

Inglewood Metal Limited  
Quarry Monitoring Programme  
Annual Report  
2010-2011

Technical Report 2011-12

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## Executive summary

Inglewood Metal Ltd operates a quarry located at Everett Road in the Kurapete catchment. The Company holds a resource consent to allow it to discharge treated washwater, stormwater and groundwater into an unnamed tributary of the Kurapete Stream. The quarry treats washwater and stormwater/groundwater within a series of retention/settlement ponds within the quarry pit and also at normal ground level, and utilises washwater re-circulation as much as possible. This report for the period July 2010-June 2011 describes the monitoring programme implemented by the Taranaki Regional Council to assess the Company's environmental performance during the period under review, and the results and effects of the Company's activities.

The Company holds one resource consent, which includes a total of fifteen special conditions setting out the requirements that the Company must satisfy. This renewed consent was granted in May 2004 for a period expiring in June 2015, with the next optional review in June 2012.

The Council's monitoring programme included six scheduled inspections (including on-site liaison with management staff), five discharge and three receiving water physicochemical surveys, and one biological survey of receiving waters.

Over the 2010-2011 year the Inglewood Metal Ltd quarry site has demonstrated a high level of environmental performance and compliance with its resource consent; the best performance to date. There were no incidents recorded during the monitoring year. Monitoring of the site has shown that, under varying receiving water flow conditions, the Inglewood Metal Ltd quarry site had minor impacts on the appearance of the receiving waters of the Kurapete Stream and on all occasions, was compliant with receiving water consent conditions. Good maintenance of the settlement facilities resulted in reduced suspended solids loadings and lessened the turbidity impact on the Kurapete Stream at all times during the monitoring year, with effects on the receiving environment of the Kurapete Stream generally found to be insignificant (with minimal re-suspension of fine sediment in the receiving water tributary). Reconfiguration of the combined washwater and quarry pit stormwater/groundwater treatment ponds system had been necessary to achieve compliance after a breach of a consent condition in the previous season, and this was particularly effective. No impacts on the biological community of the stream was found during a low flow, late summer period, with limited silt deposition on the streambed a short distance downstream beyond the consented mixing zone

The construction of larger silt ponds on the quarry lower floor area and better use of their retention capabilities has helped to improve containment of quarry silts, thereby reducing the turbidity effects in the receiving waters, particularly as the active quarry stormwater catchment has increased in area and iron-laden groundwater compounds turbidity issues. Also containment of the washwater recirculation system has been essential to avoid overloading of the fine silt content of the final wastewater pond discharge. These issues were discussed with the quarry manager at the time of appropriate inspection visits and annual report production in the 2009-2010 period and were addressed during the current period.

Fencing and planting of the DOC reserve on both banks of the Kurapete Stream from downstream of the unnamed tributary to the Everett Road bridge, which was completed in the 2003-2004 year, together with more recent riparian fencing and planting along the remaining bank of the tributary stream, have also mitigated the effects on the Kurapete Stream, and significantly added to the aesthetic value of the lower stream reach.

This report includes recommendations for the 2011-2012 monitoring year and does not require a review of the consent prior to its expiry date of June 2015.

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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 2010-June 2011 by the Taranaki Regional Council on the monitoring programme associated with a resource consent held by Inglewood Metal Ltd. The Company operates a quarry situated at Everett Road, Inglewood.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the consent held by Inglewood Metal Ltd that relate to discharges of treated wastes (consent number 1113) within the Kurapete catchment. This is the sixteenth Annual Report to be prepared by the Taranaki Regional Council to cover the Company's stormwater and washwater discharges and their effects.

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

Section 1 of this report is a background section. It sets out general information about compliance monitoring under the Resource Management Act and the Council's obligations and general approach to monitoring sites through annual programmes, the resource consents held by Inglewood Metal Ltd in the Kurapete catchment, the nature of the monitoring programme in place for the period under review, and a description of the activities and operations conducted in the lower Kurapete Stream catchment.

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 2011-2012 monitoring year.

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

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

The Resource Management Act 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 (eg, recreational, cultural, or aesthetic);
- (e) risks to the neighbourhood or environment.

In drafting and reviewing conditions on discharge permits, and in implementing monitoring programmes, the Taranaki Regional Council is recognising the comprehensive meaning of 'effects' inasmuch as is appropriate for each discharge source. Monitoring programmes are not only based on existing permit conditions, but also on the obligations of the Resource Management Act to assess the effects of the exercise of consents. In accordance with section 35 of the Resource Management Act 1991, the Council undertakes compliance monitoring for consents and rules in regional plans; and maintains an overview of performance of resource users against regional plans and consents. Compliance monitoring, including impact monitoring, also enables the Council to continuously assess its own performance in resource management as well as that of resource users particularly consent holders. It further enables the Council to continually re-evaluate its approach and that of consent holders to resource management, and, ultimately, through the refinement of methods, to move closer to achieving sustainable development of the region's resources.

#### 1.1.4 Evaluation of environmental performance

Besides discussing the various details of the performance and extent of compliance by the Inglewood Metal Ltd quarry in the Kurapete catchment during the period under review, this report also assigns an overall rating. The categories used by the Council, and their interpretation, are as follows:

- a **high** level of environmental performance and compliance indicates that essentially there were no adverse environmental effects to be concerned about, and no, or trivial (such as data supplied after a deadline) non-compliance with conditions.
- a **good** level of environmental performance and compliance indicates that adverse environmental effects of activities during the year were negligible or minor at most, items of concern were resolved positively, co-operatively, and quickly, the Council did not record any verified unauthorised incidents involving significant environmental impacts and was not obliged to issue any abatement notices, there were perhaps some items noted on inspection notices for attention but these items were not urgent nor critical, and follow-up inspections showed they have been dealt with.
- **improvement desirable** indicates that the Council may have been obliged to record a verified unauthorised incident involving significant environmental impacts against the company, and/or abatement notices may have been issued; there were adverse environmental effects arising from activities and intervention by Council staff was required, and there were matters that required urgent intervention, took some time to resolve, or remained unresolved at end of the period under review.
- **poor** performance is used when there were grounds for prosecution or infringement notice

## 1.2 Process description

The Inglewood Metal Ltd quarrying operation is located to the true right of the Kurapete Stream at Everett Road, near Inglewood. Some washing is performed at the site and the machinery includes a dry crusher and a washing and screening plant.

Waste washwater is directed through a series of settling ponds before being either reticulated for washing or discharged via a further series of ponds to the head of the unnamed tributary. The two hectares quarrying area is contoured and bunded so that groundwater and stormwater are directed back to the settling ponds in the base of the quarry floor (Figure 1) before being pumped to the pond system for washing or discharging through to the final pond and then to an unnamed tributary of the Kurapete Stream. Over recent years there has been some variability in the configuration of the upper settlement ponds system receiving the quarry floor wastewater prior to discharge to the stream.

Discharge from the final treatment pond is via a steel pipe access culvert to the unnamed tributary of the Kurapete Stream which flows approximately 600 metres before joining the Kurapete Stream upstream of the Everett Road Bridge.

Gravel filtered surface runoff from the entrance to the quarry, off Everett Road, and the upstream farm drainage enter the northern boundary drain which discharges into the unnamed tributary (Figure 1).

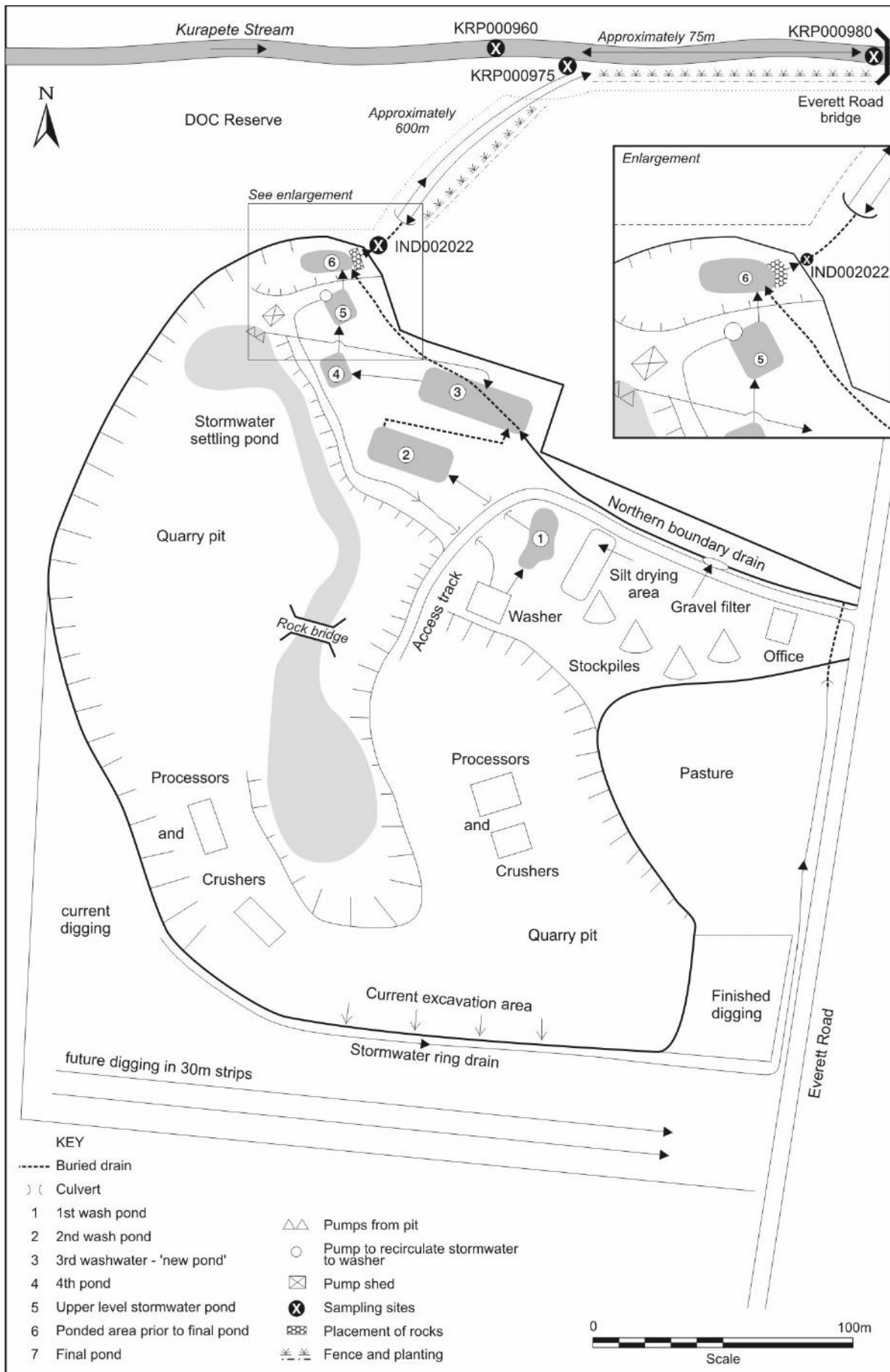
Quarry management had advised that the northern quarry face will continue to be excavated and larger ponds have been constructed on the quarry floor for improved retention and settlement prior to pumping groundwater and stormwater to the upper ponds' system.

## 1.3 Resource consents

### 1.3.1 General

In the past, a large percentage of aggregate production came from river-based sites within Taranaki. The Waiwhakaiho River supplied much of New Plymouth's requirements as far back as the 1950s with the Waitara River, Waiongana River, Kapuni Stream and Waingongoro River also providing a valuable source of aggregate. The aggregate source within these rivers was often over-exploited. The protective armouring of the boulders and gravel was removed in places, exposing the underlying erodible ash beds and creating deep narrow channels, which moved progressively upstream with no noticeable recovery. This brought about the need for the Shingle Extraction Bylaw introduced in 1974. Aggregate extraction from rivers was then controlled through the issue of permits accompanied by a set of conditions, with the removal of river-based aggregate being restricted to that for river control purposes only.

Historically, land-based sites required steady markets to compete with the easily won river-based extraction operations. However, in the early 1980s, due to the restriction placed on river-based aggregate extraction (and the completion of various major river control programmes and 'Think Big' projects) land-based sites became more widespread (Taranaki Regional Council, 1992)



**Figure 1** Quarry operations, wastewater treatment system and location of sampling sites

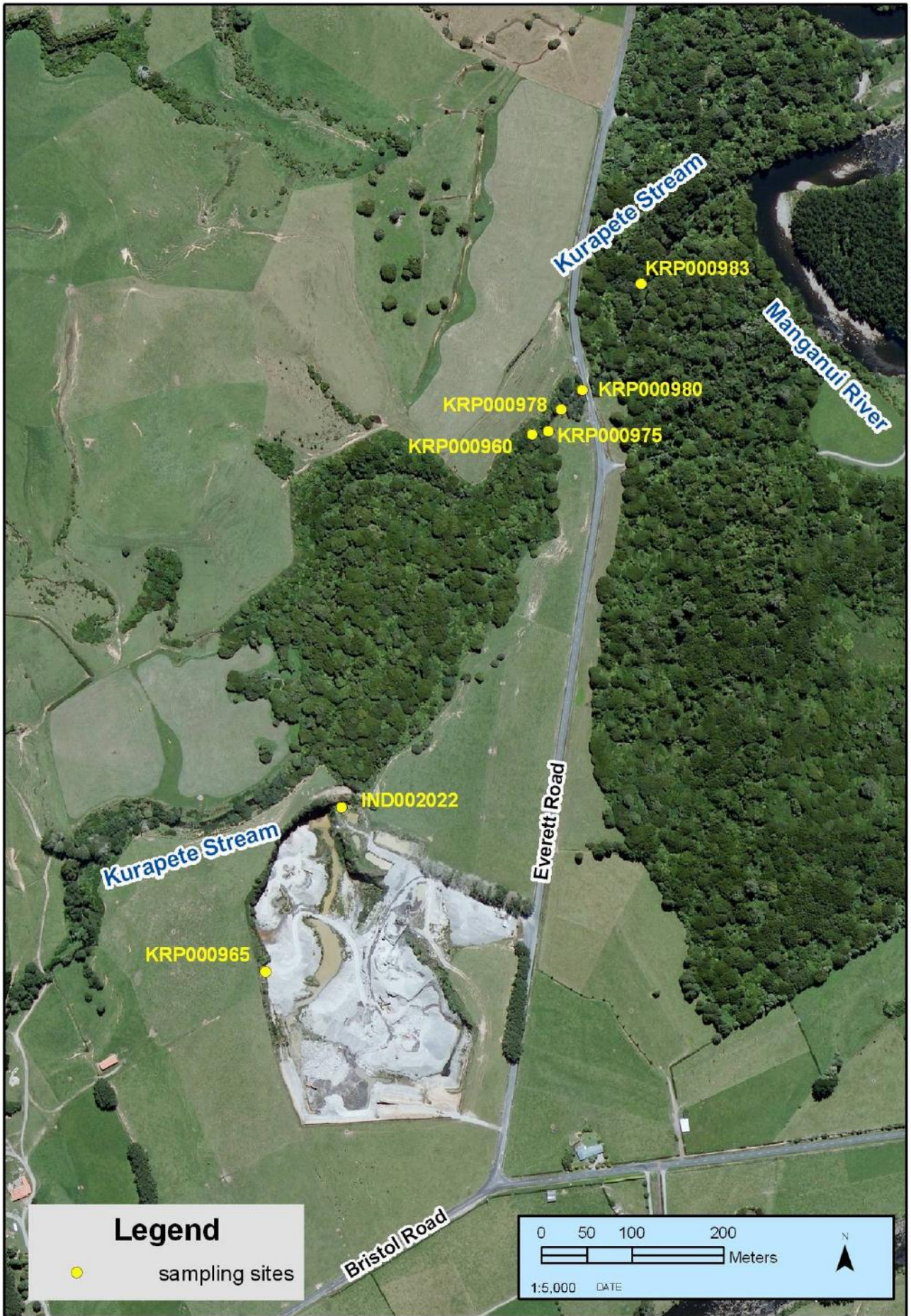


Figure 2 Aerial location map

Twenty-eight operating quarries presently supplying aggregate in Taranaki are monitored for consent compliance. These quarries are generally located in reasonable proximity to urban areas, from which the greatest demand for aggregate stems.

Provision of aggregate to meet longer-term demand will continue to be dominated by several large quarry operations. Extra demand on alluvial terraces and lahatic deposits has occurred due to the controlled river bed extraction. These resources are of good quality and are relatively plentiful, although Taranaki aggregates are known to have a lower crushing strength [85 kN] than aggregates from most other parts of New Zealand. Importation of various aggregates may need to continue to meet the requirement for aggregate types not available in Taranaki.

Quarrying and shingle extraction in Taranaki is covered by the Resource Management Act and, if the minerals in question are Crown owned, by the Crown Minerals Act 1991.

Regional councils have no control over the provision of exclusive rights to minerals. However, regional councils do have control over the environmental effects of aggregate extraction from river and lake beds, and land in certain circumstances, and these controls may act as a constraint or limitation on allocation decisions.

Sections 15 and 30 of the Resource Management Act 1991 give regional councils responsibility for the discharge of contaminants into the environment. Discharges of water into water, contaminants onto or into land that may result in water contamination, and contaminants from industrial premises into air or onto/into land, may not take place unless expressly allowed by a rule in a regional plan, a resource consent, or regulations.

Aggregate extraction usually involves washing aggregates, and therefore requires the discharge of wastes. Other discharges, such as emissions to air from crushing and processing plants, disposal of spoil and solid wastes, and discharges of stormwater are also the responsibility of regional councils.

### **1.3.2 Water abstraction permit**

Inglewood Metal previously held a resource consent to abstract surface water for washing metal. Water from the final washwater ponds is now recirculated and used for washing. Therefore a consent was no longer required and the resource consent (1112) was surrendered at the time of its expiry.

### **1.3.3 Water discharge permit**

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

Water quality is a primary concern to the Regional Council with regard to aggregate extraction. A quarry can operate as either a 'dry' quarry discharging only stormwater or a 'washing' quarry where aggregate washing facilities are in place. Many of the quarries in Taranaki have some form of washing facility and also operate in the vicinity of a water body or have some form of discharge into a water body.

Waste water from aggregate washing has a high silt concentration. Discharge of this water into a waterbody, particularly to a river during low flow, results in a smothering of instream life and deterioration in aesthetic conditions and can affect downstream abstractions of water, local fisheries and recreational activity.

Stormwater is generally less contaminated (in terms of silt concentration) and run-off tends to occur when rivers and streams are in higher flow. This means that the effect of silt contamination is reduced due to lower quantities, dilution and carrying capacity. The installation of appropriate stormwater diversion structures, together with construction and maintenance of contaminated stormwater and aggregate washing discharge treatment facilities, are most important in maintaining water quality.

Inglewood Metal Ltd currently holds discharge consent **1113-4** to cover the discharge of treated stormwater (including groundwater seepage) and treated washwater into an unnamed tributary of the Kurapete Stream. This consent (see Appendix I) was renewed by the Taranaki Regional Council on 20 May 2004 as a resource consent under Section 87(e) of the Resource Management Act. It expires on 1 June 2015.

There are fifteen special conditions associated with the discharge permit **1113-4**. Of these, eight conditions relate to the operation and management of quarrying activities and the treatment system; two conditions are related to reinstatement requirements; one condition requires provision of contingency planning; and three conditions relate to treated wastewater quality and limit effects of the discharge on the receiving water (Kurapete Stream) quality. A further condition provides for review of the consent should this be necessary.

## **1.4 Monitoring programme: water**

### **1.4.1 Introduction**

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

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

The monitoring programme for the Inglewood Metal Ltd site consisted of four primary components.

### **1.4.2 Programme liaison and management**

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

### **1.4.3 Site inspections**

The Inglewood Metal Ltd site was visited six times during the monitoring period. The main points of interest were plant processes with potential or actual discharges to receiving watercourses, including contaminated stormwater and process wastewaters. The neighbourhood and particularly the receiving waters were surveyed for environmental effects. Changes to the quarry operations contingency plan had included the installation of larger silt traps on the lower quarry floor during the 2006-2007 period.

### **1.4.4 Physicochemical sampling**

Taranaki Regional Council undertook sampling of discharges from the site and the water quality upstream and downstream of the discharge point and mixing zone in the Kurapete Stream.

The Inglewood Metal Ltd discharge was sampled on five occasions. On three of these occasions samples of the receiving waters were also collected at the end of the unnamed tributary prior to the confluence with the Kurapete Stream and in the Kurapete Stream upstream of the tributary discharge and downstream beyond the 25 metre mixing zone. The samples were analysed for pH, turbidity, conductivity and suspended solids. No discharge was occurring at the time of one inspection occasion and no significant visual impacts were apparent at the times of the other two inspections and therefore no additional receiving water surveys were performed.

### **1.4.5 Biological survey**

One biological survey of the Kurapete Stream was conducted at three sites, one upstream and two downstream of the confluence with the unnamed tributary. This survey was conducted in February 2011, two weeks after the most recent stream fresh and during a late summer relatively low flow recession period.

## 2. Results

### 2.1 Water

#### 2.1.1 Inspections and results of discharge and receiving water monitoring

During the 2010-2011 monitoring period six scheduled inspections of the Inglewood Metal Ltd quarry site were conducted by an officer of the Taranaki Regional Council. Water samples were collected for physicochemical analysis on four occasions from the discharge and on three occasions from the receiving water sites located as shown in Figures 1 and 2 and described in Table 1.

**Table 1** Location of sampling sites

Site	Location	Map reference	Site code
Kurapete Stream	100m u/s of Everett Road bridge (upstream of quarry tributary)	Q19: 207304	KRP 000960
Quarry washwater / stormwater	at discharge outlets (NB sw included after Feb 1998)	Q19: 206299	IND 002022
Unnamed tributary	5m u/s of the Kurapete Stream confluence (600m downstream of discharges at quarry)	Q19: 207304	KRP 000975
Kurapete Stream	At the Everett Road bridge (approximately 100m d/s of quarry tributary)	Q19: 207304	KRP 000980

Quarry management personnel changed in the latter part of the monitoring period with the re-appointment of a former manager. Comments associated with the meeting, inspections (with the quarry manager on site), and the results of sampling activities are as follows:

#### **Inspection of 28 September 2010**

This inspection was conducted during fine weather conditions after recent rain. General quarry operations were continuing but no washing was occurring with the first settlement pond being de-silted at the time. Crushing of metal was occurring at the upper, middle and lower plants, with a considerable stockpile of metal on site. The site was tidy and it was noted that the extraction area had been extended further toward the south-east boundary of the property.

Stormwater and groundwater were being pumped from the floor of the quarry to the upper ponds system. A high rate of discharge was occurring from the final (sixth) pond to the tributary but as there were no visual impacts of this tributary on the appearance of the Kurapete Stream at the boundary of the mixing zone only sampling of the wastewater discharge was performed i.e. there was inspectorial assessment of compliance with special conditions 11 (a) and 11 (b) of the consent. These results are presented in Table 2.

**Table 2** Results from Inglewood Metal Ltd quarry wastewater monitoring sampled on 28 September 2010

Site location		IND 002022
Parameter	Unit	Quarry stormwater/ washwater
Time	NZST	0750
Suspended Solids	g/m <sup>3</sup>	17
Turbidity	NTU	27
Conductivity @ 20 °C	mS/m	30.6
pH		7.6
Appearance		relatively clear

These results indicated that the discharged wastewater suspended solids concentration complied with special condition 10 [ss; 100 g/m<sup>3</sup>; pH; 6-9 units] of the consent. There was inspectorial confirmation of compliance with special conditions 11(a) and (b) in relation to aesthetic impacts on the receiving waters of the Kurapete Stream.

### Inspection of 15 November 2010

The next routine inspection was conducted during fine weather. The quarry was operating and pumping of stormwater from the quarry floor was occurring to the third pond of the upper ponding system. It was noted that no washing was occurring at the time. Crushing was operating at the lower plant and a large quantity of product was stockpiled on site.

The final pond in the system was discharging to the unnamed tributary, and the receiving waters of the Kurapete Stream were low and uncoloured. Wastewater and receiving water sampling was undertaken with these results presented in Table 3.

**Table 3** Results from Inglewood Metal Ltd quarry monitoring sampled on 15 November 2010

Site location		IND 002022	KRP 000975	KRP 000960	KRP 000980
Parameter	Unit	Quarry stormwater/ washwater	Tributary S downstream near confluence	Kurapete S upstream	Kurapete S downstream
Time	NZST	1040	1055	1050	1100
Suspended Solids	g/m <sup>3</sup>	10	3	<2	<2
Turbidity	NTU	14	2.7	1.0	0.9
Conductivity @ 20 °C	mS/m	29.0	28.7	12.5	13.6
pH		7.6	7.4	7.8	7.6
Appearance		relatively clear	clear; very low flow	clear; low flow	clear; low flow

These results confirmed that the treated wastewater discharge was in compliance with special condition 10 of the consent. There was no visual impact beyond the mixing zone in the receiving waters of the Kurapete Stream (which were clearer than noted on most previous occasions) and there was no increase in suspended solids concentration between the upstream and downstream sites in the stream. This complied with the relevant special condition 12(a) of the consent.

### Inspection of 14 December 2010

This inspection was performed under dry weather conditions. Washing of product was occurring and pumping from the settlement pond system on the quarry pit floor was occurring to the third (upper) treatment pond where washwater was being recirculated. There was no visual impact on the main Kurapete Stream. A sampling survey was not required as no discharge was occurring from the final pond to the unnamed tributary. There was a considerable stockpile of product on the site which was tidy at the time of the inspection.

### Inspection of 16 February 2011

This inspection was performed following and during fine weather conditions. The site was busy at the time of the inspection with crushing of product at one of the bottom plants and a lot of product stockpiled on site. No washing was taking place and pumping of stormwater from the quarry pit to the lower end of the third upper pond was occurring. Sampling of the wastewater and in the receiving waters was performed. The sampling results are presented in Table 4.

**Table 4** Results from Inglewood Metal Ltd quarry monitoring sampled on 16 February 2011

Site location		IND 002022	KRP 000975	KRP 000960	KRP 000980
Parameter	Unit	Quarry stormwater/ washwater	Tributary S downstream near confluence	Kurapete S upstream	Kurapete S downstream
Time	NZST	0805	0830	0835	0825
Suspended Solids	g/m <sup>3</sup>	31	23	4	8
Turbidity	NTU	35	25	3.0	9.3
Conductivity @ 20 °C	mS/m	29.1	28.6	12.4	18.0
pH		7.8	7.7	7.9	7.7
Appearance		relatively clear	slightly turbid	clear	slightly turbid

These results indicated that the treated wastewater discharge was in compliance with special condition 10 of the consent. There was a slight visual impact beyond the mixing zone in the receiving waters of the Kurapete Stream. However, the small increase in suspended solids concentration between the upstream and downstream sites in this stream was in compliance with the relevant special condition 12 (a) despite an increase in turbidity caused by the fine, colloidal particles suspended in the water column.

### Inspection of 16 May 2011

A wet weather inspection was performed during a busy period of crushing and stockpiling of product following a change in quarry management. The extraction area was very tidy. No washing was being performed. A digger was operating in the vicinity of the quarry pit stormwater ponds which were being pumped up to the third pond with a slightly discoloured flow discharged from the final (sixth) upper pond to the unnamed tributary stream. There was no increase in turbidity noted in the Kurapete Stream below the tributary confluence after the consented mixing zone, as the stream was in fresh following recent wet weather, and therefore no sampling of the receiving waters was undertaken.

Sampling of the wastewater discharge was performed with results presented in Table 5.

**Table 5** Results from Inglewood Metal Ltd quarry wastewater sampled on 16 May 2011

Site location		IND 002022 Quarry stormwater/ washwater
Parameter	Unit	
Time	NZST	0920
Suspended Solids	g/m <sup>3</sup>	24
Turbidity	NTU	31
Conductivity @ 20 °C	mS/m	26.4
pH		7.6
Appearance		slightly discoloured

These results confirmed that the treated wastewater discharge was in compliance with special condition 10 of the consent. There was inspectorial assessment of compliance with the relevant special conditions 11 (a) and 11 (b) in relation to aesthetic impacts on the receiving waters of the Kurapete Stream.

#### Inspection of 29 June 2011

This fine weather inspection was performed some five days after wet weather. The quarry had been processing metal from the lower plants earlier in the day but no washing of product was occurring. The extraction area was tidy but the quarry pit was flooded due to recent heavy rain. Stormwater was being pumped from the pit ponds system to the fifth upper pond. This had been shifted from the third pond by management to better cope with the flooding on the pit floor. It was understood that it would be returned to the third pond (as had been the preferable situation previously for compliance purposes). There was a relatively clean discharge from the final upper pond to the unnamed tributary with no apparent visual impact on the receiving waters. Sampling of the wastewater discharge and the receiving waters was undertaken with results presented in Table 6.

**Table 6** Results from Inglewood Metal Ltd quarry and receiving waters, sampled on 29 June 2011

Site location		IND 002022 Quarry stormwater/ washwater	KRP 000975 Tributary S downstream near confluence	KRP 000960 Kurapete S upstream	KRP 000980 Kurapete S downstream
Parameter	Unit				
Time	NZST	1000	1020	1015	1025
Suspended Solids	g/m <sup>3</sup>	6	4	3	3
Turbidity	NTU	11	4.6	3.3	2.7
Conductivity @ 20 °C	mS/m	28.8	25.0	10.5	13.5
pH		7.0	7.2	7.3	7.3
Appearance		relatively clear	relatively clear	clear; swift flow	clear, swift flow

These results indicated that the wastewater discharge suspended solids concentration complied with special condition 10 of the consent and that the absence of any increase in suspended solids concentration (or turbidity) between the

upstream and downstream Kurapete Stream sampling sites complied with the relevant special condition (12a) of the consent.

## 2.1.2 Freshwater biological monitoring

### 2.1.2.1 Introduction

One of a number of recommendations contained in the 1995-96 Annual Report (TRC 96-15c) stated that the monitoring programme should include a summer biomonitoring survey performed in the lower reaches of the Kurapete Stream. This requirement was made in recognition of the fisheries importance of the lower reaches of this stream, and because the consent compliance record at that time indicated a need for a form of monitoring which provided longer-term evaluation of potential siltation effects on receiving water quality.

Various subsequent biomonitoring surveys (see TRC, 2004, TRC, 2008, and TRC, 2010) have found evidence of macroinvertebrate faunal community deterioration in the Kurapete Stream, beyond the boundary of the mixing zone, 50 metres downstream of the confluence with the small tributary which drained the quarry area. However, other surveys have also found limited, but insignificant, impacts on this reach of the Kurapete Stream. Some of these improvements were coincidental with the upgrade to quarry wastewater treatment systems instigated in the 1998-99 monitoring period and improved maintenance of these systems since this time.

From time-to-time, variability in the impacts on the macroinvertebrate communities of the Kurapete Stream may have been related to confounding issues of upstream water quality improvement subsequent to the diversion of the Inglewood oxidation pond systems wastes out of the catchment. Cattle access and lack of riparian vegetation in the proximity of the downstream site, on some occasions may have accentuated the variability of these impacts. An additional site was included in some recent biomonitoring surveys to assess the extent of such effects (TRC, 2004, TRC, 2005, TRC, 2007, TRC, 2008, TRC, 2009, and TRC, 2010) but it was not required for the current survey because of the relative absence of visual impacts on the receiving waters and limited substrate sedimentation noted at the time of the survey during a period of very low flow conditions.

### 2.1.2.2 Survey for the 2010-2011 period

One scheduled freshwater biological survey was performed under low recession flow conditions during the 2010-2011 monitoring period in late summer (February 2011). This survey was performed at the two established sites in the Kurapete Stream, one upstream and the other downstream of the confluence of the tributary with the Kurapete Stream (Table 7 and Figure 2).

**Table 7** Biomonitoring sites surveys

Site number	Site code	Map reference	Location
I	KRP000960	Q19: 207 304	Upstream of quarry tributary stream
J	KRP000980	Q19: 208 305	Everett Road bridge, d/s of tributary stream

The biomonitoring report, which illustrates the location of the sampling sites, is attached as Appendix II to this report. The results from this survey are summarised in Table 8 with the specific quarry monitoring historical data to date.

**Table 8** Summary of Inglewood Metal Ltd quarry biomonitoring results for the Kurapete Stream performed from March 1997 to February 2011

Site	Taxa numbers				MCI values		
	1996-2009			2010-11 result	1996-2009		2010-11 result
	No. of surveys	Range	Median	Feb 2011	Range	Median	Feb 2011
I	16	19-32	27	23	80-105	95	92
J	16	18-32	25	25	71-101	86	94
K	8	22-35	29	-	87-103	94	-

These results indicated no recent impacts on the faunal community over the short reach of the stream, below the small turbid tributary draining the quarry area, downstream of the site and a short distance beyond the boundary of the permitted mixing zone. Only minor differences in faunal richnesses between these sites were found, despite some sedimentation in the reach of the lower Kurapete Stream below the quarry tributary inflow and a small increase in visual turbidity of the main stream. There was an atypical (although very small) downstream increase in MCI score (reflecting minimal change in community structure) coincident with some variability in physical habitat. In general, these results continued the recent trend of stream biota improvement recorded over most previous summers in the lower reach of the stream coincident with improved management and upgrades to the quarry wastewater treatment system and also following upstream water quality improvement subsequent to the diversion of the Inglewood oxidation ponds system wastes out of the stream in mid-catchment. These improvements in the configuration and operation of the quarry wastewater/stormwater settlement ponding system must be maintained in order to reduce the visual, aesthetic impacts of the often turbid quarry tributary receiving waters on the main Kurapete Stream in the immediate vicinity of Everett Road. Relatively recent riparian vegetation planting in the proximity of the Everett Road site and fencing of the stream margins preventing stock access, should continue to enhance the stream habitat in this reach, particularly as the plantings develop.

## 2.2 Register of incidents

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

Incidents may be alleged to be associated with a particular site. If there is 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 2010-2011 year, there were no incidents recorded by the Council that were associated with the consent holder.

### **2.3 Contingency plan**

An updated contingency plan was received from the consent holder in August 2006 for review by the Council, in compliance with Special Condition 14 of consent 1113. This contingency plan remains operative.

### **3. Discussion**

#### **3.1 Discussion of plant performance**

Management of the site during 2010-2011 was good with no complaints received by the Council and no requirement for the issue of abatement notices by the inspecting officer in terms of the operational performance of the quarry. Additional retention within the quarry floor ponds and operation of a closed washwater re-circulation ponding system, continues to be necessary to provide compliance with treated wastewater standards. The provision of additional ponding within the quarry pit, presence of a silt trap and gravel filter to treat the stormwater from the area near the weighbridge, and de-silting of the treatment ponds, have been effective in achieving compliance with appropriate resource consent conditions. Further modifications to the treatment ponds may be necessary (particularly the correct configuration of the upper ponds system) as it has been recognised that greater retention in the groundwater/stormwater treatment pond system has the potential to improve treatment performance, particularly a reduction in the carry through of fine suspended sediment into the Kurapete Stream and re-suspension of fines in the tributary stream. In relation to this, fencing of the tributary stream below the quarry discharge, to prevent stock access to the tributary, was more recently undertaken by DOC, Taranaki Tree Trust and Kaimata School. This fencing and planting of the tributary stream has prevented cattle disturbance of the stream bank and bed, allowing riparian benefits to occur and ultimately helping to stabilise and settle fine suspended solids. The performance of the system will continue to be monitored in this respect.

#### **3.2 Environmental effects of exercise of water permit**

The main potential environmental effect of quarrying activities on waterways is associated with discharges of washwater and stormwater containing fine silt particles and high suspended solids concentrations. Such discharges may result in discolouration of the receiving waters near the discharge point and smothering of benthic life forms, form a barrier to fish movement and/or affect fish spawning habitats. This is particularly relevant in the lower reaches of the Kurapete Stream near its confluence with the Manganui River.

The Taranaki Regional Council monitors for possible effects on stream biota and aesthetic quality by conducting a visual inspection of the stream both up and downstream of the quarry, and measuring physicochemical properties of the stormwater and receiving environment. Biological monitoring surveys have also been undertaken at established sites under low flow conditions to provide longer term indications of receiving water quality.

Monitoring of the quarry site during the 2010-2011 year has shown that the Inglewood Metal Ltd site has had minor impacts on the receiving waters of the Kurapete Stream, limited to occasional noticeable increases in turbidity, particularly under low stream flow conditions. No significant effects were found by physicochemical monitoring of the receiving waters on all occasions during the period. In addition, biological monitoring during a low flow, summer period found no localised impacts of quarrying activities on the biota of the Kurapete Stream coincidental with only a slight increase in visual turbidity in the lower reach of the stream.

On occasions, a combination of very fine suspended sediment in the treated wastewater discharged, limited dilution by the receiving waters of the small tributary stream and possibly some re-suspension of accumulated sediment previously deposited on the tributary stream bed from time to time, has contributed to cloudy (turbid) plumes entering the Kurapete Stream. Although increased retention of the wastewater by additional ponding in the quarry pit prior to discharge has been provided, appropriate isolation of the washwater recirculation (from the quarry pit wastewater inflow) must be maintained. More recent fencing and planting of the tributary's margins have also prevented cattle access which caused re-suspension of fine sediment. This may possibly allow aquatic vegetation to establish, providing filtration mechanisms and stabilisation of the silt laden bed, and reduce the effects of fine sediment plumes discharging to the Kurapete Stream.

It has been noted that the quarry stormwater catchment area (as authorised by Special Condition 3 of the consent) has expanded with the potential to overtax the settlement facilities due to increased volumes of stormwater/groundwater generated. Inflows of iron-laden groundwater seepages onto the quarry floor will continue to add to turbidity issues within the ponding system. This aspect of compliance has been assessed during the 2010-2011 period in conjunction with changes to the management of the settlement ponding facilities both on the floor of the quarry and associated with the washwater recirculation system but will continue to form a component of future monitoring activities.

### 3.3 Evaluation of performance

A tabular summary of the Company's compliance record for the year under review is set out in Table 9.

**Table 9** Consent 1113-4 for discharge of treated quarry groundwater, stormwater and washwater to a tributary of the Kurapete Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Exercise methodology	Inspections of activities and treatment systems	Yes
2. Best practicable options to minimise effects	Liaison and inspections of treatment system and receiving waters	Yes
3. Limit to active quarry site	Inspections	Yes (marginal)
4. No direct discharges	Inspections	Yes
5. Washwater treatment and recirculation requirements	Inspections	Yes
6. Quarry site stormwater treatment provision	Inspections	Yes
7. Minimisation of silt discharged	Inspections and sampling	Yes
8. Minimisation of exposed areas of quarry and reinstatement requirements	(to be addressed later in quarry life)	N/A
9. Silt control operation	Inspections and sampling	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
10. Concentration limits on contaminants	Physicochemical sampling	Yes
11. Limits on effects on receiving waters	Physicochemical and biological sampling	Yes
12. Limits on turbidity effects in receiving waters	Physicochemical sampling	Yes (on all occasions)
13. Reinstatement provision	Scheduled for consideration at end of active quarry life	N/A
14. Maintenance of contingency plan	Liaison with management (plan provided)	Yes
15. Optional review provision re environmental effects	Scheduled for consideration in June 2012	N/A
Overall assessment of consent compliance and environmental performance		<b>High</b>

N/A = not applicable

During the year, Inglewood Metal Ltd demonstrated a high level of environmental performance and compliance with the resource consents at its Everett Road quarry site as issues relating to the operation of the wastewater treatment pond system and its configuration were given the necessary close attention due to the increase in size of the active quarry.

Fencing and planting of the DOC reserve on both banks of the Kurapete Stream downstream of the unnamed tributary and Everett Road (completed seven years previously), and along the right bank of the tributary stream (completed five years previously), helped mitigate the effects on the Kurapete Stream and should continue to improve the aesthetic value of this reach of the lower stream.

### 3.4 Recommendations from the 2009-2010 Annual Report

As a result of the 2009-2010 site specific monitoring programme and in recognition of the compliance performance during the period, the following recommendations were made:

1. THAT monitoring of discharges from Inglewood Metal Ltd, Everett Road quarry in the 2010-2011 year continue at the same level as in 2009-2010.
2. THAT turbidity and sedimentation effects on receiving waters be minimised by operating and maintaining the sediment pond system in accordance with best quarry management practices.
3. THAT the consent holder and staff of the Regional Council liaise with respect to matters contained in Recommendation 2 (particularly when personnel changes occur amongst these officers).

The first recommendation was implemented and the monitoring programme was performed by the Taranaki Regional Council. In particular, the issues of turbidity and sedimentation effects on receiving waters had been addressed with management (recommendations 2 and 3) in relation to additional treatment ponds retention

capacity and appropriate operation of the system in the 2008-2009 period when a meeting of TRC staff and the quarry manager was held to address these and other matters. The improved performance over the 2009-2010 period reflected these initiatives. Riparian fencing and planting of the tributary stream, undertaken relatively recently, has continued to assist with mitigation of these effects.

### **3.5 Alterations to the monitoring programme for 2011-2012**

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

In recognition of the good management practices and compliance with resource consent conditions it is proposed that there be no change to the site-specific monitoring programme for the 2011-2012 period. A recommendation to this effect is attached to this report.

### **3.6 Exercise of optional review of consent**

Resource Consent 1113 does not provide for an optional review of the consent until June 2012. Condition 15 allows the Council to review the consent if grounds require a review.

Although regular ongoing liaison with quarry management will be necessary to ensure that wastes treatment practices are attuned to the continuing expansion of this active quarry operation, it is not considered necessary to review the consent given that these matters may be considered comprehensively at the time of the expiry date (June, 2015) of the consent.

## 4. Recommendations

As a result of the 2010-2011 site specific monitoring programme and in recognition of the compliance performance during the period, the following recommendations are made:

1. THAT monitoring of discharges from the Inglewood Metal Ltd, Everett Road Quarry in the 2011-2012 year continues at the same level as in 2010-2011.
2. THAT turbidity and sedimentation effects on receiving waters be minimized by operating and maintaining the settlement ponds system in accordance with best quarry management practices.
3. THAT the consent holder and staff of the Regional Council continue to liaise with respect to matters contained in Recommendation 2 (particularly when personnel changes occur amongst these officers).
4. THAT the option for a review of the resource consent in June 2012 not be exercised on the grounds that existing conditions will adequately deal with the environmental effects arising from the exercise of the consent over the remaining three years of its term.

## Glossary of common terms and abbreviations

The following abbreviations and terms are used within this report.

biomonitoring	assessing the health of the environment using aquatic organisms
bund	a wall around a structure to contain its contents in the case of leakage
Condy	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m
fresh	elevated flow in a stream, such as after heavy rainfall
g/m <sup>3</sup>	grammes per cubic metre, and equivalent to milligrammes per litre (mg/L). In water, this is also equivalent to parts per million (ppm)
l/s	litres per second
MCI	macroinvertebrate community index; a numerical indication of the state of biological life in a stream. It 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.
NTU	Nephelometric Turbidity Unit, a measure of the turbidity of water
O&G	oil and grease, defined as anything that will dissolve into a particular organic solvent (e.g. hexane). May include both animal material (fats) and mineral matter (hydrocarbons)
pH	a numerical system for measuring acidity in solutions, with 7 as neutral. Values lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5.
physicochemical	measurement of both physical properties (e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment
resource consent	refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15)
RMA	Resource Management Act 1991 and subsequent amendments
SS	suspended solids,
Temp	temperature, measured in °C
Turb	turbidity, expressed in NTU
UI	Unauthorised Incident
UIR	Unauthorised Incident Register – contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan

## Bibliography and references

- Taranaki Regional Council, 1992: 'Regional Policy Statement Working Paper. Aggregate extraction in Taranaki'. TRC Report.
- Taranaki Regional Council, 1996: 'Quarries Monitoring Programme Annual Report 1995-96. Inglewood Metal Ltd'. Technical Report 96-15c.
- Taranaki Regional Council, 1997: 'Quarries Monitoring Programme Annual Report 1996-97. Inglewood Metal Ltd'. Technical Report 97-46.
- Taranaki Regional Council, 1998: 'Quarries Monitoring Programme Annual Report 1997-98. Inglewood Metal Ltd'. Technical Report 98-63.
- Taranaki Regional Council 1999: 'Quarries Monitoring Programme Annual Report 1998-99 Inglewood Metal Ltd'. Technical Report 99-86.
- Taranaki Regional Council 2000: 'Inglewood Metal Ltd Monitoring Programme Annual Report 1999-2000'. Technical Report 2000-65.
- Taranaki Regional Council 2001: 'Inglewood Metal Ltd Monitoring Programme Annual Report 2000-2001'. Technical Report 2001-39.
- Taranaki Regional Council 2002: 'Inglewood Metal Ltd Monitoring Programme Annual Report 2001-2002'. Technical Report 2002-11.
- Taranaki Regional Council 2003: 'Inglewood Metal Ltd Monitoring Programme Annual Report 2002-2003'. Technical Report 2003-58.
- Taranaki Regional Council 2004: 'Inglewood Metal Ltd Monitoring Programme Annual Report 2003-2004'. Technical Report 2004-47.
- Taranaki Regional Council 2005: 'Inglewood Metal Ltd Monitoring Programme Annual Report 2004-2005'. Technical Report 2005-34.
- Taranaki Regional Council 2006: 'Inglewood Metal Ltd Monitoring Programme Annual Report 2005-2006'. Technical Report 2006-46.
- Taranaki Regional Council 2007: 'Inglewood Metal Ltd Monitoring Programme Annual Report 2006-2007'. Technical Report 2007-49.
- Taranaki Regional Council 2008: 'Inglewood Metal Ltd Monitoring Programme Annual Report 2007-2008'. Technical Report 2008-54.
- Taranaki Regional Council 2009: 'Inglewood Metal Ltd Monitoring Programme Annual Report 2008-2009'. Technical Report 2009-15.
- Taranaki Regional Council 2010: 'Inglewood Metal Ltd Monitoring Programme Annual Report 2009-2010'. Technical Report 2010-17.

## **Appendix I**

**Resource consent held by  
Inglewood Metal Ltd**





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

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

Name of  
Consent Holder:           Inglewood Metal Limited  
                                  P O Box 44  
                                  INGLEWOOD

Consent Granted  
Date:                         20 May 2004

**Conditions of Consent**

Consent Granted:         To discharge treated stormwater, treated groundwater and  
                                  treated shingle washwater from quarry activities into an  
                                  unnamed tributary of the Kurapete Stream a tributary of the  
                                  Manganui River in the Waitara catchment at or about GR:  
                                  Q19:206-299

Expiry Date:               1 June 2015

Review Date(s):         June 2009, June 2012

Site Location:            Everett Road, Inglewood

Legal Description:       Pt Secs 15, 16 & 17 Blk XIII Waitara SD

Catchment:                Waitara

Tributary:                 Manganui  
                                  Kurapete

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

[www.trc.govt.nz](http://www.trc.govt.nz)

**General conditions**

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

**Special conditions**

- 1. The exercise of this consent shall be conducted in accordance with the information submitted in support of the application and to ensure that the conditions of this consent are met at all times.
- 2. At all times the consent holder shall adopt the best practicable option [as defined in Part 2 of the Act] to prevent or minimise any actual or likely adverse effect on the environment associated with the discharges including, but not limited to, the water quality and aquatic habitat of the receiving waters of the Kurapete Stream.
- 3. The active quarry stormwater catchment shall have a maximum area of no more than 2 hectares.
- 4. There shall be no direct discharge of untreated stormwater, groundwater or waste washwater from the active quarry site into the unnamed tributary of the Kurapete Stream as a result of the exercise of this consent.
- 5. The washing and washwater treatment system shall be bunded to prevent the inflow of stormwater and groundwater from other areas of the quarry. In addition the consent holder shall implement appropriate recirculatory systems so as to minimise the volume of washwater required to be discharged.
- 6. The active quarry site shall be contoured/bunded so that all water generated in this area is directed to silt retention systems for treatment prior to discharge, and to prevent the flow of uncontaminated stormwater into the quarry, as far as is practicable.
- 7. The consent holder shall undertake measures to minimise the amounts of silt and sediment that could be contained in the discharge licensed by this consent.
- 8. The consent holder shall operate and progressively reinstate the quarry in a manner that minimises the quarry stormwater catchment area and ensures that the area of exposed unvegetated earth within the quarry stormwater catchment is kept to a minimum at all times.
- 9. The consent holder shall properly and efficiently maintain and operate the silt control structures in such a manner that any discharge which may occur shall not breach the conditions of this consent. The silt control structures shall be operated, as far as practicable, so as to maximise the treatment of the stormwater and minimise the duration, frequency and rate of the discharge.

10. The following concentrations shall not be exceeded in any discharge:

Component	Concentration
pH (range)	6-9
Suspended solids	100gm <sup>-3</sup>
Total recoverable hydrocarbons	15gm <sup>-3</sup>

This condition shall apply prior to the entry of any discharge into the receiving waters of the unnamed tributary of the Kurapete Stream, at a designated sampling point approved by the Chief Executive.

11. After allowing for reasonable mixing, within a mixing zone extending 25 metres downstream of the confluence of the unnamed tributary with the Kurapete Stream, the discharge shall not give rise to any of the following effects in the receiving waters of the Kurapete Stream:
- a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
  - b) any conspicuous change in the colour or visual clarity;
  - c) any emission of objectionable odour;
  - d) the rendering of fresh water unsuitable for consumption by farm animals;
  - e) any significant adverse effects on aquatic life.
12. After allowing for reasonable mixing, within a mixing zone extending 25 metres downstream of the confluence of the unnamed tributary with the Kurapete Stream, the discharge shall not give rise to either of the following effects in the receiving waters of the of the Kurapete Stream:
- a) an increase in suspended solids concentration in excess of 10 gm<sup>-3</sup>, when the stream turbidity as measured immediately upstream of the confluence of the unnamed tributary with the Kurapete Stream is equal to or less than 5 NTU [nephelometric turbidity units]; or
  - b) an increase in turbidity of more than 50% when the stream turbidity as measured immediately upstream of the confluence of the unnamed tributary with the Kurapete Stream is greater than 5 NTU [nephelometric turbidity units].
13. On cessation of quarrying operations at the site licensed by this consent, the active quarry area, including the silt control structures, and surrounding areas shall be reinstated satisfactorily, prior to the surrender or lapsing of this consent.
14. The consent holder shall maintain a contingency plan to the satisfaction of the Chief Executive, outlining measures and procedures to be undertaken to prevent the spillage or accidental discharge of contaminants in the stormwater catchment, and measures to avoid, remedy, or mitigate the environmental effects of such a spillage or discharge.
15. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2009 and/or June 2012, 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 May 2004

For and on behalf of  
Taranaki Regional Council

  
\_\_\_\_\_  
Director Resource Management



## **Appendix II**

### **Biomonitoring survey of February 2011**



To K Brodie, Environmental Monitoring Manager  
From CR Fowles, Scientific Officer  
File 1113  
Document 877182  
Report No CF 525  
Date 25 March 2011

## **Biomonitoring of the lower reaches of the Kurapete Stream, in relation to Inglewood Metal Ltd Quarry discharges, surveyed in February 2011**

### **1. General Introduction**

A formal consent monitoring programme established for Inglewood Metal Ltd, Everett Road in the lower Kurapete Stream catchment, has been the subject of fourteen TRC Annual Reports to date (eg: TRC, 2010). Various impacts of the consent holder's quarrying activities were noted from a programme of regular inspections and physicochemical receiving water sampling. One of the recommendations of these reports required:

*"That monitoring be continued ..... with an appropriate programme formulated in accordance with the requirements of existing consents and taking into account matters addressed in these Annual Reports. This programme to include a limited summer biomonitoring survey undertaken at two sites in the lower reach of the Kurapete Stream (upstream and downstream of the confluence of the quarry tributary stream)."*

This requirement recognised the fisheries importance of the lower reaches of the Kurapete Stream and the need for a form of monitoring which provided longer-term indications of receiving water quality.

Therefore, late summer-autumn low flow biomonitoring surveys have been undertaken in the lower reaches of the Kurapete Stream situated upstream and downstream of the small tributary receiving quarry run-off and wastes discharges. Fifteen such biomonitoring surveys have been performed to date. Additional surveys were performed in May 1997, in response to an unauthorised incident report (CF145), and in October 2002 (CF259), as a follow-up to the previous summer biomonitoring survey (March 2002) performed under low recession flow conditions in the lower reaches of the Kurapete Stream which indicated a significant impact on the faunal community of the stream below the small turbid tributary draining the quarry area.

In recent years, confounding issues of upstream water quality improvement (due to removal of the Inglewood oxidation ponds effluent discharge from the Kurapete Stream (TRC, 2009a)), together with cattle access in the proximity of the Everett Road bridge site, necessitated the addition of a third monitoring site some 150 m downstream of the bridge for effects assessment.

The current February 2011 survey continued the summer biomonitoring component of the formal consent monitoring programme but did not require the inclusion of this additional site after an inspection of the substrate and the aesthetic appearance of the

Kurapete Stream downstream of the confluence with the tributary draining the quarry area.

## 2. Method

The standard '400 ml kick sampling' technique was used to collect streambed (benthic) macroinvertebrates from the two established sites (I and J) in the lower reaches of the Kurapete Stream, near Everett Park on 7 February 2011 (Figure 1).

These sites were:

Site No	Site code	Map Reference	Location
I	KRP000960	Q19: 207 304	Upstream of quarry tributary stream
J	KRP000980	Q19: 208 305	Everett Road bridge, d/s of tributary stream

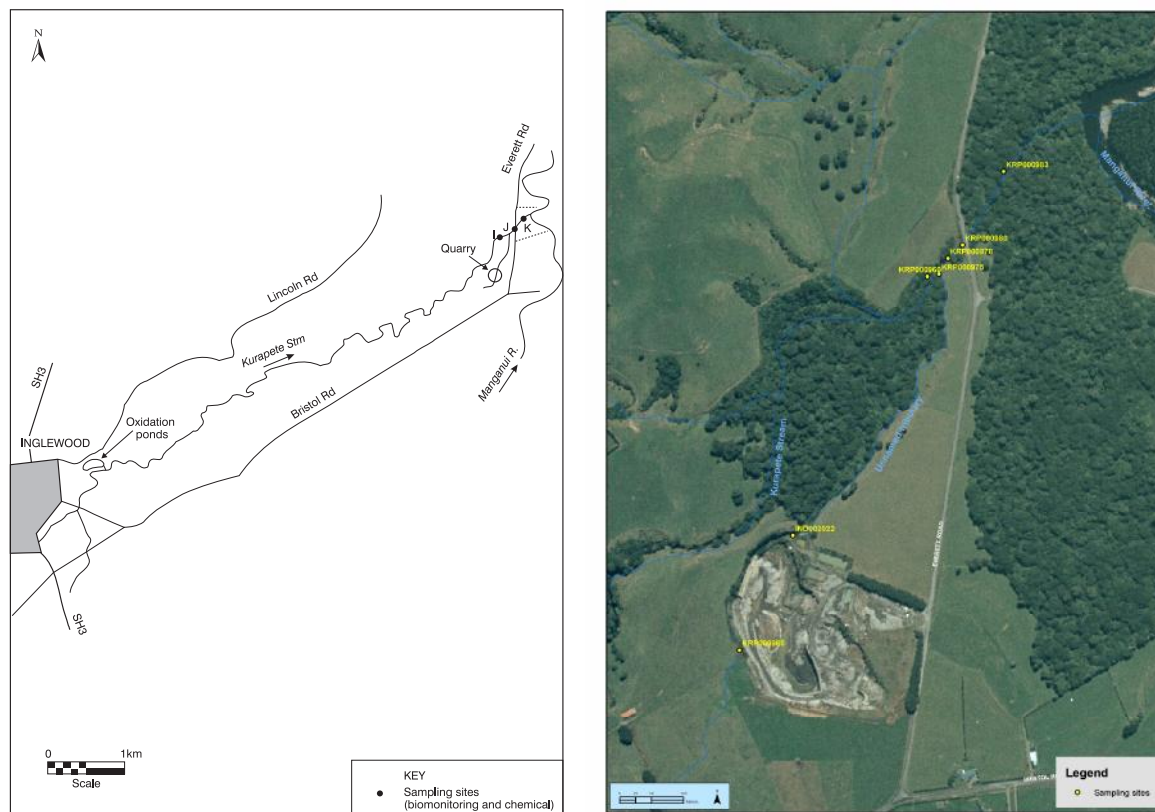
This 'kick-sampling' technique is very similar to Protocol C1 (hard-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark et al, 2001).

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)	= 20-99 individuals;
VA (very abundant)	= 100-499 individuals;
XA (extremely abundant)	= 500 or more individuals.

Macroinvertebrate Community Index (MCI) values were calculated for taxa present at each site (Stark 1985) with certain taxa scores modified in accordance with Taranaki experience.

A semi-quantitative MCI value, SQMCI<sub>s</sub> (Stark, 1999) 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 scores, and dividing by the sum of the loading factors. 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).



**Figure 1** Sampling sites in the Kurapete Stream in relation to Inglewood Metals Ltd, quarry

### 3. Results and discussion

This summer survey was performed under low recession flow conditions, 14 days after a fresh in excess of three times median flow and 41 days since a fresh in excess of seven times median flow. A relatively dry summer period preceded this survey. Water temperatures ranged from 19.7°C to 20.0°C at the time of this midday survey.

The flow at the downstream site was slightly cloudier in appearance compared to that at the clear upstream site. This was due to the influence of the quarry tributary, which was slightly turbid at its confluence with the Kurapete Stream. Site I was shaded, with patchy periphyton mats, no filamentous algae, and patchy moss cover and leaf litter on the substrate. The more open site J, below the quarry tributary, had patchy moss, leaf litter, periphyton mats, and filamentous algae covering the substrate. The stream banks had been fenced adjacent to this site more than seven years previously to prevent stock access and riparian growth was extensive on both banks. Some silt was apparent at site J, trapped amongst the periphyton and deposited amongst components of the bed of the stream, and more abundant in slower flowing areas toward the stream's right bank at site J. Although significant improvements had been made to waste disposal practices at the quarry over the past fourteen years, fines from the settled quarry stormwater and groundwater discharge, entered the Kurapete Stream between sites I and J causing increased cloudiness noted at the downstream site. The more open stream margins in the vicinity of site J contributed to the denser periphyton substrate cover on the relatively more sedimented bed of this reach of the stream.

### 3.1 Macroinvertebrate communities

Biomonitoring of the impacts of quarrying activities on the Kurapete Stream has been performed previously on fifteen occasions and site I had been surveyed as a component of the Inglewood oxidation pond system monitoring programme between early 1989 and March 1993. A summary of all data for this site to date is provided in Table 1.

**Table 1** Summary of macroinvertebrate taxa numbers and MCI values for all previous surveys performed at site I (KRP000960), upstream of the quarry

No of surveys	Taxa numbers		MCI values	
	Range	Median	Range	Median
25	12 - 32	23	70 - 105	89

A summary of comparative data for all three sites since quarry biomonitoring commenced is presented in Table 2. (Eight surveys have been performed at site K to date).

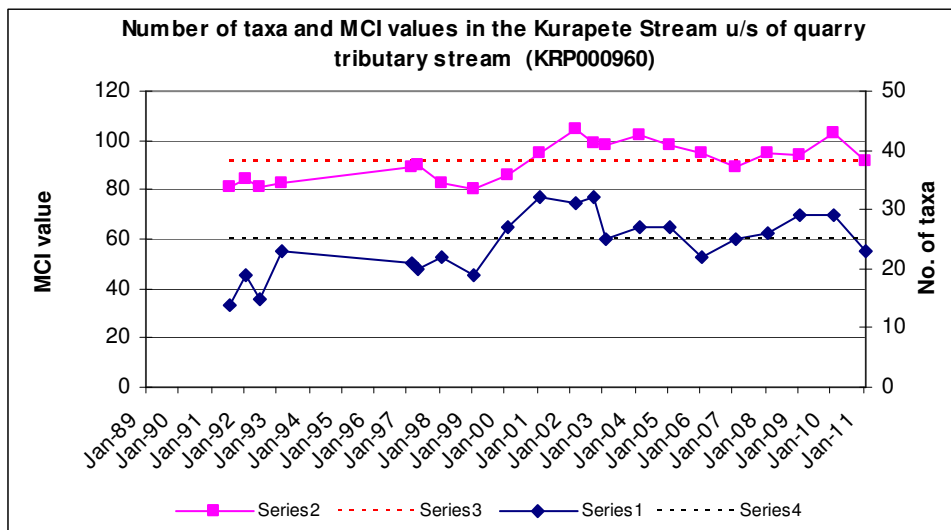
**Table 2** Summary of macroinvertebrate taxa numbers and MCI values for previous surveys performed between January 1997 and February 2010

Site	No. of surveys	Taxa Numbers		MCI Values	
		Range	Median	Range	Median
I	16	19 - 32	27	80 - 105	95
J	16	18 - 32	25	71 - 101	86
K	8	22 - 35	29	87 - 103	94

The results of the recent survey are presented in Table 3.

#### Site I: upstream of quarry tributary

Historical data for this site are illustrated in Figure 2.



**Figure 2** Taxa richness and MCI scores recorded to date at site I

**Table 3** Macroinvertebrate fauna of the Kurapete Stream in relation to Inglewood Metal Ltd's quarry discharge sampled on 7 February 2011

Taxa List	Site Number	MCI score	I	J
	Site Code		KRP000960	KRP000980
	Sample Number		FWB11032	FWB11033
NEMERTEA	Nemertea	3	R	R
ANNELIDA (WORMS)	Oligochaeta	1	C	C
MOLLUSCA	<i>Latia</i>	5	C	R
	<i>Potamopyrgus</i>	4	VA	VA
	Sphaeriidae	3	R	-
CRUSTACEA	<i>Paranephrops</i>	5	-	R
EPHEMEROPTERA (MAYFLIES)	<i>Austroclima</i>	7	A	-
	<i>Coloburiscus</i>	7	C	C
	<i>Deleatidium</i>	8	C	R
	<i>Zephlebia group</i>	7	R	A
PLECOPTERA (STONEFLIES)	<i>Zelandobius</i>	5	C	C
COLEOPTERA (BEETLES)	Elmidae	6	VA	A
	Ptilodactylidae	8	-	R
MEGALOPTERA (DOBSONFLIES)	<i>Archichauliodes</i>	7	A	A
TRICHOPTERA (CADDISFLIES)	<i>Aoteapsyche</i>	4	VA	A
	<i>Costachorema</i>	7	C	R
	<i>Hydrobiosis</i>	5	R	R
	<i>Neurochorema</i>	6	-	R
	<i>Oxyethira</i>	2	R	C
	<i>Pycnocentroides</i>	5	C	R
	<i>Aphrophila</i>	5	VA	A
DIPTERA (TRUE FLIES)	Orthoclaadiinae	2	A	A
	<i>Polypedilum</i>	3	-	R
	Tanytarsini	3	C	C
	<i>Paradixa</i>	4	R	-
	Empididae	3	R	C
	<i>Austrosimulium</i>	3	A	A
	Tanyderidae	4	-	R
<b>No of taxa</b>			23	25
<b>MCI</b>			92	94
<b>SQMCI</b>			4.8	4.4
<b>EPT (taxa)</b>			9	9
<b>%EPT (taxa)</b>			39	36
'Tolerant' taxa		'Moderately sensitive' taxa	'Highly sensitive' taxa	

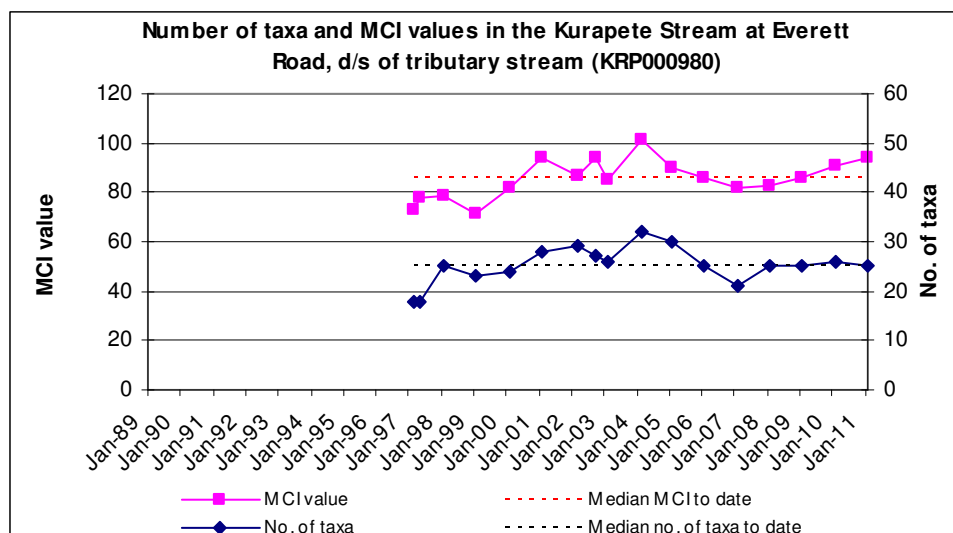
R = Rare    C = Common    A = Abundant    VA = Very Abundant    XA = Extremely Abundant

Taxa richness at site I was moderate (23 taxa) for the lower reaches of a small stony ringplain stream rising outside of the National Park, receiving agricultural run-off and point source discharges. It was equivalent with the median richness recorded for this site to date (Table 1) and slightly above the median richness since the improvement in richness recorded over the last eleven years due to the removal of the municipal ponds treated wastes discharge from the stream at Inglewood (Table 2 and Figure 2). The faunal community was dominated by no 'highly sensitive' taxa ; four 'moderately sensitive' taxa (mayfly (*Austroclima*), elmid beetles, dobsonfly (*Archichauliodes*), and cranefly (*Aphrophila*)); and four 'tolerant' taxa (snail (*Potamopyrgus*), net-building caddisfly (*Aoteapsyche*), orthoclad midges and sandfly

(*Austrosimulium*)); some of these taxa being typical of slightly enriched streams having a moderate periphyton substrate cover. No 'highly sensitive' taxa were dominant under these low flow conditions, and only one such taxon was recorded at this site. The MCI score (92) reflected the relatively high proportion of 'tolerant' taxa (48% of faunal richness) in the community. This score was 3 units below the median of all scores (Table 1) previously recorded at this site (at an elevation of 110 m a.s.l.) and was 3 units below the median score (Table 2) recorded since quarry biomonitoring commenced. The current MCI score was 4 units lower than that predicted for a ringplain stream site at an altitude of 110m asl (Stark and Fowles, 2009). However, taxa richness and MCI score (Figure 2) continued to reflect the general improvement in stream conditions (physicochemical water quality and physical habitat) consistent with the cessation of the Inglewood oxidation ponds system's discharge (which has been diverted to the New Plymouth Wastewater Treatment Plant) and the relatively few recent (consented) overflows from the system during wet weather periods to date (TRC, 2010a).

### Site J: Everett Road bridge (downstream of quarry tributary)

Historical data for this site are illustrated in Figure 3.



**Figure 3** Taxa richness and MCI scores recorded to date at site J

A small increase in taxa richness (25) of two taxa was found at the more open site J, downstream of the quarry tributary where siltier, looser substrate conditions were more characteristic of the streambed. More extensive periphyton substrate cover (particularly in the form of thicker mats and more filamentous algae) was apparent on the finer sedimented substrate. The dominant taxa were very similar in terms of the number of 'moderately sensitive' and 'tolerant' taxa in comparison to those which were abundant at the upstream site despite siltier conditions and thicker periphyton mats. There was minimal change in the proportion of 'tolerant' taxa (44% of the total taxa) comprising the fauna at this downstream site. Only two 'highly sensitive' taxa were recorded and both of these were present only as rarities.

Minor community composition changes were reflected in the slightly lower SQMCI<sub>s</sub> score (4.4 units) which was an insignificant reduction of 0.4 unit when compared to

the score obtained at the upstream site I. The MCI score at site J (94) increased by an insignificant 2 units above the score at site I upstream and it was 8 units higher than the median of scores recorded at this site to date (Figure 3). This atypical difference between the two adjacent sites was statistically insignificant (Stark, 1998) despite the variability in habitat conditions between sites.

## 4. Conclusions

This late summer biomonitoring survey was performed under a period of low recession flow conditions in the lower reaches of the Kurapete Stream. The survey indicated no recent impacts on the faunal community over the short reach of the stream, below the small tributary draining the quarry area, downstream at the site a short distance beyond the boundary of the permitted mixing zone. Only minor differences in faunal richnesses between these sites were found, despite some additional sedimentation in the reach of the lower Kurapete Stream below the quarry tributary inflow and some increase in visual turbidity of the main stream. There was an atypical, small, downstream increase in MCI score (reflective of minimal change in community structure) under a period of low flow conditions preceding the survey, coincident with some physical habitat variability. In general, these results continued the recent trend of stream biota improvement recorded over most previous summers coincident with improved management and upgrades to the quarry wastewater treatment system and following upstream water quality improvement subsequent to the diversion of the Inglewood oxidation ponds system wastes out of the stream in mid-catchment. Improvements in the configuration and operation of the quarry wastewater/stormwater settlement ponding system must be maintained in order to reduce the visual, aesthetic impacts of the often turbid quarry tributary receiving waters on the main Kurapete Stream in the immediate vicinity of Everett Road. Relatively recent riparian vegetation planting in the proximity of the Everett Road site and fencing of the stream margins preventing stock access, has enhanced the stream habitat in this reach, particularly as the plantings have developed.

## 5. Summary

The Council's standard 'kick-sampling' technique was used at two established sites to collect streambed macroinvertebrates from an unnamed tributary of the Kurapete Stream. Samples were processed to provide number of taxa (richness), MCI score, SQMCI<sub>s</sub> score and %EPT taxa 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. It may also provide more relevant information than the MCI in relation to non-organic impacts.

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.

This late summer macroinvertebrate survey indicated that the discharge of treated quarry wastewaters from the Inglewood quarry site had not had any recent detrimental effects on the macroinvertebrate communities of the Kurapete Stream.

No significant change in the macroinvertebrate communities indices was noted between the upstream 'control' site and the first site downstream of the discharge, beyond the designated 25 m mixing zone, despite a small increase in turbidity of the stream at the time of the survey, some increase in sedimentation of the streambed, and more widespread periphyton substrate cover.

The macroinvertebrate communities of the Kurapete Stream contained moderate proportions of 'sensitive' taxa at both sites and the communities were generally dominated by a combination of 'moderately sensitive' and 'tolerant' taxa with an atypical small decrease in the proportion of 'tolerant' taxa at the site downstream of the quarry discharge.

MCI and SQMCI<sub>s</sub> scores indicated that the stream communities were of 'fair' health at the two sites and were relatively typical of conditions recorded in similar Taranaki streams. The 'health' of the stream in general was typical of the trend of improvements in conditions recorded over recent years since the diversion of treated oxidation ponds wastes out of the mid catchment and improvements to quarry management practices.

## **6. References**

### **Internal Taranaki Regional Council Reports**

Fowles CR, 2009: Biomonitoring of the lower reaches of the Kurapete Stream in relation to Inglewood Metal Ltd quarry discharges, February 2009. TRC Internal Report CF481.

Fowles CR, 2010: Biomonitoring of the lower reaches of the Kurapete Stream in relation to Inglewood Metal Ltd quarry discharges, February 2010. TRC Internal Report CF500.

TRC, 2006: An interpretation of the reasons for statistically significant temporal trends in macroinvertebrate (MCI) SEM data in the Taranaki region 1995-2005. TRC Internal Report, 12pp

TRC, 2010: Inglewood Metal Limited Quarry Monitoring Programme Annual Report 2009-2010. TRC Report 2010-17.

TRC, 2010a: New Plymouth District Council Inglewood oxidation ponds' system Monitoring Programme Annual Report 2009-2010. TRC Report 2010-13.

TRC, 2011 (in prep): Freshwater Macroinvertebrate Fauna Biological Monitoring Programme Annual State of the Environment Monitoring Report 2009-2010. TRC Technical Services Report 2010-16.

### **External Publications**

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. NZJ Mar FW Res. 32: 55-66.
- Stark, J D, 1999: An evaluation of Taranaki Regional Council's SQMCI biomonitoring index. Cawthron Report No 472. 32pp.
- 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 Fowles CR, 2006: An approach to the evaluation of temporal trends in Taranaki state of the environment macroinvertebrate data. Cawthron Report No 1135. 88pp
- Stark, JD and Fowles CR, 2009: Relationships between MCI, site altitude, and distance from source for Taranaki ring plain streams. Stark Environmental Report No 2009-01. 47pp.

