 2014	12:30	4540	3	1.1	3	17.5

Waitara River: Town Wharf

Date	Time	CONDY	ECOL	ENT	FC	TEMP
		mS/m@20C	/100ml	/100ml	/100ml	Deg.C
19 Aug 2014	12:00	288	100	11	100	9.6
02 Sep 2014	10:15	813	80	4	80	11.6
09 Sep 2014	08:55	1220	48	12	48	12.3
16 Sep 2014	09:40	342	1800	390	1800	13.8
10 Nov 2014	12:10	474	140	11	140	16.3