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Waikato
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19th August 2022

Oceana Gold (New Zealand) Limited
PO Box 190
Waihi 3641
Attn: Kerry.Watson@oceanagold.com
CC: Ethan.Glover@mitchell.daysh.co.nz

Dear Kerry,

Request for Further Information under Section 92(1) of the RMA

I refer to the application received on 23 June 2022. (Application No. APP144654) for the following:

Application	Activity Description
APP144654	Suite of consents for the Waihi North Project associated with the following activities; • Construction, operation and long term maintenance of the Gladstone Open Pit (GOP); • Construction, operation and long term maintenance of a new Tailings Storage Facility (TSF3); • Construction, operation and long term maintenance of a new rock stack - Northern Rock Stack (NRS); • Construction, operation and rehabilitation of twin tunnels and a new mine (WKP); • Construction, maintenance and rehabilitation of surface facilities at Willows Road; and • Associated discharges, diversions and land use activities in conjunction with all of the above activities.

I advise that, in accordance with s92(1) of the RMA, I request further information in relation to the application. The reason I request this information is that it is necessary to enable Waikato Regional Council to better understand:

- the nature of the activity, and
- the effect(s) it will have on the environment, and
- the ways in which adverse effects may be mitigated.

The information I request is as follows:

1 Earthworks

At this stage there is no further information required relating to this aspect of the works.

2 Geochemistry

2 AMD

2.1 Source Hazard Characterisation

The explanations and technical documents provided by OGNZL focus on acid rock drainage. The materials associated with the WNP also have the potential to generate neutral metalliferous drainage. Non-acid forming (NAF) materials could still generate poor water quality. A better terminology is to use acid and metalliferous drainage (AMD) which addresses the various forms of AMD.

2.1.1 Material Types

• #1 - Further Information Required: Data are required to confirm that all lithologies, weathering zones, and alteration zones have been adequately characterised in regards to AMD potential and that environmental geochemistry risks are understood for these materials. Confirmation is needed that the sample numbers are appropriate to quantify potential risks (e.g., in line with industry standards such as DFAT, 2016; INAP, 2014).

2.1.2 Elevated Trace Metals

OGNZL proposes that a cut-off limit of >3.5 mg/kg is used to define high Hg materials, which will be treated as potentially acid forming (PAF) material. A value of 3.5 mg/kg is equivalent to a GAI[1] of 6, which represents significant enrichment above typically crustal abundances (e.g., ~>100 fold). A GAI value of 3 or greater is typically used to identify elevated contaminants with leachate testing recommended (or other analogue data provided) to demonstrate the environmental geochemistry risks are low.

• #2 - Further Information Required: Further information is required to confirm that a value of 3.5 mg/kg is suitable to manage the risk to the receiving environment of elevated Hg in non acid forming (NAF) waste rock. The AECOM (2022) summary states key contaminants that are different to historical Waihi data are Hg, Sb, and As.

• #3 - Further Information Required: Waste rock schedules are presented in GHD (2022 – Figure 8) with a focus on Hg. Could further information be provided for Sb and As or an explanation provided why these contaminants are not given the same level of attention in the material schedules. AECOM (2022) provide trace element and GAI data that show As, Hg, Sb, Se are elevated.

• #4 - Further Information Required: Why is silver (Ag) not included in this assessment given Ag is part of resource consent water quality monitoring for the water treatment plant? Further information required.

2.1.3 Materials AMD Classification System

A variety of different AMD materials are discussed in the technical reports including, for instance PAF, low capacity PAF (PAF_LC), NAF, Uncertain, NAF- Low Hg; NAF- High Hg; LPAF - Low Hg; LPAF - 1 Geochemical Abundance Index: Forstner et al. (1993) High Hg; HPAF - Low Hg; and HPAF - High Hg (High Hg is identified as materials having >3.5 mg /kg of Hg).

• #5 - Further Information Required: A process flow diagram is required (or similar) to explain how each of these materials are classified (e.g., NAG[2], NAPP[3], total metal content) and the intended use. It is noted by OGNZL that high Hg materials will be treated as PAF. The reports indicate that PAF and NAF will be classified operationally (daily testing based on NAG pH and NAPP).

• #6 - Further Information Required: No explanation is provided on how rocks will be assessed operationally for Hg. Further explanations are required. Data suggests some materials will generate acid immediately (e.g., negative ANC values). This may be greater for materials from the Gladstone Open Pit (GOP) that have a lower acid neutralisation capacity (ANC). Furthermore, a lowering of the water table due to mining activities may have exposed in situ materials to oxidation.

[1] Geochemical Abundance Index: Forstner et al. (1993)

[2] NAG = net acid generation

[3] NAPP = Net acid producing potential

• #7 - Further Information Required: Further explanation is required on how samples with no time lag to acid onset will be managed. Could the use of slurry pH[4] (and slurry EC) help with materials classification and determining the quantities of limestone that need to be applied. Would this be more than current limestone dose rates? Further information required.

2.1.4 Acid Base Accounting

EGI (2019) noted that all the ANC was not available for materials from the Correnso project, with the NAF column sample (NAPP of -1 kg H2SO4/t) becoming acidic (pH 2.6) in the fifth stage of the sequential NAG test. Later work by EGi (2019) confirmed this was a PAF sample, but still recommended further work to quantify the sulfide sulfur and the available ANC.

• #8 - Further Information Required: What work has been competed to validate the available ANC for WNP materials. A lesser amount of ANC might affect acid base accounting (ABA) methodologies and should be accounted for. This might lead to changes in material classification and quantities and should be discussed. Have any tests (e.g., acid buffering characteristic curve (ABCC) tests (AMIRA, 2002)) been completed to validate the available ANC? AECOM (2022) indicate the mean ANC value for andesite and hydrothermal breccia from the GOP (Table 1) is negative (-0.1 wt% CaCO3). This indicates acidic oxidation products of 1 kg H2SO4/t are present in the sample.

• #9 - Further Information Required: Why are negative ANC values being recorded: Is this prior oxidation or poor sample preservation.

• #10 - Further Information Required: How would this affect materials management and limestone amendment rates.

Some ANC data are determined from total C. No data are available to confirm that total C is a suitable analogue for ANC. No mineralogy is available to confirm that all carbonate minerals are calcite (e.g., acid neutralising) and that no Mn- or Fe- bearing carbonates are present (that do not neutralise acidity).

• #11 - Further Information Required: The assumption that total C can be used to calculate the neutralisation potential (NP) (i.e., ANC) requires further explanation / analysis. As noted by EGI (2019), not all the ANC is available. Further discussion is required as to the suitability of these data and how it might influence material quantities. Figure 2 of the AECOM (2022) report does not show the negative ANC values identified in Table 1 of the AECOM (2022) report. However, the data does show that the ANC is lower at WNP areas compared to the existing project areas. The report states that data < 0% are not presented in the figure.

• #12 - Further Information Required: Negative ANC data are a key indicator of stored acidity and such materials are therefore a high priority for management. What management options have been considered for these materials? Figure 7 of the AECOM (2022) report is a plot of NPR and NAG pH data and classifies samples as NAF, PAF, or uncertain with one third of the samples classified as uncertain.

• #13 - Further Information Required: Have any additional investigations been undertaken to understand why these materials are classified as uncertain?

• #14 - Further Information Required: How are uncertain category rocks managed when the project only discusses PAF and NAF materials? Please explain this as part of the materials classification process. The ABA data provided (AECOM (2022) report - Appendices) for materials from the project have NAG pH and NAG acidity data. Lane Neave indicated (8 March 2022) that the data relating to NAG-B kg H2SO4/t is the NAG acidity to pH 4.5.

• #15 - Further Information Required: The data provided shows that some samples have negative NAG-B values. Negative titrated NAG values are not possible in the standard NAG test unless the titration is back down to pH 4.5 (however some samples are < pH 4.5 with negative NAG-B values). Further explanation is required on what these data represent, or how they were determined. What QAQC was undertaken on these data

2.1.5 Excel Spreadsheet Calculator

[4] As per the Standard Operating Procedure for PAF pH Slurry Test (Document ID WAI-200-PRO-031.1

OGNZL provided an excel spreadsheet (NAF PAF Assessment Sheet) that is used to calculate geochemical classifications and limestone requirements are also presented. The excel spreadsheet classification "based on the consent criteria" uses NAG pH > 3.9 and NAPP ≤ 0 for non-acid forming materials. Resource Consent AUTH974311.01.08 Consent Condition 6 states that "Unless otherwise agreed by the Waikato Regional Council in writing, the contributing catchments to silt ponds shall contain no contaminated or potentially acid-forming soil or rock. In this regard, "non-acid-forming " is defined as: (i) NAGpH no less than 4; and (ii) NAPP is equal to or less than 0.

• #16 - Further Information Required: The excel spreadsheet is different to this consent condition. Further explanation is required on the differences. Is this calculator going to be modified to address the other material classifications explained in #5? The classification scheme presented in the excel spreadsheet also uses NAG and NAPP data to determine "Classification based on NAPP_NAG criteria" with NAG pH 4.5 and NAPP being used for definition of NAF and PAF. A flow chart would be a useful way to present the classification scheme.
• #17 - Further Information Required: How is this excel sheet used to determine AMD classification? Is this calculator going to be modified to address the other material classifications explained in #5. Limestone requirements are calculated using this excel sheet to achieve an ANC/MPA ratio of 1.3 or 1.5.
• #18 - Further Information Required: Does this calculator determine limestone application rates for the project? Why was a ratio of 1.3 and 1.5 used? Further explanations are required on limestone dose rates.

2.1.6 Neutral Metalliferous Drainage
Column tests (humidity cell and field columns) were completed on PAF materials. It appears there are no recent column leach test data for NAF materials associated with the WNP project.
• #19 - Further Information Required: What data are available to understand water quality from NAF materials and other materials (as per the classification scheme) to confirm risks to the receiving environment are low?
• #20 – Further Information required: What data are available for NAF materials with high Hg content (but < 3.5 mg/kg)?

2.1.7 Waste Rock Block Model
The geochemical classification system should be used to create a waste rock block model for the project and define all material quantities. AECOM (2022) indicates this has been completed for the GOP. Material quantities for the other mine domains that are part of this project also need to be developed.
• #21 - Further Information Required: Please provide the waste rock block model for GOP materials together with cross-sectional drillholes and ABA data, linked with the materials classification system to validate material quantities.
• #22 – Further Information Required: Please provide the waste rock block model and materials classifications for the GOP pit shell to understand materials present in the pit walls
• #23 - Further Information Required: Please provide waste rock block models, materials quantities, and the materials schedule for the entire WNP. These schedules should confirm that sufficient low Hg NAF materials will be available in a timely manner for construction activities. Please identify low Hg NAF construction requirements.

2.1.8 Nitrogenous Compounds
• #24 - Further Information Required: How will the potential effects of nitrogenous compounds from blasting activities be managed through source control activities. For instance, do blast management plans consider best practice handling and spill management for ammonium nitrate based explosives. Further information required.

2.2 Forward Drilling Program
A forward drilling program is proposed for the Wharekirauponga Underground Mine (WUG) and the access tunnels. Forward work includes the assessment of geotechnical issues and groundwater. No consideration is given to geochemistry.

• #25 - Further Information Required: What geochemical studies will be undertaken on the forward drilling program? How will these data be integrated into mine planning and material schedules?

2.3 Limestone Dose Rates

OGNZL indicate that 2.5 kg/tonne of limestone is applied to PAF Rock[5], which is different to the excel calculator provided (see Section 2.1.5 above). AECOM (2022) states that monitoring of the rock is proposed to refine the limestone amendment rates. It is proposed that no limestone will be added to GOP materials when the exposure time is < 10 weeks.

• #26 - Further Information Required: How will materials with varying lag times to acid onset be managed? How will samples with soluble stored acidity be managed? What does exposure time mean if the waste rock is placed in high lifts where oxidation may continue? Please provide further explanation on limestone dose rates and the proposed procedure.

2.4 Kinetic and Column Testing

• #27 - Further Information Required: Six samples of Gladstone Vent Breccia were selected for column leach testing. Why was no andesitic material tested when it is a significant part of the GOP? Further explanation is required given these materials are elevated and different to the current project in regards to contaminants such as As, Hg, Se, and Sb. Column leach test data are provided but no summary of the key ABA data are provided for each column. Ratio data as presented in Figure D1 do not help consider the time lag to acid onset.

• #28 - Further Information Required: Full ABA data should be provided for column test samples to understand the acid base geochemistry of the materials, which enables context for the assessment of column water quality data.

• #29 - Further Information Required: Data summaries for column leach tests do not state the volume of leachate collected. This should also be included so that independent review work can determine contaminant generation rates. The lab column data provided is only for 12 weeks.

• #30 - Further Information Required: This is a limited dataset. What was the forecast time lag to acid onset? Were any kinetic NAG tests undertaken to provide an expectation as to this time lag to acid onset? Humidity cell column leach tests were undertaken on 6 samples, with one of these being classified as uncertain by AECOM (2022; Figure D1). Field columns were also undertaken by GHD (2022) on three samples classified as PAF (AECOM, 2022; Figure D9).

• #31 - Further Information Required: No column leach test data are available for NAF materials. How are the environmental geochemistry risks assessed for NAF materials?

2.5 Engineering Controls – General

The documents discuss general AMD management controls including: • Oxidation control – Control of oxygen flux to reactive sulfides, such as by deposition under water or through the application of low permeability layers; • Geochemical control - Blending rock types or addition of neutralising materials to control pH and oxidation rates; and • Hydrological control - Placement of low permeability layers, evapotranspiration layers, and spoil management structures to control the potential leaching rate from the disposal facility. The placement strategies for waste rock can have significant implications for the ingress of oxygen and water. The materials placement strategy needs to be linked to the materials schedule (based on the waste rock block model).

• #32 - Further Information Required: Generic methodologies are not appropriate to understand potential effects. Please provide a clear explanation of materials management strategies (e.g., engineering controls) for specific mine domains. Potential effects should be based on contaminant loads (quantity and quality). No data are presented on long term oxygen flux into various mine domains to confirm oxidation rates are low, which is the key driver of long term contaminant loads.

[5] As noted in Standard Operating Procedure for Waihi Lime Addition Facility and associated control of Acid Rock Drainage (Document WAI-350-PRO-017)

• #33 - Further Information Required: What performance monitoring data are available (e.g., oxygen probes) to confirm that that engineering controls and designs are working for waste rock stacks and TSF embankments?
• #34 – Further Information Required: What performance monitoring for oxygen ingress is proposed for future mine domains that contain sulfidic materials where oxygen exclusion is a key design criterion?
Derivation of Source Terms (Water Quality Estimates) Source terms have been developed by AECOM (2022) to estimate water quality from various mine domains. These source terms are critical for understanding the proposed effects on the receiving environment.
Additional transparency would be useful to understand how data were treated to create the source terms and how source term data were integrated into water quality forecast models.
• #35 – Further Information Required: Could the process used to derive source terms be clearly articulated. A number of source term models used to develop water quality estimates for the project have minimum pH data assigned to minimum concentration data. Presumably this is a function of scenario modelling, which has not been explained.
• #36 - Further Information Required: Could the modelling process be clarified. Generally maximum hydrogen ion concentration (i.e., minimum pH) would be assigned to maximum datasets to maintain similar geochemical environments. Also, how has pH statistical analysis been managed in these models and is this appropriate (e.g., pH versus [H+])?
• #37 - Further Information Required: Have the data inputs for the model and the subsequent modelling process been reviewed by an independent expert? Given these data are significant for understanding project effects this may be a useful exercise.

2.6 Water Treatment
A significant amount of work has been undertaken to develop water quality source terms for the various mine domains. However, limited comment is provided on how this water will be managed other than the fact that mine-impacted waters will be sent to the water treatment plant (WTP).
• #38 - Further Information Required: What are the expected contaminant loads (flow and quality) reporting to the WTP from the various mine domains for the project during operations and at closure.
• #39 – Further Information Required: Is there a transition to passive treatment system technologies for certain mine domains? What does this involve? Further details are required on active and passive treatment options available for the project after closure.
• #40 – Further Information Required: OGNZL report that passive treatment trials have been undertaken and that scaleup trials are proposed. What work has been done? Are there technologies available for effective passive treatment? Further information required.
• #41 – Further Information Required: What is the duration of AMD treatment for the project? Can this be split up into active treatment (and where applicable passive treatment) for each mine domain? At the completion of scheduled mining activities in 2038 how long will the WTP operate post closure?
• #42 – Further Information Required: What is the process for AMD sludge management associated with the water treatment activities during operations and after closure? What happens once the TSFs are closed?
• #43 – Further Information Required: Is there benefit in sediment control structures also being monitoring for EC (and pH) to determine if waters are impacted by AMD? This could be supported by water quality testing for contaminants of concern. Please comment on whether this would this provide additional benefits for managing AMD risks.
• #44 – Further Information Required: The rehabilitation and closure plan states that three years of post-mining water treatment is proposed to remove metals from all sources. Further data are required to justify this duration.

2.7 Climate Change
EGL (2022; Section 3.1.1) notes that the effects of climate change will generally result in higher temperatures, lower annual rainfall, but higher intensity rainfall in extreme events.
• #45 - Further Information Required: What risks have been considered in sizing the water management infrastructure and could there be potential impacts to the receiving environment when design criteria are exceeded? What modelling has been done to show that spill events have negligible risk?

• #46 - Further Information Required: Have CO2 emissions from materials been considered (e.g., emissions to air)? This includes the addition of limestone to waste rock and the inherent carbonate minerals within the waste rock and tailings that neutralise acidity generated by sulfide mineral oxidation.

2.8 Water Quality Monitoring

Several other contaminants and queries have been identified through the review of materials provided.

• #47 – Further Information Required: Aluminium is not included in the suite of water quality monitoring parameters, although this is often a key contaminant associated with AMD sites. Further justification is needed why this is not included.

• #44 – Further Information Required: The rehabilitation and closure plan states that three years of post-mining water treatment is proposed to remove metals from all sources. Further data are required to justify this duration.

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2.9 Specific Mine Domains

2.9.1 Willows WRS Area

There is the potential to disturb near-surface AMD forming materials during excavation of the Willows Waste Rock Stack (WRS) foundations.

• #50 - Further Information Required: How will potential AMD forming materials in the gully be identified and managed in advance? Will a Trigger Action Response Plan (TARP) be developed to address this potential risk?

If potential AMD materials are disturbed during site preparatory works within other areas how will the effects be managed?

• #51 - Further Information Required: Further information is required on project scheduling to understand how potential effects of AMD will be managed. The Willows WRS will contain up to 900,000 m3 of rock. It is proposed that lime will be used to neutralise potentially acid forming contact waters.

• #52 - Further Information Required: It is unclear how lime will be used to neutralise contact waters. Will lime be applied directly to the surface of the WRS? Further explanation required.

• #53 - Further Information Required: No details are provided on how the WRS will be constructed to minimise oxidation of sulfide minerals or the mobilisation of contaminants. Further explanation is required in regards to preparatory works, lift height (e.g., Golder indicate bottom-up construction), compaction, NAF/PAF segregation (e.g., NAF on the outside of the structure); performance monitoring, control and treatment of AMD. Design criteria are required.

• #54 – Further Information Required: What are the estimated contaminant loads from this mine domain over the project life?

• #55 - Further Information Required: Underdrainage is proposed for the WRS. Further clarification is required on how this underdrainage system will be constructed to avoid these drains being oxygen pathways into the core of the WRS and contributing to ongoing oxidation and AMD generation.
• #56 - Further Information Required: Further details are required to explain how all AMD forming materials placed in the Willows WRS footprint will be removed and how this will be confirmed (e.g., geochemical testing OGL note that "Some seepage from the WRS may over time enter Mataura Stream, however, it will have a very minor effect on water quality, and will not cause an exceedance of the ambient water quality standards which are included in the proposed consent conditions to protect aquatic ecology"
• #57 - Further Information Required: The term "some seepage" from the Willows WRS to the Mataura Stream requires quantification. What models have been developed to determine contaminant loads from this mine domain?

2.9.2 Gladstone Open Pit
Exploration, geotechnical, and dewatering drilling is planned prior to works commencing. These drill programmes also provide the opportunity to collect further geochemical samples to confirm the material geochemical characteristics and refine the waste rock block model according to the materials classification scheme.
• #58 - Further Information Required: Further details are required of the proposed geochemical characterisation studies that will be undertaken as part of this drill program and how this will be used to validate / update material quantities and schedules.
• #59 - Further information is required on how materials that are potentially already oxidised, with low ANC will be assessed during this program. GHD (2022) indicate that that AECOM (2021) report that 73% of the GOP pit walls are PAF with a total volume of 13,605 m3 based on an oxidation depth of 0.1 m
• #60 - Further Information Required: 0.1 m is a simple approach. What justification is available for this depth? Does this consider friable materials or fault zones that may have a much greater depth of oxidation? Further discussion / analysis required. Would such zones or depth changes materially change the contaminant loads for this mine domain? GHD (2022) - Section 4.2 indicates that the backfill bench height will be 10 m / angle of repose. It is generally noted that end tips at > 4-6 m height will result in grainsize segregation that will facilitate higher sulfide oxidation rates.
• #61 - Further Information Required: Please provide justification for the lift height. If it is > 4- 6 m what are the management processes to minimise acid generation as the formation of acidity due to oxidation may lead to longer term treatment requirements after closure? A 1 m lift height will result in less preferential settlement, which might have benefits for construction. GHD (2022) - Section 4.3 notes that a limestone dose rate of 0.2 – 0.4% is required for a target lag time of 210 days. Other sections in this report state a target dose rate of 0.6% limestone for 250 days.
• #62 - Further Information Required: Could the dose rate be clarified. Previous information suggests 2.5 kg limestone/tonne of PAF; other information suggest that the dose rate is to achieve a specific ANC/MPA ratio (1.3 or 1.5). AECOM (2022) - Section 5.0 discusses the model to determine the GOP sump water quality. AECOM (2022) indicates that two water qualities (PAF and NAF) are used for modelling purposes.
• #63 - Further Information Required: NAF water quality is based on Martha Pit wall data. Is this a fair approach when it has been noted that NAF from the GOP can also be elevated in Hg? Presumably other metals such as Sb and As are also elevated compared to Martha Pit wall. Further explanations are required.
#64 - Further Information Required: Estimates of water quality are presented in AECOM (2022) Table 6. Given that GOP PAF materials are higher sulfur (greater acid potential) than Martha Pit (AECOM (2022) Figure 4) and have a much lower NPR (AECOM (2022) Figure 5) there needs to be justification why the modelling results for sulfate (shown in AECOM (2022) Table 6) are lower for the GOP High PAF compared to Martha Fresh PAF.
• #65 - Further Information Required: The reports provided indicate that the GOP materials are higher in Hg and Sb compared to Martha, yet the derived water quality data presented in AECOM Table 6 suggest it is lower. Further explanation is required. The data presented in AECOM (2022) Table 6 require further clarification.

• #66 - Further Information Required: The high PAF sample has a lower pH than the low PAF sample. Please explain and justify the process of deriving these water quality parameters.
• #67 - Further Information Required: The Al concentration (28 mg/L) provided for the NAF water quality is unusual given the circum-neutral pH of 7.1. Please explain and justify the process for deriving the water quality
Silver (Ag) and nitrogenous compounds are not included in the assessment (AECOM (2022) Table 6 and 7)
• #68 - Further Information required: Given that Ag is part of resource consent water quality monitoring requirements, why is this absent from the source term?
• #69 - Further Information required: What estimates are available for nitrogenous compounds in waste rock seepage? The geochemical modelling section (AECOM (2022) Section 5.3) needs further explanation of the modelling process. It suggests modelling was done at a PAF/NAF ratio of 0.73:0.27. Three models are presented.
• #70 – Further Information Required: How does the model take into account high Hg and low Hg NAF and PAF materials?
• #71 - Further Information Required: The modelling process needs to be explained in greater detail.
• #72 - Further Information Required: Table 7: Minimum pH data are assigned to minimum concentration data. Generally lowest pH data are assigned to highest concentration data. Could an alternative scenario be modelled where the lowest pH data is allocated to the highest concentrations? Does this materially affect the GHD (2022) model results? AECOM (2022) Section 6.3 states that no limestone amendment is required for Gladstone PAF materials likely to be exposed for < 10 weeks.
• #73 - Further Information Required: Given there are negative ANC data for the materials within the proposed pit, further explanation is required why 10 weeks is considered appropriate. AECOM (2022) Section 6.3.2 notes that the oxidation profile is 8 m in the GOP backfill.
• #74 - Further Information Required: How has the value of 8 m been derived? Is it applicable to all waste rock?
• #75 - Further Information Required: Is any performance monitoring planned to confirm the 8 m depth

A range of predicted concentrations are provided in Table 16. It appears the pH data are reversed with lowest pH assigned to lowest concentrations. Generally, the poorest water quality terms would have the lowest pH values and vice versa.
• #76 - Further Information Required: Please explain the modelling process, particularly why low pH is assigned to lowest concentration data.
• #77 - Further Information Required. Could an alternative scenario be modelled where the lowest pH data is allocated to the highest concentrations? Does this materially affect the GHD (2022) model results?
• #78 - Further Information Required: What estimates are available for nitrogenous compounds in waste rock seepage?

2.9.3 Northern Rock Stack AECOM (2022) Section 6.3.1 discusses the NRS and embankment seepage water quality. It suggests that, where the model is different to TSF1A leachate, the model data are used.
• #79 - Further Information Required: Is this only for concentrations that are elevated as a conservative assumption? Table 10 would benefit from having TSF1A leachate data available to compare these water quality data to understand the model outputs. Please provide the data. Table 10: Minimum pH data has been assigned to minimum concentration data. Presumably this is a function of scenario modelling, which has not been explained.
• #80 - Further Information Required: Please clarify the modelling process.
• #81 - Further Information Required: Why is silver (Ag) not included in this assessment given Ag is part of resource consent water quality monitoring? Leachate from the NRS will be managed by sub-surface seepage drains and leachate collection drains.
• #82 - Further Information Required: Underdrainage is proposed for the NRS. Further clarification is required on how this underdrainage system will be constructed to avoid these drains being oxygen pathways into the core of the WRS contributing to ongoing oxidation and AMD generation.

• #83 - Further Information Required: No details are provided on how the NRS will be constructed to minimise oxidation of sulfide minerals or the mobilisation of contaminants. Further explanation is required in regards to preparatory works, lift height, compaction, NAF/PAF segregation (e.g., NAF on the outside of the structure), cover system design, performance monitoring, and control and treatment of AMD. Design criteria are required.
• #84 – Further Information Required: What are the estimated contaminant loads from this mine domain over the project life?

OGNZL notes that the closure plan for the NRS includes the NRS Collection Pond being converted to a wetland. Once water quality in that wetland is suitable for direct discharge it will be allowed to overflow to TB1 Stream via a spillway. It is unclear what happens to seepage from PAF materials within the NRS. It is assumed this seepage reports to the NRS Collection Pond. This pond is likely to receive seepage from the NRS for a considerable period and possibly the wetland may need to be a passive treatment system.

• #85 – Further Information Required: What data are available to confirm long term water quality trends for the seepage (quality and quantity) for the NRS?
• #86 – Further Information Required: What work has been completed to look at passive treatment systems for this seepage? • #87 – Further Information Required: How long will this system operate, what are the cost estimates, longevity of media etc?

2.9.4 TSF3 It is proposed that 2 Mm3 of material that is unsuitable for use in the foundation will potentially need to be removed.
• #88 - Further Information Required: What geochemical characterisation has been undertaken on these materials? The closure plan summary does not address the long term treatment of TSF seepage.
• #89 – Further Information Required: Please provide performance data for the current TSF (e.g., TSF2) in regards to longer term estimates of water quality and quantity, including contaminants of concern (surface run-off and seepage) and how these relates to discharge criteria.
• #90 - Further Information Required: What is the estimated duration of poor water quality (surface water and seepage) for TSF3 and how this will be managed / treated in the longer term and by what technologies?
• #91 – Further Information Required: Further performance monitoring data is required (e.g., oxygen measurements) to confirm that oxygen is excluded from PAF materials within the embankments of the existing facilities. What oxygen flux rates have been determined (e.g., mol/m2/yr)? 2.10 Tailings and Rock Storage Facility Monitoring Plan It is stated in Section 7.3.4 that PAF materials can be amended with limestone to render such materials NAF if this is required in the future.
• #92 - Further Information Required: To create NAF from PAF requires a certain amount of limestone. Is this a 1:1 ANC/MPA ratio or higher (e.g., 3:1).
• #93 - Further Information Required. An explanation is required on the parameter (Table 7-1) as to what reaction kinetics between time ranges (slow/fast) means.

Trigger values are provided for discharge quality limits. Relationships have been built to address contaminants including Cu, Se, and Mn.
• #94 - Further Information Required: Additional information is required to confirm if this approach is appropriate for the new WNP orebodies that may have different contaminants / higher concentrations, etc. There was agreement to drop B, Ba, Mo, Sr, Th, and Sn from the water quality monitoring suite. However, the independent Peer Review Panel (James Pope) noted that "If ore bodies are developed in future where these metals are enriched then these metals can be reinstated – but currently there is little value in continued monitoring."
• #95 - Further Information Required: Further information is required to confirm these metals are not an issue for the WNP and that these metals do not need to be included in water monitoring. If data indicates that they are elevated (compared to existing orebodies) they should be reinstated as directed by the Peer Review Panel.

3 Groundwater Effects

GWS - Assessment of Groundwater Effects - Tunnel Elements

1. Provide further supporting information regarding management of groundwater flows while tunnelling in Andesite rockmass within existing mines at Waihi, including examples of specific results from interception of producing fracture zones.
2. Estimated groundwater inflows to the tunnels are lower than those reported for the Kaimai Rail tunnel, suggesting there is a risk that the estimated flows could be low. Provide further explanation as to the degree of uncertainty in the inflow estimates and what additional mitigation beyond grouting the main fracture zones will be undertaken.
3. Further, discuss the corresponding uncertainty in the assessment of surface water interception effects.
4. The effects on deep groundwater flows is stated as being localised although cumulatively amount to a significant portion of the Waihi basin water balance. The same may apply to the upper Otahu Basin. Discuss the distribution and magnitude of the effects of dewatering within the wider basins and the effects on basin streamflows.
5. Stream depletion effects in the Mataura catchment from the Willows Farm Access Tunnel are stated to be a small part of tunnel inflows (less than 20%) - provide further information on the uncertainty of this estimate with reference to local hydrogeological conditions.
6. Discuss the deep recharge rates used for the WUG Dual tunnels section of 10% of incipient rainfall in terms of measured stream baseflows or other field measurement. Provide an estimate of baseflow in the Waiharakeke Stream where it is passed by the tunnel and the effect on baseflow.
7. EGL have identified risks from dewatering younger volcanics in the vicinity of the MUG decline and the WUG access decline near the portal. Provide assessment of these risks, possible drawdown extents and mitigative options.

GWS - Summary of Effects on Groundwater

1. The warm spring at WUG. This spring is said to have a flow of around 3 L/s and surface close to the T Stream at an elevation slightly (~ 1m) above the stream. It is inferred to be a mix of deep sourced heated groundwater and fresher shallower groundwater. Its pathway from depth is inferred to rise through the EG vein system. Little further information is provided regarding its flow path from depth. There do not appear to be other springs in the vicinity. Provide a more detailed assessment of the spring characteristics including its passage from depth, the degree of interaction with the vein and shallow groundwaters and an assessment of whether the spring can remain undisturbed by the mining through mine planning and/or other mitigative measures. A pumping test or other stress test may assist with this assessment.
2. A drawdown contour plot is provided in Figure 12 to show the potential extent of dewatering/depressurisation from the WUG. The drawdown appears to be localised within the southern section of the EG vein. Provide a further assessment of the maximum dewatering extent from the entire mine including effects on shallow groundwater/stream flows. In particular comment on the effects on groundwater levels in the EG vein which are stated to be close to stream level and where there is an absence of cover materials. It is acknowledged the report states these matters are the subject of further investigations.
3. Provide an assessment of changes to natural groundwater flows, patterns, spring flows and stream baseflows following completion of mining accounting for changes in pathway permeability from stope backfill, open tunnels and other disturbances.

GWS - AGE - WKP

1. Provide a plan contour maps of the deep and shallow groundwater system watertables in Area 1

GHD - GW Assessment for Gladstone Pit, Northern Rock Stack and TSF3

GOP/TSF

1. The E-W section line used for analysis of the groundwater effects doesn't appear to align with the SW extension of the vein system where permeability conditions would be expected to be higher. Explain how this was taken into consideration in the assessemt of the zone of influence assessment and the assessment of leakage losses from the Ohinemuri River.
2. Fig 3.14 shows a triangular area for the extent of unsaturated deep andesite. Clarify how this was developed and how the configuration of this unsaturated zone was taken into account in the estimation of effects from the GOP/TSF.
3. Table 3.9 provides estimates of effects on Ohinemuri water quality from long term discharge of seepage water from under the TSF. Please confirm what river flow conditions were used for this assessment.

NRS

1. Modelling of the discharge of leakage through the liner indicates an ongoing flux to the Ohinemuri River. It is understood that the River in this reach is neither gaining or loosing. Provide an assessment of the possible plume configurations and fate d/g of the NRS given this likely situation. Discuss the influence of the underlying paleochannels on the plume fate.
2. It is not clear in the assessments how the presence of the existing NRS affects the assessment for the new NRS. Provide an explanation of how this has been incorporated.

Flo Solutions - Updated Conceptual Model EG Vein

1. Recommendations are made for further investigation of shallow groundwater conditions especially over the main veins (EG Vein), stream bed conductance and groundwater/surface water interaction. It is understood that the current conceptual model infers separation of the shallow and deep vein groundwaters but current time series monitoring appears to be inconclusive. Provide further information to support the inferred separation of the shallow groundwater/surface water from the deep vein groundwater, critical information for effects and mitigation assessment . Hydraulic stress testing the model through pumping tests is considered one of the more reliable methods for this purpose.
2. Provide the current understanding on the boundaries, characteristics and configuration of hydrostratigraphic units in the WUG area (Area 1).

Valenza Engineering - WKP Underground Mine, Conceptual Mitigation

1. In sections 5.3.4 and 5.3.8, 8 lists of data gaps and proposed further investigations are provided. We understand that these further investigations will be progressed as proposed in this report. Please provide further information as identified in these lists as it becomes available.
2. Proposed condition 5 "No measurable effect" relies on a thorough understanding of the natural flow regimes of the streams potentially affected by the mining works. Provide details of the scope, duration and nature of the baseline information that will be required to provide certainty that "a measurable effect" can be quantified.

4 Ecological Matters

1. **Warm Spring**
    a. Could Boffa please provide more information to support their conclusion that the ecological value of this spring is **low** and the effect of the loss of the spring is **low**. Does Boffa consider that all values of this spring are captured by the adapted EIANZ method that has been used to assess value? For example, given that it is the only example of its type in the catchment,

has the uniqueness of this ecosystem been factored into their assessment? Is MCI is an appropriate indicator of ecological value for this ecosystem?

b. I note that the algae present at the site has not been identified (listed as unknown in the Boffa report). I would recommend that identification be undertaken, given that it appears to occur only in the spring (and not in the main stream). The significance of this algae can then be considered in the assessment of ecological value.

c. I note the comment that cessation of the spring will "improve" water quality of Wharekirauponga Stream. Based on the ecological results for sites downstream of the spring, there does not appear to be any significant impact on ecological values (MCIs 113.8 and 129.8, QMCIs 6.2 and 7.3, % EPT 64.1 and 69.3). Could Boffa please provide evidence to support the statement that water quality downstream of the spring will be improved (and what the significance of any improvement would be in terms of ecological values).

2. Unnamed Tributary, Mataura River, Trib B Ecological Value

a. Could Boffa please provide justification for the rating of low ecological value for this site (rather than moderate). When compared against values of key indicators for other sites (see below) there appears to be an inconsistency in their assessment. The implication of this difference in ecological value is that the magnitude of effect is higher and thus the effects management or mitigation may be greater than what is currently proposed.

Site	Gladstone	RUA_Revegetated	RUA_Lower	RUA_Upper	RUA_Forest	RUA_Trig_Road	TB1_Lower	TB1_Upper	Mataura Unnamed Trib B
MCI	91	83	74.1	110	115	82	82.3	93.6	96.2
%EPT	0	?	23	34	32	21	23	24	21
Fish IBI Score	0	26	40	30	30	18	18	18	20
Fish IBI Category	Poor	Good	Excellent	Very Good	Very Good	Poor	Poor	Poor	Fair
SEV Score	0.617	0.575	0.435	0.532	0.850	0.403	0.501	0.409	0.594
SEV Category	Good	Moderate	Moderate	Moderate	Excellent	Poor	Moderate	Moderate	Moderate
Ecological value	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Low

3. Ecological Compensation Ratios (ECR) and proposed mitigations

a. Could Boffa please provide the calculations used to derive the ECRs and proposed mitigations for all sites. This should include a table presenting the current and potential SEV values for the site to be impacted and the site where environmental compensation is to be applied, as well as the predicted SEV value of the site to be impacted, after impact. At present it is not possible to determine how the values in Table 9-1 have been obtained.

b. I note that in some cases the mitigation site is not functionally the same as the impact site (e.g. cold headwater springs are mitigation sites for a permanent warm spring). How is this difference dealt with in the ECR calculations and resulting stream lengths?

c. I note that the NRS diversion is proposed as a mitigation site. Given that this diversion does not exist, how has a current and potential SEV value been calculated for this mitigation site? How has the delay in the establishment of this mitigation site been considered in the ECR calculations?

d. There appear to be inconsistencies in the stream lengths being impacted in different tables in the report. For example, the Executive Summary notes 2111m of the Ruahorehore Stream will require diversion associated with TSF3, whereas Table 9-1 in Appendix 1 totals 2428m. Similarly there is a slight difference for TB1. Could Boffa please confirm the correct stream lengths that are to be impacted.
e. Could Boffa please provide further details of the proposed timing of stream diversions and stream offset restoration works, given that the early timing of these works is used as a justification for a lower than recommended multiplier for the ECR calculations.

4. OGNZL examples of successful stream restoration

f. Section 22.5 mentions examples of successful stream restoration on the Ohinemuri River and Ruahorehore Streams which has resulted in improving ecological function of the watercourses. Is Boffa able to provide more details on these examples, particularly evidence for improved ecological functioning?

5 Air Quality

1. Appendix F of the Beca (2022) Air Discharge Assessment – Waihi Facilities (Part H – Section 2) provides a specific assessment of the Processing Plant Air Discharges. This report provides further clarity and discussion around emission control for the Carbon regen plant mercury emissions with specific consideration of proposed amendments to the NESAQ for control of mercury emissions in order to ratify NZ's commitment to the Minamata Convention on Mercury. The finalised report does provide more clarity around this with regards the modelled emission scenarios and discussion of the proposed amendments to the NESAQ which I agree are not a current regulation, only proposed and also potentially not relevant to this activity which is an existing activity.

   However, the proposed Waihi North Project will result in a significant increase in mercury emissions compared to the current situation. While it is good to see that these emissions will be significantly reduced by installation of a retort oven for the oven/furnace stack emissions which is the main source of mercury emissions, it is worth pointing out that without the Retort oven control, the Carbon Regen emissions contribute around 35% of the mercury emissions from the proposed operation. With the retort oven control, the Carbon Regen emissions will contribute 93% of the mercury emissions. In addition to this, while dispersion modelling indicates that with the retort oven emission control, maximum offsite ground level concentrations at a sensitive receptor will be well within the annual OEHHA guideline for mercury. However, that predicted ground level concentration is around 25% of the guideline compared to 0.05% of the guideline for the current consented activity. While I agree that effects on residents in the area will be no more than minor, there will be a significant increase in mercury being dispersed in to the environment and there is a clear signal both nationally and internationally that we need to be reducing mercury emissions where practicable. I would therefore, on this basis, **request further discussion on how practicable it is to install mercury emission control on the Carbon Regen plant.**

7 Cultural Values

WRC requires an assessment of cultural values. Therefore, further information is requested to aid WRC in assessing the cultural values associated with the Waihi North Proposal. I understand that the Company is currently engaged with all Iwi/Hapu identified as having an interest within the areas of the proposal. Further, I understand that cultural values assessment and/or cultural impacts assessment are proposed to be supplied by most (if not all) identified Iwi/Hapu.

The supply of these reports will be valuable to aid in identifying of Iwi/Hapu values where appropriate for this proposal.

6 Planning Matters

- There are currently some 83 consents held for the various mines and operations associated with the Waihi Goldmine. The Company has applied for multiple consents – some of which overlap in area and also overlap with existing consents currently held for the site. Which consents are proposed to be replaced with the consents associated with the new consents (should they be granted)? It would be helpful to have a table which identifies which existing consents are proposed to be replaced and which ones are to remain.
- Some of the consents actually applied appear to consist of permitted activities. WRC is not able to grant consent for permitted activities so it would be useful to have clarity around what consents are required and which aspects of the proposal are permitted. Please provide a table which identifies which aspects of the proposal are permitted and which ones actually require consent.
- Within the application documentation only one Area of the project has been assessed as requiring an assessment of the NES-DW policy. There are a number of drinking water supplies downstream of the entire site (admittedly significantly downstream) which in my opinion means that this NES would need to be assessed for all Areas (1-7). Please provide an assessment of this NES for all Areas of the project.

7 Other Matters

- Proposed conveyor upgrades – where in the proposal are these described in detail?
- Household roof solar systems - with a number of Community members having or moving to solar panels on household roofs what would the effect be on these systems from the proposed earthworks e.g. during the peak earthworks and over the proposed life time of the new mine?

The RMA requires that, within 15 working days of receiving this request, you must respond to the Waikato Regional Council in one of three ways, as follows:

1. Provide the information requested; or
2. Advise in writing that you agree to provide the information; or
3. Advise in writing that you refuse to provide the information.

Should you agree to provide the information, please confirm this in writing and please advise a date in which the Company expects to supply the information.

The date for a response to this letter is on or before **9th September 2022**.

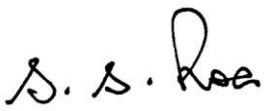
Please advise the Waikato Regional Council of any delay in replying to this letter.

Should you refuse to provide the information or not provide it within the period specified, I advise that Waikato Regional Council is required to publicly notify the application and that following public notification, we may decline your application if we consider we have insufficient information to enable us to make a decision on your application.

I advise that processing of your application will be placed on hold from the date of this letter to the date of receipt of the information requested, or if you refuse to provide the information, the date of receipt of that advice.

Should you require any further information with regard to the above, please contact me via email at sheryl.roa@waikatoregion.govt.nz

Yours faithfully



Sheryl Roa
Principal Advisor - Consents
Resource Use

Appendix 1

ABBREVIATION DEFINITIONS
ABA Acid base accounting
AMD Acid and metalliferous drainage
ANC Acid neutralisation capacity
ARD Acid rock drainage (acid drainage elevated in toxic metals)
As Arsenic
Cd Cadmium
GAI Geochemical Abundance Index
GOP Gladstone Open Pit
Hg Mercury
MCA Multi criteria analysis Mt Million tonnes
MOP Martha Open Pit
MPA Maximum potential acidity
MWM Mine Waste Management Ltd
NAF Non-acid forming (material classification category)
NAG Net Acid Generation (test)
NAPP Net acid production potential
NRS Northern Rock Stack OceanaGold OceanaGold New Zealand Limited OGNZL OceanaGold New Zealand Limited
PAF Potentially acid forming (material classification category)
PTEL Potential for trace element leaching
QA/QC Quality assurance and quality control
Sb Antimony
Se Selenium
TSF Tailings Storage Facility
UC Uncertain (material classification category)
WNP Waihi North Project
WRC Waikato Regional Council | Te Kaunihera ā Rohe o Waikato
WRS Waste Rock Stack
WTP Water Treatment Plant
WUG Wharekirauponga Underground Mine