

Before the Independent Hearing Panel

In the Matter of the Resource Management Act 1991 (**RMA**)

And

In the Matter of an application to the Central Otago District Council and Otago Regional Council for resource consent to establish and operate a gold mining activity at 1346 – 1536 Teviot Road, Millers Flat

Reference RC230325 (Central Otago District Council)
RM23.819 (Otago Regional Council)

Evidence of Nigel Goodhue on behalf of Hawkeswood Mining Limited

Air Quality

Dated 29 April 2024

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Introduction

1. My full name is Nigel David Goodhue.
2. I hold the position of Environmental Scientist at Air Matters Limited. My qualifications are a Master of Science Degree with First Class Honours from the University of Waikato.
3. I have sixteen years' experience in environmental management including over 9 years direct experience in assessing, managing & consenting air quality. During my employment at Air Matters my experience has included preparation of air quality assessments for a wide range of industrial processes. Prior to this role I held various positions in the electricity industry where I was responsible for managing air quality at a thermal (coal and gas) power station. I have also worked for a period of two years at Otago Regional Council as a Consents Officer. During this period, I was the Section 42A Officer for numerous non-notified and notified air discharge resource consents throughout the Region of Otago.
4. I was instructed by Hawkeswood Mining Limited (HML) in August 2023 to initially peer review a Dust Management Plan (DMP) for the proposed activity as it related to the Land Use Consent sought from Central Otago District Council. Following this, my scope was expanded to complete an Assessment of Environmental Effects (AEE) to support the Air Discharge Consent sought from Otago Regional Council.
5. I am familiar with the area to which the application for resource consent relates. I have visited the site and surrounding area on 19 October 2023. Having previously worked in the Otago Region I am generally familiar with the climate and terrain of the Central Otago District and implications on air quality.
6. Although this is not a hearing before the Environment Court, I record that I have read and agree to and abide by the Environment Court's Code of Conduct for Expert Witnesses as specified in the Environment Court's Practice Note 2023. This evidence is within my area of expertise, except

where I state that I rely upon the evidence of other expert witnesses as presented to this hearing. I have not omitted to consider any material facts known to me that might alter or detract from the opinions expressed.

Scope of Evidence

7. My evidence will address the following:
 - a. The key findings of my assessment of effects;
 - b. Update the assessment as a result of the change in bund design and staging;
 - c. Matters raised by submitters on the Application; and
 - d. Matters raised in the Otago Regional Council S42A reports and proposed conditions of consent for air discharge.

The Key Findings of my Assessment of Effects

8. The proposed activity relates to the extraction and processing of alluvial material through a floating processing plant. Gold material is separated from the alluvial material during the processing, with the alluvial material being placed back in-situ.
9. To access the target alluvial material, removal and temporary stockpiling of topsoil and overburden is undertaken. Rehabilitation of the mining area, including replacing the overburden and topsoil and re-grassing, is progressively completed. In total, at any one time, an active working area (comprising the open pit, stockpiles and roadways) of no more than 27 ha will be exposed. The total area to be mined covers 68ha.
10. The focal discharge to air from the proposed activity, and the emphasis of the AEE was particulate matter, more commonly referred to as 'dust'. A range of activities onsite have the potential to generate particulate matter including: topsoil and overburden removal and transport; stockpiling of topsoil and overburden; replacing overburden and topsoil, and vehicle movements on roads and accessways. Processing of the target alluvium

through the gold processing plant is undertaken as a wet process and as such the likelihood of generating particulate emission is very low.

11. The surrounding area is rural with land predominantly used for pastoral farming activities. The township of Millers Flat is located approximately 700m to the south-east at the closest point. The township of Ettrick is located approximately 800 m north-west of the site. There are a range of lifestyle and rural dwellings surrounding the site, including boutique accommodation.
12. In general, the surrounding land use was considered as having a low to medium sensitivity to the effect of dust in accordance with the MfE (2016) guideline. The exception to this is residential dwellings and accommodation facilities surrounding the site, which were identified in the AEE as having high sensitivity.
13. The most common concerns relating to dust discharges are nuisance impacts which generally impact people's amenities. The assessment of potential dust nuisance effects followed the MfE's *'Good Practice Guide for Assessing and Managing Dust'* (MfE 2016). An initial screening evaluation using separation distance guidance was undertaken, followed by a more detailed consideration of identified sensitive locations.
14. The initial screening assessment was based on the separation distance between sensitive neighbours and dust-generating activities. By having a suitable separation distance, dust emissions can be dispersed, diluted and deposited to such an extent that their effects at sensitive locations should be minimised to an acceptable level.
15. Environment Protection Authority Victoria publishes guidance on 'recommended separation distances for industrial residual air emissions' (EPA Victoria, 2013). In New Zealand these buffer guidelines have been extensively used and are accepted as appropriate separation distances.
16. In accordance with the EPA Victoria (2013) guidelines, a separation distance of 250 m from the active area to sensitive areas would be applicable in this instance based on the category *'Mine for other minerals'*.

17. Nine of the neighbouring dwellings (where written approval had not been provided at the time of completing my assessment) were located within or just beyond 250 m of an active area. These locations were:
- a. 1334 Teviot Road (Location **A**);
 - b. 61, 67 & 69 Clutha Road (Location **B**);
 - c. 1535a Teviot Road (Location **I**);
 - d. 1333 Teviot Road (Location **N**);
 - e. 5280 & 5330 Ettrick-Raes Junction Road (Location **D**); and
 - f. 1377 Teviot Road (Location **M**).
18. Since completing the AEE, additional written approvals have been provided by 1535a Teviot Road (Location **I**), 5280 & 5330 Ettrick-Raes Junction Road (Location **D**) and 69 Clutha Road (one of three properties at Location **B**).
19. Sensitive areas, including dwellings, greater than 250 m from the proposed activity area are considered unlikely to experience a significant level of nuisance dust effects. The cycle trail is within 250 m of the active areas however the users will be very transient. It is important to record that active areas on the Site will move because works are staged.¹ Therefore while identified locations above will be within 250m of active areas for a period of time, they will not be within that distance for the life of the mine.²

FIDOL assessment

20. A detailed FIDOL assessment that focuses on the exposure of sensitive locations to dust emissions was undertaken following the MfE (2016) *Good Practise Guide for Assessing and Managing Dust*. For dust emissions to become an adverse effect beyond the site boundary there are two aspects to consider. Firstly, the suspension of dust into the air from the activity. For

¹ Staging and bund design Plans dated 22 April 2024.

² This is evident from the identified “sensitive receptor management zone” (coloured yellow) on the figure included as Appendix B to the draft Dust Management Plan.

HML, a range of site activities have the potential to generate dust emissions as described in Paragraph 10.

21. The second aspect is the meteorological conditions which will disperse the generated dust offsite and towards sensitive receptors.
22. The FIDOL assessment identified that the meteorological conditions (direction and frequency of winds) have the potential to carry particulate matter towards sensitive receptor locations. Receptors **A, B, D** and **I** were identified in the screening level assessment as having an elevated risk.
23. Because of the close proximity of receptor **A** (i.e., within 100 m), they have the highest risk of experiencing elevated dust emissions including deposited dust, particularly if appropriate management practices and mitigation measures are not applied and monitored to ensure they are effective.
24. The type of dust generated from the activity will be of natural origin from the topsoil and underlying alluvial material. This dust is consistent with dust generated from surrounding properties during normal agricultural activities and use of unsealed roads and accessways. As such the dust is not out of character with the surrounding area and has low offensiveness potential.
25. Taking into account the FIDOL factors and the separation distance guidance the assessment concluded that there is potential for there to be nuisance effects at sensitive receptors **A, B, D** and **I** to the north-west and south-east. This assessed risk level is based on there being no mitigation or active monitoring of controls.

Health effects

26. Potential health effects resulting from suspended dust are associated with the smaller respirable fractions. Particles of less than 10 microns in diameter (PM₁₀) are typically the focus in relation to adverse health effects and assessments.
27. The focus of the health-based assessment was ensuring the mitigation measures employed are best practice to minimise dust emissions to acceptable levels. Controls proposed to manage nuisance dust will also adequately control any PM₁₀ (MfE, 2016).

Mitigation and controls

28. The applicant is proposing a range of mitigations and controls to minimise the discharge of dust from the site operations. A summary of these is included below.
29. Extensive use of dust suppression via a dedicated watering cart and a mobile sprinkler system will be employed onsite. Due to the ample water supply (water take, use and discharge is subject to a separate assessment of effects) watering of the site will be an imperative dust mitigation.
30. Dust suppression will be employed during activities that have a moderate to high potential to generate dust. This will include topsoil and overburden removal and replacement, stockpiling of topsoil and overburden, and vehicle movements on roadways.
31. Topsoil will be pre-dampened as far as practical prior to topsoil removal. Fixed sprinklers may also operate to 'knock down' dust during the excavation process.
32. Re-grassing will be prioritised on formed bunds and rehabilitated to establish grass cover as soon as practicable. Dust suppressants and/or geotextile cloth may also be applied as necessary to prevent dust emissions during the establishment of bunds or stockpiles where establishing grass cover may not be feasible.
33. Vehicle roadways will have speed limits imposed in accordance with best practice and use of water cart to suppress dust emissions on these roadways.
34. A setback of the active mining area from the property boundary including Teviot Road and cycle trail will be undertaken where practical. Stockpiles will also not exceed 7m limiting their potential for dust to be 'picked up' from their windward face during elevated wind speeds.
35. The dust mitigation measures as described above are considered sufficient to mitigate the effects on the higher-risk receptors identified in Paragraph 22. To provide an additional level of control for any unanticipated acute

events, such as very high wind conditions, Specific Management Zones (SMZ) are proposed. SMZ should be limited to areas where high-risk, dust-generating activities are within 400m of high-risk sensitive receptors. This would limit SMZ to the north-west extent of the proposed activity area. An SMZ on the south-east extent of the site, which was recommended in the AEE, is no longer required as the only identified sensitive receptor (Location I) has provided written approval to the activity.

36. An SMZ adjacent to the cycle trail is not considered necessary based on the transient nature of the cycle trail users and the expected effectiveness of the standard mitigation measures.
37. Within the SMZs it is recommended that all mining activities should be limited to winter periods (if practical) and specific controls put in place including: lower wind speed threshold, more frequent dust suppression, stockpile exclusion areas and/or immediate use of geotextile cloth for exposed high-risk areas. These measures are detailed in the Dust Management Plan and follow the principles of adaptive management.
38. Weather forecasts for strong winds and extended dry periods will be monitored so that appropriate dust management responses can be planned, particularly during high dust-generating activities including topsoil and over-burden removal/replacement and stockpiling. Given this, it is proposed that wind speed, direction and rainfall at the site will be continuously monitored, and high dust generating activities ceased when defined thresholds are met as set out in the Air Matter's AEE.
39. Operational areas, such as haul roads, will also be monitored by HML to verify dampness and the ongoing need for water cart use or other dust control measures.

Realtime dust monitoring (monitoring the effectiveness of the controls)

40. Continuous real-time dust monitoring is proposed to be undertaken on site to monitor the effectiveness of the controls. A mobile dust monitor, capable of measuring PM₁₀, should be located in an appropriate location downwind from the active area and within close proximity of the site boundary. Where any activity is undertaken within 400 m of a high-risk

sensitive receptor a priority should be to place a dust monitor directly between the worksite and the high-risk sensitive receptor.

41. Monitoring will be set to record real-time PM₁₀ and include a trigger level recommended by MfE (2016) of 150 µg/m³. A trigger of this limit does not necessarily mean that dust nuisance/health effects have or will occur but rather is intended to be used as an indicator that action needs to be taken to refine the controls. On this basis the trigger threshold is a preliminary value and may need to be adjusted depending on the monitoring location and any subsequent feedback from neighbours.
42. The continuous dust monitoring equipment should be fitted with an automated alarm system that, when the trigger threshold is exceeded, sends a warning to the Site Manager or other nominated person who has the responsibility for managing dust effects on the site. The nominated person must be available at all times to take immediate action as it might be necessary to reduce site dust emissions.
43. I reviewed the draft Dust Management Plan (dated 24 April 2023) as part of the initial scope of works. Subsequent to this initial review, I have assisted in reviewing a number of amendments to the DMP to take into account: updated staging and mining methodologies; alignment with the Air Matters AEE, and; addressing matters raised by submitters. I consider the draft version of the DMP (dated 13 February 2024), submitted as part of the applicant's evidence, is adequate to mitigate and avoid potential adverse effects relating to dust emissions from the site.

Conclusion

44. The effects of the proposed activity have been assessed using the Ministry of Environment's *Good Practise Guide for Assessing and Managing Dust* and applicable overseas guidelines. Based on the separation distances and a detailed FIDOL assessment there is the potential for adverse effects on neighbouring properties if the dust levels are not controlled and mitigated appropriately.
45. A range of controls to mitigate the risk of adverse dust effects have been proposed including: appropriately locating bunds and stockpiles; extensive

dust suppression through fixed and mobile watering systems and monitoring weather conditions to determine when elevated dust may occur. In addition to this, Specific Management Zones are proposed where dust generating activities are within 400m to high-risk sensitive receptors. Within the SMZ, additional measures are proposed that will ensure that any unanticipated dust effects are avoided or minimised.

46. Monitoring of the effectiveness of the controls is proposed through real-time dust (PM₁₀) monitoring. Monitoring locations will be adaptive as the dredging progresses through the site and priority will be given to locations between high-risk sensitive receptors and the activity area. Real-time monitoring will include a trigger threshold in order to review the effectiveness of the dust controls and investigate the cause of high dust levels.
47. Based on the assessment of effects, and subject to the proposed mitigations being implemented, the effects of nuisance and health-related dust will be less than minor on the receiving environment.

Change in bund design and project staging

48. I have reviewed the updated staging and bund design dated 22 April 2024 and the accompanying updated 'Site Plan Description'. These updated plans do not impact on the extent of the active mining area and therefore do not materially impact on the Air Matter's AEE dated 14 November 2023 or Peer Review of the draft DMP dated 12 October 2023.
49. The proposed additional visual bunds may provide some wind shelter for areas immediately behind the bund lessening the ability for dust to be entrained in the wind and carried offsite. However, this mitigation is only likely to be minor and wind breakage from bunding does not form part of the substantive dust controls for this site.
50. The updated Site Plan Description states that pre-stripping involves taking off the topsoil (~0.3m) and silt layer (~0.5m) and stockpiling these separately. In the Air Matters AEE these two components were described as the 'topsoil' layer and inferred that they would be removed and stockpiled

together. Both these layers will contain fine particulate material and during the removal, stockpiling and replacement have a greater risk of generating dust. The proposed controls will be effective in mitigating the generation of dust from both the topsoil and silt layers.

Matters raised by submitters

51. Based on the submissions received, a summary and response to the key points is covered below:

Location of dust monitoring

52. Placement of a dust monitor at 'each end' off-site was noted as inadequate in the submission by Graeme Young. As outlined in the AEE, and covered in Paragraph 40-42, particulate monitoring should be located in proximity to the active work site and where practical between the worksite and sensitive receptors taking into account the predominate wind direction. Monitoring is not intended to be static and should be relocated as the work progresses.
53. Submission from JP Clarke, KL Franklin & FG Works Limited requested that particulate monitoring is undertaken on the southern property boundary at 1334 Teviot Road. I agree that it would be appropriate for a dust monitor to be located at the property boundary while activities are undertaken within ~400m of the site boundary. As works move away from the property at 1334 Teviot Road and rehabilitation is completed it is unlikely that monitoring will be required at this location. Monitoring would be more effective at locations closer to the active working area.

PM₁₀ emissions

54. JP Clarke, KL Franklin & FG Works Limited submission notes that PM₁₀ emissions have not been considered in the AEE. My assessment covered the effects of fine particulate matter (PM₁₀) and is repeated in Paragraphs 25-26. In summary the proposed best practice controls will be effective at minimising the release and dispersion of PM₁₀. The AEE also recommends that the particulate monitoring specifically measures PM₁₀ and the corresponding trigger levels as adopted from the MfE (2016) Guideline should be applied.

RCS emissions

55. Crystalline silica refers to a group of silica-based minerals, principally in the form of quartz. The dust generated by the natural (alluvial) or anthropic crushing of rock can contain a fraction of crystalline silica that is within the respirable size range (particles less than four microns in diameter or PM₄). This is referred to as respirable crystalline silica (RCS).
56. Controls that are in place for minimising dust (nuisance and health) will also be effective at controlling any naturally derived RCS that is present in the excavated material. As the proposed process does not include any crushing of material the generation of anthropic RCS is negligible. PM₁₀ monitoring levels at the boundary will also capture any RCS dust and therefore enable monitoring of the effectiveness of these controls.

Combustion emissions

57. Combustion emissions from stationary (generators) and mobile (machinery) plant were raised in a number of submissions. Emissions from onsite diesel generators, which will be initially used to power the dredge were not directly assessed in the Air Matter's AEE. Discharges from combustion sources are permitted under The Regional Plan: Air for Otago Rule 16.3.4.2 subject to meeting specific chimney height and acceptable offsite effects.
58. Provided a suitable separation distance between the generators and the sensitive receptors is maintained and adequate dispersion is achieved, combustion emissions at the boundary will not result in any offensive, objectionable or dangerous effects.
59. During Stage 1, which represents 5.4 ha of the 68ha site, the processing plant will be powered by an onsite 600kVa diesel generator. This equates to an approximate heat release capacity of 1.2MW. Stage 2-4 of the development will operate from mains power supply eliminating the need for onsite generation for the operation of the dredge.
60. The site will also employ two additional generators, one for the workshop (35KVa) and one for a dewatering pump (150 KVa). These auxiliary gensets may be used at times throughout the operation, although preference will be to run the site from mains power supply. As covered in Paragraph 57-58

these generators will be operated under the permitted activity provisions of The Regional Plan: Air for Otago.

61. JP Clarke, KL Franklin & FG Works Limited submission, whose property is located to the north of the site raised concerns with combustion emission adversely affecting their property. Based on the separation distance of Stage 1 from their property (circa 750m) and that Stage 2, which adjoins their property, will be operated from mains supply, the effects on 1334 Teviot Road will be negligible.
62. Graeme Young's submission noted the previous detection of diesel fumes on the cycle trail. Users of the cycle way will be transient and any exposure to fumes will be very intermittent with negligible effects.
63. Smaller fossil-fuelled generators may still operate on occasion to run auxiliary processes on site. These generators are small in capacity and can typically operate within close proximity to sensitive locations without any adverse air quality effects. The proposed setback from the site's boundary would be adequate to mitigate any potential adverse effects on neighbouring properties.
64. Combustion emissions from mobile plant (excavators, dump truck water cart and light vehicles) will be transient and intermittent and will be akin to a typical quarry operation. Typically, adverse effects associated with vehicle/machinery emissions are only found in New Zealand in urban areas where there are particularly high traffic levels combined with a high degree of traffic congestion. Given this, it is expected that any potential adverse effects associated with combustion emissions from mobile plant will be negligible.

Separation distances

65. A submission from JP Clarke, KL Franklin & FG Works Limited requested that no works occur within 250m of the dwelling at 1334 Teviot Road and any works between 250-400m should be subject to best practice controls. The dwelling at 1334 Teviot Road was described as having an estimated separation distance of 90m in the AEE from the nearest active work area. It

is acknowledged in JP Clarke, KL Franklin & FG Works Limited submission that an estimated separation distance of 72m was provided.

66. In the context of the Air Matters AEE, the separation distance of 250m given by Victoria EPA (2013) was used as a screening level assessment to determine sensitive receptors that *may* have an elevated risk of effects of dust. It was not intended as a brightline test indicating that within this separation distance effects may be unacceptable. The MfE (2016) *Good Practice Guideline for Assessing and Managing Dust* supports this, noting that separation distances are intended to address acute unintended discharges where effects cannot be internalised even with the adoption of best practice controls.
67. As outlined in the Air Matters AEE, the applicant is employing best practice controls to minimise the release of particulate matter across the work area. Based on these controls, the effects of particulate matter beyond the property boundary will be maintained to an acceptable level at all times.
68. Potential for *unintended or accidental releases* of particulate matter in relation to the activity would be limited to very high wind speeds. Specific controls are proposed as outlined in Paragraph 38 to ensure that unacceptable dust is not generated during these high wind events.
69. Subject to the implementation of the proposed controls it is considered that the activity can operate as proposed and will not result in any offensive, objectionable or dangerous dust effects at any neighbouring sensitive receptors.

Greenhouse gas emissions

70. The Resource Management Amendment Act (2020) resulted in the retraction of Section 104E '*Applications relating to discharge of greenhouse gases*' of the RMA. Consent authorities may now consider the effects of greenhouse gases from an activity.
71. In the resource consenting process, there is currently little central government guidance or national direction, on how councils and consent

applicants should address and respond to the level of assessment required for greenhouse gas emissions.

72. The exception to this is the National Environmental Standard for Greenhouse Gas Emissions from Industrial Process Heat ('Greenhouse NES') and the associated National Environmental Policy ('Greenhouse NEP') introduced by the New Zealand Government in July 2023. Otago Regional Council amended the Regional Plan: Air for Otago to incorporate the requirements of NES and NEP which become operative on 30 September 2023.
73. The Greenhouse NES and Greenhouse NEP specifically manage fossil fuel-burning equipment which produce industrial process heat. The proposed mining activity includes the burning of fossil fuel for electricity generation and operating heavy machinery. These uses are specifically *excluded* from the Greenhouse NES and therefore these regulations are not relevant to this application.
74. Otago Regional Council have not drafted legislation or guidance to address an activity's GHG effects. Based on the absence of guidance, and that the fossil fuel-burning equipment meets the permitted activity provisions of the Regional Plan, it is not considered necessary to assess the greenhouse effects of the proposed activity. This conclusion is also supported in the Otago Regional Council's Section 42A Staff Recommending Report dated 11 April 2024.

Millers Flat School

75. A submission from Ministry for Education stated concerns with potential dust effects at Millers Flat School (MFS). Schools are considered as *highly sensitive receptors* in accordance with MfE (2016) Guidelines. Due to the significant distance (over 1.1km) from the proposed activity site, MFS was not specifically identified in the Air Matters AEE as being a receptor at elevated risk to the effects of dust.

76. Provided the proposed particulate controls are implemented, and given the separation distance from the mining activity, actual and potential effects of dust at the MFS will be negligible. Particulate monitoring at the boundary will also ensure the controls are effective in maintaining dust levels at acceptable levels at MFS and the wider Millers Flat town.

Matters raised by the Section 42A Staff Recommending Report

77. I have reviewed the Otago Regional Council's Section 42A Staff Recommending Report dated 11 April 2024 and supporting recommended consent conditions. In regards to air quality, I agree with the conclusion reached in the report that the effects on the environment and human health are considered to be appropriately managed and mitigated, so to be less than minor.³ The CODC s42A Report also concludes that the effects relating to dust are appropriate and can be managed.⁴

78. The conclusions above are supported by the Technical Review undertaken by Pattle Delamore Partners (PDP). PDP agree with the assessments I have undertaken.

79. In regards to the proposed conditions of consent included in the ORC Section 42A Staff Recommending Report, I make the following comments:

80. Proposed Condition 4: *Extracted material from the site shall not be processed, crushed or screened on the Site.* The target alluvial wash will be processed and sorted by size (screened) within the dredge. It is therefore recommended that the words 'processed' and 'screened' are removed from the proposed condition. Given the activity will not require any 'crushing' of material, which could release additional dust, it is appropriate to retain the condition referring to 'crushing'.

81. Proposed Condition 6: *The maximum area of unconsolidated land comprising of the excavation area, backfilling areas and rehabilitation area shall not exceed 2 hectares.*

³ ORC s42A Report, at [6.1.11].

⁴ CODC s42A Report, at [119] – [124].

Advice Note: The maximum area of unconsolidated land does not include the haul roads, processing area, stockpiles, areas which are covered with 50mm (or more) of washed gravels or stabilised with a dust suppressant (excluding water), portacoms or workshops, or the conveyor and its associated service area.

82. It is unclear where this proposed maximum area has been sourced from and what activities are intended to be included in the 'excavation' and 'rehabilitation' areas.
83. A more appropriate condition is to limit the area of the activity that has the greatest potential to generate dust. On this basis, if the commissioners wish to include an area limit in the conditions of consent, it is recommended that the total area of topsoil pre-stripping is limited to 1ha at any one time.
84. Proposed controls, addressed through the DMP, can ensure that the backfilling and rehabilitation area is appropriately managed and its footprint maintained to a practical minimum. This includes ensuring permanent grass cover is established in a timely manner following the replacement of topsoil.



Nigel Goodhue

Dated 29 April 2024