

**IN THE MATTER**

of the Resource Management Act 1991

**AND**

**IN THE MATTER**

of an application by Oceana Gold (New Zealand) Limited for resource consents to extend the Waihi Gold Mine via underground and open pit mining methods known as Project Martha

**Date 19 November 2018**

## **STATEMENT OF EVIDENCE OF JONATHAN PAUL CALDWELL**

### **1 INTRODUCTION**

- 1.1 My full name is Jonathan Paul Caldwell. I am employed by the Waikato Regional Council (the "WRC") as a senior scientist (environmental chemist). I have worked for the WRC since January 2007. Prior to this I worked for seven years as a research scientist at the Wool Research Organisation of New Zealand. I have a Doctorate of Philosophy degree and a Master of Science degree from the University of Waikato majoring in chemistry. I am a member of the Clean Air Society of Australia and New Zealand and the Australasian Land and Groundwater Association.
- 1.2 My responsibilities at the WRC include coordinating and providing science support for the council's regional air quality monitoring programme, science support for council's contaminated land programme, and in a general advisory capacity as a technical specialist in chemical contamination issues relating to air, land and water. I have also had previous regulatory involvement at WRC in the processing and compliance monitoring of air discharge resource consents.
- 1.3 I have read and agree to comply with the Code of Conduct for Expert Witnesses contained in the Environment Court's Practice Note 2014.

## **2 GENERAL**

- 2.1 I have provided consent officer, Ms Sheryl Roa, with a technical review of the assessment of environmental effects. This review is appended to Ms Roa's section 42A report.
- 2.2 I do not propose to read this review verbatim but instead present specific comment on further matters that have arisen since my review was completed.

## **3 FURTHER MATTERS RAISED BY SUBMITTER Mr LANCE LAPWOOD**

- 3.1 Submitter Mr Lance Lapwood raised concern in an email to Ms Sheryl Roa on 7 November, regarding my opinion (page 6, paragraph 4 of my Technical Review) that PM<sub>2.5</sub> concentrations should also meet relevant guidelines despite the absence of any specific monitoring of PM<sub>2.5</sub> to date.
- 3.1 I provided the following response by email to Lance on 9 November: "With regards to my assumption that PM<sub>2.5</sub> concentrations should meet relevant guidelines, this is based on knowledge that discharges to air from mining and quarrying activities will have a much higher proportion of particulate matter in the coarse range i.e. 2.5 micron size to 10 micron size range. Therefore if PM<sub>10</sub> guidelines are currently being met then there is a high level of certainty that PM<sub>2.5</sub> guidelines will be met. This is not however the case when combustion related emissions are the main source of particulate matter. I have PM<sub>10</sub> and PM<sub>2.5</sub> monitoring data from both Hamilton and Tokoroa that provides evidence of this. In addition to this recent monitoring of PM<sub>10</sub> and PM<sub>2.5</sub> at the Yaldhurst quarry in Christchurch also shows evidence for this. Also, the ministry for the environment recently engaged NIWA to estimate the annual PM<sub>2.5</sub> and PM<sub>10</sub> concentrations for Waihi and the prediction is that Waihi's annual PM<sub>2.5</sub> concentration is likely to be around half the World Health Organisation annual average guideline. I acknowledge however that it could have been useful for me to have referred to this information in justifying my assumption".
- 3.2 In addition to my response to submitter Mr Lapwood on 9 November, I also provided him with a copy of the Air Quality Monitoring Report (Waikato Regional Council Technical Report 2012/06) which summarises the PM<sub>10</sub> monitoring undertaken in Waihi by WRC over the period

January 2008 to January 2012 and a spreadsheet of the daily PM<sub>10</sub> data that was collected over this period.

3.3 I understand that Commissioner Robert van Voorthuysen has asked WRC to address four matters raised as a result of Mr Lapwood's submission presented at the Environment Court Hearing on Thursday 15 November which I will address in the following paragraphs.

3.4 **What the effect of the plume rise is (with reference to section 3 of Lance's submission)?**

In response to this question I have read through section 3 of Mr Lapwood's submission. The information provided in this section includes various descriptions of both passive and actively engineered plume rise and downwind transport. I cannot find anything in the information provided that I would disagree with. I specifically agree with the comments "Where control of pollutant emissions is impossible ... ensure dispersion over a wide area to prevent objectionable ground level concentrations" and "The addition of exhaust fans in the Martha Pit should aid Plume rise from the Martha Pit." While I do not have expertise in air dispersion modelling, I have had experience in assessing the results of numerous air dispersion models provided to WRC in support of air discharge consents and have had the opportunity to see the validation of models from actual downwind ambient monitoring. In my opinion, active aiding of plume rise within the Martha Pit, will increase the dispersion of air pollutants across a much larger area of Waihi and beyond. What this means is that the smaller particles that remain airborne for longer (and have the potential for more significant impact on human health) will become well diluted at downwind ground level locations. In summary, actively aided plume rise will result in a lower level of effects.

3.5 **Whether there is a need for field air quality monitors in terms of contaminants?** In

response to this question I am assuming that this question relates to Section 4 of Mr Lapwood's submission which relates to Air Quality Monitors. Firstly, I would comment that there has been previous and current monitoring over an extended period of deposited dust, TSP, PM<sub>10</sub> and associated silica content beyond the site boundary at various locations around the pit. The monitoring of combustion related gases, nitrogen dioxide and carbon monoxide have also been monitored within the site boundary for purposes of workplace exposure.

- 3.6 Mr Lapwood has raised concern that the monitoring has been undertaken close to the Martha pit and that due to plume rise the fine particulate will be transported well away and will by-pass the dust deposition gauges. With regards to this concern, it is important to note that the dust deposition gauges are designed to monitor nuisance dust effects in close proximity to the source. They are monitoring nuisance dust, the larger particles that will not remain airborne for long but will settle out at reasonably short distances from the source. For monitoring of TSP (particles smaller than 50 microns) and PM<sub>10</sub> (particles smaller than 10 microns) that will travel further, the sites have been located at various distances from the pit boundary ranging from 75 metres to 630 metres with the silica monitoring undertaken at about 300 metres from the pit boundary. WRC's previous air quality monitoring station was located on Grey Street approximately 220 metres from the pit boundary. The approximate distance from the northwestern area of the Martha Pit where above ground excavation will take place is approximately 400 to 500 metres from the downwind monitoring sites on the east and northeastern side of the pit. The approximate distance from the proposed underground portal vent to the general area of the Grey Street monitoring sites to the east and northeast of the pit (downwind location) is around 750 metres.
- 3.7 With reference to the graph presented by Lance in section 3 of his submission, I would estimate that the current distances of the TSP monitoring stations on the downwind side of the pit are within a suitable range, bearing in mind that windspeed will also have an impact on dispersion and downwind distance travelled by particles. With reference to recent air monitoring at the Yaldhurst Quarry in Christchurch, I would note that there were five monitoring sites set up at distances of 50 to 190 metres from the quarry boundary with a sixth site located 4.8 km from the site and PM<sub>10</sub> concentrations were identified as being highest at 50 metres from the boundary.
- 3.8 In my Technical Review I have recommended that optical dust monitoring capability is installed on both the eastern and western sides of the pit which should help to provide real time monitoring of airborne particulate with the ability to match this against hourly windspeeds and wind direction from the meteorological station.

3.9 In summary, I don't see the need for further field monitoring apart from what is currently being undertaken and with the addition of two continuous optical based dust monitoring instruments.

3.10 **Whether there is a need for emission testing?** I gather that this question relates to Section 4 of Mr Lapwood's submission where he advocates for emission testing of the ventilation stacks. In my opinion it would be better to continue with the current offsite monitoring approach with the additional two continuous monitoring devices as there are plenty of fugitive emission sources within the pit boundary that would not be addressed by this point source emission monitoring. However, as per my Technical Review, appended to the section 42A report, I recommend an additional round of emission testing (NO<sub>2</sub>, CO and PM<sub>10</sub>) within a 12 to 18 month period after underground excavations have commenced during a representative blasting operation for comparison with the previous emission testing undertaken in 2007. A review would be triggered if emission testing indicated potential for national environmental standards to be exceeded beyond the boundary of the site. I gather that the applicant has already agreed in principal to such monitoring and that it will just be necessary to agree on the specific detail of this testing.

3.11 **Monitoring of fine particles raised in section 5 of Lance's submission.** Under Section 5 of Mr Lapwood's submission, he raises concern that the particle monitoring programme has not included monitoring of respirable silica in the fine range i.e. from 2.5 microns and smaller. And also that while there has been no assessment of PM<sub>2.5</sub> the Resource consent certificate clearly states that the consent holder shall undertake monitoring of fine particulate and silica. In response to this, I would note that there is much confusion around the terminology given to particle sizes. The use of fine particulate has over the years been interchangeably used to identify both PM<sub>10</sub> size particle ranges and also PM<sub>2.5</sub> size particle ranges. At the time the previous consent was granted, the term fine particulate was usually used to identify the PM<sub>10</sub> range of particles. More recently, the term fine particles is used to identify the PM<sub>2.5</sub> range of particles with the range of 2.5 to 10 micron size particles referred to as the coarse fraction. With regards previous monitoring of the silica content of the PM<sub>10</sub> size particles it is important to note that this approach is actually a conservative approach

because the silica concentrations have been compared to the annual average guidelines which are based on respirable ( $PM_{2.5}$  range) particles. The  $PM_{10}$  concentration should always be higher than the  $PM_{2.5}$  concentration as  $PM_{2.5}$  is a subset of  $PM_{10}$  and therefore the silica content of  $PM_{10}$  will actually be higher than the silica content of  $PM_{2.5}$ . I therefore do not have any concern about the previous monitoring of silica which I consider to have been a conservative assessment as described on pages 4 to 6 of my Technical review.