REPORT

Waikato Regional Council: Resource Use Group

Tui Mine Remedial Works
Environmental Monitoring Plan

Report prepared for:
Waikato Regional Council: Resource Use Group

Report prepared by:
Tonkin & Taylor Ltd

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June 2011

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1 Introduction

This report sets out an Environmental Monitoring Plan (EMP) for Tui Mine Remediation Works project. The EMP includes a programme of water quality and ecological monitoring and has been prepared in general accordance with the requirements of Waikato Regional Council (WRC) Resource Consent 121042 (Appendix A). Consent 121042 authorises the discharge of contaminants to land and water in association with the remediation of the Tui Mine, Te Aroha subject to conditions.

Since the Tui Mine Remediation Works Resource Consents were issued in September 2010, the implementation of the Phase 1 of the project has been progressed and the main construction works are due for completion in May 2011, while the Alkalinity injection will continue until the end of August 2011. Phase 1 works aim to address the contaminant discharges from the mine workings into the Tunakohoia Stream.

Phase 2 works have not been started as initially planned, and are currently subject to funding being allocated by Government. Phase 2 works aim to address the Tailings impoundment area and associated contaminant discharges into the Tui and Tunakohoia Streams. It is envisaged that if funding was confirmed by June 2011, then the work would be completed by June 2013.

Due to the way the project is implemented, and the 2 year time lag between phases 1 and 2, the levels of change in water quality and biology are not expected to be recognised or measurable until completion of Phase 2 works, especially in the Tui Stream. The applicant therefore applied for a change to condition 10 of RC 121042 that included removal of the annual biological monitoring requirement. The change to Condition 10 was granted on 26 April 2011. The amended consent is attached to this plan (Appendix A).

This EMP is prepared in accordance with the requirements of Condition 19 of Consent 121042. The monitoring programme outlined in this document has therefore been tailored to suit the current project implementation phases and timeframes, and to best address the EMP requirements as outlined in Conditions 19 to 25 of Resource Consent 121042.

1.1 Background

This section provides an overview of the site and remediation project. Detailed information, including site history, is available in the Tui Mine – Phase 1 & Phase 2 Remedial Works Assessment of Environmental Effects (AECOM, 2010).

1.1.1 Site location and description

The Tui Mine is located on the north western flank of Mt Te Aroha which is the highest peak of the Kaimai Range (952 m asl). The location of the Tui Mine is shown on Figure 1. The Te Aroha Township sits at the base of the mountain, approximately 2 km to the southwest of the mine area.

The abandoned mine comprises three main components that are the subject of the remediation project. The location of these mining features are shown on Figure 2 and described as follows:

- The underground workings comprising two main networks associated with the two mineral rich veins – the Ruakaka Vein and the Champion Vein. The two networks comprise five levels of underground workings which are all located between 500m and 700 m asl. The two networks are connected by an open passage (cross cut) and can be accessed via adits at Champion levels 4 and 5.
- Waste rock stockpiles located at the base of both the Champion Level 4 and 5 adit entrances.
• The former processing plant and tailings impoundment are located adjacent the Tui Mine access road at around 350 m asl. The tailings impoundment is located within a former tributary of the Tui Stream. Tailings comprise finely ground waste product resulting from extraction of minerals from mined ore.

There are two streams within the vicinity of the mine, the Tui Stream and the Tunakohoia Stream which flow past the mine, through the township of Te Aroha and discharge to the Waihou River. The locations of these streams are shown on Figure 2. The southern branch of the Tunakohoia stream that is unaffected by the mine contributes to the current Te Aroha municipal water supply.

1.1.2 Site history and remediation project summary

The main environmental concerns that the remediation project aims to address are heavy metal contamination of watercourses from acid rock drainage (ARD) and the threat of tailings impoundment failure. Sources of ARD contamination include the underground workings, waste rock stockpiles, ore and crushed rock around the former processing area and the tailings impoundment.

Contaminant discharges to the Northern branch of the Tunakohoia Stream arise directly from the adits, via groundwater and from the waste rock stack at Champion Level 4. An underground pipe from the tailings dam is also thought to deliver contaminants to the Tunakohoia catchment. The main contaminant source to the Tui Stream occurs via surface water and groundwater discharge from the tailings impoundment.

A suite of resource consents authorising proposed remediation works were issued by WRC (Consents 121071, 121039, 121040, 121041 and 121042) and Matamata-Piako District Council (Consent 2010.10094) in late 2010. In summary the remediation works broadly comprise:

i. The partial flooding and passive treatment (alkalinity injection) of the underground workings.

ii. Re-contouring and capping of rock deposits located near Champion Level 4 and 5 adits.

iii. The re-contouring, stabilisation and capping of the existing tailings impoundment.

Items i and ii are currently underway as Phase 1 of the works. Item iii forms Phase 2 of the works and is scheduled to occur over the 2011/2012 and 2012/2013 earthworks seasons. Additional alkalinity injection may also occur as part of Phase 2 works if monitoring data suggests this is required.

A programme of baseline monitoring was commissioned by WRC in 2009 prior to the remediation work commencing. The purpose of the monitoring was in part to establish robust baseline water quality and biological conditions in the Tui and Tunakohoia Streams from which improvements as a result of the remedial project could be assessed.

The baseline monitoring work included water quality sampling, flow measurement, biological sampling and data review and was undertaken by Pattle Delamore Partners Ltd. The results of the monitoring are summarised in the PDP report entitled Tui Remedial Works: Baseline Monitoring (PDP, 2010).

Additional macroinvertebrate data is available on WRC files for sites on the Tui and Tunakohioa streams collected over December to February 1996 to 2003. Annual sampling data (between January and March) for the Pohomihi Stream is also available since 2004. This data will be added to the baseline dataset to assist with analysis of temporal variation in macroinvertebrate communities prior to the remediation.
1.2 EMP objectives and scope

The objectives of the EMP are set out in Condition 20 of Consent 121042 as follows:

i. To assess whether the habitat, biological and water quality of the Tui and Tunakohoia Streams are improving over time.

ii. To measure the effectiveness of the works in reducing ARD and as a minimum measure the following contaminant trace elements calcium, iron, manganese, zinc, arsenic, cadmium, lead, copper, and mercury.

iii. To incorporate recommendations 4, 6, 7, 8 and 9 of the document titled “Proposed Tui Mine Restoration Mount Te Aroha: Cultural Impact Assessment Report”, dated March 2010 and recorded as document 1720804 on the Waikato Regional Council document system.

The scope of the EMP is aimed at meeting the above objectives and has been developed in general accordance with Conditions 19 to 25 (EMP conditions) and Condition 10 (Biological and Water Quality Monitoring Plan condition) of WRC Consent 121042 (refer Appendix A). The programme has been tailored to suit the current works programme based on the following rationale:

- The bulk of the monitoring work will be programmed to commence once all remediation works (Phase 1 and Phase 2) are complete, and allowing time (say 6 months) for environmental conditions to settle.
- Sufficient baseline data is available to characterise pre-remediation water quality and biological condition in the Tui and Tunakohoia streams. No improvement in Tui Stream conditions is anticipated until Phase 2 works are complete. Therefore no monitoring will occur on Tui Stream until after Phase 2 works are complete (anticipated to be in 2013).
- It is desirable to assess the outcomes of Phase 1 works on the Tunakohoia Stream and collect data to inform decisions on additional alkalinity injection for Phase 2. Therefore water quality and flow monitoring will be undertaken at Tunakohoia Stream and discharge sites only during 2011 and 2012. Note that the tailings impoundment discharge to the Tunakohoia Stream will not be addressed until Phase 2.
- Biological communities are anticipated to take longer to re-colonise impacted stream reaches compared to timeframes for water quality improvement. For this reason no biological monitoring is proposed until Phase 2 works are completed (anticipated to be 2013), again three years following completion and then at 5 year intervals thereafter.

Sampling methods and timing will closely follow that used in the baseline monitoring project (PDP, 2010) so that all data collected are comparable and any improvements in water quality and ecological health as a result of the remedial project can be clearly identified.

1.3 Reference documents

Key documents referenced in developing this EMP include:

- WRC Consent 121042 (refer Appendix A).
- Tui Remedial Works: Baseline Monitoring (Pattle Delamore Partners Ltd, 2010). This report was prepared for Waikato Regional Council and assesses baseline water quality in the various discharges on the site and in the Tui and Tunakohoia Streams and baseline ecological health in the Tui and Tunakohoia Streams.
- Proposed Tui Mine Restoration Mount Te Aroha: Cultural Impact Assessment Report. Prepared by Ngati Rahiri Tumutumu (Kaitiaki of Mt Te Aroha). This report sets out values of particular cultural significance for consideration in regard to the design and development of the Tui Mine Remediation Project and includes a series of recommendations.
2 Liaison with Ngati Rahiri Tumutumu

Consultation with Ngati Rahiri Tumutumu on the Draft EMP has been undertaken. The Draft EMP was approved in principle by the Tui Mine Iwi Advisory Group at the meeting of 19 April 2011 (see meeting minutes in Appendix B).

Ngati Rahiri Tumutumu representatives are to be provided with a copy of this EMP and notified when monitoring is to occur. In particular:

- Karakia is required for all new projects on the site.
- New visitors/workers to the site are to be blessed with karakia prior to work commencing.

3 Sampling locations

Sampling sites included in the ongoing monitoring programme generally follow the baseline monitoring project with some modifications. Sites to be included in the ongoing monitoring programme and their rationale for inclusion are described in Table 1 and shown on Figure 2. Note that the overall rationale for site selection is the availability of previous monitoring data (baseline monitoring) and ease of access.

Table 1: Tui Mine water quality, flow and biology sampling site locations

<table>
<thead>
<tr>
<th>Site</th>
<th>Monitored for</th>
<th>Site description</th>
<th>Rationale for selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW3</td>
<td>Water quality Flow</td>
<td>Adit 4 outlet (discharges to Tunakohoia Stream, north branch).</td>
<td>Will become the primary discharge point for the underground workings following Phase 1 works.</td>
</tr>
<tr>
<td>SW5*</td>
<td>Water quality Flow</td>
<td>Adit 5 outlet (discharges to Tunakohoia Stream north branch).</td>
<td>Only likely to be a residual discharge following Phase 1 works.</td>
</tr>
<tr>
<td>SW7</td>
<td>Water quality Flow Biology</td>
<td>Tunakohoia Stream north branch, upstream of south branch confluence and downstream of the tailings dam.</td>
<td>Downstream of all discharges from underground workings, waste stockpiles and tailings leachate. Improvements expected following Phase 1 works.</td>
</tr>
<tr>
<td>SW8</td>
<td>Water quality Flow Biology</td>
<td>Tunakohoia Stream south branch, upstream of north branch confluence and upstream of the town water supply inlet.</td>
<td>Tunakohoia Stream water quality and biology control site.</td>
</tr>
<tr>
<td>SW11</td>
<td>Water quality Flow</td>
<td>Tailings dam tributary, downstream of the tailings dam.</td>
<td>Tailings Dam discharge. Improvements expected following Phase 2 works.</td>
</tr>
<tr>
<td>SW12</td>
<td>Biology</td>
<td>Tui Stream upstream of the tailings dam inflow.</td>
<td>Tui Stream biology control site.</td>
</tr>
<tr>
<td>SW13</td>
<td>Water quality Flow Biology</td>
<td>Tui Stream downstream of the tailings dam discharge, upstream of the ford and culverts.</td>
<td>Downstream of the tailings dam discharge. Improvements expected following Phase 2 works.</td>
</tr>
<tr>
<td>SW15</td>
<td>Water quality Flow</td>
<td>Tailings dam tributary, diverted through a culvert below Tui Road to the Tunakohoia Stream north branch.</td>
<td>Will remain a source of contaminants to the Tunakohoia Stream north branch until Phase 2 works are completed.</td>
</tr>
<tr>
<td>SW100</td>
<td>Water quality Flow</td>
<td>Tunakohoia Stream north branch, upstream of the access road and downstream of SW3 and the waste rock site at Adit 5.</td>
<td>Impacted by underground workings discharges. Improvements expected following Phase 1 works.</td>
</tr>
<tr>
<td>Site</td>
<td>Monitored for</td>
<td>Site description</td>
<td>Rationale for selection</td>
</tr>
<tr>
<td>---------</td>
<td>---------------</td>
<td>------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>SW101</td>
<td>Water quality Flow</td>
<td>Ruakaka Adits Tributary, downstream of the Ruakaka Adits and upstream of the access road culverts (discharges to the Tunakohoia Stream north branch)</td>
<td>Receives discharges from Ruakaka Adits.</td>
</tr>
<tr>
<td>WRC 1076_5</td>
<td>Biology</td>
<td>Additional impact site located on the Tunakohoia Stream off Hamilton Street.</td>
<td>Downstream of all discharges. Selected to provide additional data with which to assess downstream effects on biology.</td>
</tr>
<tr>
<td>Tui Stream TBC</td>
<td>Biology</td>
<td>Additional impact site located on the Tui Stream. Exact location to be determined during the 2013 biological survey.</td>
<td>Downstream of all discharges. Selected to provide additional data with which to assess downstream effects on biology.</td>
</tr>
</tbody>
</table>

*We understand that Phase 1 works will result in a significant reduction in flows from the Adit 5 source. Consideration could be given to replacing this site with SW4 on the Tunakohoia Stream north branch downstream of SW3 but upstream of the waste rock site at Adit 5.

4 Water quality

The water quality monitoring programme is detailed in the following sections and will closely follow methods used in the baseline monitoring undertaken between September and November 2009.

4.1 Monitoring parameters

Parameters included in the ongoing monitoring programme will be as per the baseline monitoring project (PDP, 2010). Parameters to be monitored are outlined in Table 2.

Table 2: Monitoring parameters and measurement methods

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Sites</th>
<th>Method</th>
<th>Detection level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physicochemical</td>
<td>Field</td>
<td>All water quality sites</td>
<td>Calibrated field meter/s</td>
</tr>
<tr>
<td></td>
<td>Laboratory</td>
<td>All water quality sites</td>
<td>-</td>
</tr>
<tr>
<td>Cyanide</td>
<td>SW11, SW13 and SW15</td>
<td>Total recoverable</td>
<td>0.001 g/m$^3$</td>
</tr>
<tr>
<td>Total and dissolved trace elements</td>
<td>All water quality sites</td>
<td>Field filter for dissolved metals</td>
<td>Trace</td>
</tr>
<tr>
<td>Anions and cations</td>
<td>SW3, SW5, SW 100, SW101</td>
<td>Field filtered</td>
<td>-</td>
</tr>
</tbody>
</table>
The rationale for the parameters included in the water quality monitoring programme is as follows:

- All of the parameters included were tested for in the baseline monitoring programme that was undertaken in part to enable improvements in water quality to be assessed following remediation works.
- Trace levels of cyanide (although low) were detected in samples from SW11 (tailings impoundment tributary). Cyanide is included so that any further improvement can be detected.
- The same metals suite is proposed for ongoing monitoring as was used in the baseline monitoring, although some parameters were below detection levels at all sites. This is due to the economy of testing for a set metals suite rather than individual elements.
- Anion and cation balances are included as changes are expected as a result of remediation works. Data should be checked to ensure that all potential ionic contaminants are being analysed.

4.2 Sampling timing and frequency

Water samples are to be collected from each site on three occasions each year that monitoring is required. Three sampling occasions are considered necessary to allow for the effect of flow variability on contaminant concentrations and loads. Sampling rounds should occur between the months of September and November inclusive. Sampling events should be evenly spaced in terms of timing where possible but should aim to capture a range of flow conditions (low flow and elevated flow).

A preliminary monitoring schedule based on anticipated works programming is included as Appendix C. Water quality (and flow) monitoring is scheduled as follows:

- 2011 and 2012 – sampling at the six Tunakohoia Sites only (three sampling occasions annually) to assess outcomes of Phase 1 works and inform decisions on additional alkalinity injection.
- Post Phase 2 – sampling at all water quality monitoring sites for three years following completion of Phase 2 works (Tui and Tunakohoia Stream sites, three sampling occasions annually). Anticipated to occur from 2013 to 2015.
- Ongoing monitoring – sampling at all water quality monitoring sites on a five yearly basis (anticipated to commence in 2020, three sampling occasions each year that monitoring is required)

4.3 Sampling methods

4.3.1 Sampling order

Samples are to be collected in a specific order on each sampling occasion in order to minimise potential for cross contamination. Sampling should progress from the downstream sites with potentially lower levels of contamination to potentially more contaminated sites. Sampling from downstream to upstream also ensures that sediment disturbed through the sampling work does not affect downstream collection sites.

The exact order for sampling will depend on the remediation works progress but should be documented on each sampling occasion.

Water samples should be collected at each site before any field measurements, flow measurements (see Section 5) or biological sampling (Section 6) to avoid any sediment disturbance affecting water samples.
4.3.2 Sample collection

Water samples should be collected from mid-stream in the main stream flow from immediately below the water surface. If disturbed iron floc or sediment enters the sample then the sample should be discarded downstream of the site and a new sample collected in a new sample container.

Samples are to be collected and placed directly into laboratory supplied (clean) sample containers. In this regard field filters (0.45 µm) shall be used for the collection of dissolved metals, and total metals shall be collected directly into sample containers with nitric acid preservative.

Sample containers are to be labelled with the site name, date and time of sampling. Sample details should be recorded on chain of custody documentation with a copy of this documentation remaining with the samples.

All samples are to be analysed by an accredited laboratory within the recommended holding times set out by that laboratory.

4.3.3 Measurement using field meters

All field meters used to collect field water quality data are to be calibrated against appropriate standards prior to each monitoring occasion and re-checked while sampling is in progress or at completion of the monitoring round. Meter sensors are to be rinsed with de-ionised water between each site.

4.4 Quality assurance / quality control

The water sampling programme is to include quality assurance (QA)/quality control (QC) procedures in general accordance with the Contaminated Land Management Guidelines No.5. Minimum QA / QC procedures are outlined below.

4.4.1 Field QC

Field QC procedures should be in place to manage sampling errors. Field QC procedures are used to measure the uncertainty in the data from sampling, handling and laboratory errors. The recommended number of field QC samples that should be included are:

- One (1) blind replicate sample for the dissolved and total water quality samples collected at each sampling event;
- One (1) split sample for the dissolved and total water quality samples collected during one of the sampling events (each year); and
- One (1) rinsate blank for the dissolved water quality samples collected at each sampling event.

A blind replicate sample, also referred to as field duplicate or replicate, involves collecting two separate (replicate) samples from a single sample location, storing in separate containers and submitting them for analysis to the laboratory as two separate samples. The blind replicate can provide information on the overall variability or precision of both the sampling technique and the analytical laboratory.

Split samples are used to check on the analytical proficiency and provide information on the overall variability or precision of the analytical laboratory. A split sample is prepared by requesting the primary laboratory to prepare a sample by thorough homogenisation and sending a portion to a second independent laboratory for analysis.

A rinsate blank should be collected for the field filter kit, at each sampling event. A rinsate blank is collected by running distilled water through the filter and collection in laboratory prepared
sample containers. The blank is tested for any residual contamination, which assesses the potential for cross contamination between samples.

4.4.2 Laboratory QA/QC

The laboratory selected for analysis should be accredited and must be able to demonstrate the procedures and checks in place to ensure accurate testing and reporting of analytes. As a minimum, every batch of analysis should include:

- Calibration standards
- A laboratory ‘blank’
- Replicates, at a frequency of 1:10 samples (to suit the sampling methodology for Tui mine)

Only data that has passed the internal laboratory QC tests will be valid for reporting from the laboratory. If the laboratory has a ‘QC failure’ then the analysis must not be approved for reporting and the whole batch will need to be repeated. Occasionally however, the analyst may decide that there is an obvious valid reason for the failure and the data would be reported with appropriate comments.

All analytical testing shall be accompanied by the laboratory QC report.

4.5 Data analysis

The selection of control and impact sampling sites and the collection of baseline and post-remediation data represent a standard before and after, control and impact (BACI) study design. The inclusion of a control site will enable the differentiation of effects due to the works from natural variability.

Reporting of water quality data should be factual for 2011 and 2012 (Phase 1 outcomes) and for 2013 and 2014 with a more detailed statistical analysis undertaken after three years of post-remediation data is available (anticipated to be 2015).

Factual reports should include a comparison of impact sites to control sites, a comparison of contaminant levels to ANZECC guidelines for aquatic ecosystems and a qualitative assessment against baseline data for key contaminants.

Statistical analysis of water data should be included in reporting after three years of post remediation data is available and at five yearly intervals thereafter. Standard statistical tests (e.g. ANOVA or time-trends) should be used to determine if there are statistically significant differences between control and impact sites and for before and after data.

We note that PDP state in their baseline monitoring report that caution should be used in any statistical analysis using historic data from sites SW3 and SW11. This is due to effects of an adit cave in and associated flow diversion and previous partial remediation works respectively.

5 Stream and discharge flow

Flow monitoring is required at each water quality monitoring site on each sampling occasion to establish an estimate of mass contaminant loads from the mine adits, tailings dam, Tui Stream and Tunakohoia Stream. It is likely that a range of different monitoring techniques will need to be used to measure flow due to site limitations. As an indication, the methods used for each site in the baseline monitoring study are presented in Table 3.
Table 3: Flow monitoring methods

<table>
<thead>
<tr>
<th>Site</th>
<th>Previous method for flow measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW3</td>
<td>V-notch weir</td>
</tr>
<tr>
<td>SW5</td>
<td>Flow gauging</td>
</tr>
<tr>
<td>SW7</td>
<td>Flow gauging</td>
</tr>
<tr>
<td>SW8</td>
<td>Flow gauging</td>
</tr>
<tr>
<td>SW11</td>
<td>Flow gauging /V notch weir</td>
</tr>
<tr>
<td>SW13</td>
<td>Flow gauging</td>
</tr>
<tr>
<td>SW15</td>
<td>Volumetric</td>
</tr>
<tr>
<td>SW100</td>
<td>Flow gauging</td>
</tr>
<tr>
<td>SW101</td>
<td>Culvert gradient and depth calculations</td>
</tr>
</tbody>
</table>

6 Biological monitoring

Biological monitoring will be undertaken following the completion of all remediation works. Biological sampling is to include macroinvertebrate assessment, periphyton growth and macrophyte growth in accordance with Condition 10 of Consent 121042.

6.1 Assessment sites, frequency and timing

Biological sampling will be undertaken at sites SW7 and SW8 on the Tunakohoia Stream and sites SW12 and SW13 on the Tui Stream described in Table 1. These sites were included in the baseline survey (Coffey, 2010). Two additional impact sites will also be established on the downstream reaches of the Tui and Tunakohoia Streams to provide more data with which to determine downstream effects or improvements. The additional impact site on the Tunakohoia Stream will be located at WRC SOE site 1076_5, for which there is existing baseline data. The additional site on the Tui Stream will be confirmed during the first post-remediation survey (2013).

Annual sampling is to occur following completion of all remediation works (anticipated to be 2013), in 2015 and then in association with five yearly water quality and flow monitoring (from 2020).

Biological monitoring is to be undertaken during the month of September in order to be consistent with the baseline survey. Monitoring should be undertaken during stable flow conditions and at least two weeks after a storm event that results in significant movement of stream bed material.

6.2 Macroinvertebrate assessment

Macroinvertebrate sampling is to be undertaken in accordance with WRC’s “Regional Guidelines for Ecological Assessments in Freshwater Environments – Macroinvertebrate Sampling in Wadeable Streams” (WRC, 2005). This is to include the qualitative habitat assessment in the guidelines along with updates to the original methods comprising:

- Wetted widths and channel widths to be measured at five transects equally spaced along the study reach.
- Thalweg depth and current velocity measured at each transect.
- Substrate size measured along transects using the Wolman procedure.
Water quality data (temperature, dissolved oxygen, pH) will be collected at each site using calibrated field meters.

Four replicate macroinvertebrate samples are to be collected from each site using kick net sampling techniques in accordance with the guidelines. This level of replication is the minimum required for detection of statistically significant differences in macroinvertebrate community indices. The macroinvertebrate samples shall be preserved in the field for later processing and analysis. Sample processing is to be in accordance with MfE protocol P2 (200 fixed count with a scan for rare taxa).

Macroinvertebrate data is to be analysed using the indices listed in WRC (2005) guidelines. Basic statistical tests (e.g. ANOVA) are to be used as appropriate to determine any difference between monitoring sites and dates. Available baseline macroinvertebrate data held by WRC for sites on the Tui Stream (Site SW8), the Tunakohioa Stream (WRC Ref. 1076_5) and the Pohomihi Stream (WRC Ref. 781_2) will be included in the assessment to interpret temporal variation in macroinvertebrate communities prior to the remediation.

6.3 Periphyton and macrophytes

Periphyton and macrophyte cover is to be assessed at each site on each monitoring occasion in accordance with the rapid assessment protocols outlined in WRC’s “Regional Guidelines for Ecological Assessments in Freshwater Environments: Aquatic Plant Cover in Wadeable Streams” (WRC, 2007). Datasheets for each rapid assessment type are included as appendices to the WRC (2007) guidelines.

7 Reporting and review

A report detailing the results of all monitoring work undertaken is to be prepared each year that monitoring occurs. Copies of all reports are also to be provided to Ngati Rahiri Tumutumu.

Reporting of water quality, flow and biological monitoring data should be factual until three years of post-remediation data is available. Factual reports shall be provided to WRC within 60 days of the receipt of the final analytical results and include:

- Field monitoring results including QA/QC records.
- Laboratory results including QA/QC records.
- The findings of ecological monitoring.
- An assessment against appropriate water quality guideline levels.
- An assessment of mass loads of contaminants within the Tui and Tunakohioa Streams.

The report prepared following three years of post remediation data being available, and at five yearly intervals thereafter, should include in addition to the above:

- Statistical analysis of the water quality and biological data to determine if habitat, and water quality conditions are improving over time and in relation to the remedial works.
- A review of the EMP and any recommendations for modifications to the monitoring programme. The review shall be based on monitoring outcomes and cover items such as:
  - The scope for a reduction in monitoring frequency and/or number of sites.
  - The scope for reducing the number contaminants tested for (i.e. only testing key contaminants of concern).
  - The 2015 review will include consideration of more frequent biological sampling post-remediation to document the rate and temporal consistency of macroinvertebrate community recovery (as recommended by Collier (2011)).
The 2020 review will include the consideration of fine sediment analysis and measurement of metal levels in sediments if water quality has improved but there has been no concomitant improvement in benthic macroinvertebrate communities (as recommended by Collier (2011)).

The detailed report shall be provided to WRC within six months of the receipt of the final analytical results.
8 Applicability

This report has been prepared for the benefit of Waikato Regional Council – Resource Use Group with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

Tonkin & Taylor Ltd
Environmental and Engineering Consultants
Report prepared by: Authorised for Tonkin & Taylor Ltd by:

Dean Miller David Bouma
Environmental Scientist Tauranga Group Manager

Report reviewed by:

Peter Cochrane
Senior Environmental Scientist
9 References


Appendix A: Resource Consent 121042
Resource Consent Certificate

Resource Consent: 121042

File Number: 61 47 65A

Pursuant to the Resource Management Act 1991, the Waikato Regional Council hereby grants consent to:

Department of Conservation (East Coast Bay of Plenty Conservancy Office)
PO Box 1146
Rotorua 3040

(hereinafter referred to as the Consent Holder)

Consent Type: Discharge permit
Consent Subtype: Discharge to land and water
Activity authorised: Discharge contaminants to land and water in association with remediation of the Tui Mine
Location: Tui Road - Te Aroha - Tui Mine Remediation Works
Map Reference: NZMS 260 T13:517-052
Consent Duration: This consent will commence on the date of decision notification and expire thirty five (35) years from the date of commencement

Subject to the conditions overleaf:
CONDITIONS

1. The discharges authorised by this resource consent shall be undertaken in general accordance with:

   (i) The application for this resource consent; and
   (ii) The document titled “Tui Mine – Phase 1 and Phase 2 Remedial Works – Assessment of Environmental Effects” dated 8 March 2010 recorded as document 1646482 on the Waikato Regional Council’s document system unless superseded by the documents titled “Tailings Impoundment Remediation Design Report” dated 20 May 2010 and “Phase 2 Design – Tailings Impoundment Drawing Volume” dated 14 May 2010 recorded as documents 1737446 and 1737419 respectively on the Waikato Regional Council’s document system,

   except where inconsistent with the conditions below which shall prevail should any inconsistencies occur.

2. The consent holder shall ensure contractors are made aware of the conditions of this resource consent and ensure compliance with those conditions.

3. The discharges authorised by this consent shall be undertaken within the properties legally described as Section 117, Block IX, Aroha Survey District and Part Te Aroha.

4. The consent holder shall be responsible for any erosion control works that become necessary to preserve the integrity and stability of the stream channels and/or to control erosion as a result of the exercise of this resource consent.

   Advice Note: A separate resource consent may be required as a result of the need to undertake erosion control works. Any such consent shall be obtained by the consent holder at their sole expense prior to any works being undertaken.

Landscaping Plan

5. Within twenty four (24) months of the commencement of this consent the consent holder shall in conjunction with Matamata-Piako District Council’s Parks and Reserves Manager and in consultation with the Project Iwi Advisory Group, provide a final landscaping plan to the Resource Use Group of the Waikato Regional Council designed by a suitably qualified and experienced person who shall be approved in writing by the Resource Use Group of the Waikato Regional Council.

6. The objectives of the Landscaping Plan shall be to:

   (i) Address the relevant aspects (principally Section 5.1.2) of the Matamata-Piako District Plan requirements for landscaping at the subject site;
   (ii) Detail the process to address the long term use of the site;
   (iii) Incorporate recommendations 5, 6, 7, 8 and 9 of the document titled “Proposed Tui Mine Restoration Mount Te Aroha: Cultural Impact Assessment Report”, dated March 2010 and recorded as document 1720804 on the Waikato Regional Council’s document system; and
   (iv) Preserve the integrity of the cap and ensure that any vegetative layer will be not compromised.
   (v) Detail the design and location of fences, railings and other safety structures to be erected.
7. The Landscape Plan required by condition 5 shall be submitted to the following parties:

- Environmental Futures Limited
- Te Aroha Earthwatch
- Wolfgang Faber
- Gisela Ludke-Faber
- Kordia
- Michael and Judy Baker

These parties shall have no less than 20 working days to provide comments on the Landscape Plan after which the consent holder shall submit the Landscape Plan and any comments received to the Resource Use Group of the Waikato Regional Council.

8. The consent holder's final landscaping plan shall be submitted to the Resource Use Group of the Waikato Regional Council for its approval, acting in a technical certification capacity, prior to its implementation. Should the Resource Use Group of the Waikato Regional Council not respond in writing within 20 working days of receipt of the final landscaping plan, either providing certification of the final landscaping plan or clearly outlining areas of the landscaping plan that are not accepted, then the landscaping plan shall be considered to be approved and this condition satisfied.

9. The consent holder shall implement the approved Landscape Plan.

**Biological and Water Quality Monitoring Plan**

10. The consent holder shall undertake an annual biological and water quality sampling programme of the Tui and Tunakohoia Streams for the first three years of this consent. Thereafter annual biological and water quality sampling shall occur on a five yearly basis. Stream biological sampling shall include as a minimum algal (periphyton) and macrophyte growth, and macroinvertebrate assessment using appropriate metrics.

The design of the sampling programme shall be included in the Environmental Monitoring Plan prepared in accordance with condition 19 of this consent.

**Air Discharge Management Plan**

11. As a result of the exercise of this consent there shall be no odour or dust emissions that cause an objectionable effect beyond the boundary of the property defined in condition 3 above. To this end, measures to minimise discharges to air shall be implemented in accordance with an overall Air Discharge Management Plan ("ADMP") for the project.

**Advice Note:** Chapter 6.4 of the Waikato Regional Plan provides guidance on the assessment of the effects of odour and dust emissions.

12. The consent holder shall provide the ADMP to the Resource Use Group of the Waikato Regional Council at least 20 working days prior to the commencement of activities authorised by this resource consent.

13. The objectives of the ADMP shall be to:

i. minimise, to the greatest extent practicable, odour and dust generation potential;

ii. minimise, to the greatest extent practicable, any potential adverse environmental effects that could arise from the discharges; and

iii. incorporate recommendations 6, 7, 8 and 9 of the document titled “Proposed Tui Mine Restoration Mount Te Aroha: Cultural Impact Assessment Report”, dated March 2010 and recorded as document 1720804 on the Waikato Regional Council’s document system.
14. The ADMP required by condition 11 shall include as a minimum, details of all procedures and practices that will be implemented to satisfy the objectives of the ADMP including:

   (i) Short term procedures and practices to satisfy the objectives of the ADMP including:
       a. identified vehicle wash down areas for all vehicles leaving the site; and
       b. Details of the location and treatment of discharges from vehicle wash down areas;
   (ii) Long term procedures and practices to satisfy the objectives of the ADMP; and
   (iii) Identification and contact details of personnel responsible for the activities addressed in the ADMP.

15. The ADMP required by condition 11 shall be prepared by a suitably qualified and experienced person who shall be approved in writing by the Resource Use Group of the Waikato Regional Council.

16. The ADMP required by condition 11 shall be approved in writing by the Resource Use Group of the Waikato Regional Council acting in a technical certification capacity prior to any works authorised by this consent commencing. Should the Resource Use Group of the Waikato Regional Council not respond in writing within 20 working days of receipt of the ADMP, either providing certification of the ADMP or clearly outlining areas of the ADMP that are not accepted, then the ADMP shall be considered to be approved and this condition satisfied.

17. Any changes proposed to the ADMP, shall be confirmed in writing by the consent holder and approved in writing by the Resource Use Group of the Waikato Regional Council acting in a technical certification capacity, prior to the implementation of any changes proposed. Should the Resource Use Group of the Waikato Regional Council not respond in writing within 20 working days of receipt of the proposed changes to the ADMP, either providing certification of the ADMP or clearly outlining areas of the ADMP that are not accepted, then the ADMP shall be considered to be approved and this condition satisfied.

18. All discharges to air associated with the exercise of this consent shall be undertaken in accordance with the approved ADMP for the duration of this consent.

Environmental Monitoring Plan

19. The consent holder shall provide a Environmental Monitoring Plan (“EMP”) to the Resource Use Group of the Waikato Regional Council within six months of the commencement of this consent.

20. The objectives of the EMP shall be to:
   (i) assess whether the habitat, biological and water quality of the Tui and Tunakohoa Streams are improving over time;
   (ii) Measure the effectiveness of the works in reducing ARD (Acid Rock Drainage) and as a minimum measure the following contaminant trace elements calcium, iron, manganese, zinc, arsenic, cadmium, lead, copper, and mercury; and
   (iii) incorporate recommendations 4, 6, 7, 8 and 9 of the document titled “Proposed Tui Mine Restoration Mount Te Aroha: Cultural Impact Assessment Report”, dated March 2010 and recorded as document 1720804 on the Waikato Regional Council’s document system.

21. The EMP required by condition 19 shall be prepared by a suitably qualified and experienced person who shall be approved in writing by the Resource Use Group of the Waikato Regional Council.
22. The purpose of the EMP is to:

(i) design a sampling programme to achieve the objectives detailed within condition 20;

(ii) provide all data associated with the sampling programme including:
   a. all parameters to be monitored including the rationale for their selection;
   b. all sampling/monitoring locations, including the rationale for their selection;
   c. the methods of sampling and/or measurement that are to be used, including the rationale for their selection; and
   d. the analyses, including statistical analyses, that the data collected will be subject to, together with an explanation of how those analyses will enable the effects of the activities authorised by this consent to be determined and discriminated from natural variability,

(iii) provide an assessment of whether the objectives detailed within condition 20 are being achieved;

(iv) Identify the frequency with which reporting of the EMP will occur.

23. The EMP required by condition 19 shall be approved in writing by the Resource Use Group of the Waikato Regional Council acting in a technical certification capacity prior to any works authorised by this consent commencing. Should the Resource Use Group of the Waikato Regional Council not respond in writing within 20 working days of receipt of the EMP, either providing certification of the EMP or clearly outlining areas of the EMP that are not accepted, then the EMP shall be considered to be approved and this condition satisfied.

24. All monitoring activities of the streams shall be undertaken in accordance with the approved EMP for the duration of this consent.

25. Any changes proposed to the EMP required by condition 19 shall be confirmed in writing by the consent holder and approved in writing by the Resource Use Group of the Waikato Regional Council acting in a technical certification capacity, prior to the implementation of any changes proposed. Should the Resource Use Group of the Waikato Regional Council not respond in writing within 20 working days of receipt of the proposed changes to the EMP, either providing certification of the EMP or clearly outlining areas of the EMP that are not accepted, then the EMP shall be considered to be approved and this condition satisfied.

**Hazardous Material**

26. If any drums containing hazardous material (e.g. cyanide) are found then the consent holder shall immediately inform the Resource Use Group of the Waikato Regional Council of the existence of hazardous material and confirm the intended approach to contain or remove this material. For cyanide contaminated material a tiered management approach is to be generally implemented as set out below:

   a) material with cyanide concentrations less than 100mg/kg does not require specific containment and will be incorporated into the general stabilisation of the tailings;
   b) material with cyanide concentrations greater than 100 mg/kg and less than 200mg/kg will be contained on site within a lined containment cell within the tailings;
   c) material with cyanide concentrations greater than 2000 mg/kg will require on-site treatment to reduce containment concentrations or be removed offsite for disposal;
   d) any remaining drums containing cyanide shall be taken off site and disposed at a hazardous waste facility.
Drainage Design Standards

27. The consent holder shall design and construct all permanent drainage structures in accordance with accepted engineering practices. Permanent stormwater drains over high risk areas (defined as those areas where a failure of a drainage channel could lead to severe scouring of the tailings impoundment) will be designed to withstand a 1 in 500 year storm return period. All other permanent drains will be designed to withstand a 1 in 100 year storm return period. Drainage designs will take future climate change into account.

Complaints

28. The consent holder shall maintain a register to record all complaints received by the consent holder. The register shall be made available to the Resource Use Group of the Waikato Regional Council on request, and shall record the following:
   (a) the date, time and duration of the event;
   (b) the name and location of the complainant when the event was detected;
   (c) measures taken to verify the event;
   (d) the weather conditions and wind direction when the event allegedly occurred;
   (e) the possible causes of the event; and
   (f) any corrective action taken by the consent holder in response to the complaint.

The consent holder shall advise the Resource Use Group of the Waikato Regional Council within 24 hours of the receipt of any complaints by the consent holder.

Downstream Domestic and Municipal Water Supplies

29. The consent holder shall as soon as reasonably practicable, notify the Matamata-Piako District Council, the Hauraki District Council, and the Resource Use Group of the Waikato Regional Council of an event that may in itself, or as a consequence of an event, have a significant adverse effect on the quality of the water within the south branch of the Tunakoihoa Stream or the Waihou River at the abstraction points of the Te Aroha (Tunakohoia Stream take only) and Kerepehi Water Supplies.

The consent holder shall record the reasons why the situation occurred, the actions taken by the consent holder and an assessment of what measures can be adopted in the future to minimise such occurrences and upon written request from the Resource Use Group of the Waikato Regional Council provide a report to the Resource Use group of the Waikato Regional Council and the Medical Officer of Health addressing this matter.

Public Meetings

30. At six (6), twelve (12) and eighteen (18) months intervals following the commencement of this consent the consent holder shall initiate a public meeting within Te Aroha, via notice within the local newspaper. The purpose of each meeting shall be to provide an update to the general public on the remediation works and any monitoring results undertaken to date. Future public meetings shall occur within the six month period following the fifth, tenth, fifteenth, twenty-fifth and thirtieth anniversary of the commencement of this consent. The frequency of these public meetings may change with the written approval of the Resource Use Group of the Waikato Regional Council.

Site Validation Reporting

31. In order to demonstrate the condition of the site, upon completion of the remediation works, the consent holder shall provide to the Resource Use Group of the Waikato Regional Council a copy of the site validation report and the ongoing monitoring and management plan prepared in accordance with accepted best practice for reporting on
contaminated sites. As a minimum the report shall demonstrate how the existing geotechnical and geochemical risks at the site have been addressed.

Reviews

32. Within 12 months of the Crown settling any claim made under the provisions of the Treaty of Waitangi Act 1975 the Resource Use Group of the Waikato Regional Council may, following service of notice on the consent holder, commence a review of the conditions of this consent pursuant to section 128(1) of the Resource Management Act 1991, for the purpose of ensuring that this consent is in alignment with the provisions of any such settled claim.

33. Within the six month period following the fifth, tenth, fifteenth, twentieth, twenty-fifth and thirtieth anniversary of the commencement of this consent the Resource Use Group of the Waikato Regional Council may, following service of notice on the consent holder, commence a review of the conditions of this resource consent under section 128(1) of the Resource Management Act 1991 for the following purposes:

(i) to review the effectiveness of the conditions of this resource consent in avoiding or mitigating any adverse effects on the environment from the exercise of this resource consent and if necessary to avoid, remedy or mitigate such effects by way of further or amended resource consent conditions; or
(ii) to review the adequacy of and the necessity for monitoring undertaken by the consent holder; or
(iii) to review the effectiveness of the conditions of this resource consent in achieving an order of magnitude or better improvement of water quality in the lower Tui Stream and the main-stem of the Tunakohoia Stream.

In terms of s116 of the Resource Management Act 1991, this consent commences on 22\textsuperscript{nd} September 2010

Dated at Hamilton this 23\textsuperscript{rd} day of September 2010

For and on behalf of the
Waikato Regional Council
Advice Notes: In Respect of Resource Consent Numbers 121071, 121039, 121041, 121040, 121042

1. In accordance with section 125 RMA, any consent with a duration greater than five (5) years shall lapse five (5) years after the date on which it was granted, unless it has been given effect to before the end of that period.

2. Where a resource consent has been issued in relation to any type of construction, (e.g. dam, bridge, jetty) this consent does not constitute authority to build and it may be necessary to apply for a Building Consent from the relevant territorial authority.

3. These resource consents do not give any right of access over private or public property. Arrangements for access must be made between the consent holder and the property owner.

4. These resource consents are transferable to another owner or occupier of the land concerned, upon application, on the same conditions and for the same use as originally granted (s.134-137 RMA).

5. The consent holder may apply to change the conditions of a resource consent under s.127 RMA.

6. The costs incurred by the Resource Use Group of the Waikato Regional Council arising from the supervision and monitoring of this/these consents or the review of the conditions of these resource consents or any administrative charges will be borne by the Waikato Regional Council in accordance with the Memorandum of Understanding agreed in June 2009 between the Ministry for the Environment, Waikato Regional Council, Matamata-Piako District Council and the Department of Conservation defining governance arrangements for the Tui Mine Remedial Project.

7. Note that pursuant to s332 of the RMA 1991, enforcement officers may at all reasonable times go onto the property that is the subject of this consent, for the purpose of carrying out inspections, surveys, investigations, tests, measurements or taking samples.

8. If you intend to replace these consents upon their expiry, please note that an application for a new consent made at least 6 months prior to each consent's expiry, gives you the right to continue exercising the consent after it expires in the event that your application is not processed prior to this consent's expiry.
In reply please quote: 61 47 65A
Doc #
Enquiries to: Ruth Hutchinson

23rd September 2009

Department of Conservation (East Coast Bay of Plenty Conservancy Office
PO Box 1146
Rotorua 3040

Dear Sir/Madam

RESOURCE CONSENT NUMBER 121042

Please find enclosed the certificate detailing the terms and conditions of your resource consent recently granted by the Waikato Regional Council. Please keep this important document in a safe place for easy reference during the term of the consent.

Please note the following:

(i) Only the holder of the consent or their agent may exercise this consent, and then only for the purpose specifically authorised by the consent.
(ii) Those exercising the consent must comply with the conditions of the consent at all times.
(iii) The majority of consent holders will incur annual charges for holding consents, and may also incur costs associated with monitoring, inspecting and reporting on the exercise of this consent.
(iv) This consent will expire on the date specified on the certificate. If unexercised, the consent will lapse on the date specified in the consent, or if no date is specified, within 5 years from the date of commencement, unless approval has been obtained from Environment Waikato to extend the lapse period.
(v) Should you no longer wish to perform the activities authorised by the consent, you may wish to apply to surrender the consent, giving reasons for the surrender. In addition should you sell the property or the operation to which this consent applies, you may wish to transfer the consent to the new owner. If you wish to undertake either of these actions, please forward the resource consent certificate to this office with advice of the action you require to be taken.

Should you have any further queries on these matters, or any other issues relating to the exercise of this resource consent, please do not hesitate to contact the Hamilton office toll-free on 0800 800 402 quoting the above reference.

Yours faithfully

Ruth Hutchinson
Business Support – Resource Use
Appendix B: Tui Mine Iwi Advisory Group Meeting Minutes (19 April 2011)
Tui Mine Iwi Advisory Group
Meeting Minutes

Tues 19th April 2011, 10-12pm, Waikato Regional Council Depot, Terminus St, Te Aroha

Minute taker: Rob Griffiths (DOC)
Facilitator/Chairperson: Helen Neale (DOC)

Present: Penny Wakelin (Waikato Regional Council), Pauline Clarkin (Ngati Hako) Megan Noble (Ngati (Hako), Mapuna Turner (Rahiri Tumutumu), Carol Henry (Waikato Regional Council),

Proceedings
1. Apologies – Andrew Baucke (DOC), Katrina Knill (DOC), Ghassan Basheer (Waikato Regional Council), Susan Tutuki (Rahiri Tumutumu)

2. Matter arising from previous meeting
   • Appointed representative of Rahuri Tumutumu is still outstanding to the advisory group – Hui on 1st May that should resolve this issue. Confirmation by letter required.
   • Did not have two appointed reps present, so could not have formal meeting. However some informal discussion held as follows.

3. Additional agenda item requests
   • Iwi newsletter
   • ECHO walking festival event to Tui Mine

4. Site visit requirements
   • Like to do a site visit after the meeting – Carol to investigate. It would appear that this would be best if it was prearranged so site manager is organised etc.

5. Cultural monitoring programme
   • Group meeting with Carol after meeting to consider cultural monitoring plan

6. Report back from Steering &/or Governance Group meetings
   • New MOU - issues re responsibilities still to be resolved by Governance Group.
   • EW proceeding with tender for phase two – EW and MPDC are contributing funds to project. Anticipated that remainder of funding could be confirmed in May.
   • No iwi representative at last steering group

7. Operational update
   a. Progress report to date – Project Manager
      • Phase One - Bulkhead complete. McDowells demobilising site. Lime injection work to be completed end of August. Level four waste rock stack work to be completed in May including hydro seeding.
• Final inspection of the works for phase one – a substantial completion cert to be issued – 1yr warranty on works/infrastructure.
• Phase Two – RFT (3) for this close 10 June.

8. Environmental monitoring plan – Comments on plan
   • 4.2 Sampling timing and frequency – Pauline would like to see more testing/sampling using a seasonal/cultural approach to testing. Penny commented that the current plant meets the requirements of the resource consent. Can be reviewed and include more. Pauline happy to accept monitoring plan in principle with plan for better linkages between this and the cultural monitoring plan.

9. Proposed amendment to consent condition 10
   • Waikato Regional Council has recommended a change to consent condition for biological monitoring. This monitoring to move to a 5 year period starting after the three year monitoring phase. Base information is encapsulated in the AEE document. Pauline not comfortable with this, preference to remain as is but not objecting.

10. Project Plan review – covered above

11. Appointments for upcoming meetings:
   • Iwi Advisory Group representative at Steering Group April 28th & May 26th 2011 – Pauline Clarkin to attend and circulate minutes

12. Underground site visit
   • Look at bulkhead and infrastructure – 27th April – 10am – will confirm via email. Key stakeholders, Iwi, DOC. Invitations to go out. Need numbers for safety gear etc. Hui at the Pa was suggested by Mapuna. Carol to work with Mapuna & Penny for a plan for the day.

13. ECHO Walks event to Tui Mine
   • Brochure there is walk to the mine. It is believed that this is lead by DOC. Is there a cultural component? Will look into it and report back.

   • Iwi advisory group would like the newsletter circulated that went to forum in February. This will need to be updated so it is appropriate for circulation – Penny to follow up with Ghassan.

Next meeting Tues 17 May, 10-12 noon EW Depot, Terminus St, Te Aroha
Appendix C: Monitoring schedule to 2020

- Based on the anticipated works programme as at May 2011
### Tui Mine Monitoring Schedule

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*Note: The table indicates that monitoring activities, such as water quality and flow, were conducted at specific timeframes (e.g., September and November) from 2011 to 2020.*