APPENDIX J

Freshwater Ecology Assessment
Amended Report dated 10 August 2018 in response to WRC Further Information Request received 11 July 2018
(Boffa Miskell)

Project Martha

Assessment of Freshwater Ecological Effects
Prepared for Oceana Gold (New Zealand) Limited

10 August 2018

Boffa Miskell

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Prepared by:	Ian Boothroyd Ecologist | Senior Principal Boffa Miskell Limited	
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1.0 Introduction

1.1 Background

The current Waihi life of mine plan for Correnso / Daybreak / Empire is to complete production by the end of 2019, based on published reserves and resources. Some small extensions to these resources are likely to be identified but these are expected to only provide an additional few months of mine life.

Successful exploration and optimisation work now means the opportunity exists for OceanaGold NZ Ltd. (OceanaGold) to extend the life of mine through interlinked underground mines and an open pit extension. The combined project is referred to as Project Martha.

OceanaGold intend to lodge resource consent applications for Project Martha comprising:

- Martha underground mine including the Rex vein, and
- Martha Phase 4 pit.

1.2 Project Description

The resource consent application will seek to provide for open pit and underground mining methods, and provide for the appropriate rehabilitation and closure of Project Martha mining facilities. There is sufficient confidence around the geological resources to define the works required for Project Martha. The Project will use:

- The existing processing plant in its current configuration for the processing of ore.
- The existing tailings storage facilities (TSF1A and TSF2) for the disposal of tailings.
- The existing tailings storage embankments and stockpiles for the permanent disposal of some rock.
- The existing water treatment plant and reverse osmosis plant (if required) in their current configurations for the treatment of mine water discharges. There will be no change to the water treatment standards at the plant.
- The existing mine accesses.

The completion phases of the project remain the same as previous, with the filling of the lake from natural groundwater sources as well as accelerated filling via abstraction from the Ohinemuri River. Once filling is complete there will be a discharge from the lake to the Mangatoetoe Stream (which is currently authorised by Consent 971293, but which will need to be re-consented).

1.3 Scope of work

The scope of work detailed in this report is for an Assessment of Environmental Effects of Project Martha, particularly on the ecology and water quality of the receiving waters of the Ohinemuri River and its tributaries; and the quality of the Pit Lake at completion of filling.

Accordingly, the scope and this report is set out as follows:

- Description of the condition and ecology of the Ohinemuri River.
- Description and ecology of the Mangatoetoe Stream.
- Effects of the abstraction on the values of the Ohinemuri River.
- Effects of filling on the quality and condition of the Pit Lake.
- The effects of discharge from the Pit Lake to the Mangatoetoe Stream.

2.0 Location and catchment landuse

The Waihi gold mines are located within the Waihi township, near the east coast of the North Island. The site currently consists of the Martha Open Pit and the Correnso, Slevin, Favona and Trio Underground mines.

The site is predominantly located within a primarily rural area in the Hauraki District, with access from either SH25 or SH2. The land surrounding the current mining operations (mainly zoned Martha Mineral Zone) is predominantly rural, with the exception of the Martha Pit which is surrounded by residential, low-density residential and town centre areas.

The land surrounding the existing mine operations, excluding the Martha Pit, is generally open with predominantly grazed pasture and horticulture with some areas of plantation pine, native vegetation and low-density rural dwellings. The land is typically low-lying with some rolling hills and small ridges.

The mining site is located within the Ohinemuri River Catchment, a tributary of the Waihou River and within the Waihi Ecological District (ED). Major tributaries of the Ohinemuri River include the Ruahorehore Stream and Mangatoetoe Stream, as well as a number of smaller waterbodies draining into the river.

3.0 Ohinemuri River

3.1 Introduction

The Ohinemuri River[1] is a large tributary of the Waihou River, and arises in the Waihi Basin, at the base of the Coromandel Peninsula in the northeast of the Waikato Region. The Ohinemuri River catchment is some 287 km^2, with an average annual rainfall near 2700 mm/y in the north, but closer to 1500 mm/y in the south[2].

3.2 Water Quality and Ecology Monitoring of the Ohinemuri River

3.2.1 Background

There have been several programmes and reports detailing the water quality and ecology of the Ohinemuri River. The commencement of silver and gold mining within the catchment in the 1980s after a period of relative inactivity in mining in the area resulted in a number of baseline assessments of potential impacts reports on the water quality and ecological condition of the river, and many reports on the annual biological and water quality compliance monitoring. This information provides useful historical baseline information.

The most relevant, recent, and long-term water and ecological monitoring programmes are held and reported by OGNZL (annual compliance monitoring since 1987), NIWA (National Rivers programme), and the Waikato Regional Council State of the environment monitoring. These programmes have been established to achieve different purposes, and each is described briefly below. It is not our intention to summarise and repeat all of the data from these monitoring programmes; such data is well reported and will be referenced accordingly.

All of the programmes include sampling water quality and ecological attributes of the river.

3.2.2 Water quality guidelines

National Policy Statement Freshwater Management (NPS-FM)

The National Policy Statement Freshwater Management was enacted in 2014 and updated in 2017. The NPS-FM requires that water quality is maintained or improved

[1] The full name is Te Waitangi-o-Hinemuri: literally "the weeping water of Hinemuri, the youngest daughter". In Maori legend the river and floodplain were formed by the tears of Hinemuri. She was the youngest daughter of the Hauraki chief who turned away her many suitors because her older sisters remained unwed until finally the suitors fell away and she was left alone and disconsolate. Her copious tears formed the river and floodplain (see fn 2 below).

2 https://www.niwa.co.nz/freshwater-and-estuaries/freshwater-and-estuaries-update/no01-2002/freshwater-feature-ohinemuri-river-coromandel

(Objective A2), water quality is suitable for primary contact (Objective A3) and the life supporting capacity is safeguarded through the sustainable management of discharges (Objective A1).

The NPS-FM requires regional councils, through their regional plans, to set freshwater objectives that provide for freshwater values, and to set water quality limits and develop management actions to achieve those objectives.

The NPS-FM identifies 'attributes' to assist regional councils in developing numeric objectives for rivers and lakes, as well as policies (including limits) for achieving those objectives. 'Attributes' are the 'measureable characteristics of freshwater, including physical, chemical and biological properties which supports particular values'.

USEPA (1985)

The USEPA currently uses a series of guidelines established in 1985 to derive ambient water quality criteria (AWQC) for aquatic life. The guidelines address acute risk (short-term effects such as survival and growth) and chronic risk (longer term effects such as reproduction) for traditional pollutants. USEPA's 1985 Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses (USEPA 1985) describe an objective, internally consistent, appropriate, and feasible way of deriving national criteria for the protection of aquatic ecosystems. The derivation of numerical national water quality criteria for the protection of aquatic organisms and their uses is a complex process that uses information from many areas of aquatic toxicology.

It is important to note that the USEPA (1985) guidelines do not provide specific standards; rather they provide for a process for the derivation of acceptable standards for a waterbody. If enough acceptable data on acute or chronic toxicity to aquatic animals are available, they are used to estimate the highest one-hour average concentration that should not result in unacceptable effects on aquatic organisms and their uses.

If a thorough review of the pertinent information indicates that enough acceptable data are available, numerical water quality criteria are derived for fresh water or salt water or both to protect aquatic organisms and their uses from unacceptable effects due to exposures to high concentrations for short periods of time, lower concentrations for longer periods of time, and combinations of the two.

The USEPA (1985) guidelines were used to derive water quality standards for the acceptability of the final lake water quality discharge to the Mangatoetoe Stream. The water quality standards form part of consent number 971293.

Waikato Regional Council

The Waikato Regional Council have identified three categories of water quality for ecological health: excellent, satisfactory and unsatisfactory. These are based on 'critical values' for seven water quality variables identified as relevant to the suitability of river water for ecological health:

- dissolved oxygen
- pH
- turbidity
- ammonia
- temperature
- total phosphorus
- total nitrogen.

3.2.3 NIWA National River Water Quality Network (NRWQN)

NIWA undertake a national water quality and ecological sampling programme of some 77 sites on 35 rivers around the country. Sites were selected so that a national perspective of state and trends of water quality could be developed. On most rivers there are two or more sites representing an upstream 'Baseline' site (lightly impacted) and a downstream 'Impact' site (reflecting the impacts of humans on water quality). A single site on the Ohinemuri River is sampled at the Karangahake Gorge. The NIWA programme measures the following water quality parameters:

- Physico - chemical variables: dissolved oxygen, temperature, pH, conductivity
- Optical variables: Visual clarity, turbidity, coloured dissolved organic matter
- Nutrients: Total and dissolved forms of nitrogen and phosphorus
- Microbial Indicator: E. coli (since 2005).

3.2.4 Waikato Regional Council State of the Environment Water Quality Monitoring

The Waikato Regional Council undertakes monthly state of the environment (SoE) monitoring of river and stream sites throughout the region[3]. Four sites are listed for the Ohinemuri River:

- Ohinemuri River at the SH 25 Bridge (upstream of OGNZL site)
- Ohinemuri River at Queen's Head (downstream of the OGNZL site)
- Ohinemuri River at Waikino (downstream of the OGNZL site, but upstream of confluence with the Waitekauri River)
- Ohinemuri River at Karangahake Gorge (downstream of OGNZL site).

Water quality data from the past five years from these four sites is summarised in Table x below and forms the primary data for discussion on the water quality of the Ohinemuri River.

3.2.5 OGNZL Treated Water Discharge Monitoring

OceanaGold holds a discharge permit (Discharge Permit 971318) to discharge treated mine water into the Ohinemuri River. The mine water is treated in a water treatment plant (WTP) prior to being discharged into the river through either (or both, depending

[3] https://www.waikatoregion.govt.nz/environment/natural-resources/water/rivers/healthyrivers/

on circumstances) an 'upper' (E1) or 'lower' (E2) discharge (Figure 1). At times the mine can also discharge water from TSF2 (Figure 1) into an unnamed tributary of the Ohinemuri River.

As part of the conditions of the discharge permit, OceanaGold undertakes a range of long-term receiving water biological, sediment and water quality monitoring. Monitoring is undertaken at nine sites; five of which are located on the Ohinemuri River and four are located on tributaries to the Ohinemuri River. The purpose of the data collection is to ensure compliance with the conditions of the resource consent.

Of the sites on the Ohinemuri River, site one is located upstream of all mine related discharges (OC2), one is located downstream of the tributary into which TSF2 discharges into, but upstream of discharge E1 (OH3), two are located between discharge E1 and E2 (OH5 and OH1) and one is downstream of all mine related discharges (OH6).

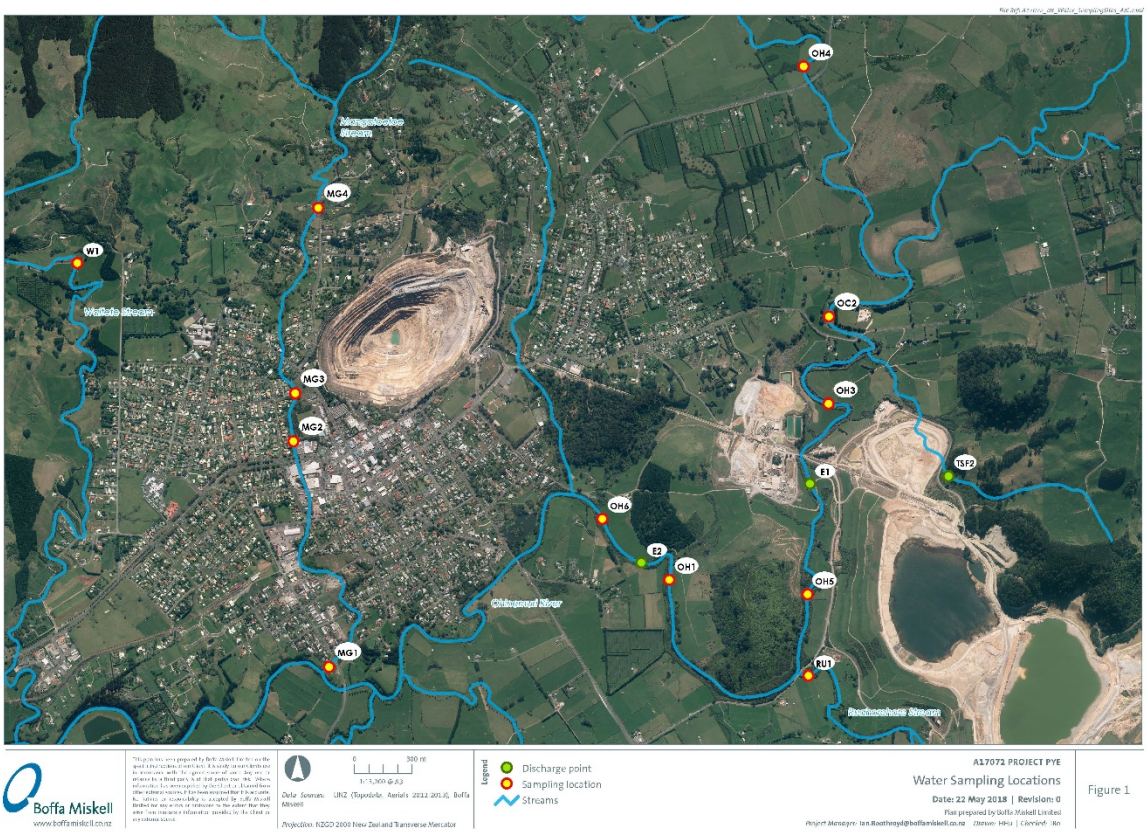

Figure 1: Sampling site locations, Ohinemuri River and Mangatoetoe Stream

3.3 Summary of water quality of the Ohinemuri River

Water quality data from NIWA and Waikato Regional Council is reported on the Council website[4]. Summary data from the last of the selected water quality parameters are provided in Table 1.

LAWA[5] reports the water quality of the Ohinemuri River at SH25 and Karangahake Gorge (respectively upstream and downstream of both the proposed abstraction point, and the existing treated water treatment plant) as within Category A NPS attribute state for dissolved oxygen, Ammoniacal nitrogen, TON and *E.coli* but that trends were indeterminate or improving (especially total phosphorus). Note that at the Queens Head site (downstream of the OGNZL site), the LAWA site reports E. coli, TON and ammoniacal nitrogen (annual median) also as meeting NPS Category A, but the annual maximum for ammoniacal nitrogen as Category B and listed as degrading.

For the most part water quality variables met the WRC 'Excellent' category for the physico-chemical components (pH, dissolved oxygen, turbidity) of water quality within the Ohinemuri River. Not all attributes monitored by WRC are the equivalent of those used in the NPS categories listed but the median value for total phosphorus suggests at least satisfactory quality (WRC water quality categories).

Water quality within the Ohinemuri River has elevated levels of Nitrogen (satisfactory – unsatisfactory) but lower levels of phosphorus (~satisfactory-excellent). Biological indicators of water quality (cf; periphyton, MCI and QMCI) show a poor to moderate water quality condition of the Ohinemuri River within the Waihi Basin, and indicative of moderate nutrient enrichment (LAWA[6], Golder 2017), mostly resulting from landuse activity within the catchment.

[4] https://www.waikatoregion.govt.nz/environment/natural-resources/water/rivers/water-quality-monitoring-map-and-sites/

[5] www.lawa.org.nz/explore-data/waikato-region/river-quality/waihou-river

[6] https://www.lawa.org.nz/explore-data/waikato-region/river-quality/waihou-river/ohinemuri-river-at-sh25-br-mci_swq/

Table 1. Summary statistics for water quality at selected sites along the Ohinemuri River and relevant water quality guidelines. Data provided courtesy of Waikato Regional Council. Data shows median values, with range in parentheses, followed by the number of samples. All units g/m^3 except where otherwise stated.

Site	SH25	Queen's Head	Karangahake Gorge	Trigger level (ANZECC 2000)[#]	NPSFM Attribute State (for rivers)	WRC Water Quality Categories[$]
Sample period	01/2013-01/2018	01/2013-01/2018	01/1994-02/2015			
Dissolved Oxygen	10.5 (8.8-11.7), 61	10.4 (8-13) 61	10.3 (9.7-10.8) 6		A=>8.0	E=>90% S=80-90% U=<80%*
pH (pH units)	7.2 (6.4-7.8), 61	7.1 (6.7-8.3) 61	7.2 (7.0-7.8) 6	7.2-7.8		E=7-8 S=6.5-7 or 8-9 U=<6.5 or >9
Turbidity (NTU)	1.04 (0.55-41), 61	1.1 (0.4-16.6) 61	1.48 (0.74-2.1) 6			E=<2 S=2-5 U=>5
Ammonia (NH4)	0.023 (0.01-0.049), 61	0.071 (0.011-0.29) 61	0.03 (0.015-0.037) 6	0.021	A=<0.03 B=>0.03-<0.24	
TKN	0.13 (0.06-1.02), 61	0.25 (0.09-0.79) 31	0.19 (0.13-0.28) 6			
TON (NNN)	0.45 (0.067-0.97), 61	0.95 (0.042-1.84) 61	0.68 (0.182-0.84) 6			
Total Phosphorus	0.011 (0.004-0. 162), 13	0.01 (0.004-0.076) 61	0.009 (0.004-0.011) 6	0.033		E=<0.01 S=0.01-0.04 U=>0.04
DRP	0.005 (0.004-0.031), 61	0.005 (0.004-0.015) 61	0.0045 (0.004-0.005) 6	0.001		

[#] Default trigger levels for physical and chemical stressors in New Zealand for slightly to moderately disturbed ecosystems (ANZECC, 2000); [$]E=Excellent, S=Satisfactory, U=Unsatisfactory. [$] For Dissolved oxygen the WRC guidelines are expressed in percent saturation, and the monitoring results as g/L. The conversion of empirical units to percent saturation for dissolved oxygen in water is dependent on the water temperature and elevation at the site. However, median dissolved oxygen levels of >10 g/L would be expected to be >90% saturated and therefore be in the Excellent category.

3.4 Heavy metals

The OGNZL treated water discharge monitoring requires that heavy metals are sampled and measured and assessed against the limits detailed in the resource consent, which are derived from USEPA (1985) criteria. The historical range from the collective OGNZL monitoring sites (n=6) for each parameter is provided in Table 2.

Golder (2017) conclude that in-river metals were below compliance limits (USEPA criteria) and often below detection limit. Similar conclusions were reported in Golder (2015a) and Golder (2016).

Table 2. Historical range for heavy metals recorded at OGNZL monitoring sites in the Ohinemuri River in the vicinity of Martha Mine, Waihi. Data from sites OC2, OH3, OH5, OH1, OH6, RU1, Golder (2017), see Figure 1. All units g/m^3.

	Min	Max
Antimony	<0.0002	0.026
Arsenic	<0.001	0.0046
Cadmium	<0.00005	0.00007
Copper	<0.0005	0.0092
Iron	0.01	0.64
Lead	<0.0001	0.0013
Manganese	0.0011	0.88
Mercury	<0.00008	0.0001
Nickel	<0.0005	0.0058
Selenium	<0.001	0.0095
Silver	<0.0001	0.0015
Zinc	<0.001	0.082

3.5 Summary of ecological condition of the Ohinemuri River

The ecological condition of the Ohinemuri River in the vicinity of Martha Mine is best informed by the consent monitoring undertaken by OGNZL. As described above, the monitoring programme requires that habitat, algae, macroinvertebrates and fish are surveyed at regular intervals. The most recent survey data is provided in Golder (2017), but reports on baseline studies and regular monitoring extend back to 1983. We have not attempted to summarise all of the previous information here; rather we have drawn on the most recent monitoring data from the OGNZL treated water monitoring programme, as well as data from the NIWA and Waikato Regional Council state of the environment monitoring programmes.

The ecological condition of the Ohinemuri River at the SH25 site upstream of Waihi shows considerable variation over the 23-year record (Table 3). In recent years the condition of the river, as measured by the Macroinvertebrate Community Index (MCI), has been fair, and this is reflected in the results of the OGNZL monitoring of the treated water discharge (Table 4). The increase in taxa number represents a shift in the community composition to a more condition-tolerant fauna, largely dominated by dipteran flies and worms.

Table 3. Summary statistics for macroinvertebrate samples from the Ohinemuri River at SH25, 1994-2017. Data provided courtesy of Waikato Regional Council.

Sample Date	Taxa number	Abundance#	EPT	%EPT abundance	MCI
Dec-94	13	100	7	73	110
Dec-95	9	100	1	2	73
Sep-97	17	100	8	12	112
Mar-99	9	111	2	14	80
Jan-00	11	127	4	11	85
Dec-00	17	137	6	25	81
Feb-02	15	227	4	23	69
Feb-03	9	212	2	10	76
Jan-04	16	204	4	18	85
Jan-05	16	222	7	19	106
Jan-06	24	219	12	45	100
Feb-07	22	218	6	31	84
Feb-08	15	200	5	34	80
Jan-09	28	229	8	31	82
Mar-11	20	215	8	21	88
Feb-12	26	221	9	24	86
Jan-14	25	248	9	29	94
Mar-15	20	234	7	17	81
Apr-17	22	215	10	24	94

#Note different subsampling methods have been used over the record to estimate abundance.

Table 4. Results of biological indices for the Ohinemuri in the vicinity of Martha Mine (Data from Golder 2015, 2016, 2017). Categories for MCI are: <80 = poor; 80-99 = Fair; 100-119 = Good; >119 = Excellent (Stark 1985).

	MCI	QMCI
Nov 2014	Fair	Poor
March 2015	Poor-Fair	Poor-Fair
Nov 2015	Poor-Fair	Poor
May 2016	Poor-Fair	Poor
Nov 2016	Poor-Fair	Poor-Fair
May 2017	Poor-Fair	Poor-Fair

Periphyton is also sampled as part of the OGNZL treated water discharge monitoring. As for other biological parameters the results can be variable, but ranges from dominance of diatoms to filamentous algae.

The key conclusions from the OGNZL treated water monitoring (Golder 2017) summarise the current ecological results from the Ohinemuri River:

- Periphyton (benthic algae) were below the threshold for filamentous algae and algal mats as set out in the NZ Periphyton Guidelines.

- Algal productivity (measured as Chlorophyll a (ChL-*a*) exceeded the NZ Periphyton Guidelines at sites upstream and downstream of the discharges; Ch-*a* was highest at the upstream site.
- Periphyton was dominated by diatoms followed by filamentous algae.
- Algal standing crop or biomass was below the thresholds set out in the NZ Periphyton guidelines.
- Macroinvertebrate community Index scores (QMCI and MCI) show the Ohinemuri River to range from poor to fair.
- Shortfin eels and common bullies were the most widespread and common species recorded during monitoring, but longfin eels, Cran's Bully, and rainbow trout were all recorded during monitoring surveys. Banded kokopu have been recorded in earlier surveys.

In summary, the mid-lower reaches of the Ohinemuri River, indicators of ecological condition suggest moderate ecological values, and values increase towards the headwater areas. There is no evidence that discharges associated with mining activities at Waihi have an adverse impact on the ecological values of the Ohinemuri River.

The Ohinemuri River catchment is not identified as a priority catchment or as an outstanding freshwater body (although the Waihou River at Whites Road is listed to be included as outstanding) in the WRPS (section 8.2.1).

3.6 Selenium

As part of the OGNZL monitoring programme required by the treated water discharge consent, selenium is currently monitored in the treated water discharge, river water, river sediments, macrophytes, periphyton and fish. Whole fish body selenium sampling is conducted in accordance with the methods provided in USEPA (1998). Composite samples of shortfin eels and common bullies from sites upstream and downstream of the WTP discharge points are collected for selenium fish tissue analysis.

Selenium levels in both plants and fish have shown to be variable over time and, other than being elevated downstream of the treated water discharge compared with those analysed upstream, without any clear pattern. The selenium concentration in eels collected at OH6 (downstream of the treated water discharge, Fig. 1) exceeded the trigger limit of 8.1 mg Se/kg twice over the last ten years of monitoring (March 2018 and February 2017). In addition, the selenium concentration in bullies exceeded the trigger limit twice over the last ten years (June 2018 and September 2008).

Repeat sampling immediately after each trigger limit exceedance revealed no further trigger limit exceedance. Golder (2017) suggested that the lower concentration in the repeat sampling of eels may be from changes in the diet and eating patterns of the fish or movement of eels within the river and its tributaries.

Over a ten-year period, OGNZL has carried out additional monitoring and investigations to determine the cause of the trigger limit exceedances, including a statistical analysis of the data (Golder 2015b) that supported a change to the monitoring programme. It

is worth noting that OGNZL continues to comply with the consent conditions by carrying out the monitoring and any repeat sampling and investigations required by the treated water discharge permit (which is not part of the current applications).

3.7 Riparian vegetation

It is worth noting that extensive plantings have been undertaken by OGNZL at the Martha Mine site. In total some 467,500 plants have been planted between 1991 and 2016, for a mix of riparian, swamp, gully and hillside enhancements.

Available records show that of these some 91,600 plants covering 18.8 ha of riverbank were planted along the margins of the Ohinemuri River mainstem in the vicinity of the Martha Mine site between 1995 and 2005. Given the length of time that has passed since even the last of these plantings, the result is a mature riparian vegetation that contributes greatly to the ecological values of the Ohinemuri River.

In addition to these plantings some 107,000 plants (covering 10 ha) have been planted alongside a number of tributaries to the Ohinemuri River, including over 70,000 plants (covering 5.9 ha) alongside the Ruahorehore Stream; likewise contributing to the ecological health and values of the river system as a whole.

As the Ohinemuri River in the vicinity of the Martha Mine is a larger channel (widths range from 6-20 m, Golder 2017), the riparian vegetation does not form a full canopy cover and thus shading across the river is limited.

3.8 Mangatoetoe Stream

3.8.1 Background

The Mangatoetoe Stream is a tributary of the Ohinemuri River that runs down the western margin of Martha Mine pit. The headwaters arise in steeply rising farmland and scrub, before passing through farmland and central Waihi before its confluence with the Ohinemuri River.

3.8.2 Water Quality of the Mangatoetoe Stream

The currently consented pit lake will discharge to the Mangatoetoe Stream., and under Project Martha this will remain the position. The stream catchment is some 4.31 km^2 in area, with about 4.11 km of channel length. The catchment is predominantly rural with about 25% as urban (WRC 2005). A summary of the water quality of Mangatoetoe Stream is provided in Table 2.

The water quality of Mangatoetoe Stream is variable, with neutral pH and generally acceptable dissolved oxygen levels, and with low nutrient levels (nitrates and phosphorus). Based on the WRC water quality categories, for the most part, the Mangatoetoe Stream meets the satisfactory criteria, with some poorer quality reaches

reflecting the rural landuse in the upper reaches and the urban intensification in the lower reaches (Table 5). Although the same parameters are not included in the Mangatoetoe Stream receiving water standards, the rating suggests that there is no reason to revisit these standards.

3.8.3 Ecology of the Mangatoetoe Stream

There have been few studies on the ecology of the Mangatoetoe Stream, the most informative being those carried out in the mid-1980s as part of the baseline assessment for the mine, and again in the 1990s for the Martha Mine Extended Project.

The macroinvertebrate and periphyton data reflects the water quality with biotic communities in the upper catchment reflecting the better water quality and habitat, and the lower reaches reflecting a poorer degraded water quality and habitat. Similarly, although only two species of fish were recorded from the survey (short fin eel and common bully), the habitat and condition of the Mangatoetoe Stream in the upper catchment was better than the lower catchment (Bioresearches 1985, 1998). The number and diversity of macroinvertebrates was low throughout the catchment (Bioresearches 1998).

3.8.4 Mangatoetoe Stream Habitat Enhancement

It is worth noting that, in April 2015, Habitat Enhancement and Landcare Partnership (HELP)[7], signed an agreement with the Ministry for the Environment for a three-year project aimed to remove weeds along the banks of the Mangatoetoe Stream and replant with natives. OGNZL donated plants to the project, and funding has been raised from other local sources. During winter 2015 planting of the streambank between SH2 and Station Road was undertaken, with over 6,000 plants put in.

[7] http://www.waihihabitat.co.nz/text/mangatoetoe.html

Table 5: Summary of water quality information for Mangatoetoe Stream, Waihi. Data records vary at each site. Result show Median (min-max), and number of samples. All units g/m^3 except where otherwise stated. See Figure 1 for location of sampling sites.

Site	MG1	MG2	MG3	MG4	WRC Water Quality Categories[$]
Sample period	01/1994-05/1999	05/1993-05/1999	07/1994-05/1999	01/1994-02/2015	
Dissolved Oxygen	9.1 (7.1-10.7), 19	8.8 (6.5-10.9), 23	8.4 (6.8-10.8), 19	8.7 (7.2-10.9), 17	E=>90% S=80-90% U=<80%
pH (units)	7.15 (6.1-7.7), 24	7.0 (6-7.4), 28	6.9 (6.1-7.3), 24	7.1 (6.1-7.4), 23	E=7-8 S=6.5-7 or 8-9
Total Ammoniacal Nitrogen	0.03 (0.02-0.11), 24	0.02 (0.01-0.1), 28	0.02 (0.01-0.08), 24	0.01 (0.01-0.11), 21	
TKN	0.12 (0.1-2.1), 18	0.1 (0.1-1.7), 18	0.1 (0.1-1.2), 18	0.1 (0.1-1.6), 14	
Nitrates	0.765 (0.26-1.88), 24	0.735 (0.28-1.76), 28	0.725 (0.16-1.72), 24	0.45 (0.08-1.33), 21	
Total Phosphorus	0.03 (0.005-0.656), 18	0.009 (0.004-0.4340, 18	0.013 (0.004-0.244), 18	0.01 (0.004-0.469), 15	E=<0.01 S=0.01-0.04 U=>0.04

[$]E=Excellent, S=Satisfactory, U=Unsatisfactory.

4.0 Effects of water abstraction on the Ohinemuri River

4.1 Background

Resource consent 971293 (Provided in Appendix 1) authorises the take of surface water from the Ohinemuri River for the purposes of:

i. Accelerating the flooding of the underground workings on completion of Golden Link Project; and

ii. Accelerating the filling of the pit lake on completion of the Golden Link Project.

The current consented abstraction point is located in the vicinity of the second WTP discharge (E2) as shown in Fig. 1, and provides for:

- a take of 15,000 cubic metres of water per day
- a restriction of take to times when river flows are more than twice the 7-day mean annual low flow at the point of abstraction
- The maximum rate of abstraction shall not exceed 10% of the river flow at the point of abstraction
- The maximum abstraction rate for the Ohinemuri River of 175 l/s.

4.2 The proposal

The Project Martha proposal is to increase the amount of water that can be taken from the Ohinemuri River for the purpose of accelerating the filling of the Martha Pit and the flooding of the underground areas at the cessation of mining. The proposal is to to take up to 20% of the river flow at the point of abstraction when the flow is greater than twice MALF. This will enable an average take of 15,000m^3/day and has been calculated to mean that the pit lake should fill to the overflow level (with a resulting commencement of discharge to the Mangatoetoe Stream) about 10 years after pumping commences.

4.3 Statutory and Planning Framework

4.3.1 Waikato Regional Plan

The Waikato Regional Plan includes objectives, policies, rules and methods that establish a water allocation and consenting framework for water takes from the Ohinemuri River. An analysis of the relevant objectives, policies, rules and methods has concluded that:

- The proposed abstraction regime for the replacement of RC124862 will not take water from either the primary or secondary allocable flows prescribed in Policy 2 and Table 3-5, as it will only involve the taking of water when the flow in the Ohinemuri River is greater than twice MALF. The abstraction is also not deemed to be "water harvesting", which is defined in the Waikato Regional Plan as Taking water to be stored for future use in accordance with Section 3.3.3 Policy 20.
- The proposed take is for the purpose of filling the pit take – there is no storage of water for a future use such as irrigation.
- The policies in the Waikato Regional Plan addressing the primary and secondary allocable flows, and water harvesting, are not directly relevant to the proposed abstraction regime.

4.3.2 Policy 11

Policy 11 is, however, considered to be relevant to the proposed abstraction regime as it applies when assessing any resource consent application for a surface water take. The matters in Policy 11 relevant to the proposed abstraction regime include:

- Cultural effects (Clause (b)
- Demonstrating the need for the take and water efficiency measures (Clause (d))
- The need to ensure that water is available for existing and foreseeable water supply needs (Clause (e));
- The significance of the benefits derived from existing takes and the significance of investment that relies on the continuation of these takes (Clause (i));
- Potential adverse effects on existing users (Clause (j));
- Effects on water quality (Clause (l));
- Consideration of alternative water sources (Clause (m);
- Whether Tangata Whenua uses and values are maintained or enhanced (Clause (q));
- Effects on ecological values and biodiversity, including the benefits of natural flow variability (Clause (r));
- The need to ensure waterbodies are not over-allocated (Clause (s));
- Whether the applicant has demonstrated a continued need for the take (Clause (t));
- Effects on wetlands and significant indigenous areas (Clause (v));
- Effects on fish passage and migration (Clause (w)); and
- Mitigation measures (Clause (x)).

4.4 Effects of the proposed increased water take on the Ohinemuri River

4.4.1 Introduction

In this section we address the effects of the proposed increase in maximum water take on the water quality and ecology of the Ohinemuri River. We address the relevant matters of Policy 11 (as outlined in 7.3 above).

4.4.2 FRE_3 flows

The FRE_3 flow statistic is a useful metric for understanding the frequency of disturbance that a river (biota) is subject to, i.e., the regime of floods and freshes. Clausen and Biggs (1996, a, b) identified that the average annual frequency at which flows exceed three times the median (FRE_3) is the most useful flow statistic for classifying rivers according to the habitat for benthic biota (periphyton and invertebrates). The statistic FRE_3 is derived by calculating three times the median flow, counting the number of occasions that this

was exceeded in the flow record and dividing this number by the number of years of record.

FRE_3 is an indicator of flood or disturbance events that cause ecological disturbance, such that a low FRE_3 value (e.g., FRE_3 <5) indicates a stable flow regime (e.g., a spring or lake-fed river). Rivers with higher FRE_3 (e.g., FRE_3 > 10) tend to drain high rainfall areas that may have a high base flow but also have frequent floods that disturb the river bed.

For the Ohinemuri River, based on 94 years of flow, and considering 3xmedian flows alone:

- At the abstraction point the 3xmedian flow = 327,435 m3/d (3,790 L/s)
- Without abstraction this flow is exceeded 16.86% of the time.
- Under current consent conditions (peak extraction of 175 L/s and 10% take above 2*MALF) the portion of days exceeding 3xmedian flow reduces to 15.77%.
- With peak extraction increased to 270 L/s (15,000 m^3/d pump) and 20% take (above 2*MALF) the portion of days exceeding 3xmedian reduces to 15.17%

For the FRE_3 statistic[8]:

- Without abstraction FRE_3 = 14.16 (exceedances/year)
- Under current consent conditions (peak abstraction of 175 L/s and 10% take above 2xMALF), FRE_3 = 14.02
- With peak abstraction increased to 270 L/s (15,000 m^3/d pump) and 20% take above 2xMALF), FRE_3 = 13.59

The FRE_3 statistic for all scenarios places the disturbance regime of the Ohinemuri River in a 'low relief country' flow regime (MFE 1998). The difference between the no-extraction (FRE_3=14.16) to the proposed peak extraction (FRE_3 = 13.59) shows a small but insignificant reduction in the FRE_3 value.

The Ohinemuri River will retain its overall hydrological disturbance regime with the proposed abstraction regime in place. That is because the FRE_3 statistic varies little when the proposed abstraction regime is applied and retains the 'low relief country' flow regime. In addition, there are unlikely to be any significant changes to the biological character and values of the river as a result of the proposed new abstraction regime because the frequency of high water flow events (as defined by 3xmedian flows) will not vary to any great extent. The freshes and floods that typically move bed materials, flush algae from the substrate and re-suspend sediment will still occur within the natural regime for the river. The life-supporting capacity of the river will be safeguarded and there will be no adverse effects resulting from the proposed modifications to the abstraction.

[8] Note that the analysis is based on daily flow data so could miss short term fluctuations in flow, and one exceedance is counted from the point at which 3xMedian is exceeded until the daily flow drops below this again.

4.4.3 Effects on water quality

The effects of elevated levels of nutrients generally manifest themselves during low flows, particularly during summer, when a combination of low flows, higher temperatures, greater light penetration, nutrient enrichment and suitable habitat can result in excessive growth of algae and macrophytes, which can influence the aquatic biota communities.

At elevated flood flows, the flows play a role in removing the algae and macrophytes (through movements of the bed substrates, uplifting roots and abrasion from movement of bed materials), but also introduce increased volume of sediments and nutrients as direct run-off from the land. For the most part, under such high flow conditions, the additional nutrients and sediments will be washed downstream and settle once flows recede. Although some nutrient enriched water and sediment load will be removed as part of the abstraction, the proportion is not likely to change the downstream water quality or ecological characteristics of the river.

As there is minimal change to the high flow disturbance regime of the river, there will be no effect on the water quality of the river resulting from the proposed change in abstraction. The regular and low flow regimes of the river will remain the same.

The proposed water take is not expected to have any effect on the levels of heavy metals within the river water, or to influence the uptake of selenium in fish tissue.

4.4.4 Effects on ecological values and biodiversity, including the benefits of natural flow variability

Natural flow variability is important in influencing and maintaining the ecological condition of the waterway through the prevailing interaction of velocity, depth and substrate. The structure and function of most aquatic communities is highly influenced by the stability of the predictability of hydrological patterns and instream hydraulic conditions.

The effects of modifications to the hydrological regime can heavily influence the biota such that dramatic changes in the type and composition of the biotic communities occur. This is most obviously seen from river impoundments which truncate flows and lead to extended periods of low flow. As outlined above for water quality, it is during low flows, particularly during summer, when a combination of low flows, higher temperatures, greater light penetration, nutrient enrichment and suitable habitat can result in excessive growth of algae and macrophytes, which can modify the benthic aquatic biota and fish communities.

During elevated flows, disturbance to river beds and stream channels results in bed movements that dislodge algae and biota, which is transported away from the site. This creates opportunity for invasion and recolonisation when the flood waters recede.

As outlined above, the flow variability of the Ohinemuri River resulting from the proposed increase in abstraction will remain largely unchanged. As a result, there will

be no meaningful impact on the natural flow variability and thus no impact on the ecological values and biodiversity of the Ohinemuri River.

4.4.5 Effects on wetlands and significant indigenous areas

Natural flow variability is also important for sustaining wetlands associated with rivers and streams. The periodic inundation of wetland areas from elevated flows, and the connection that groundwater has with the natural river levels, are essential components of wetland function.

Wetland areas occur along the margins of the Ohinemuri River, both within the vicinity of the Martha Mine site, and downstream. These wetland areas vary in size and for the most part are highly modified; however, these wetlands can have significant values for terrestrial fauna (e.g., marsh birds) and aquatic biota (e.g., feeding grounds for eels). Wetlands have important functions in retaining water and the slow release of water for baseflow of waterways, trapping and retaining sediments (and other contaminants), denitrification, and retaining carbon.

As outlined above, the flow regime of the Ohinemuri River resulting from the proposed increase in abstraction remains largely unchanged and retains its natural flow characteristics. As a result, there will be no meaningful impact on the natural flow variability and thus no impact on the wetland values and function.

4.4.6 Effects on fish passage and migration

Several of the 41 species of native fish of New Zealand are 'diadromous' or 'sea run', which means that they migrate between freshwater and saltwater during some part of their life cycle (McDowall 1990). Species such as longfin and shortfin eels, require migration to the sea for breeding; others such as banded kokopu require passage for young larva to the sea for growth purposes. The migration (and spawning) periods are often associated with specific environmental conditions such as rainfall, river flows, temperature, lunar cycles and tidal regimes. Elevated river flows have been considered as a cue for migration upstream. The Ohinemuri River is also an important rainbow trout fishery, with spawning grounds in the river tributaries.

The proposed increase in maximum water take from the Ohinemuri River is unlikely to result in any changes to fish migration regimes (or fish passage). As the abstraction is restricted and provides for flows to continue downstream of a similar magnitude, the alteration to flow is not significant.

It is worth noting that the existing consent requires screening of the intake at the abstraction point and it is intended that any new consent will require the same level of protection to prevent fish fatalities at the extraction point.

5.0 The Pit Lake

5.1 Introduction

Pit lakes form when open-cut mining operations cease and the remaining pit fills with ground, surface and rain water. Mine pits, and therefore pit lakes, tend to have high depth-to-surface-area ratios with relatively flat bottoms and steep sides (in order to minimise resource extraction costs).

As far back to the time of the granting of the original resource consents (water rights under the Water and Soil Conservation Act 1967 at the time of issue) the post-mining Martha Mine pit has been planned as a lake, with amenity areas and access available to the local community.

Pit lakes are a common feature of mine rehabilitation world-wide and in quarried and mined areas of New Zealand. Because these lakes are typically deep, relative to their area, pit lakes are prone to stratification. Therefore, pit lake water quality, and the effects of discharges from these lakes into receiving environments, cannot be assumed based on conservative mixing of the likely source waters. Instead, pit lake chemistry must be modelled to account for changes in geochemistry, such as changes as a result of de-oxygenation and water quality changes at the water-sediment interface. The lake chemistry of the proposed Martha Mine Pit Lake (hereafter the lake) has been modelled by AECOM, and HydroNumerics has modelled water mixing in the lake, nutrient levels, and likely trophic state.

5.2 Background

Resource consent 971293 (Provided in Appendix 1) authorises the take of surface water from the Ohinemuri River for the purposes of accelerating the flooding of the underground workings on completion of Golden Link Project; and accelerating the filling of the pit lake on completion of the Golden Link Project.

The effects of the take on the Ohinemuri River is discussed above. In this section of our report we consider the pit lake including the lake filling and the quality and condition of the lake along with some opportunities for lake enhancement.

5.3 Lake objective

The primary goal for the lake is:

To create a lake with water suitable for contact recreation.

5.4 Lake filling

Five water components have been identified as contributing to the filling of the lake:

- Groundwater; natural re-watering of the pit on cessation of pumping.
- Net rainfall: allowing for rainfall and evaporation of water to and from the lake surface.
- Pit wall runoff: rainfall on pit walls travelling overland to the pit lake.
- Ohinemuri River: water diverted from the river to supplement filling of the lake.
- Water sourced from the WTP.

The proportion of each of the above five components will vary as the lake fills. AECOM (2018) describe the lake filling process and discuss each of the components listed above.

5.5 Lake fill times

The time to fill the pit lake from the commencement of pumping from the Ohinemuri River under the abstraction consent being applied for by OGNZL has been calculated by GHD to be 9.4 years +/- 0.7 years at the 90th%ile confidence level (GHD 2018).

5.6 Lake Water Quality

AECOM (2018) has modelled the potential water quality of the pit lake focussed on several different stages of both the lake filling, and the lake post-filling. AECOM considered six base scenarios which investigate the 'worst case' results (from a physical model) in relation to the geochemical makeup of the epilimnion. Several scenarios have been considered to determine what if any mitigation is required to meet the recreational use and lake discharge water quality standards.

Lake water quality would be affected by the pit wall lithology, mineralogy and the subsequent runoff into the lake, which will reduce the pH in particular without mitigation. Potential improvements to lake water quality can be achieved by reducing the relative contribution that pit wall run-off makes to the lake volume, and also by adding alkalinity to the river water to buffer against the acidity of the pit wall runoff (AECOM 2018).

The results of the most recent water quality modelling for the pit lake are presented in full in AECOM (2018). The treatments within the lake that provide for a lake that meets the recreational objective and an overflow that meets the discharge resource consent conditions after mixing are:

- the addition of alkalinity to Ohinemuri River water, as the pit lake is being filled,
- An active treatment system as required to add alkalinity once the lake is filled.

HydroNumerics (2018) have modelled the water quality of the lake and its likely effects on primary production. External inputs of nitrogen will be the dominant source into the lake during filling and will come from the river water (as nitrate and nitrite). Phosphorus levels from the river water are expected to be a low contributor to the lake water quality, and other sources such as pit wall run-off are expected to dominate. HydroNumerics (2018) go on to conclude that it is reasonable to assume that in comparison to the external sources, the internal contributions of Nitrogen and

Phosphorus will be small in the lake filling and immediate post-filling stages. However, the relative TN:TP ratios in the epilimnion in summer means that, given other conditions in the lake being suitable (see below), there is a 'potential' for growth of blue-green algae (Cyanobacteria) (HydroNumerics (2018).

5.7 Trophic status

HydroNumerics (2018) provide extensive discussion on the trophic status of lakes and the likely trophic condition of the pit lake. The most relevant factors are light penetration, lake water disturbance and movement, lake stratification and nutrient availability.

HydroNumerics (2018) conclude that:

- There are likely to be seasonal patterns of primary production. Provided there is sufficient nutrient availability, highest production will occur in spring and summer in response to the warmer temperatures that favour growth;
- Light limitation in the epilimnion is not likely given the clarity of the river waters and settling of suspended solids, except in the event of significant algal production;
- The river waters, and pit-wall run-off are significant external inputs into the available nutrient pool in the epilimnion during filling;
- It is most likely that the extent of primary production during filling will be limited by the availability of phosphorus in the source waters;
- During filling the nutrient availability is sufficient to suggest productivity consistent with a eutrophic lake;
- After filling, the internal cycling of nutrients is likely to dominate nutrient availability and both physical and biogeochemical mechanisms will control nutrient availability in the epilimnion, hence reducing the trophic status (and following observations in other pit lakes) to potentially oligotrophic with low productivity;
- After filling, loss of nitrogen from the lake due to denitrification in the anoxic waters may lead to a shift towards nitrogen limitation, therefore increasing the potential risk of cyanobacterial growth;
- The depleted oxygen concentrations in the hypolimnion and associated sediment release of nutrients into the hypolimnion followed by the subsequent entrainment of these nutrient enriched waters into the epilimnion during mixing will be an important sequence of processes that control nutrient availability in the photic zone after filling;

- Nutrient bioavailability in the epilimnion is therefore likely to be irregular, given the changes in the depth of winter mixing and the associated changes in the extent of entrainment of nutrient-enriched waters. This may in turn lead to years that are significantly more productive than others when mixing occurs after an extended period of hypolimnetic nutrient enrichment; and

- Given the complexity of the nutrient cycles and the unknown rates of oxygen depletion and nutrient release from the sediments, it is difficult to predict post-filling primary production, other than to say it is likely to initially reduce from the filling period.

What this means is that during filling and for some years post-filling there is some potential for algal blooms, including blue-green algal blooms, particularly during settled periods of warm, stable climatic conditions during summer. High cell counts of blue-green algae can be detrimental for contact recreation. In addition, some blue-green algae are toxin-producing and contact recreation is not advised during periods of outbreaks of such conditions.

Whether such algal blooms do occur once the lake is filled (recognising that during filling the lake will have restricted access), their extent, and whether they will impact on the recreational use of the lake to any great extent are all uncertain. However, this uncertainty exists at present, and it seems unlikely that Project Martha will alter the likelihood of algae blooms occurring.

Over time, if the lake moves to a lesser trophic status, and the potential of high nutrient availability is decreased, the frequency of potential algal bloom events is likely to decrease.

5.8 Lake Ecology

At the time of the Golden Link Project, it was considered that the pit lake would be suitable for freshwater aquatic organisms, especially in the uppermost (20 m) layer, and we expect that following the pit expansion and filling, the lake will remain suitable for colonisation and habitation by freshwater aquatic organisms. We expect that with nutrient inputs from the river during filling, inputs of nutrients will decrease significantly following completion of the filling, and following an initial period of high productivity, the quality and trophic status of the lake is likely to improve in the longer term (HydroNumerics 2018).

For a period of time at least it can be expected that the conditions of the lake will be enriched, with the potential for algal blooms under preferential conditions (warm temperatures, calm weather, direct sunlight). Nevertheless, typical open water invertebrates (damselflies, dragonflies, water boatmen, non-biting midges and other fly larvae) can be expected to colonise the lake, and zooplankton and algae will occur in the water column. Water birds are likely to visit the lake, and some may remain resident where conditions along the margins permit. However, the lake is not expected to have extensive habitat for birds.

As much as possible, provision for a littoral zone as part of the mine closure plan, that creates conditions for emergent and submerged aquatic plants (aquatic

macrophytes) will provide additional habitat for aquatic organisms and birds, and contribute to the biotic productivity of the lake. The ability to provide riparian planting (especially for shading) is limited, but will assist in the provision of organic (allochthonous) material to the lake.

The lake outlet is required to provide for native fish passage, although it is likely that only the hardiest climbers will reach the lake, such as eels and possibly banded kokopu. Unless specifically provided for, there is unlikely to be extensive habitat or refugia for fish or benthic aquatic organisms in the pit lake.

6.0 Outlet discharge from Pit Lake

6.1 Background

Resource consent 971293 authorises the discharge of overflow from the pit lake via an outlet structure and channel to the Mangatoetoe Stream. The consent provides for:

- The outlet channel to be designed to provide for the passage of migratory fish.
- Minimal disturbance to the bed of the Mangatoetoe Stream during construction of the outlet structure.
- Receiving water quality standards for the Mangatoetoe Stream after mixing.
- Monitoring of the Pit Lake water quality.
- Monitoring of the water quality of Mangatoetoe Stream.

The consent requires that the quality of the Mangatoetoe Stream is equal to or better than the receiving water standards defined in Table 1 of the consent. The consent with the receiving water standards is included as Appendix 1 of this report.

We note that the receiving water standards are from the USEPA (1985) standards.

6.2 Lake outlet

The outlet has been designed to control the release of water from the lake to the Mangatoetoe Stream. The final design of the outflow structure will need to be decided at design phase nearer to mine closure, as the exact dimensions of the lake and shore height become finalised.

As much as practicable, it is recommended that, notwithstanding the matters already provided for in the resource consent, the outlet design will need to allow for:

- the flow of water.
- the passage of migratory native fish with ability to climb obstacles.
- Improvement to the dissolved oxygen content of discharged water.

Lake discharge quality and effects on the Mangatoetoe Stream.

As discussed above, AECOM (2018) have modelled the lake water quality under a series of scenarios. Only the treatment scenarios that result in a discharge water quality that meets the existing Mangatoetoe Stream receiving water quality standards (USEPA 1985, consent 971293) will be considered. The discharge quality will ensure that these standards are met for the Mangatoetoe Stream. These standards are protective of aquatic life and therefore remain appropriate as water quality standards to be met in the Mangatoetoe Stream, and no changes are recommended.

7.0 Summary and Concluding Comments

7.1 Background

OceanaGold New Zealand Ltd. (OGNZL)are planning to extend the life of mine through interlinked underground mines and an open pit extension. Although the changes are small, OceanaGold intend to lodge resource consent applications for Project Martha that will require reconsenting of:

- the abstraction from the Ohinemuri River to fill the pit to create a pit lake
- discharge of lake water from the pit lake to the Mangatoetoe Stream when lake filling is completed.

7.2 Effects of abstraction on Ohinemuri River

Indicators of ecological values suggest moderate ecological values in the mid-lower reaches of the Ohinemuri River, in the vicinity of Martha Mine site. Values increase towards the headwater areas. The Ohinemuri River catchment is not identified as a priority catchment or as an outstanding freshwater body in the WRPS. Water quality within the Ohinemuri River has elevated levels of Nitrogen but lower levels of phosphorus. Biological indicators of water quality (cf; periphyton, MCI and QMCI) show a poor to moderate water quality condition of the Ohinemuri River within the Waihi Basin, and indicative of moderate nutrient enrichment.

GHD (2018) have indicated that the pit lake could be filled within approximately 10 years via an abstraction regime which retains the existing limit on when the abstraction of water may commence (i.e. when the flow is greater than twice MALF), but which increases the maximum take to 20% of the river flow at the point of abstraction. The effect of increasing the take during elevated flows has minimal effect on the high flow disturbance regime (as measured by FRE_3), and the life-supporting capacity of the river will be safeguarded and there will be no adverse effects resulting from the proposed modifications to the abstraction.

7.3 Effects of discharge on Mangatoetoe Stream

For the Mangatoetoe Stream, the upper catchment retains better water quality and habitat, while the lower reaches below the proposed lake discharge point has degraded water quality and habitat.

The discharge quality of water from the filled lake will ensure that the existing consented water quality standards (based on USEPA 1985 criteria) for Mangatoetoe Stream are met. These standards are protective of aquatic life and therefore remain appropriate as water quality standards to be met in the Mangatoetoe Stream, and no changes are recommended.

7.4 Pit lake ecology

Typical open water biota can be expected to colonise the lake, but the lake is not expected to have extensive littoral or benthic habitat. The provision for a littoral zone as part of the mine closure plan, that creates conditions for aquatic plants will be beneficial for water quality and habitat for aquatic organisms.

7.5 Pit lake water quality

Modelling of the likely pit lake water quality has indicated that external inputs of nitrogen will be the dominant source into the lake during filling and will come from the river water. Phosphorus levels from the river water are expected to be a low contributor to the lake water quality, and other sources such as pit wall run-off are expected to dominate. However, the balance of nitrogen and phosphorus in the epilimnion in summer means that, given other conditions in the lake being suitable, there is a potential for growth of blue-green algae (Cyanobacteria).

During filling and for some years post-filling there is the potential for algal blooms to occur, including blue-green algal blooms, particularly during settled periods of warm, stable climatic conditions during summer. High cell counts of blue-green algae can be detrimental for contact recreation. In addition, some blue-green algae are toxin-producing, and contact recreation is not advised during periods of outbreaks of such conditions. Over time, if the lake moves to a lesser trophic status, and the potential of high nutrient availability is decreased, the frequency of potential algal bloom events is likely to decrease.

The extent and potential influence on contact recreation of algal blooms that may occur once the lake is filled is uncertain. However, this uncertainty exists at present, Project Martha will not will alter the likelihood of algae blooms occurring.

8.0 References

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Appendix 1: Resource Consent 971293

Resource Consent

HAMILTON OFFICE
401 Grey Street
PO Box 4010, Hamilton East
Telephone 07 856 7184
Facsimile 07 856 0551

File Number: 60 59 02M
Resource Consent Number: 971293

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

Waihi Gold Company Limited
P O Box 190
WAIHI

25/2/05

(hereinafter referred to as the Consent Holder)

Consent type:	Discharge Permit
Consent subtype:	Discharge to Water
Activity authorised:	To discharge overflow from the lake via an outlet structure and channel to the Mangatoetoe Stream at a maximum rate of 2,700 litres per second and at an average rate of 13 litres per second
Location:	Area I (as identified on Waihi Gold Company Plan No.T70725A dated 25 July 1997)
Map Reference:	NZMS260 T13 : 614-197
Term:	35 years from date of commencement
Lapse Period:	2 years from date of commencement
Date of commencement of consent:	22 years from date of grant provided that the consent holder may by notification in writing to the Council nominate an earlier commencement date

Subject to the following conditions:

CONDITIONS

1 This consent is subject to each of the conditions set out in Schedule 1.

2 The consent holder shall be responsible for the structural integrity and maintenance of the works associated with the exercise of these consents and for any erosion control and energy dissipation works which become necessary as a consequence of the exercise of these consents.

Ohinemuri River Intake

3 The consent holder's design for the location and construction of the intake shall be submitted to the Waikato Regional Council for approval prior to construction.

4 The intake shall be provided with a screen designed such that the intake velocity at the screen surface does not exceed 0.3 m/s.

5 The intake screen mesh aperture size shall not exceed 5 mm dimension and the intake screen shall be located parallel to the river flow.

6 Disturbance to the stream bed during installation of the intake structure shall be minimised.

7 Water abstraction from the Ohinemuri River shall be restricted to times when river flows are more than twice the annual low flow at the point of abstraction.

8 The maximum rate of abstraction from the Ohinemuri River shall not exceed 10% of the river flow at the point of abstraction.

9 The maximum abstraction rate from the Ohinemuri River shall be 175 litres per second.

10 The consent holder shall establish and maintain river gauging facilities for the purpose of determining the Ohinemuri River flow at the point of abstraction. These facilities shall be located, installed and operated to the satisfaction of the Waikato Regional Council.

11 The consent holder shall determine and record daily the flow in the Ohinemuri River at the point of abstraction and shall measure and record the volume of water abstracted from the river. Those measurements shall be reported to Waikato Regional Council at annual intervals.

Outlet to Mangatoetoe Stream

12 The pit lake outlet shall be at or about RL104 m above mean sea level (RL1104 m above mine datum).

13 The pit outlet structure and channels shall be designed in such a manner that provides for passage of migratory fish species.

14 Disturbance to the Mangatoetoe Stream bed during installation of the outlet structure shall be minimised.

15 The consent holder shall retain a person or persons with recognised documented experience in the design of such structures (the Designer). All aspects of the design of this outlet structure shall be undertaken under the supervision of the Designer, who shall prior to the exercise of this consent provide to Waikato Regional Council written confirmation that all aspects of the design of this structure have been suitably investigated and properly and safely designed in accordance with currently accepted engineering practise.

16 The outlet structure and channel construction works shall be implemented under the supervision of persons with appropriate experience in the supervision of civil engineering construction works.

17 Following completion of the construction of this outlet structure the Designer shall supply to Waikato Regional Council further written confirmation that construction has been completed according to the design.

18 Prior to commencing discharge from Pit Lake the consent holder shall complete, to the satisfaction of Waikato Regional Council, a report that clearly details the likely incremental impact that this discharge will have on the flood routing capacity of the Mangatoetoe Stream.

The consent holder shall then prepare a plan of works designed to mitigate the impacts of this discharge on any potentially affected properties or public utilities in the Mangatoetoe Stream catchment.

Subject to the grant of any necessary consents, and at least 6 months prior to commencing discharge from Pit Lake, the consent holder shall implement those measures to the satisfaction of the Waikato Regional Council.

19 Discharge from the pit lake shall not commence until the discharge, after reasonable mixing, is able to meet the receiving water criteria specified in Table 1, and the consent holder has received written approval from the Waikato Regional Council for the discharge to commence.

Pit Lake

20 The consent holder shall, in consultation with the Waikato Regional Council, develop and undertake a monitoring programme to assess :

(a) Pit Lake water quality (at a range of depths) during filling. This programme shall commence within one month of cessation of dewatering or when the first water from Ohinemuri River is discharged to Pit Lake, whichever occurs first. Monitoring shall continue for a minimum period of five years after Pit Lake first overflows. This programme is for the purposes of comparing actual quality to the lake water quality predictions provided in the evidence of Mr M. Logsdon to the joint hearing committee and detailed in Appendix A of that evidence.

This monitoring programme shall include an assessment of the quality of the run-off from the pit wall, and an assessment of the aquatic life found in the lake.

(b) Mangatoetoe Stream water quality after discharge from Pit Lake commences. The consent holder shall monitor the effect of Pit Lake discharge on the Mangatoetoe Stream for a minimum period of five years after the lake first overflows. This programme is for the purposes of confirming that as a result of Pit Lake discharge (and after reasonable mixing) the quality of the Mangatoetoe Stream is equal to or better than the receiving water standards defined in Table 1.

(c) Springs arising from Pit Lake filling. The consent holder shall, in consultation with the Waikato Regional Council, develop and undertake a monitoring programme during lake filling and for a period of up to 5 years after filling for the purpose of locating any springs that may be reactivated or result from connections from Pit Lake.

This monitoring programme shall be submitted by the consent holder to the Waikato Regional Council whose approval shall be received prior to implementation of monitoring. Any updates required to the monitoring programme shall also be submitted to Council for approval.

21 The results of the monitoring programmes referred to in condition 20 shall be reported to the Waikato Regional Council on at least an annual basis from the date of commencement of lake filling. The reports shall discuss at least the following matters :

(a) Pit Lake water quality;
(b) filling progress (e.g. percentage filled and predicted 'lake full' date);
(c) Mangatoetoe Stream water quality;
(d) what, if any, springs have been identified, the effect (actual and predicted) on Pit Lake water levels and the impact of the springs on the area at which they occur;
(e) any water quality trends that are apparent from the results of the monitoring programme undertaken;
(f) what, if any, contingency measures have been implemented in the previous 12 months and a prediction of what, if any, contingency measures may be required in the following 12 months.

22 Should the monitoring programme demonstrate that :

(a) Pit Lake water quality is of a standard lower than that predicted by Mr Logsdon in his technical report and evidence given to the joint hearings committee; and / or,
(b) as a result of Pit Lake discharge (and after reasonable mixing) the quality of the Mangatoetoe Stream does not meet the receiving water criteria defined in Table 1; and/or,
(c) a spring is, or springs are, identified,

then Waikato Regional Council may serve written notice on the consent holder to prepare and implement at its own cost, appropriate contingency/remedial measures to the satisfaction of Waikato Regional Council.

23 The discharges authorised by this consent, in combination with all other discharges authorised for this site, shall not cause a significant adverse environmental effect on the receiving water, or on users of that resource, or in the case of surface water, on aquatic biota. To that end any discharge to the Mangatoetoe Stream, either separately or in combination with other discharges, shall not cause the receiving water standards in Table 1 to be breached.

Table 1 : Mangatoetoe Receiving Water Quality Standards

Parameter	Receiving Water Concentration(2)	
(g/m^3 unless otherwise stated)	Hardness 20 g/m^3 $CaCO_3$	Hardness 100 g/m^3 $CaCO_3$
Temperature	less than 3°C increase	less than 3°C increase
pH	6.5 to 9.0	6.5 to 9.0
suspended solids	For upstream concentrations of less than or equal to 100g/m^3 the increase shall be no greater than 10g/m^3. For upstream concentrations of greater than 100g/m^3 the increase shall be no greater than 10%	For upstream concentrations of less than or equal to 100g/m^3 the increase shall be no greater than 10g/m^3. For upstream concentrations of greater than 100g/m^3 the increase shall be no greater than 10%
Cyanide (CN_{WAD})(1)	0.093	0.093
Iron	1.0	1.0
Manganese	2.0	2.0
Copper	0.003	0.011
Nickel	0.040	0.160
Zinc	0.027	0.100
Silver[1]	0.0002	0.0024
Total Ammonia	Refer Table 2	Refer Table 2
Antimony	0.030	0.030
Arsenic	0.190	0.190
Selenium	0.005	0.005
Mercury	0.000012	0.000012
Cadmium	0.0003	0.001
Chromium (VI)	0.010	0.010
Lead	0.0004	0.0025

Notes :

(1) Site specific derived criteria using US EPA (1985) methodology.
(2) Monitoring of metals shall be based on the soluble test method, defined as the concentration of dissolved metals measured in that fraction which passes through a 0.45 um filter, except for mercury (Hg) which shall be based on acid soluble concentrations determined on unfiltered samples.

(3) Current analytical procedures for mercury have a practical quantification limit (PQL) of 0.0005 ppm. This PQL is acceptable for the purposes of reporting mercury concentrations. The reporting 'limit' for mercury concentrations shall be reviewed annually by the consent holder and shall be adjusted in line with improvements in analytical technology.

Table 2 : Criteria For Total Ammonia

Chronic Criterion - g/m^3 as Ammonia							
Temp ^{0}C / pH	0	5	10	15	20	25	30
6.50	3.0	2.8	2.7	2.5	2.5	2.5	2.4
6.75	3.0	2.8	2.7	2.6	2.5	2.5	2.5
7.00	3.0	2.8	2.7	2.6	2.5	2.5	2.5
7.25	3.0	2.8	2.7	2.6	2.5	2.5	2.5
7.50	3.0	2.8	2.7	2.6	2.5	2.5	2.5
7.75	2.8	2.6	2.5	2.4	2.3	2.3	2.4
8.00	1.82	1.70	1.62	1.57	1.55	1.55	1.59
8.25	1.03	0.97	0.93	0.90	0.90	0.91	0.94
8.50	0.58	0.55	0.53	0.53	0.53	0.55	0.58
8.75	0.34	0.32	0.31	0.31	0.32	0.35	0.38
9.00	0.195	0.189	0.189	0.195	0.21	0.23	0.27

Note: To convert these values to mg/l as nitrogen, multiply by 0.822.

Dated at Hamilton this **13** day of **October 1999**

For and on behalf of the
Waikato Regional Council

.....
for Secretary

13.0 SCHEDULE 1

1.0 Interpretation

Annual Work Programme means the Annual Work Programme described in condition 6 of this Schedule.

Panel means the Peer Review Panel described in condition 8 of this Schedule.

Plan means the Rehabilitation and Closure Plan described in condition 9 of this Schedule.

Site means areas A, B, C, D, E, F, H and I as identified on Waihi Gold Company plan number T70725A dated 25 July 1997.

2.0 The consent holder shall notify the Waikato Regional Council in writing at least two weeks in advance of the first exercise of this consent.

3.0 The consent holder shall pay to the Waikato Regional Council any administrative charge fixed in accordance with section 36 of the Resource Management Act 1991, or any charge prescribed in accordance with regulations made under section 360 of that Act.

4.0 The Waikato Regional Council may serve notice on the consent holder of its intention to review the conditions of this resource consent within one month after the first anniversary of the commencement of this consent, and within one month after each subsequent anniversary, 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 consent holder's activities and, if considered appropriate by the Waikato Regional Council, to deal with such effects by way of further or amended conditions;

(ii) to review the adequacy of and the necessity for monitoring undertaken by the consent holder.

Such a review shall be commenced only after consultation between the Waikato Regional Council and the consent holder. Actual and reasonable costs associated with the undertaking of each review shall be borne by the consent holder.

5.0 The consent holder may apply to change or cancel any condition of this resource consent other than a condition as to the duration of the consent, within one month after the first anniversary of the commencement of this consent, and within one month after each subsequent anniversary.

6.0 Annual Work Programme

The consent holder shall, within six months after the commencement of this consent and annually thereafter, prepare and submit to Council for information, an Annual Work Programme that outlines the anticipated activities to be performed during the following year and the management systems under which those activities will be undertaken. The Annual Work Programme shall include the following :

(i) Mining operations proposed for the forthcoming year.

(ii) Description of the sequencing of works, and description of the environmental procedures to be adopted during construction and the maintenance and management of facilities.

(iii) Proposed progressive rehabilitation and revegetation of the active areas of the mine operation.

The Annual Work Programme may also include any other information that the consent holder wishes, and may be combined with any other document which the consent holder is required to produce.

6.0A Annual Consultation Reports

The consent holder shall forward to the Council a report annually, covering the period to 1 June of each year, that details the discussions and outcomes of ongoing consultation with Ngati Tamatera in relation to the spiritual and cultural interests of Ngati Tamatera. Each report shall be produced in conjunction with Ngati Tamatera and forwarded to the Council within 3 months of the end of the 12 month period to which the particular report relates.

7.0 Complaints

The consent holder shall report in writing at six monthly intervals to the Waikato Regional Council summarising the following :

- all complaints received during the previous six month period, action taken by the consent holder and the resolution, if any;
- any other matters of concern raised by the public;
- any mediation entered into by the consent holder and others with respect to operational matters and the outcome (unless the parties have agreed to keep such outcome confidential).

8.0 Peer Review

8.1 The consent holder shall engage, at its cost, a peer review panel ("the Panel"). The members of this Panel shall be fully independent of the planning, design, and construction of the Martha mine and all its associated facilities.

8.2 The primary functions of the Panel are to ensure that the conditions of design, construction, operation and maintenance of Storage 1A are met and that such work is undertaken by appropriately qualified personnel in accordance with good practice; and to assess and review the plans for the rehabilitation and closure of the Site.

8.3 The panel shall comprise technical specialists who between them have demonstrated expertise in the following fields :

- Geochemistry, with recognised experience in management of acid rock drainage
- Geotechnical engineering, with recognised experience in design and construction of tailings storage facilities
- Hydrogeology
- Rehabilitation, with experience in mine revegetation, rehabilitation, and closure

Note that there may be any number of individuals on the Panel, so long as the necessary areas of expertise are covered.

8.4 The members of the Panel, and their defined field(s) of expertise, shall be approved by the Waikato Regional Council prior to appointment to the Panel.

8.5 Each member of the Panel, when acting as a Peer Reviewer, shall act only in his/her area of expertise, but the full Panel shall review all rehabilitation/closure plans.

8.6 The Panel may co-opt other specialist members to assist in any of its functions for specified tasks and periods, subject to the prior approval of the Waikato Regional Council.

8.7 The consent holder shall provide the Panel with all records, plans, designs, etc, that the Panel requests, and shall afford the Panel full access to the Site at all reasonable times.

8.8 The Panel may be the same panel as that which undertakes peer review as required by any other consent (including authorisations issued prior to the Resource Management Act) at this Site.

8.9 The Panel shall report directly to the Waikato Regional Council in writing on all matters which are submitted to it for review, other than draft proposals submitted to it by the consent holder and which are superceded.

9.0 Rehabilitation/closure Plan

9.1 Prior to commencement of construction of the tailings storage facility (Storage 1A), the consent holder shall prepare a concept plan ("the Plan") describing the proposed method of rehabilitation and closure of the Site. The objective of this Plan shall be to ensure rehabilitation and closure of the Site in such a manner that in the long term the Site, and any structures on it, will remain stable; and any water discharging from the Site, and any groundwater under the Site, will be of a quality such that it will not adversely affect aquatic life, or other users of the water resource.

9.2 The Plan shall be in two parts :

- Part A shall describe the programme of progressive rehabilitation (including revegetation) that is proposed for the Site for the following twelve months, should closure not be proposed during that period; and shall report on any such works undertaken during the previous year
- Part B shall :

(a) describe the proposed method of final rehabilitation and closure should closure occur within the following twelve months

(b) include an assessment of any residual risk that the Site would pose to the environment and the neighbouring community should closure occur within the following 12 months

(c) include a programme for monitoring of the Site following closure, and list all maintenance works likely to be necessary at the closed Site for the foreseeable future.

9.3 Review

The Plan shall be reviewed and updated annually and the concepts shall be described in more detail as appropriate.

The consent holder shall submit the Plan, and each annual review and update thereof, to the Panel for its review.

The consent holder shall then submit the peer reviewed Plan to the Waikato Regional Council for approval.

9.4 Implementation

The consent holder shall progressively implement Part A of the approved Plan and shall implement Part B of the approved Plan in the event of closure occurring.

10.0 Bond and Trust Fund

10.1 Prior to the exercise of this consent the consent holder shall provide and maintain in favour of Waikato Regional Council and Hauraki District Council ("the Councils") a rehabilitation bond to :

(a) secure compliance with the conditions of this consent and to enable any adverse effect on the environment resulting from the consent holder's activities and not authorised by a resource consent to be avoided, remedied, or mitigated;

(b) secure the completion of rehabilitation and closure in accordance with the approved Plan;

(c) ensure the performance of any monitoring obligations of the consent holder under this consent;

(d) enable the Councils to undertake monitoring and management of the Site until completion of closure of the Site; and

(e) enable the Councils in the event of the bonds being called upon, to purchase Industrial and Special Risk Insurance in the sum of $12 million (1998 dollars) and Public Liability Insurance in the sum of $5 million (1998 dollars).

10.2 The rehabilitation bond shall be in a form approved by the Councils and shall, subject to these conditions, be on the terms and conditions required by the Councils.

10.3 The rehabilitation bond shall provide that the consent holder remains liable under the Resource Management Act 1991 for any breach of the conditions of consent which occurs before expiry of this consent and for any adverse effects on the environment which become apparent during or after the expiry of the consent.

10.4 Section 109(1) of the Resource Management Act 1991 shall apply to the rehabilitation bond and the rehabilitation bond shall be registered under the Land Transfer Act 1952 by the consent holder at its expense against the certificates of title of the properties comprising Areas C and D owned by the consent holder or its subsidiaries, and as identified on Waihi Gold Company Plan no. T70725A dated 25 July 1997.

10.5 Unless the rehabilitation bond is a cash bond, the performance of all of the conditions of the bond shall be guaranteed by a guarantor acceptable to the Councils. The guarantor shall bind itself to pay for the carrying out and completion of any condition in the event of any default of the consent holder, or any occurrence of any adverse environmental effect requiring remedy.

10.6(a) The amount of the rehabilitation bond shall be fixed at the commencement of the extended project and ~~every anniversary~~ thereafter at least annually by the Councils who shall take into account any calculations and other matters submitted in the Plan, or otherwise, by the consent holder which are relevant to the determination of the amount. The amount of the rehabilitation bond shall be advised in writing to the consent holder at least one month prior to the review date.

(b) The amount of the rehabilitation bond, to achieve the purposes set out in 10.1 above, shall include :

(i) the estimated costs (including any contingencies necessary) of rehabilitation and closure in accordance with the conditions of the consent, on completion of the mining operations proposed for the next year and described in the Plan;

(ii) any further sum which the Councils consider necessary to allow for remedying any adverse effect on the environment that may arise from the exercise of the consent;

(iii) the estimated costs of monitoring, in accordance with the monitoring conditions of the consent, until the consent expires; and

(iv) any further sum which the Councils consider necessary for monitoring any adverse effect on the environment that may arise from the exercise of the consent including monitoring anything which is done to avoid, remedy, or mitigate an adverse effect.

10.7 Should the consent holder not agree with the amount of the rehabilitation bond fixed by the Councils then the matter shall be referred to arbitration in accordance with the provisions of the Arbitration Act 1996. Arbitration shall be commenced by written notice by the consent holder to each of the Councils advising that the amount of the rehabilitation bond is disputed, such notice to be given by the consent holder within two weeks of notification of the amount of the rehabilitation bond. If the parties cannot agree upon an arbitrator within a week of receiving the notice from the consent holder, then an arbitrator shall be appointed by the President of the Institute of Professional Engineers of New Zealand. Such arbitrator shall give an award in writing within 30 days after his or her appointment, unless the consent holder and

the Councils agree that time shall be extended. The parties shall bear their own costs in connection with the arbitration. In all other respects, the provisions of the Arbitration Act 1996 shall apply. Pending the outcome of that arbitration, and subject to condition 10.8, the existing bond shall continue in force. That sum shall be adjusted in accordance with the arbitration determination.

10.8 If, for any reason other than default of the Councils, the decision of the arbitrator is not made available by the 30th day referred to above, then the amount of the bond shall be the sum fixed by the Councils, until such time as the arbitrator does make his/her decision. At that stage the new amount shall apply. The consent holder shall not exercise this consent if the variation of the existing bond or new bond is not provided in accordance with this condition.

10.9 The rehabilitation bond may be varied, cancelled, or renewed at any time by agreement between the consent holder and the Councils provided that cancellation will not be agreed to unless a further or new rehabilitation bond acceptable to the Councils is available to replace immediately that which is to be cancelled (subject however to the condition below as to release of the rehabilitation bond on the completion of closure of the site – as that phrase is elsewhere defined – to the Councils' satisfaction).

10.10 The Councils shall release the rehabilitation bond on the completion of closure of the Site.

"Completion of closure of the Site" means when the rehabilitation objective as defined in condition 9.1 of this Schedule has been demonstrated by the consent holder, to the satisfaction of the Councils, to have been met.

10.11 All costs relating to the rehabilitation bond shall be paid by the consent holder.

10.12 This consent shall not become operative unless and until the consent holder provides the rehabilitation bond to the Councils.

10.13 As soon as practicable after the grant of this consent and in any event prior to the placement of PAF waste into Storage 1A, the consent holder, in consultation with the Councils, shall establish a trust ("the Trust") (charitable if possible) whose purposes and powers shall be :

- after completion of the closure of the Site to take legal title to the land on which Storage 2 and Storage 1A are located, (as shown in Appendix A). The Trust shall have no power of sale of the land;
- after completion of the closure of the Site to take legal title to the park to be formed at Junction Road (as shown in Appendix A);
- after completion of the closure of the Site to take legal title to the land upon which the Water Treatment Plant is located (as shown in Appendix A);
- to monitor and maintain these facilities in perpetuity, and to be responsible for such monitoring and maintenance as to ensure that Storage 2 and Storage 1A and the park (and proposed pit lake if acceptable to LINZ) remain in a stable, self- sustaining, rehabilitated state;
- to obtain any resource consents that may be required after completion of the closure of the Site and the expiration or surrender of this consent;
- without limiting the above, to take out insurance cover against unexpected risks;
- to reimburse the Councils for any costs incurred by them in monitoring or maintaining Storage 2 and Storage 1A, the park, and proposed pit lake;
- to invest any funds held to generate the necessary income to pay for the above purposes.

These purposes and powers shall be recorded in a Trust Deed approved by the Councils.

The Trust Deed shall provide :

- that the Councils shall have the power to appoint two trustees each to the Trust;

- for the appointment by the Councils, after consultation with Ngati Tamatera, of one additional trustee representing Ngati Tamatera; and
- for the appointment by Te Runanga a Iwi o Ngati Tamatera Incorporated of one advisory trustee representing Ngati Tamatera.

10.14 The consent holder shall be responsible for all costs associated with the establishment of the Trust. The solicitor appointed to act for the Trust shall be independent of the solicitors acting for the consent holder and shall be approved of by the Councils.

10.15 The consent holder shall execute an irrevocable deed of transfer in favour of the Trust of the land upon which Storage 2 and 1A are sited, and shall provide the executed transfer together with the certificates of title (as soon as they are issued) to be held in escrow subject to condition 10.18 by the solicitor acting for the Trust.

10.16 The consent holder shall execute an irrevocable deed of transfer in favour of the Trust of the land upon which the park at Junction Road is to be sited, and shall provide the executed transfer together with the certificates of title (as soon as they are issued) to be held in escrow subject to condition 10.18 by the solicitor acting for the Trust.

10.17 The consent holder shall execute an irrevocable deed of transfer in favour of the Trust of the land upon which the Water Treatment Plant is sited and shall provide the executed transfer together with the certificates of title (as soon as they are issued) to be held in escrow subject to condition 10.18 by the solicitor acting for the Trust.

10.18 The Trust Deed shall provide that upon the completion of closure of the Site to the satisfaction of the Councils, the transfers of land will be completed by the trustees registering the transfers on the relevant certificates of title, and the trustees shall undertake their responsibilities with respect to the park, proposed pit lake and surrounds, and tailings storage facilities. The Water Treatment Plant shall be in good working condition at the time the transfer of it to the Trust is completed.

10.19 Prior to the exercise of this consent the consent holder shall provide and maintain in favour of the Councils a capitalisation bond to secure the settlement on the Trust of the required capital sum to fund the Trust to carry out its obligations.

10.20 The capitalisation bond shall be in a form approved by the Councils and, subject to these conditions, shall be on the terms and conditions required by the Councils.

10.21 Unless the capitalisation bond is a cash bond, the performance of all of the conditions of the capitalisation bond shall be guaranteed by a guarantor acceptable to the Councils.

10.22 The amount of the capitalisation bond shall be fixed annually by the Councils and shall cover :

- the estimated costs of dealing with any adverse effect on the environment which may become apparent after the surrender or expiry of this consent. This sum may include (without limitation) provision to deal with structural instability or failure, land and/or water contamination, and failure of rehabilitation. Such estimated costs shall include the costs of investigation, prevention, and remediation of any adverse effect
- the estimated costs of monitoring for and of any adverse effect and of measures taken to avoid, remedy, or mitigate any adverse effect
- the estimated costs of long-term monitoring and maintenance of the area to be owned or managed by the Trust, following completion of closure of the Site
- provision for contingencies
- provision for the reasonable remuneration of the trustees having regard to their duties and responsibilities as trustees

and be based on the residual risk assessment dated 20 July 1998 prepared by the consent holder and provided to the Councils. Such residual risk assessment shall be updated annually.

The amount of the reviewed bond shall be advised to the consent holder at least one month prior to the annual review date.

The amount of the bond shall be reduced by the capital amounts settled on the Trust from time to time by the consent holder.

10.23 Should the consent holder not agree with the amount of the capitalisation bond fixed by the Councils then the matter shall be referred to arbitration in accordance with the procedures set out in conditions 10.7 and 10.8. Subject to condition 10.8, that sum shall be adjusted in accordance with the arbitration determination. The consent holder shall not exercise this consent if the variation of the existing capitalisation bond or new capitalisation bond is not provided in accordance with this condition.

10.24 The capitalisation bond may be varied, cancelled, or renewed at any time by agreement between the consent holder and the Councils.

10.25 The capitalisation bond shall expire upon the settlement on the Trust by the consent holder of the required capital sum.

10.26 All costs relating to the capitalisation bond shall be paid by the consent holder.

10.27 ~~The consent holder shall throughout the term of this consent maintain at least the following insurance cover as set out in the evidence of Bruce Farren Price to the Hearings Committee (para 23) :~~

~~(a) Global property package cover (limit of liability $A250 million) which provides for the rebuilding of any damaged tailings storage facility and the cleanup of pollution and/or contamination arising therefrom;~~
~~(b) Liability package (limit of liability $A150 million) which provides coverage for damage to property, and injuries to third parties following a sudden and accidental pollution and/or contamination incident.~~
~~(c) Environment impairment liability (limit of liability $A5 million) which provides coverage for a pollution event, excluded by the liability package, that is not sudden, accidental, or unexpected.~~

~~The consent holder shall upon request provide evidence to the Waikato Regional Council that such insurance cover is in place.~~

In addition to the insurance cover required for the Rehabilitation Bond in condition 10.1(e), the consent holder shall throughout the term of this consent be able to demonstrate to the satisfaction of the Waikato Regional Council that it holds sufficient funds, insurances or other financial instruments (“cover”) to enable any adverse effect on the environment resulting from the consent holder's activities and not authorised by a resource consent to be promptly avoided, remedied or mitigated.

The consent holder shall provide evidence to the Council annually, or such other period as may be subsequently agreed with the Council in writing that sufficient cover is in place. This evidence shall be provided to Council at the same time as the Annual Work Programme is submitted as required by condition 6 of this Schedule.

Should the consent holder and the Council not agree on the sufficiency of the level of cover, the matter shall be referred to arbitration in accordance with the provisions of the Arbitration Act 1996. Arbitration shall be commenced by written notice by the Council advising that the amount of the cover is disputed, such notice to be given by the Councils within two weeks of notification of the amount of the cover. If the

parties cannot agree upon an arbitrator within a week of receiving the notice from the consent holder, then an arbitrator shall be appointed by the President of the Institute of Professional Engineers in New Zealand. Such arbitrator shall give an award in writing within 30 days after his or her appointment, unless the consent holder and the Councils agree that time shall be extended. The parties shall bear their own costs in connection with the arbitration. In all other respects, the provisions of the Arbitration Act 1996 shall apply. Pending the outcome of that arbitration, the existing cover shall continue in force. The sum of the cover shall be adjusted in accordance with the arbitration determination

 09/04/2010

10.28 These conditions form an integrated whole and are not severable.

Note: This condition is complementary to the requirements of condition 3.31 of the land use consent granted by the Hauraki District Council.

In reply please quote 60 59 02M
Enquiries to Ruth Hutchinson

13 October 1999

Waihi Gold Company
P O Box 190
WAIHI

Dear Sir/Madam

RESOURCE CONSENT NUMBER 971293

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) If the consent has not been exercised within two years from the commencement date of the consent, the consent will lapse unless approval has been obtained from the Regional Council to extend the 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 quoting the above reference.

Yours faithfully

Ruth Hutchinson
Administration Officer, Resource Use