Kaituna Closed Landfill Annual Monitoring Report 2011-2012

Prepared for
Marlborough District Council

October 2012

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Quality Control Sheet

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Directed, reviewed and approved by

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Peter Callander

Limitations:

The report has been prepared for Marlborough District Council, according to their instructions, for the particular objectives described in the report. The information contained in the report should not be used by anyone else or for any other purposes.

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Appendices

[1] Resource Consent Decision granted 22nd April 2009.

[2] Baseline monitoring undertaken in 2009, monitoring for indicator parameters since then.

1.0 Introduction

The Kaituna Closed Landfill ('the Landfill') is located on the north bank of the Wairau River near the intersection of Northbank Road and State Highway Six (SH6) as shown in Figure 1, Appendix A.

The Landfill was opened in 1987 and officially closed in 1996. Prior to closure, it accepted waste from the Kaituna area including Renwick and surrounding rural communities.

The Landfill site is approximately 14,870 m^2, of which refuse extends over an area of approximately 3,000 m^2. The volume of refuse stored in it is estimated at 12,000m^3 and has a refuse depth of approximately 4 metres.

Discharges from the site and post-closure environmental monitoring are regulated under:

- Resource Consent U080998 (copy attached at Appendix B); and
- The current Closed Landfill Management Plan (CLMP, Rev. 6, November 2011).

2.0 Current Monitoring Requirements

Current environmental monitoring requirements are summarised in Table 1. Sampling locations are shown in Figure 2 in Appendix A.

Table 1: Current Environmental Monitoring Requirements (CLMP, Rev. 6, November 2011)

	Monitoring Points	**Frequency**	**Analyses**
Site Inspection	Entire site	Annual	Monitor for any signs of exposed refuse on the Landfill surface. Erosion of the banks of the Onamalutu River adjacent to the Landfill.
Groundwater	• Upgradient monitoring wells (P28w/1284 and 10050) • Monitoring well on the southern margin of the Landfill (10051) • Downgradient wells: P28w/1850, P28w/1851	Annual	Indicator parameters: Ammonia-N, Conductivity, pH, Temperature and water level.

Table 1: Current Environmental Monitoring Requirements (CLMP, Rev. 6, November 2011)			
	Monitoring Points	**Frequency**	**Analyses**
Surface Water	⁘ ONR-008 (Upstream of the Landfill on the Onamalutu River) ⁘ ONR-009 (Onamalutu River, immediately upstream of the confluence with the Wairau River)	Annual	Indicator parameters: Ammonia-N, Arsenic, Boron, Cadmium, Chloride, Chemical Oxygen Demand, Conductivity, Iron, Lead, Nickel, Nitrate-N, Nitrite-N, pH, Sulphate, Total Suspended Solids, Temperature and Zinc.
Landfill Gas	Not required at this site		
Leachate Chamber	TIP-017 (KV-4)	Annual	Indicator parameters (as for surface water).

MDC have recently completed two new bores in close proximity to P28w/1850 and P28w/1851. The two new bores (10301 and 10300) are screened from 2.5 to 6.3 m. Water levels in the two new bores are approximately 4.5 m below ground level.

The new bores are shallower compared to the existing bores and should enable MDC to better interpret dilution factors, given shallower bores will require a reduced sampling volume, which should more accurately pick up the impact of any leachate from the Landfill.

In time, monitoring of bore P28w/1850 and P28w/1851 may cease, with monitoring transferring to the shallower bores instead.

3.0 Details of Monitoring Undertaken

Monitoring results from groundwater sampling sites at the Landfill are presented in Section 3.1 and surface water monitoring results (including the leachate chamber) are presented in Section 3.2. Water quality data is presented in Appendix D. Section 3.3 describes the results of a site inspection undertaken in July 2012.

3.1 Groundwater Monitoring

Data from groundwater samples is available from five different locations around the Landfill. Note that static water levels in the boreholes indicate that groundwater flow is generally west to east across the site, sub parallel to the Wairau River:

⁘ Bore P28w/1284, located approximately 300 m to the north of the Landfill, represents background groundwater quality results as it is located away from the Landfill;

- Bore 10050, located at the western edge of the Landfill and upgradient of the Landfill;
- Bore 10051, located adjacent to the leachate sump on the southern margin of the Landfill;
- Bore P28w/1850, located due east and downgradient of the Landfill; and
- Bore P28w/1851, located to the north east of the Landfill, approximately 50 m from the boundary.

According to the current Closed Landfill Management Plan (CLMP, Rev 6, November 2011) annual sampling should take place at P28w/1284, P28w/1850, P28w/1851, 10050 and 10051 for indicator parameters. Data in Appendix D indicates that annual sampling has taken place at boreholes P28w/1284, P28w/1850, P28w/1851, 10050 and 10051 since February 2010 for indicator parameters, as required.

Monitoring will also shortly start at the new wells and this will in time be formalised through the CLMP.

3.2 Surface Water Monitoring (including leachate chamber)

Consent U080998 indicates that surface water monitoring should take place at two sites on the Onamalutu River:

- ONR-008, Upstream of the Landfill on the Onamalutu River; and
- ONR-009, Onamalutu River, immediately upstream of the confluence with the Wairau River.

Data for these sites are presented in Appendix D. Sampling at these sites took place at annual intervals in accordance with consent requirements.

The data in Appendix D indicates that the full suite of indicator parameters were sampled as required.

Annual sampling also took place in the leachate chamber (TIP-017) for all parameters as required.

3.3 Annual Site Inspection

The site inspection allows assessment of the physical condition of the Landfill and any associated infrastructure, including drains and pump systems.

The site inspection was undertaken by MDC engineering staff on 27th July 2012 and a copy of the site notes are attached at Appendix E, together with photos of the site in its current state.

Additional commentary is given in Section 4.3.

4.0 Assessment of Environmental Effects

There are two main receptors at risk from the Landfill: groundwater beneath the site and surface water in the Onamalutu River (and Lambert Creek) adjacent to the site. The

borehole used for abstraction close to the site is P28w/1284, located away from the site some 300 m north east of the site boundary. Based on monitoring of key chemical parameters at the site, the original CLMP indicates that the Australia and New Zealand Environment and Conservation Council (ANZECC) 95 % guideline values[3] are the appropriate reference points for surface water samples, while New Zealand Drinking Water Standards (NZDWS)[4] have been applied to groundwater samples.

4.1 Groundwater Results

Results from groundwater monitoring at the Landfill indicate that except for pH, there are no exceedances of the NZDWS in the 2011 and 2012 monitoring rounds. A wider range of parameters were sampled between 2009 and 2011, which showed some exceedances of Lead and Iron. However, these exceedances were not considered to be caused by the Landfill.

In keeping with previous monitoring, pH levels were below the NZDWS guideline in all boreholes, indicating that the pH of the background water quality is low and not reduced by processes occurring in the Landfill. A low pH is commonly encountered in shallow groundwaters in New Zealand that are dominated by rainfall recharge. No significant difference between samples from upgradient bores (P28w/1284 and 100050) and downgradient bores (10051, P28w/1850 and P28w/1851) was noted in the water quality results.

The results from the monitoring do not indicate any adverse effects on groundwater arising from the Landfill.

4.2 Surface Water Results (including Leachate Chamber)

As expected, elevated concentrations occurred in the leachate chamber (TIP-017) with Iron, Nitrate-N, and Zinc exceeding the ANZECC 95 % guideline values. However, the results indicate that there are no exceedances of the ANZECC 95 % guideline values for any of the indicator parameters in surface water samples from either the upgradient (ONR-008) or downgradient (ONR-009) sampling sites.

pH levels have occasionally been problematic in previous monitoring rounds, falling below the ANZECC guideline value in February 2009 and August 2009. However, pH levels in the two most recent sampling rounds were within the ANZECC 95 % guideline range (7-8.5) at both the sampling points (ONR-008 and ONR-009), which are in keeping with the results from prior monitoring in November 2009 and September 2010.

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[3] ANZECC, 2000. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. The 95 % level of protection intends to protect 95 % of aquatic species and is considered appropriate for a moderately disturbed ecosystem.

[4] Ministry of Health, 2008. Drinking Water Standards for New Zealand 2005 (Revised 2008). Wellington: Ministry of Health.

The results from the monitoring in 2011 and 2012 do not indicate any adverse effects on surface water quality arising from the Landfill.

4.3 Site Inspection

The site inspection indicated that the condition of the Landfill was generally good. No cracks or slumps were observed, nor was any exposed refuse evident at the site. The site is generally covered with vegetation, and pruning to control the spread of trees and gorse has been undertaken.

5.0 Conclusions and Recommendations for Future Monitoring

5.1 Conclusion

Overall, the effects of the Landfill on the surrounding environment are considered to be minor. However, monitoring should continue to ensure that any changes are identified. Recommendations for future monitoring are provided below.

5.2 Recommendations for Future Monitoring

1. Monitoring should continue to take place at the following groundwater monitoring locations: P28w/1284, P28w/1851, P28w/1850, 10051 and 10050. Analyses of samples should include the following indicator parameters: Ammonia-N, conductivity, pH, temperature and water levels.

2. Monitoring should start in the two new boreholes (10030 and 10031) at the next monitoring round (June 2013). Monitoring in the two new boreholes should overlap monitoring in the existing, deeper bores (P28w/1850 and P28w/1851) for a period of two years (until June 2015). An updated monitoring sheet is included as part of the updated CLMP (Rev.7, September 2012) at Appendix C.

3. Sampling at groundwater monitoring locations should take place on an annual basis and should be reviewed in August 2013, ideally after the 2013 sampling round has taken place and the results have been analysed.

4. Monitoring should continue to take place annually at the following surface water sites: ONR-008, ONR-009 and TIP-017. Analyses of samples should include the following indicator parameters: Ammonia-N, Arsenic, Boron, Cadmium, Chloride, Chemical Oxygen Demand, Conductivity, Iron, Lead, Nickel, Nitrate-N, Nitrite-N, pH, Sulphate, Total Suspended Solids, Temperature and Zinc.

5. Sampling at surface water monitoring locations should take place on an annual basis and should be reviewed in August 2013, ideally after the 2013 sampling round has taken place and the results have been analysed.

6. It would also be useful to estimate the flow in the surface water channels (Lambert Creek) and the water conditions at the time of sampling.

7. The Annual Site Inspection should continue to take place.

8. The proposed 2012-2013 monitoring schedule is attached at Appendix C and forms part of the updated CLMP (Rev. 7, October 2012) for the Kaituna Closed Landfill site.

Appendix A:

Figures

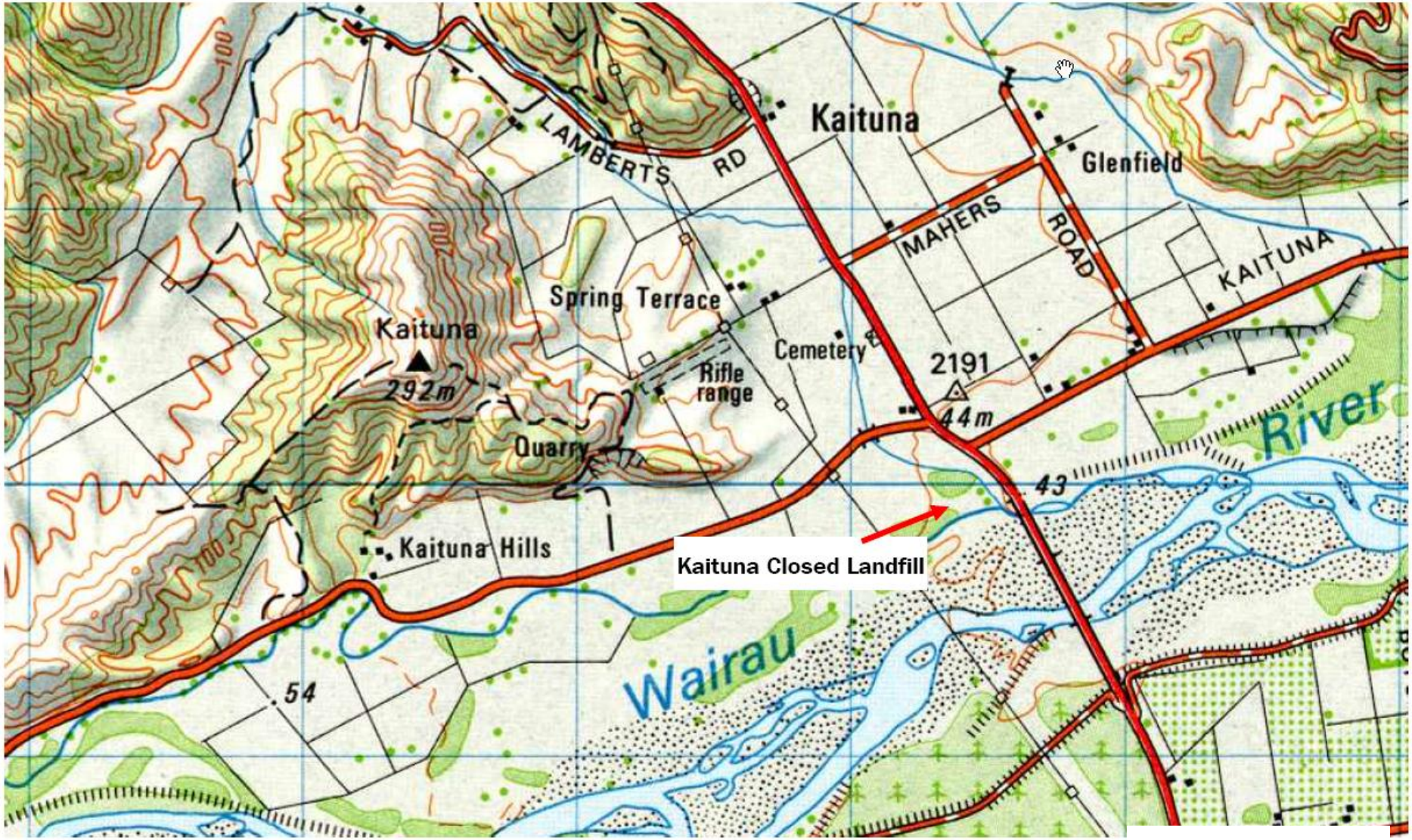

Figure 1: Location of Kaituna Closed Landfill

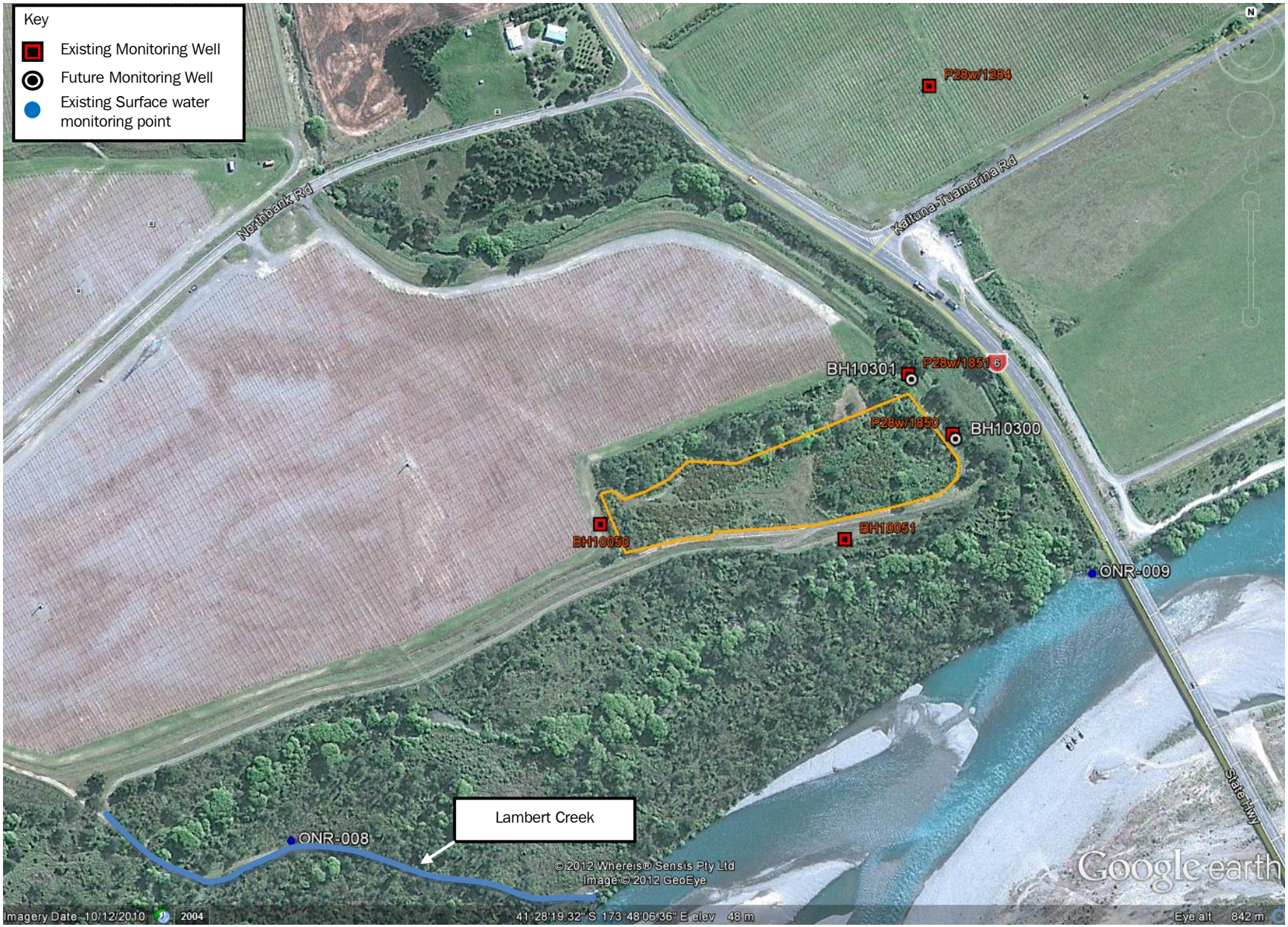

Figure 2: Location of Monitoring Points, Kaituna Closed Landfill

Appendix B:

Copy of Resource Consent Decision No. U080998

MARLBOROUGH
DISTRICT COUNCIL

ISO 9001:2000
Document Number:
RAD0010-CI984

RESOURCE MANAGEMENT ACT 1991

Decision on Application for Resource Consent

RESOURCE CONSENT No: U080998

APPLICANT: Marlborough District Council

This document contains a record of decision(s) on the following application for resource consent(s):

DISCHARGE PERMIT (TO LAND)
DISCHARGE PERMIT (TO AIR)

DECISION DATE:

22 April 2009

MARLBOROUGH DISTRICT COUNCIL
SEYMOUR SQUARE, P O BOX 443
BLENHEIM
NEW ZEALAND

TELEPHONE (0064) 3 520 7400
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WEB www.marlborough.govt.nz

Important Information

A resource consent is comprised of:

- A decision document (subject to the outcome of any appeals/objections), and;
- The application for resource consent, except where modified by conditions.

An information sheet is attached which sets out the provisions of the Resource Management Act 1991.

It is important that you keep this document in a safe place; together with any future amendments that may be made to conditions of the resource consent.

RESOURCE CONSENT DECISION

Decision No: U080998

Applicant: Marlborough District Council

Location of Activity: State Highway 6, Kaituna

Legal Description: Lot 1 DP 336803

Grid Reference:

Easting	2577426
Northing	5969963

Discharge Permit (to Land)

Pursuant to the Resource Management Act 1991 a resource consent has been GRANTED:

- To discharge landfill leachate onto and into land in circumstances that it may enter ground and surface water, from the closed Kaituna landfill on Lot 1 DP 336803.

This resource consent is subject to compliance with the following conditions:

1. The activity shall be undertaken in accordance with the application documents received by Council on 1 October 2008, and further information received 4 February 2009 and 18 March 2009 and held on Marlborough District Council file U080998, unless specified otherwise by the following conditions.

2. This consent shall expire on 1 April 2044.

3. Ongoing management of the site will occur in accordance with the Management Plan. The definition of the Management Plan is as follows:
   (a) For the purpose of this consent, the "Management Plan" shall be the "Marlborough District Council Closed Landfill Management Plan for Blenheim (Taylor Pass) Havelock, Kaituna, Picton, Rai Valley, Seddon, and Wairau Valley Landfills" prepared by Pattle Delamore Partners Limited, dated February 2009, Revision 0.1 attached to this consent, or any updated version of the Management Plan.
   (b) Any updated versions of the Management Plan shall be:
      (i) In accordance with the most recent version of the relevant guidelines for surface water and/or drinking water quality and closed landfill management or any equivalent guidelines; or
      (ii) For improving the understanding of and minimising environmental effects; and
      (iii) Consistent with the environmental monitoring programme conditions below.
   (c) It shall be prepared by a suitably qualified person in landfill management in consultation with the Manager, Resource Consents, Marlborough District Council (or nominee).
   (d) Any updated versions to the Management Plan shall be provided to the Manager, Compliance, Marlborough District Council.

Initial

4. Site inspections for landfill stability, site erosion and cover condition, evaluation and response shall be undertaken in accordance with section 4.0 monitoring and section 5.3 'Kaituna' of the management plan.

5. The location of the groundwater wells and surface water sampling sites monitored shall be in accordance with locations shown on the aerial photograph contained Appendix E of the management plan.

6. The consent holder shall supply to the Manager, Compliance, Marlborough District Council, with the GPS locations for the surface water sampling sites.

7. The parameters sampled shall be in accordance with section 4.1 monitoring of discharges to groundwater and surface water and table 1 of the management plan.

8. The frequency of sampling shall be in accordance with table 3 of the management plan.

9. All monitoring information shall be summarised in an annual report noting:
   (a) Raw data from all monitoring activities;
   (b) Interpretation and discussion of any important environmental trends or potential environmental effect(s) of leachate on groundwater, surface water and aquatic sediment quality;
   (c) Description of the environmental monitoring programme for groundwater, surface water and any aquatic sediment quality monitoring frequencies and parameters for the next reporting year and beyond. Any programme beyond two years will be indicative;
   (d) List any maintenance works needed, proposed or undertaken, including ongoing capping/coverage of the landfill, to ensure mitigation of environmental effects; and
   (e) GPS locations for where surface water samples were collected.

   This report (and all corresponding details) shall be provided to the Manager Compliance, Marlborough District Council, by 31 August each year.

10. In the event that the interpretation of environmental trends indicate actual environmental effect(s) (as agreed by Council's monitoring officer) of leachate on groundwater and/or surface water, the consent holder shall identify and implement appropriate responses or measures (refer to important notes) to mitigate any adverse effects in consultation with the Manager, Compliance, Marlborough District Council (or nominee).

11. In accordance with section 128 of the Resource Management Act 1991, the Marlborough District Council may review the conditions of this resource consent. This review may be conducted annually during September, for the duration of the consent, for the following purposes:
   (a) To review the effectiveness of the existing resource consent conditions in avoiding or mitigating any adverse effects on the environment from the exercise of this resource consent and, if necessary, to avoid, remedy or mitigate such effects by way of further or amended conditions.
   (b) To review the adequacy of and necessity for monitoring the effect(s) of the discharge on the environment.
   (c) Enabling Council to impose any further condition or take any further action requiring the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment arising out of the above matters.

Initial

REASONS FOR DECISION

The environmental effects arising from the discharge of leachate contaminant is a legacy of past waste disposal practices. In this instance the small volume of material and isolated location of the landfill means that the risk is assessed as low and effects arising from the landfill discharge are assessed as no more than minor.

The consent application is consistent with the purpose and principles in Part II of the Resource Management Act 1991 and overall, the proposal is consistent with the relevant objectives and policies in the Wairau/Awatere Resource Management Plan.

OTHER MATTERS

1. Unless otherwise specified, this is the full text of the decision.

Lapse Date

2. If no lapse date is specified in the conditions of this consent, the consent will lapse 5 years after the decision date, unless the consent has been actioned (given effect to).

   The lapse date is subject to the provisions of section 125 of the Resource Management Act 1991.

Appeal Information

3. If intending to appeal this decision, the appeal must be lodged with the Environment Court within 15 working days of the receipt of this decision.

Authorised under the Marlborough District Council's Instrument of Delegation by:

E.J. Davidson

.....

Marlborough District Council Commissioner/Delegated Officer

Dated this 22nd **day of** April **2009**

.....

Marlborough District Council Commissioner/Delegated Officer

Dated this 23rd **day of** April **2009**

RESOURCE CONSENT DECISION

Decision No: U080998

Applicant: Marlborough District Council

Location of Activity: State Highway 6, Kaituna

Legal Description: Lot 1 DP 336803

Grid Reference:

Easting	2577427
Northing	5969964

Discharge Permit (to Air)

Pursuant to the Resource Management Act 1991 a resource consent has been GRANTED:

- To discharge landfill gas to air from the closed Kaituna landfill on Lot 1 DP 336803.

This resource consent is subject to compliance with the following conditions:

1. The discharge of landfill gas shall occur in general accordance with the application documents received by Council on 1 October 2008 and held on Marlborough District Council file U080998, unless specified otherwise by the following conditions.

2. This consent shall expire on 1 April 2044.

3. Ongoing management of the site will occur in accordance with the Management Plan. The definition of the Management Plan is as follows:
   (a) For the purpose of this consent, the "Management Plan" shall be the "Marlborough District Council Closed Landfill Management Plan for Blenheim (Taylor Pass) Havelock, Kaituna, Picton, Rai Valley, Seddon, and Wairau Valley Landfills" prepared by Pattle Delamore Partners Limited, dated February 2009, Revision 0.1 attached to this consent, or any updated version of the Management Plan.
   (b) Any updated versions of the Management Plan shall be:
      (i) In accordance with the most recent version of the relevant guidelines for surface water and/or drinking water quality and closed landfill management or any equivalent guidelines; or
      (ii) For improving the understanding of and minimising environmental effects; and
      (iii) Consistent with the environmental monitoring programme conditions below.
   (c) It shall be prepared by a suitably qualified person in landfill management in consultation with the Manager, Resource Consents, Marlborough District Council (or nominee).
   (d) Any updated versions to the Management Plan shall be provided to the Manager. Compliance, Marlborough District Council.

Initial

4. There shall be no odour detectable beyond the boundary of the property that in the opinion of a Council Officer responsible for air quality functions, is offensive and objectionable.

5. In accordance with section 128 of the Resource Management Act 1991, the Marlborough District Council may review the conditions of this resource consent. This review may be conducted annually during September, for the duration of the consent, for the following purposes:
   (a) To review the effectiveness of the existing resource consent conditions in avoiding or mitigating any adverse effects on the environment from the exercise of this resource consent and, if necessary, to avoid, remedy or mitigate such effects by way of further or amended conditions.
   (b) To review the adequacy of and necessity for monitoring the effect(s) of the discharge on the environment.
   (c) Enabling Council to impose any further condition or take any further action requiring the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment arising out of the above matters.

REASONS FOR DECISION

The environmental effects arising from the discharge of landfill gas is a legacy of past waste disposal practices. In this instance the small volume of material, isolated location and infrequent use of the landfill means that the risk of the discharge is considered low and the effects arising from the landfill gas are assessed as no more than minor.

The consent application is consistent with the purpose and principles in Part II of the Act and overall, the proposal is consistent with the relevant objectives and policies in the Wairau/Awatere Resource Management Plan.

OTHER MATTERS

1. Unless otherwise specified, this is the full text of the decision.

Lapse Date

2. If no lapse date is specified in the conditions of this consent, the consent will lapse 5 years after the decision date, unless the consent has been actioned (given effect to).

   The lapse date is subject to the provisions of section 125 of the Resource Management Act 1991.

Appeal Information

3. If intending to appeal this decision, the appeal must be lodged with the Environment Court within 15 working days of the receipt of this decision.

Initial

Authorised under the Marlborough District Council's Instrument of Delegation by:

E.L.Davidson
.....
Marlborough District Council Commissioner/Delegated Officer

Dated this 22nd **day of** April **2009**

.....
Marlborough District Council Commissioner/Delegated Officer

Dated this 23rd **day of** April **2009**

ADVICE NOTE

In terms of remediation referred to in condition 10, appropriate response measures in this instance may include but are not limited to: (a) the surface of the landfill will be capped to minimise the infiltration of water, (b) the surface of the landfill will be contoured to facilitate surface runoff and prevent ponding of surface water on the landfill, and (c) biological monitoring of aquatic macro invertebrate communities.

ANNOTATION HISTORY

Date	Reason for Amendment/Alteration

Record No: 0982533

Appendix C:

Updated Extract Closed Landfill Management Plan, Rev. 7, October 2012

5.3 Kaituna

The Kaituna Closed Landfill ('the Landfill') has resource consents to discharge landfill gas to air and leachate into land in circumstances that it may enter ground water and surface water namely the Onamalutu River. Copies of the consent conditions and a site location plan are attached in Appendices A and B of the 2011-2012 Annual Monitoring Report.

5.3.1 Recommended Remedial works

Overall, an assessment of the environmental monitoring data suggests that the Landfill is not having an adverse effect on the water quality of the Onamalutu River or groundwater. Due to historical situations relating to inappropriate sampling locations, inconsistent measurement of individual parameters and variation in sampling frequencies, the assessment of long term trends and comparisons between sample locations is limited. However, based on an analysis of the environmental monitoring data collected to date, significant remedial work, such as final capping of the Landfill does not appear necessary and is not recommended at this stage.

To gain a better understanding of the potential for leachate to enter groundwater, two new monitoring bores (10030 and 10031) were installed in 2011 and monitoring will be undertaken at these wells for the 2012-2013 monitoring period.

5.3.2 Environmental Monitoring Programme 2012-2013

During each site visit, particular observations should be made with regards to:

- Any exposed refuse on the Landfill surface; and
- Erosion of the banks of the Onamalutu River adjacent to the Landfill

Groundwater shall be monitored at the following locations;

- Upgradient monitoring wells (10050 and P28w/1284);
- Monitoring well on the southern margin of the Landfill (10051); and
- Downgradient wells (10030, 10031, P28w/1850 and P28w/1851)

Surface water of the Onamalutu River shall be monitored at the following locations concurrent with site visits performed to monitor groundwater:

- An upstream sampling site on the Onamalutu River (ONR-008);
- A downstream site, located immediately upstream of the confluence with the Wairau River (ONR-009); and
- The leachate chamber (TIP-017)

A summary list of monitoring parameters is provided in the table below:

Recommended Environmental Monitoring Programme 2012-2013 (Kaituna Closed Landfill)			
	Monitoring Points	**Frequency**	**Analyses**

Recommended Environmental Monitoring Programme 2012-2013 (Kaituna Closed Landfill)			
	Monitoring Points	**Frequency**	**Analyses**
Site Inspection	Entire site	Annual	Monitor for any signs of exposed refuse on the Landfill surface Erosion of the banks of the Onamalutu River adjacent to the Landfill.
Groundwater	Upgradient monitoring wells (P28w/1284 10050) Monitoring well on the southern margin of the Landfill (10051) Downgradient wells: P28w/1850, P28w/1851, 10030 and 10031	Annual	Indicator parameters: Ammonia-N, Conductivity, pH, Temperature and water levels.
Surface Water	ONR-008 (Upstream of the landifill on the Onamalutu River) ONR-009 (Onamalutu River, immediately upstream of the confluence with the Wairau River)	Annual	Indicator parameters: Ammonia-N, Arsenic, Boron, Cadmium, Chloride, Chemical Oxygen Demand, Conductivity, Iron, Lead, Nickel, Nitrate-N, Nitrite-N, pH, Sulphate, Totsl Suspended Solids, Temperature and Zinc.
Landfill Gas	Not required at this site		
Leachate Chamber	TIP-017 (KV-4)	Annual	Indicator parameters (as for surface water).

Appendix D:

Summary of Environmental Monitoring Results 2009 - 2012

Appendix D -Groundwater Monitoring

Kaituna Landfill

10050 (Upgradient of the landfill, adjacent to the vineyard)

Parameter	units	New Zealand Drinking Water Standards	25-Feb-2009	26-Aug-2009	11-Feb-2010	27-May-2010	16-Aug-2010	29-Sep-2010	17-Nov-2010	26-Sep-2011	25-Jun-2012
Required Parameters											
Ammonia-N*	g/m3	1.5			0.005	0.006	0.005	0.005	0.013		0.005
Arsenic	g/m3	0.01			0.001						
Boron	g/m3	1.4			0.03						
Cadmium	g/m3	0.004			0.0005						
Chloride*	g/m3	250			7						
COD	g/m3				4						
Conductivity	mS/m				6.8	5.9	5.8	5.8	5.8	**6.1**	**6**
Iron (soluble)*	g/m3	0.2			**0.58**						
Lead	g/m3	0.01			0.003						
Nickel	g/m3	0.08			0.0005						
Nitrate-N	g/m3	11.300			0.21						
Nitrite-N	g/m3	0.9									
pH*	pH units	outside of the 7.0-8.5 range			**6.6**	**6.57**	**6.63**	**6.77**	**6.37**	**6.51**	**6.57**
Sulphate*	g/m3	250			1.9						
Total Suspended Solids	g/m3				15						
Temperature (field)	oC										11.8
Zinc*	g/m3	1.5			0.005						

Notes:

* Denotes parameters with drinking water aesthetic guideline value only

Shading Indicates Exceedence of Drinking water standard

Bold Font Indicates Exceedence of Aesthetic Guideline Value

Appendix D -Groundwater Monitoring

Kaituna Landfill

10051 (Adjacent to leachate sump, southern margin of the landfill)

Parameter	**units**	**New Zealand Drinking Water Standards**	25-Feb-2009	26-Aug-2009	11-Feb-2010	27-May-2010	16-Aug-2010	29-Sep-2010	17-Nov-2010	26-Sep-2011	25-Jun-2012
Required Parameters											
Ammonia-N***	g/m3	1.5				0.005	0.005	0.005	0.012		0.005
Arsenic****	g/m3	0.01									
Boron	g/m3	1.4									
Cadmium	g/m3	0.004									
Chloride	g/m3	250									
COD	g/m3										
Conductivity	mS/m					5.5	5.8	5.8	5.8	6.1	6
Iron (soluble)**	g/m3	0.2									
Lead	g/m3	0.01									
Nickel	g/m3	0.08									
Nitrate-N	g/m3	11.300									
Nitrite-N	g/m3	0.9									
pH	pH units	outside of the 7.0-8.5 range				**6.37**	**6.78**	**6.77**	**6.28**	**6.54**	**6.76**
Sulphate	g/m3	250									
Total Suspended Solids	g/m3										
Temperature (field)	oC										
Zinc	g/m3	1.5									

Notes:

* Denotes parameters with drinking water aesthetic guideline value only

Shading Indicates Exceedence of Drinking water standard

Bold Font Indicates Exceedence of Aesthic Guideline Value

Appendix D -Groundwater Monitoring

Kaituna Landfill

P28w/1284 (Background levels)

Parameter	**units**	**New Zealand Drinking Water Standards**								
Required Parameters			25-Feb-2009	26-Aug-2009	11-Feb-2010	27-May-2010	16-Aug-2010	29-Sep-2010	17-Nov-2010	26-Sep-2011	25-Jun-2012
Ammonia-N***	g/m3	1.5	0.005	0.005				0.005			0.005
Arsenic****	g/m3	0.01									
Boron	g/m3	1.4									
Cadmium	g/m3	0.004									
Chloride	g/m3		7	6.5							
COD	g/m3		4	4							
Conductivity	mS/m		7.4	7.3				7.1		7	5.8
Iron (soluble)**	g/m3	0.2	**1**	**1.1**							
Lead	g/m3	0.01	0.006	0.007							
Nickel	g/m3	0.08									
Nitrate-N	g/m3	11.300	0.35	0.45							
Nitrite-N	g/m3		0.03	0.03							
pH	pH units	outside of the 7.0-8.5 range	7.1	**6.6**				**6.93**		**6.89**	**6.99**
Sulphate	g/m3										
Total Suspended Solids	g/m3										
Temperature (field)	oC										
Zinc	g/m3	1.5	0.014	0.017							

Notes:

* Denotes parameters with drinking water aesthetic guideline value only

Shading Indicates Exceedence of Drinking water standard

Bold Font Indicates Exceedence of Aesthic Guideline Value

Appendix D -Groundwater Monitoring

Kaituna Landfill

P28w/1850 (Downgradient of the landfill)

Parameter	**units**	**New Zealand Drinking Water Standards**	25-Feb-2009	26-Aug-2009	11-Feb-2010	27-May-2010	16-Aug-2010	29-Sep-2010	17-Nov-2010	26-Sep-2011	25-Jun-2012
Required Parameters											
Ammonia-N***	g/m3	1.5	0.005	0.005				0.005			0.005
Arsenic****	g/m3	0.01	0.001	0.001							
Boron	g/m3	1.4	0.02	0.02							
Cadmium	g/m3	0.004	0.0005	0.0005							
Chloride	g/m3		5.5	5.2							
COD	g/m3		4	8							
Conductivity	mS/m		6.5	6.4				5.7		6.1	6.3
Iron (soluble)**	g/m3	0.2	0.016	0.046							
Lead	g/m3	0.01	**0.011**	0.008							
Nickel	g/m3	0.08	0.0005	0.0005							
Nitrate-N	g/m3	11.300	0.23	0.38							
Nitrite-N	g/m3		0.03	0.03							
pH	pH units	outside of the 7.0-8.5 range	**6.9**	**6.5**				**6.75**		**6.83**	**6.68**
Sulphate	g/m3										
Total Suspended Solids	g/m3										
Temperature (field)	oC			9.8							
Zinc	g/m3	1.5	0.005	0.008							

Notes:

* Denotes parameters with drinking water aesthetic guideline value only

Shading Indicates Exceedence of Drinking water standard

Bold Font Indicates Exceedence of Aesthic Guideline Value

Appendix D -Groundwater Monitoring

Kaituna Landfill

P28w/1851 (Downgradient of the landfill)

Parameter	**units**	**New Zealand Drinking Water Standards**	25-Feb-2009	26-Aug-2009	11-Feb-2010	27-May-2010	16-Aug-2010	29-Sep-2010	17-Nov-2010	26-Sep-2011	25-Jun-2012
Required Parameters											
Ammonia-N***	g/m3	1.5	0.008	0.005				0.005			0.005
Arsenic****	g/m3	0.01									
Boron	g/m3	1.4									
Cadmium	g/m3	0.004									
Chloride	g/m3		5.8	4.9							
COD	g/m3		4	8							
Conductivity	mS/m		6.8	6.6				6.3		6.2	6.6
Iron (soluble)**	g/m3	0.2	0.022	0.041							
Lead	g/m3	0.01	**0.01**	0.007							
Nickel	g/m3	0.08									
Nitrate-N	g/m3	11.300	0.35	0.36							
Nitrite-N	g/m3		0.03	0.03							
pH	pH units	outside of the 7.0-8.5 range	7.2	**6.5**				**6.66**		**6.34**	**6.64**
Sulphate	g/m3										
Total Suspended Solids	g/m3										
Temperature (field)	oC		15.1	9.8							
Zinc	g/m3	1.5	0.006	0.012							

Notes:

*** Denotes parameters with drinking water aesthetic guideline value only**

Shading Indicates Exceedence of Drinking water standard

Bold Font Indicates Exceedence of Aesthic Guideline Value

Appendix D - Surface Water Monitoring

Kaituna Landfill

ONR-008- Upstream of the Landfill on the Onamalutu River

Parameter	units	ANZECC (2000) Freshwater Aquatic (95% Level of Protection)	ANZECC (2000) Freshwater Aquatic (90% Level of Protection)	*Date collected* 25-Feb-2009	7-May-2009	26-Aug-2009	12-Nov-2009	29-Sep-2010	20-Sep-2011	25-Jun-2012
Required Parameters										
Ammonia-N***	g/m3	0.9	1.43	0.005	0.005	0.005	0.005	0.005		0.005
Arsenic****	g/m3	0.013	0.042					0.001		0.0005
Boron	g/m3	0.37	0.68	0.02	0.02	0.02	0.02	0.02		0.01
Cadmium	g/m3	0.0002	0.0004					<0.0005		0.00005
Chloride	g/m3			5.6	5.8	17	6.3	5.3		4.1
COD	g/m3			4	7	15	4	4		5
Conductivity	mS/m			6.1	5.7	4.7	6.1		6.3	4.5
Iron (soluble)*'	g/m3	0.3	0.3	0.061	0.063	0.27	0.075	0.12		0.13
Lead	g/m3	0.0034	0.0056	0.003	0.003	0.003	0.003	0.003		0.0002
Nickel	g/m3	0.011	0.013					<0.0005		0.0005
Nitrate-N	g/m3	0.700	3.40	0.21	0.23	0.45	0.16	0.2		0.25
Nitrite-N	g/m3			0.03	0.03	0.03	0.03	0.001		0.002
pH	pH units	outside of the 7.2-7.8 range		7	7.2	6.9	7.4	7.58	7.8	7.42
Sulphate	g/m3							1.4		1
Total Suspend	g/m3			2	2	39	2	1		5
Temperature ('	oC			14.3	10.6	10.9	11.5	13.3	11.4	8.5
Zinc	g/m3	0.008	0.015	0.005	0.005	0.005	0.005	0.005		0.005

Notes:

Guidelines used as reference, leachate sump is not a natural receiving environment

ANZECC 2000 Guideline values based on 95% protection for aquatic species

* analyses unable to be performed

** Interim values used, refer to guidelines (section 8.3.7) for trigger level details

***Based on 95% level of protection and pH = 8.0, ANZECC 2000

****Based on Arsenic V, 95% level of protection, ANZECC 2000

Shading Indicates Exceedence of 90% Guideline Value (and 95 % Guideline Value)

Bold Font Indicates Exceedence of 95% Guideline Value

Appendix D - Surface Water Monitoring

Kaituna Landfill

ONR-009 Downstream of the landfill and immediately upstream of the confluence with the Wairau River

Parameter	units	ANZECC (2000) Freshwater Aquatic (95% Level of Protection)	ANZECC (2000) Freshwater Aquatic (90% Level of Protection)	Date collected						
Required Parameters				25-Feb-2009	7-May-2009	26-Aug-2009	12-Nov-2009	29-Sep-2010	26-Sep-2011	25-Jun-2012
Ammonia-N***	g/m3	0.9	1.43	0.005	0.005	0.008	0.005	0.005		0.005
Arsenic****	g/m3	0.013	0.042					0.001		0.0005
Boron	g/m3	0.37	0.68	0.02	0.02	0.02	0.02	0.02		0.01
Cadmium	g/m3	0.0002	0.0004					<0.0005		0.00005
Chloride	g/m3			5.8	5.7	3.1	6.3	5.2		4
COD	g/m3			4	6	14	4	4		4
Conductivity	mS/m			6.1	5.7	4.6	6		6.4	4.5
Iron (soluble)*'	g/m3	0.3	0.3	0.062	0.068	0.28	0.072	0.054		0.14
Lead	g/m3	0.0034	0.0056	0.003	0.003	0.003	0.003	0.003		0.0002
Nickel	g/m3	0.011	0.013					0.0005		0.0005
Nitrate-N	g/m3	0.700	3.40	0.22	0.22	0.43	0.18	0.19		0.25
Nitrite-N	g/m3			0.03	0.03	0.03	0.03	0.001		0.002
pH	pH units	outside of the 7.2-7.8 range		7.1	7.2	7	7.3	7.46	7.44	7.54
Sulphate	g/m3							1.5		1.1
Total Suspend	g/m3			1	3	30	2	1		5
Temperature ('	oC			14.3	10.6	10.7		13.6	12.8	8.6
Zinc	g/m3	0.008	0.015	0.005	0.005	0.005	0.005	0.005		0.005

Notes:

Guidelines used as reference, leachate sump is not a natural receiving environment

ANZECC 2000 Guideline values based on 95% protection for aquatic species

* analyses unable to be performed

** Interim values used, refer to guidelines (section 8.3.7) for trigger level details

***Based on 95% level of protection and pH = 8.0, ANZECC 2000

****Based on Arsenic V, 95% level of protection, ANZECC 2000

Shading Indicates Exceedence of 90% Guideline Value (and 95 % Guideline Value)

Bold Font Indicates Exceedence of 95% Guideline Value

Appendix D - Surface Water Monitoring

Kaituna Landfill

TIP-017 Leachate Chamber

Parameter	units	ANZECC (2000) Freshwater Aquatic (95% Level of Protection)	ANZECC (2000) Freshwater Aquatic (90% Level of Protection)	*Date collected* 25-Feb-2009	7-May-2009	26-Aug-2009	12-Nov-2009	29-Sep-2010	26-Sep-2011	25-Jun-2012
Required Parameters										
Ammonia-N***	g/m3	0.9	1.43	35	16	0.42	0.51	0.16		0.157
Arsenic****	g/m3	0.013	0.042	0.003	0.001	0.001	0.001	0.001		0.005
Boron	g/m3	0.37	0.68	0.23	**0.37**	0.25	0.16	0.21		0.28
Cadmium	g/m3	0.0002	0.0004	0.001	<0.0005	<0.0005	<0.0005	<0.0005		0.0005
Chloride	g/m3			25	51	22	12	16		11.4
COD	g/m3			570	170	63	40	39		55
Conductivity	mS/m			130	120	90	69	73.2	78.7	72.4
Iron (soluble)*'	g/m3	0.3	0.3	30	2.9	0.85	1	0.27		3.4
Lead	g/m3	0.0034	0.0056	**0.005**	**0.004**	0.003	0.003	0.003		0.002
Nickel	g/m3	0.011	0.013	0.0023	0.0026	0.0016	0.0015	0.0012		0.005
Nitrate-N	g/m3	0.700	3.40	0.03	3.4	4	**2.6**	5.5		6.4
Nitrite-N	g/m3			0.03	0.25	0.03	0.03	0.022		0.109
pH	pH units	outside of the 7.2-7.8 range		7	7.5	7.6	7.1	7.02	7.35	7.39
Sulphate	g/m3							11		22
Total Suspend	g/m3			350	31	7	3	2		18
Temperature ('	oC			15.4	13	8.8	10.7	10	10.5	10.2
Zinc	g/m3	0.008	0.015	0.061	**0.013**	0.007	**0.011**	0.007		0.04

Notes:

Guidelines used as reference, leachate sump is not a natural receiving environment

ANZECC 2000 Guideline values based on 95% protection for aquatic species

* analyses unable to be performed

** Interim values used, refer to guidelines (section 8.3.7) for trigger level details

***Based on 95% level of protection and pH = 8.0, ANZECC 2000

****Based on Arsenic V, 95% level of protection, ANZECC 2000

Shading Indicates Exceedence of 90% Guideline Value (and 95 % Guideline Value)

Bold Font Indicates Exceedence of 95% Guideline Value

Appendix E:

Assets & Services monitoring sheets

Marlborough District Council – Annual [Site] Closed Landfill Inspection Report

TRIM: 11112365

Site	Kaituna
Date and time of inspection	25 July 2012, 4pm
Weather	Dry
Inspector(s)	Alec McNeil

Closed Landfill Site Inspection (Annual)	**Yes**	**No**	**Photo**	**Comments / Action required (Refer to attached sheet if required)**
• Cap condition (cracks or slumps evident?)		✔		
• Site stability (erosion evident?)		✔	✔	**Observation:** site is undulating in contour
• Exposed refuse?		✔		
• Site fencing suitable?		✔		
• Distressed Vegetation?		✔		
• Other onsite req? – review plans and planning decisions before visiting (eg): o Sump cleaning o New fencing o New kerbing		✔	✔	**Observation:** tree pruning and gorse control has been undertaken
Photographs				

Additional Comments	
General	

Notes written by Alec McNeil on 25/7/12.

Observation: site is undulating in contour

Observation: tree pruning and gorse control has been undertaken