IN THE MATTER OF the Resource Management Act 1991

AND

IN THE MATTER OF Application RM24.184 by Oceana Gold (New Zealand) Limited for various consents relating to the Macraes Phase Four mine expansion

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EVIDENCE OF

JOHN GRAHAM ISELI

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1 Introduction, Qualifications and Experience

1.1 My full name is John Graham Iseli. I hold a Master of Science degree from the University of Canterbury. During the past 31 years I have worked on air quality matters in New Zealand as an Air Quality Scientist, Hearings Commissioner and Consents Auditor. I have provided air quality advice to councils, central government and industries and prepared numerous decisions on consent applications to discharge contaminants to air. I am experienced in the assessment of air quality effects for processes discharging particulate matter, including large mining and quarrying operations.

1.2 I have been a director and Principal Air Quality Scientist with Specialist Environmental Services Limited (SESL) for the past 25 years. During this time, I have reviewed discharge to air applications and assessed the environmental effects of emissions to air from a wide range of industrial and commercial facilities throughout New Zealand. I have presented air quality evidence at numerous resource consent hearings, including at the Environment Court. I have prepared assessments of effects (as part of consent applications) for a wide range of activities that discharge contaminants into air, including particulate matter discharges from quarries, earthworks and various industrial sites.

1.3 My work has included significant technical input to various Regional Air Plans. I am regularly employed by several councils in New Zealand to undertake expert peer reviews of air discharge permit applications and to provide technical advice on air quality matters. I have

acted as peer reviewer for a number of previous OGL applications at the Macraes mine site, including the Frasers West, Golden Point Underground and Deepdell applications.

1.4 I have been appointed as a commissioner to hear and determine resource consent applications on more than 90 occasions over the past 20 years, being certified by the Ministry for the Environment as a Resource Management Act Decision Maker and Hearing Panel Chair. I have sat on hearings of major proposals with air quality impacts, including from large scale quarries.

2 Code of Conduct

2.1 I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2023. My report has been prepared in compliance with that code. The opinions expressed are within my sphere of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

3 Scope of Evidence and Material Reviewed

3.1 My evidence will address the following matters:

- The proposal
- Contaminants assessed
- Sensitive Receptors
- Local Meteorological Conditions
- Existing Monitoring Information
- Mitigation measures and the dust management plan
- Dust nuisance effects
- Health effects
- Greenhouse gas effects
- Proposed monitoring
- Comments on submissions
- Consent conditions.

3.2 I have reviewed the following material:

- The Beca Ltd (Beca) assessment of effects (AEE) of the discharges to air from the MP4 mine expansion.
- The further information request response provided by Beca, dated 4th October 2024 (the Beca RFI response).
- The consent conditions for the air discharge permit proposed by OGL in April 2025.
- The submissions on the applications.

Site Visit

3.3 I visited the existing mine site on 11th June 2024, along with ORC staff and other peer reviewers. We were shown the various MP4 mining areas by OGL staff. I was also able to observe the locations of the nearest existing dwellings and other sensitive receptors to the proposed mine sites and haul roads.

4 Executive Summary

4.1 The primary contaminant discharged from the proposed mine expansion at Macraes Flat is particulate matter (PM). Key emission sources are loading and unloading of waste rock and ore, vehicle movements on haul roads and site areas, and wind action on dry surfaces. Beca has assessed the nuisance dust effects and health effects associated with particulate matter discharges.

4.2 Sensitive receptors that could be affected by the discharge have been appropriately identified by Beca. I consider that the potentially most impacted sensitive receptors (dwellings) are Receptor R1 (1668 Macraes Road), approximately 650m west of the haul road and 1km west of the Innes Mills MP4 area, and Receptor R5 (406 Horse Flat Road), approximately 1km west of the haul road and 2.2km south of Coronation Pit. Other sensitive receptors in the vicinity of Macraes Village are at greater distance from mining activities. The Macraes Moonlight School is approximately 1.8km from the proposed mining areas.

4.3 Dust deposition monitoring indicates that for the majority of the time during 2019 to 2022 deposition associated with existing mining activities has been within the consent limit of 3g/m^2/30 days above background. Suspended particulate monitoring data indicate that PM emissions from current mining activities have generally been within acceptable levels to prevent significant dust nuisance effects. The complaints record supports this view.

4.4 Haul roads can be a major source of dust and are closer to sensitive receptors than the mining areas. Provided good mitigation is diligently applied, particularly in relation to the haul roads and proposed tailings storage facility, I agree with Beca that significant dust effects are not expected to typically occur at receptors over 400m from the source. However, the analysis of complaints relating to the existing mining activities indicates that dust effects can extend well beyond this distance on occasion. Dust complaints have occurred from Receptor R5 (Horse Flat Road) at a distance of approximately 1km from the haul road.

4.5 I conclude that adverse dust nuisance effects at Receptors R1, R5 and other receptors at greater distance from the dust emission sources are likely to be minor. The complaints

record and TSP monitoring for recent years indicates a good level of compliance with conditions of the existing consents. Good practice dust control and monitoring will need to be implemented via the Dust Management Plan to achieve this outcome.

4.6 In relation to potential health effects, monitoring information for PM_{10}, $PM_{2.5}$ and RCS has been presented by Oceana Gold. The results are in line with expectations and are generally consistent with monitoring results I have reviewed for a 2018 study undertaken adjacent to a large area of aggregate quarries at Yaldhurst, Christchurch. Taking into account the separation distances from the proposed MP4 activities to neighbouring dwellings and other sensitive receptors, I consider that the monitoring indicates that the discharge of fine particulate matter and RCS from mining and associated activities is not likely to cause adverse health effects.

4.7 Generally appropriate mitigation measures have been proposed and are implemented via the Dust Management Plan. However, a high vehicle speed limit of 60kph is specified. Good practice mitigation will be required, including ongoing watering of the haul roads. Continuous monitoring of TSP at a location west of the central mining area and haul road, with appropriate short-term trigger levels, is recommended to assist the consent holder in maintaining appropriate dust control. The suggested monitoring site would be upwind of the village during easterlies and therefore well sited to allow reaction to dust emissions from the major area sources and haul road in proximity to sensitive receptors in the village.

4.8 Greenhouse gas emissions have been described cumulatively across the mining site. While the assessment indicates an overall reduction in GHG emissions due to mitigation, the application is not clear if any specific reduction measures are proposed as conditions of consent. It is expected that this will be clarified in evidence from the applicant.

4.9 I have commented on relevant matters raised in the submissions of Mr Geels and Mr Roy.

4.10 The proposed consent conditions are generally appropriate. However, I recommend some additions and amendments that primarily relate to monitoring of the discharges.

5 The Proposal

5.1 Oceana Gold (New Zealand) Ltd (OGL) operates a large existing open cast and underground gold mine at Macraes Flat, Otago. OGL is seeking a resource consent for the discharges to air from mine extensions as follows:

- at the Coronation Pit (Stage 6),
- backfilling Coronation North Pit,
- backfilling in Golden Point Open Pit,

- extension of Innes Mills Pit (Stages 9-10),
- backfilling of Frasers and Innes Pits and development and operation of Frasers Tailings Storage Facility (FTSF) all in the main central mine area, and
- extension of Golden Bar Pit (Stage 2) and associated waste disposal to the south.

5.2 The proposed mine extensions and associated waste and tailings disposal features are predicted to increase the life of the mine by approximately three years to around 2030 and are collectively called the Macraes Phase 4 Stage 3 development project (MP4).

5.3 The project generally involves mining of waste rock and ore, the transportation of material and the disposal of waste rock in stacks or backfilling of retired and active pits. The mining operations will move around the site and the mining machinery will be redeployed in new locations as required. The application states that only one additional excavator is planned, therefore the level of mining activity from the whole site will remain of similar scale but occur in different locations.

6 Contaminants Assessed and Emission Sources

6.1 I concur with Beca's assessment that the primary contaminant discharged from mining and associated activities is total suspended particulate (TSP). The discharge will include inhalable fine particles PM_{10} and to a lesser degree $PM_{2.5}$ and Respirable Crystalline Silica (RCS). Larger particulate matter (PM) particles have potential to cause nuisance dust effects, whereas PM_{10}, $PM_{2.5}$ and RCS have potential to cause adverse health effects.

6.2 Beca states that the key sources of dust discharges from the project activities include the following:

- Loading and unloading of mined waste rock and ore,
- Vehicle movements on unpaved haulage roads and site areas,
- Wind action on dry exposed surfaces.

6.3 I agree that these are the primary sources of TSP emissions from the mine site. Dust emissions from vehicles on haul roads can be significant if mitigation is not diligently applied, given the relatively high vehicle speed limit of 60kph proposed. In terms of the scale of mining activities, there are large areas of exposed surfaces subject to wind action. Dust discharges from these areas can be significant during strong winds. Tailings storage facilities such as the proposed FTSF can generate substantial dust emissions if surfaces become dry and therefore diligent management is required.

6.4 Beca's assessment has focussed on dust nuisance effects. Based on my conclusions regarding potential health effects of PM_{10}, $PM_{2.5}$ and RCS in Section 7, I consider that this approach is appropriate.

6.5 Diesel combustion in trucks and other vehicles will result in discharge of combustion products, including PM, nitrogen oxides, sulphur dioxide and carbon monoxide. Taking into account the large separation distance to sensitive receptors from mining activities and haul roads (discussed in Section 7), I concur with the assessment that any adverse effects of combustion products will be less than minor.

6.6 The AEE includes an assessment of Greenhouse Gas (GHG) emissions from the proposal. GHG emissions are discussed further in Section 13.

7 Sensitive Receptors

7.1 The AEE has identified the separation distances from each of the proposed activity areas to the nearest sensitive receptors, primarily rural dwellings. I agree that these stated separation distances are approximately correct, subject to clarification regarding receptors to the east of Macraes village discussed below.

7.2 Sensitive receptors are identified in Table 4-1, page 23 of the Beca AEE. Further information was sought in relation to identification of receptors east of the village. The Beca RFI response confirmed that the dwelling identified as Receptor R9 is a shed on land owned by OGL. Therefore, the closest habitable existing dwelling to mining activities east of the village is R1.

7.3 I consider that the potentially most impacted sensitive receptors (dwellings) are:

- R1 (1668 Macraes Road) approximately 650m west of the haul road and 1km west of the Innes Mills MP4 area;
- R5 (406 Horse Flat Road) approximately 1km west of the haul road and 2.2km south of Coronation Pit.

7.4 Other sensitive receptors in the vicinity of Macraes Village are at greater distance from mining activities than R1. The Macraes Moonlight School is approximately 1.8km from the proposed sites.

7.5 Beca has classified the school as high sensitivity and the dwellings as medium-high sensitivity. I agree that the school has high sensitivity to PM discharges from mining. I also agree that isolated rural dwellings will have moderate to high sensitivity to dust from mining

activities, as indicated at page 24 of the Good Practice Guide for Assessing and Managing Dust[1] (GPG Dust).

7.6 The location of receptors in the Macraes village area is shown in the image below, taken from the Beca AEE. Note that Receptor R9 (shed) is no longer classified as a sensitive receptor and the correct address for R1 has been confirmed by Beca as 1668 Macraes Road.

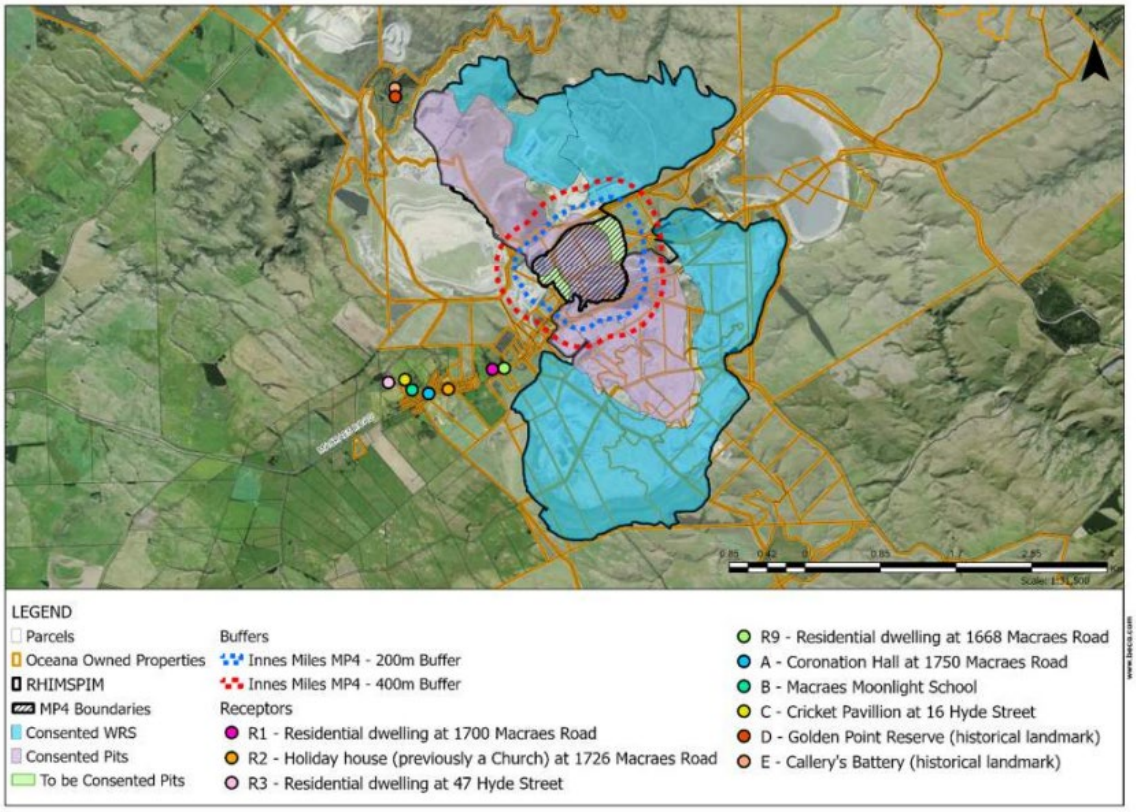

Figure 3-4. IM and Frasers Pit sensitive receptors

7.7 A more detailed view of the Macraes village receptors is shown in the figure below, reproduced from the Beca AEE.

[1] Ministry for the Environment, 2016. Good Practice Guide for Assessing and Managing Dust. Wellington, 2016.

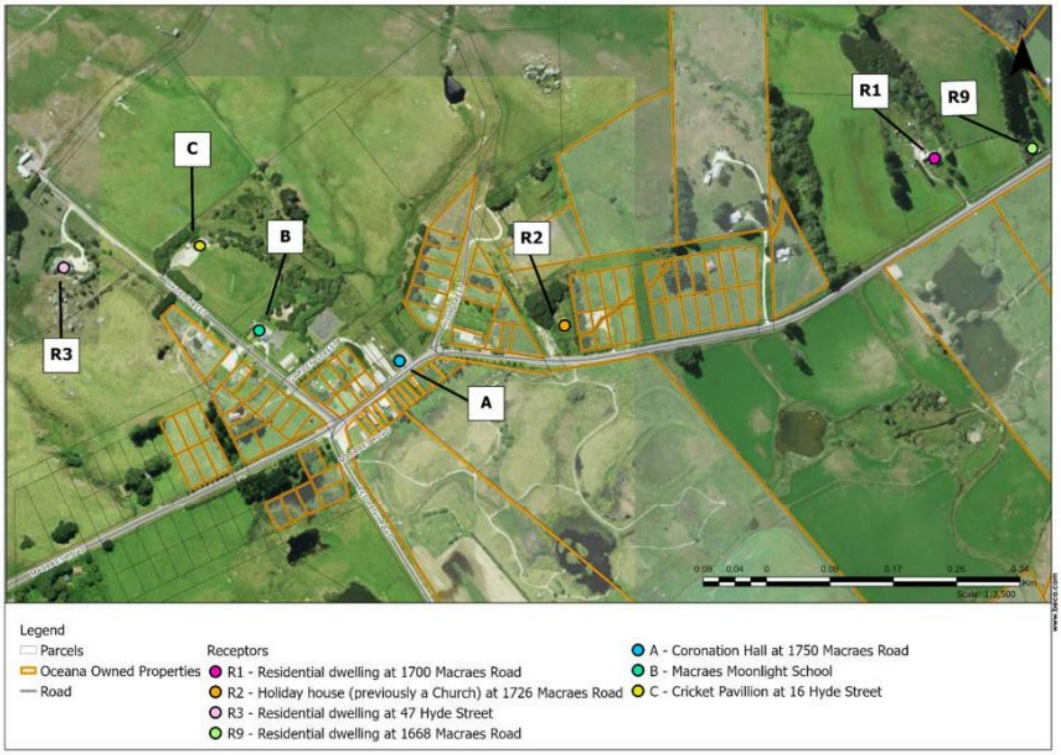

Figure 3-5. Location of Macraes township sensitive receptors

7.8 The location of Receptor R5 at Horse Flat Road is shown in the image below, reproduced from the Beca AEE. The location of the haul road is visible on the aerial image.

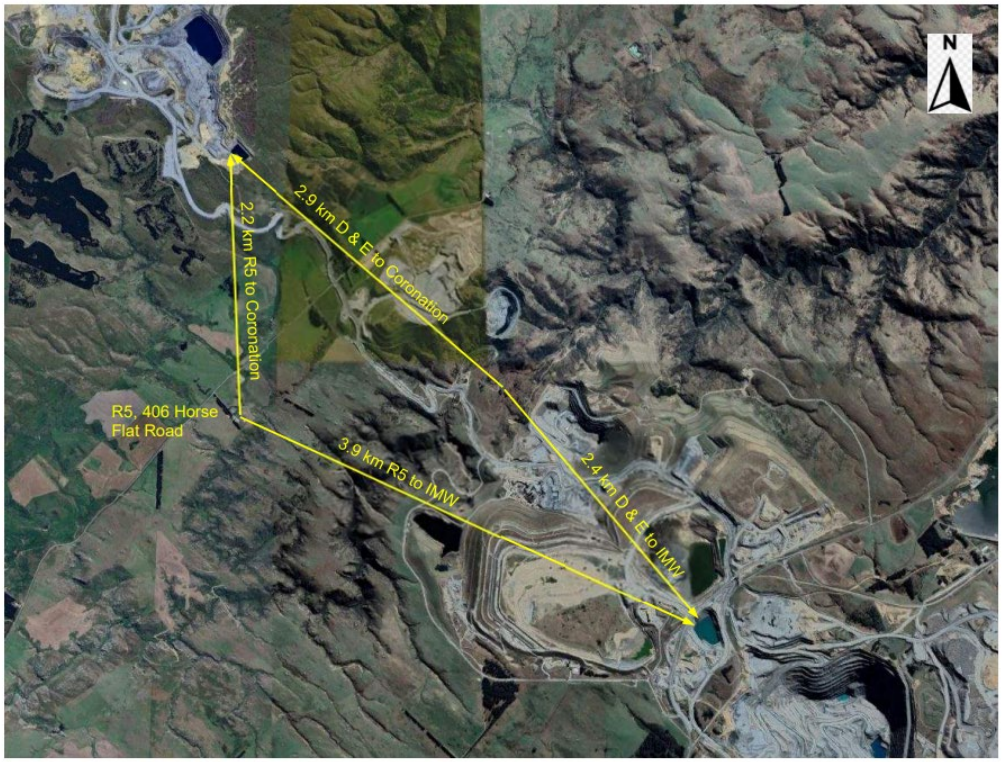

Figure 3-3. Receptor R5, D & E separation distances

7.9 Two potential dwellings are shown on aerial photographs that are located on land owned by OGL to the east of Receptor R1. These dwellings are shown in Figure 1, provided by OGL in response to the request for further information. OGL has provided evidence that the dwelling at 1644 Macraes Road is a derelict house. I am satisfied that this dwelling is unlikely to be occupied. The other dwelling is the Gay Tan Historic Cottage. The cottage has historic value but is unlikely to be occupied based on the interior photographs provided by OGL.

Figure 1. Aerial image showing the location of uninhabited buildings east of Receptor R1 (image provided by OGL).

8 Local Meteorological Conditions

8.1 Meteorological monitoring occurs at sites DG03 and DG15 close to Macraes village. Beca has provided wind roses of the recorded data for 2018 to 2022, shown in the image reproduced below. The wind roses indicate that prevailing winds are from the southwest, northwest and northeast quarters. The strongest winds blow from the northwest and southwest quarters.

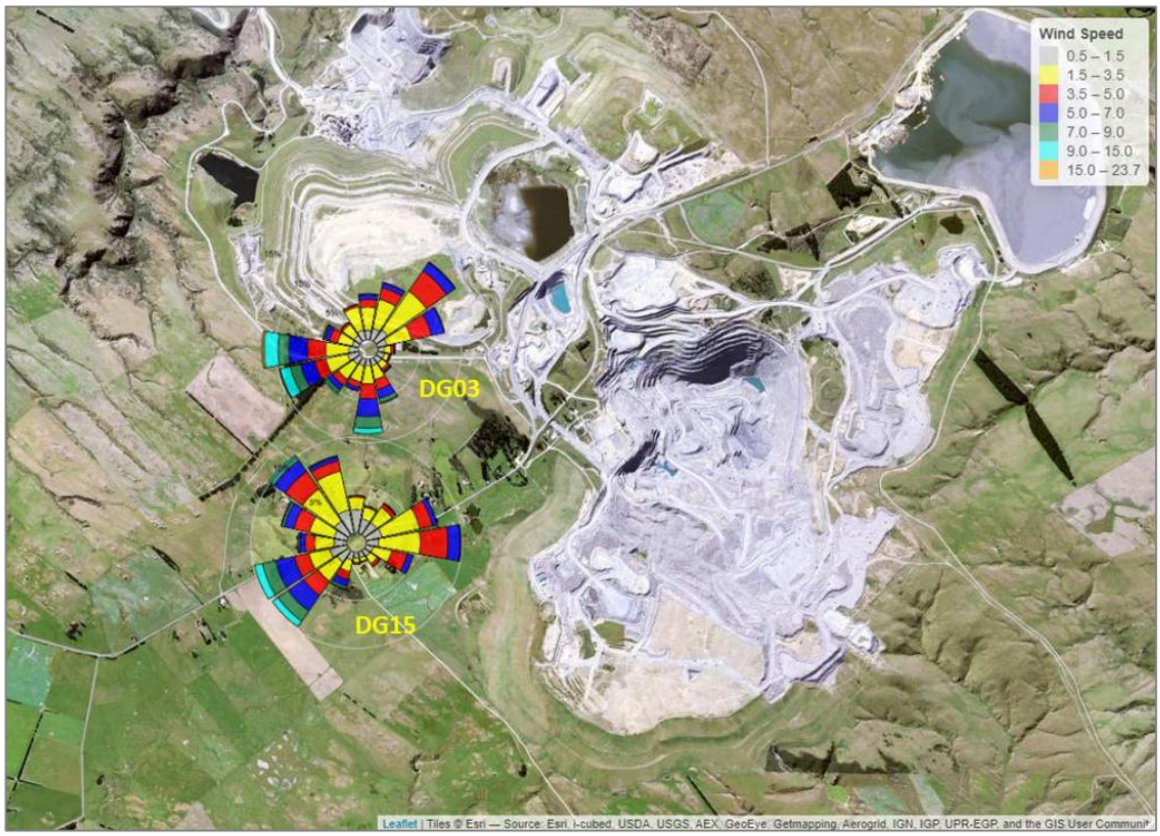

Figure 6-2. Sites DG03 and DG15 windroses (hourly averages) from 1 January 2018 – 31 December 2022 (Met data provided by OGNZL).

8.2 The analysis of local wind conditions indicates that light to moderate strength winds from the eastern quarter are common. These winds will blow from the large area of central mining activity (Frasers and Innes Mills) towards Receptor R1 and the village for approximately 31% of the time, based on the DG15 (Macraes village) data.

8.3 Beca states that winds have greatest potential to transport dust at speeds greater than 5m/s. Based on the DG15 wind data, winds blowing from the central mining area towards R1 and the village occur for approximately 2.7% of the time. The figure below, reproduced from the Beca AEE, shows the wind roses when only wind speeds greater than 5m/s are included.

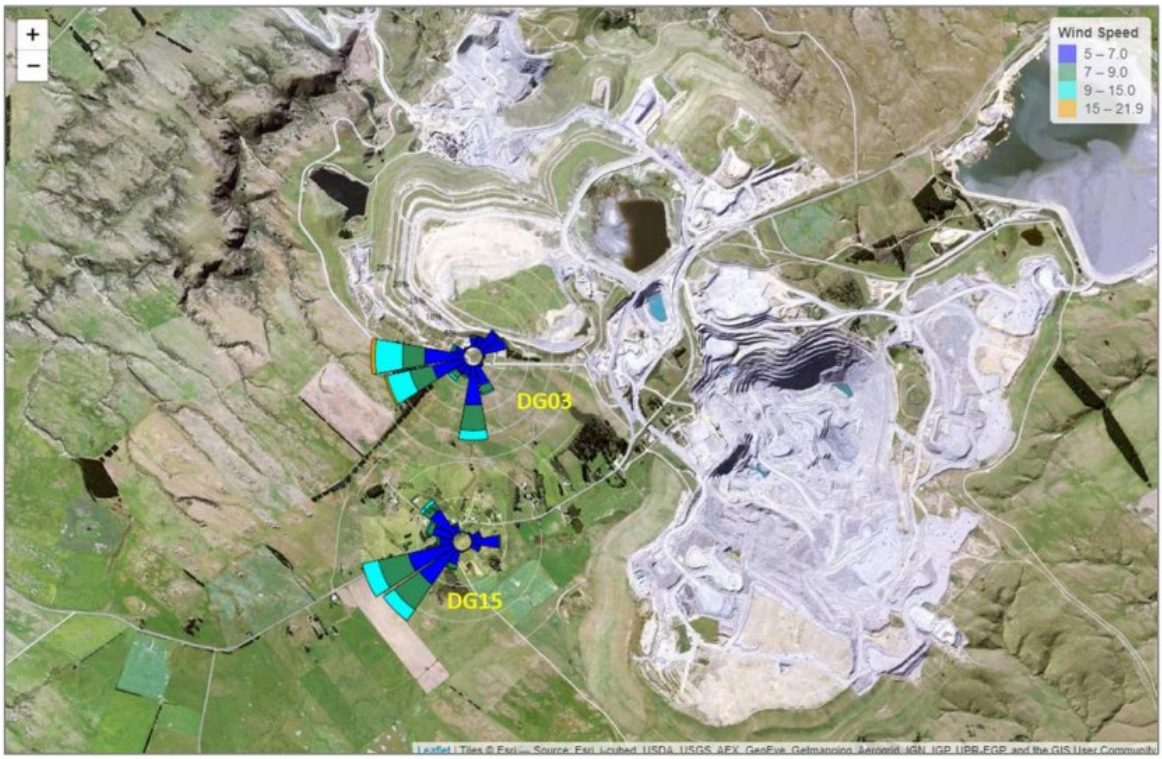

Figure 6-3. Sites DG03 and DG15 wind roses (hourly averages) of wind speeds >5m/s from 1 January 2018 – 31 December 2022(Met data provided by OGNZL).

8.4 I agree with Beca that wind speeds of greater than 5m/s have the greatest potential to transport dust for significant distances, particularly in relation to entrainment of dust from the large areas of exposed surfaces involved. However, I note that some activities undertaken will generate relatively fine particulate matter with potential to be transported significant distances, even at lower wind speeds, when dry conditions prevail. In relation to this application, the haul road serving the Innes Mills and Frasers pits is a potentially significant dust source that can generate finer particles subject to transport for substantial distances, even at lower wind speeds, if appropriate mitigation is not applied.

8.5 The GPG Dust notes that vehicles travelling over paved or unpaved surfaces pulverise any surface particles. These particles are lifted and dropped from the rolling wheels, and the road surface is exposed to strong air currents due to turbulent shear between the wheels and the surface. Dust particles are also sucked into the turbulent wake created behind the moving vehicles. These emissions, including fine PM, are generated regardless of wind speed.

8.6 The low annual rainfall and relatively high average wind speeds contribute to the dust generating potential of mining activities in this area. However, there are large separation distances to sensitive receptors that are downwind of the proposed sites during the prevalent strong westerly and southwesterly winds.

9 Existing Monitoring Information

9.1 The description of background air quality has relied on dust deposit gauge monitoring and TSP monitoring that has occurred at various locations adjacent to the existing mining areas over an extended period of time. Updated TSP monitoring data for 2022 and 2023 have been provided.

9.2 Deposition gauges DG02, DG11 and DG15 have been identified as most relevant to the MP4 activities. Monitoring indicates that for the majority of the time during 2019 to 2022 deposition has been within the consent limit of 3g/m^2/30 days above background. Infrequent exceedances were described by Beca as being due to fertiliser spreading and bird droppings in the gauge. Monthly dust deposition monitoring has limited value as an indicator of short-term nuisance effects and is primarily used to indicate long term trends. More useful information is generally provided by TSP and PM_{10} monitoring.

9.3 TSP monitoring data (24-hour average) for sites DG15 (Macraes Village), DG11 (south of Receptor R1) and DG07 (Horse Flat Road near Receptor R5) during 2022 and 2023 have been provided in the Beca RFI response. Occasional exceedances of the existing consent limit (120µg/m^3 TSP, 24-hour average) occurred during this period. Beca notes that there were several times where the monitor indicated the limit was exceeded when the humidity was 100%, indicating that the optical monitoring method (nephelometer) was likely measuring water aerosols. Beca further states that review of days where the TSP concentration measured at DG15 was over 120µg/m^3 has shown that none of the exceedances related to mining activities.

9.4 The GPG Dust suggests TSP trigger levels for moderate sensitivity receiving environments of 80µg/m^3 (24-hour average) and 250 µg/m^3 (1-hour average). These trigger values have been applied to monitoring at DG07 and DG11 under other OGL consents. Beca accepts in the RFI response that these trigger values are also appropriate for monitoring at DG15 near the village.

9.5 Excluding the limit exceedances not due to mining activities, Beca stated that there would have been 12 trigger events above 80µg/m^3 (24-hour average) during 2022-2023 at DG15. Beca considers that some of these events are likely to relate to non-mining activities in the area or humidity effects as has been found with the consent limit exceedances. Analysis of TSP trigger events above 250 µg/m^3 (1-hour average) has not been provided.

9.6 In the RFI response, Beca states:

"The TSP concentrations presented in the Dust GPG are trigger values and are not intended to be compliance limits. The GPG states "These triggers are intended to be used for the proactive management of dust on site. They are not intended to be used for enforcement because exceedance of trigger levels does not necessarily infer an adverse effect offsite." As discussed above, the current dust management practices are complying well with consent limits and also maintain low occurrences of exceedances of the TSP trigger level of 80 µg/m^3. Therefore, whilst it is not necessary to suggest a compliance limit related to the Dust GPG trigger values, having this trigger limit will mean the site will operate in keeping with good practice in so far as managing potential mining related exceedances."

9.7 Overall, I agree that the TSP monitoring data indicate that PM emissions from mining activities have generally been within acceptable levels to prevent dust nuisance effects. The complaints record supports this view. However, I note that 1-hour average TSP data have not been provided. This would provide useful information regarding short-term dust events. I also agree that TSP trigger levels should be applied to the monitoring sites to require OGL to respond to detected dust events.

9.8 Relevant monitoring information for PM_{10}, $PM_{2.5}$ and RCS is discussed in relation to health effects in Section 11.

10 Assessment of Dust Nuisance Effects

10.1 Beca has assessed the potential effects of dust on the closest residences to the project activities using a combination of the FIDOL (frequency, intensity, duration, offensiveness and location) factors and the Institute of Air Quality Management (IAQM) risk assessment methods[2]. Assessment was undertaken for the individual project areas with reference to separation distance and wind direction to the nearest sensitive receptors. A qualitative assessment of this type is common practice for area source dust discharges from mines and quarries.

10.2 The assessment has not specifically considered the cumulative effects of concurrent discharges from MP4 and existing consented dust emission sources that are adjacent to the proposed MP4 activities. Even if the mining focus has largely shifted to MP4, there is potential for ongoing dust emissions for a time from the large open areas associated with existing activities. Consequently, I consider that the frequency of winds when each receptor is downwind of dust sources is understated in terms of a cumulative affects assessment.

[2] Institute of Air Quality Management "Guidance on the Assessment of Mineral Dust Impacts for Planning" May 2016.

Given the relatively large separation distances to sensitive receptors, I do not consider this omission to be critical to the assessment. I have considered potential cumulative effects in my evaluation of the proposal.

10.3 The IAQM assessment matrix is a somewhat coarse tool with broad risk categories. In my view a degree of caution should be applied to its use for assessing very large and complex dust emission sources in dry climatic conditions, particularly given the potential for cumulative effects noted earlier. The IAQM assessment assumes that dust mitigation will occur. My experience is that the degree of ongoing diligence in applying dust control measures is strongly related to the extent of off-site effects for this type of activity. Continuous monitoring of TSP with short-term (1-hour or 5-minute average) trigger levels is an effective means of assessing the ongoing effectiveness of such mitigation.

10.4 The dust assessment undertaken by Beca states the following:

"As a rule, based on the discussion regarding particles size in the GPG Dust and the results of research into dust entrainment, dust deposition is unlikely to occur to any significant degree beyond a distance of approximately 100 - 200 m from significant dust sources in most circumstances. Dust nuisance is more likely to occur within such proximity of a significant dust source. IAQM considers receptors located more than 200m to 400m from a dust source as being "Distant" (which is the farthest separation distance category).

The terrain in the area surrounding the project site is predominantly flat, which may increase the potential for some dust deposition to occur at greater distances. However, dust impacts will occur mainly within 200-400 m of sources, even at the dustiest sites.

The closest sensitive receptor (dwelling) in the vicinity of the project is more than 1 km from Innes Mills (refer Figure 3-6). Sensitive receptors in other areas are more than 2.2 km from the Coronation Pit and Golden Bar Pit. Therefore, provided the dust mitigation methods specified in the site DMP are implemented, any dust emitted from the proposed activities project is expected to be well dispersed before reaching these receptors."

10.5 I note that the haul roads can be a major source of dust and are closer to sensitive receptors than the mining areas. Provided good mitigation is diligently applied, particularly in relation to the haul roads and proposed tailings storage facility, I agree significant dust effects are not expected to typically occur at receptors over 400m from the source. However, the analysis of complaints relating to the existing mining activities indicates that dust effects can extend well beyond this distance on occasion. I note that dust complaints have occurred from Receptor R5 (Horse Flat Road) at a distance of approximately 1km from the haul road.

10.6 With regard to complaints of dust from haul roads, the Beca RFI response states:

"Three complaints (listed in Table 7-7 of Beca's AEE) related to Coronation haul road (R5) between 2018 - 2019. Weather conditions played a part in two of the complaints. None of these complaints have related to the haul road near receptors R1 and R9 near Frasers Pit. The corrective actions undertaken for Coronation haul road indicate that provided water trucks are routinely watering the road as per the Dust Management Plan, dust is effectively controlled."

10.7 Receptor R1 is approximately 650m west of the Innes Mills haul road and is the most potentially affected by emissions from this source. The AEE states that 192 truck movements per day will occur on this haul road. Winds will blow from the large, combined area of central mining activity (Frasers and Innes Mills) towards R1 and the village for approximately 31% of the time (2.7% > 5m/s), based on the DG15 (Macraes village) data. Wind speed is less critical for the transport of PM (particularly the finer PM fraction) generated by heavy vehicle movements, relative to entrainment from exposed surfaces.

10.8 A 2017 study undertaken for Waka Kotahi (NZTA)[3] monitored PM adjacent to an unsealed road in Northland. PM_{10} was found to comprise approximately 30% of TSP measured at locations where people were most likely to be affected. Measurements showed that the effect of the PM_{10} dust plume extended beyond 80m from the roadside. It is important to note that the distance of PM travel recorded in the Northland example is not directly comparable to haul roads at the Macraes mine. These haul roads involve a significant volume of very large trucks in a climate where dry conditions are prevalent. The Horse Flat Road complaints from 2019 indicate that dust can travel over 1km if vigilant watering of haul roads is not undertaken.

10.9 Taking into account the above information sources, I consider that adverse dust effects at Receptors R1, R5 and other receptors at greater distance from the dust emission sources are likely to be minor, provided good practice mitigation is applied. The complaints record and TSP monitoring for recent years indicates a good level of compliance with conditions of the existing consents. No dust complaints were received during the past three years. The frequency of strong winds blowing from the eastern quarter is small. This reduces the risk of dust impacts at the receptors closest to emission sources, dwellings R1 and R5.

10.10 Beca concludes that the likely magnitude of dust effects at the most impacted receptor will be a "slight adverse effect" in terms of the IAQM definition. The IAQM considers "slight

[3] Golder Associates. 2017. Impacts of exposure to dust from unsealed roads. NZ Transport Agency Research Report 590, April 2017.

adverse effects" to be "not significant". The AEE states that provided appropriate dust control procedures are implemented, potential impacts are considered to be appropriately mitigated and therefore less than minor. Overall, I consider that cumulative adverse dust effects at the nearest dwellings are likely to be minor. I agree that good dust control and monitoring will need to be implemented via the Dust Management Plan (DMP) to achieve this outcome.

11 Health Effects

11.1 OGL undertook monitoring of PM_{10}, $PM_{2.5}$ and RCS in accordance with Consent 96785 at four sites around the Macraes mine during the summers of 1998-2000. The 24-hour average RCS concentrations reported indicate that annual average RCS concentrations at sensitive receptors are unlikely to exceed the long-term reference exposure level of 3µg/m^3 (annual average).

11.2 The PM_{10} monitoring around the existing mine for the summers of 1999 and 2000 observed concentrations of up to 17µg/m^3 (24-hour average). This value is well within the National Environmental Standard for Air Quality (NESAQ) for PM_{10} of 50µg/m^3 (24-hour average). PM_{10} has also been previously monitored at Site 15 at Macraes Village and the results showed concentrations that are well below the NESAQ.

11.3 It is recognised that the monitoring information for PM_{10}, $PM_{2.5}$ and RCS presented by OGL is now somewhat dated. Nevertheless, the results are in line with expectations and generally consistent with monitoring results I have reviewed for a 2018 study undertaken adjacent to a large area of aggregate quarries at Yaldhurst, Christchurch.[4]

11.4 Taking into account the separation distances from the proposed MP4 activities to neighbouring dwellings and other sensitive receptors, I consider that the monitoring indicates that the discharge of fine PM and RCS from mining and associated activities is not likely to cause adverse health effects.

12 Mitigation Measures and the Dust Management Plan

12.1 An updated 2023 DMP has been provided in response to the request for further information. I have reviewed the DMP and consider it to be generally fit for purpose. The DMP will need to be updated to respond to any additional monitoring and mitigation required by conditions of consents for the proposed MP4 activities, if granted.

[4] Mote (2018): Yaldhurst Air Quality Monitoring - Summary Report: 22 December – 21 April 2018. Report prepared for Environment Canterbury by Mote Limited. Available online at: https://www.ecan.govt.nz

12.2 Key aspects of the DMP are:

- A separate dust control manual is included for tailings storage facilities, with appropriate mitigation included. This is appropriate as tailings storage can be a significant source of dust and requires specific controls.
- Continuous TSP monitoring at sites DG15 and DG07 is described (monitoring at DG11 was required by the Frasers consent for at least one year but has now ceased). TSP trigger levels of 80µg/m^3 (24-hour average) and 250µg/m^3 (1-hour average) are proposed for this application, consistent with the Deepdell and Frasers consent requirements.
- Generally appropriate mitigation measures are described. However, a high vehicle speed limit of 60kph is specified, relative to recommendations in the GPG Dust. Given the large separation to sensitive receptors and the results of monitoring to date, this may be acceptable in this case. However, good practice mitigation will be required, including ongoing watering of the haul roads. Continuous monitoring of TSP at a location west of the central mining area and haul road, with appropriate trigger levels, would assist OGL in maintaining appropriate dust control.

12.3 The Beca RFI response notes that:
"TSP monitoring at Site DG11 (closer to the mine than DG15 in Macraes village) was decommissioned in 2023 as allowed for by Condition 6(a)(e) of consent RM10.351.52.V3 (Frasers). This request was made and approved on the basis that monitoring results at DG11 were very similar to those for DG15 (as can be seen in Figure 1)".

12.4 I have reviewed the 24-hour average monitoring results provided and agree that they are similar for DG15 and DG11. Elevated short-term TSP concentrations associated with nuisance effects can be obscured by the 24-hour averaging period. Unfortunately, the 1-hour average data was not provided. It is this short-term TSP monitoring data that is more useful in terms of setting a trigger level for additional mitigation if spikes occur.

12.5 From a site management perspective, I consider there is value in ongoing TSP monitoring to the west of the central Innes Mills/Frasers mining area. This monitoring would be used to alert OGL to implement additional dust controls in response to exceedances of short-term trigger levels. A suitable location would be in the vicinity of the Gay Tan historic cottage, approximately 350m southwest of the haul road. Such monitoring using a nephelometer is cost-effective and alerts can be sent to OGL, allowing prompt response (such as watering haul roads) if TSP spikes exceed short-term trigger levels. The monitoring site would be upwind of the village during easterlies and therefore well sited to allow reaction to dust emissions from the major area sources and haul road in proximity to sensitive receptors in the village.

12.6 I recommend that such monitoring be included in the updated DMP. An operational TSP trigger level of 250µg/m^3 (5-minute average) would be appropriate to allow prompt management response, such as applying water to the haul road. I note that this is not a compliance limit but a useful tool to optimise dust control and site management.

13 Greenhouse Gas Effects

13.1 The AEE states that the activities at the Macraes site have involved the operation of diesel vehicles and machinery for a long period. As there is a small level of variation in mining fleet numbers as the wider mining activities progress, Beca considers that the application will not significantly increase the overall vehicle emissions from the site. OGL is also proposing the introduction of an electric excavator which is part of a site emissions reduction plan.

13.2 CO_2 equivalent GHG emissions from vehicles and machinery for the Macraes site are predicted to remain approximately the same as current operations in the near term, due to the mining machinery moving from one active area to another as the site operations progress. Beca notes that OGL has implemented a GHG mitigation plan aimed at minimising emissions from the overall site.

13.3 The AEE states that a proposed GHG Mitigation Plan has been formulated by OGL to balance economic and environmental outcomes. The table below (reproduced from page 65 of the Beca AEE) provides a consolidated view of the projects to be undertaken at the Macraes site as part of this plan. The Beca AEE states that OGL have purchased, and are planning to commission, the planned electric shovel (prime mover for overburden) in the near future.

Table 7-8. Feasible greenhouse gas reduction options at Macraes site

Primary activities	GHG emissions reduction (annual tonnes)	Capital Investment ($M)	Operational cost impact per annum,(E$M)	Marginal abatement cost ($/tonne CO2e)
Purchase of certified renewable electricity	23,430	0.000	0.300	16
Electrification of one overburden excavator	3,000	2.560	-1.500	-192
Electric water heating of the processing plant	890	0.390	-0.080	-5
Plant heat recovery	440	0.034	-0.140	-178
Totals / Weighted average marginal abatement cost	**27,760**		**-1.455**	

13.4 The AEE states that the baseline scenario involves none of these initiatives and sees annual CO_2 equivalent emissions rising from 92,520 tonnes in 2019 to about 113,000 tonnes by 2027 and continuing to 2030 due to deeper pits and longer hauls. The planned reduction of 27,760 tonnes represents a 14% reduction in cumulative CO_2 equivalent emissions (based on

the 2019 baseline) and 20% reduction in cumulative emissions (based on the business-as-usual scenario). Beca states that further secondary options are being considered including a second electrical excavator, based on economic viability.

13.5 GHG emissions have been described cumulatively across the OGL site. I consider this approach is appropriate. The assessment of GHG effects adequately addresses the requirements of the Resource Management Act in my opinion. However, it should be noted that I do not have specific expertise in the assessment of GHG mitigation effectiveness and preparation of emissions reduction plans. While the assessment indicates an overall reduction in GHG emissions due to mitigation, the application is not clear if any specific reduction measures are proposed as conditions of consent. It is expected that this will be clarified in evidence from the applicant. A condition requiring implementation and ongoing review of the GHG Mitigation Plan would be appropriate in my opinion.

14 Proposed Monitoring

14.1 I agree with Beca that ongoing monitoring of TSP and dust deposition is appropriate.

14.2 Continuous TSP monitoring in Macraes village currently occurs at site DG15. This location is substantially further west of the primary dust sources than the dwelling at 1668 Macraes Road (Receptor R1, near DG11). OGL proposes to discontinue the temporary TSP monitoring formerly undertaken at site DG11. Provided continuous TSP monitoring for operational dust control purposes occurs, as recommended in new condition 12B (detailed in paragraph 16.3), I consider that this change is acceptable.

15 Comment on Submissions

15.1 The submission of Mr Geels opposes the “mine extension and use of Frasers Pit and other activities close to private dwellings”. He expresses concern regarding the location of tailings facilities.

15.2 I have reviewed the location of sensitive receptors (including dwellings) in relation to the proposed mining activities, including tailings facilities and haul roads. Subject to the recommended additional TSP monitoring that would assist implementation of dust controls, I am satisfied that any adverse dust effects at dwellings are likely to be minor.

15.3 Mr Roy’s submission refers to placement of a dust deposition gauge besides Macraes Road, near the haul road overbridge and closer to Innes Mills pit. He considers that monitoring at this location would give a fairer reading of dust created by the mining process. I have recommended that continuous TSP monitoring occurs in this general area (near the Gay Tan

cottage), to assist control of dust from the Innes Mills and Frasers mining areas, including the haul road.

16 Consent Conditions

16.1 I have reviewed the consent conditions for the MP4 project (RM10.351.52.V4) proposed by OGL, dated 25 April 2025. The conditions are generally appropriate. However, I recommend the following additions and amendments.

16.2 Condition 6. Dust deposition monitoring should continue at site DG11 which is nearby the closest sensitive receptor to central mining operations.

16.3 New Condition 12B. Continuous TSP monitoring for operational purposes should be required as follows:
"Continuous TSP monitoring must be undertaken in the general vicinity of the Gay Tan historic cottage, corner of Macraes and Gifford Roads. The purpose of monitoring is to inform the management of dust control measures to minimise dust impacts from mining and haul roads at sensitive receptors in Macraes village. The monitoring instrument must be a nephelometer or similar equipment that provides continuous real-time data with alerts sent to the consent holder when trigger levels are reached. The instrument must be regularly serviced and calibrated. Wind speed and direction must be continuously measured at the monitoring site to assist in the interpretation of monitoring data. The monitoring location, design, operation and trigger levels must be in accordance with the recommendations of a suitably qualified and experienced expert and shall be agreed in writing with the Consent Authority."

16.4 Condition 16. The dust management plan and any revisions should be prepared by a suitably qualified and experienced person and certified by the ORC. In my experience this is now standard practice for management plans of this type. Condition 16 should include a new clause (d) as follows:
"*(d) A description of the continuous monitoring undertaken in accordance with Condition 12B to provide operational alerts for the management of dust mitigation. The monitoring location, design, operation and trigger levels (1-hour average or less) must be included."*

16.5 The plan in Appendix 1 should be amended to show the TSP and dust deposition monitoring sites. This comment also applies to the Golden Bar discharge permit (RM24.184.30).

John G Iseli
16th May 2025