

NPDC – Colson Road Landfill  
Monitoring Programme  
Annual Report  
2014-2015

Technical Report 2015-74

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## Executive summary

The New Plymouth District Council (NPDC) operates a regional landfill located on Colson Road, New Plymouth, in the Waiwhakaiho catchment. The landfill is currently filling stage three of the site which has a design capacity of approximately 800,000 cubic metres. Stages one and two have been closed and are fully reinstated. This report, for the period July 2014 to June 2015, describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess the consent holder's environmental performance during the period under review, and the results and environmental effects of the consent holder's activities.

**Overall, an improvement in NPDC's environmental performance is required.**

NPDC holds a total of eight resource consents in relation to the Colson Road landfill. These consents contain a total of 100 special conditions setting out the requirements that NPDC must satisfy. NPDC holds one consent to discharge uncontaminated stormwater into the Puremu Stream, two consents to discharge leachate and contaminated stormwater into the Puremu Stream, two consents to discharge emissions into the air, one consent to discharge solids onto and into land and one consent to discharge stormwater from earthworks. NPDC also holds one consent to divert water.

The Council's monitoring programme for the year under review included 16 inspections, four discharge samples, 18 surface water samples, seven groundwater samples, two biomonitoring surveys of receiving waters, and five air quality surveys. NPDC also collected four leachate samples and two under-liner drainage samples for physicochemical analysis.

At inspection issues were found in regards to site management, and although most of them were resolved and none resulted in off site effects, a small number of minor issues were recurrent, or remained unresolved at the end of the monitoring period.

Groundwater and under liner drainage sampling indicated that there is no significant contamination occurring in the local aquifer as a result of the landfill's presence.

Chemical and bacteriological monitoring of the Puremu and Manganaha Streams found that the receiving water quality criteria on the consents were met at the time of the three sampling surveys.

Although biomonitoring found that the macroinvertebrate results were indicative of poor biological health at some of the Puremu Stream sites, this was considered to be a reflection of the poor habitat conditions at these sites. It was concluded that the results were not indicative of any significant adverse effects on either the Puremu Stream or the Manganaha Stream from the discharges from the Colson Road Landfill at the time of 2014-2015 surveys.

Air quality monitoring showed that off site suspended particulates and dust deposition rates were within guideline levels.

There were 20 incidents associated with the Colson Road landfill in the 2014-2015 period, all of which related to odours. Although it was found that the site was compliant with consent conditions at the time of investigation, and on seven occasions there were no odours found, noticeable or strong odours were found on six occasions.

Overall, an improvement was required in NPDC's environmental performance and administrative compliance with the resource consents. The improvement required in NPDC's environmental performance in relation to the air discharge consent was signalled by the issuing of an abatement notice. This was issued early in the year under review due to likelihood of significant effects to occur as a result of the landfill gas emissions that were, on occasion, found to be resulting in strong off site odours at times in the winter/late autumn months. In terms of administrative performance, there were occasional non compliances with the management plan found during the period under review, and the Management Plan was not updated at the required frequency.

For reference, in the 2014-2015 year, 75% of consent holders in Taranaki monitored through tailored compliance monitoring programmes achieved a high level of environmental performance and compliance with their consents, while another 22% demonstrated a good level of environmental performance and compliance with their consents

This report includes recommendations for the 2015-2016 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 2014 to June 2015 by the Taranaki Regional Council (the Council) on the monitoring programme associated with resource consents held by New Plymouth District Council (NPDC). NPDC operates a regional landfill situated on Colson Road, New Plymouth, in the Waiwhakaiho catchment.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the consents held by NPDC that relate to discharges of water within the Waiwhakaiho catchment, and the two air discharge permits held by NPDC to cover emissions to air from the Colson Road landfill.

One of the intents of the *Resource Management Act 1991* (RMA) is that environmental management should be integrated across all media, so that a consent holder's use of water, air, and land should be considered from a single comprehensive environmental perspective. Accordingly, the Council generally implements integrated environmental monitoring programmes and reports the results of the programmes jointly. This report discusses the environmental effects of the NPDC's use of water, land, and air, and the 15<sup>th</sup> site specific Annual Report by the Council for NPDC covering only this site. Prior to this, during the period from 1990-1999, the Council produced 10 combined NPDC landfills' Annual Reports that included the Colson Road landfill.

### **1.1.2 Structure of this report**

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

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

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

Section 4 presents recommendations to be implemented in the 2015-2016 monitoring year.

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

### 1.1.3 The Resource Management Act (1991) and monitoring

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

- (a) the neighbourhood or the wider community around a discharger, and may include cultural and 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 (for example recreational, cultural, or aesthetic);
- (e) risks to the neighbourhood or environment.

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

### 1.1.4 Evaluation of environmental performance

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

**Environmental performance** is concerned with actual or likely effects on the receiving environment from the activities during the monitoring year.

**Administrative performance** is concerned with the Company's approach to demonstrating consent compliance in site operations and management including the timely provision of information to Council (such as contingency plans and water take data) in accordance with consent conditions.

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

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

## Environmental Performance

- **High:** No or inconsequential (short-term duration, less than minor in severity) breaches of consent or regional plan parameters resulting from the activity; no adverse effects of significance noted or likely in the receiving environment. The Council did not record any verified unauthorised incidents involving significant environmental impacts and was not obliged to issue any abatement notices or infringement notices in relation to such impacts.
- **Good:** Likely or actual adverse effects of activities on the receiving environment were negligible or minor at most. There were some such issues noted during monitoring, from self reports, or in response to unauthorised incident reports, but these items were not critical, and follow-up inspections showed they have been dealt with. These minor issues were resolved positively, co-operatively, and quickly. The Council was not obliged to issue any abatement notices or infringement notices in relation to the minor non-compliant effects; however abatement notices may have been issued to mitigate an identified potential for an environmental effect to occur.

For example:

- High suspended solid values recorded in discharge samples, however the discharge was to land or to receiving waters that were in high flow at the time;
- Strong odour beyond boundary but no residential properties or other recipient nearby.
- **Improvement required:** Likely or actual adverse effects of activities on the receiving environment were more than minor, but not substantial. There were some issues noted during monitoring, from self reports, or in response to unauthorised incident reports. Cumulative adverse effects of a persistent minor non-compliant activity could elevate a minor issue to this level. Abatement notices and infringement notices may have been issued in respect of effects.
- **Poor:** Likely or actual adverse effects of activities on the receiving environment were significant. There were some items noted during monitoring, from self reports, or in response to unauthorised incident reports. Cumulative adverse effects of a persistent moderate non-compliant activity could elevate an 'improvement required' issue to this level. Typically there were grounds for either a prosecution or an infringement notice in respect of effects.

## Administrative compliance

- **High:** The administrative requirements of the resource consents were met, or any failures to do this had trivial consequences and were addressed promptly and co-operatively.
- **Good:** Perhaps some administrative requirements of the resource consents were not met at a particular time, however this was addressed without repeated interventions from Council staff. Alternatively adequate reason was provided for

matters such as the no or late provision of information, interpretation of 'best practical option' for avoiding potential effects, etc.

- **Improvement required:** Repeated interventions to meet the administrative requirements of the resource consents were made by Council staff. These matters took some time to resolve, or remained unresolved at the end of the period under review. The Council may have issued an abatement notice to attain compliance.
- **Poor:** Material failings to meet the administrative requirements of the resource consents. Significant intervention by the Council was required. Typically there were grounds for an infringement notice.

For reference, in the 2014-2015 year, 75% of consent holders in Taranaki monitored through tailored compliance monitoring programmes achieved a high level of environmental performance and compliance with their consents, while another 22% demonstrated a good level of environmental performance and compliance with their consents.

## 1.2 Process description

Wastes originating from municipal refuse kerbside collection, the Colson Road transfer station, other municipal transfer stations and commercial operators are discharged to the landfill. As of December 2007 Colson Road became the sole operating landfill in the Taranaki region. Once the waste is discharged it is compacted and, according to the management plan, covered daily with clay or a suitable alternative. Currently, waste is discharged to stage three of the operation, which is expected to operate until approximately 2019. Once full, the area will be covered with clay and topsoil to a predetermined specification before being grassed. Leachate from stages two and three is collected and directed to the New Plymouth Municipal Wastewater Treatment Plant, along with contaminated stormwater from stage three. An aerial plan of the site is shown in Figure 1.

The current stage in use (Stage 3) has a fully engineered liner consisting of high density polyethylene (HPDE) laid over compacted clay. Leachate is collected in porous pipes that have been put down in herring bone configuration over the polyethylene liner. During the 2013-2014 year, the lining of stage three was completed so that the liner now covers Stage 3's entire footprint. From this point on, there was an increase in the amount of potentially contaminated stormwater generated due to the increase in the lined and filled area, and this was therefore directed to the leachate collection system for discharge via the New Plymouth wastewater treatment plant.

Daily operations at the site are governed by the requirements contained in the Colson Road Regional Landfill Management Plan.



Photograph 1 Stage three extension works, February 2011

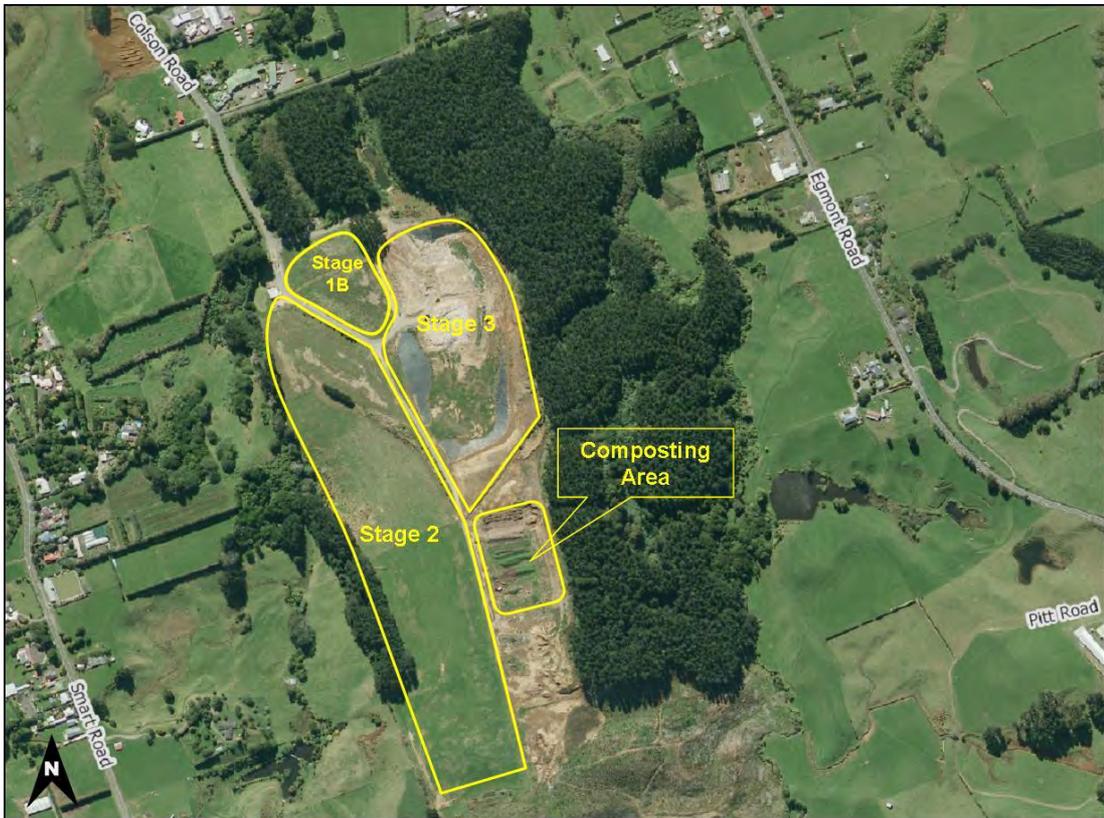


Figure 1 Aerial view of the Colson Road landfill

### 1.3 Resource consents

NPDC holds a total of eight resource consents in relation to the Colson Road landfill. These consents contain a total of 100 special conditions setting out the requirements that NPDC must satisfy. NPDC holds two consents to discharge uncontaminated stormwater into the Puremu Stream, two consents to discharge leachate and contaminated stormwater into the Puremu Stream, two consents to discharge emissions into the air, and one consent to discharge solids onto and into land. NPDC also holds one consent to divert water.

**Table 1** Summary of the resource consents held by NPDC

Consent No	Purpose	Review	Expire
0226-1	Divert Puremu Stream	-	01 Oct 2026
2370-3	Discharge leachate and stormwater from area A to Puremu Stream	June 2018	01 Jun 2025
4619-1	Discharge treated stormwater and minor amounts of leachate from areas B1, B2, C1 & C2 to groundwater and the Puremu Stream	June 2018	01 Jun 2025
4620-1	Discharge uncontaminated stormwater from areas B1, B2, C1 and C2 into the Puremu Stream	June 2018	01 Jun 2025
4621-1	Discharge solids to land	June 2018	01 Jun 2025
4622-1	Discharge emissions to air from composting	June 2018	01 Jun 2025
4779-1	Discharge emissions to air from landfilling	June 2020	01 Jun 2026
6177-1	Discharge stormwater from earthworks	-	01 Jun 2020

#### 1.3.1 Water discharge permits

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

NPDC holds water discharge permit **2370-3** to cover the discharge of up to 1,000 m<sup>3</sup>/day of leachate and contaminated stormwater from the closed section, Area A, of Colson Road municipal landfill to groundwater in the vicinity of and into the Puremu Stream. This permit was issued by the Council on 19 March 2003 under Section 87(e) of the RMA. This consent was reviewed in June 2006 and is due to expire on 1 June 2026.

Condition 1 requires the consent holder to adopt the best practicable option to avoid or minimise adverse effects.

Condition 2 requires that the consent be exercised in accordance with the documentation submitted in support of the consent application.

Condition 3 prohibits certain water quality effects in the Puremu Stream.

Condition 4 prohibits significant impacts on aquatic life.

Condition 5 states that monitoring of surface and groundwaters at the site shall be to the satisfaction of the Council.

Condition 6 requires that the NPDC abides by their Proposed District Plan.

Condition 7 states that the NPDC shall maintain and comply with a site management plan.

Conditions 8 and 9 require the consent holder to maintain area A of the landfill to a certain standard.

Conditions 10 and 11 require the consent holder to maintain water flow and silt control measures on site, and prevent vehicle cleaning on site.

Conditions 12, 13, 14 and 15 state the location of a mixing zone and place restrictions on the physicochemical impacts of the discharge in the Puremu Stream.

Condition 16 states that the discharge should not render water in the Puremu Stream unfit for stock consumption.

Condition 17 requires that systems relating to leachate on the site are maintained to the satisfaction of the Council.

Condition 18 provides opportunities to review the conditions of the consent, if monitoring shows that it is warranted.

The permit is attached to this report in Appendix I.

The NPDC holds resource consent **4619-1** to discharge up to 675 L/s of treated stormwater and minor amounts of leachate from areas B1 B2 C1 and C2 of the Colson Road Landfill to groundwater in the vicinity of and into the Puremu stream a tributary of the Mangaone Stream in the Waiwhakaiho Catchment. This permit was issued by the Taranaki Regional Council on 21 March 1999 under Section 87(e) of the RMA. This consent was reviewed in June 2006, provides for a further review in June 2018, and is due to expire on 1 June 2025.

Condition 1 of this consent states that the water quality of the Manganaha Stream shall not be changed as a result of the discharge.

Conditions 2 and 3 outline specific water quality criteria for the Puremu Stream that must not be exceeded as a result of the discharge.

Conditions 4 and 5 deal with management plans and monitoring programmes.

Condition 7 provides opportunities to review the conditions of the consent, if monitoring shows that it is warranted.

The permit is attached to this report in Appendix I.

The NPDC holds consent **4620-1** to discharge up to 675 L/s of uncontaminated stormwater from areas B1, B2, C1 and C2 of the Colson Road Landfill into the Puremu Stream, a tributary of the Mangaone Stream in the Waiwhakaiho Catchment.

This permit was issued by the Taranaki Regional Council on 21 March 1999 under Section 87(e) of the RMA. This consent is due to expire on 1 June 2025.

Conditions 1, 2 and 8 specify the level of water quality in the Puremu and Manganaha streams that must be maintained.

Condition 3 prohibits the discharge of any leachate.

Conditions 4 and 5 require that all constructions, earthworks and stormwater systems be designed and maintained in a manner that minimises erosion and land instability.

Condition 6 states the consent holder shall repair and rehabilitate any land made unstable and any erosion occurring due to the construction or maintenance of the diversion channels or landfilling operations or composting site associated with the exercise of this consent.

Condition 7 requires the consent holder to notify Council of any works that may affect the areas contributing to the stormwater discharged under this consent.

Condition 9 prohibits activities that may result in contaminated stormwater entering the Manganaha Stream.

Conditions 10 and 11 require the consent holder to produce and adhere to a compliance monitoring programme and a landfill management plan.

Conditions 12 and 13 deal with rules associated with lapse and review dates for the consent.

The permit is attached to this report in Appendix I.

The NPDC holds resource consent **6177-1** to discharge stormwater (due to earthworks in providing an area for Stage 3 of the municipal landfill) onto land and into the Puremu Stream a tributary of the Mangaone Stream in the Waiwhakaiho catchment. This permit was issued by the Taranaki Regional Council on 11 June 2003 under Section 87(e) of the RMA. It is due to expire on 1 June 2020.

Condition 1 states parameter limits on the discharge to the Puremu Stream.

Condition 2 states that leachate shall not be discharged by the exercise of the consent.

Condition 3 deals with stormwater diversion and channels.

Conditions 4 and 5 state that the activity shall not alter certain characteristics of the water or significantly adversely impact on its aquatic life.

Condition 6 relates to water monitoring.

Conditions 7 and 8 require the provision of a site management plan, contingency plan and erosion control plan.

Condition 9 outlines that the best practicable option is to be taken in the management of the site to avoid or minimise adverse effects.

Condition 10 requires repair and rehabilitation of land, if made unstable by drainage works.

Condition 11 places requirement on the consent holder in relation to stormwater movement control on the site.

Condition 12 prohibits certain water quality effects in the Puremu Stream.

Condition 13 provides opportunities for review of the consent.

The permit is attached to this report in Appendix I.

### **1.3.2 Air discharge permit**

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

#### **Composting operations**

The NPDC holds resource consent **4622-1** to cover the discharge of emissions into the air from composting and ancillary activities at the Colson Road landfill. This permit was issued by the Taranaki Regional Council on 21 March 1999 under Section 87(e) of the RMA. It is due to expire on 1 June 2025.

Condition 1 requires the consent holder to adopt the best practicable option to prevent or minimise any actual or likely adverse effect on the environment arising from the emissions from the composting operation.

Condition 2 requires that the discharge of contaminants to air from the landfilling operations not result in offensive or objectionable odours or dust or dangerous or noxious ambient concentrations of any airborne contaminants at or beyond the boundary of the site.

Condition 3 states that the discharge shall not give rise to any significant adverse ecological effects on any ecosystems.

Condition 4 states that the nature of materials acceptable for composting and the operation of the composting activities shall give effect to the 'Assessment of Discharges to Air', July 1994 and the 'NPDC Colson Road Landfill: Landfill Management Plan', July 1994 and requires that the landfill management plan be updated at least yearly.

Conditions 5 and 6 state that any composting windrow shall be located at least 300 m from any dwelling house, and shall comprise no greater than 5% by weight of materials that are not plant-derived.

Special condition 7 required that the composting operation be initially undertaken on a trial basis for 6 months, with the consent holder reporting to the Council on effects-based monitoring and any complaints about odour at the end of this trial period.

Conditions 8 and 9 outline lapsing and review provisions.

### **Landfilling operations**

The NPDC holds resource consent **4779-1** to cover the discharge of emissions into the air from the existing landfill (Area A) and proposed landfill extension in Areas A, B1, B2, C1 and C2 of the Colson Road municipal landfill site. This permit was issued by the Taranaki Regional Council on 21 March 1999 under Section 87(e) of the RMA. This consent was reviewed in June 2006 and is due to expire on 1 June 2025.

Condition 1 requires the consent holder to adopt the best practicable option to prevent or minimise any actual or likely adverse effect on the environment arising from the emissions from the landfilling operation.

Condition 2 states that the discharge of contaminants to air from the landfilling operations shall not result in offensive or objectionable odours or dust or dangerous or noxious ambient concentrations of any airborne contaminants at or beyond the boundary of the site.

Condition 3 states that no material is to be burnt at the landfill site.

Condition 4 states that the discharge shall not give rise to any significant adverse ecological effects on any ecosystems.

Condition 5 states that no extraction venting of untreated landfill gases be located closer than 200 m to any boundary of the landfill property.

Condition 6 requires that the landfill be operated to give effect to the 'Air Discharge Consent Application Supporting Documentation, July 1995' and in accordance with the 'NPDC Colson Road Landfill: Landfill Management Plan, July 1994'. The management plan shall be updated at least yearly and offer no lesser level of environmental protection than the original documents.

Condition 7 requires the consent holder to consult with the Council prior to undertaking any alteration to the site or site operations other than specified in the application and supporting documentation lodged with the application.

Condition 8 requires the consent holder to meet at least once per year with the submitters of the consent and any other interested party to discuss any matter relating to the exercise of the consent and to facilitate ongoing consultation.

Condition 9 requires the consent holder to provide to the Council a report on the feasibility of collecting, extracting, venting or combusting landfill gas at the landfill, within one year of the commencement of the consent.

Conditions 10 and 11 outline the provisions for lapsing and review of the consent.

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

The NPDC holds resource consent **4621-1** to cover the discharge of up to 500 tonnes of contaminants onto or into land per day in areas B1, B2, C1 and C2 of the Colson Road landfill. This permit was issued by the Taranaki Regional Council on 21 March 1999 under Section 87(e) of the RMA. This consent is due to expire on 1 June 2025.

Condition 1 requires the consent holder to install and maintain a further groundwater monitoring piezometer between the bores at sites AH9 and L2 and to maintain groundwater bores at the sites WQA, WQB, WQC, AH1, AH2, AH3, AH5, AH6, AH7, L1, L2, L5, L7, and L8 (as per the AEE).

Condition 2 requires the consent holder to prevent surface water runoff or contaminants to the Manganaha Stream from areas used for deposition of refuse or earthworks unless the area has been covered and rehabilitated.

Condition 3 requires the consent holder to demonstrate that the stormwater systems, surface contours and landscaping works have been undertaken to ensure that compliance with special condition 2 will be achieved, prior to commencing any use of Areas B, C1 and C2 for deposition of refuse.

Condition 4 requires that a registered engineer certify the construction, installation, integrity and performance of groundwater drainage systems, landfill lining systems and leachate interception, collection, holding, recirculation and discharge systems in Areas B1, B2, C1 and C2 prior to any discharge of solids wastes in those areas.

Condition 5 requires the consent holder to remedy or mitigate and if practicable to prevent any continuation of effects upon the quality of groundwater should the groundwater quality be significantly affected by the landfilling and composting activities.

Condition 6 outlines monitoring requirements, and criteria to be used to determine if contamination is occurring.

Condition 7 requires the consent holder to operate the landfill in a manner conforming to the relevant requirements of the 'NPDC Colson Road Landfill: Landfill Management Plan 1994' and to update the plan at least yearly.

Condition 8 outlines the criteria for the acceptance and disposal of waste types at the landfill.

Condition 9 and 10 outline provisions for lapsing and review of the consent. The permit is attached to this report in Appendix I.

### 1.3.4 Water right

The NPDC holds water right **0226-1** to allow the diversion, by culverting, of the Puremu Stream to provide road access to the landfill. The Taranaki Catchment Commission issued this on 2 April 1975, and renewed it on 14 May 1986 under section 21 (3) of the Water and Soil Conservation Act, 1967. It is due to expire on 1 October 2026 as per section 386 (2) of the RMA.

## 1.4 Monitoring programme

### 1.4.1 Introduction

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

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

The monitoring programme for the Colson Road landfill site consisted of five primary components, as described in Sections 1.4.2 to 1.4.6. A summary is also provided in Table 2.

**Table 2** Summary of monitoring activity for 2014-2015

Activity	Number
Inspections	16
Discharge samples	1
Stormwater samples	3
Receiving water samples	18
Groundwater samples	7
Air deposition samples	12
Methane readings	22
PM10 readings	21
Biomonitoring surveys	2

### 1.4.2 Programme liaison and management

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

- ongoing liaison with the resource consent holder over consent conditions and their interpretation and application;
- Colson Road Liaison Committee meetings;
- discussion over monitoring requirements;
- preparation for any reviews;
- renewals;

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

### **1.4.3 Site inspections**

The Colson Road landfill site was inspected on a total of 16 occasions during the monitoring period. There were 12 routine compliance monitoring inspections and five follow up inspections undertaken. With regard to consents for the abstraction of or discharge to water, the main points of interest were plant processes with potential or actual discharges to receiving watercourses, including contaminated stormwater and process wastewaters. Air inspections focused on plant processes with associated actual and potential emission sources and characteristics, including potential odour, dust, noxious or offensive emissions. Sources of data being collected by the consent holder were identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. The neighbourhood was surveyed for environmental effects.

### **1.4.4 Chemical sampling**

The Council undertook sampling of both the discharges from the site and the water quality upstream and downstream of the discharge points and mixing zones. Water-quality and discharge sampling sites are shown in Figure 2.

The Puremu Stream, Manganaha Stream, and stormwater were all sampled on three occasions during the period under review. The discharge from the composting area treatment system was sampled on one occasion. The samples were analysed for a range of parameters including ammoniacal nitrogen, unionised ammonia, suspended solids, conductivity, and metals.

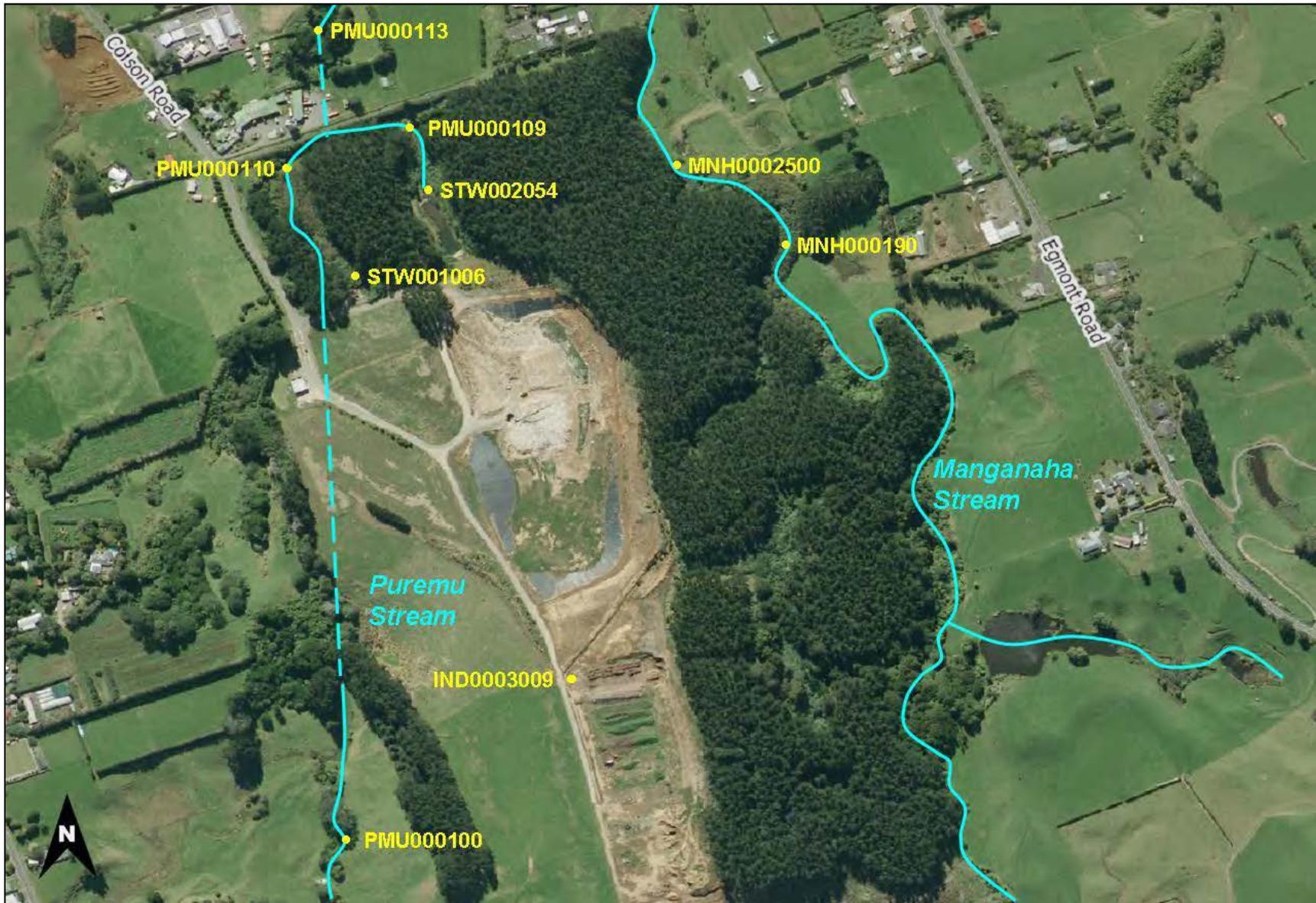
Groundwater in the vicinity of the landfill was sampled on one occasion, and the groundwater sampling sites are shown in Figure 3. These sites were analysed for a range of physicochemical parameters including semi volatile organic compounds (SVOC) and metals.

### **1.4.5 Air quality**

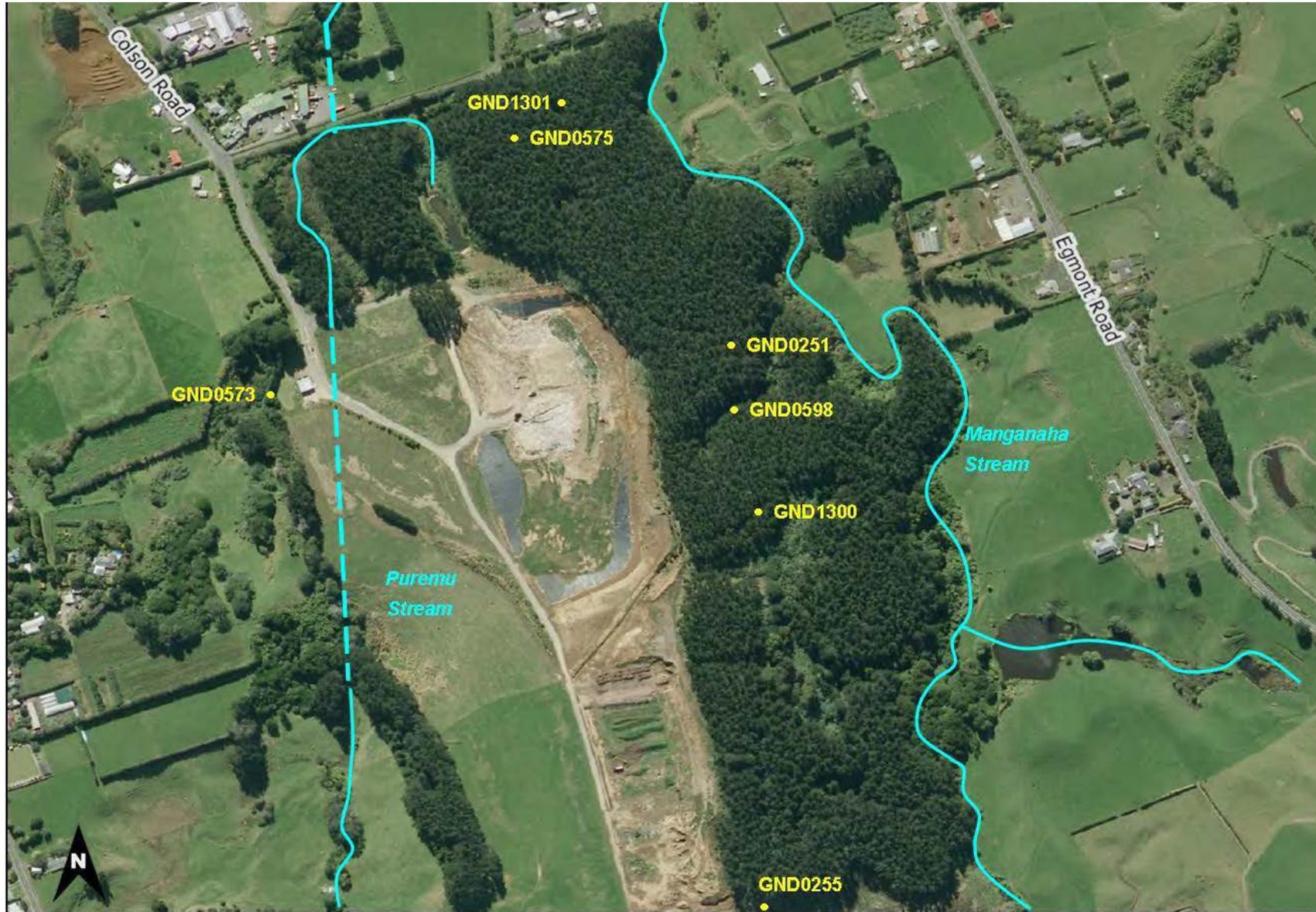
The Council undertook sampling of the ambient air quality in the neighbourhood. Six deposition gauges were also placed at selected sites in the vicinity of the landfill and at the landfill on two occasions, and the collected samples analysed for solids. Three ambient particulate matter and three methane surveys were also undertaken. Air monitoring sites are shown in Figure 4.

### **1.4.6 Biomonitoring surveys**

Biological surveys were performed on two occasions in the Puremu Stream (three sites) and Manganaha Stream (two sites) to determine whether or not the discharges from the site have had a detrimental effect upon the communities of the streams.



**Figure 2** Aerial photo showing the stormwater and receiving water sampling sites at Colson Road landfill



**Figure 3** Aerial view of Colson Road landfill showing the positions of groundwater monitoring bores



**Figure 4** Aerial view of Colson Road landfill showing the positions of air quality monitoring sites

## 2. Results

### 2.1 Inspections

Twelve routine compliance monitoring and five follow up inspections were carried out during the period under review. Below are summaries of the findings of those inspections.

#### 16 July 2014

The site was inspected in a moderate to fresh southerly breeze. Prior to going on site it was noted that there was a slight intermittent leachate odour detectable just inside the main road gate.

It was noted that the cover on the retired areas of the landfill looked good.

It was found that the compost area was quite empty. The outgoing contractor had moved the majority of his material to the southern end of the composting area. The new operator had a low amount of material on site, with the chipper operating at the time of inspection. It was noted that there was a slight intermittent earthy odour between the composting area and the landfill area.

The eastern perimeter drains were free of rubbish. It was noted that the litter fence on the southern side of the landfill had come away at the base along about half the length of the fence. Although this was upwind of the landfill at the time of inspection, the consent holder was asked to ensure that this was anchored as soon as possible before it got damaged.

Gas monitoring was undertaken inside the outlet of the leachate drain on the south east side of the landfill using the MultiRea gas analyser, with the following results: hydrogen sulphide, >99.9 ppm; methane lower explosive limit (LEL), 7-99%; ammonia, 29 ppm; volatile organic compounds; 1 ppm.

It was observed that there was only a small amount of rubbish protruding from the covered areas of the active landfill. Leachate was visible in the special waste pit, and some bubbling was observed.

The active tip face was less than the maximum permitted 900 m<sup>2</sup>, with a haul road of approximately 50 m by 20 m actively in use, and to be compacted soon. It was observed that there was cover material banked up on either side of the haul road ready for use. There was a slight intermittent leachate odour noted above the tip face.

It was found that there was a surface flow of leachate occurring along the western side of the landfill, originating approximately 40 m above the sites low point on that side. The flow was estimated to be approximately 0.5 L/s.

Ambient air quality monitoring downwind of the leachate breakout area found that only 0.1 ppm of volatile organic compounds were present.

The area around the big silt pond looked good, and was relatively clean showing evidence of recent housekeeping activities, however, it was noted that the bottom of the weir may need de-silting soon.

It was found that the small silt pond (west of the leachate overflow pond) needed urgent desilting. It was recommended that a sucker truck be used rather than a digger to minimise the effects on the stream from sediment disturbance.

There was evidence of litter collection happening in this area, however there was still quite a bit of litter around.

It was found that the Puremu Stream culvert outlet was quite clear, with only a small amount of leaf litter present. The stream flow was clear over an iron oxide bed.

It was found that the SPCA driveway grate needed cleaning. It was observed that the biker's bridge had been removed from the tributary below the landfill.

It was noted that the stream and tributary upstream of the confluence were slightly milky, as was the Puremu Stream at site PMU000113.

No objectionable or offensive odours were noted beyond the boundary of the site at the time of inspection.

The following action was to be undertaken:

- anchor southern litter fence
- continue with litter removal
- remove silt from small pond urgently. It is recommended that a sucker truck be used to minimise effects
- silt removal would be needed soon at the base of the big silt pond weir
- clean grate on the culvert by the SPCA driveway

### **13 August 2014**

The site was inspected in light variable wind conditions. A sampling survey of the surface waters and discharges was also undertaken. It was noted that there were no off-site odours detected at the time of inspection. There was a small area at the edge of the access road, about 100 meters passed the office, where there was an accumulation of litter and silt, that needed to be cleaned up.

The capped areas of the landfill looked to be satisfactory and the compost areas were neat and tidy. It was noted that the material in the area operated by the new contractor was a lot coarser than that of the previous contractor, and there was very little material present. The litter fence on the southern boundary of the landfill had been anchored as requested at the previous inspection.

It was noted that there was a slight intermittent leachate odour present in the vicinity of the compost pad retention ponds.

There was leachate visible in the special wastes pit, and it was noted that sawdust had been applied at the northern edges of the pit. There was a strong constant leachate odour present in this area, and it was observed that staff were spraying the odour masking agent onto the pit at the time of inspection. A truck load of sawdust was also applied to the special waste pit at the time of inspection, with a significant amount of localised dust being generated. Photographs were taken. The dust dispersed quickly in

the wind conditions prevailing at the time, but the consent holder was warned that this activity had the potential for off-site effects if it was not managed effectively. Strong intermittent leachate odours were present at various locations on the capped cells to the west of the present fill area, with methane detected at 1 % of its LEL. It was found that the main tip face was within the 900 m<sup>2</sup> limit in the site management plan.

The leachate and stormwater retention ponds were found to be satisfactory, although it was noted that there was litter starting to accumulate at the edges of the large silt pond, and below the litter fence, that could do with being addressed soon. It was noted that the level in the leachate pond was quite high, indicating that the consent holder was trying to reduce the amount of leachate present in the filled areas. The requested de-silting of the ponds was found to have been completed.

It was found that there was only a very small amount of leaf debris and small branches at the SPCA driveway and main Puremu culvert grates. The consent holder was asked to continue to monitor these, and clean them as required.

The following action was to be undertaken:

- Continue with litter removal especially in the large silt pond and below the litter fence in the area.
- Clean up litter and silt from the access road.

#### **17 September 2014**

The site was inspected in fine weather conditions. It was noted that there was still litter present on the eastern side of the access road past the office. The cap of the retired areas was walked. It was found that the vegetative cover was satisfactory, with no evidence of pugging, and no cracking found. There were some small areas of erosion on the eastern batter of area A that would need to be monitored. There were some small localised areas of slumping in the stage 2 cap, but no evidence of ponding. The consent holder was advised that this would need continued monitoring. It was also found that there was some minor erosion/slumping in a gateway in the southern paddocks. This would need to be monitored with a view to adding some extra cover in the summer.

It was observed that there was more material present in the area operated by the new composting contractor. The material was observed to be quite coarse with little, if any, odour. It appeared to be all vegetative material, and it was considered that due to its nature, was not likely to have much impact on stormwater quality.

It was found that the southern litter fence was working well.

Above the tip face it was found that there were numerous areas with minimal cover. There was a noticeable refuse odour on the northern side of the fill area as well as an intermittent leachate odour. The inspecting officer was informed that the northern batter was at its final level, and that it was ready to cap and grass. The fill profile would then go up from the top, back towards the south. At that stage waste disposal would be by means of a rolling tip face. At the time of inspection there was a lot of exposed refuse. The inspecting officer was informed that this was due to recontouring in preparation for the final cap, and erosion of the interim cap during recent heavy rain. Photographs were taken. Cover material was being brought on at the time of

inspection, however it was noted that the ground conditions were making this difficult, with the trailer observed to be slipping on the track. NPDC agreed to email the Council with the timeframes involved in the capping of the northern batter, and advised that it was progressing with getting proposals and costings from consultants to look at the odour issues that had been experienced at the site. It was expected that the proposals would be in by the end of the month.

It was found that the leachate channel at the northern toe was full of litter, and there was litter also present in and around the big silt pond, below the litter fence in this area, and in the vicinity of the leachate pond. The grated sump at the leachate pond was covered by a large piece of plastic, and the consent holder was contacted by phone to advise them of this. The culvert grate by the site entrance was clear of debris, but it was noted that there was quite a bit of wind blown litter above this area (true right bank).

The inspecting officer was informed that there were to be some staff changes at the landfill, which included a reduction in the number of staff based there. The Council expressed its concerns about how this may affect performance at the landfill, given the deterioration in housekeeping observed at this inspection.

The following action was to be undertaken:

- Continue with litter removal especially in the large silt pond, in the tributary below the litter fence in this area, and at the leachate pond.
- Clean up litter from the access road on the left past the site office.
- Cover exposed refuse that is not part of the active tip face or haul road.

#### **23 September 2014**

A follow-up inspection was undertaken prior to the Colson Road Liaison meeting. It was found that additional cover material had been added to the northern toe and above this area, however the consent holder was informed that more cover was still required. It was also noted that the large piece of plastic was still present on the leachate sump pump grate.

The following action was to be undertaken:

- Continue with litter removal especially in the large silt pond, in the tributary below the litter fence in this area, and at the leachate pond.
- Clean up litter from the access road on the left past the site office.
- Cover exposed refuse that is not part of the tip face or haul road.

#### **22 October 2014**

The site was inspected in fine weather with a light north-westerly wind.

There was refuse present in the road side drains on the uphill slope just past the office. The consent holder was asked to ensure that this was removed.

The cap on the retired area of the landfill looked good, as did the composting area. No odours were noted.

The water in the compost treatment ponds was dark brown, but the final pond was empty. The consent holder was asked to monitor the amount of wind blown refuse in the compost treatment system, and address as required.

It was noted that the litter fence on the eastern side of the landfill had trapped quite a bit of wind blown material. Dust suppression was being undertaken at the time of inspection.

There were localised, intermittent refuse and slight leachate odours noted in the vicinity of the eastern stormwater drain. This drain was found to contain quite a lot of loose clay in places, as the use of the road above the drain appeared to be causing material to fall into the drain. The culvert in this drain was partially obstructed with clay and the contractor was alerted to this at the time of inspection. There was also refuse present in the drain. This was also discussed with the contractor at the time of inspection, and the contractor advised that the material was being recovered from the silt ponds.

It was found that preparations were being made for a new special waste pit, as the existing one was about to be retired. The inspecting officer was informed that the hole to be used was to have drains incorporated to direct any leachate to the western leachate pipes and through to the leachate pump, rather than it flowing through the fill and into the system that drains to the leachate pond (subsequent monitoring found that the design of the pit had been changed and that this drainage system was not installed).

At the time of inspection a second tip face was in operation, with the first partially covered. Although the exposed refuse was judged to be greater than 900 m<sup>2</sup> at the time of inspection, the inspecting officer was informed that covering of the tip face used earlier in the day would continue, once the second operator returned from lunch break. The contractor advised that he was pacing out the areas to be used for tipping to ensure that the 900 m<sup>2</sup> tip face requirement was being met. The refuse was being tipped on a central gravel road and was being pushed out onto the working cell. This eliminated the need for a haul road in addition to a tip face.

The special waste pit was found to have had a lot of sawdust cover applied, with only a small area of the surface being exposed liquid. There was very little bubbling observed, and the odours from the pit were minimal in comparison to previous inspections. Capping of the completed areas was discussed, and it was noted that the depth of cover required would be checked and confirmed. The inspecting officer was informed that there were now going to be three full time staff members operating the landfill.

It was observed that there was only a small amount of rubbish protruding from the covered areas of the active landfill.

There was evidence that litter picking had been occurring in the vicinity of the leachate pond.

The small silt pond west of the leachate overflow pond, although it had been desilted since the last inspection, was again quite full of silt. The consent holder was advised that this needed to be desilted again. It was again recommended that a sucker truck be

used rather than a digger, to minimise the effects on the stream from sediment disturbance.

There was a large pile of silt (with some refuse in it) near the big silt pond, indicating that regular desilting of this pond was occurring. There was evidence of litter collection happening in this area, however there was still a bit of litter around. It was found that the Puremu Stream culvert outlet was unobstructed, and no objectionable or offensive odours were noted beyond the boundary of the site at the time of inspection.

The following action was to be undertaken:

- Continue with litter removal especially on the access road just past the office, in the eastern stormwater drain, and at the big silt pond
- Remove silt from the small pond. It is recommend that a sucker truck be used to minimise effects
- Monitor slumping into the eastern drain and address as necessary to ensure that the culvert remains unobstructed and the conditions of the consent are complied with

#### **18 November 2014**

The site inspection was undertaken in a variable westerly to north westerly wind.

The roadside drains past the office had been cleared of litter and silt as requested at the previous inspection, and now looked good. The caps of stages 1 and 2 also appeared to be satisfactory.

At the Return2Earth composting area it was found that some of the compost stockpiles were covered. There was a strong localised manure odour down wind of the fresh, uncomposted material, reducing to only light and intermittent approximately 50 metres downwind, which was well within the site boundary. The consent holder was asked to confirm that the 25 L containers on site were filled only with sand and/or water, to be used as weights for the covers.

At the Revital composting area it was found that the stocks or green waste were still fairly low, with only some material awaiting "chipping", and one windrow present so far.

At the landfill it was noted that the eastern litter fence was working effectively in containing windblown litter. The stormwater pipe in the eastern drain had been cleared, and the amount of loose soil in the drain had been reduced, although there was a reasonable amount of litter present in the eastern drain.

There were light and intermittent leachate odours noted on site, and there were an average number of seagulls present. There was localised dust being generated with vehicle movements, but this dissipated within the site boundary. No dust control was being undertaken at the time of inspection.

The active fill area was well controlled, with the amount of exposed refuse being minimised. The northern batter had adequate cover, and was unchanged from the previous inspection.

There was some litter present around the big silt pond and in the undergrowth below the outlet pipe to the tributary. There was some plastic sheeting present in the outlet structure that should be removed.

The small silt pond to the west of the leachate pond had been de-silted, and there was only a minimal amount of litter present in this area.

The grate on the Puremu Stream outlet was clear of obstructions.

The following action was to be undertaken:

- Continue with litter removal especially in the eastern stormwater drain, and in the undergrowth below the big silt pond litter fence
- Remove the plastic from the big silt pond outlet structure

#### **9 December 2014**

The site was inspected in overcast conditions with a light north westerly wind. The caps on the retired areas of the landfill looked good, and were found to be well vegetated. The roadside drains were substantially clear of refuse and silt. There was more green waste stock present at the Revital area than there had been at the previous inspection, and it appeared to be well managed.

There was minimal refuse present in the eastern drain, and the culvert under the track was clear. There was a localised leachate odour (sulphur) present in the immediate vicinity of the capped leachate pipe close to the southern end on the eastern side of the landfill. It was noted that minor amounts of landfill gas was escaping from this capped line.

It was observed that there was localised dust being created with traffic movements, but this was settling well within the site boundary. The recently filled areas had good intermediate cover on them.

The on site contractor outlined his plans for capping and stormwater/leachate control at the site. It was noted that these were to be confirmed with the consent holder, and assessed against the site management plan and consent conditions prior to this work being undertaken.

The fresh piles of silt near both the big and small silt ponds showed that the silt build-up in these treatment devices was being well managed. There were only minor amounts of refuse present in the vicinity of the ponds.

The following action was to be undertaken:

- Continue the good work with litter removal and silt management

#### **9 January 2015**

The site was inspected in fine conditions with a light north westerly wind. The cap on the retired areas of the landfill looked good, and were well vegetated. There was more green waste stock present at the Revital area, and there was a shredder operating at the time of the inspection.

It was observed that there was localised dust being created with traffic movements, but this was settling well within the site boundary. A water cart was operating during

the inspection to suppress dust. An ambient dust survey was carried out and PM<sub>10</sub> levels of <3.0 g/m<sup>3</sup> were found in and around the site. A methane meter was also deployed and no methane was detected.

The tip face was within the 900 m<sup>2</sup> requirement, with the operational area looking tidy and organised. The recently filled cells were well covered, and it was noted that this was a welcome improvement in site management. On the east side of Stage 3 the base layer (400 mm of compacted clay) of the final cover had been applied.

The large silt pond was free of litter, as was the surrounding area. This was also the case for the leachate pond and small silt pond. Overall litter control and removal was very good at the site.

During the inspection only noticeable odours were noted in and around the tip face, and none were noted at the boundary downwind of the tip face.

Overall the site was well managed and the improved levels of interim cover and rubbish removal received special mention.

The following action was to be undertaken:

- Continue the good work with litter removal and interim cover.

#### **13 January 2015**

The site was inspected after a fire in the most recent cell on Stage 3 had been extinguished. Council staff attended the incident, and further details are presented in Section 2.8.

At this inspection it was found that the area affected had been covered with 400 mm of clay and was being checked often for signs of hot spots. A temporary tip face had been set up at the top end of Stage 3, near the top of the central access road. This was not the area that was intended to be used next, but it was out of the way of the area where the fire has occurred. It was outlined that the new area for filling would be opened after the temporary cell was full.

#### **4 February 2015**

A site inspection and sampling were undertaken in light intermittent rain. A very light intermittent leachate type odour was noted at the site entrance, and at the small silt ponds. The smell of the odour masking agent was also noted to be present at the small silt ponds. It was found that the inflow and outflow were clean and clear at both of the small silt ponds. Litter control in this area was very good, and all the silt ponds looked good. There was iron oxide discolouration, but the ponds appeared to contain very little silt.

There was a moderate amount of litter present around the large silt pond. The flow from this pond was clean and clear.

It was found that the Revital composting area was quite full of both green waste stockpiles and compost windrows. It was noted that the compost contained > 95% plant derived matter as per consent conditions.

The caps on the completed stages of the landfill were not walked at this inspection, but the areas visible from the road appeared to be satisfactory.

The cover on the temporary cell looked to be either a bit thin, or was predominantly reclaimed cover material containing litter. Coverage on the eastern cell was good and was free from any exposed refuse/litter.

The area of exposed refuse in the working area was bordering on the 900 m<sup>2</sup> management plan requirement, however it was outlined that this was predominantly to allow the corner between two cells to be contoured with a smooth 1 in 5 batter. This was then to be covered with reclaimed interim cover, and then clean cover. The cover to the east of this area also appeared to be predominantly reclaimed interim cover containing quite a lot of exposed refuse. It was outlined that the D7 scoop (a piece of earth moving equipment) had broken down about 2 weeks prior to this inspection, and the contractor was now waiting on the parts to undertake the necessary repairs. The contractor was not sure how long it would be before the equipment would be operational again. When questioned, it was explained to the inspecting officer that, with this machine out of action, clean cover could not be imported from the eastern side, and could only be banjoed up from below the batter. The supplies of clean clay were therefore limited.

The consent holder was instructed that the contractor needed to ensure that adequate equipment was at the site at all times, and was advised that temporary replacements should be brought in during breakdowns.

The following action was to be undertaken:

- Continue with litter removal especially in the area of the big silt pond
- Take steps to ensure that the cover meets management plan requirements. A re-inspection will take place after 10 February 2015
- 

#### **11 February 2015**

A follow-up inspection was undertaken in fine weather with a light to gentle, west to southwest breeze. Photographs were taken.

It was found that there was adequate machinery present and in operation on site, with a scoop and a truck both present to enable the import of fresh cover. There were piles of fresh cover on top of the reclaimed cover on the cell used after the fire.

The exposed refuse that was present at the previous inspection in the north west corner had been covered with reclaimed material. There were also piles of fresh clean cover present in this area, and a digger was in operation spreading this fresh cover.

It was noted that there were localised dust clouds with traffic movements, as the track was very dry. The dust was dissipating well within the site boundary, and it was observed that the water cart was being re-filled at the time of inspection.

There was quite a lot of litter present in the area of the track to the large silt pond. This was likely to have been due to the strong southerly winds the previous day.

There were some localised noticeable landfill gas odours noted, but these were not detected off-site.

The following action was to be undertaken:

- Continue with litter removal especially in the area of the big silt pond, and access road
- Continue with application of fresh cover

### **30 March 2015**

This site inspection was undertaken in fresh south to south west wind conditions after a few days of intermittent rain. No off site dust or odour issues were noted. It was found that there was a build up of organic matter starting to accumulate behind the culvert grate on the Puremu Stream culvert outlet between the road to the ponds and the site entrance. The consent holder was advised that this needed to be monitored.

It was noted that the roadside drains along the roadways were litter free, with secured bags of collected litter present along roadway to the silt ponds. It was observed that the piles of silt/litter (that were stockpiles of material that had been removed from the silt ponds during de-silting) had been removed from by the big silt pond. The small silt ponds and leachate pond were in satisfactory condition.

The contractor advised that the area of exposed refuse was currently greater than 900 m<sup>2</sup>. This was temporary, and was due to the need to recontour the northern batter in previously filled areas. The inspecting officer was informed that the batter in this previously filled area was not at the necessary 1 in 5 batter. This meant that the cover had to be stripped, fresh refuse added and then recovered. This was found to be getting undertaken in narrow strips to minimise the area being re-exposed at any one time, and the contractor advised that the area of exposed refuse present on the northern batter at the time of inspection would be covered by the end of the day. Reclaimed cover material was noted to be on hand, and it was observed that there was only a narrow area left to go. Photographs were taken that showed the good depth of cover that had been applied to the completed areas.

Localised intermittent leachate odours were noted at the base of the northern face of the landfill, and at the eastern drain. A small amount of localised dust was being generated from the movement of sawdust on site. This was dissipating well within the site boundary. There was no dust being generated from traffic movements on site as the site surfaces were wet from recent rain.

It was found that there was some litter in the eastern drain and that work had been undertaken to clear vegetation/trees from a strip of land outside the litter fence to enable easier recovery of wind blown litter that gets past the litter fence. It was observed that there were a few small holes in the eastern litter fence (at the southern end of the fence) that would need to be addressed.

It was found that both compost areas were quite full, with the material present appearing to be of an acceptable nature. There were no Womad food wastes observed to be present at the time of inspection, and there were no odours noted in this area.

The caps on the completed areas of the landfill (stages 1 and 2) appeared to be satisfactory, although these were not walked on this inspection.

The following action was to be undertaken:

- Continue with litter removal especially in the area of the big silt pond
- Monitor the Puremu Stream culvert outlet as this is likely to need cleaning out soon
- Address the holes in the eastern litter fence

#### **29 April 2015**

The site was inspected in dry cloudy conditions after recent rain. There was a very light north westerly wind. No odours were detected off site. The cap on the completed areas of the landfill were well vegetated with the southern paddock being grazed by low numbers of sheep. It was noted that there were intermittent noticeable leachate odours on the access road near the southern litter fence.

The Return2Earth compost area appeared to be well managed and no odours were noted.

The Rivital area was quite full with compost windrows, with only a small amount of incidental non-green waste material present. The chipper was not in operation at the time of inspection. It was noted that there were a small number of bags of food and general waste present at the edge of a green waste pile (at the northern end of the drop off area) that would need to be removed prior to chipping.

There was stormwater flowing to the ponds below the composting areas. It was found that the first pond was quite full and the contents were dark brown. The level in the final pond was low, and the contents were clean and clear, with only a small amount of litter present.

The southern litter fence was in good condition, however holes were observed in the eastern litter fence. There was a relatively small hole in the fence close to ground level between the 3<sup>rd</sup> and 4<sup>th</sup> post from the southern end of this fence, and there was a hole several metres long between the 10<sup>th</sup> and 11<sup>th</sup> post.

There was some litter present in the eastern drain, but it was noted that the culvert was unobstructed.

There were no dust issues at inspection as the ground was very wet. The special waste pit was not inspected as the tipping area was too close to allow safe access. The area of exposed refuse appeared to comply with the 900 m<sup>2</sup> area required by the landfill management plan.

It was noted that the water level in the leachate pond was quite low, indicating that the system was currently coping well with the combined stormwater/leachate flow. It was observed that there were some sacks of collected litter in this area, and these bags were starting to degrade. It is recommended that these be removed while the bags were still holding together.

The small silt ponds were both in satisfactory condition at the time of inspection, but the silt build-up in the western most pond would need to be monitored and addressed as required.

The big silt pond was in satisfactory condition, with only minor amounts of litter present. It was noted that there was a build-up of silt starting to occur above the weir close to the inlet that would need to be cleaned out soon.

It was noted that the correction of the angle of the batter on the northern face appeared to have been completed, and the area was covered with either clean or reclaimed cover material. It was confirmed by the site operator that this had been completed earlier that morning. The application of the 400 mm of clean cover was discussed, which would then allow the northern ring drain to be re-directed to the tributary of the Puremu Stream. The inspecting officer was informed that this cover would need to be applied using the D7, and that due to the weight of this machine, ground conditions were unlikely to allow this work to be completed until after the winter and spring rains had cleared.

The following action was to be undertaken:

- Remove bags of non-green waste material for appropriate disposal, and ensure that all readily accessible food and general waste is removed prior to chipping or composting
- Monitor the Puremu Stream culvert outlet as this is likely to need cleaning out soon
- Address all holes in the eastern litter fence
- Continue with litter collection, especially in the area of the eastern drain

#### **28 May 2015**

A site visit was made to undertake sampling and a routine compliance monitoring inspection.

It was found that there was a build-up of silt present above and below the weir at the inlet to the large silt pond, and there was floating litter present at the outlet end of the pond that was being retained in the pond by the outlet structure. During sampling it was found that the area below the outlet structure was substantially free of litter, however the three holes in the outlet structure were obstructed to varying degrees by thin plastic.

The level in the leachate pond was relatively low, and there was no ponding observed in the drain at the base of the northern toe of the landfill. It was however noted that there was a 'v' notch present in the wall of this drain that in periods of heavy or prolonged rain, may have the potential to allow contaminated stormwater and backed up leachate to flow overland to the stormwater system.

At the composting areas it was found that screening was occurring at the Return2Earth site. No dust emissions were observed, and only light intermittent clean compost odours were detected at approximately 50 m downwind. The Revital composting area was quite full with both compost windrows, and green waste stock piles. All except the last pond in the treatment system below the compost area were full of dark brown liquid. The final pond in the series was empty, and there was no discharge occurring.

A number of holes were noted in the southern and eastern litter fences, and light intermittent leachate odours were noted by the eastern litter fence. The top half of the eastern drain was found to be substantially free of litter.

It was found that there was one completed cell and a working cell, present, and uncovered, at the time of inspection. There was minimal odour present at the tip face and special waste pit.

A worker returning from lunch informed the inspecting officer that he was about to start covering the completed cell. A load of sawdust was off loaded during the inspection. The dust generated from this activity remained localised and was settling or dissipating close to the source due to the calm wind conditions.

It was observed that the retired landfill area was being grazed by a small herd of bulls, and the areas visible from the road looked good.

The Puremu Stream culvert outlet was clear of obstructions.

The consent holder was contacted following the inspection and was advised of the litter blocking the silt pond outlet structure, the large silt pond needing desilting and was advised that the low spot in the bund at the toe of the northern batter needed to be addressed as soon as possible.

The consent holder informed the inspecting officer that the long reach digger that was required to undertake the de-silting of the pond will take some time to get on site, and this was in the process of being organised. The other matters would be addressed.

The consent holder advised that a new odour suppressant had been ordered and a contractor had visited the site to assess the requirements for upgrading the odour suppressant delivery system. The consent holder also advised that he was having trouble making contact with the farmer to discuss the relocation of the gate in the paddock identified at a previous inspection.

The following action was to be undertaken:

- Address the low spot in the drain at the toe of the northern batter to ensure that backed up stormwater and leachate can not overflow to the silt pond. This must be addressed as soon as possible
- Remove the plastic obstructing the large silt pond outlet holes
- Assess the overall condition of the litter fences at the site and repair or replace as required
- De-silt above and below the weir at the big silt pond
- Continue with litter removal

A follow-up inspection was undertaken at 5:00 pm to confirm that the completed cell had been covered. It was found that no cover had been applied as yet, although staff were still working on site compacting the working cell. A phone call was made to the consent holder who advised that the contractor was planning on working late to ensure that cover would be applied before the end of the day.

**29 May 2015**

A site visit was made at 8.30 am to conduct a further follow up inspection. The finished cell had been covered as requested and the open face was within the 900 m<sup>2</sup> limit.

A discussion was held with the site manager, and it was outlined that the area being worked currently was sometimes difficult to keep under 900 m<sup>2</sup> due to the fact they were working on the final batter in a tight (corner) space, and long haul roads were needed to push refuse in. It was also noted that the loader had been out of commission for the last 6-8 weeks.

**16 June 2015**

The site was visited in fine weather conditions, and an air monitoring survey was also undertaken. No methane or hydrogen sulphide were detected, and dust levels were found to be low.

The compost areas were satisfactory. The first four ponds treating stormwater from this area were full, but the last pond was empty, and no discharge was occurring. There was no activity at the Return2Earth area. Chipping activities were occurring at the Revital area and no dust or odour issues were found.

There was litter present in the eastern drain, with increased quantities towards the northern end. It was noted that there was also some litter outside the litter fence in this area. It was observed that the litter fences had still not been repaired or replaced as yet.

The big and small silt ponds had all been de-silted since the last inspection, and there was minimal litter around the ponds. There was however a build-up of floatable litter in the big silt pond, and it was found that the plastic partially obstructing the drain holes in the outlet structure below the pond (noted during the previous inspection) was yet to be removed. It was also observed that one of the plastic pipes entering the riser in the pond was broken.

The rubbish drop off area was being cleared to the working cell at the time of inspection, and the completed cell was in the process of being covered.

The low spot in the bunding below the northern batter had been addressed.

The northern end of the old landfilled area had been grazed more heavily than usual, but it was noted that there was no stock present at the time of inspection, and although there was little vegetation present, it appeared that no significant damage had occurred to the cap itself.

It was found that the new special waste pit had been prepared, with signage indicating that this was now the current drop off point. It was noted that the pit was much larger than the previous pit, and there was a large area below the drop off area containing liquid. A drain had been dug into the refuse above, and to the south of the pit, that would drain stormwater down into the pit. It was noted that this was to be discussed further with the consent holder.

The following action was to be undertaken:

- Outline how the new special waste pit will be managed in relation to daily cover, and any other proposed mitigation measures to minimise potential odours and leachate generation
- Remove the plastic obstructing the holes in the outlet structure below the large silt pond outlet
- Assess the overall condition of the litter fences at the site and repair/replace as required
- Continue with litter removal especially in the eastern drain and the big silt pond

#### **17 June 2015**

Notification was received that a compactor had caught fire at the landfill earlier that day. The Council was informed that a loader would be brought on site to provide a temporary replacement for this vehicle, as it may take several weeks or months to repair or replace the compactor. The Council was also informed that the incident had not affected landfill operations and the site would remain open.

#### **22 June 2015**

A site visit was made to inspect the landfill after the 145 mm rainfall event on 19 and 20 June 2015. Notification was received on 20 June that the leachate pumping station was beyond capacity, indicating that the system begun to overflow into the Puremu Stream.

The leachate pond was found to be at capacity and just on the cusp of the overflow mark. Water marks on the concrete risers indicated that the level was dropping. The site manager outlined that both pumps were running to clear the backlog in the pond. The site was walked and it found that it had stood up well to the heavy weather. The compacted clay areas of the northern batter were in good shape with no evidence of rilling. A discussion was held with site manager regarding his concerns about stormwater flows down the lower western edge, and how water was in danger of overtopping the existing western batter, and running down to the main access road. The consent holder was phoned to discuss this, and it was outlined that drainage works in the area were already planned, and that these concerns would be taken on board. The large silt pond was full and discharging, and it was outlined by the site manager that at one point this pond level was approximately 300 mm above the outlet riser.

The rest of the site was walked and no issues were noted.

Following this inspection the Council was advised no overflow had occurred on this occasion. Council was further advised that the alarm is triggered at a level approximately 100 mm below the actual overflow point. This high level warning allows staff to attend the site in order to adjust the flow control valve, reducing the flow to the leachate pond, if necessary.

## 2.2 NPDC monitoring results

### 2.2.1 Leachate

The NPDC collected four samples of leachate during the 2014-2015 monitoring period. Analyses were carried out for a range of parameters. The leachate is pumped to, and treated at the New Plymouth Waste Water Treatment Plant (NPWWTP), and whilst the leachate is not discharged directly to the environment, the results are used by the Council to compare with groundwater and surface water quality. The results are also of interest to the Council because the leachate can reveal information about the landfill processes taking place. The results of the analyses from the samples collected by the NPDC are presented in Table 3.

**Table 3** Chemical analysis of Colson Road landfill leachate

Parameter	Unit	06-Nov-14	18-Sep-14	12-Feb-15	17-Apr-15
pH	pH	7.8	7.6	7.4	7.4
CBOD	g/m <sup>3</sup>	770	1060	840	-
BOD	g/m <sup>3</sup>	93	110	130	63
Suspended solids	g/m <sup>3</sup>	20	32	20	46
Conductivity	mS/m	706.6	915	756	465
Alkalinity	g/m <sup>3</sup>	2900	3820	3016	1853
Ammoniacal N	g/m <sup>3</sup>	585	740	670	320
Arsenic	g/m <sup>3</sup>	0.091	-	-	-
Chromium	g/m <sup>3</sup>	0.111	-	<0.1	<0.1
Copper	g/m <sup>3</sup>	0.0157	-	<0.02	<0.02
Iron	g/m <sup>3</sup>	6	-	9	14
Lead	g/m <sup>3</sup>	0.002	-	<0.07	<0.07
Manganese	g/m <sup>3</sup>	0.93	-	0.94	2.3
Nickel	g/m <sup>3</sup>	0.028	-	<0.03	<0.03

The results gathered by NPDC during the year under review reflect typical leachate quality. As there are no obvious trends emerging at this stage, the concentration variations within each parameter are likely to reflect seasonal variations in leachate quality.

### 2.2.2 Under-liner drainage

NPDC collected two samples of the groundwater that drains from a network of pipes under the liner. The results of the analyses are given in Table 4. The quality of this water is a useful indicator of whether leachate is passing through the liner. This is especially important in view of the slip that occurred in 2005 that ripped the liner in several places on the western side of stage three. The exposed rips were repaired but it was not known if the liner had ripped underneath the slipped refuse.

**Table 4** Results of analysis of under liner drainage

Parameter	Unit	9 December 2014	19 March 2015
pH	pH	6.5	6.7
BODC	g/m <sup>3</sup>	<1	<5
Suspended solids	g/m <sup>3</sup>	9	12
Faecal coliforms	cfu/100 mL	51	<2
Conductivity	mS/m	39.4	38.8
Turbidity	N.T.U.	52.0	48.2
Alkalinity	g/m <sup>3</sup>	100	99
Ammoniacal nitrogen	g/m <sup>3</sup> -N	1.4	1.0
Cadmium	g/m <sup>3</sup>	<0.002	<0.002
Chromium	g/m <sup>3</sup>	<0.02	<0.02
Chloride	g/m <sup>3</sup>	56.0	52.0
Copper	g/m <sup>3</sup>	<0.02	<0.02
Iron	g/m <sup>3</sup>	6.0	10.5
Lead	g/m <sup>3</sup>	<0.03	<0.07
Manganese	g/m <sup>3</sup>	1.50	1.40
Nickel	g/m <sup>3</sup>	<0.03	<0.008
Zinc	g/m <sup>3</sup>	<0.04	<0.04

On going drainage analysis has shown that little, if any, contamination has been occurring in the groundwater immediately below the liner, and the results from this monitoring period continue to show this.

The levels of key indicator species such as zinc and ammoniacal nitrogen remain comparable to background levels, and are relatively stable over time. Chloride and iron levels also remain within normal ranges for Taranaki groundwater

Monitoring during the 2014-2015 year indicates that there does not currently appear to be any potential issues in regards to faecal coliform levels, and that the unusually high faecal coliform result obtained on 18 March 2014 (3,460 cfu/100ml) was likely to have been as a result of sample contamination, rather than the start of an on going issue. Monitoring of the under liner groundwater will be continuing.

## 2.3 Results of dry weather receiving environment monitoring

### 2.3.1 Manganaha Stream

The Colson Road landfill site has two streams associated with it. The Puremu Stream has been culverted to run under the north-western quadrant of the landfill site. It emerges from the culvert near the landfill entrance driveway, and then flows approximately 300 m to a second culvert that takes it under two other properties. Just upstream of the second culvert, the unnamed tributary that carries discharge from the large settling pond, flows in to the main stream stem. The smaller silt pond discharges directly into the main stream stem just upstream of the confluence (see Figure 5).

The Manganaha Stream follows alongside the eastern boundary of the site and is approximately 200 m away from the landfill (at its closest point). As required by the

landfill's water discharge permits, there are no direct discharges into the Manganaha Stream from the landfill.

Tables 5-7 give the results of the dry weather freshwater sampling undertaken during the period under review. An aerial view of the sampling sites is given in Figure 2.

**Table 5** Chemical analysis of the Manganaha Stream

Parameter	Units	04 February 2015		28 May 2015	
		MNH000190 u/s of landfill	MNH000250 d/s of landfill	MNH000190 u/s of landfill	MNH000250 d/s of landfill
Alkalinity	g/m <sup>3</sup> – CaCO <sub>3</sub>	28	27	24	22
Conductivity	mS/m	15.9	15.8	13.5	13.5
Acid soluble iron	g/m <sup>3</sup>	0.72	0.91	0.55	0.49
Ammonia (unionised)	g/m <sup>3</sup> -N	0.00045	0.0008	0.00014	0.00014
Ammoniacal nitrogen	g/m <sup>3</sup> -N	0.060	0.085	0.038	0.037
pH	pH	7.3	7.4	7.2	7.2
Suspended solids	g/m <sup>3</sup>	3	3	6	5
Temperature	Deg C	16.8	16.8	10.5	10.5
Dissolved zinc	g/m <sup>3</sup>	<0.005	<0.005	<0.005	<0.005

On both sampling occasions the Manganaha Stream showed no adverse effects from the landfilling operation.

The upstream and downstream results showed very little difference in water quality on both sampling occasions. All results were comparable to background levels, and were similar to those found over the last five years.

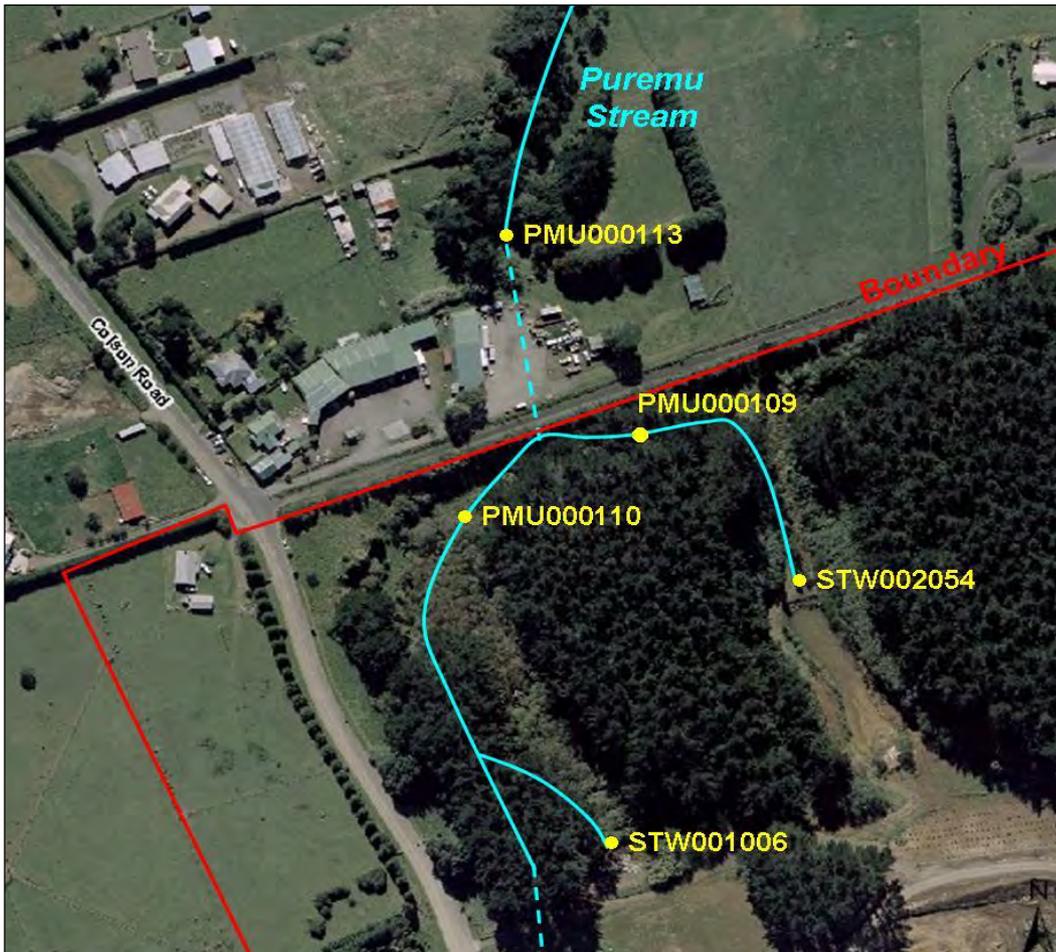
There are no specific consent conditions in regards to the Manganaha Stream water quality other than that authorised discharges to land, and to the Puremu Stream from the landfill, shall not affect water quality in the Manganaha Stream.

Based on these results, and those from previous monitoring periods, the landfill's presence is having no measurable effect on water quality in the Manganaha Stream.

### 2.3.2 Puremu Stream

The Puremu Stream was also sampled on two occasions in dry weather, under low to moderate flow conditions.

The downstream sampling sites shown in Figure 5 and the results are given in Tables 6 and 7.



**Figure 5** Sampling sites on the Puremu Stream down stream of the landfill

**Table 6** Chemical analysis of the Puremu Stream, sampled on 04 February 2015

Parameter	Unit	PMU000100 500 m u/s of landfill	PMU000109 Trib d/s large silt pond	PMU000110 d/s landfill culvert	PMU000113 d/s SPCA drive culvert	Consent limits at PMU000113* (PMU000110**)
Alkalinity	g/m <sup>3</sup> CaCO <sub>3</sub>	20	86	41	45	NA
BOD	g/m <sup>3</sup>	3.2	1.7	2.2	1.6	NA
Conductivity	mS/m	12.8	29.4	19.2	20.1	NA
Dissolved oxygen	g/m <sup>3</sup>	-	-	-	-	- (5.0)
DRP	g/m <sup>3</sup>	0.006	0.006	0.005	0.005	NA
Faecal coliforms	cfu/100ml	930	1600	730	1000	≤1000
Unionised ammonia	g/m <sup>3</sup> N	0.00007	0.0012	0.00582	0.0051	NA
Ammoniacal N	g/m <sup>3</sup> N	0.024	0.236	0.895	0.801	2 (2.5)
Nitrate/nitrite N	g/m <sup>3</sup> N	0.14	0.17	0.77	0.73	10 (100)
Oxygen saturation	%	-	-	-	-	NA

Parameter	Unit	PMU000100 500 m u/s of landfill	PMU000109 Trib d/s large silt pond	PMU000110 d/s landfill culvert	PMU000113 d/s SPCA drive culvert	Consent limits at PMU000113* (PMU000110**)
pH	pH	6.8	7.1	7.2	7.2	≥6.5 & ≤8.5
Sulfates	g/m <sup>3</sup>	11.3	6.5	12.1	10.6	1000 (500)
Suspended solids	g/m <sup>3</sup>	33	7	4	2	43
Temperature	Deg C	19.5	17.8	18.0	17.7	(≤21.5)

Key: \*Consent limits shown in brackets are for consent 2370-3 at site PMU000110.

\*\* Consent limits with no brackets are for consent 4619 at site PMU000113

**Table 7** Chemical analysis of the Puremu Stream, sampled on 28 May 2015

Parameter	Unit	PMU000100 500 m u/s of landfill	PMU000109 Trib d/s large silt pond	PMU000110 d/s landfill culvert	PMU000113 d/s SPCA drive culvert	Consent limits at PMU000113* (PMU000110**)
Alkalinity	g/m <sup>3</sup> CaCO <sub>3</sub>	23	86	46	46	NA
BOD	g/m <sup>3</sup>	0.6	2.4	2.5	2.3	NA
Conductivity	mS/m	13.2	32	20	20.8	NA
Dissolved oxygen	g/m <sup>3</sup>	10.07	6.93	10.26	10.43	≥9.07 (5.0)
DRP	g/m <sup>3</sup>	<0.003	<0.003	<0.003	<0.003	NA
Faecal coliforms	cfu/100ml	120	1800	180	200	≤1000
Unionised ammonia	g/m <sup>3</sup> N	0.00013	0.00363	0.00809	0.00613	NA
Ammoniacal N	g/m <sup>3</sup> N	0.054	1.26	1.71	1.63	2 (2.5)
Nitrate/nitrite N	g/m <sup>3</sup> N	0.61	0.55	0.97	1.00	10 (100)
Oxygen saturation	%	87.4	60.4	90.3	90.7	NA
pH	pH	7.0	7.1	7.3	7.2	≥6.5 & ≤8.5
Sulfates	g/m <sup>3</sup>	6.8	9.1	10.3	9.8	1000 (500)
Suspended solids	g/m <sup>3</sup>	2	6	3	4	13
Temperature	Deg C	10.5	10.1	10.6	10.6	(≤20.1)

Key: \*Consent limits shown in brackets are for consent 2370-3 at site PMU000110.

\*\* Consent limits with no brackets are for consent 4619 at site PMU000113

The samples taken on both 4 February 2015 and 28 May 2015 were in compliance with all consent conditions.

### 2.3.3 Dry weather metals analysis

Consents 2370 and 4619 have some differing limits on the concentrations of various metals at sites PMU000100 and PMU000113 respectively, with PMU000110 being the

compliance point for consent 2370, and with PMU000113 being the compliance point for consent 4619.

In the consents, total recoverable metal limits are given as absolute concentrations that must not be exceeded, whereas the dissolved metal limits are given in terms of a maximum permitted increase relative to the upstream site.

In previous monitoring periods, as the limits for each are similar, and PMU000110 is only short way upstream of PMU000113, a metals screen was undertaken on site PMU000113 only, with site PMU000100 (upstream of the landfill) acting as a control.

During the 2013-2014 year, metals monitoring at sites PMU000110 and PMU000109 was introduced. The results of the dry weather metals monitoring are given in Tables 8 and 9.

**Table 8** Results of metal analysis undertaken on 20 February 2015

Parameter	Unit	PMU000100	PMU000109	PMU000110	PMU000113	Consent limit at PMU000113 (PMU000110)
Dissolved aluminium	g/m <sup>3</sup>	0.012	<0.003	0.006	0.005	0.112
Total aluminium	g/m <sup>3</sup>	0.185	0.068	0.027	0.025	5.0 (5.0)
Dissolved arsenic	g/m <sup>3</sup>	<0.0010	<0.0010	<0.0010	<0.0010	0.05
Total arsenic	g/m <sup>3</sup>	<0.0011	<0.0011	<0.0011	<0.0011	0.2 (0.1)
Dissolved beryllium	g/m <sup>3</sup>	<0.00010	<0.00010	<0.00010	<0.00010	n/a
Total beryllium	g/m <sup>3</sup>	<0.00011	<0.00011	<0.00011	<0.00011	0.1 (0.1)
Dissolved boron	g/m <sup>3</sup>	0.02	0.023	0.027	0.026	n/a
Total boron	g/m <sup>3</sup>	0.023	0.025	0.03	0.027	5.0 (0.5)
Dissolved cadmium	g/m <sup>3</sup>	<0.00005	<0.00005	<0.00005	<0.00005	0.05
Total cadmium	g/m <sup>3</sup>	<0.000053	<0.000053	<0.000053	<0.000053	0.05 (0.01)
Dissolved cobalt	g/m <sup>3</sup>	<0.0002	0.0007	0.0004	0.0004	n/a
Total cobalt	g/m <sup>3</sup>	0.00067	0.00081	0.00042	0.00047	1.0 (0.05)
Dissolved chromium	g/m <sup>3</sup>	<0.0005	<0.0005	<0.0005	<0.0005	0.02
Total chromium	g/m <sup>3</sup>	<0.00053	<0.00053	<0.00053	<0.00053	1.0 (0.1)
Dissolved copper	g/m <sup>3</sup>	0.0012	0.0007	0.0011	0.0011	0.5012
Total copper	g/m <sup>3</sup>	0.00158	0.00107	0.00134	0.00123	0.5 (0.2)
Dissolved iron	g/m <sup>3</sup>	0.39	0.08	0.59	0.50	0.69
Total iron	g/m <sup>3</sup>	1.92	2.2	1.46	1.48	10.0 (5.0)
Dissolved manganese	g/m <sup>3</sup>	0.0187	1.26	0.47	0.53	n/a

Parameter	Unit	PMU000100	PMU000109	PMU000110	PMU000113	Consent limit at PMU000113 (PMU000110)
Total manganese	g/m <sup>3</sup>	0.136	1.29	<0.48	0.55	5.0 (1.0)
Dissolved lead	g/m <sup>3</sup>	<0.00010	<0.00010	<0.00010	<0.00010	0.002
Total lead	g/m <sup>3</sup>	<0.00011	<0.00011	<0.00011	<0.00011	0.1 (0.1)
Dissolved selenium	g/m <sup>3</sup>	<0.0010	<0.0010	<0.0010	<0.0010	<0.002
Total selenium	g/m <sup>3</sup>	<0.0011	<0.0011	<0.0011	<0.0011	0.05 (0.02)
Dissolved selenium	g/m <sup>3</sup>	<0.0010	<0.0010	<0.0010	<0.0010	n/a
Total vanadium	g/m <sup>3</sup>	<0.0011	<0.0011	<0.0011	<0.0011	0.1 (0.1)
Dissolved zinc	g/m <sup>3</sup>	0.0016	0.001	0.0014	0.0019	0.0316
Total zinc	g/m <sup>3</sup>	0.0039	0.0021	0.0022	0.0025	2.4 (2.0)

**Table 9** Results of metal analysis undertaken on 20 February 2015

Parameter	Unit	PMU000100	PMU000109	PMU000110	PMU000113	Consent limit at PMU000113 (PMU000110)
Dissolved aluminium	g/m <sup>3</sup>	0.012	< 0.003	0.005	0.005	0.112
Total aluminium	g/m <sup>3</sup>	0.046	0.089	0.12	0.11	5.0 (5.0)
Dissolved arsenic	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	0.05
Total arsenic	g/m <sup>3</sup>	< 0.0011	< 0.0011	< 0.0011	< 0.0011	0.2 (0.1)
Dissolved beryllium	g/m <sup>3</sup>	< 0.00010	< 0.00010	< 0.00010	< 0.00010	n/a
Total beryllium	g/m <sup>3</sup>	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.1 (0.1)
Dissolved boron	g/m <sup>3</sup>	0.015	0.028	0.023	0.025	n/a
Total boron	g/m <sup>3</sup>	0.0185	0.031	0.028	0.027	5.0 (0.5)
Dissolved cadmium	g/m <sup>3</sup>	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.05
Total cadmium	g/m <sup>3</sup>	< 0.000053	< 0.000053	< 0.000053	< 0.000053	0.05 (0.01)
Dissolved cobalt	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	n/a
Total cobalt	g/m <sup>3</sup>	< 0.00053	< 0.00053	< 0.00053	< 0.00053	1.0 (0.05)
Dissolved chromium	g/m <sup>3</sup>	< 0.0002	0.0018	0.0008	0.0009	0.02
Total chromium	g/m <sup>3</sup>	0.00037	0.00198	0.00088	0.00092	1.0 (0.1)
Dissolved copper	g/m <sup>3</sup>	0.001	0.0006	0.0006	0.0006	0.5012
Total copper	g/m <sup>3</sup>	0.00102	0.00108	0.00093	0.00084	0.5 (0.2)
Dissolved iron	g/m <sup>3</sup>	0.30	0.14	0.45	0.47	0.69

Parameter	Unit	PMU000100	PMU000109	PMU000110	PMU000113	Consent limit at PMU000113 (PMU000110)
Total iron	g/m <sup>3</sup>	0.69	2.8	1.52	1.54	10.0 (5.0)
Dissolved lead	g/m <sup>3</sup>	< 0.00010	< 0.00010	< 0.00010	< 0.00010	0.002
Total lead	g/m <sup>3</sup>	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.1 (0.1)
Dissolved manganese	g/m <sup>3</sup>	0.025	2.9	0.54	0.7	n/a
Total manganese	g/m <sup>3</sup>	0.051	2.9	0.57	0.7	5.0 (1.0)
Dissolved selenium	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	<0.002
Total selenium	g/m <sup>3</sup>	< 0.0011	< 0.0011	< 0.0011	< 0.0011	0.05 (0.02)
Dissolved selenium	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	n/a
Total vanadium	g/m <sup>3</sup>	< 0.0011	< 0.0011	< 0.0011	< 0.0011	0.1 (0.1)
Dissolved zinc	g/m <sup>3</sup>	0.0054	0.0016	0.0029	0.0027	0.0316
Total zinc	g/m <sup>3</sup>	0.0065	0.0019	0.0047	0.0034	2.4 (2.0)

The results show that all parameters were in compliance with the conditions on consents 2370 and 4619 and that, although there were very slight increases in most of the metals determined, there were no increases of environmental significance between the site upstream and sites downstream of the landfill.

## 2.4 Result of stormwater and receiving environment monitoring

A survey was conducted during a rainfall event, and the results are given in the tables below. Table 9 shows the results for discharges and receiving water into which the discharges from within the landfill catchment flow (Puremu Stream), whilst Table 10 shows the results for the Manganaha Stream, which lies adjacent the landfill site and has no surface water discharges from the landfill directed to it.

**Table 10** Results of rain event monitoring – discharge and Puremu Stream samples, 13 August 2014

Site	Conductivity mS/m	Faecal Coliforms cfu/100ml	Unionised ammonia g/m <sup>3</sup> -N	Ammoniacal nitrogen g/m <sup>3</sup> -N	pH	Suspended solids g/m <sup>3</sup>	Temp. Deg.C	Turbidity NTU
PMU000100	12.8	160	0.00007	0.027	7.0	10	10.8	5.2
PMU000109	31.3	-	0.00123	0.392	7.1	12	11.3	23
PMU000110	19.4	-	0.00773	1.54	7.3	9	11.4	12
PMU000113	20.3	420	0.00587	1.46	7.2	7	11.5	9.9
STW001006	62.6	280	0.02854	15.8	6.8	95	13.1	290
STW002054	37.1	330	0.00289	0.736	7.2	160	11.2	140
IND003009	53.7	18000	0.00301	0.42	7.5	170	10	180

Key: **Bold** = Breach of conditions  
( ) = consent condition limit (shown only if in exceedance)

**Table 11** Results of rain event monitoring - Manganaha Stream, 13 August 2014

Parameter	Unit	MNH000190	MNH000250
Conductivity	mS/m	13.1	13.1
Unionised ammonia	g/m <sup>3</sup>	0.00018	0.00027
Ammoniacal nitrogen	g/m <sup>3</sup> -N	0.045	0.043
pH	-	7.2	7.4
Suspended solids	g/m <sup>3</sup> -N	7	7
Temperature	°C	11.1	11.1
Turbidity	NTU	4.2	3.7

The Puremu Stream system receives discharges from two stormwater ponds on the site. STW001006 discharges stormwater and leachate from Stages one and two, and STW002054 discharges stormwater from the eastern forest of the site and the composting pad. STW002054 also receives leachate from stage three in the event that the leachate pumping system is overloaded, or fails. It is noted that consent 4619 provides only for minor amounts of leachate to be present in this discharge

The results show that during stormwater discharges, the site was complying with consent conditions in regards to all the water quality parameters in both the Puremu and Manganaha Streams.

At all the freshwater sites monitored the levels of ammonia, suspended solids and conductivity were within acceptable ranges, and indicated reasonable water quality.

As stated earlier, the Manganaha Stream receives no direct discharges from the landfill catchment, but it is a useful indicator for any groundwater contamination, or potential effects from windblown refuse.

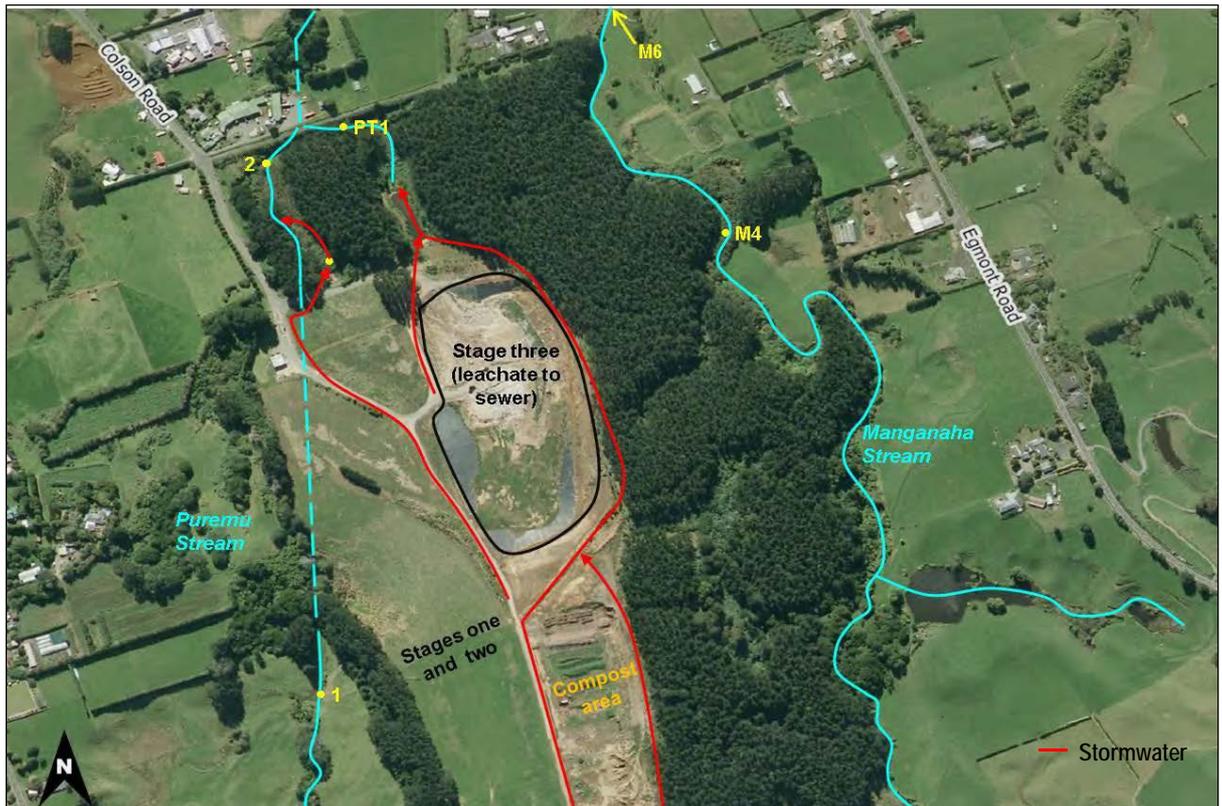
The results show that water quality in the stream is quite high and there is negligible difference in water quality when comparing the results from the two Manganaha Stream sites. These results are comparable to those obtained in previous monitoring periods.

## 2.5 Biological monitoring

### 2.5.1 Macroinvertebrate surveys

Two macroinvertebrate surveys were conducted during the 2014-2015 monitoring year. Summaries of the surveys' findings are given below and a full copy of the reports can be found in Appendix II.

The sites sampled are shown in Figure 6, and are described in Table 12.



**Figure 6** Biomonitoring sites related to the Colson Road landfill, New Plymouth.

**Table 12** Biomonitoring sites in the Puremu and Manganaha Streams related to the Colson Road Landfill.

Stream	Site No.	Site Code	Location	Sampling method
Puremu Stream	1	PMU000104	Upstream of the landfill	Sweep-kick sampling
	2	PMU000110	400 m downstream landfill	Kick sampling
Unnamed tributary of Puremu Stream	PT1	PMU000108	60 m upstream of the confluence with Puremu Stream	Kick sampling
Manganaha Stream	M4	MNH000190	10 m downstream of an unnamed tributary of the Manganaha Stream	Kick sampling
	M6	MNH000260	500 m downstream of site M4	Sweep-kick sampling

#### 5 December 2014

The standard 'kick-sampling' technique was used at sites 1 and M6, and the 'sweep-sampling' technique was used at sites 2, Pt1 and M4 to collect streambed macroinvertebrates from the Puremu and Manganaha Streams on 5 December 2014. Samples were sorted and identified to provide number of taxa (richness), MCI and SQMCI<sub>s</sub> 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<sub>s</sub> takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities, particularly if non-organic impacts are occurring. Significant differences in either the MCI or the SQMCI<sub>s</sub> between sites indicate the degree of adverse effects (if any) of the discharges being monitored.

No undesirable biological growths were detected at any sites during this December 2014 survey indicating that there had not been high levels of organic enrichment entering the streams surveyed.

This late spring macroinvertebrate survey indicated that the discharge of treated stormwater and leachate discharged from the Colson Road landfill site had not had any detrimental effect on the macroinvertebrate communities of the Puremu and Manganaha Streams.

There was an insignificant difference (Stark, 1998) in MCI scores and no marked difference in SQMCI<sub>s</sub> scores between site 1 'control site' and site 2. MCI and SQMCI<sub>s</sub> scores at site 2 were similar to the median scores from previous surveys. This indicates that leachate from the compost area was not having an effect on the freshwater macroinvertebrate communities in the Puremu Stream at the time of the survey. There was a significant decrease in macroinvertebrate community health between site 1 and site PT1. However, there were insignificant differences in scores compared with the median values from previous surveys at the site. The reason for the significant difference was a higher than usual MCI score at the 'control' site rather than a decrease in macroinvertebrate community health at site PT1.

Both sites on the Manganaha Stream (M4 and M6) had macroinvertebrate communities of 'fair' health. Comparisons with the nearby Puremu Stream 'control' site indicated minor, insignificant differences in MCI and SQMCI<sub>s</sub> scores between sites M4 and M6 and site 1 suggesting no impacts from the Colson Road landfill. There was an insignificant decrease (Stark, 1998) in MCI scores and a marked decline in SQMCI<sub>s</sub> scores from site M4 to M6. There was also a significant decrease in MCI score at site M6 when compared to the previous survey. Site M4 typically has higher macroinvertebrate health than M6, possibly due to the site being well shaded. Differences in habitat quality are therefore the most likely explanation for the differences in macroinvertebrate health between sites M4 and M6. Scouring from a fresh may have contributed to site M4 having a decreased taxa richness, less taxa abundances and lowering MCI scores compared with the previous survey.

Overall, the results of this survey were indicative of poor biological health in the Puremu Stream and in the unnamed tributary of the Puremu Stream. The results in the Manganaha Stream were indicative of fair biological health at sites M4 and M6. The poor habitat conditions observed in the Puremu Stream and unnamed tributary of the Puremu Stream at the time of this survey were the most likely reason for this, rather than to the effects of the discharges from the landfill. In summary, these results were not indicative of any significant adverse effects on either the Puremu Stream or the Manganaha Stream from the discharges from the Colson Road Landfill at the time of this survey.

### **19 February 2015**

The standard 'kick-sampling' technique was used at sites 2 and M4, the 'sweep-sampling' technique was used at sites 1 and Pt1 and a combination of both techniques were used at site M6 to collect streambed macroinvertebrates from the Puremu and Manganaha Streams on 19 February 2015. Samples were sorted and identified to provide number of taxa (richness), MCI and SQMCI<sub>s</sub> 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<sub>s</sub> takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities, particularly if non-organic impacts are occurring. Significant differences in either the MCI or the SQMCI<sub>s</sub> between sites indicate the degree of adverse effects (if any) of the discharges being monitored.

No undesirable biological growths were detected at any sites during this February 2015 survey indicating that there had not been high levels of organic enrichment entering the streams surveyed.

This summer macroinvertebrate survey indicated that the discharge of treated stormwater and leachate discharged from the Colson Road landfill site had not had any detrimental effect on the macroinvertebrate communities of the Puremu and Manganaha Streams.

The Puremu Stream sites including the 'control' site usually have 'poor' macroinvertebrate health, which would have been due to the lack of good available habitat within the stream. There was a significant difference (Stark, 1998) in MCI scores and a marked difference in SQMCI<sub>s</sub> scores between sites 1 and 2. Site PT1 also had a markedly lower SQMCI<sub>s</sub> score than site 1. However, the differences in MCI and SQMCI<sub>s</sub> scores between site 1 and sites 2 and PT1 are more a reflection of the improvement at site 1 ('fair' health as opposed to 'poor' health), rather than a deterioration at sites 2 and PT1.

Both sites on the Manganaha Stream (M4 and M6) had macroinvertebrate communities of 'fair' health. There was an insignificant difference (Stark, 1998) in MCI scores between sites M4 and M6, and a marked improvement in SQMCI<sub>s</sub> score at site M6 compared with site M4. This result indicates that Colson Road leachate was not affecting macroinvertebrates in the Manganaha Stream.

Overall, the results of this survey were indicative of 'fair' biological health at site 1 in the Puremu Stream, and 'poor' biological health in the Puremu Stream at site 2 and in the unnamed tributary of the Puremu Stream at site PT1. The results in the Manganaha Stream were indicative of fair biological health at both sites surveyed. The poor habitat conditions at the Puremu Stream, and unnamed tributary of the Puremu Stream at the time of this survey were the most likely reason for the 'poor' health, rather than the effects of the discharges from the landfill. In summary, these results were not indicative of any significant adverse effects on either the Puremu Stream or the Manganaha Stream from the discharges from the Colson Road Landfill at the time of this survey.

## 2.6 Groundwater

Groundwater was sampled from seven bores on 9 June 2015. The results of the analyses are given in Table 13.

Like the NPDC subsurface drainage samples (Table 3, Section 2.2.1), the groundwater results show little evidence of leachate contamination. All parameters measured for all the bores, were well within the ranges expected in Taranaki groundwater and within the ranges of the historical data.

**Table 13** Chemical analysis of Colson Road Landfill groundwater sampled 9 June 2015

Parameter	Unit	GND0251	GND0255	GND0573	GND1301	GND0575	GND0598	GND1300
Alkalinity	g/m <sup>3</sup> CaCO <sub>3</sub>	38	30	32	84	55	158	24
Chloride	g/m <sup>3</sup>	20.9	44.6	39.1	26.2	52.7	22.0	17.4
Filtered COD	g/m <sup>3</sup>	<5	<5	<5	<5	<5	11	<5
Conductivity	mS/m	14.7	22.1	20.7	25.9	28.2	34	12.4
Water level	m	13.16	10.81	4.77	8.18	8.00	10.2	12.9
Unionised ammonia	g/m <sup>3</sup> N	<0.00001	<0.00001	<0.00001	0.00008	<0.00001	0.01303	0.00006
Ammoniacal N	g/m <sup>3</sup> N	<0.003	0.003	0.012	0.031	<0.003	1.24	0.174
Nitrate/nitrite N	g/m <sup>3</sup> N	0.52	2.02	0.70	3.09	1.00	0.07	1.02
Nitrite N	g/m <sup>3</sup> N	<0.001	<0.001	<0.001	0.002	<0.001	0.006	<0.001
pH	pH	6.1	5.6	5.7	6.9	6.1	7.5	6.0
Sulphate	g/m <sup>3</sup>	6.0	2.8	9.8	6.0	3.2	<1	5.9
Temperature	Deg C	14.7	15.4	15.3	15.2	15.1	15.2	15.0
Dissolved aluminum	g/m <sup>3</sup>	0.011	0.010	0.007	0.009	0.009	0.005	0.048
Dissolved arsenic	g/m <sup>3</sup>	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved boron	g/m <sup>3</sup>	0.012	0.019	0.020	0.024	0.017	0.051	0.018
Dissolved beryllium	g/m <sup>3</sup>	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved cadmium	g/m <sup>3</sup>	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Dissolved cobalt	g/m <sup>3</sup>	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002
Dissolved chromium	g/m <sup>3</sup>	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	<0.0002	<0.0005
Dissolved copper	g/m <sup>3</sup>	0.0007	<0.0005	<0.0005	<0.0005	0.0007	0.0009	0.0005
Dissolved Iron	g/m <sup>3</sup>	<0.02	<0.02	<0.02	<0.02	<0.02	0.16	0.03
Dissolved manganese	g/m <sup>3</sup>	0.0014	0.0039	0.0083	0.0133	0.0032	0.057	0.0017
Dissolved lead	g/m <sup>3</sup>	0.0001	<0.00010	<0.00010	<0.00010	0.00019	0.00023	<0.00010
Dissolved selenium	g/m <sup>3</sup>	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved vanadium	g/m <sup>3</sup>	0.0014	<0.0010	<0.0010	0.0099	0.0038	0.0015	<0.0010
Dissolved zinc	g/m <sup>3</sup>	0.0045	0.0105	0.0058	0.018	0.012	0.0060	0.0022

Bore GND0598 shows some elevation in alkalinity, ammoniacal nitrogen and zinc when compared to the other bores. However, this bore is up gradient of the landfill in terms of groundwater flow, and the results are consistent with those obtained from the bore since 1996. The elevated levels of these parameters was therefore unlikely to be a result of leachate contamination.

Bores GND1301 and GND0575 also show some elevation in alkalinity, and bore GND0575 in COD, and as these bores are down gradient of the filled areas, this may be attributable to some minor leachate contamination from the older landfilled areas.

The samples were also analysed for SVOC's (semi-volatile organic compounds) and none were found to be above detection levels. A copy of the SVOC results is appended to this report.

In general terms, the groundwater quality in the vicinity of the landfill is good, and all parameters are comparable with typical Taranaki groundwater. The data gathered in this, and other monitoring periods, indicates that the Colson Road Landfill is not having a significant adverse effect on groundwater quality.

## 2.7 Air

### 2.7.1 Results of receiving environment monitoring

#### 2.7.1.1 Deposition gauging

Many industries emit dust from various sources during operational periods. In order to assess the effects of the emitted dust, industries have been monitored using deposition gauges.

Deposition gauges are basically buckets elevated on a stand to about 1.6 m. The buckets have a solution in them to ensure that any dust that settles out of the air is not resuspended by wind.

Gauges are placed around the site and within the surrounding community. The gauges were left in place for a period of two weeks to a month, on two separate occasions.

The rate of dust fall is calculated by dividing the weight of insoluble material collected (g) by the cross-sectional area of the gauge (m<sup>2</sup>) and the number of days over which the sample was collected. The units of measurement are g(grams)/m<sup>2</sup>(metre<sup>2</sup>)/day.

Guideline values used by the Taranaki Regional Council for dust deposition are 4 g/m<sup>2</sup>/30 days or 0.13 g/m<sup>2</sup>/day deposited matter. Consideration is given to the location of the industry and the sensitivity of the surrounding community, when assessing results against these values.

Material from the gauges was analysed for solid particulates, the results of which are presented in Table 14 and 15.

**Table 14** Air deposition monitoring results for 13 January- 4 February 2015

	Site	Days deployed	Particulate g/m <sup>2</sup> /day
AIR001604	Adjacent to Manganaha Stream, behind rose nursery	22	Discarded Bird droppings
AIR001608	124 Egmont Road, paddock boundary, west of house	22	0.08
AIR001622	At rear of RSPCA building	22	0.01
AIR001603	At entrance to landfill	22	0.05
AIR001613	Grass lawn, behind work shed	22	0.10
AIR001623	Behind 194 Egmont Road	22	0.06

**Key:** Bold = exceeded guideline value of 0.13 g/m<sup>2</sup>/day

**Table 15** Air deposition monitoring results for 12 February – 5 March 2015

	Site	Days deployed	Particulate g/m <sup>2</sup> /day
AIR001604	Adjacent to Manganaha Stream, behind rose nursery	21	0.11
AIR001608	124 Egmont Road, paddock boundary, west of house	21	0.05
AIR001622	At rear of RSPCA building	21	0.02
AIR001603	At entrance to landfill	21	0.09
AIR001613	Grass lawn, behind work shed	21	<b>0.20</b>
AIR001623	Behind 194 Egmont Road	21	0.12

**Key:** Bold = exceeded guideline value of 0.13 g/m<sup>2</sup>/day for residential areas

During the 2014-2015 period, there was only one particulate level obtained that was above the Council guideline level for dust deposition of 0.13 g/m<sup>2</sup>/day.

This was found behind the landfill's work shed, which is close to an area of high truck movements. This monitoring location is well within the landfill site's boundary so is unlikely to represent non-compliant off site effects.

### 2.7.1.2 Ambient suspended particulate monitoring

Particulates can derive from many sources, including motor vehicles (especially diesels), solid and oil-burning processes for industry and power generation, incineration and waste burning, photochemical processes, and natural sources such as pollen, abrasion and sea spray.

PM<sub>10</sub> particles (those of less than 10 µm in diameter) are linked to adverse health effects that arise primarily from the ability of particles of this size to penetrate the defences of the human body and enter deep into the lungs. Health effects from inhaling PM<sub>10</sub> include increased mortality and the aggravation of existing respiratory and cardiovascular conditions such as asthma and chronic pulmonary diseases. The national guideline for air quality (averaged over a 24 hr period) is 50 µg/m<sup>3</sup> PM<sub>10</sub>.

Suspended particulate (dust) monitoring was carried out under dry weather conditions on three occasions at seven monitoring locations on, and in the neighbourhood of, the landfill. The results are shown in Tables 16 to 18. The monitoring showed that this guideline was only being exceeded at two monitoring locations, both during the May survey.

**Table 16** Ambient PM<sub>10</sub> and methane survey results 9 January 2015

Site	Methane (%LEL)	Dust µg/m <sup>3</sup>
AIR001609	0	26
AIR001606	0	16
AIR0001605	0	20
AIR0001614	0	23
AIR0001612	0	29
AIR0001603	0	16
AIR0001618	0	17
Averages	0	21

**Table 17** Ambient PM<sub>10</sub> and methane survey results 6 May 2015

Site	Methane	Dust µg/m <sup>3</sup>
AIR001603	0	33
AIR001618	0	39
AIR001610	0	41
AIR001613	0	57
AIR001620	0	46
AIR001615	0	78
AIR001614	0	31
Averages	0	46

**Table 18** Ambient PM<sub>10</sub> and methane survey results 16 June 2015

Site	Methane	Dust µg/m <sup>3</sup>
AIR001611	0	2
AIR001620	0	1
AIR001613	0	18
AIR001609	0	1
AIR001608	0	6
AIR001606	0	9
AIR001605	0	1
Averages	0	5

The marginal instantaneous exceedance at AIR001613 was behind the landfill's work shed, which is close to an area of high truck movements. This monitoring location, although downwind of landfill activities, is well within the landfill site's boundary so is unlikely to represent non-compliant off site effects.

The other monitoring location at which there was an instantaneous exceedance of the 24 hr average National environmental Standard was at site AIR001615. This site is at the end of Colson Road, and it was noted that at the time the ambient suspended particulates were recorded at this particular monitoring location that the wind was from the northwest, rather than from the landfill. It is also noted that there were roadworks on Colson Road associated with the construction of the new transfer station, and there were earthworks occurring at a subdivision on the corner of Colson Road and Atiawa Street (to the north west of the monitoring location).

## 2.8 Investigations, interventions, and incidents

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

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

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

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

In the 2014-2015 period, the Council was required to undertake significant additional investigations and interventions, or record incidents, in association with the NPDC's conditions in resource consents or provisions in Regional Plans.

In summary, during the period under review there were 19 odour complaints that were investigated by the Council, and one incident recorded following a fire at the landfill. A summary of the investigations and findings in relation to each of the incident register entries is given in Table 19.

Although it was found that the site was compliant with consent conditions at the time of investigation, noticeable odours were found on occasion. At an investigation on 23 July 2014, it was considered that there was the potential for objectionable or offensive odours to occur.

A meeting was held in July 2014, at the Council offices, in order to determine why the odour was worse this winter. During these discussions it was outlined that, following the full and complete lining of Stage 3 during the 2013-2014 monitoring year, the volume of leachate and potentially contaminated stormwater had increased. It was also agreed that the leachate flow control valve was limiting the flow exiting Stage 3 causing fluids to back up in the landfill, which could potentially push out gas through and/or alongside the leachate lines.

At this point, to mitigate the issue, it was outlined by NPDC that they had installed fixed deodorant sprayers, increased their deodorant spraying regime to four times per day, and capped the lateral leachate lines. They were also going to look at the leachate pumping system, and the possibility of gas extraction.

Following this meeting an abatement notice was issued, requiring NPDC to undertake works to;

- ensure no offensive or objectionable odours; offensive or objectionable dust; or dangerous or noxious ambient concentrations of any airborne contaminant discharge beyond the boundary of the site,
- to ensure compliance with resource consent 4779-1 and Section 15(1)(c) of the Resource Management Act 1991.

On 19 August 2014, NPDC reported to the Council with an update on how reducing the potential for odour from the landfill was being progressed. At this point NPDC had:

- Checked the quality of intermediate cover over non-active areas of landfill. An instigated more regular checking to make sure the cover remains appropriate.
- Inspected the leachate pump station area to check that this was not a significant odour source.
- Temporarily capped the exposed leachate line ends, which were suspected to be the main point source of landfill gas odour.
- Ensured there was on going monitoring any ponding in the landfill foot print to ensure this remained minimal.

NPDC was also in the process of:

- Reviewing daily cover practices to see if any improvements can be made.
- Extending the de-odorising spray hose to include the area between the leachate pump station/ponds and the property boundary
- Investigating an automated spray system for the de-odorant that could operate when staff were not on site, as early morning and late evening is when odour is most frequently present.
- Producing a project brief to engage a consultant to investigate and present a proposal to minimise landfill gas emissions to the environment in order to prevent odour becoming offensive or objectionable beyond the landfill site boundary.

The Council continued to follow-up with NPDC regarding progress with engaging the consultant, receiving and reviewing the report and implementing the recommended improvements.

**Table 19** Summary of incident register investigations during the period under review

Date and time of complaint	Incident notes	Date and time of investigation	Investigation details	Findings/ Outcomes
13-Jul-2014 09:19	A complaint was received regarding odour at Smart Road, Fitzroy.	13-Jul-2014 10:55	In response to an odour complaint, an area in the vicinity of the Colson Road Landfill was inspected. No objectionable and or offensive odour was found. The site was compliant at time of inspection.	No offensive or objectionable odours
13-Jul-2014 13:24	An odour complaint was received from Smart Road, Fitzroy.	13-Jul-2014 21:30	In response to an odour complaint, an area in the vicinity of the Colson Road Landfill was inspected. No objectionable and/or offensive odour was found. The site was compliant at time of inspection.	No offensive or objectionable odours
23-Jul-2014 10:30	A complaint was forwarded on from NPDC call centre regarding objectionable sewage odours frequently discharging beyond the boundary of a site used for waste disposal at Colson Road, New Plymouth. The odour was not occurring when the complaint was made.	23-Jul-2014 10:30	<p>The investigation commenced in calm wind conditions, which rose to a very light south easterly breeze. An odour survey was undertaken in response to a constant and distinct landfill type odour found to be present in the Waiwhakaiho valley retail area. The odour was considered to be unpleasantly pungent with sulphur undertones. The distinct odour was detected along Colson, Smart, Rifle Range and Devon Roads. The same odour was also detected along Clemow Road and Constance Street, but it was intermittent and weak. Directly beyond the landfill site boundary, along the access track to the SPCA (75 Colson Road), the odour was found to be the strongest, and would have been considered objectionable if it had become continuous. Approximately 100 m north of the site boundary, in the paddock beyond the SPCA, the air was clear, and no land-fill odour was detected, however within 100 m of the boundary the odour could be detected. Over the course of the odour survey the wind increased, which cleared the air within the valley retail park. NPDC was instructed to ensure that no objectionable odours were discharged beyond the site boundary.</p> <p>A follow up inspection was carried out on 24 July 2014 at 15:30 after NPDC notified Council of an odour complaint. There was a west south west wind at the time of the inspection. The perimeter of stage three was walked with a methane meter. On the western southern sides of stage three, no ambient methane or significant odours were detected. The open ended lateral leachate lines on the western edge were checked, and it was found that there was very little gas flow from them, and no methane or ammonia were detected in the flow. On the eastern edge of the landfill noticeable fresh rubbish odour was detected when downwind of the tip face. When directly down wind of the special waste pit there was strong sulphur like smell. No ambient methane was detected in these areas. The exposed leachate lines on the south eastern boundary were venting gas at a flow rate detectable to the hand, but it was noticeably less than that observed in the compliance monitoring inspection on 16 July 2014. Methane, carbon monoxide and ammonia were detected in the flow (methane LEL 22%-31%, ammonia 9-13 ppm, CO 5-8 ppm). No ambient levels of these were detected 3 m away from the pipe openings. The special waste pit was inspected and there appeared to be strong odour emanating from it. Sawdust had been dropped into the pit, and was covering the northern side of it, however, there was an open area of black liquid visible below the tipping area. During discussions with the site manager and consent holder it was outlined that they were trying to thicken up the wastes in the pit with sawdust. The site staff said they would put in more sawdust and spray it with deodorant. No odours were noted along Egmont Road (downwind of the site).</p> <p>A further follow-up inspection was undertaken on 25 July 2014 at 07:40 after NPDC notified Council of an odour complaint. This visit was undertaken during conditions that would be likely to create odour issues. It was a cool, mostly still morning with a very light south south westerly breeze blowing down over the site and into the Valley. No odours were detected along the RSPCA drive way or in the RSPCA car park. At the landfill entrance very faint intermittent odours were detected (mostly deodorant). Only noticeable odours were detected on site on the northern access road.</p>	<p>Strong intermittent off site odours.</p> <p>Abatement notice issued due to the potential for objectionable/offensive odours</p>

Date and time of complaint	Incident notes	Date and time of investigation	Investigation details	Findings/ Outcomes
27-Jul-2014 20:15	A complaint received regarding odour on Colson road originating from the Landfill.	27-Jul-2014 20:15	It was reported that the officer arrived to the complainants address to find a weak odour, increasing to noticeable at times. The wind direction was from the south east with only a hint of a breeze. 8 minutes into odour assessment, the wind shifted to the south, and the assessment was concluded after being on site for 25 minutes. Resource consent 4779-1 was compliant at this location at the time of inspection. However, a strong odour was noticed at the Waiwhakaiho lights, and it was reported that, had this odour been observed at the complainants address, resource consent 4779-1 would have been in non compliance.	Strong odour
29-Jul-2014 20:38	Complaint was received concerning and objectionable/offensive odour emanating beyond the site boundary of the Colson Road Landfill, New Plymouth	30-Jul-2014 12:45	At the time of investigation, the wind was coming out of the north west.. The temperature was below 10 degrees and there was a mostly clear night sky. Odour surveys were undertaken on Colson Road, Smart Road, Dorset Road, Pitt Road, Egmont Road and the corner of Devon and Katere Roads. None of the odours detected were found to be objectionable or offensive at time of investigation. No noticeable odour was found to be emanating beyond the site boundary of the Colson Road landfill at the time of investigation.	No offensive or objectionable odours
30-Jul-2014 08:20	Notification was received from a staff member about a landfill type odour in the Devon Road Fitzroy area.	30-Jul-2014 09:48	Investigation led to the landfill, where a noticeable odour was present. A large area of exposed domestic rubbish was uncovered. NPDC advised that deodorizers were shortly to be deployed to minimise odours and exposed areas of rubbish were to be covered with clay. NPDC was informed that a reinspection would take place to ensure that deodorisers were effectively deployed.	Noticeable odours only
7-Aug-2014 09:46	A complaint was received about an odour on Colson Road, New Plymouth	7-Aug-2014 22:24	No odour found in the vicinity of the complainant's residence.	No odours
16-Aug-2014 20:30	A complaint was received regarding odours on Colson Road, New Plymouth	16-Aug-2014	Investigations could not find any odours.	No odours
21-Sep-2014 08:43	A complaint was received regarding odour emanating from NPDC Colson Road Landfill, NP	21-Sep-2014 10:00	An odour survey was conducted in the vicinity of the Colson Road landfill. No odour was found beyond the site boundary	No odours
10-Oct-2014 13:20	A complaint was received regarding an odour emanating from the landfill on Colson Road, New Plymouth.	10-Oct-2014 15:20	An odour survey was undertaken. Investigation found no odour discharging beyond the boundary of the property. NPDC was instructed to ensure no objectionable or offensive odour discharged beyond the boundary of the property.	No odours
16-Oct-2014 06:40	A complaint was received regarding odour being emitted from the Colson Road landfill.	16-Oct-2014 08:20	An investigation was undertaken following a complaint being received from a member of the public regarding odours being emitted from the Colson Road landfill. Weather conditions at the time of the inspection were overcast with heavy fog about the Colson Road, Smart Road area. A heavy dew was present on the ground, with no breeze able to be detected at the time of the inspection. No odour was detected at the intersection of Colson Road and Smart Road. An odour survey at the top end of Colson Road near the entrance to the landfill detected a slight odour. This odour was best described as a gassy type odour similar to that noted on previous call outs. The odour, although detectable, was slight and consistent, with no stronger periods of odour experienced. No odour was noted on Egmont Road and Katere Road. The odour was not considered offensive or objectionable at the time of the investigation.	Consistent, but slight odour

Date and time of complaint	Incident notes	Date and time of investigation	Investigation details	Findings/ Outcomes
9-Nov-2014 08:00	A complaint was received concerning odour discharging from the NPDC landfill.	9-Nov-2014 07:30	An inspection notice was issued to advise that a complaint was received concerning offensive odour discharging from the NPDC landfill. An odour survey was carried out at the base of the landfill and along Colson Road. Only very weak odours were detected for short periods during the odour survey period (10 minutes). NPDC was informed that no further action would be taken on this occasion.	Very weak and intermittent odours
12-Jan-2015 09:00	Notification was received from NPDC that a fire had ignited in the Colson Road landfill. New Zealand Fire Service were in attendance. NPDC requested that TRC attend a meeting to discuss ways to extinguish the fire.	12-Jan-2015 09:40	Inspection found that noticeable odours and smoke were discharging beyond the boundary of the site. NPDC undertook monitoring and to eliminate off site effects by clay capping of the area as recommended by NZ Fire Service. It was noted that monitoring of the site would continue until the fire was extinguished. Follow-up later in the day found that the fire seat had been totally encapsulated by clay, and no evidence of any smoke or odours were found.	Noticeable odours due to fire on site
23-Jan-2015 21:30	Complaint was received concerning objectionable odour from the Colson Road landfill, New Plymouth.	23-Jan-2015 22:10	An odour survey was undertaken near the complainant's property and at the boundary of the landfill. No noticeable odours were found, and NPDC was informed that no further action would be taken on this occasion.	No odours
24-Feb-2015 23:41	A complaint was received regarding ammonia type odours emanating from NPDC's landfill on Colson Road New Plymouth	24-Feb-2015 23:41	Inspection and an odour survey were undertaken shortly after the complaint was received. It was found that no odours were present. NPDC were notified of this outcome.	No odours
27-Mar-2015 20:40	A complaint was received regarding odour being emitted from the Colson Road landfill and also the use of an odourless chemical used on-site to treat the odour.	27-Mar-2015 21:08	A complaint was received regarding odour being emitted from the Colson Road landfill. Inspection found that no odour was being emitted. NPDC advised of ongoing issues.	No odours
14-Apr-2015 18:30	A complaint was received regarding odour from the Colson Road Landfill, Colson Road, Fitzroy.	14-Apr-2015 18:30	Odour survey found very slight and very intermittent noticeable odour from Colson Road Landfill. Site compliant at time of inspection.	No odours
18-Apr-2015 09:15	A complaint regarding odour from the Colson Road Landfill was received from Colson Road, Fitzroy.	18-Apr-2015 09:15	Odour survey found very slight, very intermittent, odour at complainant's property. No objectionable and / or offensive odours were found.	Very slight intermittent odours

Date and time of complaint	Incident notes	Date and time of investigation	Investigation details	Findings/ Outcomes
16-May-2015 08:45	Complaint received regarding odour originating from the Colson Road Landfill	16-May-2015 09:10	At the time of investigation there was a noticeable odour at the complaints address, which dissipated quickly after arrival. The weather was fine, with limited cloud cover and a very slight south easterly breeze. An odour was present at the complainant's address of noticeable intensity, however 5 minutes into the inspection the odour dissipated and was no longer detectable at that location. Inspection down the driveway of 75 Colson Road (SPCA) found that very strong odours were present that were consistent in strength and nature. NPDC was instructed that the following action was to be taken: No odours of an objectionable nature were detected at the complainants address, so the inspection notice would be issued with the site being compliant with consent conditions, however contact with NPDC would be made over what was proposed to control odours from the site (see below).	Strong off site odours
16-May-2015 17:30	Complaint received regarding odour originating from the Colson Road Landfill.	16-May-2015 18:06	At the time of investigation it was a clear night with no cloud cover and a slight south easterly breeze. An odour was detected at the complainants address for approximately 1-2 minutes then the odour dissipated and was not detected again during the half hour odour survey. It was reported that a very pungent odour was noticed at the Waiwhakaiho lights when the officer was heading to the location of the complaint. NPDC was instructed that the following action was to be taken: An explanation would be sought as to the cause of the odour present in the Waiwhakaiho valley. It was expected that this would be addressed in the Odour Management report being drafted by Tonkin and Taylor. NPDC informed Council that the first draft had been received, and the final version, incorporating some amendments and additions, was expected by the end of the month.	Off site odours present, but not offensive or objectionable

Tonkin and Taylor visited the site on 28 February 2015 to undertake an assessment of the odour issues at the site and to make recommendation on the actions to be undertaken to minimise the potential for effects. The report was received by the Council on 2 June 2015, with the following recommendations:

- That a staged odour mitigation approach be adopted as per the following table, with the operation improvements implemented immediately and the following stages implemented as required, and
- that the odour suppressant in use be reviewed for effectiveness.

It was also noted that as the landfill was generating a significant volume of gas and does not have a capture system, reducing the permeability of the cap in one area will simply push the gas towards escaping in other areas. As odour issues typically arise from point source discharges it is beneficial to eliminate these and encourage dispersed discharge across the intermediate cap. Constructing a system to capture and dispose of the gas is the ultimate solution, however this comes at significant cost. Tonkin and Taylor recommended undertaking stages one and two in Table 20, and if odour continued to be an issue, then the construction of a gas capture and disposal system prior to closure of the landfill (their stage 3 recommendation).

**Table 20** Staged odour mitigation recommended by Tonkin and Taylor

Stage 1 (Immediately)	Operation improvements	<ul style="list-style-type: none"> <li>• Leachate pipe remediation – as required install reticulation or active recirculation to capture leachate breakouts</li> <li>• Regular visual walkover inspections</li> <li>• Improvements to fence-mounted odour neutralising sprays:</li> <li>• Use odour neutralising sprays to target active filling area, particularly when daily cover is removed. Use mobile or fixed sprayers directed down or up wind of the area</li> <li>• Review odour spray system product, pump sizing &amp; pressure</li> <li>• Improve the methodology for sludge disposal</li> </ul>
Stage 2	Target hot spots	<ul style="list-style-type: none"> <li>• Cap remediation</li> <li>• Target hot spots using Odour sprays mobile or fixed sprayers</li> </ul>

## 2.9 Management and reporting

### 2.9.1 Landfill Management and Contingency Plans

Daily operations at the site are governed by the requirements contained in the Colson Road Regional Landfill Management Plan, which the consents require is updated at not less than yearly intervals.

A contingency plan is also required for the site by special condition 7 of consent 6177-1.

The plans in effect during the 2014-2015 period were issued by NPDC in July 2013. A reminder was sent to NPDC in August 2014 regarding the need to update the

management plan. The plan was not updated during the period under review, however, a revised plan had been received at the time of writing this report.

### **2.9.2 Colson Road Landfill Liaison Committee**

A liaison committee comprising representatives of NPDC, Taranaki Regional Council, landfill contractor, and neighbours of the landfill was set up in 1999 as required by condition 32 of the land use consent for Colson Road. The purpose of the committee is to facilitate the airing of concerns of the neighbours to the landfill and to ensure that the landfill's neighbours are kept abreast of the development of the landfill site.

It is also a requirement of condition 8 of consent 4779 that the consent holder, staff of the Council, submitters to the application and any other party (at the Council's discretion) meet at least once per year. The liaison committee meetings also fulfil this consent requirement.

During the period under review, the committee met on 12 November 2014, 11 February 2015 and 16 June 2015. This periodicity of meetings was agreed by all parties. The meetings covered site development progresses, operations at the landfill, and future activities. It is also an opportunity for submitters and neighbours to be kept informed of any issues arising at the site, and mitigation measures NPDC is putting in place. Attendees of the meeting agree that they are worthwhile and provide useful feedback to NPDC.

The Colson Road landfill liaison committee has been very successful to date and will continue in its present format for the 2015-2016 monitoring period.

### **2.9.3 Independent Consultant's Reports**

Site inspections were undertaken by WAI Environmental (independent consultants) on 29 October 2014, 13 February 2014 and 5 June 2014.

#### **29 October 2014**

The report of the 29 October 2014 visit noted that:

- Litter control was being undertaken and was, for the most part, well controlled
- The extent of the uncovered refuse was within the 900 square metre requirement of the site management plan
- Management of the sludge (special waste) area was much improved since the last visit
- Refuse coverage was adequate
- Sealing the landfill gas collection system appeared to have put pressure on the system causing an uncontrolled discharge of landfill gas from other places on site
- A long term solution to leachate collection had been provided at the northern end of the landfill. Installation of a new manhole and valve in the discharge line from the Stage 3 landfill together with the installation of a control valve, enabled the flow to be throttled back or even closed off at times of high demand. It was noted that the northern end of the landfill appeared to be close to completion levels.

- The landfill was being operated at high level of compliance

#### **11 February 2015**

The report of the 11 February 2015 inspection noted that:

- All litter fences were devoid of litter on this occasion suggesting that collection was a continual activity. Litter control was occurring but some areas need more attention
- Silt needed to be removed from the large silt pond in order to ensure effectiveness
- Cover was greatly improved with a definite reduction in the extent of exposed refuse and improved cover
- The extent of uncovered refuse was in the order of 700 m<sup>2</sup>, less than 900 m<sup>2</sup> as required by the management plan. Continued vigilance is required
- The management of the landfill was currently at an acceptable standard

#### **21 May 2015**

The report of the 21 May 2015 visit noted that:

- The normal high standard of operation has not been maintained during the difficult weather conditions experienced over the last few weeks.
- Odour on the west side of Stage 3 was traced to fumarole-like vents in the cap. For consideration, the utilisation of stockpiled cover material to increase odour control
- The working face was about 50% greater than allowed for in the management plan
- Cover was stockpiled beside the working face, but it was not being applied to the refuse in sufficient quantity
- Litter had a greater prevalence than normal in drains and ditches around the site.
- As silt significantly reduces the efficacy of the silt pond, it should be removed from the weir and pond as soon as conditions allow
- Leachate had again appeared at the northern end of the site after great efforts were undertaken to remove it. This presents the risk of creating an uncontrolled overland flow. NPDC staff were currently trying to identify if this was caused by a blockage, or simply by heavy rainfall. It was found that this was not due to a blockage, but to the heavy rainfall, and the absence of the staff member that manages the flow through by adjusting the valve to the leachate pump system.

### **2.9.4 Composting**

In the past concerns have been raised about whether the material in each windrow had a plant derived matter content of at least 95% as required by consent conditions. These concerns were mostly directed at the acceptance of stock bedding which is a mixture of hay (or wood chips) and manure. To address this the Council clarified plant derived matter as being any plant derived material that has only been exposed to external degradation processes (and has not been partially or wholly ingested by any type of animal). This definition includes green waste, shredded green waste,

humate, untreated woodchip/shavings, the plant derived component of animal litter (such as hay and wood shavings), and old existing compost stored on the site. This definition does not include paunch grass, or animal manure. It is however Council's position, that poultry, goat and horse manure are acceptable constituents of the 5% non-plant derived proportion of the windrows.

Changes occurred to the composting operations during the period under review, due to a change in the contractor employed by Envirowaste, who is the operator of the transfer station.

The main compost operator on site changed to Revital, with the previous operator moving to a hard stand area to the south of the main composting area.

It was noted that the amount of green waste processing occurring in the main area had reduced significantly at the start of the monitoring period, but increased to above the volumes managed by the previous operator towards the end of the period under review. Concerns were raised at times about the presence of the occasional bit of food waste, non-organic rubbish, and the amount of plastic (from the use of plastic bags to contain the green waste taken to the transfer station).

It was noted that the compost produced by the new operator was coarser than the previous operator, and therefore may be less prone to leachate generation.

The majority of the stormwater drainage from the new composting area operated by Return2Earth was directed through a roadside open drain and culvert to the four pond treatment system for the combined composting area stormwater discharges.

In summary, findings during the year under review were that, based on estimates at inspection, it appeared that the condition relating to the acceptable percentage of non-plant derived material was being complied with throughout the monitoring period, and that the stormwater from the composting areas were being managed such that, compliance with the conditions of the stormwater discharge consents for the landfill were not being compromised by the composting activities.

### 3. Discussion

#### 3.1 Site performance

Overall site management was found to be a little inconsistent during the period under review, with operations managed to a very high standard at the inspections on 9 December 2014 and 9 January 2015, but non-compliances noted at the inspections in September 2014.

A revised management plan, due in July 2014, was not received during the period under review, however, an updated plan had been received by the time of writing this report.

The independent consultant found that the site was managed to a high standard at the start of the monitoring period, was managed satisfactorily at the mid year inspection, but it was reported in May 2015 that the normal high standard of operation had not been maintained during the difficult weather conditions experienced over the preceding few weeks. The issues mentioned by the independent consultant following this inspection included the size of the working face, insufficient application of cover, prevalence of litter and silt, and leachate control in the absence of a key staff member.

Council inspections found that the composting areas were well managed with no dust or odour issues reported relating to these activities. Dust control at the landfill was also adequate to ensure that there were no resultant off site effects.

The completed, earlier stages of the landfill were well managed, with only a couple of minor, insignificant matters raised; one regarding early signs of stock erosion in a gateway, and one in relation to one occasion of over grazing, neither of which would have resulted in any significant environmental effects.

The main matters raised at inspection in relation to the operational areas of the landfill were in relation to:

- On site litter control, including litter being found just outside the litter control fences in the eastern forestry and in the tributaries below the silt ponds. The condition of the litter fences was first raised at inspection in March 2015, and although this matter had not been addressed by the end of the period under review, the new fencing was on site, awaiting installation at the time of writing this report. Additionally, soft plastics were being carried into critical parts of the stormwater and leachate discharge systems, with (most significantly) a plastic bag found to be covering the leachate pond outlet grate on 17 September 2014 still being present at a reinspection on 23 September. This was not noted to be present at the inspection on 22 October 2014.
- On site silt control.
- The size of working face, and adequacy of cover.

Although, at times, high levels of landfill gases were found on site, along with very strong odours, these were relatively localised, and no off site odours were found at any of the routine compliance monitoring inspections.

Surface water monitoring found that the component concentration limits of the stormwater consents had been met, and groundwater sampling found that the groundwater in the vicinity of the site was such that no remedial actions, as contained in special condition 5 of consent 4621-1, were required.

### 3.2 Environmental effects of exercise of consents

There were no significant adverse effects found in the Puremu stream during the period under review, and the parameter concentration limits at both of the Puremu Stream compliance points were met at the time of all three sampling surveys. The Manganaha Stream was found not to be measurably affected by discharges from the landfill, and no direct discharges were found to this waterbody during the year under review.

Although there were issues raised regarding on site litter control, there were no issues noted regarding litter being found on Colson Road, or anywhere else beyond the site boundary.

Biomonitoring found that there were no indications of any significant adverse effects on either the Puremu Stream or the Manganaha Stream from the discharges from the Colson Road Landfill at the time of either survey.

Groundwater quality remains satisfactory and there is no evidence of significant contamination either in the groundwater or in the under-liner drainage system.

With exception of one (on site) result, all ambient deposited particulate levels obtained were below the Council guideline level for dust deposition in residential areas (0.13 g/m<sup>2</sup>/day). Therefore, based on the results of the deposition gauge surveys undertaken during the period under review, it is unlikely that landfill is causing off site dust deposition levels that exceed the guideline. Suspended particulate readings also indicate that the site is complying with National Environmental Standard for PM<sub>10</sub>.

There were a total of 19 odour complaints investigated by Council during the period under review.

At the time of investigation no offensive or objectionable odours were found on any of these occasions, and at the time of eight of the investigations it was reported that there was no odour present at all. However, at the time of three of the investigations strong off site odours were found, and as a result of the potential for these odours to become objectionable an abatement notice was issued on 31 July 2014. The abatement notice required that NPDC "*Undertake works to ensure no offensive or objectionable odours; offensive or objectionable dust; or dangerous or noxious ambient concentrations of any airborne contaminant discharge beyond the boundary of the site, to ensure compliance with resource consent 4779-1 and Section 15(1)(c) of the Resource Management Act 1991*".

As there were no offensive or objectionable odours found beyond the site boundary, this abatement notice was complied with during the period under review.

### 3.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the year under review is set out in Tables 17 to 24.

**Table 21** Summary of performance for diversion consent 0226-1

<i>Purpose: To divert the Puremu Stream in the Waiwhakaiho Catchment by culverting stream to provide road access to refuse tip</i>		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Comply with Water Right 226	Site inspections	Yes
2. Pipe laid in accordance with manufacturer's specifications	Site inspection	Yes
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

**Table 22** Summary of performance for contaminated stormwater and leachate consent 2370-3

<i>Purpose: To discharge up to 1000 m<sup>3</sup>/day [5 L/s] of leachate and contaminated stormwater from the closed section, Area A, of Colson Road municipal landfill to groundwater in the vicinity of and into the Puremu Stream a tributary of the Mangaone Stream in the Waiwhakaiho catchment</i>		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Best practice to be adopted	Site inspection	Yes
2. Consent undertaken in accordance with information supplied in the application	Site inspection and review of documentation on file	Yes
3. Discharge not alter colour, clarity or pH of Puremu Stream	Site inspection and water sampling	Yes
4. No significant adverse effects on aquatic life	Site inspection, sampling and biomonitoring	Yes
5. Monitor surface water on/near the site	Undertaken by the Council via site specific monitoring programme, inspections and water sampling	Yes
6. Satisfy all requirements of the District Plan of the New Plymouth District Council	N/A	N/A
7. Management and site contingency plan	Site inspection and review of documentation on file	Yes
8. Maintain a landfill capping barrier and vegetative cover	Site inspection (stages 1 & 2)	Yes
9. Area is closed and managed in accordance with the management plan	Site inspection and review of documentation on file	Yes
10. Maintain drains, ponds and contours on site to minimise unwanted water movement and ponding on site	Site inspections	Yes

Purpose: <i>To discharge up to 1000 m<sup>3</sup>/day [5 L/s] of leachate and contaminated stormwater from the closed section, Area A, of Colson Road municipal landfill to groundwater in the vicinity of and into the Puremu Stream a tributary of the Mangaone Stream in the Waiwhakaiho catchment</i>		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
11. No cleaning or hosing out of refuse vehicles on site	Site inspections	Yes
12. The mixing zone extends downstream from the culvert outlet to 2 m above the confluence between the Puremu Stream and its tributary	N/A	N/A
13. Discharge shall not alter the Puremu Stream in the way of films, foams or suspended materials, change colour or visibility, objectionable odour, harm aquatic or farm animals, or increase temperature by more than 2.0°C	Site inspection and water sampling	Yes
14. Discharge shall not alter the water quality of the Puremu Stream below the given criteria	Site inspection and water sampling	Yes
15. Discharge shall not reduce the concentration of dissolved oxygen below 5 mg/litre	Site inspection and water sampling	Yes
16. Discharge shall not render the Puremu Stream unfit for stock consumption	Site inspection and water sampling	Yes
17. Satisfactorily maintain and manage the leachate collection and treatment systems	Site inspection	Yes
18. Optional review provision re environmental effects	Next opportunity for review June 2020	N/A
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

**Table 23** Summary of performance for Consent 4619-1 Treated stormwater and leachate discharge

Purpose: <i>To discharge up to 675 litres/second of treated stormwater and minor amounts of leachate from areas B1 B2 C1 and C2 of the Colson Road Landfill to groundwater in the vicinity of and into the Puremu stream a tributary of the Mangaone Stream in the Waiwhakaiho Catchment</i>		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Water quality in the Manganaha Stream shall not be changed	Site inspection and water sampling	Yes
2. Water quality of the Puremu Stream shall not exceed the given criteria	Site inspection and water sampling	Yes

Purpose: <i>To discharge up to 675 litres/second of treated stormwater and minor amounts of leachate from areas B1 B2 C1 and C2 of the Colson Road Landfill to groundwater in the vicinity of and into the Puremu stream a tributary of the Mangaone Stream in the Waiwhakaiho Catchment</i>		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
3. Discharge shall not alter the Puremu stream in the way of films, foams or suspended materials, change colour or visibility, objectionable odour, harm aquatic or farm animals, or increase temperature by more than 2.0°C	Site inspection and water sampling	Yes
4. Operate according to the 'New Plymouth District Council Colson Road Landfill: Landfill Management Plan July 1994, or subsequent versions with no less environmental protection Plan to be updated at not greater than yearly intervals	Site inspection and review of documentation on file. Plan on file dated July 2013. Reminder sent to NPDC August 2014	<b>Plan overdue for updating from August 2014</b>
5. Maintain and comply with a monitoring programme	Not assessed during period under review	N/A
6. Consent will lapse after six years if not exercised	N/A, consent exercised	N/A
7. Optional review provision re environmental effects	Next opportunity for review June 2018	N/A
Overall assessment of environmental performance and compliance in respect of this consent Overall assessment of administrative performance in respect of this consent		<b>High Improvement required</b>

N/A = not applicable

**Table 24** Summary of performance for uncontaminated stormwater consent 4620-1

Purpose: <i>To discharge up to 675 L/s of uncontaminated stormwater from areas B1 B2 C1 and C2 of the Colson Road Landfill into the Puremu Stream a tributary of the Mangaone Stream in the Waiwhakaiho Catchment</i>		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Water quality in the Manganaha Stream shall not be altered	Inspections and water sampling	Yes
2. Discharge to have pH 6.5-8.5, maximum suspended solids 100 g/m <sup>3</sup> , and maximum ammoniacal nitrogen 0.5 g/m <sup>3</sup> as nitrogen	Inspections and water sampling	Not able to assess as discharge is mixed with that of consent 4619
3. No leachate discharge	Sampling and inspection	Yes
4. Channels shall minimise erosion	Site inspections	<b>Some erosion found on one inspection (17-09-14)</b>
5. Channels shall minimise instability of the surrounding land	Site inspections	<b>Some instability found outside eastern drain at one inspection (17-09-14)</b>

Purpose: <i>To discharge up to 675 L/s of uncontaminated stormwater from areas B1 B2 C1 and C2 of the Colson Road Landfill into the Puremu Stream a tributary of the Mangaone Stream in the Waiwhakaiho Catchment</i>		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
6. Repair land eroded/made unstable due to construction/maintenance	Site inspections	Yes
7. Notification of any proposal which may affect areas contributing runoff	Site inspections and liaison with consent holder	Yes
8. Discharge shall not alter the Puremu Stream in the way of films, foams or suspended materials, change colour or visibility, objectionable odour, harm aquatic or farm animals, or increase temperature by more than 2.0°C	Site inspections and water sampling	Yes
9. No excavation or landfilling if any runoff to Manganaha Stream will contain suspended solids or any other contaminant	Site inspection and water sampling	Yes
10. Operate according to the 'New Plymouth District Council Colson Road Landfill: Landfill Management Plan July 1994, or subsequent versions with no less environmental protection Plan to be updated at not greater than yearly intervals	Site inspection and review of documentation on file. Plan on file dated July 2013. Reminder sent to NPDC August 2014	Plan overdue for updating from August 2014
11. Maintain and comply with a monitoring programme	Not assessed during period under review	N/A
12. Consent will lapse after six years if not exercised	N/A, consent has been exercised	N/A
13. Optional review provision re environmental effects	Next opportunity for review June 2018	N/A
Overall assessment of environmental performance and compliance in respect of this consent		Good
Overall assessment of administrative performance in respect of this consent		Improvement required

N/A = not applicable

**Table 25** Summary of performance for discharge to land consent 4621-1

Purpose: <i>To discharge up to 500 tonnes/day of contaminants onto and into land in areas B1, C1 and C2 at the Colson Road landfill</i>		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Install and maintain groundwater monitoring piezometers	Site inspection and liaison with consent holder	Yes
2. Prevent surface runoff into the Manganaha Stream from any area used or previously used for the deposition of refuse	Site inspection and water sampling	Yes
3. Prior to use all drainage channels, bunds and contouring is complete	N/A	N/A

<b>Purpose: <i>To discharge up to 500 tonnes/day of contaminants onto and into land in areas B1, C1 and C2 at the Colson Road landfill</i></b>		
<b>Condition requirement</b>	<b>Means of monitoring during period under review</b>	<b>Compliance achieved?</b>
4. Civil works relating to construction of Stage 3 be certified by a registered engineer prior to use	N/A	N/A
5. Mitigate if adverse effects on groundwater	Sampling	Yes
6. Maintain and comply with a monitoring programme	Not assessed during period under review	N/A
7. Operate according to the 'New Plymouth District Council Colson Road Landfill: Landfill Management Plan July 1994, or subsequent versions with no less environmental protection Plan to be updated at not greater than yearly intervals	Site inspection and review of documentation on file. Plan on file dated July 2013. Reminder sent to NPDC August 2014	<b>Plan overdue for updating. Inadequate cover on occasion. Working face over allowed area on occasion</b>
8. Disposal of waste shall comply with the 'criteria for calculating landfill potentials' and the 'Draft Health and Environment Guidelines for selected Timber Treatment Chemicals'	Not assessed during period under review	N/A
9. Consent will lapse after six years if not exercised	N/A, consent exercised	N/A
10. Optional review provision re environmental effects	Next opportunity for review June 2018	N/A
Overall assessment of environmental performance and compliance in respect of this consent Overall assessment of administrative performance in respect of this consent		<b>Good Improvement required</b>

N/A = not applicable

**Table 26** Summary of performance for composting air consent 4622-1

<b>Purpose: <i>To discharge emissions into the air from composting and ancillary activities at the Colson Road Landfill</i></b>		
<b>Condition requirement</b>	<b>Means of monitoring during period under review</b>	<b>Compliance achieved?</b>
1. Minimise adverse effects on the environment	Site inspection and liaison with consent holder	Yes
2. No offensive odours	Air surveys	Yes
3. No adverse ecological effects on any ecosystem	Site inspection, sampling, and neighbourhood surveys	Yes
4. Materials accepted for composting comply with the 'Assessment of Discharges to Air' July 1994 and the New Plymouth District Council Colson Road Landfill Management Plan July 1994	Site inspection	Yes

Purpose: <i>To discharge emissions into the air from composting and ancillary activities at the Colson Road Landfill</i>		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
5. All composting to occur at least 300 m from any dwelling existing as of 21 March 1999	Site inspections	Yes
6. Composting piles must consist of no less than 95% plant-derived material	Site specific monitoring programme - site inspections and visual assessment	Yes – as best as could be estimated
7. Composting to occur on a trial basis until the consent is approved or reviewed on receipt of a full report	N/A	N/A
8. Consent will lapse after six years if not exercised	N/A, consent has been exercised	N/A
9. Optional review provision re environmental effects	N/A	N/A
Overall assessment of environmental performance and compliance in respect of this consent		<b>High</b>
Overall assessment of administrative performance in respect of this consent		<b>High</b>

N/A = not applicable

**Table 27** Summary of performance for air discharge consent 4779-1

Purpose: <i>To discharge contaminants into the air from the existing landfill [Area A] and proposed landfill extension in areas A B1 B2 C1 and C2 of the Colson Road Municipal Landfill Site, New Plymouth</i>		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Best practicable option (BPO) to prevent or minimise adverse effects on the environment	Site inspection, air surveys, complaint response	BPO not implemented re: minimising odours. Abatement notice issued due to potential for significant effects
2. No offensive odours or dust or noxious concentrations	Site inspection, air surveys, complaint response	Yes
3. No burning on site	Site inspection, complaint response	Self notification re: two accidental fires on site
4. No adverse ecological effects on any ecosystem	Inspections of site and neighbouring areas	Yes
5. No venting untreated landfill gases within 200 m of any boundary	Not assessed during period under review	N/A
6. Comply with 'Air Discharge Consent Application Supporting Documentation' and according to the 'New Plymouth District Council Colson Road Landfill: Landfill Management Plan July 1994, or subsequent versions with no less environmental protection Plan to be updated at not greater than yearly intervals	Site inspection and review of documentation on file. Plan on file dated July 2013. Reminder sent to NPDC August 2014	Plan overdue for updating. Inadequate cover on occasion. Working face over allowed area on occasion

<i>Purpose: To discharge contaminants into the air from the existing landfill [Area A] and proposed landfill extension in areas A B1 B2 C1 and C2 of the Colson Road Municipal Landfill Site, New Plymouth</i>		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
7. Council approval to be sought in the event of alterations at the site or to site operations	Site inspections and liaison with consent holder and site operator	Yes
8. Meet once a year to discuss any matter relating to the consent	Landfill liaison committee meetings	Yes
9. Provide a report within a year on the collection, extraction, venting and combustion of landfill gas	Review of documentation on file. Compliance previously achieved, as report had been received	Yes
10. Optional review provision re environmental effects	Next opportunity for review in June 2018	NA
11. Optional review provision re collection, extraction, venting and combustion of landfill gas	Next opportunity for review in June 2018	NA
Overall assessment of environmental performance and compliance in respect of this consent		Improvement required
Overall assessment of administrative performance in respect of this consent		Improvement required

N/A = Not applicable

**Table 28** Summary of performance for earthworks stormwater consent 6177-1

<i>Purpose: To discharge stormwater [due to earthworks in providing an area for Stage 3 of the municipal landfill] onto land and into the Puremu Stream a tributary of the Mangaone Stream in the Waiwhakaiho catchment</i>		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Discharge quality within specified parameters	Site inspection and sampling	Not able to assess as discharge is mixed with that of consent 4619
2. No leachate discharged	Site inspection	Yes
3. Maintenance of drains to prevent erosion and sedimentation	Site inspections	Some erosion found on one inspection (17-09-2014)
4. No conspicuous effect on clarity or colour of receiving waters	Site inspection and sampling	Yes
5. No significant effect on aquatic life	Site inspection, sampling and biomonitoring	Yes
6. Monitoring to satisfaction of the Council	Site inspection, sampling and data review	Yes
7. Preparation and maintenance of a management plan	Review of Council records and liaison with consent holder	Plan over due for updating from August 2014
8. Sediment and erosion management plan	Not assessed during year under review	Yes
9. Adopt best practice	Site inspection and liaison with content holder	Yes

<i>Purpose: To discharge stormwater [due to earthworks in providing an area for Stage 3 of the municipal landfill] onto land and into the Puremu Stream a tributary of the Mangaone Stream in the Waiwhakaiho catchment</i>		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
10. Rehabilitation of disturbed areas	Site inspection	Yes
11. Maintain stormwater system to prevent ponding and overland flow.	Site inspection	Yes
12. Receiving waters not adversely affected	Site inspection, sampling and biomonitoring	Yes
13. A review condition	No further review opportunities prior to consent expiry	N/A
Overall assessment of environmental performance and compliance in respect of this consent		Good
Overall assessment of administrative performance in respect of this consent		Improvement required

N/A = Not applicable

Overall, an improvement was required in NPDC's environmental performance and administrative compliance with the resource consents. The improvement required in NPDC's environmental performance in relation to the air discharge consent was signalled by the issuing of an abatement notice. This was issued early in the year under review due to likelihood of significant effects to occur as a result of the landfill gas emissions that were, on occasion, found to be resulting in strong off site odours at times in the winter/late autumn months. In terms of administrative performance, there were occasional non compliances with the management plan found during the period under review, and in addition to this, the Management Plan was not updated at the required frequency.

### 3.4 Recommendations from the 2013-2014 Annual Report

The 2013-2014 Annual Report recommended:

THAT for 2014-2015 the monitoring of discharges at the Colson Road landfill remains unchanged from that of the 2013-2014 monitoring period.

This recommendation was implemented.

### 3.5 Alterations to monitoring programmes for 2015-2016

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

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

#### **4. Recommendation**

1. THAT monitoring of discharges from the Colson Road regional landfill in the 2015-2016 period monitoring continues at the same level as in 2014-2015.

## 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
DO	dissolved oxygen
DRP	dissolved reactive phosphorus
<i>E.coli</i>	<i>escherichia coli</i> , 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 <sup>3</sup>	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
HDPE	high density polyethylene
IR	Incident Register – contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan
L/s	litres per second
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
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
Moxie	A large earthmoving truck
NH <sub>4</sub>	ammonium, normally expressed in terms of the mass of nitrogen (N)
NH <sub>3</sub>	unionised ammonia, normally expressed in terms of the mass of nitrogen (N)
NO <sub>3</sub>	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 <sub>10</sub>	relatively fine airborne particles (less than 10 micrometre diameter)
ppm	parts per million on a volume/volume basis
resource consent	refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15)
RMA	Resource Management Act 1991 and subsequent amendments
SS	suspended solids
Temp	temperature, measured in °C (degrees Celsius)
Turb	turbidity, expressed in NTU
UI	Unauthorised Incident
Zn*	zinc

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

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

## Bibliography and references

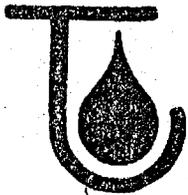
- Beca Carter Hollings and Ferner (1994): *Groundwater and Geotechnical Investigations; Colson Road Landfill Consents* (unpublished report prepared for New Plymouth District Council).
- New Plymouth District Council (2013): *Colson Road Regional Landfill Management Plan*. July 2013.
- Taranaki Regional Council (1990): *New Plymouth District Council Waitara and New Plymouth Landfill. Annual Report 1989/90*. Technical Report 90-31.
- Taranaki Regional Council (1991): *New Plymouth District Council Waitara and New Plymouth Landfill. Annual Report 1990/91*. Technical Report 91-12.
- Taranaki Regional Council (1992): *New Plymouth District Council Landfills, Inglewood, New Plymouth, Okato, Okoki, Tongaporutu and Waitara Annual Report 1991-92*. Technical Report 92-23.
- Taranaki Regional Council (1993): *New Plymouth District Council, Inglewood, New Plymouth, Okato, Okoki, Tongaporutu and Waitara. Annual Report 1992-93*. Technical Report 93-65.
- Taranaki Regional Council (1994): *New Plymouth District Council, Inglewood, New Plymouth, Okato, Okoki, Tongaporutu and Waitara. Annual Report 1993-94*. Technical Report 94-22.
- Taranaki Regional Council (1995): *New Plymouth District Council, Inglewood, New Plymouth, Okato, Okoki, Tongaporutu and Waitara Landfills Annual Report 1994-95*. Technical Report 95-51.
- Taranaki Regional Council (1996): *New Plymouth District Council, Inglewood, New Plymouth, Okato, Okoki, Tongaporutu and Waitara Landfills Annual Report 1995-96*. Technical Report 96-45.
- Taranaki Regional Council (1997): *New Plymouth District Council, Inglewood, New Plymouth, Okato, Okoki, Tongaporutu and Waitara Landfills Annual Report 1996-97*. Technical Report 97-56.
- Taranaki Regional Council (1998): *New Plymouth District Council, Inglewood, New Plymouth, Okato, Okoki, Tongaporutu and Waitara Landfills Annual Report 1997-98*. Technical Report 98-51.
- Taranaki Regional Council (1999): *New Plymouth District Council, Inglewood, New Plymouth, Okato, Okoki, Tongaporutu and Waitara Landfills Annual Report 1998-99*. Technical Report 99-44.
- Taranaki Regional Council (2000): *New Plymouth District Council, New Plymouth (Colson Road) Landfill Monitoring Programme Annual Report 1999-00*. Technical Report 00-38.
- Taranaki Regional Council (2001): *New Plymouth District Council, New Plymouth (Colson Road) Landfill Monitoring Programme Annual Report 2000-01*. Technical Report 2001-61.

- Taranaki Regional Council (2002): *New Plymouth District Council, New Plymouth (Colson Road) Landfill Monitoring Programme Annual Report 2001-02*. Technical Report 2002-81.
- Taranaki Regional Council (2003): *New Plymouth District Council, New Plymouth (Colson Road) Landfill Monitoring Programme Annual Report 2002-03*. Technical Report 2003-83.
- Taranaki Regional Council (2004): *New Plymouth District Council, New Plymouth (Colson Road) Landfill Monitoring Programme Annual Report 2003-04*. Technical Report 2004-112.
- Taranaki Regional Council (2005): *New Plymouth District Council, New Plymouth (Colson Road) Landfill Monitoring Programme Annual Report 2004-05*. Technical Report 2005-65.
- Taranaki Regional Council (2006): *New Plymouth District Council, New Plymouth (Colson Road) Landfill Monitoring Programme Annual Report 2005-06*. Technical Report 2006-63.
- Taranaki Regional Council (2007): *New Plymouth District Council, New Plymouth (Colson Road) Landfill Monitoring Programme Annual Report 2006-07*. Technical Report 2007-48.
- Taranaki Regional Council (2008): *New Plymouth District Council, New Plymouth (Colson Road) Landfill Monitoring Programme Annual Report 2007-08*. Technical Report 2008-56.
- Taranaki Regional Council (2009): *New Plymouth District Council, New Plymouth (Colson Road) Landfill Monitoring Programme Annual Report 2008-09*. Technical Report 2009-60.
- Taranaki Regional Council (2010): *New Plymouth District Council, New Plymouth (Colson Road) Landfill Monitoring Programme Annual Report 2009-10*. Technical Report 2010-66.
- Taranaki Regional Council (2011): *New Plymouth District Council, New Plymouth (Colson Road) Landfill Monitoring Programme Annual Report 2010-11*. Technical Report 2011-46.
- Taranaki Regional Council (2012): *New Plymouth District Council, New Plymouth (Colson Road) Landfill Monitoring Programme Annual Report 2011-12*. Technical Report 2012-38.
- Taranaki Regional Council (2013): *New Plymouth District Council, New Plymouth (Colson Road) Landfill Monitoring Programme Annual Report 2012-13*. Technical Report 2013-51.
- Taranaki Regional Council (2014): *New Plymouth District Council, New Plymouth (Colson Road) Landfill Monitoring Programme Annual Report 2013-14*. Technical Report 2014-59.

## **Appendix I**

### **Resource consents held by NPDC for Colson Road landfill**





TARANAKI CATCHMENT COMMISSION  
AND  
REGIONAL WATER BOARD

COPY

PO BOX - 159  
TELEPHONE - 7127

MANAGER  
MUNICIPAL CHAMBERS  
BROADWAY  
STRATFORD  
NEW ZEALAND

RIGHT IN RESPECT OF NATURAL WATER

NO: 226.VF V2 *MB*

Pursuant to Section 21 (3) of the Water and Soil Conservation Act 1967, a right is hereby granted by the Taranaki Catchment Commission as the Regional Water Board for the area to:

Name: NEW PLYMOUTH CITY COUNCIL

of: PRIVATE BAG NEW PLYMOUTH

occupation: LOCAL AUTHORITY

for a period to: ~~PLEASURE OF THE COMMISSION~~ 1 OCTOBER 2026 (as per section 386(2) of the Resource Management Act 1991

from: 14 MAY 1986

DETAILS OF RIGHT

Purpose for which right is granted: TO DIVERT THE PUREMU STREAM BY  
CULVERTING STREAM TO PROVIDE ROAD ACCESS TO REFUSE TIP

Location of: COLSON ROAD, NEW PLYMOUTH

Grid reference: N109 694 919 Catchment: WAIWAKAIHO

Legal description of land at site: NEW PLYMOUTH CITY COUNCIL REFUSE  
DISPOSAL SITE

Rate: WHOLE FLOW

Local Authority: NEW PLYMOUTH CITY COUNCIL

CONDITIONS OF RIGHT

- (a) The Grantee shall provide to the Manager, Taranaki Catchment Commission, on request plans, specifications and maintenance programmes of works associated with the exercise of this right, showing that the conditions of this right are able to be met.
- (b) The standards, techniques and frequency of monitoring of this right shall be to the specific approval of the Manager, Taranaki Catchment Commission.

*MB*

- (c) The actual and reasonable cost of administration supervision and monitoring of this right, deemed necessary by the Manager, Taranaki Catchment Commission, shall be met by the Grantee.
- (d) This right may be cancelled in writing to the grantee by the Commission if the right is not exercised within twelve months of the date of grant or such longer time as the Manager, Taranaki Catchment Commission, may approve.
- (e) This right may be terminated by the Commission upon not less than six months notice in writing to the grantee if, in the opinion of the Commission, the public interest so requires, but without prejudice to the grantee to apply for a further right in respect of the same matter.

Special Conditions

1. The terms and conditions pertaining to Water Right 226 shall apply.
2. ~~The existing 900 mm pipe shall be sealed in such a manner so as to prevent leachate from entering the pipe~~ (deleted as per variation of 08 October 1986) *AL Bray*
3. The new 900 mm pipe shall be laid in accordance with the manufacturers specifications.

Signed at STRATFORD this *14<sup>th</sup>* day of *May* 1986

For and on behalf of  
THE TARANAKI CATCHMENT COMMISSION  
AND REGIONAL WATER BOARD

*AL Bray*  
Secretary



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

CHIEF EXECUTIVE  
PRIVATE BAG 713  
47 CLOTEN ROAD  
STRATFORD  
NEW ZEALAND  
PHONE 06-765 7127  
FAX 06-765 5097

Please quote our file number  
on all correspondence

Name of  
Consent Holder: New Plymouth District Council  
Private Bag 2025  
NEW PLYMOUTH

Review Completed 20 July 2004 [Granted: 19 March 2003]  
Date:

**Conditions of Consent**

Consent Granted: To discharge up to 1000 cubic metres/day [5 litres/second]  
of leachate and contaminated stormwater from the closed  
section, Area A, of Colson Road municipal landfill to  
groundwater in the vicinity of and into the Puremu Stream  
a tributary of the Mangaone Stream in the Waiwhakaiho  
catchment at or about GR: P19:074-372

Expiry Date: 1 June 2026

Review Date(s): June 2004, June 2006, June 2008, June 2014, June 2020

Site Location: Colson Road Landfill, Colson Road, New Plymouth

Legal Description: Sec 223 Hua Dist Blk VI Paritutu SD

Catchment: Waiwhakaiho

Tributary: Mangaone  
Puremu

*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 87/228, 92/205 and 1664. In the case of any contradiction between the documentation submitted in support of applications 87/228, 92/205 and 1664 and the conditions of this consent, the conditions of this consent shall prevail.
  3. Any discharge shall not alter to a conspicuous extent the natural colour, clarity or pH of the receiving water, nor shall it contain visible oil or grease, nor shall it emit objectionable odours, nor shall it increase the temperature of the Puremu Stream by more than 2.0°C.
  4. There shall be no significant adverse impact upon natural aquatic life downstream of the landfill as a result of the exercise of this consent.
  5. Monitoring of surface waters and groundwater on or in the vicinity of the site shall be undertaken to the satisfaction of the Chief Executive, Taranaki Regional Council.
  6. The consent holder shall satisfy all relevant requirements, obligations and duties of the Proposed District Plan of the New Plymouth District Council.
  -  7. The consent holder shall prepare, maintain and comply with a site management plan to the approval of the Chief Executive, Taranaki Regional Council.
  8. The consent holder shall maintain an adequate landfill capping barrier and vegetative cover on the site to the satisfaction of the Chief Executive, Taranaki Regional Council.
  -  9. The consent holder shall ensure that the area to which this consent is attributed is closed and subsequently managed in accordance with the Colson Road Regional Landfill Management Plan provided June 2004 or as subsequently amended provided that subsequent amendments do not reduce the level of environmental protection set out in the June 2004 plan.

10. The consent holder shall maintain stormwater drains, sediment detention ponds, and/or ground contours at the site, in order to minimise stormwater movement across, or ponding on the site.
11. The consent holder shall ensure that there shall be no cleaning or hosing out of refuse-containing vehicles at the site.
12. The mixing zone in each condition of this consent shall extend for a distance downstream of the point of the culvert outlet of the Puremu Stream to 2 metres above the confluence of the unnamed tributary of the Puremu Stream and the Puremu Stream at the site's legal boundary.
13. After allowing for reasonable mixing the consent holder shall ensure that the discharge shall not give rise to any of the following effects in the receiving waters of the Puremu Stream:
- The production of any conspicuous oil or grease films, scums or foams, or floatable or suspended material;
  - any conspicuous change in colour or visual clarity;
  - any emission of objectionable odour;
  - the rendering of fresh water unsuitable for consumption by farm animals;
  - any significant adverse effects on aquatic life.
  - an increase in the temperature of the Puremu Stream by more than 2.0° Celsius
14. The discharge shall not be shown to reduce the quality of the Puremu Stream at or beyond the mixing zone below the following criteria:

constituent	maximum concentration or level
aluminium	5.0 mg/l
arsenic	0.1 mg/l
beryllium	0.1 mg/l
boron	0.5 mg/l
cadmium	0.01 mg/l
chromium	0.1 mg/l
cobalt	0.05 mg/l
copper	0.2 mg/l
fluoride	1.0 mg/l
iron	5.0 mg/l
lead	0.1 mg/l
manganese	1.0 mg/l
nitrate + nitrite (NO <sub>3</sub> -N + NO <sub>2</sub> -N)	100 mg/l
nitrite -N	5.0 mg/l
selenium	0.02 mg/l
vanadium	0.1 mg/l
zinc	2.0 mg/l
ammoniacal nitrogen	2.5 mg/l
pH	6.5 - 8.5
sulphate	500 mg/l

Note: levels of trace metals expressed as total recoverable metals

Consent 2370-3

- 
15. The discharge shall not be shown to reduce the concentration of dissolved oxygen in the Puremu Stream below 5 mg/litre, beyond the mixing zone specified in special condition 12 above.
  16. The discharge shall not, in the opinion of the Chief Executive, Taranaki Regional Council, contain substances or constituents other than those listed in condition 14, nor pathogenic organisms, which would render the water of the Puremu Stream, beyond the mixing zone specified in condition 12 above, unpalatable or unfit for stock consumption purposes.
  17. The maintenance, management and operation of the leachate and collection and treatment systems shall be to the satisfaction of the Chief Executive, Taranaki Regional Council, to ensure that the conditions attached to this consent can be met.
  18. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2004 and/or June 2006 and/or June 2008 and/or 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 July 2004

For and on behalf of  
Taranaki Regional Council



---

~~Director~~ Resource Management

TRK994619



## DISCHARGE PERMIT

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

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

Name of  
Consent Holder: **NEW PLYMOUTH DISTRICT COUNCIL  
PRIVATE BAG 2025 NEW PLYMOUTH**

Consent  
Granted Date: **21 March 1999**

## CONDITIONS OF CONSENT

Consent Granted: **TO DISCHARGE UP TO A MAXIMUM OF 675 LITRES/SECOND OF TREATED STORMWATER AND MINOR AMOUNTS OF LEACHATE FROM AREAS B1, B2, C1 AND C2 OF THE COLSON ROAD LANDFILL TO GROUNDWATER IN THE VICINITY OF AND INTO THE PUREMU STREAM A TRIBUTARY OF THE MANGAONE STREAM IN THE WAIWHAKAIHO CATCHMENT AT OR ABOUT GR: P19:074-372**

Expiry Date: **1 June 2025**

Review Date[s]: **June 2006, June 2012, June 2018 and/or within six months of the first exercise of this consent**

Site Location: **COLSON ROAD LANDFILL, COLSON ROAD, NEW PLYMOUTH**

Legal Description: **SEC 223 HUA DIST BLK VI PARITUTU SD**

Catchment: **WAIWHAKAIHO 392.000**

Tributary: **MANGAONE 392.010  
PUREMU 392.012**

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

TRK994619

### General conditions

- a) That on receipt of a requirement from the General Manager, Taranaki Regional Council (hereinafter the General Manager), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
  - i) the administration, monitoring and supervision of this consent; and
  - ii) charges authorised by regulations.

### Special conditions

1. THAT the water quality in the Manganaha Stream above its confluence with the Mangaone Stream shall not be changed as a result of this discharge.
2. THAT the exercise of this consent shall not cause the water quality of the Puremu Stream at the northern boundary of the site to exceed the following criteria:

Component	Criteria
pH	range within 6.5-8.5
Dissolved oxygen	maximum reduction of $1.0 \text{ gm}^{-3}$ in the upstream dissolved oxygen concentration
Ammoniacal nitrogen	$2.0 \text{ gm}^{-3}$ for pH below 7.75 $1.3 \text{ gm}^{-3}$ for pH between 7.75-8.00 $1.0 \text{ gm}^{-3}$ for pH between 8.00-8.50
Nitrate	$10 \text{ gm}^{-3}$ as nitrogen
Nitrite	$0.06 \text{ gm}^{-3}$ as nitrogen
Faecal coliforms	1000/100 mL
Sulphate	$1000 \text{ gm}^{-3}$
Oil and grease	$10 \text{ gm}^{-3}$
Suspended solids maximum permitted increase in instream concentration	
[dry weather conditions]	$10 \text{ gm}^{-3}$
[wet weather conditions]	10%
of upstream concentration	

	Maximum instream concentration Total Recoverable Metals gm <sup>3</sup>	Maximum permitted increase in concentration Filtered Metals gm <sup>3</sup>
Aluminium	5.0	0.1
Arsenic	0.2	0.05
Beryllium	0.1	n/a
Boron	5.0	n/a
Cadmium	0.05	0.001
Chromium	1.0	0.02
Cobalt	1.0	n/a
Copper	0.5	0.002
Iron	10.0	0.3
Lead	0.1	0.002
Manganese	5.0	n/a
Selenium	0.05	0.001
Vanadium	0.1	n/a
Zinc	2.4	0.03

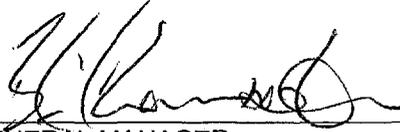
3. THAT the discharge authorised by this consent, in conjunction with the exercise of any other consent associated with the landfill property, shall not give rise to any of the following effects in the Puremu Stream at the northern boundary of the site:
  - a) the production of conspicuous oil or grease films, scums or foams, or floatable or suspended materials [other than storm debris and suspended solids as permitted under condition 2 above];
  - b) any conspicuous change in the colour or visual clarity;
  - c) any emission of objectionable odour;
  - d) the rendering of fresh water unsuitable for consumption by farm animals;
  - e) any significant adverse effects on aquatic life.
  
4. THAT this consent shall be exercised in a manner conforming with the relevant requirements of the 'New Plymouth District Council Colson Road Landfill: Landfill Management Plan 1994', or any subsequent version of that document which does not lessen environmental protection standards. The Management Plan shall be updated at not greater than yearly intervals, to the satisfaction of the General Manager, Taranaki Regional Council.
  
5. THAT the consent holder shall provide, maintain and comply with a monitoring programme, to the satisfaction of the General Manager, Taranaki Regional Council, setting out details of monitoring to be carried out and containing guidelines for the determination of whether contamination is occurring, the initial plan to be provided at least three months prior to the exercise of this consent.
  
6. THAT this consent shall lapse on the expiry of six years after the date of commencement of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(b) of the Resource Management Act 1991.

TRK994619

7. THAT pursuant to section 128(1)(a) of the Resource Management Act 1991, the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2006, June 2012, June 2018 and/or within six months of the first exercise of this consent, to deal with any significant adverse ecological effects on any ecosystems, including but not limited to, habitats, plants, animals, microflora and microfauna, arising from discharges licensed by this consent.

Signed at Stratford on 21 March 1999

For and on behalf of  
TARANAKI REGIONAL COUNCIL



---

GENERAL MANAGER

TRK994620



**DISCHARGE PERMIT**

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

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

Name of  
Consent Holder: **NEW PLYMOUTH DISTRICT COUNCIL  
PRIVATE BAG 2025 NEW PLYMOUTH**

Consent  
Granted Date: **21 March 1999**

**CONDITIONS OF CONSENT**

Consent Granted: **TO DISCHARGE UP TO 675 LITRES/SECOND OF  
UNCONTAMINATED STORMWATER FROM AREAS B1 B2 C1  
AND C2 OF THE COLSON ROAD LANDFILL INTO THE  
PUREMU STREAM A TRIBUTARY OF THE MANGAONE  
STREAM IN THE WAIWHAKAIHO CATCHMENT AT OR ABOUT  
GR: P19:074-372**

Expiry Date: **1 June 2025**

Review Date[s]: **June 2006, June 2012, June 2018 and/or within six months of the  
first exercise of this consent**

Site Location: **COLSON ROAD LANDFILL, COLSON ROAD, NEW PLYMOUTH**

Legal Description: **SEC 223 HUA DIST BLK VI PARITUTU SD**

Catchment: **WAIWHAKAIHO 392.000**

Tributary: **MANGAONE 392.010  
PUREMU 392.012**

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

TRK994620

**General conditions**

- a) That on receipt of a requirement from the General Manager, Taranaki Regional Council (hereinafter the General Manager), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
  - i) the administration, monitoring and supervision of this consent; and
  - ii) charges authorised by regulations.

**Special conditions**

- 1. THAT the water quality in the Manganaha Stream above its confluence with the Mangaone Stream shall not be changed as a result of this discharge.
- 2. THAT the water quality of uncontaminated stormwater discharged to the Puremu Stream shall meet the following criteria:

pH	6.5-8.5
suspended solids	maximum concentration of 100 gm <sup>-3</sup>
ammoniacal nitrogen	maximum concentration of 0.5 gm <sup>-3</sup> as nitrogen
- 3. THAT no leachate discharge shall be permitted by the exercise of this consent.
- 4. THAT all stormwater diversion and containment channels shall be designed, constructed and maintained so as to prevent or minimise erosion of the channel in all circumstances.
- 5. THAT the earthworks and construction associated with the landfill and the composting site and the stormwater diversion and containment channels shall be designed, constructed and maintained so as to minimise instability of the surrounding land.
- 6. THAT the consent holder shall repair and rehabilitate any land made unstable and any erosion occurring due to the construction or maintenance of the diversion channels or landfilling operations or composting site associated with the exercise of this consent.
- 7. THAT the consent holder shall notify the General Manager, Taranaki Regional Council, of any proposal which may alter or affect the areas contributing runoff insofar as may affect the exercise of this consent, other than as advised to the Taranaki Regional Council in the application for this consent, at least two months prior to commencing any such works. The consent holder shall obtain any necessary approvals under the Resource Management Act 1991 prior to commencing any such works.

TRK994620

8. THAT the discharge authorised by this consent, in conjunction with the exercise of any other consent associated with the landfill property, shall not give rise to any of the following effects in the Puremu Stream at the northern boundary of the site:
  - a) the production of conspicuous oil or grease films, scums or foams, or floatable or suspended materials [other than storm debris and suspended solids as permitted under condition 2 above];
  - 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, including but not limited to, freshwater fish, eels and watercress.
9. THAT there shall be no excavation or earthworks or other landfilling-related activities or composting activities in any area if any runoff of water containing suspended solids or any other contaminant arising from such activities might by reason of land topography or engineered works enter the Manganaha Stream, and in the event of any runoff water entering the Manganaha Stream contrary to this consent the consent holder shall immediately undertake such works as may be necessary to cease the discharge and to prevent a recurrence.
10. THAT this consent shall be exercised in a manner conforming with the relevant requirements of the 'New Plymouth District Council Colson Road Landfill: Landfill Management Plan July 1994', or any subsequent version of that document which does not lessen environmental protection standards. The Management Plan shall be updated at not greater than yearly intervals, to the satisfaction of the General Manager, Taranaki Regional Council.
11. THAT the consent holder shall provide, maintain and comply with a monitoring programme, to the satisfaction of the General Manager, Taranaki Regional Council, setting out details of monitoring to be carried out and containing guidelines for the determination of whether contamination is occurring, the initial plan to be provided at least three months prior to the exercise of this consent.
12. THAT this consent shall lapse on the expiry of six years after the date of commencement of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(b) of the Resource Management Act 1991.
13. THAT pursuant to section 128(1)(a) of the Resource Management Act 1991, the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2006, June 2012, June 2018 and/or within six months of the first exercise of this consent, for the purpose of reviewing the best practicable option or options available to reduce or remove any adverse effects on the environment, or to deal with any significant adverse ecological effects on any ecosystems, including but not limited to, habitats, plants, animals, microflora and microfauna, arising from discharges licensed by this consent.

Signed at Stratford on 21 March 1999

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

Change To                    19 January 2010    [Granted: 21 March 1999]  
Conditions Date:

**Conditions of Consent**

Consent Granted:           To discharge up to 500 tonnes/day of contaminants onto  
and into land in areas B1, C1 and C2 at the Colson Road  
landfill at or about (NZTM) 1697313E-5675450N

Expiry Date:                1 June 2025

Review Date(s):            June 2012, June 2018

Site Location:              Colson Road Landfill, Colson Road, New Plymouth

Legal Description:         Sec 223 Hua Dist Blk VI Paritutu SD

Catchment:                 Waiwhakaiho

Tributary:                  Puremu

### **General conditions**

- a) That 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) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
  - i) the administration, monitoring and supervision of this consent; and
  - ii) charges authorised by regulations.

### **Special conditions**

1. THAT the consent holder shall install and maintain to the satisfaction of the Chief Executive, Taranaki Regional Council, a further groundwater monitoring piezometer approximately equidistant between the bores designated as AH9 and L2, and shall maintain to the satisfaction of the Chief Executive, Taranaki Regional Council, groundwater monitoring piezometers and bores at the sites designated as WQA, WQB and WQC, as AH1, AH2, AH3, AH5, AH6, AH7, and as L1, L2, L5, L7 and L8. [Bore designations are those in Appendix A2, Figure 1, in the Assessment of Effects on the Environment prepared by Woodward-Clyde for New Plymouth District Council, July 1994].
2. THAT the consent holder shall prevent surface runoff of water or contaminants to the Manganaha Stream from any surface area being used or previously used for the deposition of refuse, or for extraction of soil, clay, or other cover material, or prepared for the deposition of refuse, unless such surface area has been covered and rehabilitated to the satisfaction of the Chief Executive, Taranaki Regional Council.
3. THAT prior to commencing any use of any part of Area B, C1 or C2 for the deposition of refuse or for composting activities, the consent holder shall demonstrate to the satisfaction of the Chief Executive, Taranaki Regional Council, that drainage channels, bunds, surface contouring, or other engineering and landscaping works associated with an Area or part of an Area have been undertaken and completed to the extent that compliance with condition 2 above will be achieved.

## Consent 4621-1

4. THAT the construction, installation, placement, integrity and performance of groundwater drainage systems, landfill lining systems, and leachate interception, collection, holding, recirculation, and discharge systems in any part of Areas B1, B2, C1 and C2 of the Colson Road Landfill as described in the 'Colson Road Landfill Assessment of Effects on the Environment' July 1994 and the 'New Plymouth District Council Colson Road Landfill Management Plan' July 1994 be certified by a registered engineer prior to any discharge of solid wastes in such part of those areas.
5. THAT should groundwater quality be significantly affected by activities or processes associated with the landfill or composting, then the consent holder shall implement such measures as are necessary to remedy or mitigate and if practicable to prevent the continuation of any effect upon quality of the groundwater. 'Significantly affected' for the purposes of this condition is defined as a change greater than the maximum natural variation in any parameter for water in any piezometer, bore, or spring, and the criteria for this shall be set out in the monitoring programme under condition 6.
6. THAT the consent holder shall provide, maintain and comply with a monitoring programme, to the satisfaction of the Chief Executive, Taranaki Regional Council, setting out details of monitoring to be carried out and containing guidelines for the determination of whether contamination is occurring, the initial plan to be provided at least three months prior to the exercise of this consent.
7. THAT the disposal of wastes shall be carried out in a manner conforming with the relevant requirements of the 'New Plymouth District Council Colson Road Landfill: Landfill Management Plan July 1994', or any subsequent version of that document which does not lessen environmental protection standards. The Management Plan shall be updated at not greater than yearly intervals, to the satisfaction of the Chief Executive, Taranaki Regional Council.
8. THAT the acceptance and disposal of waste types at the landfill for disposal shall conform to Section 2.5, Section 5.6 and Appendix E [or their equivalent] of the Landfill Management Plan referred to in condition 7 above, and in particular shall conform to the following:

Table 11.2 'Criteria for calculating landfill potentials' Hazardous Waste Management Handbook, Ministry for the Environment, 1994;

**and**

Chapter 5 of the 'Draft Health and Environmental Guidelines for Selected Timber Treatment Chemicals', Ministry for the Environment / Ministry of Health, September 1993, in compliance with the requirement for a Class 2 landfill.
9. THAT this consent shall lapse on the expiry of six years after the date of commencement of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(b) of the Resource Management Act 1991.

Consent 4621-1

10. THAT pursuant to section 128(1) of the Resource Management Act 1991, the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2006, June 2102, June 2018 and/or within six months of the first exercise of this consent, to deal with any significant adverse ecological effects on any ecosystems, including but not limited to, habitats, plants, animals, microflora and microfauna, arising from discharges licensed by this consent.

Signed at Stratford on 19 January 2010

For and on behalf of  
Taranaki Regional Council

---

**Director-Resource Management**

TRK994622



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: **21 March 1999**

## CONDITIONS OF CONSENT

Consent Granted: **TO DISCHARGE EMISSIONS INTO THE AIR FROM  
COMPOSTING AND ANCILLARY ACTIVITIES AT THE  
COLSON ROAD LANDFILL AT OR ABOUT GR: P19:074-372**

Expiry Date: **1 June 2025**

Review Date[s]: **June 2006, June 2012 and June 2018**

Site Location: **COLSON ROAD LANDFILL, COLSON ROAD, NEW PLYMOUTH**

Legal Description: **SEC 223 HUA DIST BLK VI PARITUTU SD**

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

TRK994622

### General conditions

- a) That on receipt of a requirement from the General Manager, Taranaki Regional Council (hereinafter the General Manager), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
  - i) the administration, monitoring and supervision of this consent; and
  - ii) charges authorised by regulations.

### Special conditions

1. THAT the consent holder shall at all times adopt the best practicable option to prevent or minimise any actual or likely adverse effect on the environment arising from emissions from the composting operation. 'Best practicable option' [as defined in section 2 of the Act] shall be determined by the Taranaki Regional Council, following review of the conditions of this consent as set out under condition 9 of this consent.
2. THAT the discharge of contaminants into the air from the composting operation shall not result in offensive or objectionable odours or dust or dangerous or noxious ambient concentrations of any airborne contaminant in the opinion of an enforcement officer of the Taranaki Regional Council, at or beyond the boundary of the site.
3. THAT the discharges authorised by this consent shall not give rise to any significant adverse ecological effects on any ecosystems, including but not limited to, habitats, plants, animals, microflora and microfauna.
4. THAT the nature of materials accepted for composting and the operation of the composting activities shall give effect to the 'Assessment of Discharges to Air' July 1994, prepared for the New Plymouth District Council by Woodward-Clyde [in particular, but not exclusively, section 2.2.2] and the New Plymouth District Council Colson Road Landfill Management Plan July 1994 [in particular, but not exclusively, section 5.9.6 and Figure 1 of Appendix A] or any subsequent version of that document which does not lessen environmental protection standards. The Management Plan shall be updated at not greater than yearly intervals, to the satisfaction of the General Manager, Taranaki Regional Council.
5. THAT any composting pile or windrow shall be located at least 300 metres from any dwellinghouse existing as of 21 March 1999.
6. THAT the maximum proportion of a composting windrow or pile comprising other than plant-derived material shall not exceed 5% by weight.
7. THAT the composting operation shall initially be undertaken on a trial basis. After at least six, but not more than nine, months of operation, the consent holder shall report to the Taranaki Regional Council on trial, noting particularly the results of operation and effects-based monitoring, and recording any complaints received about odour from composting. Upon receipt of that report, the Taranaki Regional Council may either approve the continuation of composting, or require a review of this consent pursuant to section 128(1)(a) of the Resource Management Act 1991.

TRK994622

8. THAT this consent shall lapse on the expiry of six years after the date of commencement of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(b) of the Resource Management Act 1991.
9. THAT pursuant to section 128(1)(a) of the Resource Management Act 1991, the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2006, June 2012, June 2018, for the purpose of reviewing the best practicable option or options available to reduce or remove any adverse effects on the environment, or to deal with any significant adverse ecological effects on any ecosystems, including but not limited to, habitats, plants, animals, microflora and microfauna, arising from discharges licensed by this consent.

Signed at Stratford on 21 March 1999

For and on behalf of  
TARANAKI REGIONAL COUNCIL



---

GENERAL MANAGER



TRK994779



**DISCHARGE PERMIT**

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

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

Name of  
Consent Holder: **NEW PLYMOUTH DISTRICT COUNCIL  
PRIVATE BAG 2025 NEW PLYMOUTH**

Consent  
Granted Date: **21 March 1999**

**CONDITIONS OF CONSENT**

Consent Granted: **TO DISCHARGE CONTAMINANTS INTO THE AIR FROM THE  
EXISTING LANDFILL [AREA A] AND PROPOSED LANDFILL  
EXTENSION IN AREAS A, B1, B2, C1 AND C2 OF THE  
COLSON ROAD MUNICIPAL LANDFILL SITE, NEW  
PLYMOUTH AT OR ABOUT GR: P19:074-372**

Expiry Date: **1 June 2025**

Review Date[s]: **June 2001, June 2003, June 2006, June 2012, June 2018 and/or  
within six months of the first exercise of this consent**

Site Location: **COLSON ROAD LANDFILL EXTENSION, COLSON ROAD,  
NEW PLYMOUTH**

Legal Description: **SEC 223 HUA DIST BLK VI PARITUTU SD**

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

TRK994779

**General conditions**

- a) That on receipt of a requirement from the General Manager, Taranaki Regional Council (hereinafter the General Manager), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
  - i) the administration, monitoring and supervision of this consent; and
  - ii) charges authorised by regulations.

**Special conditions**

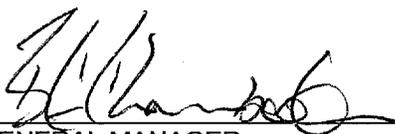
- 1. THAT the consent holder shall at all times adopt the best practicable option to prevent or minimise any actual or likely adverse effect on the environment arising from emissions from the landfill operation. 'Best practicable option' [as defined in section 2 of the Act] shall be determined by the Taranaki Regional Council, following review of the conditions of this consent as set out under conditions 10 and 11 of this consent and having regard to the requirements of condition 6 of this consent.
- 2. THAT 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.
- 3. THAT no material is to be burnt at the landfill site.
- 4. THAT 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.
- 5. THAT no extraction venting of untreated landfill gases be located closer than 200 metres to any boundary of the landfill property site.
- 6. THAT the operation of the landfill shall give effect to the 'Air Discharge Consent Application Supporting Documentation' July 1995, prepared for the New Plymouth District Council by Woodward Clyde, and the New Plymouth District Council Colson Road Landfill Management Plan July 1994 or any subsequent version of that document which does not lessen the standard of environmental protection afforded by that document. The management plan shall be updated at not greater than yearly intervals, to the satisfaction of the General Manager, Taranaki Regional Council.
- 7. THAT prior to undertaking any alteration to the site or site operations other than as specified and discussed in the application and supporting documentation lodged with the Taranaki Regional Council for this consent, which may significantly alter the nature or quantities of contaminants discharged from the site into the air, the consent holder shall consult with the General Manager, Taranaki Regional Council, and shall obtain any necessary approvals under the Resource Management Act 1991.

TRK994779

8. THAT the consent holder and staff of the Taranaki Regional Council shall meet as appropriate, and at least once per year, with the submitters to the consent, and any other interested party at the discretion of the General Manager, Taranaki Regional Council, to discuss any matter relating to the exercise of this consent, and in order to facilitate ongoing consultation.
9. THAT the consent holder shall, within one year of the commencement of this consent, provide a report on the feasibility of collecting, extracting, venting, or combusting of landfill gas at the Colson Road landfill, to the satisfaction of the General Manager, Taranaki Regional Council.
10. THAT pursuant to section 128(1)(a) of the Resource Management Act 1991, the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2006, June 2012, June 2018 and/or within six months of the first exercise of this consent, for the purpose of reviewing the best practicable option or options available to reduce or remove any adverse effects on the environment, or to deal with any significant adverse ecological effects on any ecosystems, including but not limited to, habitats, plants, animals, microflora and microfauna, arising from discharges licensed by this consent.
11. THAT in addition to the review provisions of condition 10 above, pursuant to section 128(1)(a) of the Resource Management Act 1991 the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review within six months of receipt of the report required by condition 9, and/or during June 2001, June 2003, June 2006, June 2012 and/or June 2018, for the purpose of considering the options of collecting, extracting, venting or combusting landfill gas.

Signed at Stratford on 21 March 1999

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**

CHIEF EXECUTIVE  
PRIVATE BAG 713  
47 CLOTEN ROAD  
STRATFORD  
NEW ZEALAND  
PHONE 06-765 7127  
FAX 06-765 5097

Please quote our file number  
on all correspondence

Name of  
Consent Holder: New Plymouth District Council  
Private Bag 2025  
NEW PLYMOUTH

Consent Granted  
Date: 11 June 2003

**Conditions of Consent**

Consent Granted: To discharge stormwater [due to earthworks in providing an area for Stage 3 of the municipal landfill] onto land and into the Puremu Stream a tributary of the Mangaone Stream in the Waiwhakaiho catchment at or about GR: P19:074-372

Expiry Date: 1 June 2020

Review Date(s): June 2004, June 2006, June 2008, June 2014

Site Location: Colson Road Landfill, Colson Road, New Plymouth

Legal Description: Sec 223 Hua Dist Blk VI Paritutu SD

Catchment: Waiwhakaiho

Tributary: Mangaone  
Puremu

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

## Consent 6177-1

### General conditions

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
  - i) the administration, monitoring and supervision of this consent; and
  - ii) charges authorised by regulations.

### Special conditions

1. The water quality of uncontaminated stormwater discharge to the Puremu Stream shall meet the following criteria:

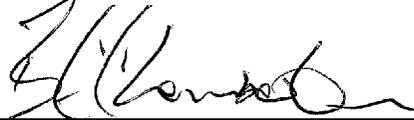
pH	6.5-8.5
suspended solids	maximum concentration of 100gm <sup>-3</sup>
ammoniacal nitrogen	maximum concentration of 0.5 gm <sup>-3</sup> as nitrogen
2. No leachate discharge shall be permitted by the exercise of this consent.
3. All stormwater diversion and channels shall be designed, constructed and maintained so as to prevent or minimise erosion of the channel in all circumstances.
4. Any discharge shall not alter to a conspicuous extent the natural colour or clarity of the receiving water in the Puremu Stream.
5. There shall be no significant adverse impact upon natural aquatic life downstream of the landfill as a result of the exercise of this permit.
6. Monitoring of surface waters on or in the vicinity of the site shall be undertaken to the satisfaction of the Chief Executive, Taranaki Regional Council.
7. The consent holder shall prepare and maintain a management plan and site contingency plan for the site and associated activities on the site, to the satisfaction of the Chief Executive, Taranaki Regional Council.
8. The consent holder shall prepare and maintain a site erosion and sediment control management plan for the site and associated activities on the site, to the satisfaction of the Chief Executive, Taranaki Regional Council.
9. The consent holder shall at all times adopt the best practicable option, as defined in the Resource Management Act 1991, to prevent or minimise any or likely adverse effects on the environment associated with the discharges of stormwater from the site, including but not limited to the collection, containment and removal from the site of any discharge of contaminated stormwater.
10. The consent holder shall repair and rehabilitate any land made unstable and any erosion occurring due to the construction or maintenance of the diversion channels.

Consent 6177-1

11. The consent holder shall maintain stormwater drains, sediment detention ponds, and ground contours at the site, in order to minimise stormwater movement across, or ponding on the site, to the satisfaction of the Chief Executive, Taranaki Regional Council.
12. After allowing for reasonable mixing the consent holder shall ensure that the discharge shall not give rise to any of the following effects in the receiving waters of the Puremu 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.
  - f) an increase in the temperature of the Puremu Stream by more than 2.0 degrees Celsius.
13. 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 2004 and/or June 2006 and/or 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 11 June 2003

For and on behalf of  
Taranaki Regional Council



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**Chief Executive**



## **Appendix II**

### **Biomonitoring reports for Colson Road landfill**



To Job Manager, Lorraine Smith  
From Scientific Officer, Darin Sutherland  
Report No DS029  
Document No 1555505  
Date August 2015

## **Biomonitoring of the Puremu and Manganaha Streams in relation to the New Plymouth District Council Colson Road landfill, February 2015**

### **Introduction**

New Plymouth District Council holds resource consents to authorise discharges to land and to water in relation to the operations of the Colson Road Landfill, in New Plymouth. The resource consents most relevant to this biological survey are summarised in Table 1 below.

**Table 1** Summary of discharge consents held by NPDC which are of most relevance to this biological survey.

Consent	Purpose
2370	To discharge leachate to groundwater and into the Puremu Stream
4619	To discharge stormwater and leachate to land and into the Puremu Stream
4620	To discharge stormwater into Puremu Stream
4621	To discharge contaminants into land

The Colson Road land fill site has been opened up, filled and capped off progressively in stages since it was established (Figure 1). Stages 1 and 2 of the landfill site have been completed and, at present the landfill is operating in the stage 3 area of the site. A section of the site is also dedicated to the management of composting waste.

Leachate from stages two and three is collected and directed to the New Plymouth Municipal Wastewater Treatment Plant. Leachate from stage one and stormwater from these areas including the access road are directed towards the Puremu Stream which flows through the landfill site. Stormwater from the compost area and from clean areas surrounding the stage 3 area of the site is directed to a large 'stormwater pond' which then discharges into an unnamed tributary of the Puremu Stream. There may also be some stormwater runoff and groundwater seepage from the landfill towards the Manganaha Stream which runs along the north-eastern boundary of the land fill.

Biological surveys have been undertaken on the Puremu Stream since 1986, to assess potential adverse effects of leachate from the landfill on the macroinvertebrate communities of the stream. Further to this, biological monitoring has been undertaken on the Manganaha Stream since 1994 to assess the effects of seepage from the landfill site on the macroinvertebrate communities in the stream.

Results of freshwater biological surveys performed in relation to the Colson Road landfill since the 2000-2001 monitoring year are discussed in numerous biomonitoring reports listed in the references.

## Methods

This survey was undertaken on 19 February 2015 at two established sampling sites in the Puremu Stream catchment and at two established sites in the Manganaha Stream (Figure 1 and Table 2). A third site located in an unnamed tributary of the Puremu Stream (PT1), which was routinely monitored in previous surveys, had been significantly modified by instream activities prior to the spring 2012 survey, and as a result, a new site was established 50m upstream. This is the sixth survey undertaken at this site.

Site 1, the 'control' site, was located on the Puremu Stream upstream of the landfill site and site M6. Site 2 was also located on this stream, but downstream of stage one and two areas. PT1 is located downstream of the large 'stormwater pond' discussed above. Site M4 was located on the Manganaha Stream downstream of an unnamed tributary which drains from the eastern side of the landfill site and site M6 is situated approximately 500 metres downstream of M4.

The standard '400 ml sweep-sampling' technique was used to collect macroinvertebrates from sites 1 and PT1. The 'sweep-sampling' technique is very similar to Protocol C2 (semi-quantitative methods for soft-bottomed streams) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark *et al*, 2001). The standard '400 ml kick-sampling' technique was used to collect streambed macroinvertebrates from sites 2 and M4. 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). A combination of the 'sweep-sampling' and 'kick-sampling' techniques was used to collect streambed macroinvertebrates from site M6.

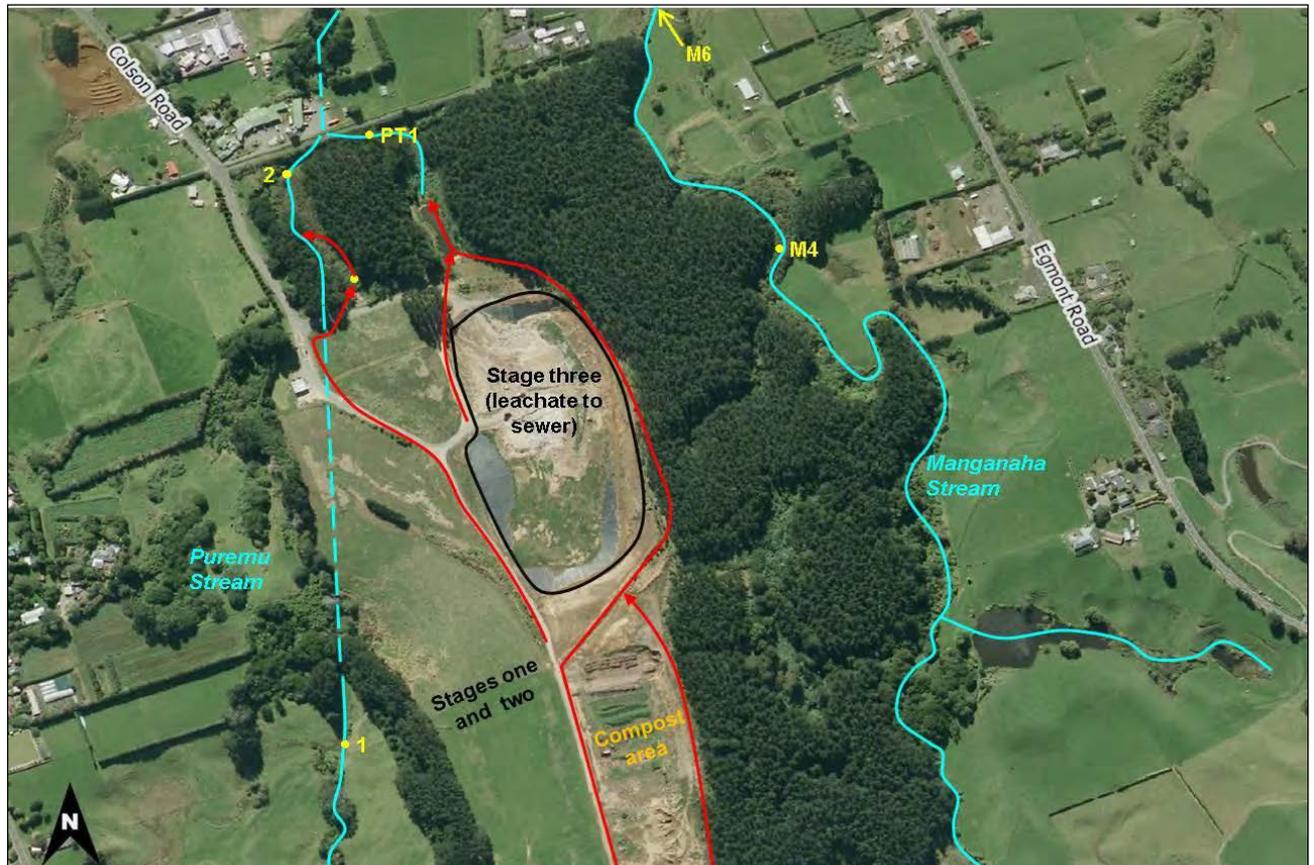
**Table 2** Biomonitoring sites in the Puremu and Manganaha Streams related to the Colson Road Landfill.

Stream	Site No.	Site Code	Location	Sampling method
Puremu Stream	1	PMU000104	Upstream of the landfill	Sweep sampling
	2	PMU000110	400 metres downstream landfill	Kick sampling
Unnamed tributary of Puremu Stream	PT1	PMU000108	60 metres upstream of the confluence with Puremu Stream	Sweep sampling
Manganaha Stream	M4	MNH000190	10 metres downstream of an unnamed tributary of the Manganaha Stream	Kick sampling
	M6	MNH000260	500 downstream of site M4	Sweep-kick sampling

Samples were preserved with Kahle's Fluid for later sorting and identification under a stereomicroscope according to Taranaki Regional Council methodology using protocol P1 of NZMWG protocols for sampling macroinvertebrates in wadeable streams (Stark *et al*. 2001).

Macroinvertebrate taxa found in each sample were recorded as:

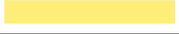
R (rare)	= less than 5 individuals;
C (common)	= 5-19 individuals;
A (abundant)	= estimated 20-99 individuals;
VA (very abundant)	= estimated 100-499 individuals;
XA (extremely abundant)	= estimated 500 individuals or more.



**Figure 1** Biomonitoring sites related to the Colson Road landfill, New Plymouth. The red lines on the aerial photograph indicate the direction of stormwater runoff from the land fill site.

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams. Highly 'sensitive' taxa were assigned the highest scores of 9 or 10, while the most 'tolerant' forms scored 1. Sensitivity scores for certain taxa have been modified in accordance with Taranaki experience. Averaging the scores from a list of taxa taken from one site and multiplying by a scaling factor of 20 produces a Macroinvertebrate Community Index (MCI) value. A difference of 11 units or more in MCI values is considered significantly different (Stark 1998).

A gradation of biological water quality conditions based upon MCI ranges has been adapted for Taranaki streams and rivers (TRC, 2015) from Stark's classification (Stark, 1985). This is as follows:

Grading	MCI	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<sub>s</sub>) 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<sub>s</sub> is not multiplied by a scaling factor of 20, so that its corresponding range of values is 20x lower.

Where necessary, 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.

## Results

### Site habitat characteristics and hydrology

This February 2015 survey followed a period of 16 days since a fresh in excess of three times median flow, and 71 days since a fresh in excess of seven times median flow. In the month prior to this survey there had been only the one fresh event.

Water temperatures ranged from 15.5°C to 18.1°C in Puremu Stream and its tributary. Water levels were very low and flows slow. Water was uncoloured and clear at site 1, grey and cloudy at site 2 and brown and cloudy at site PT1. There were no periphyton mats, filamentous algae or moss at any of the Puremu Stream sites. Site 1 had no leaves and wood but macrophytes were present on the streambed. Site 2 had patchy leaves and wood but no macrophytes were present and site PT1 had patchy leaves and wood and no macrophytes present. The substrate at sites 1 and 2 were entirely composed of silt and site PT1 had a mostly silt substrate with some wood/root.

Site 1 had no shading, site 2 had complete shading from overhanging vegetation and site PT1 had partial shading from steep sided banks. No unusual bacterial, fungal or protozoan growths were found by microscopic examination of the samples for 'heterotrophic growths' at any of the Puremu Stream sites in this survey.

Water temperatures ranged from 15.6°C to 16.3°C in the unnamed tributary of the Manganaha Stream. Water levels were low at both sites and flow slow at site M4 and steady at site M6. Water was grey and cloudy at both sites. There were no periphyton mats and filamentous algae at both sites in the unnamed tributary of the Manganaha Stream. Site M4 had no moss, patchy leaves, patchy wood and no macrophytes on the streambed. Site M6 had widespread moss, patchy leaves and wood and no macrophytes on the streambed. The substrate at site M4 was comprised of silt while at site M6 the substrate composition was predominately hard clay. Site M4 had shading from overhanging vegetation while site M6 had partial shading. No unusual bacterial, fungal or protozoan growths were found by microscopic examination of the samples for 'heterotrophic growths' at any of the unnamed tributary of the Manganaha Stream sites in this survey.

### Macroinvertebrate communities

A summary of the results of previous macroinvertebrate surveys performed at the sites used in the current survey is presented in Table 3, together with current results.

**Table 3** Numbers of taxa and MCI values recorded in previous surveys performed at sites in the Puremu and Manganaha Streams and a tributary of the Puremu Stream in relation to the Colson Road landfill since July 1986, together with current results.

Site No.	Number of taxa				MCI values			SQMCI <sub>s</sub> values			
	No. samples	Range	Median	Current survey	Range	Median	Current Survey	No. of samples	Range	Median	Current survey
1	44	8-27	18	14	60-90	74	80	30	1.4-5.0	3.6	4.1
2	56	7-24	17	11	51-87	73	67	30	1.2-3.9	3.1	2.1
PT1*	29	11-22	16	13	55-79	71	72	28	1.2-3.7	2.6	2.0
M4	39	11-25	19	22	76-104	88	95	30	2.3-6.9	4.9	4.1
M6	33	12-27	19	25	58-100	84	92	30	2.8-6.8	4.1	5.8

\* Summary statistics given for PT1 combine data for sites PMU000108 and PMU000109.

## Puremu Stream

The current results for the Puremu Stream and the unnamed tributary of the Puremu Stream are presented in Table 4 below.

**Table 4** Macroinvertebrate fauna of the Puremu Stream (sites 1 & 2) and tributary (site PT1) in relation to the Colson Road landfill sampled on 19 February 2015.

Taxa List	Site Number	MCI score	1	2	PT1
	Site Code		PMU000104	PMU000110	PMU000108
	Sample Number		FWB15163	FWB15165	FWB15164
PLATYHELMINTHES (FLATWORMS)	<i>Cura</i>	3	C	R	R
NEMERTEA	Nemertea	3	-	R	C
NEMATODA	Nematoda	3	-	-	R
ANNELIDA (WORMS)	Oligochaeta	1	VA	A	C
HIRUDINEA (LEECHES)	Hirudinea	3	-	R	C
MOLLUSCA	<i>Potamopyrgus</i>	4	VA	C	R
	Sphaeriidae	3	R	R	-
CRUSTACEA	Ostracoda	1	VA	A	VA
	<i>Paracalliope</i>	5	XA	R	C
COLEOPTERA (BEETLES)	Hydrophilidae	5	R	-	-
TRICHOPTERA (CADDISFLIES)	<i>Polypectropus</i>	6	VA	R	-
	<i>Psilochorema</i>	6	R	-	-
	<i>Tripletides</i>	5	C	R	-
DIPTERA (TRUE FLIES)	<i>Zelandotipula</i>	6	-	-	R
	<i>Polypedilum</i>	3	-	A	-
	Tanypodinae	5	A	-	C
	Tanytarsini	3	R	-	-
	Ceratopogonidae	3	-	-	R
ACARINA (MITES)	<i>Paradixa</i>	4	R	-	-
	Stratiomyidae	5	-	-	R
	Acarina	5	R	-	A
No of taxa			14	11	13
MCI			80	67	72
SQMCI <sub>s</sub>			4.1	2.1	2.0
EPT (taxa)			3	2	0
%EPT (taxa)			21	18	0
'Tolerant' taxa		'Moderately sensitive' taxa		'Highly sensitive' taxa	

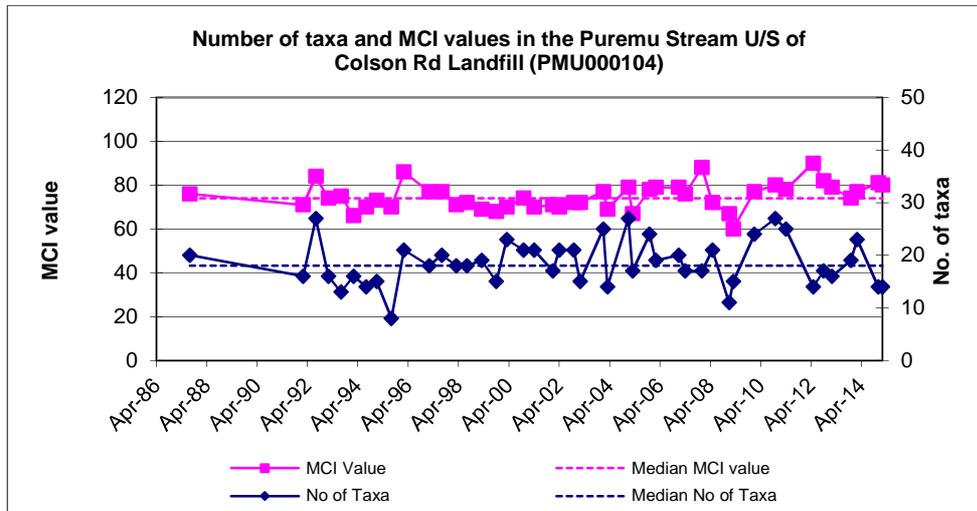
R = Rare    C = Common    A = Abundant    VA = Very Abundant    XA = Extremely Abundant

### Site 1 (PMU000104)

A moderately low taxa richness of 14 taxa was found at site 1 ('control' site) at the time of the survey which was four less than the median number recorded for the site (median taxa richness 18; Table 3) and the same number as recorded in the previous sample (taxa richness 14; Figure 2).

The MCI score of 80 units indicated a community of 'fair' biological health which was not significantly different (Stark, 1998) to the median value recorded for the site (median MCI score 74 units; Table 3) or from the previous survey score (MCI score 81 units; Figure 2). The

SQMCI<sub>s</sub> score of 4.1 units was similar to the median value recorded at the site (median SQMCI<sub>s</sub> score 3.6 units; Table 3) and to the previous survey (SQMCI<sub>s</sub> score 3.2 units).



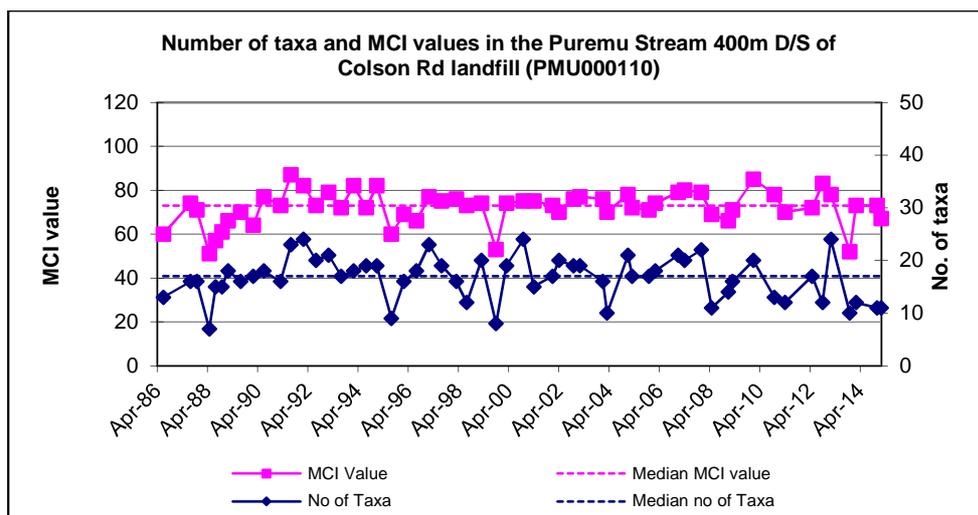
**Figure 2** Number of macroinvertebrate taxa and MCI values recorded at site 1 in the Puremu Stream, upstream of Colson Road Landfill since April 1987.

The community was characterised by three ‘tolerant’ taxa [oligochaete worms, snail (*Potamopyrgus*) and ostracod seed shrimp] and three ‘moderately sensitive’ taxa [amphipod (*Paracalliope*), caddisfly (*Polyplectropus*) and tanypod midges] (Table 4).

### Site 2 (PMU000110)

A low taxa richness of 11 taxa was found at site 2 at the time of the survey which was six less than the median number recorded for the site (median taxa richness 17; Table 3) and the same as the previous sample (taxa richness 11; Figure 3).

The MCI score of 67 units indicated a community of ‘poor’ biological health which was not significantly different (Stark, 1998) to the median value recorded for the site (median MCI score 73 units; Table 3) and to the previous survey score (MCI score 73 units; Figure 3). The SQMCI<sub>s</sub> score of 2.1 units was lower than the median value recorded at the site (median SQMCI<sub>s</sub> score 3.1 units; Table 3) and to that of the previous survey (SQMCI<sub>s</sub> score 3.3 units).



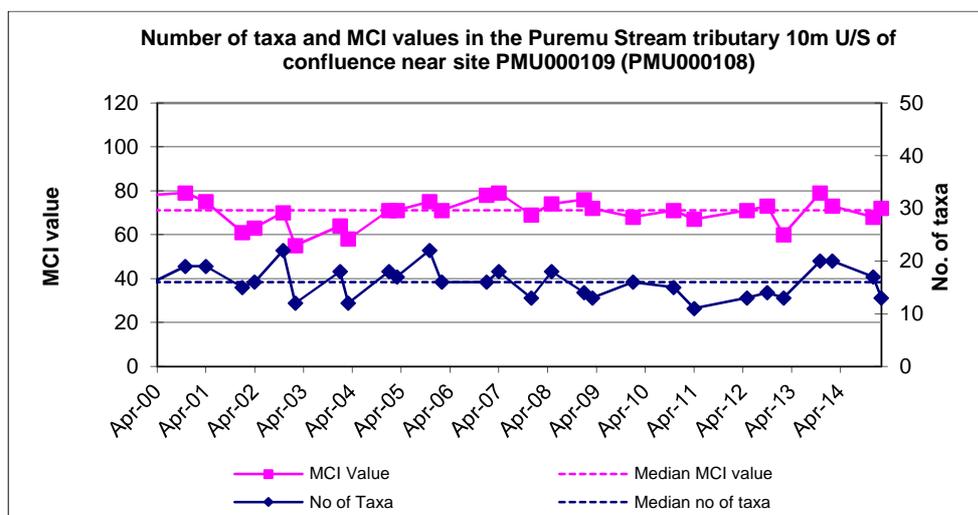
**Figure 3** Taxa numbers and MCI values recorded at site 2, 400 m downstream of Colson Rd Landfill.

The community was characterised by three 'tolerant' taxa [oligochaete worms, ostracod seed shrimp and midge (*Polypedilum*)] (Table 4).

### Site PT1 (PMU000108)

A low taxa richness of 13 taxa was found at site PT1 at the time of the survey which was three less than the median number recorded for the site (median taxa richness 16; Table 3) and four taxa less than the previous sample (taxa richness 17; Figure 4).

The MCI score of 72 units indicated a community of 'poor' biological health which was not significantly different (Stark, 1998) to the median value recorded for the site (median MCI score 71 units; Table 3) and the previous survey score (MCI score 68 units; Figure 4). The SQMCI<sub>s</sub> score of 2.0 units was slightly lower than the median value recorded at the site (median SQMCI<sub>s</sub> score 2.6 units; Table 3) and the same as the previous survey (SQMCI<sub>s</sub> score 2.0 units).



**Figure 4** Numbers of taxa and MCI values recorded to date at site PT1, downstream of Colson Road Landfill.

The community was characterised by one 'tolerant' taxon (ostracod seed shrimp) and one

'moderately sensitive' taxon (Acarina mites) (Table 4).

## Manganaha Stream

The results for the current survey of the Manganaha Stream are presented in Table 5 below.

**Table 5** Macroinvertebrate fauna of the Manganaha Stream in relation to the Colson Road landfill sampled on 19 February 2015.

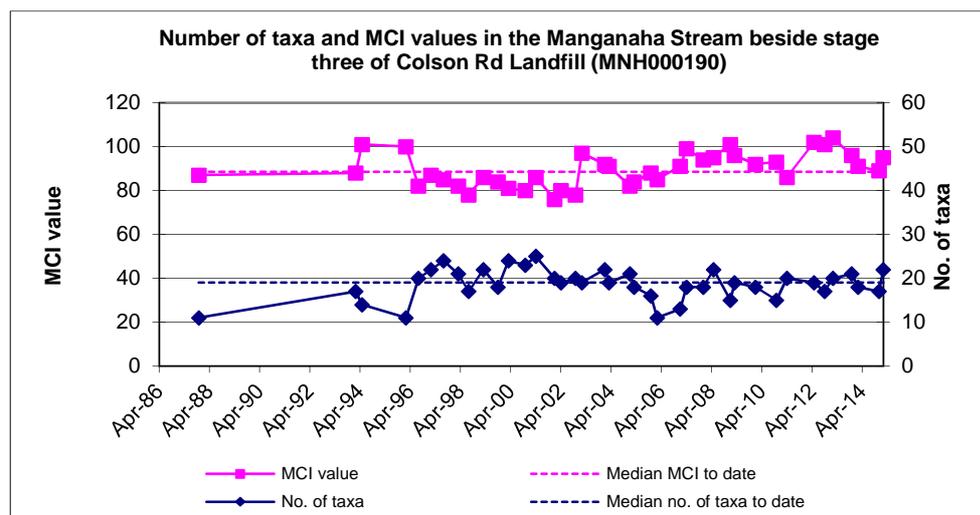
Taxa List	Site Number	MCI score	M4	M6
	Site Code		MNH000190	MNH000260
	Sample Number		FWB15166	FWB15167
NEMERTEA	Nemertea	3	R	R
NEMATODA	Nematoda	3	R	-
ANNELIDA (WORMS)	Oligochaeta	1	A	A
	Lumbricidae	5	-	R
HIRUDINEA (LEECHES)	Hirudinea	3	-	R
MOLLUSCA	Lymnaeidae	3	-	R
	<i>Potamopyrgus</i>	4	VA	C
	Sphaeriidae	3	C	-
CRUSTACEA	Ostracoda	1	R	R
	Isopoda	5	-	R
	<i>Paracalliope</i>	5	A	XA
EPHEMEROPTERA (MAYFLIES)	<i>Austroclima</i>	7	R	XA
	<i>Coloburiscus</i>	7	C	A
	<i>Zephlebia group</i>	7	C	R
ODONATA (DRAGONFLIES)	<i>Antipodochlora</i>	5	R	-
	<i>Procordulia</i>	5	R	-
COLEOPTERA (BEETLES)	Hydrophilidae	5	-	R
	Ptilodactylidae	8	R	R
MEGALOPTERA (DOBSONFLIES)	<i>Archichauliodes</i>	7	R	-
TRICHOPTERA (CADDISFLIES)	Ecnomidae/Psychomyiidae	6	R	R
	<i>Hydrobiosis</i>	5	-	C
	<i>Hydropsyche (Orthopsyche)</i>	9	-	R
	<i>Psilochorema</i>	6	-	R
	Oeconesidae	5	R	-
DIPTERA (TRUE FLIES)	<i>Triplectides</i>	5	A	A
	<i>Harrisius</i>	6	R	-
	Orthoclaadiinae	2	-	C
	<i>Polypedilum</i>	3	R	R
	Tanypodinae	5	R	-
	<i>Paradixa</i>	4	-	C
	Empididae	3	-	R
	<i>Austrosimulium</i>	3	R	C
ACARINA (MITES)	Acarina	5	R	R
No of taxa			22	25
MCI			95	92
SQMCIs			4.1	5.8
EPT (taxa)			6	8
%EPT (taxa)			27	32
'Tolerant' taxa		'Moderately sensitive' taxa	'Highly sensitive' taxa	

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

### Site M4 (MNH000190)

A moderate taxa richness of 22 taxa was found at site M4 at the time of the survey which was three more than the median number recorded for the site (median taxa richness 19; Table 3) and five more than the previous sample (taxa richness 17; Figure 3).

The MCI score of 95 units indicated a community of ‘fair’ biological health which was not significantly different (Stark, 1998) to the median value recorded for the site (median MCI score 88 units; Table 3) and to the previous survey score (MCI score 89 units; Figure 3). The SQMCI<sub>s</sub> score of 4.1 units was similar to the median value recorded at the site (median SQMCI<sub>s</sub> score 4.9 units; Table 3) but was markedly lower than the previous survey (SQMCI<sub>s</sub> score 5.8 units).



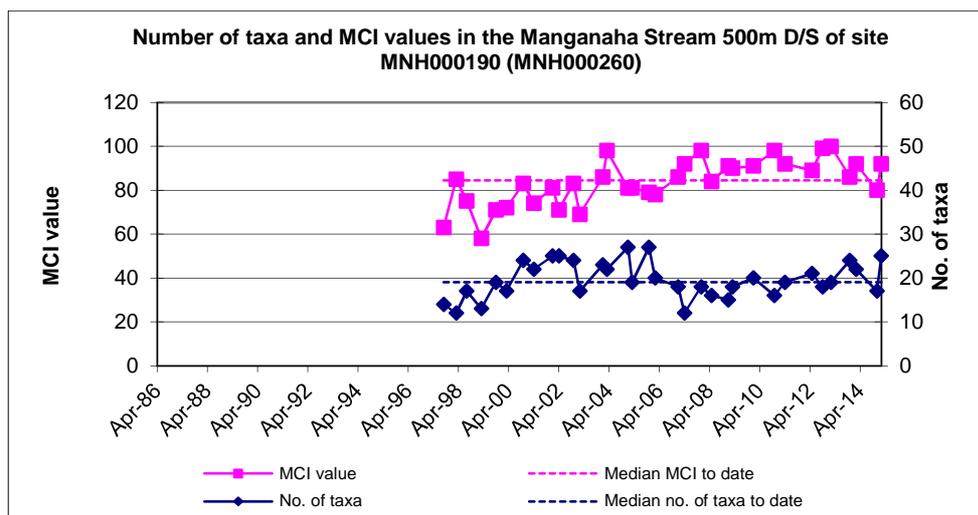
**Figure 5** Taxa numbers and MCI values recorded at site M4, in the Manganaha Stream adjacent to Colson Road landfill.

The community was characterised by two ‘tolerant’ taxa [oligochaete worms and snail (*Potamopyrgus*)] and two ‘moderately sensitive’ taxa [amphipod (*Paracalliope*) and caddisfly (*Tripletides*)] (Table 4).

### Site M6 (MNH000260)

A moderate taxa richness of 25 taxa was found at site M6 at the time of the survey which was six more than the median number recorded for the site (median taxa richness 19; Table 3) and eight more than the previous sample (taxa richness 17; Figure 3).

The MCI score of 92 units indicated a community of ‘fair’ biological health which was not significantly different (Stark, 1998) to the median value recorded for the site (median MCI score 84 units; Table 3) and was significantly (Stark, 1998) more than the previous survey score (MCI score 80 units; Figure 3). The SQMCI<sub>s</sub> score of 5.8 units was markedly higher than the median value recorded at the site (median SQMCI<sub>s</sub> score 4.1 units; Table 3) and that of the previous survey (SQMCI<sub>s</sub> score 4.1 units).



**Figure 6** Taxa numbers and MCI values recorded at site M6, in the Manganaha Stream downstream of Colson Road landfill.

The community was characterised by one ‘tolerant’ taxon (oligochaete worms) and four ‘moderately sensitive’ taxa [amphipod (*Paracalliope*), mayflies (*Austroclima* and *Coloburiscus*) and caddisfly (*Triplectides*)] (Table 4).

## Discussion

Landfills may have a variety of contaminants leaching from them (e.g. nutrients and metals). A decrease in taxa richness is usually associated with toxic impacts. Taxa richnesses for the four ‘potentially impacted’ sites were either higher or similar to site 1 ‘the control’ site and therefore there is no evidence for leachate causing toxic effects in the macroinvertebrate communities downstream of the Colson Road landfill.

No undesirable biological growths were detected at any sites during this February 2015 survey indicating that there were not high levels of organic enrichment entering the streams surveyed.

The Puremu Stream sites including the ‘control’ site usually have ‘poor’ macroinvertebrate health which would be due to the available habitat within the stream. At the time of the current survey there was found to be a significant decrease in macroinvertebrate community health from site 1 ‘control site’ to site 2. There was a significant difference (Stark, 1998) in MCI scores and a marked difference in SQMCI<sub>s</sub> scores between the two sites. The Puremu Stream at site 1 was open and the bed was dominated by macrophytes, whereas the stream at site 2 was shaded, with the silted bed covered significantly in a mixture of iron oxide accumulations, leaf and wooded debris. Overall, the differences in MCI and SQMCI<sub>s</sub> scores between site 1 and site 2 reflect higher than usual macroinvertebrate health at site 1 than deterioration at site 2. Site PT1 had an insignificantly lower (Stark, 1998) MCI score and markedly lower SQMCI<sub>s</sub> score than site 1. There was also an insignificant difference in MCI scores compared with the median value from previous surveys at the site indicating that landfill leachate was not having a significant effect on site PT1 since the previous survey.

Both sites on the Manganaha Stream (M4 and M6) had macroinvertebrate communities of ‘fair’ health. No ‘control’ site existed on the Manganaha Stream but comparisons with the

nearby Puremu Stream 'control' site indicated that the Manganaha Stream sites were significantly healthier than the control site suggesting no impacts from the Colson Rd landfill. There was an insignificant difference (Stark, 1998) in MCI scores between sites M4 and M6 and a marked improvement in SQMCI<sub>5</sub> score at site M6 compared with site M4. Site M6 had abundant 'sensitive' mayflies (*Austroclima* and *Coloburiscus*) which contributed to the high SQMCI<sub>5</sub> score. This result indicates that Colson Rd leachate was not affecting macroinvertebrates in the Manganaha Stream.

## Summary

The standard 'kick-sampling' technique was used at sites 2 and M4, the 'sweep-sampling' technique was used at sites 1 and Pt1 and a combination of both techniques were used at site M6 to collect streambed macroinvertebrates from the Puremu and Manganaha Streams on 19 February 2015. Samples were sorted and identified to provide number of taxa (richness), MCI and SQMCI<sub>5</sub> 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<sub>5</sub> takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities, particularly if non-organic impacts are occurring. Significant differences in either the MCI or the SQMCI<sub>5</sub> between sites indicate the degree of adverse effects (if any) of the discharges being monitored.

No undesirable biological growths were detected at any sites during this February 2015 survey indicating that there were not high levels of organic enrichment entering the streams surveyed.

This summer macroinvertebrate survey indicated that the discharge of treated stormwater and leachate discharged from the Colson Road landfill site had not had any detrimental effect on the macroinvertebrate communities of the Puremu and Manganaha Streams.

The Puremu Stream sites including the 'control' site usually have 'poor' macroinvertebrate health which would be due to the available habitat within the stream. There was a significant difference (Stark, 1998) in MCI scores and a marked difference in SQMCI<sub>5</sub> scores between sites 1 and 2. Site PT1 also had a markedly lower SQMCI<sub>5</sub> score than site 1. However, the differences in MCI and SQMCI<sub>5</sub> scores between site 1 and sites 2 and PT1 reflect more the improvement at site 1 ('fair' health as opposed to 'poor' health) than a deterioration at sites 2 and PT1.

Both sites on the Manganaha Stream (M4 and M6) had macroinvertebrate communities of 'fair' health. There was an insignificant difference (Stark, 1998) in MCI scores between sites M4 and M6 and a marked improvement in SQMCI<sub>5</sub> score at site M6 compared with site M4. This result indicates that Colson Rd leachate was not affecting macroinvertebrates in the Manganaha Stream.

Overall, the results of this survey were indicative of 'fair' biological health at site 1 in the Puremu Stream, and 'poor' biological health in the Puremu Stream at site 2 and in the unnamed tributary of the Puremu Stream at site PT1. The results in the Manganaha Stream

were indicative of fair biological health at both sites surveyed. The poor habitat conditions at the Puremu Stream and unnamed tributary of the Puremu Stream at the time of this survey were the most likely reason for the 'poor' health, rather than the effects of the discharges from the landfill. In summary, these results were not indicative of any significant adverse effects on either the Puremu Stream or the Manganaha Stream from the discharges from the Colson Road Landfill at the time of this survey.

## References

- Australian & New Zealand Environment & Conservation Council, Agriculture and Resource Management Council of Australia and New Zealand, 2000: Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Volumes 1 and 2. Environment Australia.
- Dunning KJ, 2002a: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, January 2002. TRC report KD94.
- Dunning KJ, 2002b: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, April 2002. TRC report KD125.
- Hope KJ, 2005: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, March 2005. TRC report KD033.
- Hope KJ, 2005: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, November 2005. TRC Report KH076.
- Fowles CR and Hope KJ, 2005: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, January 2005. TRC report CF383.
- Fowles CR and Moore SC, 2004: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, March 2004. TRC report CF333.
- Jansma B, 2006: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, February 2006. TRC report BJ008.
- Jansma B, 2007a: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, January 2007. TRC report BJ022.
- Jansma B, 2007b: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, April 2007. TRC report BJ023.
- Jansma B, 2008a: Biomonitoring of the Mangati Stream, in relation to the Bell Block industrial area, February 2008. TRC report BJ043.

Jansma B, 2008b: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, December 2007. TRC report BJ044.

Jansma B, 2008c: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, May 2008. TRC report BJ045.

Jansma B, 2009a: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, January 2009. TRC report BJ074.

Jansma B, 2009b: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, March 2009. TRC report BJ075.

Jansma B, 2010: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, January 2010. TRC report BJ126.

Jansma B, 2011: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, November 2010. TRC report BJ163.

Jansma B, 2011: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, April 2011. TRC report BJ164.

Jansma B and Smith K, 2013: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, October 2012. TRC report BJ205.

Jansma B and Smith K, 2013: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, February 2013. TRC report BJ206.

McWilliam H, 2000b: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, March 2000. TRC report HM211.

McWilliam H, 2001a: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, November 2000. TRC report HM241.

McWilliam H, 2001b: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, April 2001. TRC report HM252.

Moore S, 2003a: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, November 2002. TRC report SM573.

Moore S, 2003b: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, 17 February 2003. TRC report SM580.

- Moore S and Colgan BG, 2004: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, 6 January 2004. TRC report SM586.
- Smith K, 2012: Biomonitoring of the Puremu and Manganaha Streams in relation to the New Plymouth District Council Colson Road landfill, May 2012. TRC report KS009.
- Stark JD, 1985: A macroinvertebrate community index of water quality for stony streams. *Water and Soil* Miscellaneous Publication No. 87.
- Stark JD, 1998: SQMCI: a biotic index for freshwater macroinvertebrate coded abundance data. *New Zealand Journal of Marine and Freshwater Research* 32(1): 55-66.
- Stark JD, 1999: An evaluation of Taranaki Regional Council's SQMCI biomonitoring index. Cawthron Institute, Nelson. Cawthron Report No. 472.
- Stark JD, Boothroyd IKG, Harding JS, Maxted JR, Scarsbrook MR, 2001: Protocols for sampling macroinvertebrates in wadeable streams. New Zealand Macroinvertebrate Working Group Report No. 1. Prepared for the Ministry for the Environment. Sustainable Management Fund Project No. 5103. 57p.
- Stark JD and Maxted JR, 2004. Macroinvertebrate community indices for Auckland's soft-bottomed streams and applications to SOE reporting. Prepared for Auckland Regional Council. Cawthron Report No. 970. Cawthron Institute, Nelson. ARC Technical Publication 303. 59p.
- Stark JD and Maxted JR, 2007. A biotic index for New Zealand's soft bottomed streams. *New Zealand Journal of Marine and Freshwater Research* 41(1).
- Stark JD and Maxted JR, 2007a. A user guide for the macroinvertebrate community index. Cawthron Institute, Nelson. Cawthron Report No. 1166.
- Sutherland DL, 2015: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, December 2014. TRC report DS028.
- Taranaki Regional Council, 2000: New Plymouth District Council New Plymouth (Colson Road) Landfill Monitoring Programme Annual Report 1999-2000. Technical Report 2000-38.
- Taranaki Regional Council, 2015: Freshwater macroinvertebrate fauna biological monitoring programme annual state of the environment monitoring report 2013-14. TRC Technical Report 2014-20.
- Thomas B, 2014a: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, November 2013. TRC report BT025.
- Thomas B, 2014b: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, February 2014. TRC report BT026.



To Job Manager, Lorraine Smith  
From Scientific Officer, Darin Sutherland  
Report No DS028  
Document No 1552899  
Date August 2015

## **Biomonitoring of the Puremu and Manganaha Streams in relation to the New Plymouth District Council Colson Road landfill, December 2014**

### **Introduction**

New Plymouth District Council holds resource consents to authorise discharges to land and to water in relation to the operations of the Colson Road Landfill, in New Plymouth. The resource consents most relevant to this biological survey are summarised in Table 1 below.

**Table 1** Summary of discharge consents held by NPDC which are of most relevance to this biological survey.

Consent	Purpose
2370	To discharge leachate to groundwater and into the Puremu Stream
4619	To discharge stormwater and leachate to land and into the Puremu Stream
4620	To discharge stormwater into Puremu Stream
4621	To discharge contaminants into land

The Colson Road land fill site has been opened up, filled and capped off progressively in stages since it was established (Figure 1). Stages 1 and 2 of the landfill site have been completed and, at present the landfill is operating in the stage 3 area of the site. A section of the site is also dedicated to the management of composting waste.

Leachate from stages two and three is collected and directed to the New Plymouth Municipal Wastewater Treatment Plant. Leachate from stage one and stormwater from these areas including the access road are directed towards the Puremu Stream which flows through the landfill site. Stormwater from the compost area and from clean areas surrounding the stage 3 area of the site is directed to a large 'stormwater pond' which then discharges into an unnamed tributary of the Puremu Stream. There may also be some stormwater runoff and groundwater seepage from the landfill towards the Manganaha Stream which runs along the north-eastern boundary of the land fill.

Biological surveys have been undertaken on the Puremu Stream since 1986, to assess potential adverse effects of leachate from the landfill on the macroinvertebrate communities of the stream. Further to this, biological monitoring has been undertaken on the Manganaha Stream since 1994 to assess the effects of seepage from the landfill site on the macroinvertebrate communities in the stream.

Results of freshwater biological surveys performed in relation to the Colson Road landfill since the 2000-2001 monitoring year are discussed in numerous biomonitoring reports listed in the references.

## Methods

This survey was undertaken on 5 December 2014 at two established sampling sites in the Puremu Stream catchment and at two established sites in the Manganaha Stream (Figure 1 and Table 2). A third site located in an unnamed tributary of the Puremu Stream (PT1), which was routinely monitored in previous surveys, had been significantly modified by instream activities prior to the spring 2012 survey, and as a result, a new site was established 50m upstream. This is the fifth survey undertaken at this site.

Site 1, the 'control' site, was located on the Puremu Stream upstream of the landfill site and site M6. Site 2 was also located on this stream, but downstream of stage one and two areas. PT1 is located downstream of the large 'stormwater pond' discussed above. Site M4 was located on the Manganaha Stream downstream of an unnamed tributary which drains from the eastern side of the landfill site and site M6 is situated approximately 500 metres downstream of M4.

A combination of the 'sweep-sampling' and 'kick-sampling' techniques were used to collect streambed macroinvertebrates from sites 1 and M6. The standard '400 ml kick-sampling' technique was used to collect streambed macroinvertebrates from sites 2, PT1 and M4. 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). The 'sweep-sampling' technique is very similar to Protocol C2 (semi-quantitative methods for soft-bottomed streams) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark *et al*, 2001).

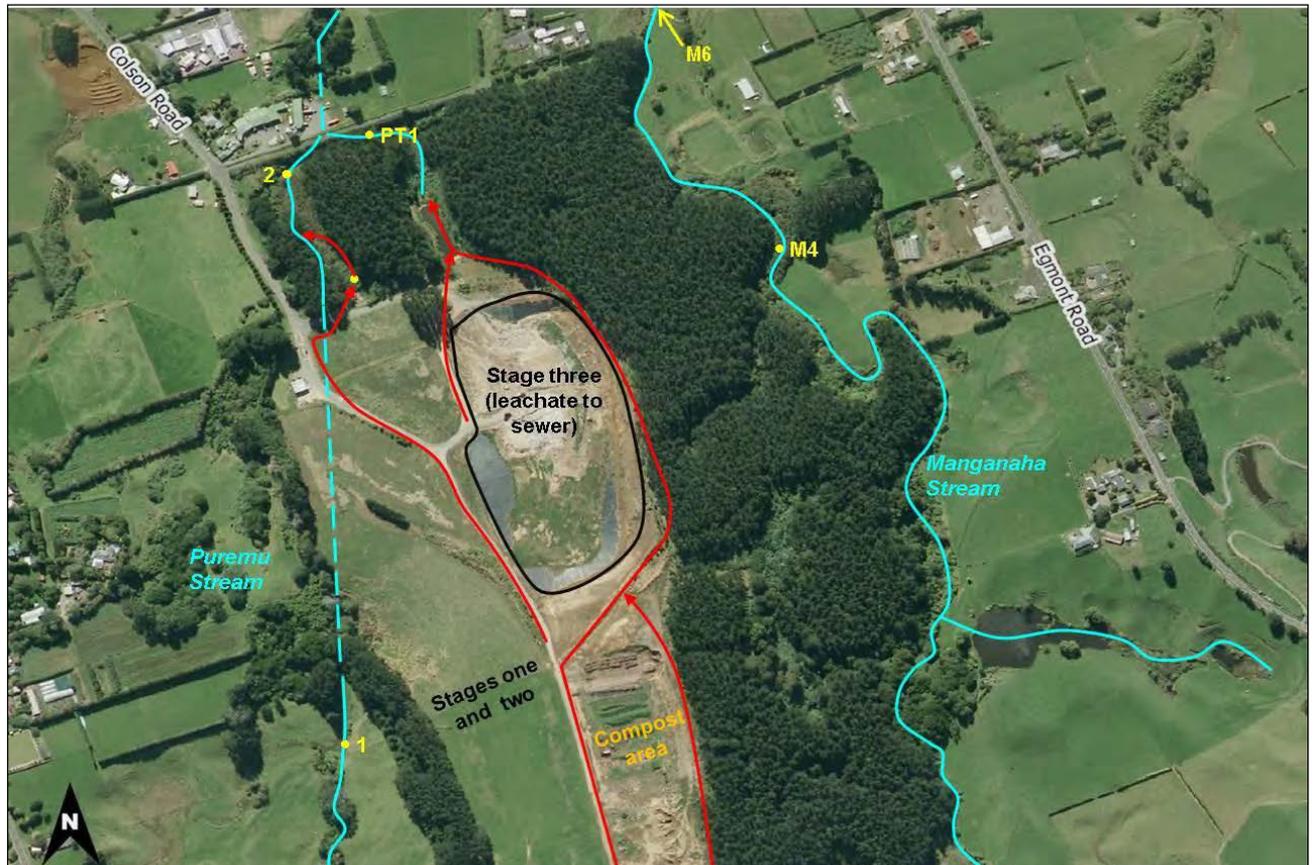
**Table 2** Biomonitoring sites in the Puremu and Manganaha Streams related to the Colson Road Landfill.

Stream	Site No.	Site Code	Location	Sampling method
Puremu Stream	1	PMU000104	Upstream of the landfill	Sweep-kick sampling
	2	PMU000110	400 metres downstream landfill	Kick sampling
Unnamed tributary of Puremu Stream	PT1	PMU000108	60 metres upstream of the confluence with Puremu Stream	Kick sampling
Manganaha Stream	M4	MNH000190	10 metres downstream of an unnamed tributary of the Manganaha Stream	Kick sampling
	M6	MNH000260	500 downstream of site M4	Sweep-kick sampling

Samples were preserved with Kahle's Fluid for later sorting and identification under a stereomicroscope according to Taranaki Regional Council methodology using protocol P1 of NZMWG protocols for sampling macroinvertebrates in wadeable streams (Stark *et al*. 2001).

Macroinvertebrate taxa found in each sample were recorded as:

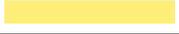
R (rare)	= less than 5 individuals;
C (common)	= 5-19 individuals;
A (abundant)	= estimated 20-99 individuals;
VA (very abundant)	= estimated 100-499 individuals;
XA (extremely abundant)	= estimated 500 individuals or more.



**Figure 1** Biomonitoring sites related to the Colson Road landfill, New Plymouth. The red lines on the aerial photograph indicate the direction of stormwater runoff from the land fill site.

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams. Highly 'sensitive' taxa were assigned the highest scores of 9 or 10, while the most 'tolerant' forms scored 1. Sensitivity scores for certain taxa have been modified in accordance with Taranaki experience. Averaging the scores from a list of taxa taken from one site and multiplying by a scaling factor of 20 produces a Macroinvertebrate Community Index (MCI) value. A difference of 11 units or more in MCI values is considered significantly different (Stark 1998).

A gradation of biological water quality conditions based upon MCI ranges has been adapted for Taranaki streams and rivers (TRC, 2015) from Stark's classification (Stark, 1985). This is as follows:

Grading	MCI	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<sub>s</sub>) 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<sub>s</sub> is not multiplied by a scaling factor of 20, so that its corresponding range of values is 20x lower.

Where necessary, 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.

## Results

### Site habitat characteristics and hydrology

This December 2014 survey followed a period of 7 days since a fresh in excess of three times median flow, and 18 days since a fresh in excess of seven times median flow. In the month prior to this survey there had been four fresh events, three of which exceeded three times median flow and one that exceeded seven times median flow.

Water temperatures ranged from 15.4°C to 18.2°C in Puremu Stream. Water levels were very low at sites 1 and PT1 and low at site 2. Water speed was steady at site 1, slow at site 2 and very slow at site PT1. Water was cloudy and uncoloured at site 1 and cloudy and brown at sites 2 and PT1. There were no periphyton mats, filamentous algae or moss at any of the Puremu Stream sites. Site 1 had patchy leaves, patchy wood and macrophytes on the streambed. Site 2 had patchy leaves and wood but no macrophytes were present and site PT1 had no leaves, patchy wood and no macrophytes present. The substrate at site 1 was entirely composed of silt, site 2 had a hard clay substrate and site PT1 had a silt substrate. Site 1 had no shading, site 2 had complete shading from overhanging vegetation and site PT1 had partial shading from steep sided banks. No unusual bacterial, fungal or protozoan growths were found by microscopic examination of the samples for 'heterotrophic growths' at any of the Puremu Stream sites in this survey.

Water temperatures ranged from 15.2°C to 15.7°C in the Manganaha Stream. Water levels were low and flows steady at both sites. Water was clear and uncoloured. There were no periphyton mats, filamentous algae or moss at both sites in the Manganaha Stream. Site M4 had patchy leaves, patchy wood and no macrophytes on the streambed. Site M6 had no leaves and wood but had macrophytes on the streambed. The substrate at site M4 was made up of hard clay while at site M6 the substrate composition was predominately hard clay with some silt. Both sites had shading from overhanging vegetation. No unusual bacterial, fungal or protozoan growths were found by microscopic examination of the samples for 'heterotrophic growths' at any of the Manganaha Stream sites in this survey.

## Macroinvertebrate communities

A summary of the results of previous macroinvertebrate surveys performed at the sites used in the current survey is presented in Table 3, together with current results.

**Table 3** Numbers of taxa and MCI values recorded in previous surveys performed at sites in the Puremu and Manganaha Streams and a tributary of the Puremu Stream in relation to the Colson Road landfill since July 1986, together with current results.

Site No.	Number of taxa				MCI values			SQMCI <sub>s</sub> values			
	No. samples	Range	Median	Current survey	Range	Median	Current Survey	No. of samples	Range	Median	Current survey
1	43	8-27	18	14	60-90	74	81	29	1.4-5.0	3.7	3.2
2	55	7-24	17	11	51-87	73	73	29	1.5-3.9	3.0	3.3
PT1*	28	11-22	16	17	55-79	71	68	27	1.2-3.7	2.6	2.0
M4	38	11-25	19	17	76-104	88	89	29	2.3-6.9	4.8	5.3
M6	32	12-27	19	17	58-100	84	80	29	2.8-6.8	4.1	4.1

\* Summary statistics given for PT1 combine data for sites PMU000108 and PMU000109.

## Puremu Stream

The current results for the Puremu Stream and the unnamed tributary of the Puremu Stream are presented in Table 4 below.

**Table 4** Macroinvertebrate fauna of the Puremu Stream (sites 1 & 2) and tributary (site PT1) in relation to the Colson Road landfill sampled on 5 December 2014.

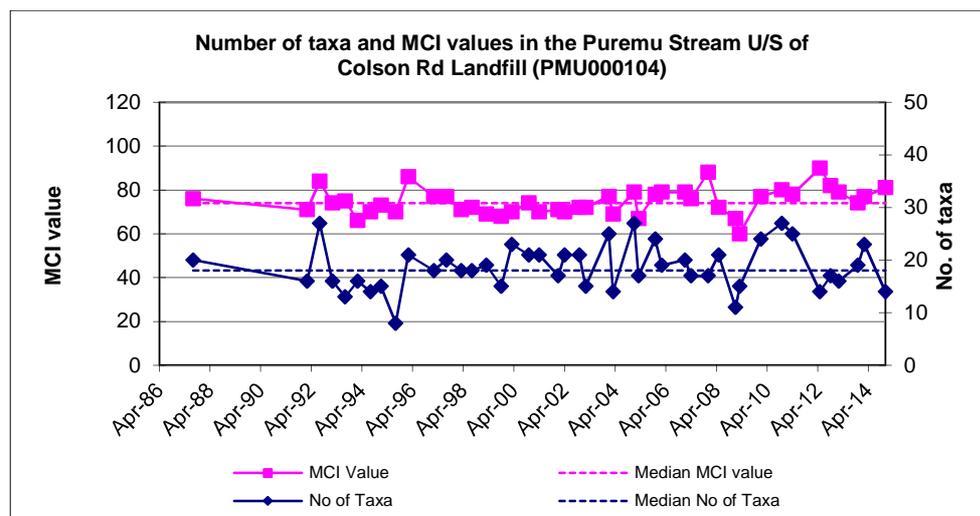
Taxa List	Site Number	MCI score	1	2	PT1
	Site Code		PMU000104	PMU000110	PMU000108
	Sample Number		FWB14376	FWB14377	FWB14378
COELENTERATA	Coelenterata	3	-	R	-
NEMERTEA	Nemertea	3	-	-	R
NEMATODA	Nematoda	3	-	-	C
ANNELIDA (WORMS)	Oligochaeta	1	A	A	VA
HIRUDINEA (LEECHES)	Hirudinea	3	-	-	R
MOLLUSCA	<i>Physa</i>	3	-	-	R
	<i>Potamopyrgus</i>	4	C	A	-
CRUSTACEA	Ostracoda	1	C	C	VA
	Isopoda	5	-	R	-
	<i>Paracalliope</i>	5	C	-	A
EPHEMEROPTERA (MAYFLIES)	<i>Austroclima</i>	7	R	-	-
HEMIPTERA (BUGS)	<i>Microvelia</i>	3	-	-	R
TRICHOPTERA (CADDISFLIES)	<i>Plectrocnemia</i>	8	C	-	-
	<i>Polypsectropus</i>	6	-	C	-
	<i>Tripletides</i>	5	R	C	R
DIPTERA (TRUE FLIES)	<i>Paralimnophila</i>	6	-	-	R
	<i>Zelandotipula</i>	6	R	-	R
	<i>Chironomus</i>	1	-	-	R
	Orthoclaadiinae	2	C	C	C
	<i>Polypedilum</i>	3	C	A	-
	Tanypodinae	5	C	R	A
	Ceratopogonidae	3	-	-	R
	<i>Paradixa</i>	4	R	-	-
	Empididae	3	-	-	R
	Psychodidae	1	R	-	-
ACARINA (MITES)	Acarina	5	C	A	A
No of taxa			14	11	17
MCI			81	73	68
SQMCIs			3.2	3.3	2.0
EPT (taxa)			3	2	1
%EPT (taxa)			21	18	6
'Tolerant' taxa		'Moderately sensitive' taxa	'Highly sensitive' taxa		

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

### Site 1 (PMU000104)

A moderately low taxa richness of 14 taxa was found at site 1 ('control' site) at the time of the survey which was four less than the median number recorded for the site (median taxa richness 18; Table 3) and nine less than the previous sample (taxa richness 23; Figure 2).

The MCI score of 81 units indicated a community of 'fair' biological health which was not significantly different (Stark, 1998) to the median value recorded for the site (median MCI score 74 units; Table 3) or from the previous survey score (MCI score 77 units; Figure 2). The SQMCI<sub>s</sub> score of 3.2 units was similar to the median value recorded at the site (median SQMCI<sub>s</sub> score 3.7 units; Table 3) and to the previous survey (SQMCI<sub>s</sub> score 3.3 units).



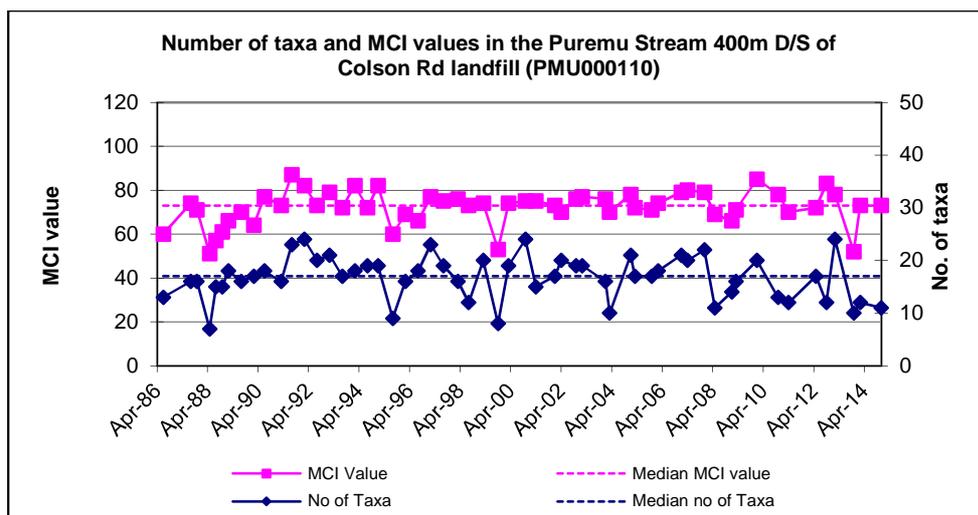
**Figure 2** Number of macroinvertebrate taxa and MCI values recorded at site 1 in the Puremu Stream, upstream of Colson Road Landfill since April 1987.

The community was characterised by one 'tolerant' taxon (oligochaete worms) (Table 4).

### Site 2 (PMU000110)

A low taxa richness of 11 taxa was found at site 2 at the time of the survey which was six less than the median number recorded for the site (median taxa richness 17; Table 3) and one more than the previous sample (taxa richness 12; Figure 3).

The MCI score of 73 units indicated a community of 'poor' biological health which was the same as the median value recorded for the site (median MCI score 73 units; Table 3) and the previous survey score (MCI score 73 units; Figure 3). The SQMCI<sub>s</sub> score of 3.3 units was similar to the median value recorded at the site (median SQMCI<sub>s</sub> score 3.0 units; Table 3) and markedly higher than the previous survey (SQMCI<sub>s</sub> score 1.2 units).



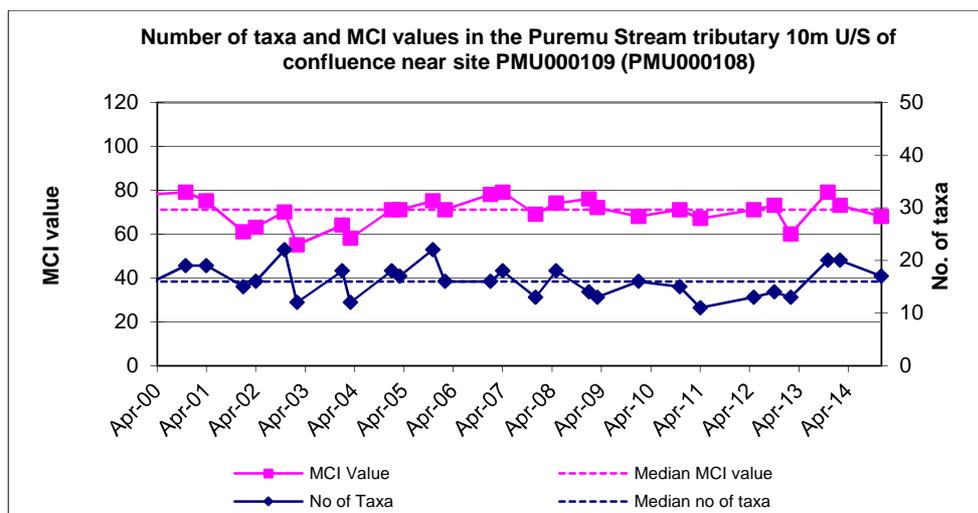
**Figure 3** Taxa numbers and MCI values recorded at site 2, 400 m downstream of Colson Rd Landfill.

The community was characterised by three 'tolerant' taxa [oligochaete worms, snail (*Potamopygus*) and midge (*Polypedilum*)] (Table 4).

#### Site PT1 (PMU000108)

A moderately low taxa richness of 17 taxa was found at site PT1 at the time of the survey which was one more than the median number recorded for the site (median taxa richness 16; Table 3) and three less than the previous sample (taxa richness 20; Figure 4).

The MCI score of 68 units indicated a community of 'poor' biological health which was not significantly different (Stark, 1998) to the median value recorded for the site (median MCI score 71 units; Table 3) and to the previous survey score (MCI score 73 units; Figure 4). The SQMCI<sub>s</sub> score of 2.0 units was similar to the median value recorded at the site (median SQMCI<sub>s</sub> score 2.6 units; Table 3) and lower than the previous survey (SQMCI<sub>s</sub> score 3.0 units).



**Figure 4** Numbers of taxa and MCI values recorded to date at site PT1, downstream of Colson Road Landfill.

The community was characterised by three 'tolerant' taxa (oligochaete worms and ostracod

seed shrimp) and three 'moderately sensitive' taxa [amphipod (*Paracalliope*), Acarina mites and tanypod midges] (Table 4).

## Manganaha Stream

The results for the current survey of the Manganaha Stream are presented in Table 5 below.

**Table 5** Macroinvertebrate fauna of the Manganaha Stream in relation to the Colson Road landfill sampled on 05 December 2014.

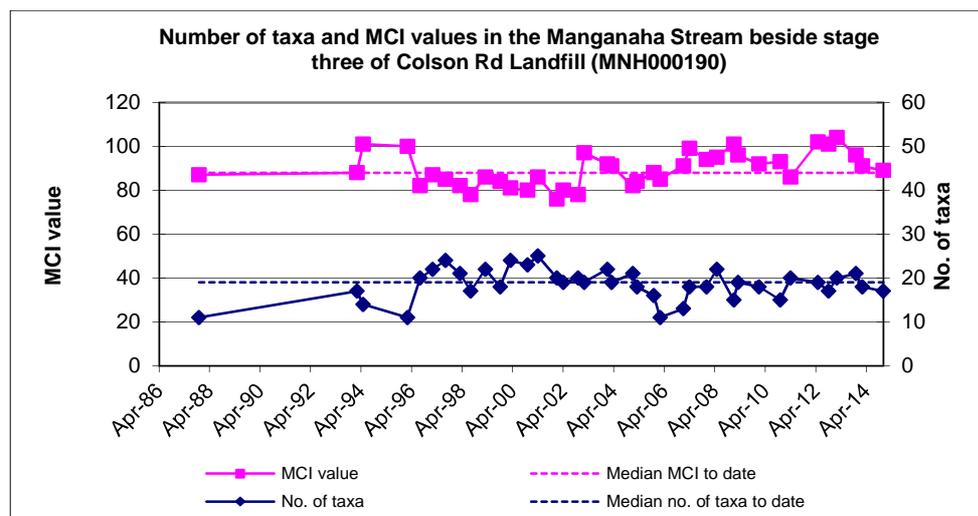
Taxa List	Site Number	MCI score	M4	M6
	Site Code		MNH000190	MNH000260
	Sample Number		FWB14379	FWB14380
ANNELIDA (WORMS)	Oligochaeta	1	C	A
MOLLUSCA	<i>Potamopyrgus</i>	4	C	A
	Sphaeriidae	3	-	C
CRUSTACEA	Ostracoda	1	-	R
	<i>Paracalliope</i>	5	A	A
	<i>Paratya</i>	3	-	R
EPHEMEROPTERA (MAYFLIES)	<i>Austroclima</i>	7	A	A
	<i>Coloburiscus</i>	7	C	-
	<i>Zephlebia group</i>	7	A	R
COLEOPTERA (BEETLES)	Staphylinidae	5	R	-
TRICHOPTERA (CADDISFLIES)	Ecnomidae/Psychomyiidae	6	C	R
	<i>Hydrobiosis</i>	5	-	R
	<i>Polypectropus</i>	6	R	-
	<i>Tripletides</i>	5	C	R
DIPTERA (TRUE FLIES)	<i>Zelandotipula</i>	6	R	-
	Orthoclaadiinae	2	C	R
	<i>Polypedilum</i>	3	C	-
	Tanypodinae	5	R	R
	Ceratopogonidae	3	-	R
	Empididae	3	R	R
	Psychodidae	1	R	-
<i>Austrosimulium</i>	3	C	C	
ACARINA (MITES)	Acarina	5	-	R
No of taxa			17	17
MCI			89	80
SQMCI			5.3	4.1
EPT (taxa)			6	5
%EPT (taxa)			35	29
'Tolerant' taxa		'Moderately sensitive' taxa		'Highly sensitive' taxa

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

### Site M4 (MNH000190)

A moderately low taxa richness of 17 taxa was found at site M4 at the time of the survey which was two more than the median number recorded for the site (median taxa richness 19; Table 3) and one less than the previous sample (taxa richness 18; Figure 3).

The MCI score of 89 units indicated a community of 'fair' biological health which was not significantly different (Stark, 1998) to the median value recorded for the site (median MCI score 88 units; Table 3) and to the previous survey score (MCI score 88 units; Figure 3). The SQMCI<sub>s</sub> score of 5.3 units was similar to the median value recorded at the site (median SQMCI<sub>s</sub> score 4.8 units; Table 3) and to the previous survey (SQMCI<sub>s</sub> score 5.8 units).



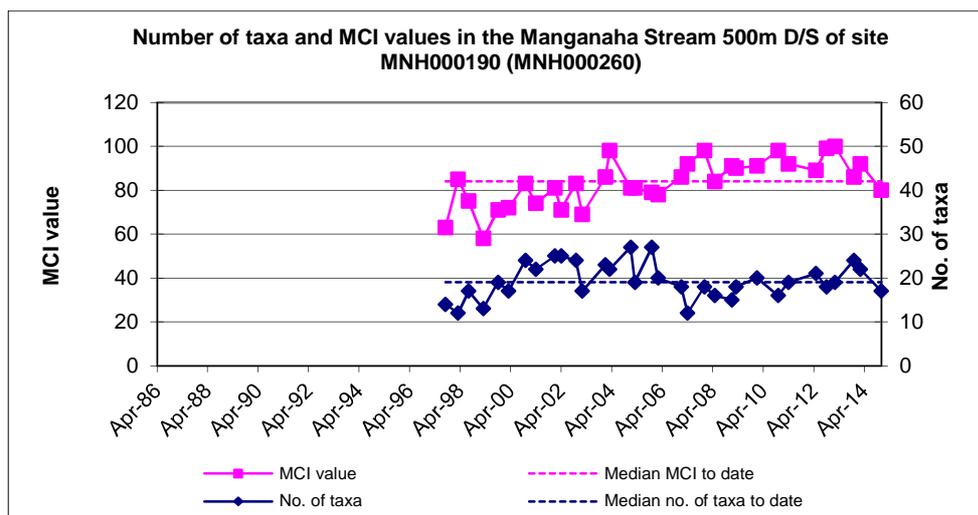
**Figure 5** Taxa numbers and MCI values recorded at site M4, in the Manganaha Stream adjacent to Colson Road landfill.

The community was characterised by three 'moderately sensitive' taxa [amphipod (*Paracalliope*) and mayflies (*Austroclima* and *Zephlebia* group)] (Table 5).

### Site M6 (MNH000260)

A moderately low taxa richness of 17 taxa was found at site M6 at the time of the survey which was two more than the median number recorded for the site (median taxa richness 19; Table 3) and five less than the previous sample (taxa richness 22; Figure 3).

The MCI score of 80 units indicated a community of 'fair' biological health which was not significantly different (Stark, 1998) to the median value recorded for the site (median MCI score 84 units; Table 3) and was significantly less (Stark, 1998) than the previous survey score (MCI score 92 units; Figure 3). The SQMCI<sub>s</sub> score of 4.1 units was the same as the median value recorded at the site (median SQMCI<sub>s</sub> score 4.1 units; Table 3) and markedly lower than the previous survey (SQMCI<sub>s</sub> score 5.5 units).



**Figure 6** Taxa numbers and MCI values recorded at site M6, in the Manganaha Stream downstream of Colson Road landfill.

The community was characterised by two ‘tolerant’ taxa [oligochaete worms and snail (*Potamopygus*) and two ‘moderately sensitive’ taxa [amphipod (*Paracalliope*) and mayfly (*Austroclima*)] (Table 5).

## Discussion

Landfills may have a variety of contaminants leaching from them (e.g. nutrients and metals). A decrease in taxa richness is usually associated with toxic impacts. Taxa richnesses for the four ‘potentially impacted’ sites were similar to site 1 ‘the control’ site and therefore there is no evidence for leachate causing toxic effects in the macroinvertebrate communities downstream of the Colson Road landfill.

No undesirable biological growths were detected at any sites during this December 2014 survey indicating that there were not high levels of organic enrichment entering the streams surveyed.

There was a small, insignificant difference (Stark, 1998) in MCI scores between site 1 ‘control site’ and site 2. There was also no marked difference in SQMCI<sub>5</sub> scores between the two sites. Furthermore, MCI and SQMCI<sub>5</sub> scores at site 2 were similar to the median scores from previous surveys. This indicates that leachate from the compost area was not having an effect on the freshwater macroinvertebrate communities in the Puremu Stream at the time of the survey. There was a significant difference in macroinvertebrate community health between site 1 and site PT1. Site PT1 had a significantly lower (Stark, 1998) MCI score and lower SQMCI<sub>5</sub> score than site 1. However, there were insignificant differences in scores compared with the median values from previous surveys at the site. The reason for the significant difference was a higher than usual MCI score at the ‘control’ site rather than a decrease in macroinvertebrate community health at site PT1. Usually all three sites (site 1, 2 and PT1) are of ‘poor’ macroinvertebrate health while at the time of the survey only sites 2 and PT1 were of ‘poor’ health and site 1 was of ‘fair’ health.

Both sites on the Manganaha Stream (M4 and M6) had macroinvertebrate communities of

'fair' health. No 'control' site existed on the Manganaha Stream but comparisons with the nearby Puremu Stream 'control' site indicated minor, insignificant differences in MCI and SQMCI<sub>s</sub> scores between sites M4 and M6 and site 1 suggesting no impacts from the Colson Rd landfill. There was an insignificant decrease (Stark, 1998) in MCI score and a marked decline in SQMCI<sub>s</sub> score from site M4 to M6. Site M4 typically has higher macroinvertebrate health than M6, possibly due to the site being well shaded as opposed to M6 which was only partially shaded which contributed to site M4 having no algae or macrophyte growth recorded on the streambed while M6 had extensive macrophytes on the streambed. Differences in habitat quality are therefore the most likely explanation for the differences in macroinvertebrate health between sites M4 and M6. Site M6 also had a significant decrease in MCI score from the previous survey. Most of the habitat and water quality indicators (e.g. water colour, water clarity, flow, stock damage, macrophytes, and substrate) suggest that site M6 at the time of the current survey was in a better condition than at the time of the previous summer survey (February 2014). Analysis of the taxa assemblage indicates that there were higher numbers of more 'sensitive' invertebrate taxa and greater abundances within taxa. At the time of the current survey there was only a seven day period between the survey and a three times median base flow fresh. Seven days is the minimal amount of time according to TRC protocols that a survey can be conducted after a three time median flow fresh and it is possible that some scouring of the site produced the decline in taxa richness and taxa abundances at the site. Site M4 would not be affected by scouring to the same extent due to the channel being significantly wider and shallower than at site M6.

## Summary

The standard 'kick-sampling' technique was used at sites 1 and M6, and the 'sweep-sampling' technique was used at sites 2, Pt1 and M4 to collect streambed macroinvertebrates from the Puremu and Manganaha Streams on 5 December 2014. Samples were sorted and identified to provide number of taxa (richness), MCI and SQMCI<sub>s</sub> 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<sub>s</sub> takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities, particularly if non-organic impacts are occurring. Significant differences in either the MCI or the SQMCI<sub>s</sub> between sites indicate the degree of adverse effects (if any) of the discharges being monitored.

No undesirable biological growths were detected at any sites during this December 2014 survey indicating that there were not high levels of organic enrichment entering the streams surveyed.

This late spring macroinvertebrate survey indicated that the discharge of treated stormwater and leachate discharged from the Colson Road landfill site had not had any detrimental effect on the macroinvertebrate communities of the Puremu and Manganaha Streams.

There was an insignificant difference (Stark, 1998) in MCI scores and no marked difference in SQMCI<sub>s</sub> scores between site 1 'control site' and site 2. MCI and SQMCI<sub>s</sub> scores at site 2 were similar to the median scores from previous surveys. This indicates that leachate from the compost area was not having an effect on the freshwater macroinvertebrate communities

in the Puremu Stream at the time of the survey. There was a significant decrease in macroinvertebrate community health between site 1 and site PT1. However, there were insignificant differences in scores compared with the median values from previous surveys at the site. The reason for the significant difference was a higher than usual MCI score at the 'control' site rather than a decrease in macroinvertebrate community health at site PT1.

Both sites on the Manganaha Stream (M4 and M6) had macroinvertebrate communities of 'fair' health. Comparisons with the nearby Puremu Stream 'control' site indicated minor, insignificant differences in MCI and SQMCI<sub>s</sub> scores between sites M4 and M6 and site 1 suggesting no impacts from the Colson Rd landfill. There was an insignificant decrease (Stark, 1998) in MCI scores and a marked decline in SQMCI<sub>s</sub> scores from site M4 to M6 and a significant decrease in MCI score at site M6 from the previous survey. Site M4 typically has higher macroinvertebrate health than M6, possibly due to the site being well shaded. Differences in habitat quality are therefore the most likely explanation for the differences in macroinvertebrate health between sites M4 and M6. Scouring from a fresh may have contributed to site M4 having a decreased taxa richness, less taxa abundances and lowering MCI scores compared with the previous survey.

Overall, the results of this survey were indicative of poor biological health in the Puremu Stream and in the unnamed tributary of the Puremu Stream. The results in the Manganaha Stream were indicative of fair biological health at sites M4 and M6. The poor habitat conditions observed in the Puremu Stream and unnamed tributary of the Puremu Stream at the time of this survey were the most likely reason for this, rather than to the effects of the discharges from the landfill. In summary, these results were not indicative of any significant adverse effects on either the Puremu Stream or the Manganaha Stream from the discharges from the Colson Road Landfill at the time of this survey.

## References

- Australian & New Zealand Environment & Conservation Council, Agriculture and Resource Management Council of Australia and New Zealand, 2000: Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Volumes 1 and 2. Environment Australia.
- Dunning KJ, 2002a: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, January 2002. TRC report KD94.
- Dunning KJ, 2002b: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, April 2002. TRC report KD125.
- Hope KJ, 2005: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, March 2005. TRC report KD033.
- Hope KJ, 2005: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, November 2005. TRC Report KH076.
- Fowles CR and Hope KJ, 2005: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, January 2005. TRC report CF383.

Fowles CR and Moore SC, 2004: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, March 2004. TRC report CF333.

Jansma B, 2006: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, February 2006. TRC report BJ008.

Jansma B, 2007a: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, January 2007. TRC report BJ022.

Jansma B, 2007b: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, April 2007. TRC report BJ023.

Jansma B, 2008a: Biomonitoring of the Mangati Stream, in relation to the Bell Block industrial area, February 2008. TRC report BJ043.

Jansma B, 2008b: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, December 2007. TRC report BJ044.

Jansma B, 2008c: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, May 2008. TRC report BJ045.

Jansma B, 2009a: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, January 2009. TRC report BJ074.

Jansma B, 2009b: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, March 2009. TRC report BJ075.

Jansma B, 2010: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, January 2010. TRC report BJ126.

Jansma B, 2011: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, November 2010. TRC report BJ163.

Jansma B, 2011: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, April 2011. TRC report BJ164.

Jansma B and Smith K, 2013: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, October 2012. TRC report BJ205.

Jansma B and Smith K, 2013: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, February 2013. TRC report BJ206.

McWilliam H, 2000b: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, March 2000. TRC report HM211.

McWilliam H, 2001a: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, November 2000. TRC report HM241.

McWilliam H, 2001b: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, April 2001. TRC report HM252.

Moore S, 2003a: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, November 2002. TRC report SM573.

Moore S, 2003b: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, 17 February 2003. TRC report SM580.

- Moore S and Colgan BG, 2004: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, 6 January 2004. TRC report SM586.
- Smith K, 2012: Biomonitoring of the Puremu and Manganaha Streams in relation to the New Plymouth District Council Colson Road landfill, May 2012. TRC report KS009.
- Stark JD, 1985: A macroinvertebrate community index of water quality for stony streams. *Water and Soil* Miscellaneous Publication No. 87.
- Stark JD, 1998: SQMCI: a biotic index for freshwater macroinvertebrate coded abundance data. *New Zealand Journal of Marine and Freshwater Research* 32(1): 55-66.
- Stark JD, 1999: An evaluation of Taranaki Regional Council's SQMCI biomonitoring index. Cawthron Institute, Nelson. Cawthron Report No. 472.
- Stark JD, Boothroyd IKG, Harding JS, Maxted JR, Scarsbrook MR, 2001: Protocols for sampling macroinvertebrates in wadeable streams. New Zealand Macroinvertebrate Working Group Report No. 1. Prepared for the Ministry for the Environment. Sustainable Management Fund Project No. 5103. 57p.
- Stark JD and Maxted JR, 2004. Macroinvertebrate community indices for Auckland's soft-bottomed streams and applications to SOE reporting. Prepared for Auckland Regional Council. Cawthron Report No. 970. Cawthron Institute, Nelson. ARC Technical Publication 303. 59p.
- Stark JD and Maxted JR, 2007. A biotic index for New Zealand's soft bottomed streams. *New Zealand Journal of Marine and Freshwater Research* 41(1).
- Stark JD and Maxted JR, 2007a. A user guide for the macroinvertebrate community index. Cawthron Institute, Nelson. Cawthron Report No. 1166.
- Taranaki Regional Council, 2000: New Plymouth District Council New Plymouth (Colson Road) Landfill Monitoring Programme Annual Report 1999-2000. Technical Report 2000-38.
- Taranaki Regional Council, 2015: Freshwater macroinvertebrate fauna biological monitoring programme annual state of the environment monitoring report 2013-14. TRC Technical Report 2014-20.
- Thomas B, 2014a: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, November 2013. TRC report BT025.
- Thomas B, 2014b: Biomonitoring of the Puremu and Manganaha Streams in relation to the NPDC Colson Road landfill, February 2014. TRC report BT026.

**Appendix III**  
**Groundwater Results**



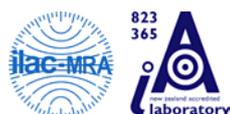


## ANALYSIS REPORT

<b>Client:</b>	Taranaki Regional Council	<b>Lab No:</b>	1436861	SPV1
<b>Contact:</b>	Scott Cowperthwaite C/- Taranaki Regional Council Private Bag 713 STRATFORD 4352	<b>Date Registered:</b>	10-Jun-2015	
		<b>Date Reported:</b>	15-Jun-2015	
		<b>Quote No:</b>	36283	
		<b>Order No:</b>	5130U	
		<b>Client Reference:</b>	Colson Rd Groundwaters	
		<b>Submitted By:</b>	L Smith	

### Sample Type: Aqueous

Sample Name:	GND0573 09-Jun-2015 8:15 am	GND1301 09-Jun-2015 9:40 am	GND0575 09-Jun-2015 9:55 am	GND0251 09-Jun-2015 9:10 am	GND0598 09-Jun-2015 9:25 am	
Lab Number:	1436861.1	1436861.2	1436861.3	1436861.4	1436861.5	
<b>Individual Tests</b>						
Dissolved Aluminium	g/m <sup>3</sup>	0.007	0.009	0.005	0.011	0.005
Dissolved Arsenic	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dissolved Beryllium	g/m <sup>3</sup>	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Boron	g/m <sup>3</sup>	0.020	0.024	0.017	0.012	0.051
Dissolved Cadmium	g/m <sup>3</sup>	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Chromium	g/m <sup>3</sup>	< 0.0005	< 0.0005	0.0006	< 0.0005	< 0.0005
Dissolved Cobalt	g/m <sup>3</sup>	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Dissolved Copper	g/m <sup>3</sup>	< 0.0005	< 0.0005	0.0007	0.0007	0.0009
Dissolved Iron	g/m <sup>3</sup>	< 0.02	< 0.02	< 0.02	< 0.02	0.16
Dissolved Lead	g/m <sup>3</sup>	< 0.00010	< 0.00010	0.00019	0.00010	0.00023
Dissolved Manganese	g/m <sup>3</sup>	0.0083	0.0133	0.0032	0.0014	0.057
Dissolved Selenium	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dissolved Vanadium	g/m <sup>3</sup>	< 0.0010	0.0099	0.0038	0.0014	0.0015
Dissolved Zinc	g/m <sup>3</sup>	0.0058	0.0018	0.0120	0.0045	0.0060
<b>Haloethers Trace in SVOC Water Samples by GC-MS</b>						
Bis(2-chloroethoxy) methane	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Bis(2-chloroethyl)ether	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Bis(2-chloroisopropyl)ether	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
4-Bromophenyl phenyl ether	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
4-Chlorophenyl phenyl ether	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
<b>Nitrogen containing compounds Trace in SVOC Water Samples, GC-MS</b>						
3,3'-Dichlorobenzidine	g/m <sup>3</sup>	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
2,4-Dinitrotoluene	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2,6-Dinitrotoluene	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Nitrobenzene	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
N-Nitrosodi-n-propylamine	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
N-Nitrosodiphenylamine	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
<b>Organochlorine Pesticides Trace in SVOC Water Samples by GC-MS</b>						
Aldrin	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
alpha-BHC	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
beta-BHC	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
delta-BHC	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
gamma-BHC (Lindane)	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
4,4'-DDD	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
4,4'-DDE	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
4,4'-DDT	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010



**Sample Type: Aqueous**

<b>Sample Name:</b>	GND0573 09-Jun-2015 8:15 am	GND1301 09-Jun-2015 9:40 am	GND0575 09-Jun-2015 9:55 am	GND0251 09-Jun-2015 9:10 am	GND0598 09-Jun-2015 9:25 am
<b>Lab Number:</b>	1436861.1	1436861.2	1436861.3	1436861.4	1436861.5

**Organochlorine Pesticides Trace in SVOC Water Samples by GC-MS**

Dieldrin	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Endosulfan I	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan II	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan sulfate	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin ketone	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Heptachlor epoxide	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Hexachlorobenzene	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005

**Polycyclic Aromatic Hydrocarbons Trace in SVOC Water Samples**

Acenaphthene	g/m <sup>3</sup>	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Acenaphthylene	g/m <sup>3</sup>	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Anthracene	g/m <sup>3</sup>	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Benzo[a]anthracene	g/m <sup>3</sup>	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Benzo[a]pyrene (BAP)	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Benzo[b]fluoranthene + Benzo[j]fluoranthene	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Benzo[g,h,i]perylene	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Benzo[k]fluoranthene	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
2-Chloronaphthalene	g/m <sup>3</sup>	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Chrysene	g/m <sup>3</sup>	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Dibenzo[a,h]anthracene	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Fluoranthene	g/m <sup>3</sup>	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Fluorene	g/m <sup>3</sup>	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Indeno(1,2,3-c,d)pyrene	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
2-Methylnaphthalene	g/m <sup>3</sup>	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Naphthalene	g/m <sup>3</sup>	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Phenanthrene	g/m <sup>3</sup>	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Pyrene	g/m <sup>3</sup>	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003

**Phenols Trace (drinkingwater) in SVOC Water Samples by GC-MS**

2-Chlorophenol	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
2,4-Dichlorophenol	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
2,4,6-Trichlorophenol	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010

**Phenols Trace (non-drinkingwater) in SVOC Water Samples by GC-MS**

4-Chloro-3-methylphenol	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2,4-Dimethylphenol	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
3 & 4-Methylphenol (m- + p-cresol)	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2-Methylphenol (o-Cresol)	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
2-Nitrophenol	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Pentachlorophenol (PCP)	g/m <sup>3</sup>	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Phenol	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2,4,5-Trichlorophenol	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010

**Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS**

Butylbenzylphthalate	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Diethylphthalate	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dimethylphthalate	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Di-n-butylphthalate	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Di-n-octylphthalate	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010

**Plasticisers Trace (drinkingwater) in SVOC Water Samples by GCMS**

Bis(2-ethylhexyl)phthalate	g/m <sup>3</sup>	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Di(2-ethylhexyl)adipate	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010

**Other Halogenated compounds Trace (drinkingwater) in SVOC Water**

1,2-Dichlorobenzene	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
1,3-Dichlorobenzene	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010

**Sample Type: Aqueous**

<b>Sample Name:</b>	GND0573 09-Jun-2015 8:15 am	GND1301 09-Jun-2015 9:40 am	GND0575 09-Jun-2015 9:55 am	GND0251 09-Jun-2015 9:10 am	GND0598 09-Jun-2015 9:25 am
<b>Lab Number:</b>	1436861.1	1436861.2	1436861.3	1436861.4	1436861.5
Other Halogenated compounds Trace (drinkingwater) in SVOC Water					
1,4-Dichlorobenzene	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Other Halogenated compounds Trace (non-drinkingwater) in SVOC					
Hexachlorobutadiene	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Hexachloroethane	g/m <sup>3</sup>	< 0.0010	< 0.0010	< 0.0010	< 0.0010
1,2,4-Trichlorobenzene	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Other SVOC Trace in SVOC Water Samples by GC-MS					
Benzyl alcohol	g/m <sup>3</sup>	< 0.005	< 0.005	< 0.005	< 0.005
Carbazole	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dibenzofuran	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Isophorone	g/m <sup>3</sup>	< 0.0005	< 0.0005	< 0.0005	< 0.0005

<b>Sample Name:</b>	GND1300 09-Jun-2015 8:35 am	GND0255 09-Jun-2015 8:00 am			
<b>Lab Number:</b>	1436861.6	1436861.7			

Individual Tests					
Dissolved Aluminium	g/m <sup>3</sup>	0.048	0.010	-	-
Dissolved Arsenic	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-
Dissolved Beryllium	g/m <sup>3</sup>	< 0.00010	< 0.00010	-	-
Dissolved Boron	g/m <sup>3</sup>	0.018	0.019	-	-
Dissolved Cadmium	g/m <sup>3</sup>	< 0.00005	< 0.00005	-	-
Dissolved Chromium	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-
Dissolved Cobalt	g/m <sup>3</sup>	< 0.0002	< 0.0002	-	-
Dissolved Copper	g/m <sup>3</sup>	0.0005	< 0.0005	-	-
Dissolved Iron	g/m <sup>3</sup>	0.03	< 0.02	-	-
Dissolved Lead	g/m <sup>3</sup>	< 0.00010	< 0.00010	-	-
Dissolved Manganese	g/m <sup>3</sup>	0.0017	0.0039	-	-
Dissolved Selenium	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-
Dissolved Vanadium	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-
Dissolved Zinc	g/m <sup>3</sup>	0.0022	0.0105	-	-

Haloethers Trace in SVOC Water Samples by GC-MS					
Bis(2-chloroethoxy) methane	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-
Bis(2-chloroethyl)ether	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-
Bis(2-chloroisopropyl)ether	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-
4-Bromophenyl phenyl ether	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-
4-Chlorophenyl phenyl ether	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-

Nitrogen containing compounds Trace in SVOC Water Samples, GC-MS					
3,3'-Dichlorobenzidine	g/m <sup>3</sup>	< 0.003	< 0.003	-	-
2,4-Dinitrotoluene	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-
2,6-Dinitrotoluene	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-
Nitrobenzene	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-
N-Nitrosodi-n-propylamine	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-
N-Nitrosodiphenylamine	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-

Organochlorine Pesticides Trace in SVOC Water Samples by GC-MS					
Aldrin	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-
alpha-BHC	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-
beta-BHC	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-
delta-BHC	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-
gamma-BHC (Lindane)	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-
4,4'-DDD	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-
4,4'-DDE	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-
4,4'-DDT	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-
Dieldrin	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-
Endosulfan I	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-
Endosulfan II	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-

**Sample Type: Aqueous**

<b>Sample Name:</b>		GND1300 09-Jun-2015 8:35 am	GND0255 09-Jun-2015 8:00 am			
<b>Lab Number:</b>		1436861.6	1436861.7			
<b>Organochlorine Pesticides Trace in SVOC Water Samples by GC-MS</b>						
Endosulfan sulfate	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-	-
Endrin	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-	-
Endrin ketone	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-	-
Heptachlor	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-	-
Heptachlor epoxide	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-	-
Hexachlorobenzene	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-	-
<b>Polycyclic Aromatic Hydrocarbons Trace in SVOC Water Samples</b>						
Acenaphthene	g/m <sup>3</sup>	< 0.0003	< 0.0003	-	-	-
Acenaphthylene	g/m <sup>3</sup>	< 0.0003	< 0.0003	-	-	-
Anthracene	g/m <sup>3</sup>	< 0.0003	< 0.0003	-	-	-
Benzo[a]anthracene	g/m <sup>3</sup>	< 0.0003	< 0.0003	-	-	-
Benzo[a]pyrene (BAP)	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-	-
Benzo[g,h,i]perylene	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-	-
Benzo[k]fluoranthene	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-	-
2-Chloronaphthalene	g/m <sup>3</sup>	< 0.0003	< 0.0003	-	-	-
Chrysene	g/m <sup>3</sup>	< 0.0003	< 0.0003	-	-	-
Dibenzo[a,h]anthracene	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-	-
Fluoranthene	g/m <sup>3</sup>	< 0.0003	< 0.0003	-	-	-
Fluorene	g/m <sup>3</sup>	< 0.0003	< 0.0003	-	-	-
Indeno(1,2,3-c,d)pyrene	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-	-
2-Methylnaphthalene	g/m <sup>3</sup>	< 0.0003	< 0.0003	-	-	-
Naphthalene	g/m <sup>3</sup>	< 0.0003	< 0.0003	-	-	-
Phenanthrene	g/m <sup>3</sup>	< 0.0003	< 0.0003	-	-	-
Pyrene	g/m <sup>3</sup>	< 0.0003	< 0.0003	-	-	-
<b>Phenols Trace (drinkingwater) in SVOC Water Samples by GC-MS</b>						
2-Chlorophenol	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-	-
2,4-Dichlorophenol	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-	-
2,4,6-Trichlorophenol	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-	-
<b>Phenols Trace (non-drinkingwater) in SVOC Water Samples by GC-MS</b>						
4-Chloro-3-methylphenol	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-	-
2,4-Dimethylphenol	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-	-
3 & 4-Methylphenol (m- + p-cresol)	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-	-
2-Methylphenol (o-Cresol)	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-	-
2-Nitrophenol	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-	-
Pentachlorophenol (PCP)	g/m <sup>3</sup>	< 0.010	< 0.010	-	-	-
Phenol	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-	-
2,4,5-Trichlorophenol	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-	-
<b>Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS</b>						
Butylbenzylphthalate	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-	-
Diethylphthalate	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-	-
Dimethylphthalate	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-	-
Di-n-butylphthalate	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-	-
Di-n-octylphthalate	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-	-
<b>Plasticisers Trace (drinkingwater) in SVOC Water Samples by GCMS</b>						
Bis(2-ethylhexyl)phthalate	g/m <sup>3</sup>	< 0.003	< 0.003	-	-	-
Di(2-ethylhexyl)adipate	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-	-
<b>Other Halogenated compounds Trace (drinkingwater) in SVOC Water</b>						
1,2-Dichlorobenzene	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-	-
1,3-Dichlorobenzene	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-	-
1,4-Dichlorobenzene	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-	-
<b>Other Halogenated compounds Trace (non-drinkingwater) in SVOC</b>						
Hexachlorobutadiene	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-	-

**Sample Type: Aqueous**

<b>Sample Name:</b>	GND1300 09-Jun-2015 8:35 am	GND0255 09-Jun-2015 8:00 am			
<b>Lab Number:</b>	1436861.6	1436861.7			
Other Halogenated compounds Trace (non-drinkingwater) in SVOC					
Hexachloroethane	g/m <sup>3</sup>	< 0.0010	< 0.0010	-	-
1,2,4-Trichlorobenzene	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-
Other SVOC Trace in SVOC Water Samples by GC-MS					
Benzyl alcohol	g/m <sup>3</sup>	< 0.005	< 0.005	-	-
Carbazole	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-
Dibenzofuran	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-
Isophorone	g/m <sup>3</sup>	< 0.0005	< 0.0005	-	-

**Analyst's Comments****Samples 1-7 Comment:**

It has been noted that the method performance for Hexachlorocyclopentadiene for SVOC analysis is not acceptable therefore we are unable to report this compound at this present time.

**SUMMARY OF METHODS**

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

<b>Sample Type: Aqueous</b>			
<b>Test</b>	<b>Method Description</b>	<b>Default Detection Limit</b>	<b>Sample No</b>
Semivolatile Organic Compounds Trace in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	0.0003 - 0.010 g/m <sup>3</sup>	1-7
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22 <sup>nd</sup> ed. 2012.	-	1-7
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22 <sup>nd</sup> ed. 2012.	0.003 g/m <sup>3</sup>	1-7
Dissolved Arsenic	Filtered sample, ICP-MS, trace level. APHA 3125 B 22 <sup>nd</sup> ed. 2012.	0.0010 g/m <sup>3</sup>	1-7
Dissolved Beryllium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22 <sup>nd</sup> ed. 2012.	0.00010 g/m <sup>3</sup>	1-7
Dissolved Boron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22 <sup>nd</sup> ed. 2012.	0.005 g/m <sup>3</sup>	1-7
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22 <sup>nd</sup> ed. 2012.	0.00005 g/m <sup>3</sup>	1-7
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22 <sup>nd</sup> ed. 2012.	0.0005 g/m <sup>3</sup>	1-7
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B 22 <sup>nd</sup> ed. 2012.	0.0002 g/m <sup>3</sup>	1-7
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B 22 <sup>nd</sup> ed. 2012.	0.0005 g/m <sup>3</sup>	1-7
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22 <sup>nd</sup> ed. 2012.	0.02 g/m <sup>3</sup>	1-7
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B 22 <sup>nd</sup> ed. 2012.	0.00010 g/m <sup>3</sup>	1-7
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B 22 <sup>nd</sup> ed. 2012.	0.0005 g/m <sup>3</sup>	1-7
Dissolved Selenium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22 <sup>nd</sup> ed. 2012.	0.0010 g/m <sup>3</sup>	1-7
Dissolved Vanadium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22 <sup>nd</sup> ed. 2012.	0.0010 g/m <sup>3</sup>	1-7
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B 22 <sup>nd</sup> ed. 2012.	0.0010 g/m <sup>3</sup>	1-7

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

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A handwritten signature in blue ink, appearing to read 'M. Cowell', is positioned above the printed name.

Martin Cowell - BSc  
Client Services Manager - Environmental Division