New Plymouth District Council
Inglewood, Okato, Okoki, Oakura and Marfell Park Landfills Monitoring Programme Annual Report 2012-2013

Technical Report 2013-61

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Executive summary

The New Plymouth District Council (NPDC) maintains two reinstated landfills at Inglewood and Okato. Both landfills have been used in the past, and are now held in reserve to accept refuse on a contingency basis. The Inglewood landfill is located on King Road at Inglewood, in the Waiongana catchment, and the Okato landfill is located on Hampton Road at Okato, in the Kaihihi catchment,

NPDC also maintains three closed landfills; Okoki landfill in the Urenui catchment, Oakura landfill in the Waiaru catchment, and Marfell Park landfill in the Huatoki catchment. None of these landfills accept waste for disposal and have all been fully reinstated.

This report for the period July 2012-June 2013 describes the monitoring programme implemented by the Taranaki Regional Council to assess NPDC's environmental performance during the period under review, and the results and environmental effects of NPDC's activities in regard to these closed landfills.

NPDC holds a total of nine resource consents, which include a total of 65 conditions setting out the requirements that NPDC must satisfy. NPDC holds five consents to discharge leachate and stormwater into various streams, two consents to discharge contaminants onto and into land, and two consents to discharge emissions into the air.

The Council's monitoring programme for the year under review included eight inspections, three discharge sample, 16 water samples , two biomonitoring surveys of receiving waters, and four ambient air quality analyses.

During the monitoring year there were no incidents logged by Council associated with NPDC's landfills covered in this report.

During the year, NPDC demonstrated a high level of environmental performance and compliance with the resource consents for the closed landfills at Inglewood, Okato, and Okoki. No monitoring was scheduled or required at Marfell or Oakura landfill sites during the year under review.

For reference, in the 2012-2013 year, 35% 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 59% demonstrated a good level of environmental performance and compliance with their consents.

Overall, NPDC demonstrated a high level of environmental performance and compliance with resource consents.

This report includes recommendations for the 2013-2014 year.

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1. Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is the Annual Report for the period July 2012-June 2013 by the Taranaki Regional Council on the monitoring programme associated with resource consents held by New Plymouth District Council (NPDC).

NPDC hold consents to discharge leachate and contaminated stormwater from its closed landfills. These are the Okoki landfill in the Urenui catchment, Oakura landfill in the Wairau catchment, and Marfell Park landfill in the Huatoki catchment. These landfills do not accept waste for disposal to land and have all been fully reinstated.

NPDC also hold consents to discharge solids to land, emissions to air and leachate and contaminated stormwater to land and water, at two contingency landfills. These are Inglewood landfill in the Waiongana catchment, and Okato landfill in the Kaihihi catchment. These landfills are non-operational and are fully reinstated. They do however retain all necessary consents to act as contingency sites if the Regional Landfill at Colson Road has to cease accepting waste in the event of an emergency.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the consents held by NPDC that relate to the discharges of leachate and stormwater within these catchments and discharges of contaminants onto and into land and emissions to air for the Inglewood and Okato sites.

One of the intents of the Resource Management Act (1991) 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 Taranaki Regional Council generally implements integrated environmental monitoring programmes and reports the results of the programmes jointly. This report discusses the environmental effects of NPDC's use of water, land, and air, and is the 22nd combined annual report by the Taranaki Regional Council for the consent holder.

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 Resource Management Act and the Council's obligations and general approach to monitoring sites through annual programmes, the resource consents held by NPDC in the Urenui, Waiaru, Huatoki, Waiongana, and Kaihihi catchments, the nature of the monitoring programme in place for the period under review, and a description of the activities and operations conducted by NPDC.

Sections 2 – 6 focus on each individual landfill. Subsections present the results of monitoring during the period under review, including scientific and technical data, discuss the results, their interpretation, and their significance for the environment, and present recommendations to be implemented in the 2013-2014 monitoring year.

Section 7 contains a summary of recommendations for the 2013-2014 monitoring period.

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

(a) the neighbourhood or the wider community around a discharger, and may include cultural and socio-economic effects;
(b) physical effects on the locality, including landscape, amenity and visual effects;
(c) ecosystems, including effects on plants, animals, or habitats, whether aquatic or terrestrial;
(d) natural and physical resources having special significance (e.g., 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 Taranaki Regional Council is recognising the comprehensive meaning of `effects' inasmuch as is appropriate for each discharge source. Monitoring programmes are not only based on existing permit conditions, but also on the obligations of the Resource Management Act to assess the effects of the exercise of consents. In accordance with section 35 of the Resource Management Act 1991, the Council undertakes compliance monitoring for consents and rules in regional plans; and maintains an overview of performance of resource users against regional plans and consents. Compliance monitoring, including impact monitoring, also enables the Council to continuously assess its own performance in resource management as well as that of resource users particularly consent holders. It further enables the Council to continually re-evaluate its approach and that of consent holders to resource management, and, ultimately, through the refinement of methods, to move closer to achieving sustainable development of the region's resources.

1.1.4 Evaluation of environmental performance

Besides discussing the various details of the performance and extent of compliance by the consent holder(s) during the period under review, this report also assigns an overall rating. The categories used by the Council, and their interpretation, are as follows:

- a **high** level of environmental performance and compliance indicates that essentially there were no adverse environmental effects to be concerned about, and no, or inconsequential (such as data supplied after a deadline) non-compliance with conditions.

- a **good** level of environmental performance and compliance indicates that adverse environmental effects of activities during the monitoring period were negligible or minor at most, or, 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, or, there were perhaps some items noted

on inspection notices for attention but these items were not urgent nor critical, and follow-up inspections showed they have been dealt with, and any inconsequential non compliances with conditions were resolved positively, co-operatively, and quickly.

- **improvement desirable (environmental)** or **improvement desirable (administrative compliance)** (as appropriate) indicates that the Council may have been obliged to record a verified unauthorised incident involving measurable environmental impacts, and/or, there were measurable environmental effects arising from activities and intervention by Council staff was required and there were matters that required urgent intervention, took some time to resolve, or remained unresolved at the end of the period under review, and/or, there were on-going issues around meeting resource consent conditions even in the absence of environmental effects. Abatement notices may have been issued.

- **poor performance (environmental)** or **poor performance (administrative compliance)** indicates generally that the Council was obliged to record a verified unauthorised incident involving significant environmental impacts, or there were material failings to comply with resource consent conditions that required significant intervention by the Council even in the absence of environmental effects. Typically there were grounds for either a prosecution or an infringement notice.

For reference, in the 2012-2013 year, 35% 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 59% demonstrated a good level of environmental performance and compliance with their consents.

1.2 Process description

NPDC holds consents to discharge leachate and contaminated stormwater from three closed landfills: the Okoki landfill in the Urenui catchment, the Oakura landfill in the Waiaru catchment, and Marfell Park landfill in the Huatoki catchment. These landfills do not accept waste for disposal and have been fully closed and reinstated.

NPDC holds consents to discharge solids to land, leachate and emissions to air at the Inglewood landfill in the Waiongana catchment and the Okato landfill in the Kaihihi catchment. These landfills do not currently accept waste but could be re-commissioned if needed.

The Colson Road regional landfill remains operational. The monitoring of this facility is reported separately.

Readers are referred to previous annual compliance monitoring reports that are listed in the bibliography of this report.

1.3 Resource consents

NPDC holds a total of nine consents in relation to its closed and contingency landfills. These are set out in Table 1 below, and further detail on the consents is given in Sections 1.3.1 to 1.3.3.

Table 1 Summary of consents held by NPDC

Site	Consent No.	Purpose	Option for Review	Expires
Inglewood	3954-2	Discharge leachate and stormwater	June 2014	1 June 2020
	4526-3	Discharge emissions to air	June 2014 June 2020	1 June 2026
	4527-3	Discharge solids to land	June 2014 June 2020	1 June 2026
Okato	3860-2	Discharge leachate and stormwater	-	1 June 2013 (expired)
	3860-3	To discharge stormwater and leachate	June 2019 June 2025	June 2031
	4528-2	Discharge emission to air	-	1 June 2013 (expired)
	4528-3	Discharge emission to air	June 2019 June 2025	June 2031
	4529-2	Discharge solids to land	-	1 June 2013
	4529-3	Discharge solids to land	June 2019 June 2025	June 2031
Marfell Park	4902-1	Discharge leachate and stormwater	-	1 June 2014
Oakura	4962-1	Discharge leachate and stormwater	-	1 June 2013 (surrendered)
Okoki	3955-2	Discharge leachate and stormwater	-	1 June 2015

1.3.1 Water discharge permits

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

NPDC holds water discharge permit 3954-2 to cover the discharge of up to a total of 4,752 cubic metres/day (55 L/s) of leachate and stormwater from the Inglewood municipal landfill to an unnamed tributary of the Awai Stream, a tributary of the Mangaoraka Stream, in the Waiongana catchment. This permit was issued by the Taranaki Regional Council on 18 February 2002 under Section 87(e) of the Resource Management Act. It is due to expire on 1 June 2020.

It has 8 special conditions;

Special condition 1 requires that a site contingency plan be prepared, maintained and adhered to.

Special condition 2 requires the consent holder to prepare a landfill operations and management plan.

Special condition 3 states that the consent holder shall prepare a landfill closure management plan by 1 June 2007 or 3 months prior to the closure of the landfill.

Special condition 4 allows for changes to management plans relating to the landfill.

Special conditions 5, 6 and 7 relate to monitoring of water associated with the site, leachate and stormwater collection and discharge, and discharge effects on aquatic life or receiving water quality respectively.

Special condition 8 allows for the review, amendment, deletion or addition to the conditions of the resource consent.

A copy of this permit is attached to this report in Appendix I.

The NPDC held resource consent 3860-1 to cover the discharge of up to 4,320 cubic metres/day of stormwater and up to 2.5 cubic metres/day of leachate from the Okato municipal landfill into an unnamed tributary of the Kaihihi Stream. This permit was issued by the Taranaki Regional Council on 22 March 1995 under Section 87(e) of the Resource Management Act. It expired on 1 June 2013. As the consent holder had lodged an application for renewal, this consent remained in force under section 124 of the Resource Management Act until renewed on 13 September 2013.

It had 5 special conditions;

Special condition 1 required the consent holder to prepare, maintain and adhere to a management plan and site contingency plan.

Special conditions 2 and 3 required that the stormwater systems be maintained and that the stream adjacent to the landfill be allowed to vegetate to assist in the treatment of any leachate.

Special condition 4 required that the discharge shall not cause any significant adverse effects on aquatic life or receiving water quality.

Special condition 5 outlined review conditions.

A copy of this permit is attached to this report in Appendix I.

The NPDC holds resource consent 3860-2 to discharge stormwater and leachate from the Okato Municipal Landfill into an unnamed tributary of the Kaihihi Stream. This permit was issued by the Taranaki Regional Council on 13 September 2013 under Section 87(e) of the Resource Management Act. It expires on 1 June 2031

It has 7 special conditions;

Special condition 1 requires the consent holder to adopt best practice.

Special condition 2 requires the consent holder to adhere to the landfill management plan as supplied with the application.

Special conditions 3 and 4 deal with the management of stormwater and leachate of the previously filled area.

Special condition 5 requires that leachate from any contingency filling be directed to a lined holding pond

Special condition 6 is lapse condition

Special condition 7 is a review condition

The NPDC holds resource consent 3955-2 to cover the discharge of up to 864 cubic metres/day [10 litres/second] of stormwater and leachate from a former landfill site into the Urenui River. This permit was issued by the Taranaki Regional Council on 26 November 1996 under Section 87(e) of the Resource Management Act. It is due to expire on 1 June 2015.

It has 6 special conditions;

Special condition 1 requires that stormwater drains and ground contours be installed and maintained to minimise stormwater movement across, or ponding on, the site; and shall maintain soil cover on the site.

Special condition 2 states that adequate vegetation cover shall be maintained to prevent dust emission or stormwater erosion of the site.

Special condition 3 stipulates that the best practicable option be adopted to prevent or minimise any adverse effect on the environment associated with the discharges of leachate.

Special condition 4 stipulates that the discharge shall not give rise to any significant adverse effects on aquatic life or receiving water quality in the Urenui River.

Special conditions 5 and 6 are review conditions.

A copy of this permit is attached to this report in Appendix I.

The NPDC holds resource consent 4902-1 to cover the discharge of up to 2 litres/second of leachate from the Marfell Park former landfill site via groundwater into the Mangaotuku Stream in the Huatoki catchment. This permit was issued by the Taranaki Regional Council on 26 January 1996 under Section 87(e) of the Resource Management Act. It is due to expire on 1 June 2014.

It has 7 special conditions;

Special condition 1 requires the installation and maintenance of stormwater drains and ground contours to minimise stormwater movement across or ponding on the site.

Special condition 2 requires maintenance of vegetation cover on the site.

Special condition 3 requires adoption of best practicable option to prevent or minimise any adverse effect on the environment associated with the discharges of leachate from the site.

Special condition 4 stipulates that the exercise of the consent shall not cause the level of unionised ammonia in the receiving water to exceed 0.025 g/m^3.

Special condition 5 stipulates that the discharge shall not give rise to any significant adverse effects on aquatic life or receiving water quality.

Special conditions 6 and 7 are review conditions.

A copy of this permit is attached to this report in Appendix I.

1.3.2 Air discharge permits

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

The NPDC holds air discharge consent 4526-3 (renewed) to discharge emissions into the air from the Inglewood municipal landfill activity. This permit was issued by the Taranaki Regional Council on 20 March 2007 under Section 87(e) of the Resource Management Act. It is due to expire on 1 June 2026 and is next due for review in June 2014.

It has 4 special conditions;

Special conditions 1 and 2 require the submission of a contingency plan and management plan.

Special condition 3 requires the NPDC to notify Council of any changes to its operations at the site.

Special condition 4 is a review condition.

A copy of this permit is attached to this report in Appendix I.

The NPDC held resource consent 4528-2 to cover the discharge of emissions to air from the Okato municipal landfill activities. This permit was issued by the Taranaki Regional Council on 22 March 2002 under Section 87(e) of the Resource Management Act. It expired on 1 June 2013. As the consent holder had lodged an application for renewal, this consent remained in force under section 124 of the Resource Management Act until renewed on 13 September 2013.

It had 2 special conditions;

Special condition 1 required the preparation and maintenance of a landfill operations management plan and a site contingency plan, and adherence to these plans.

Special condition 2 was a review condition.

A copy of this permit is attached to this report in Appendix I.

The NPDC holds resource consent 4528-3 to discharge emissions into the air from the contingency discharge of solid contaminants at the Okato Municipal Landfill. This permit was issued by the Taranaki Regional Council on 13 September 2013 under Section 87(e) of the Resource Management Act. It will expire on 1 June 2031.

It has 6 special conditions;

Special condition 1 specifies that discharge or refuse only occur on a contingency basis as set out in the management plan supplied with the application.

Special condition 2 requires the consent holder to adopt best practice.

Special condition 3 prohibits objectionable and offensive odours beyond the boundary.

Special condition 4 sets out limits for PM10 and dust deposition.

Special condition 5 is a lapse condition.

Special condition 6 is a review condition.

A copy of this permit is attached to this report in Appendix I.

1.3.3 Discharges of wastes to land

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

NPDC holds water discharge permit 4527-3 to discharge cleanfill and inert materials onto and into land at the Inglewood municipal landfill at or about GR: Q19:120-295, and to discharge municipal refuse onto and into land at the Inglewood municipal landfill when, and only when, it cannot be discharged at the Colson Road municipal landfill. The consent expires on 1 June 2026.

It has 12 special conditions;

Special condition 1 requires that the consent holder adopts best practice.

Special conditions 2, 3, 4 and 5 deal with the landfill management plan and the information supplied in the consent applications.

Special condition 6 stipulates the maximum water content of sludges to be disposed.

Special conditions 7 and 8 define the term “clean fill”.

Special condition 9 stipulates that discharge to land will not result in contaminants entering surface water.

Special conditions 10 and requires that stormwater and leachate systems are maintained.

A copy of this permit is attached to this report in Appendix I.

NPDC held resource consent 4529-2 to cover the discharge of up to 4.5 cubic metres/day of solid contaminants onto and into land at the Okato municipal landfill. This permit was issued by the Taranaki Regional Council on 22 March 1995 under Section 87(e) of the Resource Management Act. It expired on 1 June 2013. As the consent holder had lodged an application for renewal, this consent remained in force under section 124 of the Resource Management Act until renewed on 13 September 2013.

It had 2 special conditions;

Special condition 1 required preparation and maintenance of a landfill operations management plan and a site contingency plan, and adherence to these plans.

Special condition 2 was a review condition.

A copy of this permit is attached to this report in Appendix I.

NPDC holds resource consent 4529-3 to discharge cleanfill and greenwaste to land and to discharge general refuse on a contingency basis to land. This permit was issued by the Taranaki Regional Council on 9 September 2013 under Section 87(e) of the Resource Management Act. It will expire on 1 June 2031.

It has 15 special conditions;

Special condition 1 specifies that contaminants may only be discharged within the footprint of the existing landfill.

Special condition 2 requires the consent holder adopt best practice.

Special condition 3 requires the consent holder to maintain stormwater and diversion drains.

Special condition 4 requires that the existing landfill cap not be disturbed.

Special condition 5 requires any areas used for the discharge of cleanfill and green waste be re-vegetated and reinstated.

Special condition 6 requires that cleanfill be discharged as set out in the landfill management plan as supplied with the application.

Special conditions 7, 8 and 9 deal with what materials are acceptable as cleanfill.

Special condition 10 requires that greenwaste be discharged as set out in the landfill management plan as supplied with the application.

Special condition 11 states that general refuse shall only be discharged as set out in the landfill management plan as supplied with the application.

Special condition 12 deals with notification requirements.

Special condition 13 deals with site reinstatement.

Special condition 14 is a lapse condition.

Special condition 15 is a review condition.

A copy of this permit is attached to this report in Appendix I.

1.4 Monitoring programmes

1.4.1 Introduction

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

The Taranaki Regional 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 NPDC landfill sites consisted of four primary components.

1.4.2 Programme liaison and management

There is generally a significant investment of time and resources by the Taranaki Regional Council in on-going liaison with resource consent holders over consent conditions and their interpretation and application, in discussion over monitoring requirements, preparation for any reviews, renewals, or new consents, advice on the Council's environmental management strategies and the content of regional plans, and consultation on associated matters.

1.4.3 Site inspections

A total of eight inspections were carried out across all the sites. With regard to consents for the discharge to water, inspections focused on site processes with potential or actual discharges to receiving watercourses, including contaminated stormwater, and any emissions to air.

1.4.4 Chemical sampling

The Taranaki Regional Council took a total of 16 receiving water and three discharge samples for physicochemical analysis during the monitoring year across all of the NPDC landfill sites covered in this report.

1.4.5 Biomonitoring surveys

A biological survey was performed on two occasions at the Inglewood landfill in two unnamed tributaries of the Awai Stream.

Table 2 Summary of monitoring activities carried out at the NPDC landfills during the monitoring period

Landfill	Number of discharge samples	Number of receiving water samples	Number of inspections	Biomonitoring surveys	Ambient air surveys
Inglewood	2	8	4	2	4
Okato	0	4	2	0	0
Marfell Park	1	2	1	0	0
Oakura	0	2	1	0	0
TOTAL	3	16	8	2	4

2. Inglewood landfill

2.1 Results

2.1.1 Sampling sites

Figure 1 shows the sampling sites used for monitoring the Inglewood landfill.

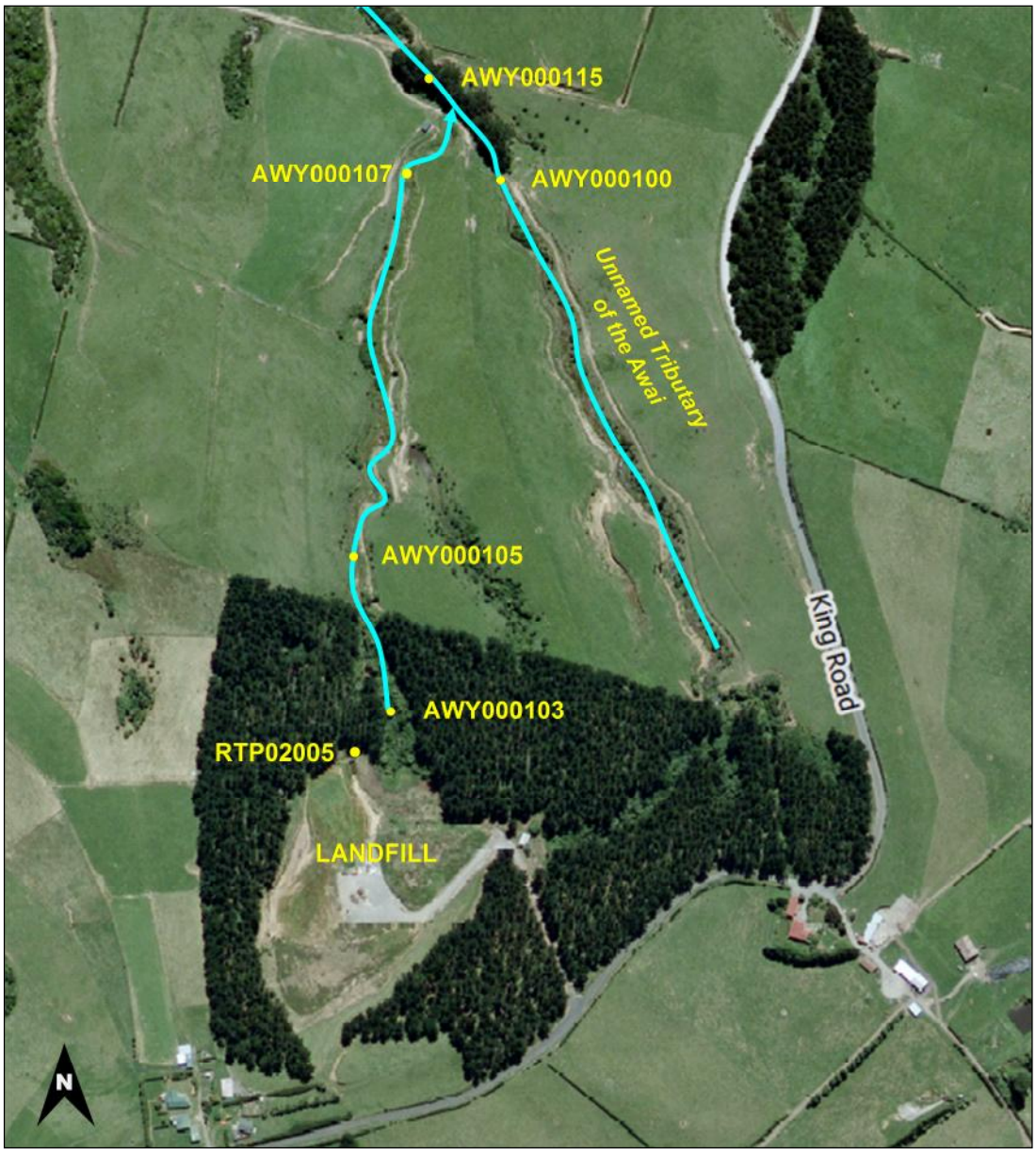

Figure 1 Inglewood landfill and sampling sites

2.1.2 Site inspections

Four site inspections were carried out during the period under review.

3 October 2012
A site visit was to conduct a compliance monitoring inspection and to take water samples. There were intermittent showers with 24 mm rain over the previous 48 hours.

The cap was well vegetated and appeared to be stable and sound.

The leachate/stormwater pond was half full and not discharging. There was some kind of organic growth floating on the surface (either algae or iron oxide bacteria). A sample of pond water was taken to be tested for the usual parameters and iron.

A methane meter was deployed at the site boundary, the leachate/stormwater pond, and at the culvert discharge, and no methane was detected.

10 January 2013
A site visit was to conduct a compliance monitoring inspection and to take methane readings. The weather was fine with no rain over the past 48 hours.

The cap had a high level grass cover and there was no evidence of cracking or subsidence. No issues were noted in regards to exposed refuse, odour or ponding. A methane meter was deployed and no methane was detected at the stormwater pond, culvert discharge, or at the site boundary.

7 February 2013
A site visit was to conduct a compliance monitoring inspection. The weather was fine with 47 mm of rain over the past 72 hours.

The cap had a thick grass and had not been grazed for sometime and there was no evidence of cracking or subsidence. No issues were noted in regards to exposed refuse, odour or ponding. The drains were clear and appeared to have performed well during the rain.

The transfer station was clean and tidy. There were issues in regards to windblown litter.

2 May 2013
A site visit was made to conduct a compliance monitoring inspection and take methane readings. It was overcast at the time of the inspection with no rain over the previous three days. The cap was in good condition and appeared to have not been grazed for awhile. It had good grass cover and there was no sign of cracking or slumping. The leachate/stormwater pond was full but not discharging at the time. A sample was taken from the pond and the sample was found to be odourless. Access to the discharge point was difficult due to gorse and blackberry growth. The site manager was contacted in regards to this and a digger was arranged to clear the access paths.

No effects were noted in the tributary system below the landfill

Methane readings were taken all during the inspection and none was detected.

2.1.3 Results of stormwater monitoring

Two samples were taken from the stormwater/leachate pond during the monitoring period. The results are presented in Table 3.

Table 3 Chemical analysis of samples taken from the Inglewood Landfill leachate/stormwater pond (site RTP002005)

Parameter	Unit	03 Oct 2012	02 May 2013
Biochemical oxygen demand	g/m^3	1.5	2.5
Conductivity @ 20 ^{o}C	mS/m	32.0	16.0
Acid soluble iron	g/m^3	0.12	*
Unionised ammonia	g/m^3 N	0.00045	0.00037
Ammoniacal Nitrogen	g/m^3 N	0.068	0.130
pH	pH	7.4	7.0
Temperature	^{o}C	12.0	13.0
Turbidity	NTU	1.6	1.5
Dissolved zinc	g/m^3	0.007	0.013

The pond only discharges directly into the landfill tributary after heavy rain. Accumulated water in the pond tends to be lost to evaporation and seepage so there is usually a significant amount of freeboard present at any given time.

On both sampling occasions the pond was not discharging, and the results indicate that any discharges when they do occur would not be likely to have any significant adverse effect on the receiving environment.

2.1.4 Results surface water sampling

2.1.4.1 Chemical analysis

Receiving water quality sampling was undertaken at sites AWY00100, AWY100115, AWY000103 and AWY000115 on two occasions, 3 October 2012 and 2 May 2013. The results of the chemical analysis of these samples are shown in Tables 4 & 5.

Table 4 Chemical analysis of the Awai Stream tributaries sites on 3 October 2012

Parameter	Unit	AWY000103	AWY000105	AWY000100	AWY000115
		30 m d/s of landfill(culvert discharge)	130m d/s of landfill	u/s of confluence of landfill trib.	d/s of confluence of landfill trib
Alkalinity	g/m3 $CaCO_3$	418	97	17	37
pH	pH	6.7	7.1	7.0	7.4
Conductivity	mS/m	90.3	34.3	8.6	16.3
Turbidity	NTU	880	2.9	4.3	1.7
Temperature	Deg C	15.8	12.4	12.3	12.1
Dissolved reactive phosphorus	g/m^3	0.010	<0.003	<0.003	<0.003
BOD	g/m^3	5.3	>16	<0.5	0.9
Ammoniacal nitrogen	g/m^3-N	46.8	3.38	<0.003	0.006
Unionised ammonia	g/m^3-N	0.08209	0.01155	0.00001	0.00004

Parameter	Unit	AWY000103	AWY000105	AWY000100	AWY000115
		30 m d/s of landfill(culvert discharge)	130m d/s of landfill	u/s of confluence of landfill trib.	d/s of confluence of landfill trib
Nitrate/nitrite nitrogen	g/m^3-N	0.02	8.45	0.49	3.58
Acid soluble iron	g/m^3	70.5	0.12	0.72	0.21
Total mercury	g/m^3	*	<0.0002	*	*
Acid soluble manganese	g/m^3	4.84	2.97	0.06	0.03
Dissolved zinc	g/m^3	0.007	<0.005	0.007	<0.005

Key * = not measured

Table 5 Chemical analysis of the Awai Stream tributaries sites on 2 May 2013

Parameter	Unit	AWY000105	AWY000100	AWY000115
		130m d/s of landfill	u/s of confluence of landfill trib.	d/s of confluence of landfill trib
Alkalinity	g/m3 $CaCO_3$	82	21	36
pH	pH	7.4	7.0	7.3
Temperature	Deg C	14.7	14.7	14.8
Conductivity	mS/m	32.2	8.5	14
Dissolved oxygen	g/m^3	5.59	9.4	9.57
% saturation oxygen	% O_2	55	93.7	95.3
Dissolved reactive phosphorus	g/m^3	<0.003	<0.003	0.003
BOD	g/m^3	2.5	<0.5	<0.5
Ammoniacal nitrogen	g/m^3-N	0.081	<0.003	0.013
Unionised ammonia	g/m^3-N	0.00065	0.00001	0.00008
Nitrate/nitrite nitrogen	g/m^3-N	9.21	0.47	2.39
Acid soluble iron	g/m^3	0.49	0.84	0.53
Total mercury	g/m^3	<0.0002	-	-
Acid soluble manganese	g/m^3	0.63	0.08	0.12
Dissolved zinc	g/m^3	<0.005	<0.005	<0.005

As with previous results the discharge from the culvert below the landfill exhibits leachate contamination as indicated by the high levels of conductivity, alkalinity, iron, manganese, and ammonia found on the one occasion it was sampled. Site AWY000103 was not sampled on the second sampling run due to access issues.

The levels of contaminants found 130 m downstream of the discharge (at site AWY000103) are far lower indicating that the intervening wetland is being effective at reducing contaminant levels.

The unnamed tributary that receives the discharge from the landfill tributary has slight increases in conductivity, alkalinity and ammoniacal nitrogen and nitrite/nitrate nitrogen when comparing results of the up and downstream sites (AWY000100 and AWY000115). These increases have been noted in previous monitoring years and are mostly likely a result of the presence of the landfill.

The levels of these contaminants however are within acceptable ranges and unlikely to have any adverse effects on aquatic ecosystems.

2.1.4.2 Biomonitoring

1 October 2012

Macroinvertebrate sampling was undertaken on 1 October 2012, at four sites in two tributaries of the Awai Streams, using either the 'sweep-net' or 'kick' sampling technique, both standard sampling techniques used by the Council. This was undertaken to assess whether leachate discharges from Inglewood landfill had had any adverse effects on the macroinvertebrate communities of this stream. Samples were processed to provide number of taxa (richness), MCI and $SQMCI_s$ scores for each site.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The $SQMCI_s$ takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtly changes in communities, particularly if non-organic impacts are occurring. Significant differences in the MCI or the $SQMCI_s$ between sites indicate the degree of adverse effects (if any) of the discharges monitored.

This October 2012 survey did not indicate that leachate from the Inglewood landfill had significantly affected the freshwater macroinvertebrate communities in these tributaries. These communities appear to be determined by the physical habitat conditions, particularly the slow to steady current speeds, soft/fine substrate and changes in macrophyte habitats available to the aquatic invertebrates.

The smaller, landfill drainage tributary sites had similar taxa richness and $SQMCI_s$ scores, but the MCI score improved significantly in a downstream direction. The differences observed between the sites can probably be attributed to the difference in available habitat, with better habitat at site 1b (downstream) resulting in a lower proportion of 'tolerant taxa'. This site has progressively become choked with vegetation, but the wetted area is greater, and water speeds swifter.

No significant differences were recorded in MCI and $SQMCI_s$ scores between the two sites (2 and 3) in the larger tributary of the Awai Stream. However, these two sites had significantly higher MCI and $SQMCI_s$ scores compared to the two sites in the smaller tributary (1a and 1b), and these scores were also significantly higher than their respective medians, which was indicative of improved water quality in the larger tributary. Once again, differences in habitat condition were thought to be the main reason for these differences in the macroinvertebrate communities in the two tributaries.

No sites supported any undesirable biological growths.

The results of this survey provide no indication that the discharge of leachate into the unnamed tributary of the Awai Stream was having a significant adverse effect on the macroinvertebrate communities in the tributaries monitored.

12 February 2013

Macroinvertebrate sampling was undertaken on 12 February 2013, at four sites in two tributaries of the Awai Streams, using either the 'sweep-net' or 'kick' sampling technique, both standard sampling techniques used by the Council. This was undertaken to assess whether leachate discharges from Inglewood landfill had had any adverse effects on the macroinvertebrate communities of this stream. Samples were processed to provide number of taxa (richness), MCI and $SQMCI_s$ scores for each site.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The $SQMCI_s$ takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtly changes in communities, particularly if non-organic impacts are occurring. Significant differences in the MCI or the $SQMCI_s$ between sites indicate the degree of adverse effects (if any) of the discharges monitored.

This February 2013 survey did not indicate that leachate from the Inglewood landfill had significantly affected the freshwater macroinvertebrate communities in these tributaries. These communities appear to be determined by the physical habitat conditions, particularly the slow to steady current speeds, soft/fine substrate and changes in macrophyte habitats available to the aquatic invertebrates.

The smaller, landfill drainage tributary sites exhibited slight improvements in taxa richness, MCI score and $SQMCI_s$ score in a downstream direction. Although these differences weren't statistically significant, the differences observed between the sites can probably be attributed to the difference in available habitat, with better habitat at site 1b (downstream) resulting in a lower proportion of 'tolerant taxa'. This site has progressively become choked with vegetation, but the wetted area is greater, and water speeds swifter.

No significant differences were recorded in the MCI scores between the two sites (2 and 3) in the larger tributary of the Awai Stream, although the $SQMCI_s$ score did reduce significantly from site 2 to site 3. However, these two sites had significantly higher MCI and $SQMCI_s$ scores compared to the two sites in the smaller tributary (1a and 1b), and these scores were also significantly higher than their respective medians, which was indicative of improved water quality in the larger tributary. Once again, differences in habitat condition were thought to be the main reason for these differences in the macroinvertebrate communities in the two tributaries.

No sites supported any undesirable biological growths.

The results of this survey provide no indication that the discharge of leachate into the unnamed tributary of the Awai Stream was having a significant adverse effect on the macroinvertebrate communities in the tributaries monitored.

2.1.5 Air quality

Methane readings were taken at the landfill entrance gate and at the culvert at the toe of the landfill during routine site inspections.

No methane was detected at either monitoring point at the landfill in the monitoring period under review. No objectionable odours were noted on the site beyond the site boundary during any inspection.

2.2 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 e.g. provision of advice and information, or investigation of potential or actual causes of non-compliance or failure to maintain good practices. A pro-active approach that in the first instance avoids issues occurring is favoured.

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

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

In the 2012-2013 period, it was not necessary for the Council to undertake significant additional investigations and interventions, or record incidents, in association with NPDC's conditions in resource consents or provisions in Regional Plans in relation to the consent holder's activities at the Inglewood landfill during the monitoring period.

2.3 Discussion

2.3.1 Discussion of site performance

The landfill at Inglewood continues to act as a contingency landfill for NPDC. There were no issues noted in regards to management of the site or its discharges over the 2012-2013 period. There were no complaints in regard to the landfill received by Council during this period. NPDC were cooperative in improving site access for Council staff during the period under review.

2.3.2 Environmental effects of exercise of consents

Water sampling undertaken during the year shows that the tributary immediately below the landfill continues to experience contamination from the landfill, however the levels of these contaminants are significantly attenuated 130 m downstream of the landfill.

The larger tributary of the Awai Stream (downstream of the land fill tributary) appears to be relatively unaffected by the discharges into the landfill tributary.

Biomonitoring surveys undertaken during the 2012-2013 period indicated that there were no significant effects to aquatic life in either of the unnamed tributaries of the Awai Stream downstream of the landfill.

Based on the results of this monitoring period the presence of the landfill is not having significant adverse effects on the water quality downstream of the site.

The results from inspections and air quality monitoring also show that the presence of the landfill is not having any significant effects in terms of emissions to air.

2.4 Evaluation of performance

A tabular summary of NPDC's compliance record for the year under review is set out in Tables 6-8.

Table 6 Summary of performance for consent 3954-2 to discharge leachate and stormwater

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Prepare and maintain a site contingency plan	Site specific monitoring programme in place – programme supervision	Yes
2. Prepare and maintain a landfill operations and management plan	Site specific monitoring programme in place – programme supervision	Yes
3. Provide a landfill closure management plan by 1 June 2007	Plan provided	Yes
4. Advise of any changes being made to the operation and management plan or closure management plan	Site specific monitoring programme in place – programme supervision	Yes
5. Monitor ground and surface water on and near the site	Site specific monitoring programme in place – water sampling	Yes
6. Maintain all stormwater and collection systems	Site specific monitoring programme in place – inspection	Yes
7. No adverse impact on aquatic life	Site specific monitoring programme in place – biomonitoring and water sampling	Yes
8. Optional review provision re environmental effects	No review required	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**

N/A = not applicable

Table 7 Summary of performance for Consent 4526-2 to discharge emissions to air

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Prepare and maintain a site contingency plan	Site specific monitoring programme in place – programme supervision	Yes
2. Prepare and maintain a landfill operations and management plan	Site specific monitoring programme in place – programme supervision	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
3. Advise of any changes being made to the operation and management plan	Site specific monitoring programme in place – programme supervision	Yes
4. Optional review provision re environmental effects	No review required	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**

N/A = not applicable

Table 8 Summary of performance for Consent 4527-3 to discharge contaminants onto land

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. The consent holder shall adopt the best practicable option	Site specific monitoring programme in place – programme supervision	Yes
2. The activity shall be undertaken in accordance with the application documents	Site specific monitoring programme in place – programme supervision	Yes
3. Notification of changes to landfill management plan	Site specific monitoring programme in place – programme supervision	Yes
4. Maintain and adhere to management plan	Site specific monitoring programme in place – programme supervision and inspection	Yes
5. Consent conditions to prevail over management plan	Site specific monitoring programme in place – programme supervision and inspection	Yes
6. Liquid waste shall not be accepted at the landfill	Site specific monitoring programme in place – water sampling	Yes
7. Acceptable cleanfill criteria	Site specific monitoring programme in place – inspection	Yes
8. Unacceptable cleanfill criteria	Site specific monitoring programme in place – programme supervision	Yes
9. Discharge shall not result in contaminants directly entering water	Site specific monitoring programme in place – programme supervision	Yes
10. Install leachate retention structures	Site specific monitoring programme in place – inspection	Yes
11. Install stormwater systems	Site specific monitoring programme in place – inspection	Yes
12. Optional review provision re environmental effects	No review required	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**

During the year, NPDC demonstrated a high level of environmental performance and compliance with the resource consents in relating to the Inglewood landfill. During the year under review there were no complaints regarding the site and no significant environmental effects due to the operation of the site.

2.5 Recommendation from the 2011-2012 Annual Report

In the 2011-2012 Annual Report, it was recommended:

THAT monitoring of discharges from Inglewood landfill in the 2012-2013 year continues at the same level as in 2011-2012.

This recommendation was implemented in full.

2.6 Alterations to monitoring programmes for 2013-2014

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

It is proposed that for 2013-2014, monitoring of the Inglewood landfill continue at the same level as in 2012-2013.

A recommendation to this effect is attached to this report.

2.7 Exercise of optional review of consent

Resource consents 3954-2, 4526-3 and 4527-3 provide for an optional review in June 2014. Conditions in these consents allow the Council to review the consents 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 was not appropriate to deal with at the time.

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

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

2.8 Recommendations

1. THAT monitoring of discharges from Inglewood landfill in the 2013-2014 year continues at the same level as in 2012-2013.

2. THAT the option for a review of resource consents 3954-2, 4526-3 and 4527-3 in June 2014 , not be exercised, on the grounds that current consent conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent.

3. Okato landfill

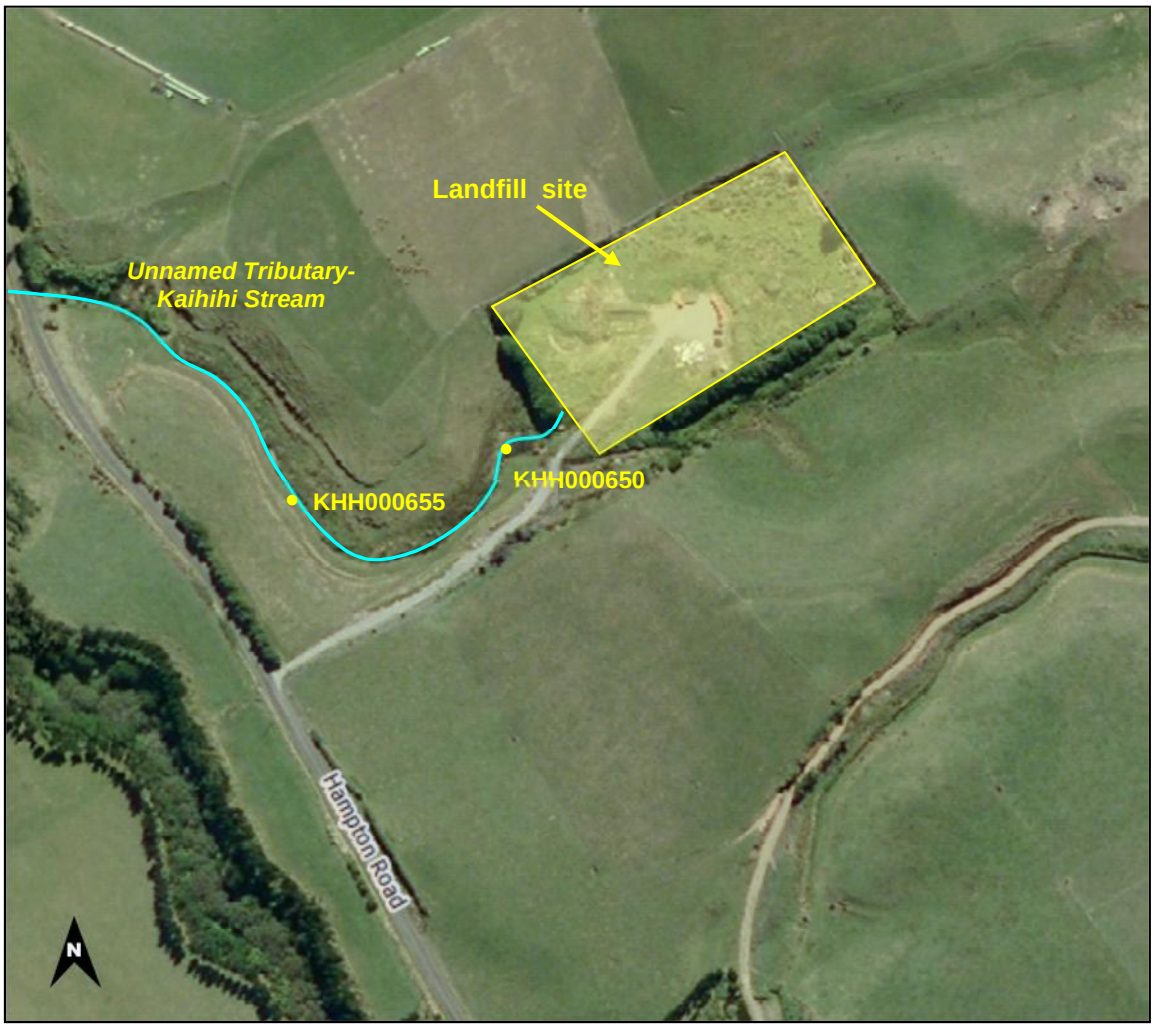

Figure 2 Okato landfill and sampling sites

3.1 Results

3.1.1 Inspections

26 July 2012
A site visit was made to conduct a compliance monitoring inspection and to take water samples. The weather was fine and cool with 40 mm rain falling over the past four days.

The vegetated area of the cap appeared to be well drained and stable with no evidence of subsidence or erosion. The transfer station area was also well drained and no ponding was observed. Samples were taken from the sites downstream of the landfill in the Raupo wetland. No issues were noted during the inspection.

8 May 2013
A site visit was made to conduct a compliance monitoring inspection and to take water samples. The weather was fine with no rain falling over the past 24 hours. The site manager was met onsite to discuss resource consent renewal applications.

The vegetated area of the cap appeared to be well drained and stable with no evidence of subsidence or erosion. The transfer station area was also well drained and no ponding was observed. Greenwaste was being discharged, covered and contoured at the usual site. Samples were taken from the sites downstream of the landfill in the raupo wetland. No issues were noted during the inspection.

3.1.2 Results of surface water sampling

Samples were collected from the tributary of the Kaihihi Stream below the landfill on two occasions on 26 July 2012 and 8 May 2013.

Figure 2 shows the Okato sampling sites and Tables 9 & 10 show the water quality results.

Table 9 Chemical analysis of a tributary of the Kaihihi Stream, sampled on 26 July 2012

Parameter	Units	KHH000650 30m d/s of landfill	KHH000655 200 m d/s of landfill
Alkalinity	g/m^3 $CaCO_3$	85	46
Conductivity	mS/m	31.3	22.9
Dissolved reactive phosphorus	g/m^3-P	<0.003	<0.003
Acid soluble iron	g/m^3	1.47	21.5
Unionised ammonia	g/m^3-N	0.00051	0.00003
Ammoniacal nitrogen	g/m^3-N	0.293	0.024
Nitrate/nitrite nitrogen	g/m^3-N	2.96	0.93
pH	pH	6.8	6.7
Temperature	Deg C	12.7	12.7
Dissolved zinc	g/m^3	0.010	<0.005

Key * = mot measured

Table 10 Chemical analysis of a tributary of the Kaihihi Stream, sampled on 8 May 2013

Parameter	Units	KHH000650 30m d/s of landfill	KHH000655 200 m d/s of landfill
Alkalinity	g/m^3 $CaCO_3$	85	76
Conductivity	mS/m	32.6	29.0
Dissolved reactive phosphorus	g/m^3-P	<0.003	0.008
Acid soluble iron	g/m^3	1.36	3.88
Unionised ammonia	g/m^3-N	0.00047	0.00034
Ammoniacal nitrogen	g/m^3-N	0.219	0.104
Nitrate/nitrite nitrogen	g/m^3-N	1.05	0.02
pH	pH	6.9	7.1
Temperature	°C	12.3	11.8
Dissolved zinc	g/m^3	<0.005	<0.005

As with previous monitoring results there is no indication that the presence of the landfill is having any significant adverse effects on the environment. The levels of ammonia immediately below the land-filled area and other indicator contaminants are low, indicating only low levels of leachate contamination. An elevated level of iron was found at the downstream site on 26 July 2012, however this site is very swampy and samples are often contaminated with sediments which may contribute to this.

Based on the results of this period, and from previous monitoring periods, the presence of the landfill is not having a significant adverse effect on the receiving environment.

3.1.3 Air quality

Objectionable odour and dust nuisance were checked for during each inspection in the monitoring period. There were no problems in regard to dust or odour during any of the inspections for the period under review.

3.2 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 e.g. provision of advice and information, or investigation of potential or actual causes of non-compliance or failure to maintain good practices. A pro-active approach that in the first instance avoids issues occurring is favoured.

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

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

In the 2012-2013 period, it was not necessary for the Council to undertake significant additional investigations and interventions, or record incidents, in association with NPDC's conditions in resource consents or provisions in Regional Plans in relation to the consent holders activities at the Okato landfill during the monitoring period.

3.3 Discussion

3.3.1 Discussion of site performance

Overall, the site was managed well during the 2012-2013 period. There were no issues in regards to cap condition. It was considered that there was good control over the site and its operation during the monitoring period.

3.3.2 Environmental effects of exercise of consents

The landfill will carry on generating leachate, some of which will continue to enter the stream below the site via ground and spring water.

Physicochemical analysis of the unnamed tributary indicates that the landfill is having no significant adverse effect on water quality at this site.

There were no issues of concern during the 2012-2013 monitoring period. No odour or dust problems were observed at or beyond the boundary of the site.

3.4 Evaluation of performance

A tabular summary of NPDC's compliance record for the year under review is set out in Tables 11-13.

Table 11 Summary of performance for consent 3860-2 to discharge leachate and stormwater

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Prepare and maintain a landfill operations and management plan and a site contingency plan	Site specific monitoring programme – programme supervision	Yes
2. Maintain all stormwater and collection systems	Site specific monitoring programme – inspection	Yes
3. Allow the stream draining the eastern side of the landfill to revegetate	Site specific monitoring programme – programme supervision	Yes
4. No adverse impact on aquatic life	Site specific monitoring programme – inspection, water sampling, and biomonitoring	Yes
5. Optional review provision re environmental effects	N/A	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High

N/A = not applicable

Table 12 Summary of performance for consent 4528-2 to discharge emissions to air

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Prepare and maintain a landfill operations and management plan and a site contingency plan	Site specific monitoring programme – programme supervision	Yes
2. Optional review provision re environmental effects	N/A	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**

N/A = not applicable

Table 13 Summary of performance for consent 4529-2 to discharge emissions to air

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Prepare and maintain a landfill operations and management plan and a site contingency plan	Site specific monitoring programme – programme supervision	Yes
2. Optional review provision re environmental effects	N/A	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High

N/A = not applicable

During the year, NPDC demonstrated a high level of environmental performance and compliance with the resource consents relating to the Okato landfill. During the year under review there were no complaints regarding the site and no significant environmental effects due to the presence of the landfill observed.

3.5 Recommendations from the 2011-2012 Annual Report

In the 2011-2012 Annual Report, it was recommended:

THAT monitoring of discharges from the Okato landfill in the 2012-2013 year continue at the same level as in 2011-2012.

This recommendation was implemented in full.

3.6 Alterations to monitoring programmes for 2013-2014

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

It is proposed that for 2013-2014, that the programme remained unchanged from that of the 2012-2013 period.

A recommendation to this effect is attached to this report.

3.7 Recommendation

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

4. Okoki Road Landfill

The Okoki Rd landfill operated as an uncontrolled landfill from around 1984. In 1991 NPDC obtained consent to discharge leachate and stormwater to the Urenui River and undertook to take control of the site with a view to closing it off within 3 years. The site was closed off and reinstated by September 1994.

Post closure management and monitoring of the site is still necessary. One inspection is undertaken triennially and leachate samples are taken by New Plymouth District Council triennially.

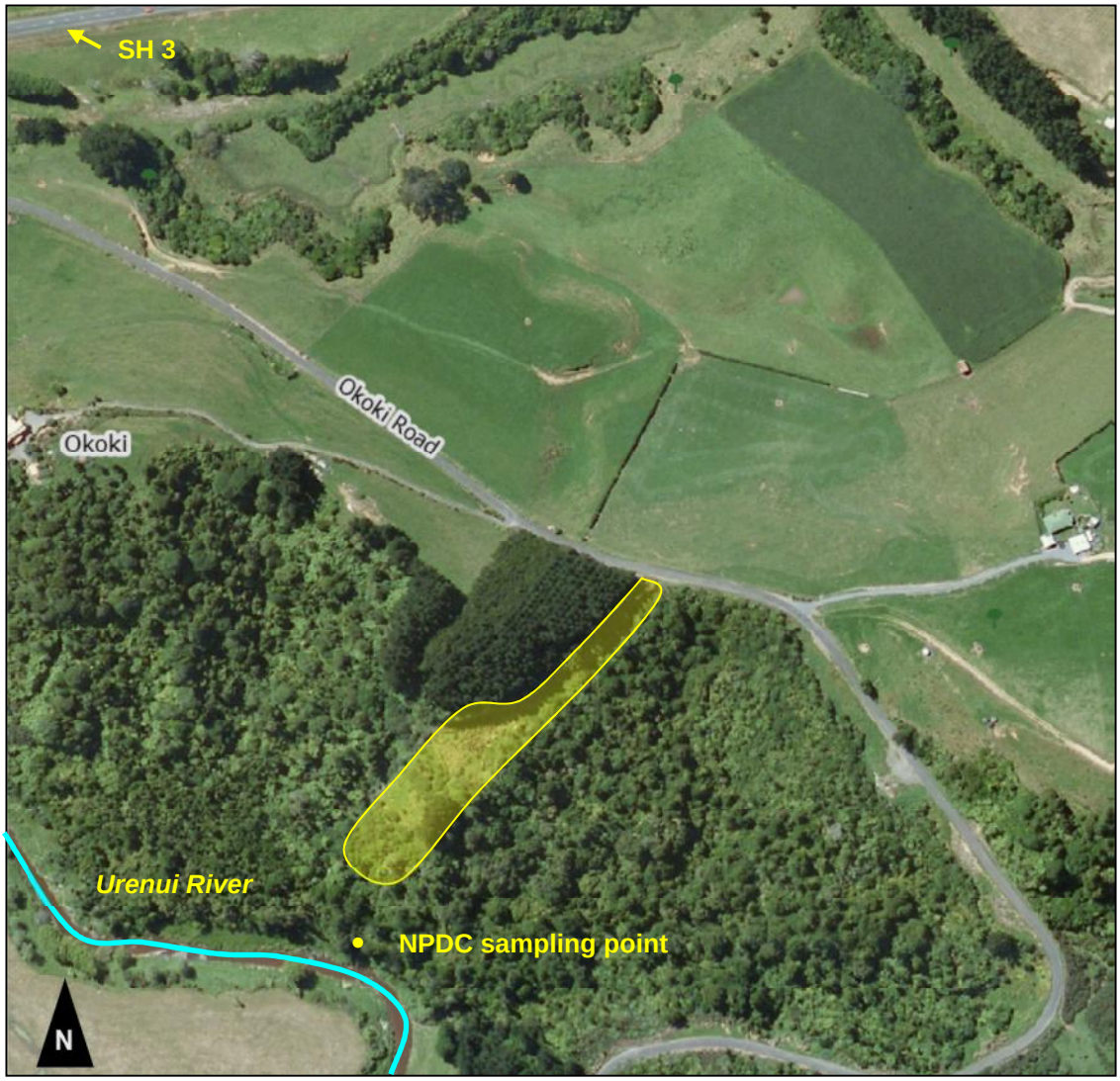

Figure 3 Aerial view of the former landfill at Okoki

4.1 Results

The closed landfill at Okoki is monitored on a triennial basis. No sampling or inspections were scheduled for this period.

4.2 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 e.g. provision of advice and information, or investigation of potential or actual causes of non-compliance or failure to maintain good practices. A pro-active approach that in the first instance avoids issues occurring is favoured.

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

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

In the 2012-2013 period, it was not necessary for the Council to undertake significant additional investigations and interventions, or record incidents, in association with NPDC's conditions in resource consents or provisions in Regional Plans in relation to the consent holders activities at the Okoki landfill during the monitoring period.

4.3 Discussion

4.3.1 Discussion of site performance

Council received no complaints about the site during the 2012-2013 year.

4.3.2 Environmental effects of exercise of consents

No monitoring was undertaken during the period under review. However based on data gathered in previous monitoring periods, the site is unlikely to be having an adverse effect on the Urenui River. The site remains secure and well vegetated and no odour issues were noted during inspection.

4.4 Evaluation of performance

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

Table 14 Summary of performance for consent 3955-2 to discharge leachate

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Maintain drains, and contours on site to minimise unwanted water movement and ponding on site	Site specific monitoring programme – programme supervision and inspection	N/A
2. Maintain an adequate vegetative cover	Site specific monitoring programme – inspections	N/A

Condition requirement	Means of monitoring during period under review	Compliance achieved?
3. Adopt best practice to prevent or minimise any adverse effects on the environment	Site specific monitoring programme – programme supervision, inspection	N/A
4. The discharge Is not to give rise to certain effects in the Urenui River	Site specific monitoring programme – water sampling and inspection	N/A
5. Optional review provision re contamination in discharge	No review this period	N/A
6. Optional review provision re environmental effects	No review this period	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		N/A

N/A = not applicable

4.5 Recommendation from the 2011-2012 Annual Report

The 2011-2012 annual report recommended;

THAT the triennial monitoring of discharges at the Okoki landfill continue unchanged and next be implemented in the 2015-2016 period.

This recommendation was fully implemented.

4.6 Alterations to monitoring programmes for 2013-2014

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

It is now proposed that the triennial monitoring of discharges at the Okoki landfill continue unchanged with the programme next being implemented in the 2015-2016 period.

A recommendation to this effect is given in section 4.7.

4.7 Recommendation

THAT the triennial monitoring of discharges at the Okoki landfill continue unchanged and next be implemented in the 2015-2016 period.

5. Marfell Park Landfill

The landfill at Marfell closed in 1982. Due to effects cause by leachate discharging into the Mangaotukutuku Stream, NPDC applied for consent to discharge leachate in 1996. In 1998 NPDC captured the main leachate flow and directed it to the trade waste system. The discharge from the site now is predominantly stormwater. The site is now a park with sports field, playground, and a BMX track.

Figure 4 An aerial view showing former landfill at Marfell Park and sampling sites

5.1 Results

5.1.1 Inspection

One inspection was undertaken in the period under review.

26 July 2012
A site visit was made to conduct a compliance monitoring inspection and to take water samples. The weather was fine and cool with 90 mm rain falling in the past 4 days.

The upper and lower capped areas were inspected. The topsoil on the cap was quite soft and had significant water content and there were a few small areas of ponding as

result of the recent heavy rain. The grass cover over the cap was healthy and in good condition.

There were no issues in regards to leachate seepages, exposed refuse or odour at the site.

Samples were taken of the stormwater discharge and receiving water.

5.1.2 Receiving water and discharge sampling

Samples were taken on one occasion during the monitoring year. The results are presented below in Table 15.

Table 15 Results of sampling undertaken a Marfell Park landfill 26 July 2012

Parameter	Units	MGK000176 10m u/s discharge	STW001123 discharge	MGK000178 20 m d/s discharge
Alkalinity	g/m^3 $CaCO_3$	27	204	32
Conductivity	mS/m	13.4	44.0	13.9
Acid soluble iron	g/m^3	0.38	19.7	0.61
Unionised ammonia	g/m^3-N	0.00010	0.01988	0.00058
Ammoniacal nitrogen	g/m^3-N	0.027	9.42	0.187
pH	pH	7.2	6.8	7.1
Temperature	°C	11.2	15.2	11.2
Dissolved zinc	g/m^3	<0.005	0.016	<0.005

The discharge is a mixture of stormwater and spring water that drains from the area surrounding the landfill. The bulk of the leachate from the filled area is captured and piped off to trade waste. The results of the discharge monitoring indicate that some low level contamination from the landfill is occurring. However the receiving water indicates very little change in water quality between up and down stream sites. On this occasion the flow conditions were moderate to high and this would contribute to increasing the level of dilution in the stream.

Based on these results and those gathered in previous monitoring periods the discharges are not having a significant adverse effect of the receiving waters.

5.2 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 e.g. provision of advice and information, or investigation of potential or actual causes of non-compliance or failure to maintain good practices. A pro-active approach that in the first instance avoids issues occurring is favoured.

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

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

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

In the 2012-2013 period, it was not necessary for the Council to undertake significant additional investigations and interventions, or record incidents, in association with NPDC's conditions in resource consents or provisions in Regional Plans in relation to the consent holders activities at the Marfell Park landfill during the monitoring period.

5.3 Discussion

5.3.1 Discussion of site performance

The site was well maintained and Council received no complaints about the site during the 2012-2013 year.

5.3.2 Environmental effects of exercise of consents

Inspection and sampling indicated that no significant adverse effects were occurring as a result of the discharges.

5.4 Evaluation of performance

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

Table 16 Summary of performance for consent 4902 -1 to discharge leachate

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Maintain drains, and contours on site to minimise unwanted water movement and ponding on site	Site specific monitoring programme – programme supervision and inspection	Yes
2. Maintain an adequate vegetative cover	Site specific monitoring programme – inspections	Yes
3. Adopt best practice to prevent or minimise any adverse effects on the environment	Site specific monitoring programme – programme supervision, inspection	Yes
4. The discharge sahl not cause free ammonia levels to exceed 0.025 g/m^3 in the Mangaotuku Stream	Site specific monitoring programme – water sampling	Yes
5. The discharge Is not to give rise to certain effects in the Mangaotuku Stream	Site specific monitoring programme – programme supervision, inspection	Yes
6. Optional review provision re contamination in discharge	No review this period	N/A
7. Optional review provision re environmental effects	No review this period	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**

N/A = not applicable

During the year, NPDC demonstrated a high level of environmental performance and compliance with the resource consents relating to the Marfell landfill. During the year under review there were no complaints regarding the site and no significant environmental effects due to the presence of the landfill observed.

5.5 Recommendation from the 2011-2012 Annual Report

In the 2011-2012 Annual Report, it was recommended:

THAT the monitoring of discharges at the Marfell Park landfill continue unchanged and that the programme next be implemented in 2012-2013.

This recommendation was implemented in full.

5.6 Alterations to monitoring programmes for 2013-2014

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

It is proposed that the biennial monitoring of discharges at the Marfell Park landfill continue unchanged with the programme next being implemented in 2014-2015. A recommendation to this effect is given in section 5.5.

5.7 Recommendation

THAT the biennial monitoring of discharges at the Marfell Park landfill continue unchanged and that the programme next be implemented in the 2014-2015 period.

6. Oakura Landfill

The Oakura Landfill (Wairau Road, Oakura) was closed in the mid 1980s and the site has since been converted into two grazed paddocks and an equestrian training arena. In 1995, NPDC applied for a resource consent to monitor the ongoing discharge of leachate from the site.

The Oakura landfill is monitored on a biennial basis and monitoring was undertaken in the 2012-2013 period.

Figure 5 Aerial image showing the former Oakura landfill and sampling sites

6.1 Results

6.1.1 Inspection

On 26 July 2012 a site visit was made to conduct a compliance monitoring inspection and to take water samples. The weather was fine and cool with 90 mm rain falling over the past four days.

The cap was inspected and found to be in good condition and well drained. There was a good cover of vegetation and no evidence of significant ponding or subsidence. The capped area continues to be used as a show-jumping ground and the site appeared to be very well looked after.

No issues with leachate seepages, odour or exposed refuse were noted during the inspection.

Two samples were taken of the receiving water 80m and 200 m downstream of the landfill site. During the sampling the receiving waters were inspected. No visual effects were noted and the samples had no odour.

6.1.2 Receiving environment results

Sampling was undertaken at two sites on one occasion during the period under review. The results are presented below in Table 17. The results indicate that the landfill is not likely to be having a significant effect on the tributary down stream of the landfill. Indicator species such as zinc and alkalinity are low in both samples. Previously sampling was also done upstream but this site had become inaccessible. The levels of alkalinity and zinc found in the sample 80 m downstream are similar to those found upstream in previous monitoring periods. There is slight elevation in ammoniacal nitrogen when making any comparison at the site 80 m downstream of the land fill which may indicate that some low level nitrogenous contamination from the landfill is still occurring. Overall the results are in low range indicating that the landfill is not likely to be having a significant adverse effect on the environment.

Table 17 Results of sampling undertaken at Oakura landfill 26 July 2013

Parameter	Units	WHK000272 80 m d/s of landfill	WHK000280 400 m d/ of landfill
Alkalinity	g/m^3 $CaCO_3$	53	43
Conductivity	mS/m	18.3	18.2
Acid soluble iron	g/m^3	1.34	0.26
Unionised ammonia	g/m^3-N	0.00046	0.00003
Ammoniacal nitrogen	g/m^3-N	0.237	0.011
pH	pH	6.9	7.1
Temperature	°C	11.2	11.0
Dissolved zinc	g/m^3	<0.005	<0.005

6.2 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 e.g. provision of advice and information, or investigation of potential or actual causes of non-compliance or failure to maintain good practices. A pro-active approach that in the first instance avoids issues occurring is favoured.

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

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

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

In the 2012-2013 period, it was not necessary for the Council to undertake significant additional investigations and interventions, or record incidents, in association with NPDC's conditions in resource consents or provisions in Regional Plans in relation to the consent holders activities at the Oakura landfill during the monitoring period.

6.3 Discussion

6.3.1 Discussion of site performance

The site was well maintained and Council received no complaints about the site during the 2012-2013 year.

6.3.2 Environmental effects of exercise of consents

Inspection and sampling indicated that no significant adverse effects were occurring as a result of the discharges. The site was found to be complying with Rule 29 of the Regional Freshwater Plan, and subsequently the consent holder chose not to renew consent 4962 (to discharge leachate), and surrendered the existing consent on 10 May 2013.

6.4 Evaluation of performance

A tabular summary of NPDC's compliance record for the year under review is set out in Table 18.

Table 18 Summary of performance for consent 4962 -1 to discharge leachate

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Maintain drains, and contours on site to minimise unwanted water movement and ponding on site	Site specific monitoring programme – programme supervision and inspection	Yes
2. Maintain an adequate vegetative cover	Site specific monitoring programme – inspections	Yes
3. Adopt best practice to prevent or minimise any adverse effects on the environment	Site specific monitoring programme – programme supervision, inspection	Yes
4. The discharge Is not to give rise to certain effects in the Wairau Stream	Site specific monitoring programme – programme supervision, inspection	Yes
5. Optional review provision re contamination in discharge	No review this period	N/A
6. Optional review provision re environmental effects	No review this period	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High

N/A = not applicable

During the year, NPDC demonstrated a high level of environmental performance and compliance with the resource consents relating to the Oakura landfill. During the year

under review there were no complaints regarding the site and no significant environmental effects due to the presence of the landfill observed.

6.5 Recommendations from the 2010-2011 Annual Report

In the 2010-2011 Annual Report, it was recommended:

THAT the monitoring of discharges at the Oakura landfill continue unchanged and that the programme next be implemented in 2012-2013.

This recommendation was implemented in full.

6.6 Alterations to monitoring programmes for 2013-2014

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

It is now proposed that the biennial monitoring of discharges at the Oakura landfill be discontinued as consent 4962 has been surrendered.

A recommendation to this effect is given in section 6.7.

6.7 Recommendation

THAT the biennial monitoring of discharges at the Oakura landfill be discontinued as consent 4962 has been surrendered.

7. Summary of recommendations

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

7.1 Inglewood landfill

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

2. THAT the option for a review of resource consents 3954-2, 4526-3 and 4527-3 in June 2014 , not be exercised, on the grounds that current consent conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent.

7.2 Okato landfill

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

7.3 Okoki landfill

4. THAT the triennial monitoring of discharges at the Okoki landfill continue unchanged with the programme next being implemented in the 2015-2016 period.

7.4 Marfell Park landfill

5. THAT the biennial monitoring of discharges at the Marfell Park landfill continue unchanged and that the programme next be implemented in the 2014-2015 period.

7.5 Oakura landfill

That the biennial monitoring of discharges at the Oakura landfill be discontinued as consent 4962 has been surrendered.

Glossary of common terms and abbreviations

The following abbreviations and terms that may have been used within this report:

Al*	aluminium
As*	arsenic
Biomonitoring	assessing the health of the environment using aquatic organisms
BOD	biochemical oxygen demand. A measure of the presence of degradable organic matter, taking into account the biological conversion of ammonia to nitrate
BODF	biochemical oxygen demand of a filtered sample
bund	a wall around a tank to contain its contents in the case of a leak
CBOD	carbonaceous biochemical oxygen demand. A measure of the presence of degradable organic matter, excluding the biological conversion of ammonia to nitrate
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
Cumec	A volumetric measure of flow- 1 cubic metre per second (1 m^3s^{-1})
DO	dissolved oxygen
DRP	dissolved reactive phosphorus
E.coli	*escherichia coli,* an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as 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
F	fluoride
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

l/s	litres per second
MCI	macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats
mS/m	millisiemens per metre
mixing zone	the zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to 7 times the width of the stream at the discharge point
NH_4	ammonium, normally expressed in terms of the mass of nitrogen (N)
NH_3	unionised ammonia, normally expressed in terms of the mass of nitrogen (N)
NO_3	nitrate, normally expressed in terms of the mass of nitrogen (N)
NTU	Nephelometric Turbidity Unit, a measure of the turbidity of water
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)
Pb*	lead
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
PM_{10}	relatively fine airborne particles (less than 10 micrometre diameter)
resource consent	refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15)
RMA	Resource Management Act 1991 and including all subsequent amendments
SS	suspended solids
SQMCI	semi quantitative macroinvertebrate community index;
Temp	temperature, measured in °C (degrees Celsius)
Turb	turbidity, expressed in NTU
UI	Unauthorised Incident
UIR	Unauthorised Incident Register – contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan
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

Inglewood

Consent 3954-2

TARANAKI REGIONAL COUNCIL

PRIVATE BAG 713
47 CLOTEN ROAD
STRATFORD
NEW ZEALAND
PHONE 0-6-765 7127
FAX 0-6-765 5097

Discharge Permit

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

Name of Consent Holder:	New Plymouth District Council Private Bag 2025 NEW PLYMOUTH
Consent Granted Date:	18 February 2002

Conditions of Consent

Consent Granted:	To discharge up to a total of 4,752 cubic metres/day (55 litres/second) of leachate and stormwater from the Inglewood Municipal Landfill into an unnamed tributary of the Awai Stream, a tributary of the Mangaoraka Stream in the Waiongana Catchment at or about GR: Q19:124-296
Expiry Date:	1 June 2020
Review Date(s):	June 2008, June 2014
Site Location:	Inglewood Municipal Landfill, 277 King Road, Inglewood
Legal Description:	Lot 1 DP 16116 Blk XI Paritutu SD
Catchment:	Waiongana
Tributary:	Mangaoraka Awai

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

General conditions

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

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

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

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

Special conditions

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

2. Within three months of granting of this consent the consent holder shall prepare and maintain a landfill operations and management plan to the satisfaction of the Chief Executive, Taranaki Regional Council, and shall adhere to such a plan in so far as they concern the exercise of this consent at all times.

3. The consent holder shall provide a landfill closure management plan to the satisfaction of the Chief Executive, Taranaki Regional Council, by 1 June 2007 or 3 months prior to the closure of the landfill should this occur before 1 June 2007; such plan to address site security, litter control, vegetation cover, stormwater diversion, leachate control, site contouring, and cover placement and compaction, in addition to any other matters relevant to the exercise of this consent.

4. The consent holder shall advise the Taranaki Regional Council one month prior to any changes being made to the operation and management plan or landfill closure management plan. Should the Taranaki Regional Council wish to review either of these plans, one month's notice shall be provided to the consent holder.

5. The monitoring of the site and adjacent surface and groundwaters shall be to the satisfaction of the Chief Executive, Taranaki Regional Council

6. The leachate and stormwater diversion, collection, treatment and discharge systems shall be maintained to the satisfaction of the Chief Executive, Taranaki Regional Council

7. Any discharge shall not, in the opinion of the Chief Executive, Taranaki Regional Council, cause nor be likely to cause any significant adverse effects on aquatic life or receiving water quality.

8. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2008 and/or June 2014, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 18 February 2002

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Consent 4526-3

TARANAKI REGIONAL COUNCIL
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PHONE: 06-765 7127
FAX: 06-765 5097
www.trc.govt.nz

Please quote our file number on all correspondence

Discharge Permit

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

Name of Consent Holder:	New Plymouth District Council Private Bag 2025 NEW PLYMOUTH 4600
Consent Granted Date:	20 March 2007

Conditions of Consent

Consent Granted:	To discharge contaminants, being landfill gas, and odours associated with a landfill, into the air from the Inglewood Municipal Landfill at or about GR: Q19:120-295
Expiry Date:	1 June 2026
Review Date(s):	June 2014, June 2020
Site Location:	Inglewood Municipal Landfill, 277 King Road, Inglewood
Legal Description:	Lot 1 DP 16116 Blk XI Paritutu SD

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document
www.trc.govt.nz

General conditions

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

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

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

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

Special conditions

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

2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of applications 4475, 1611 and 94/118. In the case of any contradiction between the documentation submitted in support of applications 4475, 1611 and 94/118 and the conditions of this consent, the conditions of this consent shall prevail.

3. The consent holder shall advise the Taranaki Regional Council one month prior to any changes being made to the landfill management plan, and/or landfill closure management plan. Should the Taranaki Regional Council wish to review any of these plans, one month's notice shall be provided to the consent holder.

4. The consent holder shall maintain the landfill management plan to the satisfaction of the Chief Executive, Taranaki Regional Council, and shall adhere to such a plan in so far as it concerns the exercise of this consent at all times.

5. In case of any contradiction between the landfill management plan and the conditions of this consent, the conditions of this consent shall prevail.

6. The discharge of contaminants into the air from the landfill operation shall not result in any of the following - offensive or objectionable odours; offensive or objectionable dust; or dangerous or noxious ambient concentrations of any airborne contaminant - as determined by at least one enforcement officer of the Taranaki Regional Council, at or beyond the boundary of the site.

7. No material is to be burnt at the landfill site.

8. The discharges authorised by this consent shall not give rise to any significant adverse ecological effects on any ecosystem, including but not limited to, habitats, plants, animals, microflora and microfauna.

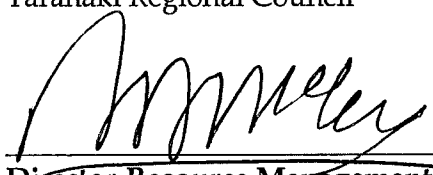
9. The consent holder shall keep a record of any complaints received relating to discharges to air with respect to the landfill activity. The complaints record shall include the following where possible:

   a) name and address of complainant;
   b) nature of complaint;
   c) date and time of the complaint and alleged event;
   d) weather conditions at the time of the event; and
   e) any action taken in response to the complaint.

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

Signed at Stratford on 20 March 2007

For and on behalf of
Taranaki Regional Council



Director-Resource Management

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Please quote our file number on all correspondence

Discharge Permit

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

Name of Consent Holder:	New Plymouth District Council Private Bag 2025 NEW PLYMOUTH 4600
Consent Granted Date:	20 March 2007

Conditions of Consent

Consent Granted:	To discharge cleanfill and inert materials onto and into land at the Inglewood Municipal Landfill at or about GR: Q19:120-295, and to discharge municipal refuse onto and into land at the Inglewood Municipal Landfill when, and only when, it cannot be discharged at the Colson Road Municipal Landfill
Expiry Date:	1 June 2026
Review Date(s):	June 2014, June 2020
Site Location:	Inglewood Municipal Landfill, 277 King Road, Inglewood
Legal Description:	Lot 1 DP 16116 Blk XI Paritutu SD
Catchment:	Waiongana
Tributary:	Awai Mangaoraka

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

General conditions

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

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

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

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

Special conditions

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

2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of applications 4476, 1613 and 94/119. In the case of any contradiction between the documentation submitted in support of applications 4476, 1613 and 94/119 and the conditions of this consent, the conditions of this consent shall prevail.

3. The consent holder shall advise the Taranaki Regional Council one month prior to any changes being made to the landfill management plan, and/or landfill closure management plan. Should the Taranaki Regional Council wish to review any of these plans, one month's notice shall be provided to the consent holder.

4. The consent holder shall maintain the landfill management plan to the satisfaction of the Chief Executive, Taranaki Regional Council, and shall adhere to such a plan in so far as it concerns the exercise of this consent at all times.

5. In case of any contradiction between the landfill management plan and the conditions of this consent, the conditions of this consent shall prevail.

6. Waste, including liquid and sludges, with a solids content of 20% or less, shall not be accepted at the landfill.

7. For the purposes of this consent, "clean fill and inert materials" are defined as materials consisting of any solid concrete, cement or cement wastes, bricks, mortar, tiles (clay, ceramic or concrete), non-tanalised timber, porcelain, glass, gravels, boulders, shingles, fibreglass, plastics, sand, soils and clays, and/or tree stumps and roots, whether singly or in combination or mixture, or any other material that when placed onto and into land will not render that land or any vegetation grown on that land toxic to vegetation or animals consuming vegetation.

8. For the purposes of this consent, "clean fill and inert materials" excludes: food wastes, paper and cardboard, grass clippings, vegetative wastes other than tree stumps and roots, textiles, steel, galvanised metals, construction materials containing paint or fillers or sealers or their containers, oils or greases or any liquids or sludges or their containers, any industrial process by-products other than as permitted under condition 7, any poisons or solvents or their containers, batteries, general domestic refuse not otherwise described, or any wastes with the potential to render land or any vegetation grown on the land toxic to vegetation or to animals consuming such vegetation.

9. The discharge to land shall not result in any contaminant entering surface water.

10. Silt and leachate retention structures shall be installed and maintained to the satisfaction of the Chief Executive, Taranaki Regional Council.

11. The consent holder shall install and maintain stormwater diversion drains to minimise stormwater movement across, or ponding on the site, to the satisfaction of the Chief Executive, Taranaki Regional Council.

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

Signed at Stratford on 20 March 2007

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Marfell Park

TRK964902

COPY

TARANAKI REGIONAL COUNCIL

PRIVATE BAG 713
47 CLOTON ROAD
STRATFORD
NEW ZEALAND
PHONE 0-6-765 7127
FAX 0-6-765 5097

DISCHARGE PERMIT

Pursuant to the RESOURCE MANAGEMENT ACT 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	NEW PLYMOUTH DISTRICT COUNCIL PRIVATE BAG 2025 NEW PLYMOUTH
Consent Granted Date:	26 January 1996

CONDITIONS OF CONSENT

Consent Granted:	TO DISCHARGE UP TO 2 LITRES/SECOND OF LEACHATE FROM THE MARFELL PARK FORMER LANDFILL SITE VIA GROUNDWATER INTO THE MANGAOTUKU STREAM IN THE HUATOKI CATCHMENT AT OR ABOUT GR: P19:006-365
Expiry Date:	1 June 2014
Review Date[s]:	June 2002 and June 2008
Site Location:	MARFELL PARK, GRENVILLE STREET, NEW PLYMOUTH
Legal Description:	LOT 1 DP9295 BLK IV PARITUTU SD

Catchment:	HUATOKI	389.000
Tributary:	MANGAOTUKU	389.030

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

TRK964902

GENERAL CONDITIONS

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

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

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

(i) the administration, monitoring and supervision of this consent;
(ii) charges for the carrying out of the Council's functions under section 35 in relation to this consent; and
(iii) charges authorised by regulations.

SPECIAL CONDITIONS

1) THAT the consent holder shall install and maintain stormwater drains and ground contours at the site, to the satisfaction of the General Manager, Taranaki Regional Council, in order to minimise stormwater movement across, or ponding on the site.

2) THAT the consent holder shall maintain an adequate vegetative cover on the site to the satisfaction of the General Manager, Taranaki Regional Council.

3) THAT the consent holder shall at all times adopt the best practicable option to prevent or minimise any or likely adverse effect on the environment associated with the discharges of leachate from the site.

4) THAT the discharge shall not be shown to raise the concentration of un-ionised ammonia in the receiving water above 0.025 gm^{-3} at any point.

5) THAT after allowing for reasonable mixing within a mixing zone extending 15 metres downstream of the discharge point, the discharge shall not give rise to any of the following effects in the receiving waters of the Mangaotuku Stream:
   (a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended material;
   (b) any conspicuous change in colour or visual clarity;
   (c) any emission of objectionable odour;
   (d) the rendering of fresh water unsuitable for consumption by farm animals;
   (e) any significant adverse effects on aquatic life

6) THAT the Taranaki Regional Council may review any or all of the conditions of this consent should further chemical sampling of the Mangaotuku Stream reveal levels of contamination resulting in significant adverse environmental effects.

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7) THAT the Taranaki Regional Council may review any or all of the conditions of this consent, by giving notice of review during June 1999 and/or June 2005, 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 consent.

Signed at Stratford on 26 January 1996

For and on behalf of
TARANAKI REGIONAL COUNCIL

OPERATIONS MANAGER

Oakura

TRK964962

TARANAKI REGIONAL COUNCIL

PRIVATE BAG 713
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FAX 0-6-765 5097

DISCHARGE PERMIT

Pursuant to the RESOURCE MANAGEMENT ACT 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	NEW PLYMOUTH DISTRICT COUNCIL PRIVATE BAG 2025 NEW PLYMOUTH
Consent Granted Date:	18 April 1996

CONDITIONS OF CONSENT

Consent Granted:	TO DISCHARGE UP TO 5 LITRES/SECOND OF LEACHATE FROM THE OAKURA FORMER LANDFILL SITE VIA GROUNDWATER INTO AN UNNAMED TRIBUTARY OF THE WAIRAU STREAM AT OR ABOUT GR: P19:926-315
Expiry Date:	1 June 2013
Review Date[s]:	June 2001 and June 2007
Site Location:	OAKURA FORMER LANDFILL SITE, MCKELLAR STREET, OAKURA
Legal Description:	LOT 10 DP8953 LOT 1 DP13361 BLK II WAIRAU SD
Catchment:	WAIRAU 384.004
Tributary:	UNNAMED TRIBUTARY

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

TRK964962

GENERAL CONDITIONS

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

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

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

(i) the administration, monitoring and supervision of this consent;
(ii) charges for the carrying out of the Council's functions under section 35 in relation to this consent; and
(iii) charges authorised by regulations.

SPECIAL CONDITIONS

1) THAT the consent holder shall install and maintain stormwater drains and ground contours at the site, to the satisfaction of the General Manager, Taranaki Regional Council, in order to minimise stormwater movement across, or ponding on the site.

2) THAT the consent holder shall maintain an adequate vegetative cover on the site, to the satisfaction of the General Manager, Taranaki Regional Council.

3) THAT the consent holder shall at all times adopt the best practicable option to prevent or minimise any or likely adverse effect on the environment associated with the discharges of leachate from the site.

4) THAT after allowing for reasonable mixing within a mixing zone extending 15 metres downstream of the discharge point, the discharge shall not give rise to any of the following effects in the receiving waters of the unnamed tributary of the Wairau Stream:

a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended material;

b) any conspicuous change in colour or visual clarity;

c) any emission of objectionable odour;

d) the rendering of fresh water unsuitable for consumption by farm animals;

e) any significant adverse effects on aquatic life.

TRK964962

5) THAT the Taranaki Regional Council may review any or all of the conditions of this consent should further chemical sampling of the unnamed tributary of the Wairau Stream reveal levels of contamination resulting in or likely to result in significant adverse environmental effects.

6) THAT the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2001 and/or June 2007, 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 consent.

TARANAKI REGIONAL COUNCIL

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Signed at Stratford on 18 April 1996

For and on behalf of
TARANAKI REGIONAL COUNCIL

OPERATIONS MANAGER

Okato

TRK953860

COPY

TARANAKI REGIONAL COUNCIL

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FAX 0-6-765 5097

DISCHARGE PERMIT

Pursuant to the RESOURCE MANAGEMENT ACT 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	NEW PLYMOUTH DISTRICT COUNCIL PRIVATE BAG 2025 NEW PLYMOUTH
Renewal Granted Date:	22 March 1995

CONDITIONS OF CONSENT

Consent Granted:	TO DISCHARGE UP TO 4,320 CUBIC METRES/DAY OF STORMWATER AND UP TO 2.5 CUBIC METRES/DAY OF LEACHATE FROM THE OKATO MUNICIPAL LANDFILL INTO AN UNNAMED TRIBUTARY OF THE KAIHIHI STREAM AT OR ABOUT GR: P19:852-257
Expiry Date:	1 June 2013
Review Date[s]:	June 2001 and June 2007
Site Location:	OKATO MUNICIPAL LANDFILL HAMPTON ROAD OKATO
Legal Description:	LOT 1 DP13150 BLK I WAIRAU SD
Catchment:	KAIHIHI 381.000
Tributary:	UNNAMED TRIBUTARY

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

TRK953860

COPY

GENERAL CONDITIONS

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

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

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

(i) the administration, monitoring and supervision of this consent;
(ii) charges for the carrying out of the Council's functions under section 35 in relation to this consent; and
(iii) charges authorised by regulations.

SPECIAL CONDITIONS

1) THAT the consent holder shall prepare and maintain both a landfill operations and management plan and a site contingency plan to the satisfaction of the General Manager, Taranaki Regional Council, and shall adhere to such plans in so far as they concern the exercise of this consent at all times.

2) THAT leachate and stormwater diversion, collection, treatment and discharge systems shall be maintained to the satisfaction of the General Manager, Taranaki Regional Council, at all times.

3) THAT the stream draining the eastern side of the landfill site shall be allowed to revegetate, to enable assimilation and treatment of any leachate generated from the current landfill operations.

4) THAT any discharge shall not cause any significant adverse effects on aquatic life or receiving water quality.

5) THAT the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2001 and/or June 2007 for the purpose of ensuring that the conditions are adequate to deal with any adverse effects of the discharge on the receiving environment.

Signed at Stratford on 22 March 1995

For and on behalf of
TARANAKI REGIONAL COUNCIL

GENERAL MANAGER

Discharge Permit

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

Name of Consent Holder:	New Plymouth District Council Private Bag 2025 NEW PLYMOUTH 4342
Decision Date:	13 September 2013
Commencement Date:	13 September 2013

Conditions of Consent

Consent Granted:	To discharge stormwater and leachate from the Okato Municipal Landfill into an unnamed tributary of the Kaihihi Stream
Expiry Date:	1 June 2031
Review Date(s):	June 2019, June 2025
Site Location:	Okato Municipal Landfill, Hampton Road, Okato
Legal Description:	Lot 1 DP 13150 Blk I Cape SD (Discharge site)
Grid Reference (NZTM)	1674817E-5663981N
Catchment:	Kaihihi

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. All discharges permitted under this consent shall be undertaken in accordance with the "Okato Landfill Contingency Disposal Management Plan" as supplied with the application (5831).

3. The consent holder shall install and maintain all stormwater diversion drains to minimise stormwater entering or flowing across the discharge area.

4. During routine operations all surface runoff and leachate from the previously filled area of the landfill shall be directed to the leachate stormwater/ collection drain.

5. During and after any contingency discharge of general refuse (as permitted under consent 4529-2), all leachate generated from the new fill shall be directed to a lined pond and removed from the site.

6. This consent shall lapse on 30 September 2018, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

7. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2019 and/or June 2025 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 13 September 2013

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

TRK954528

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STRATFORD
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PHONE 0-6-765 7127
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DISCHARGE PERMIT

Pursuant to the RESOURCE MANAGEMENT ACT 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	NEW PLYMOUTH DISTRICT COUNCIL PRIVATE BAG 2025 NEW PLYMOUTH
Renewal Granted Date:	22 March 1995

CONDITIONS OF CONSENT

Consent Granted:	TO DISCHARGE EMISSIONS INTO THE AIR FROM THE OKATO MUNICIPAL LANDFILL ACTIVITIES AT OR ABOUT GR: P19:852-257
Expiry Date:	1 June 2013
Review Date[s]:	June 2001 and June 2007
Site Location:	OKATO MUNICIPAL LANDFILL HAMPTON ROAD OKATO
Legal Description:	LOT 1 DP13150 BLK I WAIRAU SD

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

TRK954528

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GENERAL CONDITIONS

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

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

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

(i) the administration, monitoring and supervision of this consent;
(ii) charges for the carrying out of the Council's functions under section 35 in relation to this consent; and
(iii) charges authorised by regulations.

SPECIAL CONDITIONS

1) THAT the consent holder shall prepare and maintain both a landfill operations and management plan and a site contingency plan to the satisfaction of the General Manager, Taranaki Regional Council, and shall adhere to such plans in so far as they concern the exercise of this consent at all times.

2) THAT the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2001 and/or June 2007 for the purpose of ensuring that the conditions are adequate to deal with any adverse effects of the discharge on the receiving environment.

Signed at Stratford on 22 March 1995

For and on behalf of
TARANAKI REGIONAL COUNCIL

GENERAL MANAGER

Discharge Permit

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

Name of Consent Holder:	New Plymouth District Council Private Bag 2025 NEW PLYMOUTH 4342
Decision Date:	13 September 2013
Commencement Date:	13 September 2013

Conditions of Consent

Consent Granted:	To discharge emissions into the air from the contingency discharge of solid contaminants at the Okato Municipal Landfill
Expiry Date:	1 June 2031
Review Date(s):	June 2019, June 2025
Site Location:	Okato Municipal Landfill, Hampton Road, Okato
Legal Description:	Lot 1 DP 13150 Blk I Wairau SD (Discharge source & site)
Grid Reference (NZTM)	1674817E-5663981N

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 discharge of general refuse at the site shall only occur on a contingency basis and in accordance with the Okato Landfill Contingency Disposal Management Plan as submitted with application 5832.

2. The consent holder shall at all times adopt the best practicable option or options [as defined in section 2 of the Resource Management Act 1991] to prevent or minimise any actual or potential effect on the environment arising from any discharge at the site.

3. That the discharge of contaminants into the air shall not result in offensive or objectionable odours or dangerous or noxious ambient concentrations of any airborne contaminant that, in the opinion of at least one enforcement officer of the Taranaki Regional Council, is offensive or objectionable at or beyond the boundary of the site.

4. The discharges authorised by this consent shall not give rise to suspended or deposited dust at or beyond the boundary of the site that is offensive or objectionable. For the purpose of this condition, discharges in excess of the following limits are deemed to be offensive or objectionable:

   a) dust deposition rate 0.13 $g/m^2/day$; and/or
   b) suspended dust level 3 mg/m^3.

5. That this consent shall lapse on 1 June 2031, 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.

6. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2019 and or June 2025, 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 13 September 2013

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

TRK954529

COPY

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REGIONAL
COUNCIL

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NEW ZEALAND
PHONE 0-6-765 7127
FAX 0-6-765 5097

DISCHARGE PERMIT

Pursuant to the RESOURCE MANAGEMENT ACT 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	NEW PLYMOUTH DISTRICT COUNCIL PRIVATE BAG 2025 NEW PLYMOUTH
Renewal Granted Date:	22 March 1995

CONDITIONS OF CONSENT

Consent Granted:	TO DISCHARGE UP TO 4.5 CUBIC METRES/DAY OF SOLID CONTAMINANTS ONTO AND INTO LAND AT THE OKATO MUNICIPAL LANDFILL AT OR ABOUT GR: P19:852-257
Expiry Date:	1 June 2013
Review Date[s]:	June 2001 and June 2007
Site Location:	OKATO MUNICIPAL LANDFILL HAMPTON ROAD OKATO
Legal Description:	LOT 1 DP13150 BLK I WAIRAU SD

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

TRK954529

GENERAL CONDITIONS

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

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

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

(i) the administration, monitoring and supervision of this consent;
(ii) charges for the carrying out of the Council's functions under section 35 in relation to this consent; and
(iii) charges authorised by regulations.

SPECIAL CONDITIONS

1) THAT the consent holder shall prepare and maintain both a landfill operations and management plan and a site contingency plan to the satisfaction of the General Manager, Taranaki Regional Council, and shall adhere to such plans in so far as they concern the exercise of this consent at all times.

2) THAT the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2001 and/or June 2007 for the purpose of ensuring that the conditions are adequate to deal with any adverse effects of the discharge on the receiving environment.

Signed at Stratford on 22 March 1995

For and on behalf of
TARANAKI REGIONAL COUNCIL

GENERAL MANAGER

Discharge Permit

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

Name of Consent Holder:	New Plymouth District Council Private Bag 2025 NEW PLYMOUTH 4342
Decision Date:	13 September 2013
Commencement Date:	13 September 2013

Conditions of Consent

Consent Granted:	To discharge cleanfill and greenwaste to land and to discharge general refuse on a contingency basis to land
Expiry Date:	1 June 2031
Review Date(s):	June 2019, June 2025
Site Location:	Okato Municipal Landfill, Hampton Road, Okato
Legal Description:	Lot 1 DP 13150 Blk I Wairau SD (Discharge source & site)
Grid Reference (NZTM)	1674817E-5663981N
Catchment:	Kaihihi

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. All discharges permitted by this consent shall occur within the existing landfill footprint as shown by the red dotted line on the attached plan (appendix 1).

2. The consent holder shall at all times adopt the best practicable option or options [as defined in section 2 of the Resource Management Act 1991] to prevent or minimise any actual or potential effect on the environment arising from any discharge at the site.

3. The consent holder shall install and maintain stormwater diversion drains to minimise stormwater entering or flowing across the discharge area.

4. The existing landfill cap shall at all times be maintained in its existing condition and shall not be disturbed during any activities permitted by this consent.

5. Prior to the expiry or surrender of this consent all areas used to discharge greenwaste and/or cleanfill shall be stabilised and re-vegetated to minimise erosion, sedimentation and stormwater infiltration.

Cleanfill

6. Cleanfill as defined by special conditions seven and eight may be discharged at any time and shall be undertaken in accordance with the Okato Landfill Contingency Disposal Management Plan as submitted with application 5833.

7. The contaminants to be discharged shall be limited to cleanfill and/or inert materials. For the purposes of this condition, "clean fill and inert materials" are defined as materials consisting of any concrete, cement or cement wastes, bricks, mortar, tiles [clay, ceramic or concrete], non-tanalised timber, porcelain, glass, gravels, boulders, shingles, fibreglass, plastics, sand, soils and clays, and/or tree stumps and roots, whether singly or in combination or mixture, or any other material [subject to condition 8] that when placed onto and into land will not render that land or any vegetation grown on that land toxic to vegetation or animals consuming vegetation.

8. The discharge of the following contaminants shall not occur: food wastes, paper and cardboard, grass clippings, garden wastes including but not limited to wastes containing foliage or other vegetation [other than tree stumps and roots as permitted under condition 7], textiles, steel, galvanised metals, construction materials containing paint or fillers or sealers or their containers, oils or greases or any liquids or sludges or their containers, any industrial process by-products other than as permitted under condition 7, any poisons or solvents or their containers, batteries, general domestic refuse not otherwise described, or any wastes with the potential to render land or any vegetation grown on the land toxic to vegetation or to animals consuming such vegetation.

9. If the consent holder is uncertain as to the acceptability or not of a certain material the consent holder shall obtain written approval from the Consents Manager, Taranaki Regional Council, prior to its discharge.

Greenwaste

10. Green waste may be discharged at any time and shall be undertaken in accordance with the Okato Landfill Contingency Disposal Management Plan as submitted with application 5833.

Contingency Landfilling

11. The discharge of general refuse at the site shall only occur on a contingency basis and in accordance with the Okato Landfill Contingency Disposal Management Plan as submitted with application 5833.

12. In the event that contingency filling is required, the consent holder shall notify Council within 48 hours via email at worksnotification@trc.govt.nz . The notification shall include, reasons for using the site, likely volume of material to be discharged and likely duration of the contingency discharge.
13. Upon completion of any contingency discharge, the discharged refuse shall be capped and re-vegetated to the specifications set out in section 4.10.3 of the Okato Landfill Contingency Disposal Management plan as submitted with application 5833.

14. This consent shall lapse on 30 September 2018, 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

15. 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 2019 and or June 2025, 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 13 September 2013

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

Appendix 1

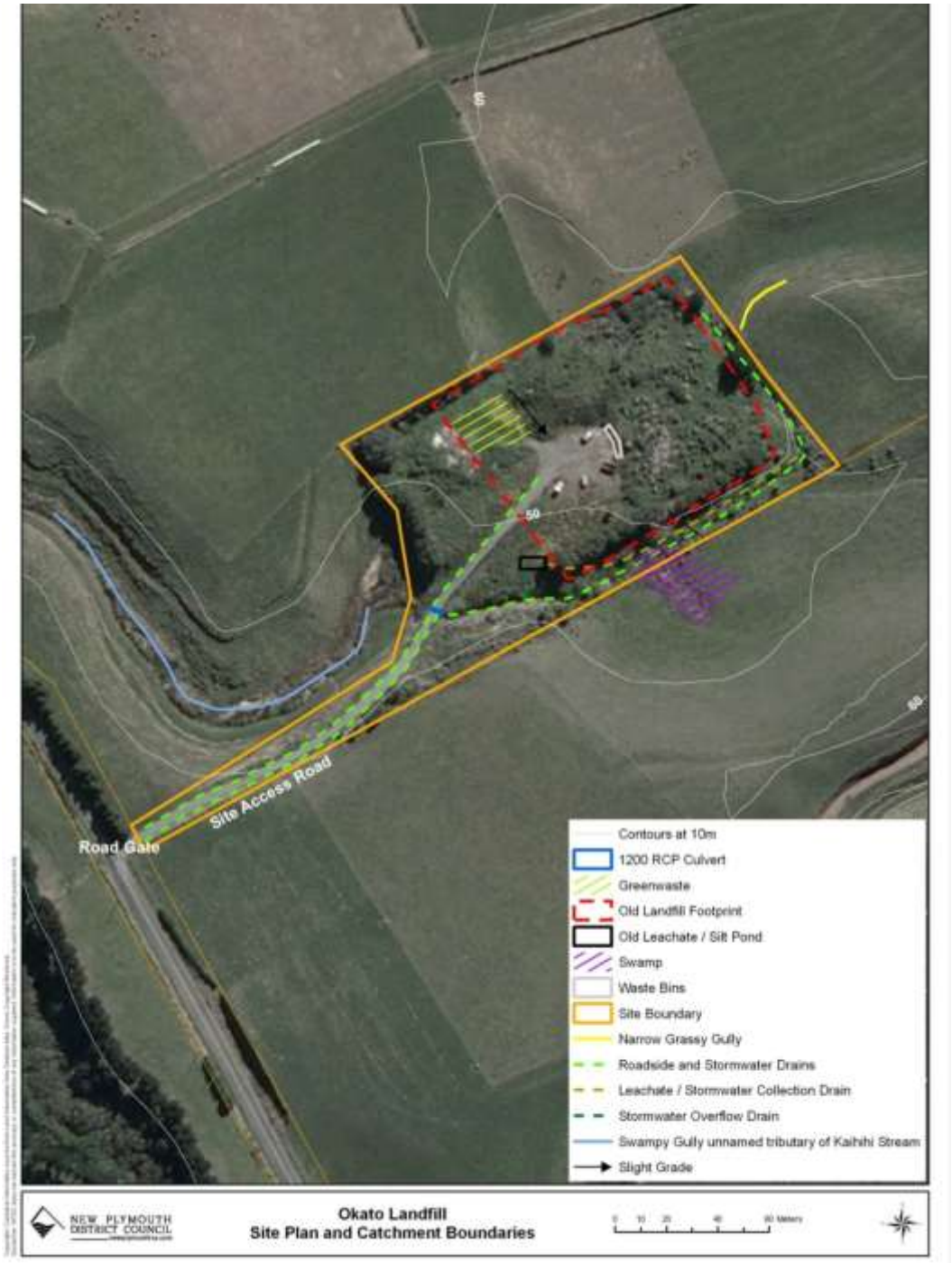

Figure 1 Aerial plan of Okato landfill site

Okoki

TRK963955

TARANAKI REGIONAL COUNCIL
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STRATFORD
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DISCHARGE PERMIT

Pursuant to the RESOURCE MANAGEMENT ACT 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	NEW PLYMOUTH DISTRICT COUNCIL PRIVATE BAG 2025 NEW PLYMOUTH
Consent Granted Date:	26 November 1996

CONDITIONS OF CONSENT

Consent Granted:	TO DISCHARGE UP TO 864 CUBIC METRES/DAY [10 LITRES/SECOND] OF STORMWATER AND LEACHATE FROM A FORMER LANDFILL SITE INTO THE URENUI RIVER AT OR ABOUT GR: Q19:347-455
Expiry Date:	1 June 2015
Review Date[s]:	June 2003 and June 2009
Site Location:	FORMER URENUI MUNICIPAL LANDFILL, OKOKI ROAD, URENUI
Legal Description:	PT URENUI 7B PT SUBSEC 24 SO9850 BLK IV WAITARA SD
Catchment:	URENUI 399.000

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

TRK963955

GENERAL CONDITIONS

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

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

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

(i) the administration, monitoring and supervision of this consent;
(ii) charges for the carrying out of the Council's functions under section 35 in relation to this consent; and
(iii) charges authorised by regulations.

SPECIAL CONDITIONS

1. THAT the consent holder shall install and maintain stormwater drains and ground contours at the site, to the satisfaction of the General Manager, Taranaki Regional Council, in order to minimise stormwater movement across, or ponding on, the site; and shall maintain soil cover on the site.

2. THAT the consent holder shall maintain an adequate vegetative cover on the site, to the satisfaction of the General Manager, Taranaki Regional Council, to prevent dust emission or stormwater erosion of the site.

3. THAT the consent holder shall at all times adopt the best practicable option to prevent or minimise any adverse effect or any likely adverse effect on the environment associated with the discharges of leachate from the site. Without restriction or limitation, the best practicable option shall include the measures specified in conditions 1 and 2 above.

4. THAT the discharge shall not give rise to any of the following effects in the receiving waters of the Urenui River:

a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;

b) any conspicuous change in the colour or visual clarity;

c) any emission of objectionable odour;

d) the rendering of fresh water unsuitable for consumption by farm animals;

e) any significant adverse effects on aquatic life.

TRK963955

5. THAT the Taranaki Regional Council may review any or all of the conditions of this consent, should further chemical sampling of the discharge at the base of the landfill biomass reveal levels of contamination resulting in, or likely to result in, significant adverse environmental effects.

6. THAT the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2003 and/or June 2009, 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 consent, which were not foreseen at the time the application was considered and which it was not appropriate to deal with at the time.

TARANAKI REGIONAL COUNCIL

PRIVATE BAG 713
47 CLOTON ROAD
STRATFORD
NEW ZEALAND
PHONE 0-6-765 7127
FAX 0-6-765 5097

Signed at Stratford on 26 November 1996

For and on behalf of
TARANAKI REGIONAL COUNCIL

OPERATIONS MANAGER

Appendix II

Biomonitoring report

To	Job Manager, Scott Cowperthwaite
From	Scientific Officers Bart Jansma & Katrina Smith
Report No	BJ207
Document No	1250277
Date	15 September 2013

Biomonitoring of two unnamed tributaries of the Awai Stream, below the Inglewood landfill, October 2012

Introduction

This was the first biological survey undertaken of the two surveys scheduled for the 2012-2013 monitoring year in two tributaries of the Awai Stream in relation to the Inglewood landfill. Leachate from the landfill discharges to a small tributary, which then joins a larger tributary approximately 450m below the face of the landfill. Results of biological surveys performed in the tributaries since the 2001-2002 monitoring year are discussed in the series of reports referenced at the end of this report.

Methods

This survey was undertaken on 1 October 2012 at four sites on the two tributaries of the Awai Stream; sites 1(a) and 1 (b) were located in the smaller tributary and sites 2 and 3 on the larger tributary (Figure 1).

The standard 400 ml 'sweep-net' sampling technique was used to collect streambed macroinvertebrates from sites 1a and 1b. The 'sweep-net' sampling technique is very similar to Protocol C2 (soft-bottomed, semi-quantitative).

The standard '400 ml kick-sampling' technique was used to collect streambed macroinvertebrates from sites 2 and 3. The 'kick-sampling' technique is very similar to Protocol C1 (hard-bottomed, semi-quantitative), of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark *et al*, 2001).

Table 1 Biomonitoring sites in tributaries of the Awai Stream

Site	Site code	Location
1a	AWY000105	Smaller tributary, 100 metres below tip face
1b	AWY000107	Smaller tributary, 400 metres below tip face
2	AWY000100	Larger tributary, above confluence with small tributary
3	AWY000115	Larger tributary, 80 metres below confluence with small tributary

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

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

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams (MCI). Highly 'sensitive' taxa were assigned the highest scores of 9 or 10, while the most 'tolerant' forms scored 1 and 0.1 in hard bottomed and soft bottomed streams respectively. The sensitivity scores for certain taxa found in hard bottomed streams have been modified in accordance with Taranaki experience. After extensive use of the MCI, categories were assigned to the sensitivity scores, to clarify their 'relative' sensitivity e.g. taxa that scored between 1 and 4 inclusive are considered tolerant (see Table 3).

By averaging the scores obtained from a list of taxa taken from one site and multiplying by a scaling factor of 20, a Macroinvertebrate Community Index (MCI) value was obtained. The MCI is a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. More 'sensitive' communities inhabit less polluted waterways.

A gradation of biological water quality conditions based upon MCI ranges has been adapted for Taranaki streams and rivers from Stark's classification (Stark, 1985 and Boothroyd & Stark, 2000). This is as follows:

Grading	HBMCI	Code
Excellent	>140	
Very Good	120-140	
Good	100-119	
Fair	80-99	
Poor	60-79	
Very Poor	<60	

A semi-quantitative MCI value ($SQMCI_s$) has also been calculated for the taxa present at each site by multiplying each taxon score by a loading factor (related to its abundance), totalling these products, and dividing by the sum of the loading factors (Stark 1998 and 1999). The loading factors were 1 for rare (R), 5 for common (C), 20 for abundant (A), 100 for very abundant (VA) and 500 for extremely abundant (XA). Unlike the MCI, the $SQMCI_s$ is not multiplied by a scaling factor of 20, so that its corresponding range of values is 20x lower.

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

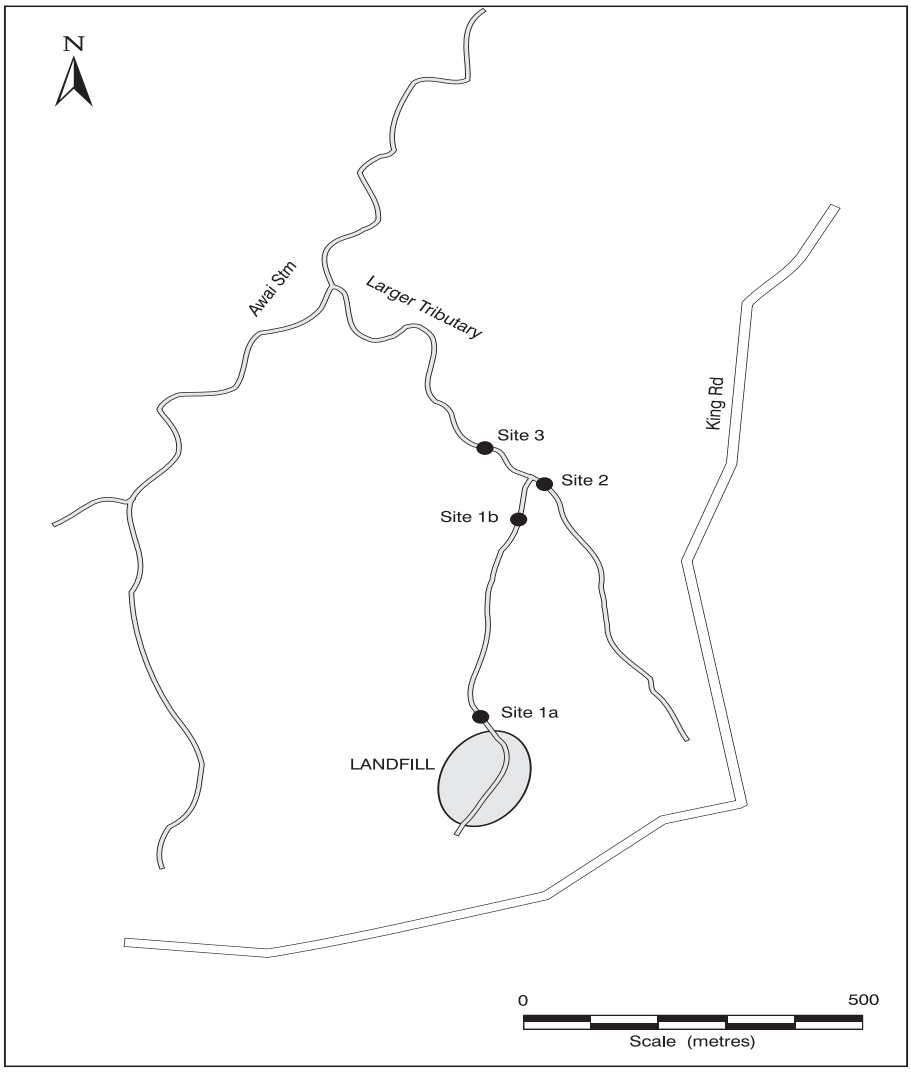

Figure 1 Biomonitoring sites in tributaries of the Awai Stream related to the Inglewood landfill

Results

This October 2012 survey was carried out under very low and very slow flow conditions at site 1a, and under moderate, steady flow conditions at site 1b.At sites 2 and 3 in the larger tributary, low but steady to swift flow conditions were observed during sampling. At all sites the water was uncoloured and clear. It had been 15 days since the nearby Mangaoraka Stream flowed at more than three times its median flow and 23 days since flows exceeded seven times median.

At sites 1a and 1b, the bed substrate consisted of silt and sand, and macrophytes dominated the bed and banks of the stream. The iron oxide coating frequently noted at site 1a, was not recorded at the site during this survey. At the time of this survey the water temperatures recorded in the small tributary ranged from 14.0°C to 15.4°C.

In the larger tributary, the substrate at sites 2 and 3 predominantly consisted of cobbles, gravels and sand, although boulders were also present at both sites. A slippery film of algae was noted at site 2, on the partially shaded bed, while site 3 had patchy algal mats and some patches of moss growing on the completely shaded bed. The temperature recorded at these sites was 13.4°C at site 2 and 13.5°C at site 3. No site supported any undesirable biological growths.

Macroinvertebrate communities

A summary of results from previous surveys performed in the tributaries of the Awai Stream in relation to the Inglewood landfill are presented together with current results in Table 2. The full results of the present survey are provided in Table 3.

Table 2 Numbers of taxa and MCI values recorded in previous surveys related to the Inglewood landfill, together with current results

Site No	No. Taxa				MCI values				$SQMCI_s$ values			
	No. samples	Range	Median	Current result	No. Samples	Range	Median	Current result	No. samples	Range	Median	Current result
1a	36	4-23	15	19	36	60-84	72	67	26	1.2-3.5	2.6	2.9
1b	39	11-29	19	19	39	69-88	76	83	26	2.1-4.5	3.2	3.2
2	40	8-29	19	11	40	79-108	89	100	26	1.4-6.1	3.6	5.7
3	40	9-27	19	16	40	74-102	90	105	26	1.3-5.8	3.2	5.1

Site 1a

A total of nineteen taxa were recorded at site 1a, 100 metres downstream of the land fill face. This result was four taxa higher than the median richness recorded at this site. The majority of taxa (65%) recorded at the site were 'tolerant' taxa which was reflected in the moderately low MCI score of 67 units. This MCI score was marginally lower than the median but well within the range of scores previously recorded at the site. There was little change in the MCI score at this site from the previous May 2012 survey.

The macroinvertebrate community at this site was characterised by the extremely abundant 'tolerant' *Polypedilum* midge larvae, four other 'tolerant' taxa (*Potamopyrgus* snails, ostracod seed shrimps, damselfly larvae (*Xanthocnemis*), and axe head caddisfly larvae (Oxyethira)) and 'moderately sensitive' tanypod midge larvae. The numerical dominance of the tolerant taxa resulted in a moderate $SQMCI_s$ score of 2.9 units which was similar to the median $SQMCI_s$ score for the site, and within the range of scores recorded at site 1a previously.

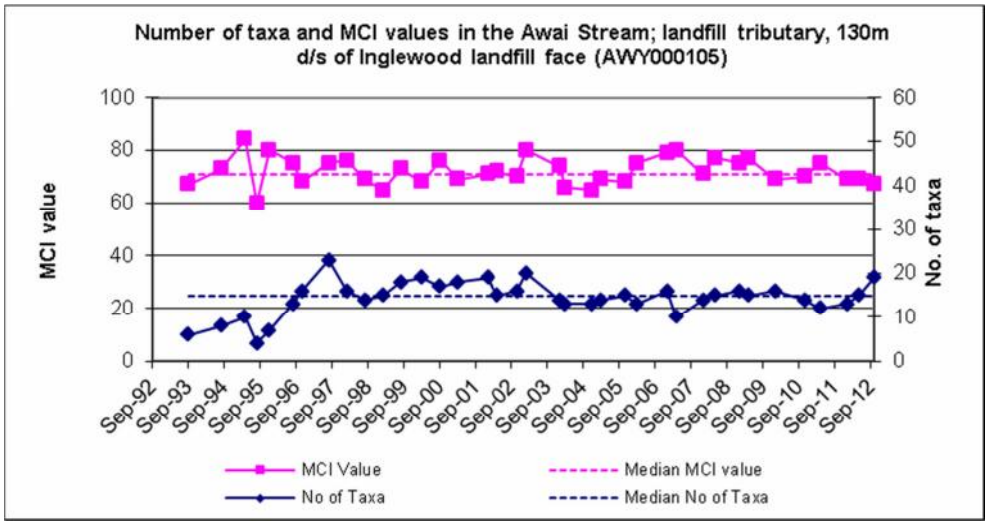

Figure 2 Number of taxa and MCI values at site 1a in a tributary of the Awai Stream

Site 1b

Nineteen taxa were recorded at site 1b, approximately 400 metres downstream of the landfill face, equal to the median recorded at this site and equal to that recorded at site 1a in this same survey. At the time of this survey, the majority (58%) of macroinvertebrate taxa recorded at this site were 'tolerant' taxa which was similar to that at site 1a, although there were differences recorded in the community composition between the two sites. This resulted in a moderate MCI score of 83 units, six units higher than the median score for the site and sixteen units higher than the MCI score recorded at site 1a in this survey, a statistically significant improvement (Stark, 1998).

In this survey, the macroinvertebrate community was dominated by five 'tolerant' taxa (*Potamopyrgus* snail, damselfly larvae (*Xanthocnemis*), axehead caddisfly larvae (*Oxyethira*), orthoclad midge larvae and sandfly larvae (*Austrosimulium*). The $SQMCI_s$ score of 3.2 units recorded at site 1b was equal to the median score for the site, and was similar to the $SQMCI_s$ score recorded at site 1a in this survey.

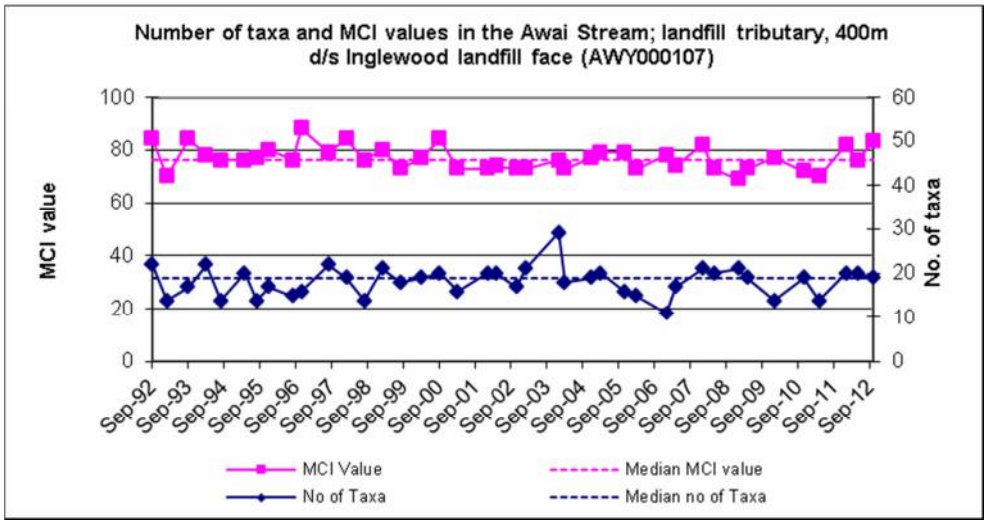

Figure 3 Number of taxa and MCI values at site 1b in a tributary of the Awai Stream

Site 2

The 'control' site 2 upstream of the confluence with the landfill tributary had a community richness of eleven taxa, eight taxa lower than the median number found by previous surveys. A moderately high proportion of the community recorded at this site in the current survey were 'sensitive' taxa (73%) which resulted in a relatively high MCI score of 100 units for the site. This MCI score was 11 units higher than the median score recorded at the site previously, a significant improvement and was significantly higher than the MCI score recorded at the two sites in the small unnamed tributary (1a and 1b) (Stark 1998).

The community was dominated by two abundant 'moderately sensitive' taxa (amphipod *Paraleptamphopidae* and mayfly *Zephlebia)* which resulted in a moderately high $SQMCI_s$ score of 5.7 units. This $SQMCI_s$ score was significantly higher than the median score recorded at the site previously and also significantly higher than score recorded at the two sites in the small unnamed tributary (1a and 1b).

Table 3 Macroinvertebrate fauna of unnamed tributaries of the Awai Stream sampled in relation to the Inglewood landfill on 1 October 2012

Taxa List	Site Number	MCI score	2	3	1a	1b
	Site Code		AWY000100	AWY000115	AWY000105	AWY000107
	Sample Number		FWB12329	FWB12330	FWB12331	FWB12332
PLATYHELMINTHES	*Cura*	3	R	R	-	R
NEMATODA	Nematoda	3	-	-	R	-
ANNELIDA	Oligochaeta	1	C	-	R	R
	Lumbricidae	5	R	-	-	-
MOLLUSCA	*Gyraulus*	3	-	-	R	-
	Lymnaeidae	3	-	-	R	C
	Potamopyrgus	4	-	R	A	VA
CRUSTACEA	Ostracoda	1	-	-	VA	R
	Paraleptamphopidae	5	A	C	-	-
	Talitridae	5	R	-	-	-
	Paranephrops	5	-	R	-	-
EPHEMEROPTERA	*Austroclima*	7	-	-	-	R
	Coloburiscus	7	-	A	-	R
	Zephlebia group	7	A	C	-	-
PLECOPTERA	*Acroperla*	5	R	R	-	-
	Zelandobius	5	-	R	-	-
ODONATA	*Xanthocnemis*	4	-	-	A	VA
HEMIPTERA	*Microvelia*	3	-	-	R	R
COLEOPTERA	Dytiscidae	5	-	-	R	-
	Hydrophilidae	5	-	-	C	-
	Ptilodactylidae	8	R	R	-	-
TRICHOPTERA	*Hydrobiosis*	5	-	-	-	R
	Orthopsyche	9	C	C	-	R
	Polyplectropus	6	-	-	C	-
	Psilochorema	6	-	-	-	R
	Oxyethira	2	-	-	A	A
	Pycnocentria	7	-	R	-	-
DIPTERA	Hexatomini	5	R	-	-	-
	Zelandotipula	6	-	-	-	R
	Chironomus	1	-	-	R	-
	Harrisius	6	-	R	-	-
	Orthocladiinae	2	R	C	C	VA
	Polypedilum	3	-	A	XA	-
	Tanypodinae	5	-	-	A	R
	Empididae	3	-	-	-	R
	Austrosimulium	3	-	C	C	VA
	Stratiomyidae	5	-	-	C	-
ACARINA	Acarina	5	-	R	C	C
		No of taxa	11	16	19	19
		MCI	100	105	67	83
		SQMCIs	5.7	5.1	2.9	3.2
		EPT (taxa)	3	6	1	5
		%EPT (taxa)	27	38	5	26

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

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

Site 3

A higher community richness was found at site 3 below the confluence with the landfill drainage tributary, where the richness (16 taxa) was three taxa less than the median richness found by previous surveys. The MCI score of 105 units reflected the high proportion of 'sensitive' taxa present in the community at this site in the current survey. This is the highest MCI score recorded of all sites surveyed in the current survey, and the highest recorded at this site to date.

The macroinvertebrate community at this site was characterised by one 'moderately sensitive' taxon (*Coloburiscus* mayfly) and one 'tolerant' taxon (*Polypedilum* midge larvae). The numerical dominance of these two taxa in the community resulted in a moderately high $SQMCI_s$ score of 5.1 units, which was significantly higher than the median score of 3.2 units recorded at this site in previous surveys. This score was also significantly higher than the scores recorded at the two sites in the smaller tributary but marginally lower than the score at site 2.

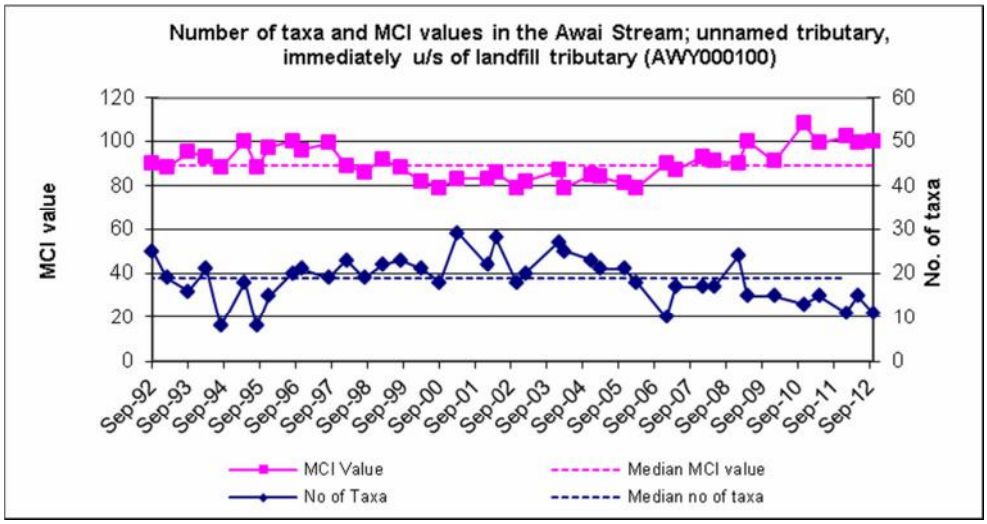

Figure 4 Number of taxa and MCI values at site 2 in a tributary of the Awai Stream

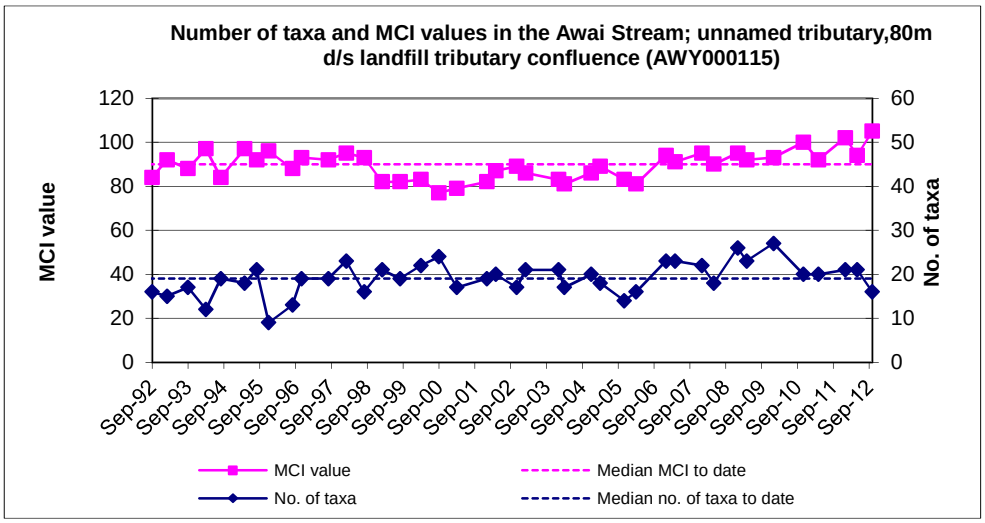

Figure 5 Number of taxa and MCI values at site 3 in a tributary of the Awai Stream

Discussion and conclusions

Wetland and grassy stream habitats such as at sites 1a and 1b often support abundances of molluscs, crustacea, true flies (dipterans), and certain caddisflies, and this was reflected in the current survey.

At the time of this October survey, there was a very low flow of very slow moving water recorded at site 1a which was indicative of a seepage feed stream. This was reflected in the macroinvertebrate community recorded at the site which was dominated by low scoring 'tolerant' taxa, adapted to living in near stagnant conditions and weedy habitat. This resulted in a moderately low MCI of 67 units and a moderately low $SQMCI_s$ score of 2.9 units. However, these scores were well within the range of scores recorded at the site in previous surveys.

Previous surveys typically recorded a poorer community at site 1a than at site 1b. The results of this survey were consistent with this. Although there was no change in taxa richness between the sites, and an insignificant increase in $SQMCI_s$ score, the MCI score increased by a significant sixteen units (Stark 1998). A difference in flow conditions and the quality of available macrophyte habitat between the two sites was considered to be the two main reasons for these results. At site 1b the stream adopted a more 'creek-like' flow, and as a consequence could support a more diverse macroinvertebrate community. The macrophyte community at site 1b consisted of pasture grass and watercress which was considered to provide more favourable habitat conditions compared to the grass dominated macrophyte community at site 1a. Eight significant changes in individual taxon abundance reflect this improvement in habitat conditions at site 1b.

In the current survey, the macroinvertebrate community recorded at the upstream 'control' site (2) consisted of a high proportion of 'sensitive taxa' including two abundant 'moderately sensitive' taxa (*Zephlebia* mayfly and the paraleptamphopid amphipods). This was reflected in the moderately high MCI and $SQMCI_s$ scores recorded at the site in this survey. These scores were significantly (Stark 1998) higher than those recorded at the two sites (1a and 1b) in the smaller tributary if the Awai Stream which is mostly likely the result of marked differences in the habitat quality at site 2 compared to sites 1a and 1b. In contrast to sites 1a and 1b, the stream at site 2 was partially shaded and the bed substrate consisted primarily of cobbles and gravels as opposed to silt. These conditions are more conducive to supporting a community containing more 'sensitive taxa' such as the mayfly *Zephlebia*.

The results recorded at site 3 downstream of the confluence with the small tributary were similar to those recorded at site 2 in this survey although the community composition differed between the two sites. Site 3 recorded a slightly below average community richness, but recorded the highest MCI score of the survey, due to a relatively high proportion of the taxa present being 'sensitive' taxa (69%). As at site 2, the moderately high MCI and $SQMCI_s$ scores recorded at site 3 were significantly (Stark 1998) higher than those recorded at the two smaller tributary sites. Once again, these differences are equated to differences in habitat quality.

Overall, the results suggest that differences in the macroinvertebrate communities between the four sites relate to differences in habitat rather than the effects of any discharge from the landfill site.

Summary

Macroinvertebrate sampling was undertaken on 1 October 2012, at four sites in two tributaries of the Awai Streams, using either the 'sweep-net' or 'kick' sampling technique, both standard sampling techniques used by the Council. This was undertaken to assess whether leachate discharges from Inglewood landfill had had any adverse effects on the macroinvertebrate communities of this stream. Samples were processed to provide number of taxa (richness), MCI and $SQMCI_s$ scores for each site.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The $SQMCI_s$ takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtly changes in communities, particularly if non-organic impacts are occurring. Significant differences in with the MCI or the $SQMCI_s$ between sites indicate the degree of adverse effects (if any) of the discharges monitored.

This October 2012 survey did not indicate that leachate from the Inglewood landfill had significantly affected the freshwater macroinvertebrate communities in these tributaries. These communities appear to be determined by the physical habitat conditions, particularly the slow to steady current speeds, soft/fine substrate and changes in macrophyte habitats available to the aquatic invertebrates.

The smaller, landfill drainage tributary sites had similar taxa richness and $SQMCI_s$ scores, but the MCI score improved significantly in a downstream direction. The differences observed between the sites can probably be attributed to the difference in available habitat, with better habitat at site 1b (downstream) resulting in a lower proportion of 'tolerant taxa'. This site has progressively become choked with vegetation, but the wetted area is greater, and water speeds swifter.

No significant differences were recorded in MCI and $SQMCI_s$ scores between the two sites (2 and 3) in the larger tributary of the Awai Stream. However, these two sites had significantly higher MCI and $SQMCI_s$ scores compared to the two sites in the smaller tributary (1a and 1b), and these scores were also significantly higher than their respective medians, which was indicative of improved water quality in the larger tributary. Once again, differences in habitat condition were thought to be the main reason for these differences in the macroinvertebrate communities in the two tributaries.

No sites supported any undesirable biological growths.

The results of this survey provide no indication that the discharge of leachate into the unnamed tributary of the Awai Stream was having a significant adverse effect on the macroinvertebrate communities in the tributaries monitored.

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To	Job Manager, Scott Cowperthwaite
From	Scientific Officers Bart Jansma & Katrina Smith
Report No	BJ208
Document No	1250569
Date	16 September 2013

Biomonitoring of two unnamed tributaries of the Awai Stream, below the Inglewood landfill, February 2013

Introduction

This was the second biological survey undertaken of the two surveys scheduled for the 2012-2013 monitoring year in two tributaries of the Awai Stream in relation to the Inglewood landfill. Leachate from the landfill discharges to a small tributary, which then joins a larger tributary approximately 450m below the face of the landfill. Results of biological surveys performed in the tributaries since the 2001-2002 monitoring year are discussed in the series of reports referenced at the end of this report.

Methods

This survey was undertaken on 12 February 2013 at four sites on the two tributaries of the Awai Stream; sites 1(a) and 1 (b) were located in the smaller tributary and sites 2 and 3 on the larger tributary (Figure 1).

The standard 400 ml 'sweep-net' sampling technique was used to collect streambed macroinvertebrates from sites 1a and 1b. The 'sweep-net' sampling technique is very similar to Protocol C2 (soft-bottomed, semi-quantitative).

The standard '400 ml kick-sampling' technique was used to collect streambed macroinvertebrates from sites 2 and 3. The 'kick-sampling' technique is very similar to Protocol C1 (hard-bottomed, semi-quantitative), of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark *et al*, 2001).

Table 1 Biomonitoring sites in tributaries of the Awai Stream

Site	Site code	Location
1a	AWY000105	Smaller tributary, 100 metres below tip face
1b	AWY000107	Smaller tributary, 400 metres below tip face
2	AWY000100	Larger tributary, above confluence with small tributary
3	AWY000115	Larger tributary, 80 metres below confluence with small tributary

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

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

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams (MCI). Highly 'sensitive' taxa were assigned the highest scores of 9 or 10, while the most 'tolerant' forms scored 1 and 0.1 in hard bottomed and soft bottomed streams respectively. The sensitivity scores for certain taxa found in hard bottomed streams have been modified in accordance with Taranaki experience. After extensive use of the MCI, categories were assigned to the sensitivity scores, to clarify their 'relative' sensitivity e.g. taxa that scored between 1 and 4 inclusive are considered tolerant (see Table 3).

By averaging the scores obtained from a list of taxa taken from one site and multiplying by a scaling factor of 20, a Macroinvertebrate Community Index (MCI) value was obtained. The MCI is a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. More 'sensitive' communities inhabit less polluted waterways.

A gradation of biological water quality conditions based upon MCI ranges has been adapted for Taranaki streams and rivers from Stark's classification (Stark, 1985 and Boothroyd & Stark, 2000). This is as follows:

Grading	HBMCI	Code
Excellent	>140	
Very Good	120-140	
Good	100-119	
Fair	80-99	
Poor	60-79	
Very Poor	<60	

A semi-quantitative MCI value ($SQMCI_s$) has also been calculated for the taxa present at each site by multiplying each taxon score by a loading factor (related to its abundance), totalling these products, and dividing by the sum of the loading factors (Stark 1998 and 1999). The loading factors were 1 for rare (R), 5 for common (C), 20 for abundant (A), 100 for very abundant (VA) and 500 for extremely abundant (XA). Unlike the MCI, the $SQMCI_s$ is not multiplied by a scaling factor of 20, so that its corresponding range of values is 20x lower.

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

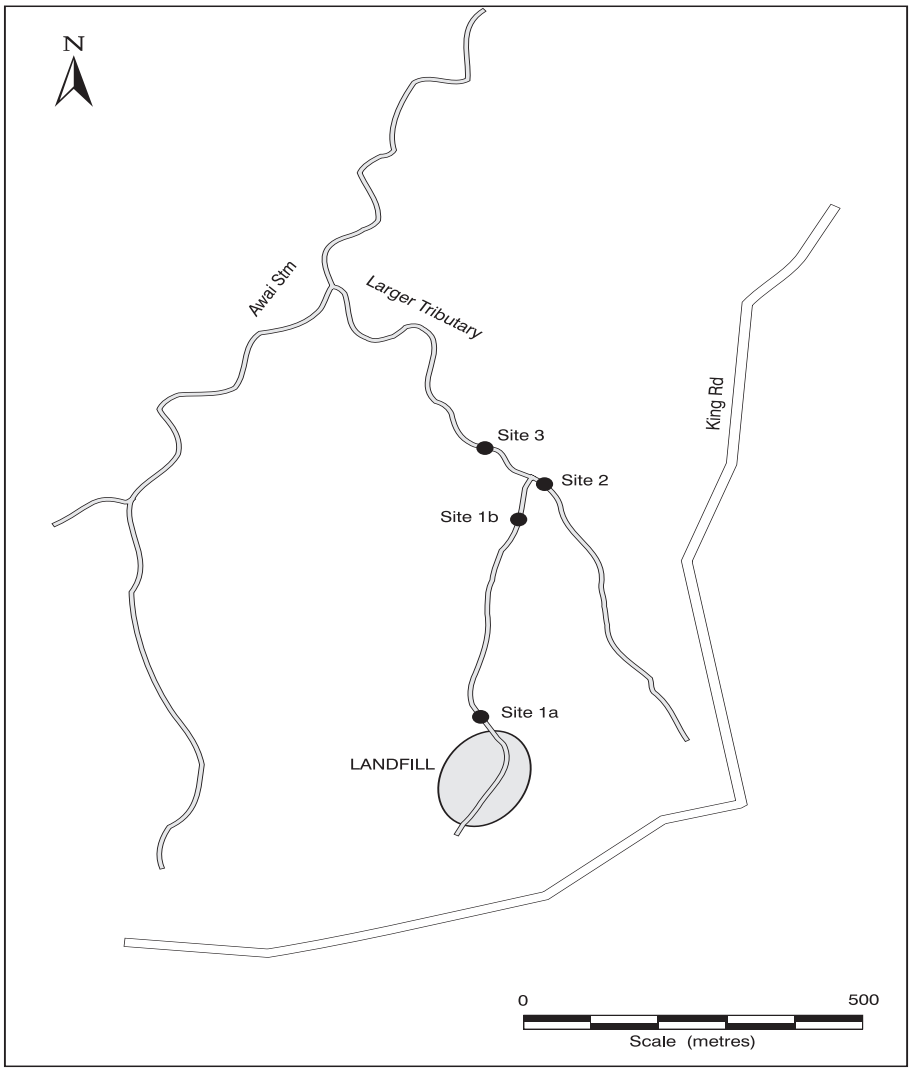

Figure 1 Biomonitoring sites in tributaries of the Awai Stream related to the Inglewood landfill

Results

This February 2013 survey was carried out under very low and very slow flow conditions at site 1a, and under low and very slow flow conditions at site 1b.At sites 2 and 3 in the larger tributary, low to very low flow conditions were observed during sampling, with water speeds being swift at site 2, and steady at site 3. At all sites the water was uncoloured and clear. It had been 7 days since the nearby Mangaoraka Stream flowed at more than three times its median flow and 88 days since flows exceeded seven times median.

At sites 1a and 1b, the bed substrate consisted almost entirely of silt, and macrophytes dominated the bed and banks of the stream. The iron oxide coating frequently noted at site 1a, was not recorded at the site during this survey. At the time of this survey the water temperatures recorded in the small tributary ranged from 16.3°C to 16.4°C.

In the larger tributary, the substrate at sites 2 and 3 predominantly consisted of cobbles, gravels and sand, although boulders were also present at both sites. A slippery film of algae was noted on the bed at both sites, with the bed at site 2 being partially shaded, while site 3 was completely shaded. The temperature recorded at these sites was 14.1°C at site 2 and 14.2°C at site 3. No site supported any undesirable biological growths.

Macroinvertebrate communities

A summary of results from previous surveys performed in the tributaries of the Awai Stream in relation to the Inglewood landfill are presented together with current results in Table 2. The full results of the present survey are provided in Table 3.

Table 2 Numbers of taxa and MCI values recorded in previous surveys related to the Inglewood landfill, together with current results

Site No	No. Taxa				MCI values				SQMCI$_s$ values			
	No. samples	Range	Median	Current result	No. Samples	Range	Median	Current result	No. samples	Range	Median	Current result
1a	37	4-23	15	14	37	60-84	71	73	27	1.2-3.5	2.6	3.0
1b	40	11-29	19	19	40	69-88	76	80	27	2.1-4.5	3.2	3.3
2	41	8-29	19	9	41	79-108	89	100	27	1.4-6.1	3.6	5.9
3	41	9-27	19	27	41	74-105	90	103	27	1.3-5.8	3.3	5.0

Site 1a

A total of fourteen taxa were recorded at site 1a, 100 metres downstream of the land fill face. This result was one taxon less than the median richness recorded at this site. The majority of taxa (57%) recorded at the site were 'tolerant' taxa which was reflected in the moderately low MCI score of 73 units. This MCI score was marginally higher than the median but well within the range of scores previously recorded at the site. There was an insignificant increase of six units in the MCI score at this site from the previous October 2012 survey (Figure 2).

The macroinvertebrate community at this site was characterised by five 'tolerant' taxa (ostracod seed shrimps, damselfly larvae (*Xanthocnemis*), water striders (*Microvelia*), orthoclad midge larvae and *Polypedilum* midge larvae) (Table 3). The numerical dominance of the tolerant taxa resulted in a moderate SQMCI$_s$ score of 3.0 units which was similar to the median SQMCI$_s$ score for the site, and within the range of scores recorded at site 1a previously.

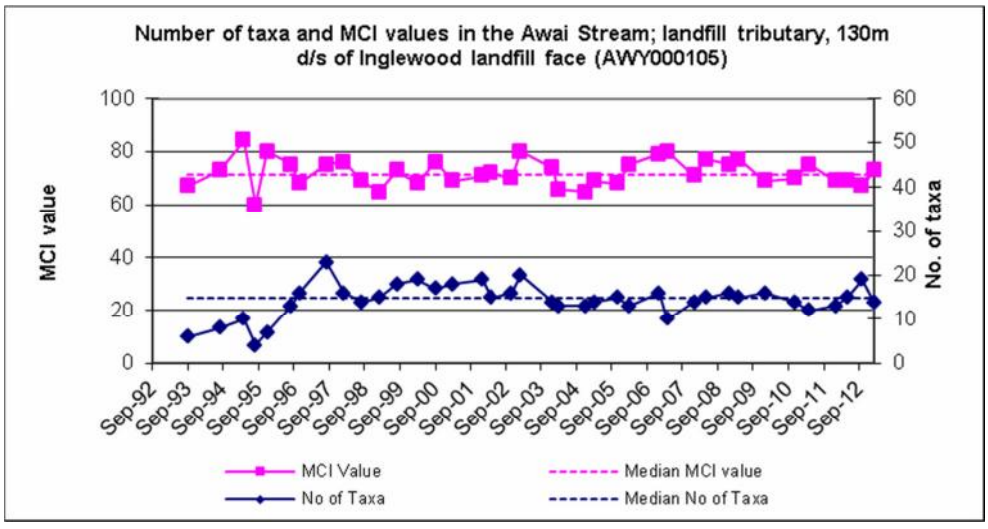

Figure 2 Number of taxa and MCI values at site 1a in a tributary of the Awai Stream

Site 1b

Nineteen taxa were recorded at site 1b, approximately 400 metres downstream of the landfill face, equal to the median recorded at this site and five taxa higher than that recorded at site 1a in this same survey. At the time of this survey, the majority (58%) of macroinvertebrate taxa recorded at this site were 'tolerant' taxa which was similar to that at site 1a, although there were differences recorded in the community composition between the two sites. This resulted in a moderate MCI score of 80 units, four units higher than the median score for the site (Figure 3) and seven units higher than the MCI score recorded at site 1a in this survey, a statistically insignificant improvement (Stark, 1998).

In this survey, the macroinvertebrate community was dominated by four 'tolerant' taxa (oligochaete worms, *Potamopyrgus* snail, axe head caddisfly larvae (*Oxyethira*) and orthoclad midge larvae) (Table 3). The $SQMCI_s$ score of 3.3 units recorded at site 1b was similar to the median score for the site, and to that recorded at site 1a in this survey.

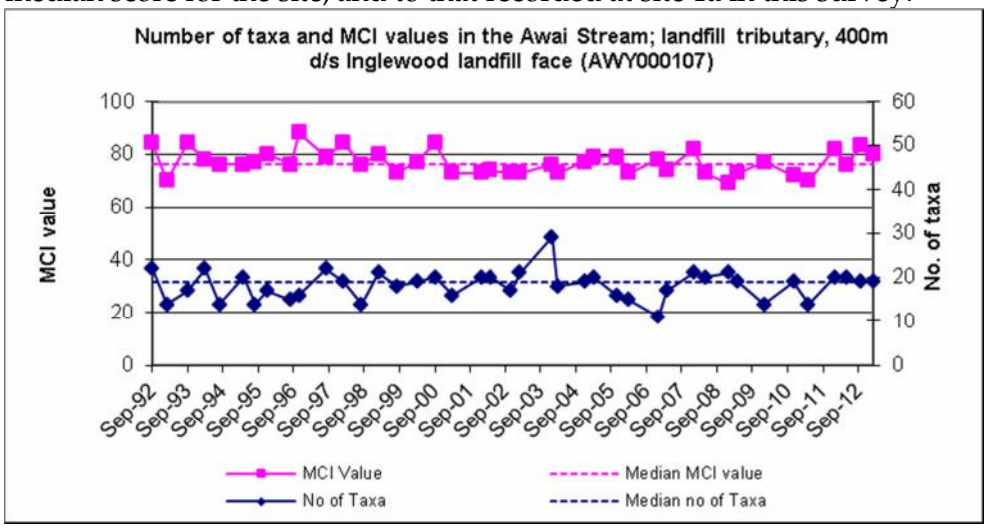

Figure 3 Number of taxa and MCI values at site 1b in a tributary of the Awai Stream

Site 2

The 'control' site 2 upstream of the confluence with the landfill tributary had a community richness of nine taxa, ten taxa lower than the median number found by previous surveys and only one taxon higher than the minimum richness recorded at this site to date (Table 2, Figure 4). A moderately high proportion of the community recorded at this site in the current survey were 'sensitive' taxa (78%) which resulted in a relatively high MCI score of 100 units for the site (Table 3). This MCI score was 11 units higher than the median score recorded at the site previously, a significant improvement and was significantly higher than the MCI score recorded at the two sites in the small unnamed tributary (1a and 1b) (Stark 1998).

The community was dominated by two very abundant 'moderately sensitive' taxa (amphipod *Paraleptamphopidae* and mayfly *Zephlebia)* which resulted in a moderately high $SQMCI_s$ score of 5.9 units (Table 3). This $SQMCI_s$ score was significantly higher than the median score recorded at the site previously and also significantly higher than score recorded at the two sites in the small unnamed tributary (1a and 1b).

Table 3 Macroinvertebrate fauna of unnamed tributaries of the Awai Stream sampled in relation to the Inglewood landfill on 12 February 2013

Taxa List	Site Number	MCI score	1a	1b	2	3
	Site Code		AWY000105	AWY000107	AWY000100	AWY000115
	Sample Number		FWB13053	FWB13054	FWB13051	FWB13052
PLATYHELMINTHES	*Cura*	3	-	R	-	-
NEMERTEA	Nemertea	3	-	-	-	C
ANNELIDA	Oligochaeta	1	-	A	-	A
MOLLUSCA	*Gyraulus*	3	-	-	-	R
	Lymnaeidae	3	R	R	-	-
	Potamopyrgus	4	-	VA	-	-
CRUSTACEA	Ostracoda	1	A	R	-	-
	Isopoda	5	-	-	-	R
	Paraleptamphopidae	5	-	R	VA	A
	Paranephrops	5	-	-	C	-
EPHEMEROPTERA	*Coloburiscus*	7	-	-	-	A
	Zephlebia group	7	-	R	VA	R
PLECOPTERA	*Spaniocerca*	8	-	-	-	R
ODONATA	*Xanthocnemis*	4	A	C	-	-
	Procordulia	5	R	-	-	R
HEMIPTERA	*Microvelia*	3	A	R	-	-
COLEOPTERA	Hydrophilidae	5	R	-	-	-
	Ptilodactylidae	8	-	-	-	R
TRICHOPTERA	*Hydrobiosis*	5	-	R	-	R
	Hydrobiosella	9	-	-	-	R
	Orthopsyche	9	-	-	-	A
	Plectrocnemia	8	-	R	-	-
	Polyplectropus	6	C	-	-	R
	Psilochorema	6	-	R	-	R
	Oeconesidae	5	-	R	-	-
	Oxyethira	2	-	A	-	-
	Pycnocentria	7	-	-	-	C
	Triplectides	5	-	-	-	C
DIPTERA	Eriopterini	5	-	-	-	R
	Hexatomini	5	-	-	R	R
	Limonia	6	-	-	R	R
	Paralimnophila	6	-	-	R	-
	Zelandotipula	6	-	R	-	-
	Chironomus	1	R	-	-	-
	Orthocladiinae	2	A	A	R	R
	Polypedilum	3	A	-	-	C
	Tanypodinae	5	C	-	-	-
	Paradixa	4	-	-	R	R
	Empididae	3	R	-	-	R
	Ephydridae	4	-	-	-	R
	Sciomyzidae	3	-	R	-	-
	Austrosimulium	3	-	C	-	A
	Stratiomyidae	5	R	-	-	-
ACARINA	Acarina	5	C	R	R	C
		No of taxa	14	19	9	27
		MCI	73	80	100	103
		SQMCIs	3.0	3.3	5.9	5.0
		EPT (taxa)	1	5	1	10
		%EPT (taxa)	7	26	11	37

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

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

Site 3

A higher community richness was found at site 3 below the confluence with the landfill drainage tributary, where the richness (27 taxa) was eight taxa more than the median richness and equal to the maximum richness recorded by all previous surveys. The MCI score of 103 units reflected the high proportion of 'sensitive' taxa present in the community at this site in the current survey. This is the highest MCI score recorded of all sites surveyed in the current survey, and the second highest recorded at this site to date (Figure 5).

The macroinvertebrate community at this site was characterised by one 'highly sensitive' taxon (net building caddisfly larvae (*Orthopsyche*), two 'moderately sensitive' taxa (paraleptamphopid amphipods and *Coloburiscus* mayfly) and two 'tolerant' taxa (oligochaete worms and *Austrosimulium* sandfly larvae) (Table 3). The numerical dominance of 'sensitive' taxa in the community resulted in a moderately high $SQMCI_s$ score of 5.0 units, which was significantly higher than the median score of 3.3 units recorded at this site in previous surveys. This score was also significantly higher than the scores recorded at the two sites in the smaller tributary but 0.9 unit lower than the score at site 2, a significant reduction (Stark, 1998).

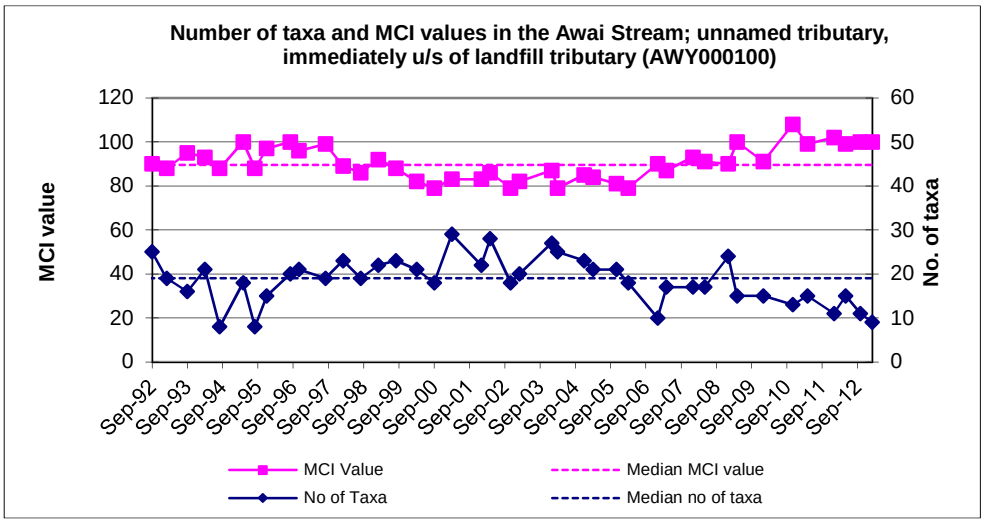

Figure 4 Number of taxa and MCI values at site 2 in a tributary of the Awai Stream

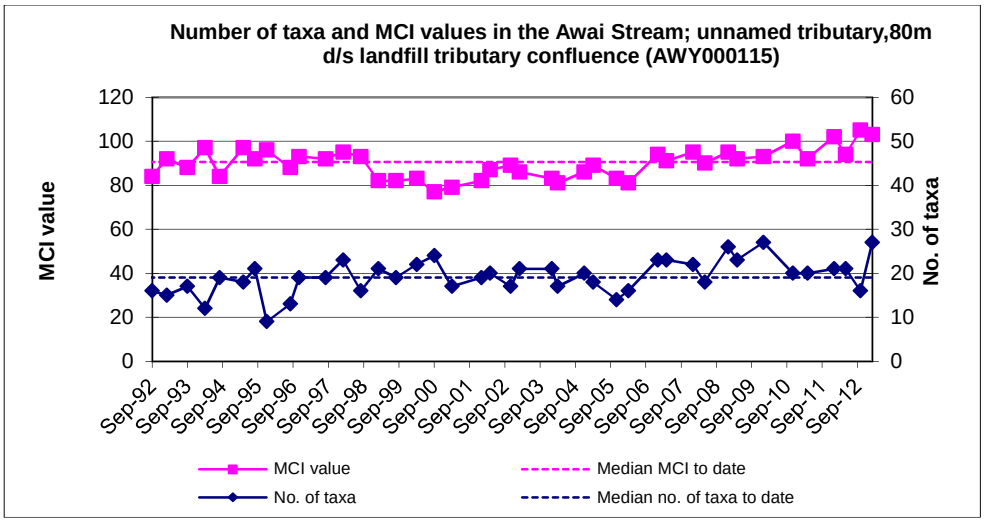

Figure 5 Number of taxa and MCI values at site 3 in a tributary of the Awai Stream

Discussion and conclusions

Wetland and grassy stream habitats such as at sites 1a and 1b often support abundances of molluscs, crustacea, true flies (dipterans), and certain caddisflies, and this was reflected in the current survey.

At the time of this February survey, there was a very low flow of very slow moving water recorded at site 1a which was indicative of a seepage feed stream. This was reflected in the macroinvertebrate community recorded at the site which was dominated by low scoring 'tolerant' taxa, adapted to living in near stagnant conditions and weedy habitat, such as the water strider *Microvelia*. This resulted in a moderately low MCI of 73 units and a moderately low $SQMCI_s$ score of 3.0 units. However, these scores were well within the range of scores recorded at the site in previous surveys.

Previous surveys typically recorded a poorer community at site 1a than at site 1b. The results of this survey were consistent with this. There was a five taxa increase in taxa richness between the sites, and the MCI and $SQMCI_s$ scores increased, although not significantly (Stark 1998). A difference in flow conditions and the quality of available macrophyte habitat between the two sites was considered to be the two main reasons for these results. At site 1b the stream adopted a more 'creek-like' flow, and as a consequence could support a more diverse macroinvertebrate community. The macrophyte community at site 1b consisted of pasture grass and watercress which was considered to provide more favourable habitat conditions compared to the reed and grass dominated macrophyte community at site 1a. Nine significant changes in individual taxon abundance reflect this improvement in habitat conditions at site 1b.

In the current survey, the macroinvertebrate community recorded at the upstream 'control' site (2) consisted of a high proportion of 'sensitive taxa' including two very abundant 'moderately sensitive' taxa (*Zephlebia* mayfly and the paraleptamphopid amphipods). This was reflected in the moderately high MCI and $SQMCI_s$ scores recorded at the site in this survey. These scores were significantly (Stark 1998) higher than those recorded at the two sites (1a and 1b) in the smaller tributary if the Awai Stream which is mostly likely the result of marked differences in the habitat quality at site 2 compared to sites 1a and 1b. In contrast to sites 1a and 1b, the stream at site 2 was partially shaded and the bed substrate consisted primarily of cobbles and gravels as opposed to silt. These conditions are more conducive to supporting a community containing more 'sensitive taxa' such as the mayfly *Zephlebia*. This site did record a lower taxa richness however, and this is likely to be a reflection of the reduced habitat availability and sampling difficulty, as this site becomes more overgrown with time.

The results recorded at site 3 downstream of the confluence with the small tributary were similar to those recorded at site 2 in this survey although the taxa richness increased markedly (by eighteen taxa), and as a result the community composition differed between the two sites. Site 3 recorded an above average community richness, equal to the highest recorded at this site to date, and also recorded the highest MCI score of the survey, due to a relatively high proportion of the taxa present being 'sensitive' taxa (66%). As at site 2, the moderately high MCI and $SQMCI_s$ scores recorded at site 3 were significantly (Stark 1998) higher than those recorded at the two smaller tributary sites. Once again, these differences are equated to differences in habitat quality.

Overall, the results suggest that differences in the macroinvertebrate communities between the four sites relate to differences in habitat rather than the effects of any discharge from the landfill site.

Summary

Macroinvertebrate sampling was undertaken on 12 February 2013, at four sites in two tributaries of the Awai Streams, using either the 'sweep-net' or 'kick' sampling technique, both standard sampling techniques used by the Council. This was undertaken to assess whether leachate discharges from Inglewood landfill had had any adverse effects on the macroinvertebrate communities of this stream. Samples were processed to provide number of taxa (richness), MCI and $SQMCI_s$ scores for each site.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The $SQMCI_s$ takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtly changes in communities, particularly if non-organic impacts are occurring. Significant differences in with the MCI or the $SQMCI_s$ between sites indicate the degree of adverse effects (if any) of the discharges monitored.

This February 2013 survey did not indicate that leachate from the Inglewood landfill had significantly affected the freshwater macroinvertebrate communities in these tributaries. These communities appear to be determined by the physical habitat conditions, particularly the slow to steady current speeds, soft/fine substrate and changes in macrophyte habitats available to the aquatic invertebrates.

The smaller, landfill drainage tributary sites exhibited slight improvements in taxa richness, MCI score and $SQMCI_s$ score in a downstream direction. Although these differences weren't statistically significant, the differences observed between the sites can probably be attributed to the difference in available habitat, with better habitat at site 1b (downstream) resulting in a lower proportion of 'tolerant taxa'. This site has progressively become choked with vegetation, but the wetted area is greater, and water speeds swifter.

No significant differences were recorded in the MCI scores between the two sites (2 and 3) in the larger tributary of the Awai Stream, although the $SQMCI_s$ score did reduce significantly from site 2 to site 3. However, these two sites had significantly higher MCI and $SQMCI_s$ scores compared to the two sites in the smaller tributary (1a and 1b), and these scores were also significantly higher than their respective medians, which was indicative of improved water quality in the larger tributary. Once again, differences in habitat condition were thought to be the main reason for these differences in the macroinvertebrate communities in the two tributaries.

No sites supported any undesirable biological growths.

The results of this survey provide no indication that the discharge of leachate into the unnamed tributary of the Awai Stream was having a significant adverse effect on the macroinvertebrate communities in the tributaries monitored.

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