

Civil Quarries Ltd – Everett Road Quarry
Monitoring Programme
Annual Report
2016-2017

Technical Report 2017-73

ISSN: 1178-1467 (Online)

Document: 1909041 (Word)

Document: 1981939 (Pdf)

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March 2018

Executive summary

Civil Quarries Ltd (the Company) operates a quarry located on Everett Road at Everett Park, in the Kurapete catchment, having taken over management from the former consent holders Inglewood Metals Ltd during the monitoring period covered by this report.

This report for the period July 2016 to June 2017 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess the Company's environmental and consent compliance performance during the period under review. The report also details the results of the monitoring undertaken and assesses the environmental effects of the Company's activities.

The Company holds two resource consents, which include a total of 29 conditions setting out the requirements that the Company must satisfy. The Company holds one resource consent to allow it to discharge treated washwater, stormwater and groundwater into an unnamed tributary of the Kurapete Stream, and one consent to abstract groundwater encountered during the quarrying process for the purposes of site dewatering and for use in aggregate washing. These resource consents were issued during the monitoring period, and are undergoing variations to conditions at the time of reporting.

During the monitoring period, Inglewood Metals Ltd demonstrated an overall level of environmental performance that required improvement.

During the monitoring period, Civil Quarries Ltd demonstrated an overall level of environmental performance that required improvement.

The Council's monitoring programme for the year under review included three scheduled inspections and one follow-up inspection, two discharge and two receiving water physicochemical surveys, and one biological survey of receiving waters.

The monitoring showed that no significant adverse effects had been identified in relation to site discharges during this monitoring period. By comparison with previous years, the monitoring indicated no further decline in the macroinvertebrate communities in the receiving waters of the Kurapete Stream and its tributary, but the water chemistry results indicated slight technical breaches of the turbidity consent limits, and a visual decline in water quality was noted during one sampling inspection. There was one unauthorised incident recording non-compliance in respect of the previous consent holder during the period under review, for which an infringement notice was served.

During the year, Inglewood Metals Ltd demonstrated a level of administrative performance regarding their resource consents that required improvement. Civil Quarries Ltd also demonstrated a level of administrative performance that required improvement. This should be addressed in the 2017-2018 monitoring period as changes to consent conditions become finalised.

For reference, in the 2016-2017 year, consent holders were found to achieve a high level of environmental performance and compliance for 74% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 21% of the consents, a good level of environmental performance and compliance was achieved.

This report includes recommendations for the 2017-2018 year.

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1 Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is for the period July 2016 to June 2017 and describes the monitoring programme associated with resource consents held by Civil Quarries Ltd (the Company). The Company operates a quarry situated on Everett Road at Everett Park, having transferred resource consents from the previous consent holders, Inglewood Metals Ltd, during the period under review. This report focusses primarily on the compliance of the current operators under the current consents, but will present results and discussion regarding the previous operators under the now expired resource consent.

This report covers the results and findings of the monitoring programme implemented by the Taranaki Regional Council (the Council) in respect of the consents held by the Company that relate to abstractions and discharges of water in the Kurapete catchment. This is the 22nd annual report to be prepared by the Council to cover the Everett Road Quarry site's water discharges and their effects, and the first report under the current Company's management.

1.1.2 Structure of this report

Section 1 of this report is a background section. It sets out general information about:

- consent compliance monitoring under the RMA and the Council's obligations;
- the Council's approach to monitoring sites through annual programmes;
- the resource consents held by the Company/companies 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 Company's site/catchment.

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

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

Section 4 presents recommendations to be implemented in the 2017-2018 monitoring year.

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

1.1.3 The Resource Management Act 1991 and monitoring

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

- a. the neighbourhood or the wider community around an activity, and may include cultural and social-economic effects;
- b. physical effects on the locality, including landscape, amenity and visual effects;
- c. ecosystems, including effects on plants, animals, or habitats, whether aquatic or terrestrial;
- d. natural and physical resources having special significance (for example recreational, cultural, or aesthetic); and
- e. risks to the neighbourhood or environment.

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

1.1.4 Evaluation of environmental and administrative performance

Besides discussing the various details of the performance and extent of compliance by the Company, this report also assigns them a rating for their environmental and administrative performance during the period under review.

Environmental performance is concerned with actual or likely effects on the receiving environment from the activities during the monitoring year. Administrative performance is concerned with the Company's approach to demonstrating consent compliance in site operations and management including the timely provision of information to Council (such as contingency plans and water take data) in accordance with consent conditions.

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

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

Environmental Performance

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

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

For example:

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

Improvement required: Likely or actual adverse effects of activities on the receiving environment were more than minor, but not substantial. There were some issues noted during monitoring, from self reports, or in response to unauthorised incident reports. Cumulative adverse effects of a persistent

minor non-compliant activity could elevate a minor issue to this level. Abatement notices and infringement notices may have been issued in respect of effects.

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

Administrative performance

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

Good: Perhaps some administrative requirements of the resource consents were not met at a particular time, however this was addressed without repeated interventions from the Council staff. Alternatively adequate reason was provided for matters such as the no or late provision of information, interpretation of 'best practical option' for avoiding potential effects, etc.

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

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

For reference, in the 2016-2017 year, consent holders were found to achieve a high level of environmental performance and compliance for 74% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 21% of the consents, a good level of environmental performance and compliance was achieved.

1.2 Process description

The Company's quarrying operation is located adjacent to the true right bank of the Kurapete Stream at Everett Road, near Inglewood. The current site is approximately 10 ha in total area, encompassing active excavation areas, stormwater treatment ponds, stockpiling and processing areas. Processing facilities include machinery for dry crushing and a washing and screening plant. Some aggregate washing is performed at the site, generating washwater that must be managed as part of the site operations. Photo 1 shows the current operation looking from the upper pond area towards the pit base and excavation area.

Waste washwater is directed through a series of settling ponds before being either recirculated for use in washing or discharged via a further series of ponds to the head of the unnamed tributary. The quarrying area is contoured and bunded so that groundwater and site 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. Discharge from the final treatment pond is via a steel pipe access culvert to the tributary which flows approximately 600 m 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).

Over recent years there has been some variability in the configuration of the upper settlement pond system receiving the quarry floor wastewater prior to discharge to the stream. At the time of reporting, the Company are applying to change their discharge consent, which requires modification of their existing water treatment system to increase pond capacity.

The Company have indicated they intend to continue extracting from the base of the current excavation area, and have applied to increase the available quarrying area. In recent years larger ponds have been constructed on the quarry floor for improved retention and settlement of turbid groundwater and stormwater prior to pumping to the upper ponds' treatment system. As the extent of the quarrying area increases, the Company will have to managing an increasing volume of generated water, necessitating the planned changes to their current circulation system, as outlined in their current consent change application.



Photo 1 Everett Road Quarry view from upper pond area, site under Civil Quarries Ltd management



Figure 1 Quarry operations, wastewater treatment system, Everett Road Quarry

1.3 Resource consents

1.3.1 Water abstraction permit

Section 14 of the RMA stipulates that no person may take, use, dam or divert any water, unless the activity is expressly allowed for by a resource consent or a rule in a regional plan, or it falls within some particular categories set out in Section 14.

Civil Quarries Ltd holds water permit **10247-1.0** to cover the abstraction of groundwater incidental to quarry operations and for aggregate washing purposes. This permit was issued by the Council to the previous site operators (Inglewood Metal Ltd) on 1 December 2016 under Section 87(d) of the RMA. The permit was then transferred to Civil Quarries Ltd on 6 April 2017. At the time of reporting the Company have applied to change the conditions of the permit, these changes are still being processed. It is due to expire on 1 June 2033.

Condition 1 imposes a limit upon the abstraction rate.

Condition 2 requires the use of an accurate flow measuring and recording device and provides for the supply of abstraction data to the Council.

Condition 3 stipulates the requirements for record keeping and submission.

Condition 4 requires the verification of the flow measurement and recording device referred to in Condition 2, and Condition 5 relates to the maintenance of said device.

Condition 6 sets out a requirement for the implementation of a monitoring programme to assess for possible impacts on groundwater resources from the exercise of the consent.

Condition 7 requires the installation of data loggers on the aforementioned flow meter devices.

Condition 8 requires the consent holder to adopt best practical option when exercising the consent.

Condition 9 is a review provision.

The permit is attached to this report in Appendix I.

1.3.2 Water discharge permit

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

Water quality is a primary concern to the 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 stream during low flow, can result in 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, greater dilution, and increased 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.

The Company holds water discharge permit **1113-5.0** to cover the discharge of treated stormwater (including groundwater seepage) and treated washwater into an unnamed tributary of the Kurapete Stream. This permit was issued by the Council to the previous site operators (Inglewood Metal Ltd) on 1 December 2016 under Section 87(d) of the RMA. This permit supersedes discharge permit **1113-4**, which expired during the monitoring period under review. Permit 1113-5.0 was transferred to Civil Quarries Ltd on 6 April 2017. At the time of reporting the Company have applied to change the conditions of the permit. It is due to expire on 1 June 2033.

Conditions 1 and 2 require the Company to implement upgrades of the existing stormwater and washwater pond system as per documentation supplied as part of the consent application.

Condition 3 requires the Company to provide a stormwater management plan.

Condition 4 requires the Company to implement and maintain a circulatory system to isolate washwater from the stormwater system.

Condition 5 stipulates the geographical location of the discharge point into the Kurapete Stream tributary.

Condition 6 requires the consent holder to adopt best practical option when exercising the consent.

Condition 7 limits the total area of the stormwater catchment.

Condition 8 gives the maximum discharge rate for stormwater and groundwater pumped to the treatment ponds.

Condition 9 requires the installation and maintenance of an accurate flow measuring and recording device at the point of discharge and provides for the supply of discharge data to the Council.

Condition 10 states that the Company must notify the Council prior to undertaking alterations to equipment or processes that may result in changes to quality or quantity of discharge water leaving the site.

Condition 11 restricts the Company from discharging untreated stormwater or washwater.

Conditions 12 and 13 require the Company to maintain site bunding and contouring to control groundwater, washwater and stormwater in the washwater treatment system and active quarry areas.

Conditions 14 and 15 discuss site silt control system requirements.

Condition 16 provides constituent concentration limits for the site discharges.

Conditions 17 and 18 limit the effects on water quality in the receiving waters of the Kurapete Stream and its tributary relative to site discharges.

Condition 19 requires the Company to maintain a site contingency plan.

Condition 20 is a review provision.

Copies of both the current and expired permits are attached to this report in Appendix I.

1.4 Monitoring programme

1.4.1 Introduction

Section 35 of the RMA sets obligations upon the Council to gather information, monitor and conduct research on the exercise of resource consents within the Taranaki region. The Council is also required to assess the effects arising from the exercising of these consents and report upon them.

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

The monitoring programme for the Everett Road Quarry site consisted of four primary components.

1.4.2 Programme liaison and management

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

- ongoing liaison with resource consent holders over consent conditions and their interpretation and application;
- in discussion over monitoring requirements;
- preparation for any consent reviews, renewals or new consent applications;
- advice on the Council's environmental management strategies and content of regional plans; and
- consultation on associated matters.

1.4.3 Site inspections

The Everett Road site was visited four times during the monitoring period, three scheduled inspections and one follow up inspection were undertaken. With regard to consents for the abstraction of or discharge to water, the main points of interest were plant processes with potential or actual discharges to receiving watercourses, including contaminated stormwater and process wastewaters. Air inspections focused on plant processes with associated actual and potential emission sources and characteristics, including potential odour, dust, noxious or offensive emissions. Sources of data being collected by the Company were identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. The neighbourhood was surveyed for environmental effects.

1.4.4 Chemical sampling

The Council undertook sampling of both the discharges from the site and the water quality upstream and downstream of the discharge point and mixing zone.

The quarry washwater/stormwater discharge was sampled on two occasions, and the samples analysed for pH, electrical conductivity, suspended solids and turbidity. The Kurapete Stream was sampled on two occasions, and the samples were analysed for the same parameters as the discharge.

1.4.5 Biomonitoring surveys

One biomonitoring survey of the Kurapete Stream was conducted at three sites to determine whether or not the discharge of treated stormwater and uncontaminated site and process water has had a detrimental effect upon the communities of the stream.

2 Results

2.1 Water

2.1.1 Inspections

19 August 2016

A scheduled inspection of the quarry site was undertaken by two inspecting officers. The quarry manager was present at the time of inspection and informed the officers there had been recent problems with stormwater from the road and farms outside of the quarry boundaries entering the site due to a blocked road culvert. At the time of inspection this was being investigated by New Plymouth District Council and Fulton Hogan.

The wash plant had not been in use at the time of inspection, and had been previously only been used to wash clean material. Stormwater pond levels were noted to be low, with stormwater being pumped to the silt ponds at the time of inspection.

There was a high flow discharge from the final pond into the unnamed tributary and the discharge was slightly turbid. This was causing discoloration at the confluence of the unnamed tributary and the Kurapete Stream. Samples were collected of the discharge and the receiving waters. The results are presented below, in Tables 2 and 3, Section 2.1.2. This inspection is also discussed further in Section 2.2.

1 September 2016

A follow up re-inspection was undertaken at the quarry site with the quarry manager. It was observed that the stormwater/washwater management system had been modified. The stormwater from the quarry pit had been separated out and was being pumped directly to the final pond and then into the unnamed tributary. Sand plant washwater was being circulated through the five silt ponds and then recirculated back to the sand plant for continual use. Stormwater could still be diverted into the wash pits to increase available volume if and when required. The tributary was inspected and found to be flowing clean and clear with no visual impact from quarrying operations.

13 December 2016

An inspection was conducted in fine weather conditions with the site manager present. Ownership of the quarry had changed since the previous inspection to the current Company (Civil Quarries Ltd); however the permits had yet to have been officially transferred between operators. Significant works had been undertaken in the quarry pit to direct and slow the flow of stormwater and groundwater to allow sediment to settle out of suspension before water is pumped up to the stormwater ponds.

The wash plant was in use at the time of inspection. Following the observations from the previous inspection, the site manager indicated the intention would be that washwater ponds were to be isolated from the stormwater ponds. Water from the stormwater ponds would still be able to discharge into the washwater ponds to top up volumes for the wash plant as required. The pond levels were all low at the time of inspection and there was no discharge into the unnamed tributary.

The unnamed tributary was slightly cloudy but there was no visual impact on the Kurapete Stream which was flowing clean and clear. There was no odour or dust discharging beyond the boundary of the property.

14 March 2017

An inspection was undertaken in fine weather conditions following recent wet weather. Inspecting officers were joined onsite by the quarry manager. No odours or dust discharges were noted during the inspection. The wash plant was not in use at the time of inspection, and the quarry manager informed inspecting officers that new settling ponds were to be built in the quarry pit area.

Stormwater was being pumped up from the quarry pit and the final pond was discharging during the inspection. Samples were collected of the discharge and the receiving waters. The unnamed tributary was slightly cloudy but there was no visual impact on the Kurapete Stream which was flowing clean and clear. Sample results are presented below in Tables 2 and 3, Section 2.1.2. At the time of inspection the groundwater abstraction consent was undergoing variations in conditions and compliance was therefore not assessed.

2.1.2 Results of abstraction, discharge and surface water quality monitoring

Abstraction monitoring will be undertaken in the following monitoring period following the finalisation of the variation to consent 10247-1.0. As part of the consenting process the Company will be modifying the existing water management system, including the installation of water metering hardware and the installation of monitoring bores on the site boundary to monitor for groundwater drawdown effects.

Discharge results from the August and March inspection sampling are presented in Tables 2 and 3. Sampling locations are described in Table 1 and Figure 2.

Table 1 Locations and details of sampling sites

| Site | Location | GPS coordinates | Site code |
|-------------------------------|--|-------------------|-----------|
| Quarry washwater / stormwater | At discharge outlets (stormwater included after Feb 1998) | 1710431E 5668301N | IND002022 |
| Kurapete Stream | 100 m upstream of Everett Road bridge (upstream of quarry tributary) | 1710640E 5668709N | KRP000960 |
| Unnamed tributary | 5m upstream of the Kurapete Stream confluence (600 m downstream of discharges at quarry) | 1710658E 5668713N | KRP000975 |
| Kurapete Stream | At the Everett Road bridge (approximately 100 m downstream of quarry tributary) | 1710695E 5668758N | KRP000980 |

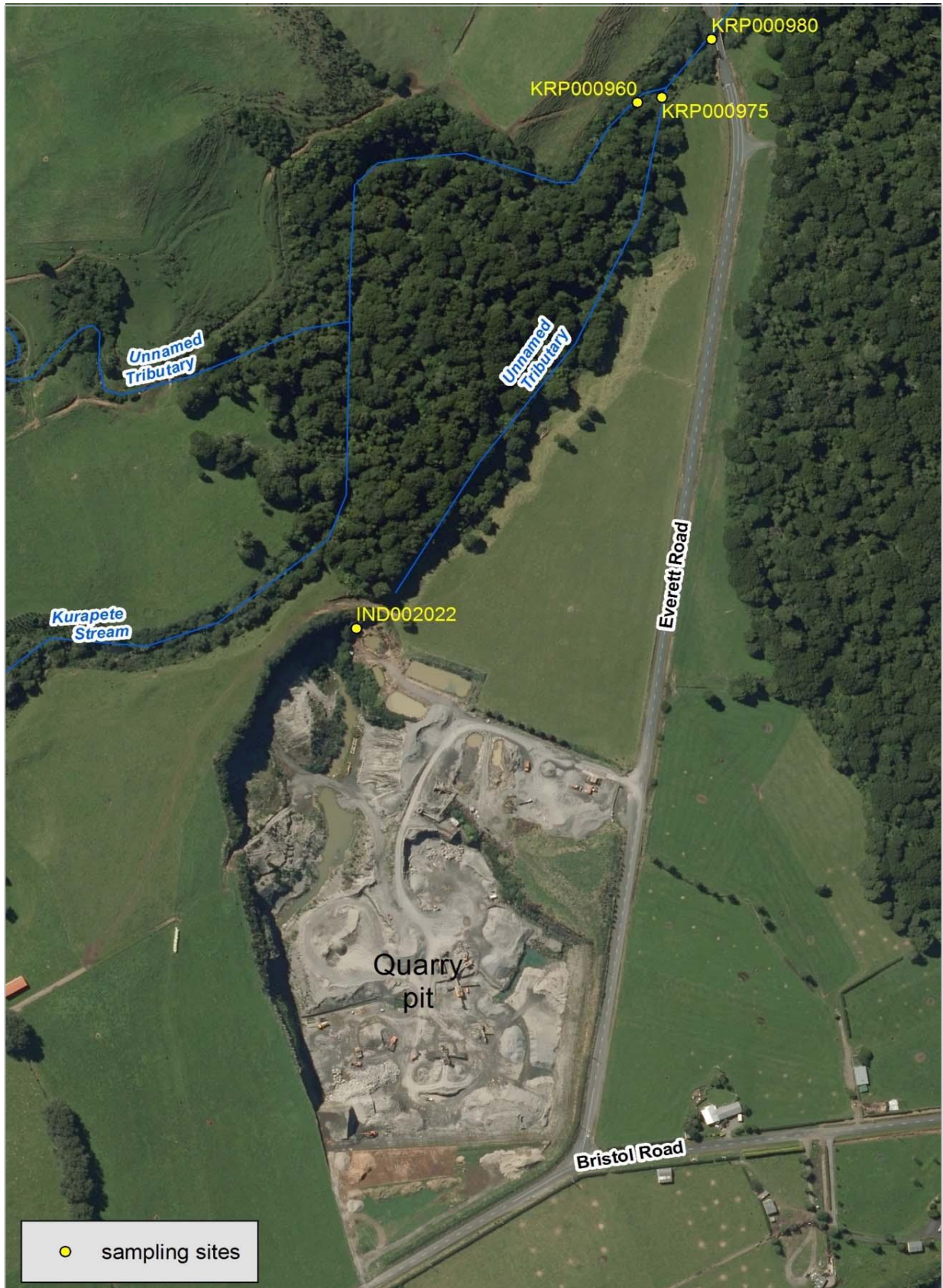


Figure 2 Sampling site locations, Everett Road Quarry

Table 2 Chemical monitoring results for discharge sampling site IND002022

| Parameter | Conductivity @ 20°C | pH | Suspended solids | Turbidity |
|-----------------------|---------------------|-----|------------------|-----------|
| Unit | mS/m @ 20°C | pH | g/m ³ | NTU |
| 19 Aug 2016 | 26.8 | 7.5 | 17 | 30 |
| 14 Mar 2017 | 29.7 | 7.9 | 30 | 29 |
| <i>Consent limits</i> | - | 6-9 | 100 | - |

Discharge samples taken during the August 2016 and March 2017 inspections were within consent limits for all measured parameters. It was however noted that during the 19 August 2016 sampling there was a high volume discharge occurring from the site which was impacting the visual quality of both the tributary and the main Kurapete Stream. At this time the site was still under former management and operating under previous discharge permit 1113-4, which has slightly different consent limits for receiving water samples. The results of sampling of the receiving water samples are presented below in Table 3.

Table 3 Chemical monitoring results for the Kurapete Stream and unnamed tributary

| Parameter | | Kurapete Stream | | |
|-----------------------|------------------|------------------|-------------------|------------------|
| | | Upstream site | Unnamed tributary | Downstream site |
| 19 August 2016 | | KRP000960 | KRP000975 | KRP000980 |
| Time | NZST | 09:50 | 09:45 | 09:40 |
| Conductivity @20°C | mS/m | 11.4 | 25.7 | 15.1 |
| pH | | 7.4 | 7.5 | 7.6 |
| Suspended solids | g/m ³ | <2 | 22 | 6 |
| Turbidity | NTU | 1.4 | 27 | 7.6* |
| 14 March 2017 | | KRP000960 | KRP000975 | KRP000980 |
| Time | NZST | 10:50 | 10:45 | 10:41 |
| Conductivity@20°C | mS/m | 11.4 | 28.7 | 13.6 |
| pH | | 7.6 | 7.6 | 7.7 |
| Suspended solids | g/m ³ | <2 | 13 | 2 |
| Turbidity | NTU | 1.8 | 17 | 4.0 |

*indicates non compliance with current consent conditions, sampling undertaken under previous consent

The receiving water results show a slight increase in suspended solids between the upstream control site and the downstream compliance point, but all results are within a normal range for a Taranaki surface water body with similar characteristics to the Kurapete Stream at Inglewood. During the monitoring period covered under this report, discharge permit 1113-4 was superseded by the current permit 1113-5.0. There has been a slight variation in the conditions regarding receiving water quality; specifically the limits on turbidity have been updated. The sample results would be technically non compliant with the current resource consent, which states the discharge should not lead to an increase in turbidity downstream of the tributary and Kurapete Stream confluence of more than 50%. The August samples would have however, been compliant at the time of sampling under the previous consent's conditions. The implications of these results are discussed further in Sections 2.2 and 3.2.

2.1.3 Biomonitoring

The Council's standard 'kick-sampling' technique was used at three established sites to collect streambed macroinvertebrates from an unnamed tributary of the Kurapete Stream. Samples were processed to provide number of taxa (richness), MCI and SQMCI_s scores, 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_s takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities. It may be the more appropriate index if non-organic impacts are occurring.

Significant differences in either the MCI or the SQMCI_s between sites indicate the degree of adverse effects (if any) of the discharges being monitored.

The 22 February 2017 macroinvertebrate survey indicated that the discharge of treated stormwater and treated quarry washwater from the Everett Road Quarry site had not had any recent specific detrimental effects on the macroinvertebrate communities of the Kurapete Stream. The macroinvertebrate communities throughout the surveyed reach on the Kurapete Stream had moderate to high taxa richness. There were no significant differences among MCI scores, SQMCI_s scores indicated 'good' health and there were relatively high proportions of EPT taxa.

No significant changes in the macroinvertebrate communities were notable between the upstream control site and two sites downstream of the site discharge. It has however, been noted in previous biomonitoring surveys, that site activities have at times led to significant impacts on the macroinvertebrate community in the Kurapete Stream downstream of the confluence with the quarry's discharge tributary. The survey conducted in the previous monitoring period had shown recent impacts and as such a recommendation was made to add a third site to the survey, which has been implemented in the 22 February 2017 survey.

The full biomonitoring report, which includes details of the location of the sampling sites, is attached to this report in Appendix II.

2.2 Investigations, interventions, and incidents

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

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

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

In the 2016-2017 period, the Council was required to record one incident in association with the previous Company's conditions in resource consents.

The results of the inspection and related sampling undertaken 19 August 2016 resulted in an incident being registered against consent 1113-4 (IN/33575). The inspecting officer noted the site discharge was having a

detrimental effect on water clarity downstream of the mixing zone, which was in contravention of existing abatement notice EAC-21162, issued to the former consent holder in the previous monitoring period.

Samples of the discharge and receiving waters were taken at the time of inspection (as presented above in Tables 2 and 3). The results were compliant with the consent limits at the time (the limits of the current consent are slightly more stringent regarding turbidity), however the discharge was deemed non compliant with special condition 11 on the grounds it led to a conspicuous change in colour and clarity in the Kurapete Stream and its tributary.

A letter of explanation was received, which stated that the non compliant discharge was the result of temporarily increasing discharge rates to avoid flooding of the quarry pit base. Following the initial inspection, the operators reconfigured their pond system to reduce flow, and re-inspection of the site found it to be operating within consent conditions. This incident resulted in the issuing of infringement notice EAC-21277 as the former consent holders had already been abated for this issue in the previous monitoring period.

3 Discussion

3.1 Discussion of site performance

Assessing site performance at Everett Road Quarry during the 2016-2017 monitoring period is slightly more complex than during previous years due to the transition between operators and changes to consents all occurring within this monitoring period. There was one instance of enforcement action being undertaken against the previous operators under the now expired and superseded discharge permit 1113-4. Current discharge consent 1113-5.0 and abstraction consent 10247-1.0 were issued in the middle of the monitoring period but were transferred shortly after to the current operators Civil Quarries Ltd. As aforementioned, at the time of reporting, changes to consent conditions for both these permits are being processed, likely resulting in additional site monitoring requirements. As part of the change of conditions, the Company are required to modify the existing treatment system to increase pond capacity, isolate washwater from the other site water and change the pumping and pond layout.

The previous operators have had a mixed history of consent compliance for the site, and the incident recorded in August 2016 against the site was similar in nature to an incident registered in the 2015-2016 period for which they were issued an abatement notice. On the basis of this incident and subsequent enforcement action, the previous operators would have been assessed as requiring improvement for consent compliance and environmental performance. However, given that site management has changed since the recording of this non-compliance, it is important to distinguish between historical and current operations when assessing consent compliance performance.

Civil Quarries Ltd have been working with Council staff and external consultants to finalise changes to the conditions of both resource consents. Their intention is to complete the required alterations to their equipment and processes in conjunction with the issuing of the finalised consents. Because of this, assessment of Company performance in relation to the abstraction permit is difficult, and several conditions in the discharge permit are also not fully assessable until the updated consents are issued.

It has been communicated to the Company, however, that in the interim period, they are still operating under the standing consent conditions. As such, they are responsible for undertaking measures where practicable to reduce the impacts of site activities while the consent variations are being completed. Since the end of the 2016-2017 monitoring period, the Company have been issued directive to begin the works outlined in the consent applications by way of abatement. At the time of reporting, the Company have advised that they have sourced water metering equipment and will complete required earthworks over the 2017-2018 summer period.

The Company are in a good position to improve on the record of the former consent holders for this site once the resource consents are finalised and associated work completed.

3.2 Environmental effects of exercise of consents

The 2015-2016 monitoring report for this site stated that 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. This is because 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 has been shown to be particularly relevant in the lower reaches of the Kurapete Stream near its confluence with the Manganui River.

The previous report also concluded that the operation of the Company's quarry was having an undesirable level of impact in the receiving environment, as reflected in the biomonitoring survey results for that period. Biomonitoring conducted in the period under review in this report, however, has not indicated any further recent adverse impacts related to site operations.

There were however, two physicochemical sampling turbidity results which were in excess of the limit given in special condition 18 of the current consent 1113-5.0. The associated discharges had relatively low concentrations of suspended solids; it is likely the increased volume of water being discharged was responsible for the increase in turbidity. No effects from these discharges were observed in the biomonitoring results, but there have been effects noted in previous monitoring periods. This indicates that the issues with site discharges noted in previous monitoring periods are ongoing, providing further justification for the Company to complete the required modifications to their water treatment systems.

There is also potential for detrimental environmental effects on groundwater quality as a result of abstraction for dewatering the excavation area. These potential effects of any groundwater take are primarily:

- Effects of abstraction on the sustainability of the aquifer;
- Drawdown and interference effects on surrounding bores/wells;
- Reduction in baseflow and drawdown interference effects on surrounding surface water bodies;
- Saltwater intrusion; and
- An increase in or the initiation of leaking between aquifers.

The potential effects associated with the taking of groundwater and the likelihood of their occurrence as a result of the proposed take, are discussed in further detail below.

Abstraction in excess of recharge on a consistent basis will lead to adverse impacts on an aquifer. These impacts can include a decline in water quality and aquifer depletion. If the aquifer is not receiving adequate recharge to balance abstraction, long-term dewatering can deplete the aquifer and reduce the ability of the aquifer to recharge. As the site is dewatering not actively abstracting groundwater for other uses the volume of water removed from the quarry is dictated by the volume of groundwater seepage into the quarry. Therefore abstraction in theory is equal to recharge. Outside the quarry perimeter however, only long term groundwater level and groundwater quality monitoring can be used to ascertain whether there are any unsustainable effects occurring in the aquifer as a result of the long term ongoing quarrying activities.

Removal of groundwater from an excavation occurring below the groundwater table produces a localised drawdown cone within the surrounding aquifer. This excavation creates a depression in the groundwater table changing local hydraulic gradients. The continuous and/or long term dewatering of the excavation can increase the size of the affected area, if abstraction is greater than recharge. Therefore, if other nearby users are also utilising the same aquifer this can lead to a reduction in availability to these users. There is only one other bore/well known to the Council within a 500 m radius of the excavation. There have been no reported impacts to this bore/well from the dewatering of this Quarry.

A high percentage of surface water baseflow can be attributed to recharge from surrounding aquifers. Therefore the drawdown cone produced by dewatering of an excavation close to a surface water body may reduce the volume of water available to maintain baseflow. In addition, due to the change in hydraulic gradients caused by the excavation surface water may flow under gravitational forces towards the excavation and result in a reduction of baseflow available downstream. A section of a local unnamed tributary was mined out during historical excavations. The remaining downstream section of this tributary now receives the groundwater and surface water runoff removed from the floor of the quarry. Therefore a reduction in the flow available downstream is unlikely.

As mentioned above, the dewatering of an excavation produces a localised drawdown cone within the aquifer and provides a sink which results in changes to local hydraulic gradients. If the drawdown cone intercepts a saline water body the saline water can flow under gravitational forces towards the excavation causing contamination of the groundwater aquifer. The excavation is 15 km away from the ocean therefore any saline intrusion is unlikely.

Abstraction from an aquifer can initiate leaking between aquifers. As the aquifer is being passively dewatered under gravitational force rather than being actively pumped an increase in the interaction between aquifers is considered unlikely.

The potential effects of dewatering the aquifer at the rates applied for have been assessed. Unless there are other groundwater users closer to the site than those currently known to the Council, there is no significant risk of dewatering affecting other groundwater users. There is no known risk of saltwater intrusion. There may be some risk of impacts on the sustainability of the aquifer or on local surface water bodies as no groundwater level or groundwater quality information is available. However a requirement to monitor groundwater levels and groundwater quality should mitigate this risk and highlight any adverse effects before they can become anything more than minor.

3.3 Evaluation of performance

A tabular summary of both consent holders' compliance record for the year under review is set out in Tables 4-7.

Table 4 Inglewood Metals Ltd summary of performance for consent 1113-5

| Purpose: To discharge treated stormwater and treated groundwater from quarry activities into an unnamed tributary of the Kurapete Stream | | |
|---|---|---|
| Condition requirement | Means of monitoring during period under review | Compliance achieved? |
| 1. Company to upgrade pond system as per supplied documentation | Inspections of treatment system and discharge point, liaison with Council | No – pending changes to consent conditions |
| 2. Upgrades to be completed within three months of issuing of consent | Inspections of treatment system and discharge point, liaison with Council | No – pending changes to consent conditions |
| 3. Provision of stormwater management plan | Plan to be supplied following change to consent conditions | N/A |
| 4. Company to isolate washwater from stormwater unless due to heavy rain events | Inspections of treatment site | Yes |
| 5. Location of discharge point | Inspections of treatment system and discharge point | Yes |
| 6. Company to adopt best practicable option | Inspections of treatment system and discharge point, liaison with Council, sampling of discharge and receiving waters | No – enforcement action undertaken for incident similar to in previous periods |
| 7. Limits quarry catchment area | Inspections | Yes |
| 8. Maximum discharge rate to not exceed 10 L/s | Inspections and supply of water meter data | Pending changes to consent conditions |
| 9. Company to install and maintain water meter and datalogger on discharge | Inspections, meter verification and supply of water meter data | Pending changes to consent conditions |
| 10. Company to notify prior to modifying processes or equipment | Notification if and when required | N/A |

| Purpose: To discharge treated stormwater and treated groundwater from quarry activities into an unnamed tributary of the Kurapete Stream | | |
|--|--|--|
| Condition requirement | Means of monitoring during period under review | Compliance achieved? |
| 11. No discharge of untreated stormwater/washwater/ groundwater | Inspections of treatment system and discharge point | Yes |
| 12. Washwater treatment system to be bunded | Inspections of treatment system | Yes |
| 13. Active quarry site to be contoured and bunded to direct water into treatment system | Inspections of treatment system | Yes |
| 14. Measures taken to reduce sediment in the discharge | Inspections of treatment system and discharge point | Pending changes to consent conditions |
| 15. Company to maintain silt control structures | Inspections of treatment system and discharge point | No – pending changes to consent conditions |
| 16. Discharge concentration limits | Physicochemical sampling | Yes |
| 17. Discharge to not adversely affect receiving waters | Inspection and physicochemical sampling of receiving waters, biological sampling | Yes |
| 18. Turbidity limit for receiving waters relative to discharge | Physicochemical sampling | No |
| 19. Contingency plan maintained | Plan received | Yes |
| 20. Optional review of consent | No review sought by Council | N/A |
| Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent | | Improvement required Improvement required |

N/A = not applicable

Table 5 Civil Quarries Ltd summary of performance for consent 1113-5

| Purpose: To discharge treated stormwater and treated groundwater from quarry activities into an unnamed tributary of the Kurapete Stream | | |
|---|---|--|
| Condition requirement | Means of monitoring during period under review | Compliance achieved? |
| 1. Company to upgrade pond system as per supplied documentation | Inspections of treatment system and discharge point, liaison with Council | No – pending changes to consent conditions |
| 2. Upgrades to be completed within three months of issuing of consent | Inspections of treatment system and discharge point, liaison with Council | No – pending changes to consent conditions |
| 3. Provision of stormwater management plan | Plan to be supplied following change to consent conditions | N/A |

| Purpose: To discharge treated stormwater and treated groundwater from quarry activities into an unnamed tributary of the Kurapete Stream | | |
|---|---|--|
| Condition requirement | Means of monitoring during period under review | Compliance achieved? |
| 4. Company to isolate washwater from stormwater unless due to heavy rain events | Inspections of treatment site | Yes |
| 5. Location of discharge point | Inspections of treatment system and discharge point | Yes |
| 6. Company to adopt best practicable option | Inspections of treatment system and discharge point, liaison with Council, sampling of discharge and receiving waters | No – Civil Quarries have not completed work to mitigate against further incidents |
| 7. Limits quarry catchment area | Inspections | Yes |
| 8. Maximum discharge rate to not exceed 10 L/s | Inspections and supply of water meter data | Pending changes to consent conditions |
| 9. Company to install and maintain water meter and datalogger on discharge | Inspections, meter verification and supply of water meter data | Pending changes to consent conditions |
| 10. Company to notify prior to modifying processes or equipment | Notification if and when required | N/A |
| 11. No discharge of untreated stormwater/washwater/ groundwater | Inspections of treatment system and discharge point | Yes |
| 12. Washwater treatment system to be bunded | Inspections of treatment system | Yes |
| 13. Active quarry site to be contoured and bunded to direct water into treatment system | Inspections of treatment system | Yes |
| 14. Measures taken to reduce sediment in the discharge | Inspections of treatment system and discharge point | Pending changes to consent conditions |
| 15. Company to maintain silt control structures | Inspections of treatment system and discharge point | No – pending changes to consent conditions |
| 16. Discharge concentration limits | Physicochemical sampling | Yes |
| 17. Discharge to not adversely affect receiving waters | Inspection and physicochemical sampling of receiving waters, biological sampling | Yes |
| 18. Turbidity limit for receiving waters relative to discharge | Physicochemical sampling | N/A sampling undertaken was under previous site management |
| 19. Contingency plan maintained | Plan received | Yes |
| 20. Optional review of consent | No review sought by Council | N/A |

| Purpose: To discharge treated stormwater and treated groundwater from quarry activities into an unnamed tributary of the Kurapete Stream | | |
|---|---|-----------------------------|
| Condition requirement | Means of monitoring during period under review | Compliance achieved? |
| Overall assessment of consent compliance and environmental performance in respect of this consent | | Improvement required |
| Overall assessment of administrative performance in respect of this consent | | Improvement required |

N/A = not applicable

Table 6 Inglewood Metals Ltd summary of performance for consent 10247-1.0

| Purpose: To take groundwater incidental to quarry operations and for aggregate washing purposes | | |
|--|--|--|
| Condition requirement | Means of monitoring during period under review | Compliance achieved? |
| 1. Abstraction rate shall not exceed 10 L/s | Inspections and data review | Pending changes to consent conditions |
| 2. Installation and maintenance of water meter and datalogger at water take | Inspections and data review | Pending changes to consent conditions |
| 3. Abstraction data formatting and supply requirements | Abstraction data review | Pending changes to consent conditions |
| 4. Flow meter to be verified | Inspection and certification to be supplied | Pending changes to consent conditions |
| 5. Company to notify if recording equipment repairs are required | Notification if and when required | N/A |
| 6. Company to undertake groundwater monitoring programme | Indicative monitoring programme received, possible modifications depending on outcome of changes to consents | Pending changes to consent conditions |
| 7. Water meters to be accessible for data retrieval | Inspections | N/A |
| 8. Company to adopt best practicable option to minimise adverse effects on groundwater | Inspections, data review, groundwater level monitoring | No – pending changes to consent conditions |
| 9. Optional review of consent | No review sought by Council | N/A |
| Overall assessment of consent compliance and environmental performance in respect of this consent | | Improvement required |
| Overall assessment of administrative performance in respect of this consent | | Improvement required |

N/A = not applicable

Table 7 Civil Quarries Ltd summary of performance for consent 10247-1.0

| Purpose: To take groundwater incidental to quarry operations and for aggregate washing purposes | | |
|--|--|--|
| Condition requirement | Means of monitoring during period under review | Compliance achieved? |
| 1. Abstraction rate shall not exceed 10 L/s | Inspections and data review | Pending changes to consent conditions |
| 2. Installation and maintenance of water meter and datalogger at water take | Inspections and data review | Pending changes to consent conditions |
| 3. Abstraction data formatting and supply requirements | Abstraction data review | Pending changes to consent conditions |
| 4. Flow meter to be verified | Inspection and certification to be supplied | Pending changes to consent conditions |
| 5. Company to notify if recording equipment repairs are required | Notification if and when required | N/A |
| 6. Company to undertake groundwater monitoring programme | Indicative monitoring programme received, possible modifications depending on outcome of changes to consents | Pending changes to consent conditions |
| 7. Water meters to be accessible for data retrieval | Inspections | N/A |
| 8. Company to adopt best practicable option to minimise adverse effects on groundwater | Inspections, data review, groundwater level monitoring | No – pending changes to consent conditions |
| 9. Optional review of consent | No review sought by Council | N/A |
| Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent | | Improvement required Improvement required |

N/A = not applicable

During the year, Inglewood Metals Ltd demonstrated an overall level of environmental performance and administrative performance that required improvement with respect to their resource consents as defined in Section 1.1.4. Ratings are as defined in Section 1.1.4.

Civil Quarries Ltd also demonstrated an overall level of environmental performance and administrative performance that required improvement, as they have not completed works to mitigate against further non-compliant discharges from site and have not established the required abstraction and discharge water metering as per both consents at the time of reporting.

3.4 Recommendations from the 2015-2016 Annual Report

In the 2015-2016 Annual Report, it was recommended:

1. *THAT monitoring of consented activities at Inglewood Metals Ltd's Everett Road Quarry in the 2016-2017 year is amended from that undertaken in 2015-2016, by including the additional biomonitoring site in the annual compliance survey.*

This recommendation was implemented during the monitoring period under review.

3.5 Alterations to monitoring programmes for 2017-2018

In designing and implementing the monitoring programmes for air/water discharges in the region, the Council has taken into account:

- the extent of information already made available through monitoring or other means to date;
- its relevance under the RMA;
- the Council's obligations to monitor consented activities and their effects under the RMA;
- the record of administrative and environmental performances of the consent holder; and
- reporting to the regional community.

The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within exercising resource consents.

It is proposed that for 2017-2018 the monitoring programme is altered to reflect the consent condition changes being processed at the time of reporting. The monitoring requirements will be finalised at the time of consent issue.

It should be noted that the proposed programme represents a reasonable and risk-based level of monitoring for the site(s) in question. The Council reserves the right to subsequently adjust the programme from that initially prepared, should the need arise if potential or actual non-compliance is determined at any time during 2017-2018.

4 Recommendations

1. THAT in the first instance, the Company completes the work specified in their application to change the conditions of discharge permit 1113-5 and abstraction permit 10247-1, including modification of their existing water circulation systems, and implementation of an appropriate groundwater monitoring programme.
2. THAT should there be issues with environmental or administrative performance in 2017-2018, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.
3. THAT monitoring of consented activities at Everett Road Quarry in the 2017-2018 year be amended from that undertaken in 2016-2017, in accordance with the outcome of consent variations as per Recommendation 1.

Glossary of common terms and abbreviations

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

| | |
|-------------------|---|
| Biomonitoring | Assessing the health of the environment using aquatic organisms. |
| Bund | A wall around a tank to contain its contents in the case of a leak. |
| Conductivity | 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 ³ | Grams per cubic metre, and equivalent to milligrams per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures. |
| Incident | An event that is alleged or is found to have occurred that may have actual or potential environmental consequences or may involve non-compliance with a consent or rule in a regional plan. Registration of an incident by the Council does not automatically mean such an outcome had actually occurred. |
| Intervention | Action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring. |
| Investigation | Action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident. |
| Incident Register | The Incident Register contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan. |
| L/s | Litres per second. |
| m ² | Square Metres. |
| MCI | Macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats. |
| mS/m | Millisiemens per metre. |
| Mixing zone | The zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to 7 times the width of the stream at the discharge point. |
| NTU | Nephelometric Turbidity Unit, a measure of the turbidity of water. |
| O&G | Oil and grease, defined as anything that will dissolve into a particular organic solvent (e.g. hexane). May include both animal material (fats) and mineral matter (hydrocarbons). |
| Pb* | Lead. |
| pH | A numerical system for measuring acidity in solutions, with 7 as neutral. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5. |
| Physicochemical | Measurement of both physical properties (e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment. |

| | |
|------------------|---|
| 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 | <i>Resource Management Act 1991</i> and including all subsequent amendments. |
| SS | Suspended solids. |
| SQMCI | Semi quantitative macroinvertebrate community index. |
| Temp | Temperature, measured in °C (degrees Celsius). |
| Turb | Turbidity, expressed in NTU. |

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

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Taranaki Regional Council (1992): *Regional Policy Statement Working Paper. Aggregate extraction in Taranaki.* TRC Report.

Appendix I

Resource consents held by Civil Quarries Limited

(For a copy of the signed resource consent
please contact the TRC Consents department)

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

Consent 1113-4

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.

Consent 1113-4

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

| Component | Concentration |
|--------------------------------|----------------------|
| pH (range) | 6-9 |
| Suspended solids | 100gm ⁻³ |
| Total recoverable hydrocarbons | 15gm ⁻³ |

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:
- the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
 - any conspicuous change in the colour or visual clarity;
 - any emission of objectionable odour;
 - the rendering of fresh water unsuitable for consumption by farm animals;
 - any significant adverse effects on aquatic life.
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:
- an increase in suspended solids concentration in excess of 10 gm⁻³, 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
 - 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

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

Name of
Consent Holder: Civil Quarries Limited
PO Box 108
Inglewood 4347

Decision Date: 10 November 2016

Commencement Date: 1 December 2016

Conditions of Consent

Consent Granted: To discharge treated stormwater and treated groundwater from quarry activities into an unnamed tributary of the Kurapete Stream

Expiry Date: 1 June 2033

Review Date(s): Annual reviews for the first 5 years and biennial reviews thereafter

Site Location: Everett Road, Inglewood

Grid Reference (NZTM) 1710454E-5668324N

Catchment: Waitara

Tributary: Manganui
Kurapete

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

General condition

- a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. The consent holder shall implement all upgrades proposed for the stormwater and washwater ponds at the site, as described in the detail provided in the application and particularly in the 'Stormwater Management' plan prepared by BTW Company Limited, Referenced 1601-03, Sheet 1, Revision 4, dated 23 August 2016 and shown in Attachment 1 of this consent. The ponds shall be of dimensions and characteristics specified below.

| | Pond Reference | Minimum Depth (m) | Minimum Surface Area (m ²) | Minimum Volume (m ³) | Maximum Inlet Discharge rate (m ³ / hr.) | Minimum Retention Time (hrs.) @ 10l/s |
|-------------------------|----------------|-------------------|--|----------------------------------|---|---------------------------------------|
| Washwater Ponds | Pond 1 | 1 | 415 | 415 | 15 | 27.7 |
| | Pond 2 | 1.5 | 410 | 615 | 15 | 41.0 |
| Stormwater Ponds | Pond 3 | 1.5 | 828 | 1242 | 51 | 24.4 |
| | Pond 4 | 1.5 | 137 | 206 | 51 | 4.0 |
| | Pond 5 | 1.5 | 190 | 285 | 51 | 5.6 |
| | Pond 6 | 1.5 | 43 | 65 | 51 | 1.3 |

Advice Note: The sizes and retention times are a minimum but may need to be larger to ensure that all other conditions are met.

2. The upgrades required in condition 1 above shall be completed within three months of the issue of this consent and prior to any further expansion of the active quarry stormwater catchment area from 11 ha.
3. Within one month of the issue of this consent, the consent holder shall provide a stormwater management plan for the quarry. The site shall be operated in accordance with the 'Stormwater Management Plan' approved by the Chief Executive, Taranaki Regional Council, acting in a certification capacity. The plan shall detail how the site will be managed to achieve compliance with the conditions of this consent and shall include but not be limited to:
 - a) monitoring the water quality and rate of the discharge into the receiving water;
 - b) treatment of stormwater, groundwater and incidental groundwater, prior to the discharge into the streams;
 - c) management/recycling of washwater on site;
 - d) disposal of recycled washwater;
 - e) management of the pond treatment systems;
 - f) maintenance of required pond depths and capacities including the minimisation of sediment and silt in the ponds;
 - g) storage and disposal of silt cleaned out from ponds;
 - h) reporting on the exercise of the consent;
 - i) measures and procedures to ensure that pond capacities are retained and maintained, including:

Consent 1113-5.0

- i. frequency of pond cleaning;
 - ii. minimisation of sediment and silt in the ponds;
 - iii. implementing silt and sediment control measures and cut-off drains; and
 - iv. stockpiling of material cleaned out from the ponds in a way that ensure silt is not remobilised.
4. The consent holder shall implement and maintain a circulatory system that prevents any washwater entering the stormwater treatment system, unless due to heavy rain within a previous 24 hours. For the purposes of this consent 'heavy rain' refers to rainfall, as recorded at the Taranaki Regional Council rainfall recorder located at 'Manganui at Everett Park' that exceeds the intensities listed in the following table:

| Time period | Rainfall Intensity (mm) |
|-------------|-------------------------|
| 30 minute | 18.6 |
| 1 hour | 25.4 |
| 2 hour | 36.9 |
| 6 hour | 67.7 |
| 12 hour | 92.1 |
| 1 day | 111.1 |
| 2 day | 140 |

5. The discharge into the unnamed tributary of the Kurapete Stream shall be located at (NZTM) 1710454E-5668324N.
6. At all times, the consent holder shall adopt the best practicable option (as defined in Part 2 of the Resource Management Act 1991) 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 and its tributary.
7. The active quarry stormwater catchment shall be no more than 13.5 hectares.
8. The maximum discharge rate of stormwater and groundwater, pumped from the lower quarry site to the upper quarry site shall not exceed 10 l/s at the inlet of pond 3, as per Attachment 1.
9. Within a month of the granting of this consent, the consent holder shall install, and thereafter maintain a water meter and a datalogger at the site of discharge into the unnamed tributary of the Kurapete Stream. The meter and datalogger shall be tamper-proof and shall measure and record the rate and volume of the discharge to an accuracy of $\pm 5\%$, at intervals not exceeding 15 minutes. Records of the date, the time and the rate and volume the discharge, shall be made available to the Chief Executive, Taranaki Regional Council on request.

Note: Water meters must be installed, and regularly maintained, in accordance with manufacturer's specifications in order to ensure that they meet the required accuracy. Even with proper maintenance water meters have a limited lifespan.

Consent 1113-5.0

10. Prior to undertaking any alterations to the quarry's processes, operations, equipment or layout, which may significantly change the nature or quantity of discharge into the treatment system and receiving environment, the consent holder shall consult with the Chief Executive, Taranaki Regional Council, and shall obtain any necessary approvals under the Resource Management Act 1991 and its amendments.
11. There shall be no direct discharge of untreated stormwater, groundwater or washwater from the active quarry site into the unnamed tributary of the Kurapete Stream as a result of the exercise of this consent.
12. The washing and washwater treatment system shall be bunded to prevent the inflow of stormwater and groundwater from other areas of the quarry.
13. The active quarry site shall be contoured and 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.
14. 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.
15. 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.
16. The following concentrations shall not be exceeded in any discharge Component Concentration.

| Constituent | Standard |
|--------------------------------|---|
| pH | Within the range 6.0 to 9.0 |
| suspended solids | Concentration not greater than 100 gm ⁻³ |
| total recoverable hydrocarbons | Concentration not greater than 15 gm ⁻³ |

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.

17. Beyond 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; and/or
 - b) any conspicuous change in the colour or visual clarity; and/or
 - c) any emission of objectionable odour; and/or
 - d) the rendering of fresh water unsuitable for consumption by farm animals; and/or
 - e) any significant adverse effects on aquatic life.

Consent 1113-5.0

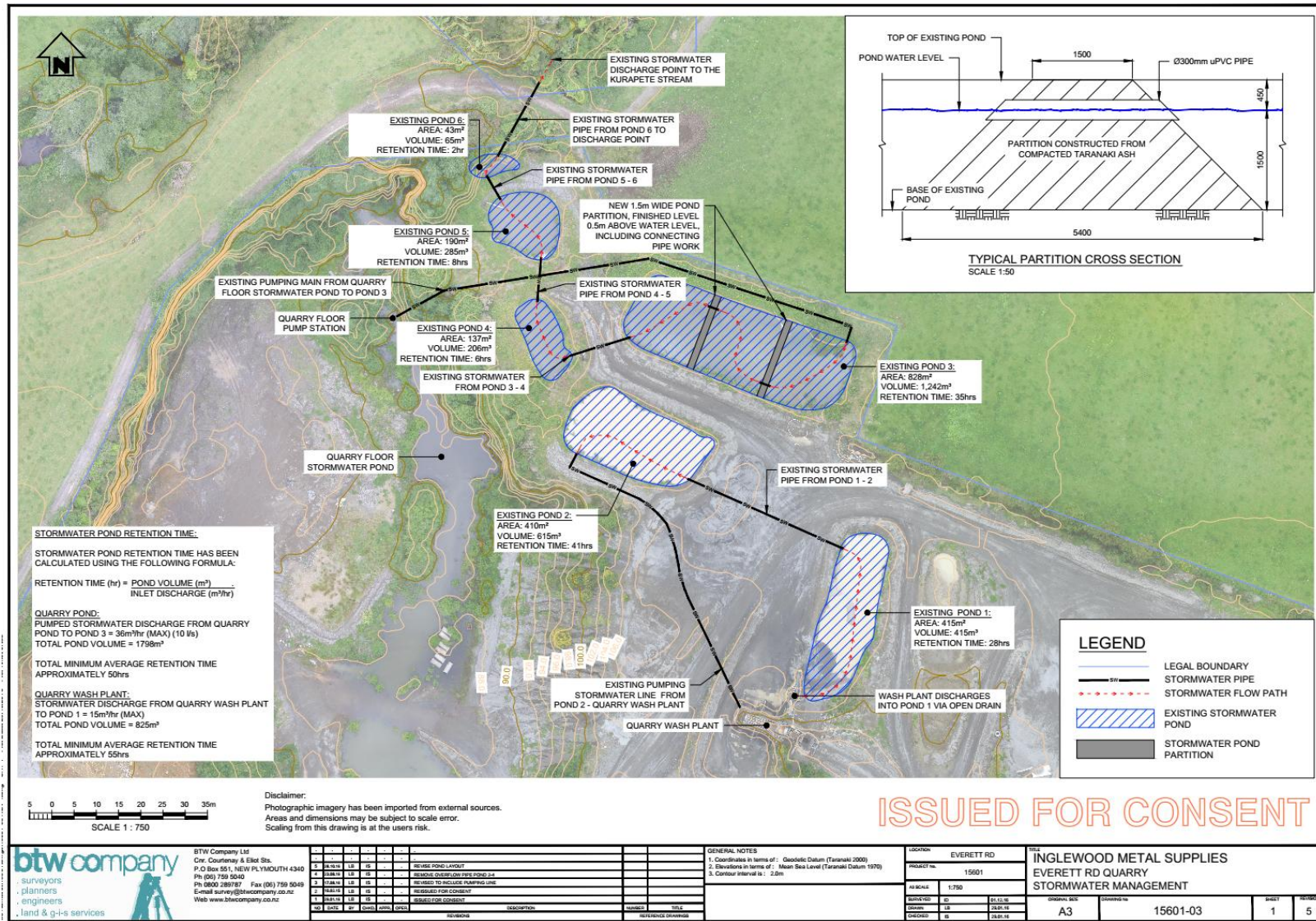
18. Beyond 25 metres downstream of the confluence of the unnamed tributary with the Kurapete Stream, the discharge shall not give rise to an increase in turbidity of the Kurapete Stream of more than 50%, as determined using NTU (nephelometric turbidity units).
19. The consent holder shall maintain a 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.
20. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review annually for the first 5 years and biennially thereafter for the purposes of:
 - a) 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; and/or
 - b) requiring continuous measuring and recording of the flow immediately downstream of the take site; and/or
 - c) requiring any data collected in accordance with the conditions of this consent to be transmitted directly to the Taranaki Regional Council's computer system, in a format suitable for providing a 'real time' record over the internet.

Transferred at Stratford on 6 April 2017

For and on behalf of
Taranaki Regional Council

A D McLay
Director - Resource Management

Attachment 1: Proposed upgrade to the Stormwater Treatment System



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

Name of
Consent Holder: Civil Quarries Limited
PO Box 108
Inglewood 4347

Decision Date: 10 November 2016

Commencement Date: 1 December 2016

Conditions of Consent

Consent Granted: To take groundwater incidental to quarry operations and for aggregate washing purposes

Expiry Date: 1 June 2033

Review Date(s): Annual reviews for the first 5 years and biennial reviews thereafter

Site Location: Everett Road, Inglewood

Grid Reference (NZTM) 1710429E-5668228N

Catchment: Waitara

Tributary: Manganui
Kurapete

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

General condition

- a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. The total rate of taking shall not exceed 10 litres per second.
2. The consent holder shall install, and thereafter maintain a water meter and a datalogger at the site of taking (or a nearby site in accordance with Regulation 10 of the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010). The water meter and datalogger shall be tamper-proof and shall measure and record the rate and volume of water taken to an accuracy of ± 5 , at intervals not exceeding 15 minutes. Records of the date, the time and the rate and volume of water taken shall be made available to the Chief Executive, Taranaki Regional Council at all reasonable times.

Note: Water meters must be installed, and regularly maintained, in accordance with manufacturer's specifications in order to ensure that they meet the required accuracy. Even with proper maintenance water meters have a limited lifespan.

3. The records of water taken shall:
 - a) be in a format that, in the opinion of the Chief Executive, Taranaki Regional Council, is suitable for auditing;
 - b) specifically record the water taken as 'zero' when no water is taken; and
 - c) for each 12-month period ending on 30 June, be provided to the Chief Executive, Taranaki Regional Council within one month after end of that period.
4. The consent holder shall provide the Chief Executive, Taranaki Regional Council with a document from a suitably qualified person certifying that water measuring equipment required by the conditions of this consent ('the equipment'):
 - a) has been installed and/or maintained in accordance with the manufacturer's specifications; and/or
 - b) has been tested and shown to be operating to an accuracy of $\pm 5\%$.

The documentation shall be provided:

- i) within 30 days of the installation of a water meter;
 - ii) at other times when reasonable notice is given and the Chief Executive, Taranaki Regional Council has reasonable evidence that the equipment may not be functioning as required by this consent; and
 - iii) no less frequently than once every five years.
5. If any measuring or recording equipment breaks down, or for any reason is not operational, the consent holder shall advise the Chief Executive, Taranaki Regional Council immediately. Any repairs or maintenance to this equipment must be undertaken by a suitably qualified person.

Consent 10247-1.0

6. The consent holder shall undertake a monitoring programme that monitors the effects of this consent on the surrounding aquifer. The monitoring programme shall be submitted to the Chief Executive, Taranaki Regional Council for certification before 31 December 2016 and shall include the drilling and monitoring of a minimum of three bores at locations determined after consultation with the Chief Executive, Taranaki Regional Council.
7. The water meters required under condition 2 and 4 and data loggers shall be accessible to Taranaki Regional Council Officers at all reasonable times for inspection and/or data retrieval.
8. At all times, the consent holder shall adopt the best practical option to prevent or minimise any actual or likely adverse effect on the environment associated with the abstraction of groundwater.
9. 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 annually for the first 5 years and biennially thereafter for the purposes of:
 - a) 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; and/or
 - b) requiring continuous measuring and recording of the flow immediately downstream of the take site; and/or
 - c) requiring any data collected in accordance with the conditions of this consent to be transmitted directly to the Taranaki Regional Council's computer system, in a format suitable for providing a 'real time' record over the internet.

Transferred at Stratford on 6 April 2017

For and on behalf of
Taranaki Regional Council

A D McLay
Director - Resource Management

Appendix II

Biomonitoring reports

To David Olson, Job manager
From Darin Sutherland, Scientific Officer
Document 1895357
Report No DS068
Date 11 July 2017

Biomonitoring of the lower reaches of the Kurapete Stream, in relation to Taranaki Civil Construction Limited Quarry discharges, surveyed in February 2017

Introduction

A formal consent monitoring programme established for the quarry at Everett Road in the lower Kurapete Stream catchment, currently operated by Taranaki Civil Construction Limited, has been the subject of twenty-one TRC Annual Reports to date (e.g. TRC, 2016). Various impacts of the consent holder's quarrying activities have been 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 biological 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. In addition to these biomonitoring surveys, other 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 more recent years, confounding issues of significant upstream water quality improvement (due to removal of the Inglewood oxidation ponds effluent discharge from the Kurapete Stream (TRC, 2014a)), together with cattle access in the proximity of the Everett Road bridge site, necessitated the addition of a third monitoring site (KRP000983) some 150 m downstream of the bridge for effects assessment. However, significant progress in terms of riparian fencing and plantings have improved habitat in the short reach of the stream between the small tributary (receiving quarry stormwater) confluence and the Everett Road Bridge.

The current February 2017 survey continued the summer biomonitoring component of the formal consent monitoring programme. Due to concerns about impacts on sensitive taxa from the preceding survey (March 2016), the third sampling site is now part of the regular monitoring programme and is no longer provisional.

Method

The standard '400 ml kick sampling' technique was used to collect streambed (benthic) macroinvertebrates from the three established sites (I, J and K) in the lower reaches of the Kurapete Stream, near Everett Park on 22 February 2017 (Table 1 and Figure 1).

Table 1 Biomonitoring sites in the tributary of the Mangaone Stream that receives stormwater discharges from MASL

| Site No | Site code | Grid reference | Location |
|---------|-----------|----------------------|--|
| I | KRP000960 | E1710640 N5668709 | Upstream of quarry tributary stream |
| J | KRP000980 | E1710695 N5668758 | Everett Road bridge, d/s of tributary stream |
| K | KRP000983 | E1710759 N5668874 | 150m d/s of Everett Road bridge |

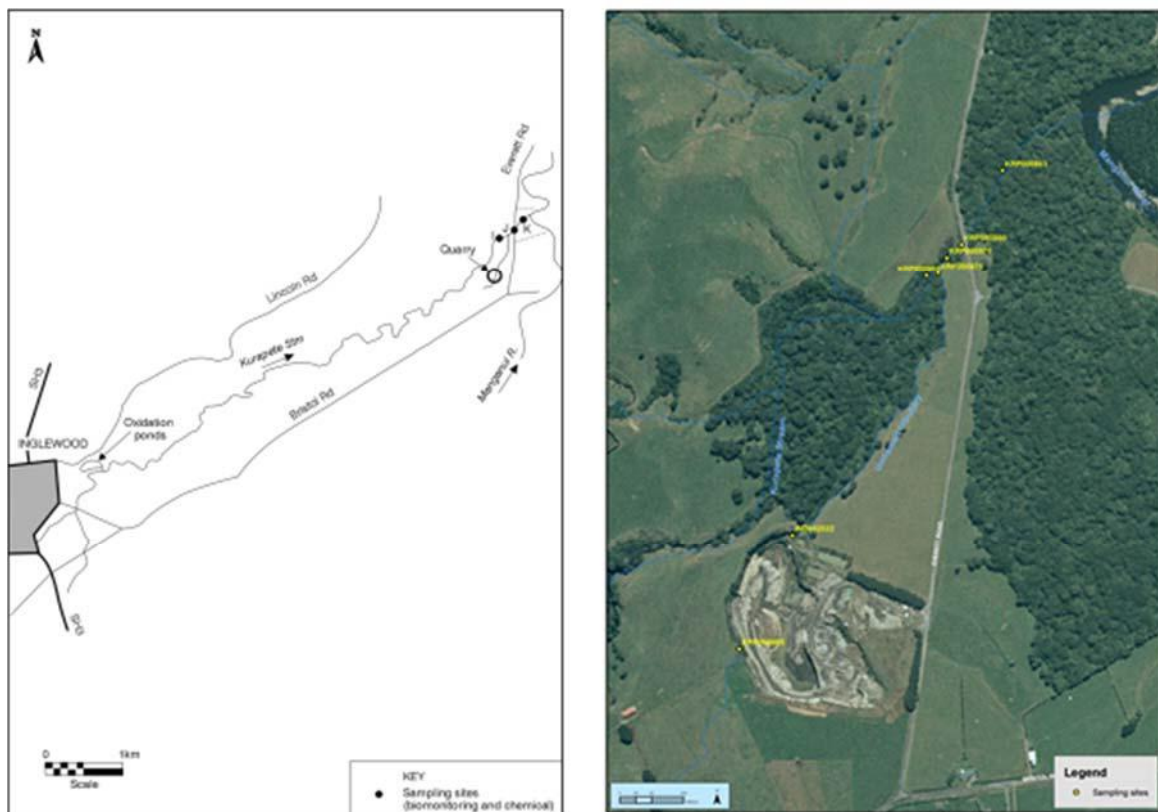


Figure 1 Sampling sites in the Kurapete Stream in relation to the Taranaki Civil Construction Limited quarry

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 abundances scored based on the categories presented in [Table 2](#).

Table 2 Macroinvertebrate abundance categories

| Abundance category | Number of individuals |
|-------------------------|-----------------------|
| R (rare) | 1-4 |
| C (common) | 5-19 |
| A (abundant) | 20-99 |
| VA (very abundant) | 100-499 |
| XA (extremely abundant) | 500+ |

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams. Highly 'sensitive' taxa were assigned the highest scores of 9 or 10, while the most 'tolerant' forms scored 1. Sensitivity scores for certain taxa have been modified in accordance with Taranaki experience. By averaging the scores obtained from a list of taxa collected from one site and multiplying by a scaling factor of 20, a Macroinvertebrate Community Index (MCI) value was obtained. The MCI is a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. A gradation of biological water quality conditions based upon MCI ranges which has been adapted for Taranaki streams and rivers (TRC, 2013) from Stark's classification (Stark, 1985 and Boothroyd and Stark, 2000) ([Table 4](#)). More 'sensitive' communities inhabit less polluted waterways. A difference of 10.83 units or more in MCI values is considered significantly different (Stark 1998).

Table 3 Macroinvertebrate health based on MCI ranges which has been adapted for Taranaki streams and rivers (TRC, 2015) from Stark's classification (Stark, 1985, Boothroyd and Stark, 2000, and Stark and Maxted, 2007)

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

A semi-quantitative MCI value (SQMCI_s) has also been calculated for the taxa present at each site by multiplying each taxon score by a loading factor (related to its abundance), totalling these products, and dividing by the sum of the loading factors (Stark 1998 and 1999). The loading factors were 1 for rare (R), 5 for common (C), 20 for abundant (A), 100 for very abundant (VA) and 500 for extremely abundant (XA). Unlike the MCI, the SQMCI_s is not multiplied by a scaling factor of 20, so that its corresponding range of values is 20x lower. A difference of 0.83 units or more in SQMCI_s values is considered significantly different (Stark 1998).

Results

Site habitat characteristics and hydrology

This summer survey was performed under low flow conditions (approximately three quarters of median flow), 10 days after a fresh in excess of 3 times median flow and 24 days after a fresh of 7 times median flow (flow gauge at the Mangaoraka Stream at Corbett Rd). The survey followed a relatively wet summer period with a number of significant freshes in January. The water temperature ranged from 15.1-15.3°C. At site I the water speed was swift, water was grey in colour and cloudy, at site J the water speed was steady, water was grey in colour and cloudy, and at site K the water speed was steady, water was grey in colour and cloudy. It was noted that turbidity was noticeably higher at the downstream sites compared with the upstream site I. There was also noticeable sediment on the rocks at site K. The quarry tributary was grey-brown in colour and dirty.

The streambed at all three sites had slippery periphyton mats and no filamentous algae. Moss and leaves were patchy on the streambed. There was partial bed shading from overhanging vegetation. Substrate was predominately cobbles with small amounts of boulder and gravels. Low amounts of silt were recorded at site I and J (5%) with slightly more at site K (10%).

Macroinvertebrate communities

Biomonitoring of the impacts of quarrying activities on the Kurapete Stream has been performed previously on 22 occasions at sites I and J and eight occasions at site K.

A summary of comparative data for all three sites since quarry biomonitoring commenced is presented in [Table 4](#).

Table 4 Summary of macroinvertebrate taxa numbers and MCI values for previous surveys performed between January 1997 and the current survey

| Site No. | N | No of taxa | | | MCI value | | | SQMCI _s value | | | |
|----------|----|------------|-------|----------------|-----------|--------|----------------|--------------------------|--------|---------|----------------|
| | | Median | Range | Current survey | Median | Range | Current survey | N | Median | Range | Current survey |
| I | 22 | 26 | 19-32 | 21 | 97 | 80-107 | 108 | 19 | 4.2 | 3.1-6.2 | 5.8 |
| J | 22 | 26 | 18-32 | 34 | 88 | 71-102 | 99 | 19 | 3.6 | 1.7-5.3 | 5.9 |
| K | 8 | 29 | 22-35 | 26 | 94 | 87-103 | 98 | 8 | 3.3 | 2.1-5.7 | 5.7 |

The results of the recent survey are presented in [Table 5](#).

Table 5 Macroinvertebrate fauna of the Kurapete Stream in relation to Taranaki Civil Construction Limited's quarry discharge sampled on 22 February 2017

| Taxa List | Site Number | MCI score | I | J | K | |
|---------------------------|----------------------------------|-----------------------------|-------------------------|-----------|-----------|---|
| | Site Code | | KRP000960 | KRP000980 | KRP000983 | |
| | Sample Number | | FWB17121 | FWB17122 | FWB17123 | |
| NEMERTEA | Nemertea | 3 | R | R | - | |
| ANNELIDA (WORMS) | Oligochaeta | 1 | A | A | A | |
| | Lumbricidae | 5 | - | R | - | |
| MOLLUSCA | <i>Latia</i> | 5 | R | R | - | |
| | <i>Potamopyrgus</i> | 4 | A | A | C | |
| EPHEMEROPTERA (MAYFLIES) | <i>Austroclima</i> | 7 | A | A | C | |
| | <i>Coloburiscus</i> | 7 | VA | A | C | |
| | <i>Deleatidium</i> | 8 | VA | VA | VA | |
| | <i>Zephlebia group</i> | 7 | C | R | A | |
| PLECOPTERA (STONEFLIES) | <i>Acroperla</i> | 5 | - | R | - | |
| | <i>Zelandobius</i> | 5 | R | R | C | |
| COLEOPTERA (BEETLES) | Elmidae | 6 | A | VA | VA | |
| | Hydraenidae | 8 | R | - | - | |
| | Ptilodactylidae | 8 | R | R | R | |
| MEGALOPTERA (DOBSONFLIES) | <i>Archichauliodes</i> | 7 | A | A | C | |
| TRICHOPTERA (CADDISFLIES) | <i>Hydropsyche (Aoteapsyche)</i> | 4 | VA | A | C | |
| | <i>Costachorema</i> | 7 | C | C | - | |
| | <i>Hydrobiosis</i> | 5 | C | C | C | |
| | <i>Neurochorema</i> | 6 | - | R | R | |
| | <i>Plectrocnemia</i> | 8 | - | - | R | |
| | <i>Beraeoptera</i> | 8 | - | R | - | |
| | <i>Hudsonema</i> | 6 | R | R | - | |
| | Oeconesidae | 5 | - | R | - | |
| | <i>Oxyethira</i> | 2 | - | R | C | |
| | <i>Pycnocentria</i> | 7 | - | C | - | |
| | <i>Pycnocentrodes</i> | 5 | C | C | A | |
| | <i>Tripletides</i> | 5 | - | - | R | |
| | DIPTERA (TRUE FLIES) | <i>Aphrophila</i> | 5 | C | A | A |
| | | Eriopterini | 5 | - | - | R |
| <i>Maoridiamesa</i> | | 3 | - | R | - | |
| Orthoclaadiinae | | 2 | R | R | A | |
| <i>Polypedilum</i> | | 3 | - | C | C | |
| Tanypodinae | | 5 | - | - | R | |
| Tanytarsini | | 3 | - | R | R | |
| Empididae | | 3 | - | R | R | |
| <i>Austrosimulium</i> | | 3 | A | A | A | |
| Stratiomyidae | | 5 | - | R | - | |
| Tanyderidae | | 4 | - | C | C | |
| ACARINA (MITES) | Acarina | 5 | - | R | - | |
| | | No of taxa | 21 | 34 | 26 | |
| | | MCI | 108 | 99 | 98 | |
| | | SQMCI | 5.8 | 5.9 | 5.7 | |
| | | EPT (taxa) | 10 | 15 | 11 | |
| | | %EPT (taxa) | 48 | 44 | 42 | |
| 'Tolerant' taxa | | 'Moderately sensitive' taxa | 'Highly sensitive' taxa | | | |

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

Site I (upstream of quarry tributary)

A moderate macroinvertebrate community richness of 21 taxa was found at site I ('control' site) at the time of the summer survey. This was five less than the historical median for this site and four taxa lower than the previous survey on March 2016 (Table 4, Table 5).

The MCI score of 108 units indicated a community of 'good' biological health and was the highest MCI score recorded at the site in 23 surveys monitored in relation to the quarry (Figure 2). This score was significantly higher (Stark, 1998) than the historical median MCI score of 97 units. The MCI score was not significantly different (Stark, 1998) to the preceding survey (107 units) which was the second equal highest MCI score recorded at the site indicating good preceding water quality upstream of the quarry (Figure 2).

The SQMCI₅ score of 5.8 units was significantly higher (Stark, 1998) than the median MCI score of 4.2 units but not significantly higher than the previous survey (5.1 units) (Stark, 1998) (Table 4, Table 5).

The community was characterised by four 'tolerant' taxa [oligochaete worms, snail (*Potamopyrgus*), caddisfly (*Hydropsyche/Aoteapsyche*) and sandfly (*Austrosimulium*)], four 'moderately sensitive' taxa [mayflies (*Austroclima* and *Coloburiscus*), and dobsonfly (*Archichauliodes*)], and one 'highly sensitive' taxon [mayfly (*Deleatidium*)] (Table 5).

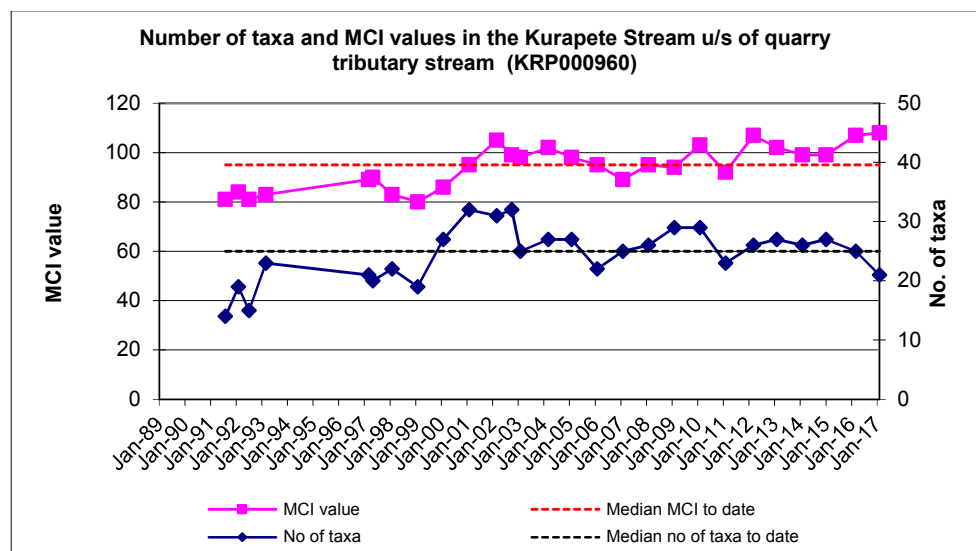


Figure 2 Taxa richness and MCI scores recorded to date at site I

Site J (Everett Road Bridge downstream of quarry tributary)

A high macroinvertebrate community richness of 34 taxa was found at site I ('primary impact' site) which was the highest number ever recorded for the site. This was ten more than the historical median for this site and 12 taxa higher than the previous survey on March 2016 (22 taxa) (Table 4, Table 5).

The MCI score of 99 indicated a community of 'fair' biological health which is significantly higher (Stark, 1998) than the historical median MCI score of 88 units. The MCI score was not significantly different (Stark, 1998) to the previous survey (89 units) (Figure 2).

The SQMCI₅ score of 5.9 units was significantly higher (Stark, 1998) than the median MCI score of 3.6 units (Stark, 1998) and to the previous survey score (3.8 units) (Table 4, Table 5).

The community was characterised by four 'tolerant' taxa [oligochaete worms, snail (*Potamopyrgus*), caddisfly (*Hydropsyche/Aoteapsyche*) and sandfly (*Austrosimulium*)], five 'moderately sensitive' taxa [mayflies

(*Austroclima* and *Coloburiscus*), dobsonfly (*Archichauliodes*), cranefly (*Aphrophila*), and one 'highly sensitive' taxon [mayfly (*Deleatidium*)] (Table 5).

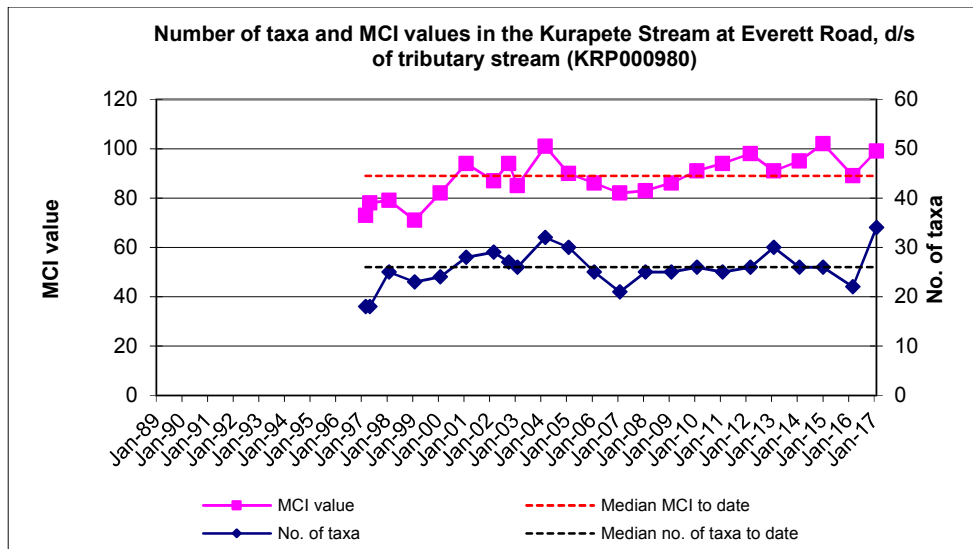


Figure 3 Taxa richness and MCI scores recorded to date at site J

Site K (150m downstream of Everett Road bridge)

A moderate macroinvertebrate community richness of 26 taxa was found at site K ('secondary impact' site) at the time of the survey. This was three less than the historical median for this site and to the previous survey which was conducted seven years ago on February 2010 (29 taxa) (Table 4, Table 5).

The MCI score of 98 units indicated a community of 'fair' biological health which was not significantly different (Stark, 1998) than the historical median MCI score of 94 units. The MCI score was also not significantly lower (Stark, 1998) than the previous survey (103 units) (Figure 2).

The SQMCI_s score of 5.7 units was significantly higher (Stark, 1998) than the median MCI score of 3.3 units (Stark, 1998) and the same as the previous survey (Table 4, Table 5).

The community was characterised by three 'tolerant' taxa [oligochaete worms, orthoclads midge and sandfly (*Austrosimulium*)], four 'moderately sensitive' taxa [mayfly (*Zephlebia* group), elmids beetles, caddisfly (*Pycnocentroides*), and cranefly (*Aphrophia*)], and one 'highly sensitive' taxon [mayfly (*Deleatidium*)] (Table 5).

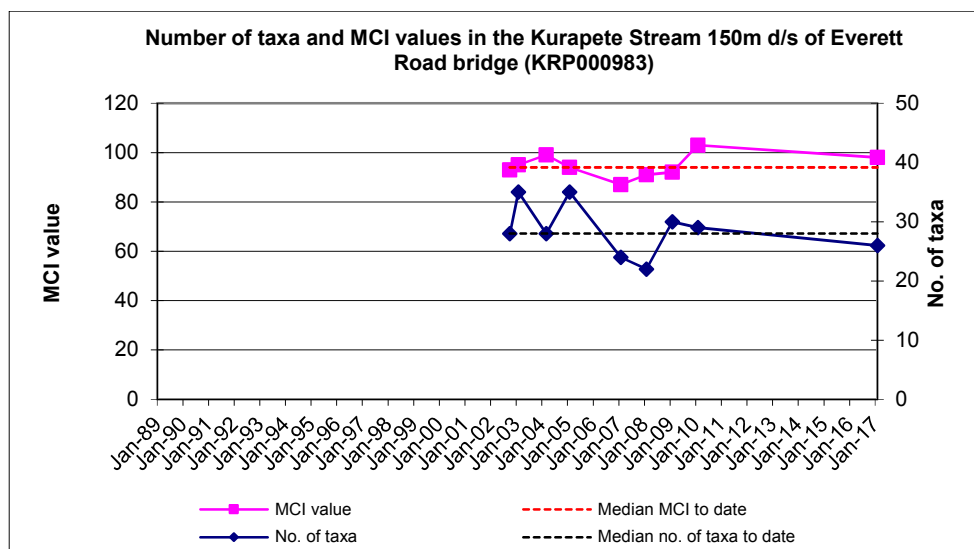


Figure 4 Taxa richness and MCI scores recorded to date at site K

Discussion and conclusions

This summer biomonitoring survey was performed under a period of low recession flow conditions in the lower reaches of the Kurapete Stream. All three sites had good taxa richness with moderate to high taxa richnesses recorded along the surveyed reach. Taxa richness is the most robust index when ascertaining whether a macroinvertebrate community has been exposed to toxic discharges. It can also be a reflection of limited food or habitat availability which might be expected if suspended or settled silt was an issue at a site. There was significant variation among sites with a large increase in richness by 13 taxa from site I to site J with a subsequent drop of eight taxa from site J to site K. Taxa richnesses also varied significantly compared with historical medians with sites having both lower and higher values and little to significant differences (3-8 taxa) but no discernible pattern existed from upstream to downstream.

The 'control' site (site I) had 'good' macroinvertebrate health and recorded its highest ever MCI score which continued to reflect the general improvement in stream conditions (physicochemical water quality and physical habitat). This was consistent with the cessation of the Inglewood oxidation ponds system's discharge (which has been diverted to the New Plymouth Wastewater Treatment Plant) and in the absence of any recent (consented) overflows from the system during wet weather periods. In contrast, both 'impact' sites were in 'fair' health but both had MCI scores that were not significantly lower (9-10 MCI units) than the 'control' site score and site J had a non-significant improvement (10 units) from the preceding survey.

The SQMCI_s scores from all three sites were indicative of 'good' water quality and were all very similar to each other (0.1-0.2 units) indicating no change in the health of the macroinvertebrates present in the surveyed reach. Furthermore, SQMCI_s scores were all significantly higher than historical medians indicating better than usual macroinvertebrate community health.

The MCI and SQMCI_s indexes are indicators of organic pollution but are also usually correlated with deposited sediment so that sites with high levels of silt tend to have lower MCI and SQMCI_s scores which makes them useful for determining impacts of discharges that are predominately fine sediment such as quarry discharges. However, macroinvertebrate sampling occurs in riffles which have high flow velocities compared with runs and pools and are therefore far less likely to accumulate deposited sediment. During the current survey only minor differences in deposited sediment were evident; the 'control' site had 5% silt and 5% sand while the 'impact' sites had 5% silt and sand and 10% silt and 5% sand. No silt coating was observed at either 'impact' site though the water was noticeably cloudier downstream of the quarry tributary.

The community composition among the site showed only minor differences in the abundances and percentages of EPT (mayflies, stoneflies and caddisflies) taxa. EPT taxa are generally more sensitive to fine

suspended sediment (Clapcott, et al. 2011) compared with other macroinvertebrate taxa and are therefore particularly useful indicators of potentially harmful sediment discharges. Changes in EPT composition between sites was therefore a strong indicator that sediment discharges were not negatively affecting the macroinvertebrate communities.

Overall, the survey indicated that quarry discharges entering the stream from a small tributary draining the quarry area were not having a negative affect on macroinvertebrate communities.

Summary

The Council's standard 'kick-sampling' technique was used at three established sites to collect streambed macroinvertebrates from the Kurapete Stream. Samples were processed to provide number of taxa (richness), MCI score, SQMCI_s score and %EPT taxa for each site.

Taxa richness is the most robust index when ascertaining whether a macroinvertebrate community has been exposed to toxic discharges. It can also be a reflection of limited food or habitat availability which might be expected if suspended or settled silt was an issue at a site. The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The SQMCI_s takes into account taxa abundance as well as sensitivity to pollution, and may reveal more 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_s between sites indicate the degree of adverse effects (if any) of the discharges being monitored. EPT taxa are generally more sensitive to fine suspended sediment (Clapcott, et al. 2011) compared with other macroinvertebrate taxa and are therefore particularly useful indicators of potentially harmful sediment discharges

The macroinvertebrate communities throughout the surveyed reach on the Kurapete Stream had moderate to high taxa richness. There were no significant differences among MCI scores, SQMCI_s scores indicated 'good' health and there were relatively high proportions of EPT taxa. Overall, this summer macroinvertebrate survey indicated that the discharge of treated quarry wastewaters from the Taranaki Civil Construction Limited quarry site had no recent detrimental effects on the macroinvertebrate communities of the Kurapete Stream.

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