Fingerboards Mineral Sands Project Inquiry and Advisory Committee
Technical note

TN No: TN 034

Date: 25 June 2021

Subject: Response by Katestone to questions asked by the IAC and EGSC

This technical note covers Katestone's response to:

- Question 3 of IAC's Fourth RFI dated 26 May 2021 (Tabled Document 401), and
- questions from East Gippsland Shire Council to Mr Simon Welchman during cross-examination on Thursday 13 May 2021.

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24 June 2021

Attn: Kirsty Campbell

White & Case
Level 32, 525 Collins Street
Melbourne VIC 3000

Email: [redacted]

Re: Information requests from the Fingerboards Mineral Sands Project Inquiry and Advisory Committee

Dear Kirsty,

Please find attached responses to recent queries from the Fingerboards Mineral Sands Project Inquiry and Advisory Committee (IAC), specifically:

- During cross examination, Ms Porritt asked questions about the dust modelling captured in the EES and my evidence. These questions were restated in paragraph 233 of East Gippsland Shire Council's Part B Submissions as whether Katestone had modelled:
  "(a) The placement of material into Perry Gully, or the filled Perry Gully in its pre-vegetated state;

  (b) The short-term placement of tailings outside the mine void until there is sufficient void space to deposit them into the void;

  (c) Material left in stockpiles in the vicinity of the centrifuge plant, or left over weekends in temporary stockpiles."
- Question 3 of the information request issued by the IAC on 26 May 2021.

Please contact the undersigned on [redacted] if you would like to discuss.

Yours sincerely,

Simon Welchman - Director

A. RESPONSE TO EAST GIPPSLAND SHIRE COUNCIL QUESTIONS

During cross examination, Ms Porritt asked questions about the dust modelling captured in the EES and my evidence. These questions were restated in paragraph 233 of East Gippsland Shire Council's Part B Submissions as whether Katestone had modelled:

"(a) The placement of material into Perry Gully, or the filled Perry Gully in its pre-vegetated state;

(b) The short-term placement of tailings outside the mine void until there is sufficient void space to deposit them into the void;

(c) Material left in stockpiles in the vicinity of the centrifuge plant, or left over weekends in temporary stockpiles."

The placement of material into Perry Gully to fill the void, which is proposed to occur in Years 1-3, has not been modelled. However, for the reasons explained below, this will not change the 'worst case' assessments already undertaken for the Project.

The EES Air Quality assessment and subsequent air quality assessment of the centrifuges considered project Years 5, 8 and 12. As described in Section 3.3.2.2 of the EES Air Quality Assessment, the three scenario years were selected to investigate the potential worst-case impacts of the mine based on the proposed extraction rates and proximity of sensitive receptors throughout the project lifetime.

Perry Gully is shown in Figure 1, circled in blue.

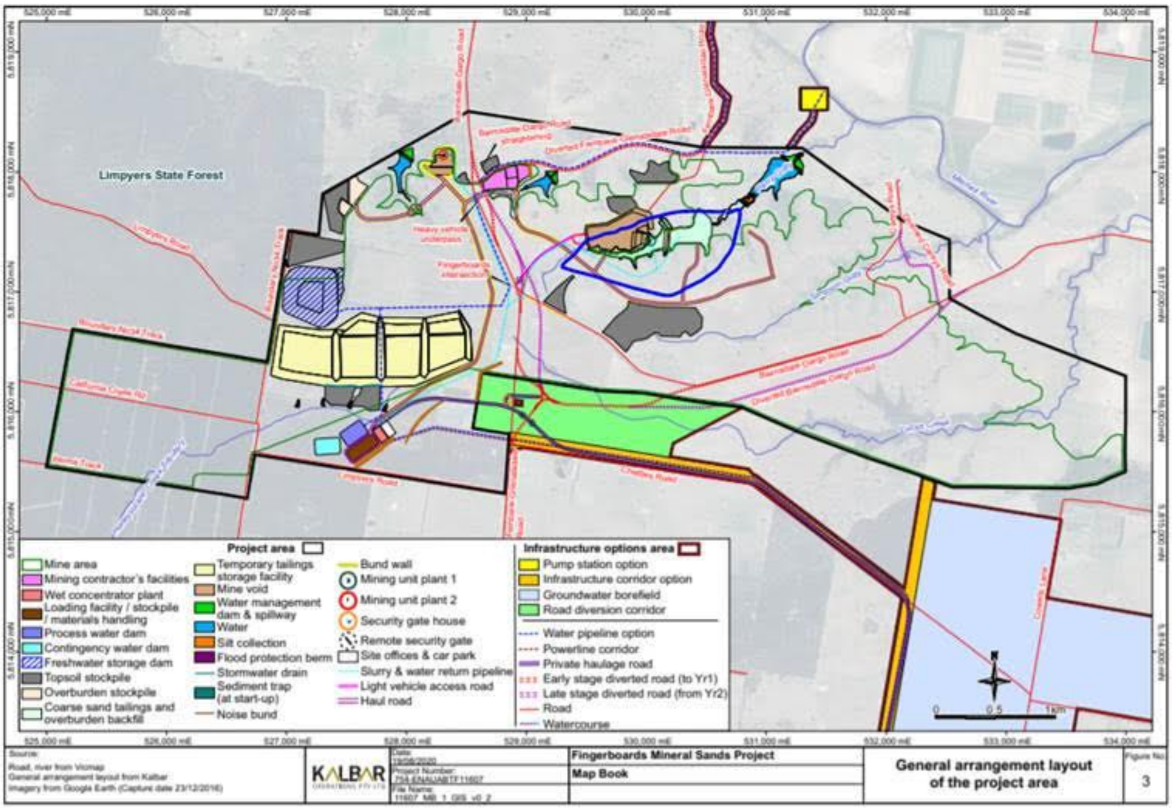

Figure 1 **Fingerboards Project, General Layout of project area showing Perry Gully circled in blue**

Figures 19 to Figure 21 of the EES Air Quality Assessment illustrate the layout of dust sources on the site for the three dispersion model scenarios (Year 5, 8 and 12). Figure 20 of the EES Air Quality Assessment is reproduced in Figure 2 below and shows that in Year 8, overburden is transported from one active pit area for placement in and around the area denoted in Figure 1 as Perry Gully. There is no emplacement of materials in the vicinity of Perry Gully in Years 5 and 12.

Predicted concentrations of dust due to Year 8 of the Fingerboards Project were less than the other two scenario years. The EES Air Quality Assessment and subsequent studies that were prepared for the IAC found that the proposed mitigation measures will ensure compliance with the Environment Reference Standard (Part 2 – Ambient Air) made under s93 of the Environment Protection Act 2017 at all sensitive receptors.

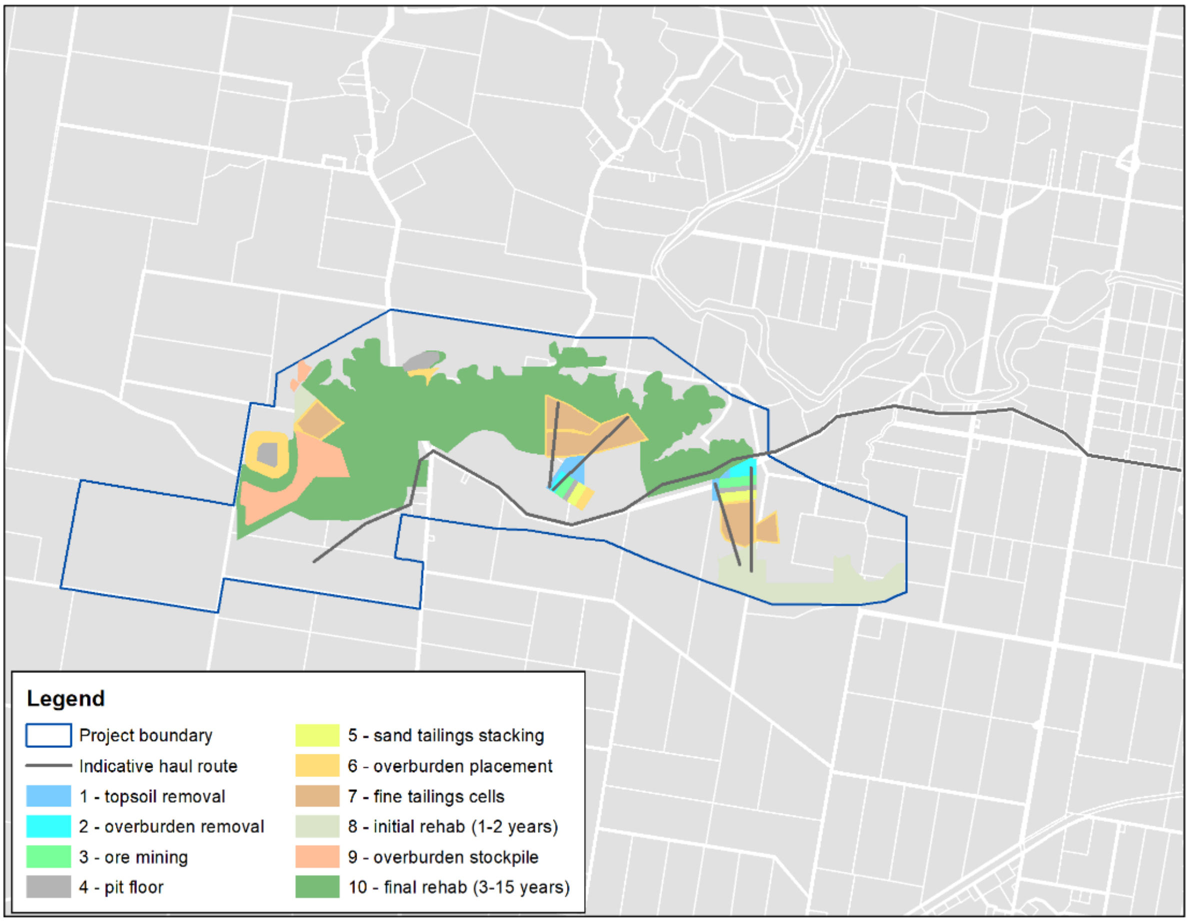

Figure 2 EES Air Quality Assessment, Figure 20, Project layout during Year 8 operations

After the EES Air Quality Assessment, Katestone conducted an assessment of the Project operating with centrifuges. For scenario Year 8, overburden from an active pit is proposed to be transported to an overburden emplacement to the southeast of Perry Gully. No placement of materials occurs near Perry Gully in centrifuge scenario Years 5 and 12.

Overall, it is important to note that the assessment scenarios were selected to capture the likely worst-case impacts of the Fingerboards Project. Placement of material into Perry Gully during Years 1-3 is not anticipated to give rise to higher ground-level concentrations of air quality indicators at sensitive receptors compared to the Years 5, 8 and 12 that were explicitly assessed because the intensity of mining activities in Year 5 and Year 12 is much greater than Years 1-3. For example, overburden extraction and related activities, which contribute a significant proportion of dust emissions, is between 1.7 and 2.2 times higher in Years 5 and 12 than in Years 1-3.

The dispersion modelling shows that the mitigation measures proposed in the EES air quality assessment and the subsequent work detailed in the Expert Witness Statements of Simon Welchman (dated 2 February 2021 and 9 February 2021) will ensure compliance with the Environment Reference Standard (Part 2 – Ambient Air) made under s93 of the Environment Protection Act 2017 at all sensitive receptors including having regard to placement of material within Perry Gully during years 1-3.

(b) The short-term placement of tailings outside the mine void until there is sufficient void space to deposit them into the void;

The dispersion modelling of the Fingerboards Project operating with centrifuges did not include short-term placement of tailings outside the mine void after haulage from the centrifuge stockpile to the vicinity of the mine void. However, these short-term stockpiles would be likely to be very small compared to the broader Fingerboards Project and unlikely to generate significant quantities of dust.

The dispersion modelling of the centrifuge did assume that tailings cake stockpiles in the vicinity of the centrifuge plant would be at their full capacity 24 hours per day, seven days per week and would therefore overestimate dust emissions associated with tailings cake stockpiles, as detailed below.

(c) Material left in stockpiles in the vicinity of the centrifuge plant, or left over weekends in temporary stockpiles.

For the reasons explained below, the assumed stockpile size in the EES dispersion model is larger than the stockpile that would accumulate over weekends, therefore, the dispersion modelling remains valid and conservative.

The dispersion modelling of the Fingerboards Project operating with centrifuges included wind erosion of tailings cake stockpiles near each centrifuge. The dispersion model has been configured assuming that the stockpile at each centrifuge is present continuously throughout the year including over weekends. The dispersion model also includes emissions associated with dozers that will maintain these stockpiles throughout the year. The dozers are also assumed to operate all days of the week including weekends.

As a result of Kalbar's proposal to not haul tailings cake after 1pm on Saturday until Monday morning, the maximum size of the tailings cake stockpile is expected to be reached on Monday morning prior to haulage recommencing. The expected size of each centrifuge stockpile at the end of each day of the week has been estimated and is shown in Table A1.

The dispersion modelling of the Fingerboards Project operating with centrifuges included a worst-case representation of dust emissions associated with wind erosion of the tailings cake stockpiles. The maximum volume at the end of a day is anticipated to be 3,155 m^3. With a 15% contingency, the volume is 3,628 m^3.

The exposed surface area of a conical stockpile with a height of 11m and volume of 3,600 m^2 is 0.11 ha. A surface area of 0.2 ha was used in the dispersion modelling. The modelled surface area, therefore, overestimates the tailings cake stockpiles by approximately two-fold. A 50% reduction in emissions due to the material being damp was also included. In addition, but not accounted for in the emissions estimation, the tailings cake is expected to crust as it dries, and this may lead to a greater reduction in emissions than the 50% reduction that was applied.

The dispersion modelling of the Fingerboards Project with centrifuges, therefore, adequately represents (and likely overestimates) the potential emissions from the tailings cake stockpiles at all times.

Table A1 Expected size of each tailings cake stockpile

Quantity	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Centrifuge production (tonne)	4,344	4,344	4,344	4,344	4,344	4,344	4,344
Quantity hauled to pit (tonne) *	5,540	5,540	5,540	5,540	5,540	3,022	0
Stockpile size at end of day (tonne)	4,797	3,601	2,405	1,209	13	1,335	5,679
Stockpile size at end of day (m^3)	2,665	2,001	1,336	672	7	742	3,155
Stockpile size at end of day including 15% contingency (m^3)	3,065	2,301	1,537	772	8	853	3,628

Table notes:

* Based on 11 hours per day, Monday to Friday and 6 hours on Saturday, at a rate of 504 tonnes per hour.

The emission rate due to wind erosion of the tailings cake stockpiles near the centrifuges has been included in the 'Tailings management' emission rate presented in Table 1 to Table 3 of the Supplementary Expert Witness Statement.

B. RESPONSE TO IAC QUESTION 3

Question 3. On Day 9 (Thursday 13 May 2021) of the Hearing Mr Welchman in response to a question from the IAC undertook to provide a breakdown of the fractions of materials inputted to the air quality modelling and used in other contingent work such as in relation to radiation. If this material has been provided or exists in the Environment Effects Statement (EES) can it be identified to the IAC. For this issue also please review Tabled Document 318 to ensure the understanding of the Bendigo District Environment Council is correct in relation to dust from heavy mineral concentrate stockpiles.

Tabled document 318 states, in part:

Our belief is that Katestone were never referred to the HMC stockpiles by the proponent so have never assessed these stockpiles as a source of dust. (hosting radionuclides).

The fractions of materials used as inputs for the air quality modelling are described below.

Emission rates for the Fingerboards Project with centrifuges are presented in Table 1 to Table 3 of the Supplementary Expert Witness Statement of Simon Welchman. The pie-charts in Figure 3, Figure 4 and Figure 5 are graphical representations of the emission rates for operational Years 5, 8 and 12, respectively. The pie charts present the percentage contribution of each dust source to PM_{10} emissions using the same data presented in the Supplementary Expert Witness Statement of Simon Welchman but given as percentages to aid interpretation.

For clarity in these figures, the activity identified as “stockpiles” in the Supplementary Expert Witness Statement of Simon Welchman has been relabelled “HMC stockpiles” in the pie charts.

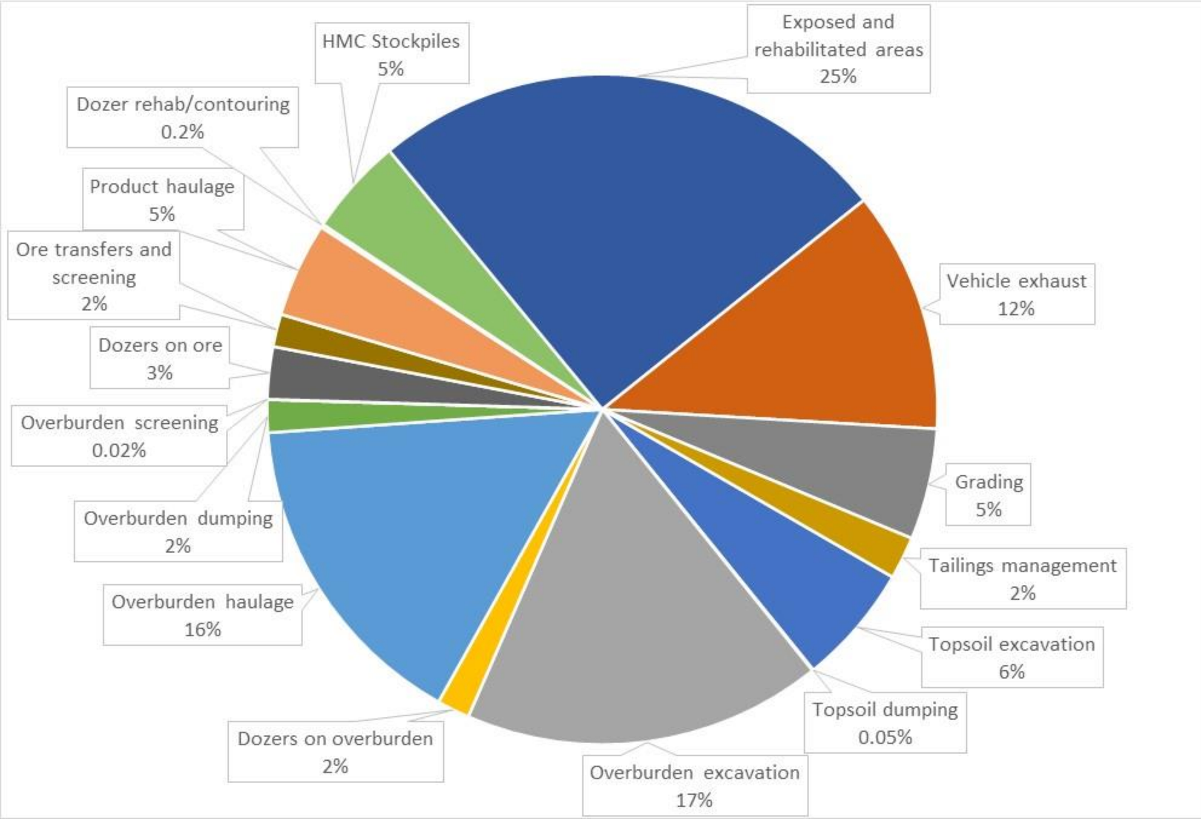

Figure 3 Year 5 - Breakdown of PM_{10} emissions by activity

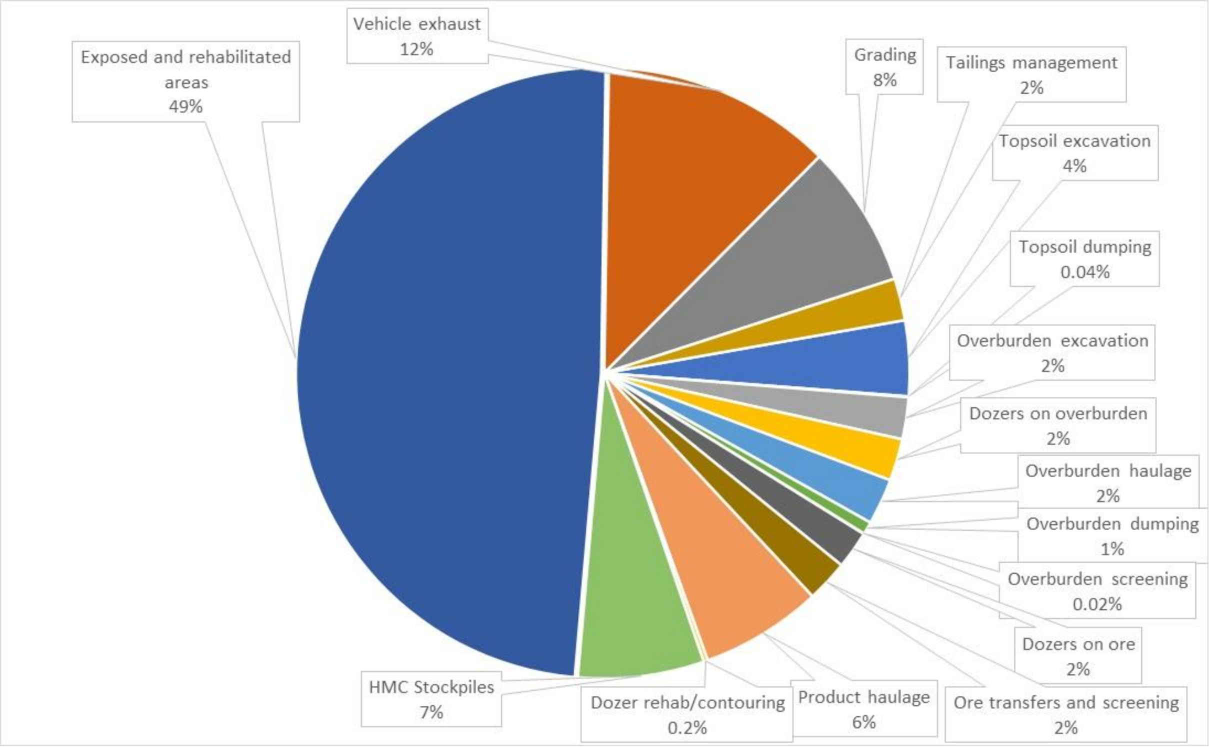

Figure 4 Year 8 - Breakdown of PM_{10} emissions by activity

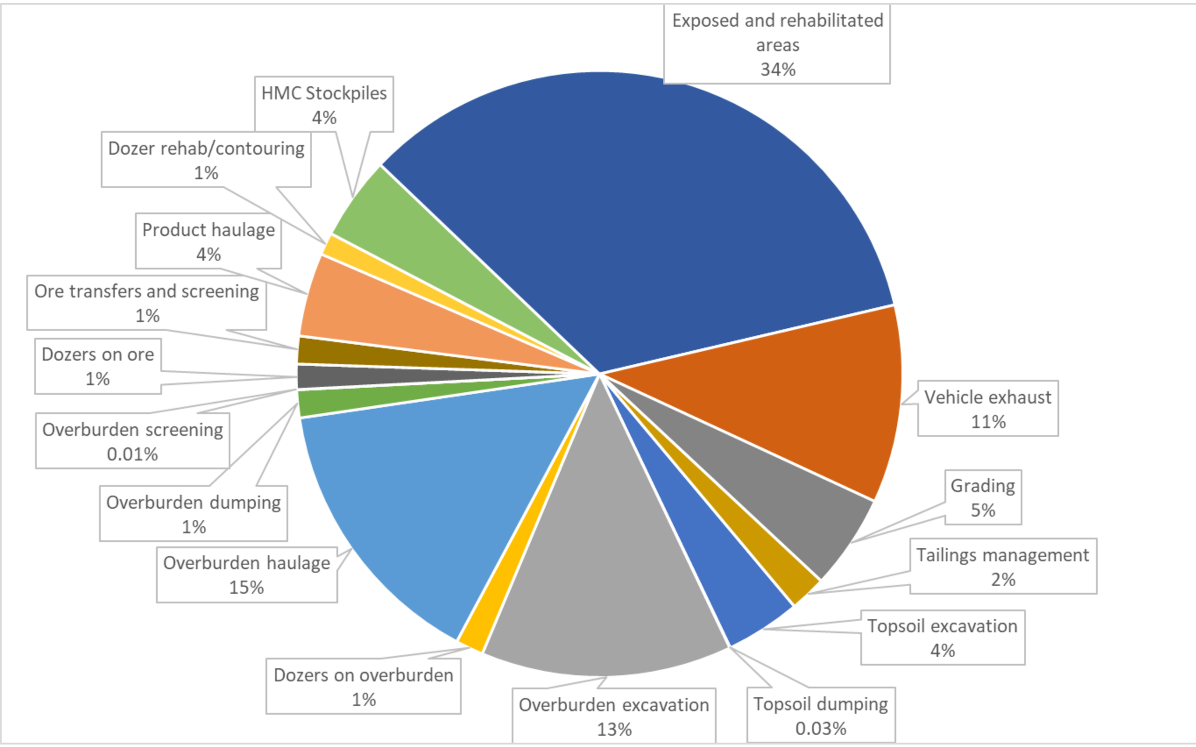

Figure 5 Year 12 - Breakdown of PM_{10} emissions by activity

HMC stockpiles

With regards to the HMC stockpile, this was assessed in the EES Air Quality Assessment and subsequent assessment of centrifuge operation of the mine. The dust emission rates due to wind erosion of the HMC stockpile are presented in Table 18 to Table 20 of the EES Air Quality Assessment and are labelled ‘Stockpiles’.

The HMC stockpile surface area is listed in Appendix B, Table B2 (page 127) of the EES Air Quality Assessment as 2.8ha.

Emissions from product haulage are presented in the EES and Supplementary Expert Witness Statement of Simon Welchman separately to HMC stockpile emissions. The haul length for product transport from the product stockpile to the edge of the model domain is listed on page 128 of the EES as approximately 10.4 km.

Figure 3, Figure 4 and Figure 5 show that HMC stockpiles contribute 4-7% of total PM_{10} emissions depending on year of operation.

Revised HMC stockpiles

Katestone has been advised by Kalbar that HMC is now proposed to be stored within silos. In Katestone’s opinion, HMC storage in silos will not be a source of dust. Figure 6, Figure 7 and Figure 8 present the breakdown by activity of emissions of PM_{10} associated with all emission sources at the Fingerboards Project with HMC stored in silos and, therefore, with no emissions of dust from HMC stockpiles.

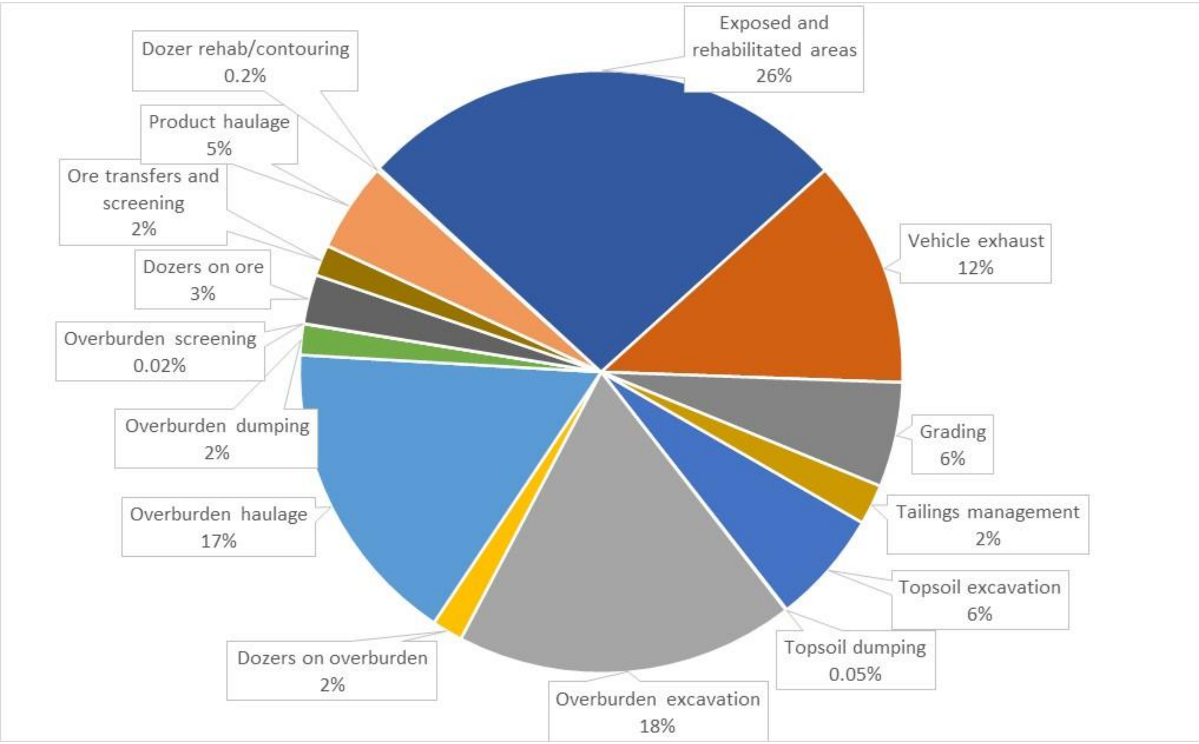

Figure 6 Year 5 - Breakdown of PM_{10} emissions by activity excluding HMC stockpiles

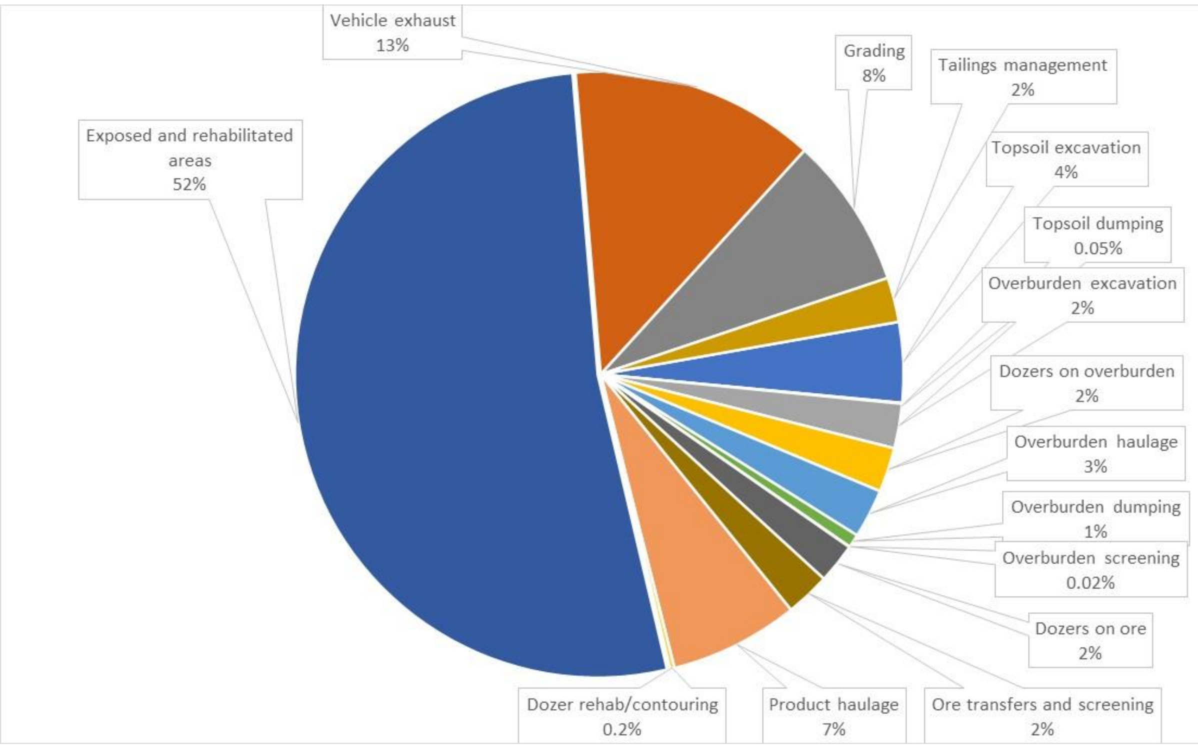

Figure 7 **Year 8 - Breakdown of PM_{10} emissions by activity excluding HMC stockpiles**

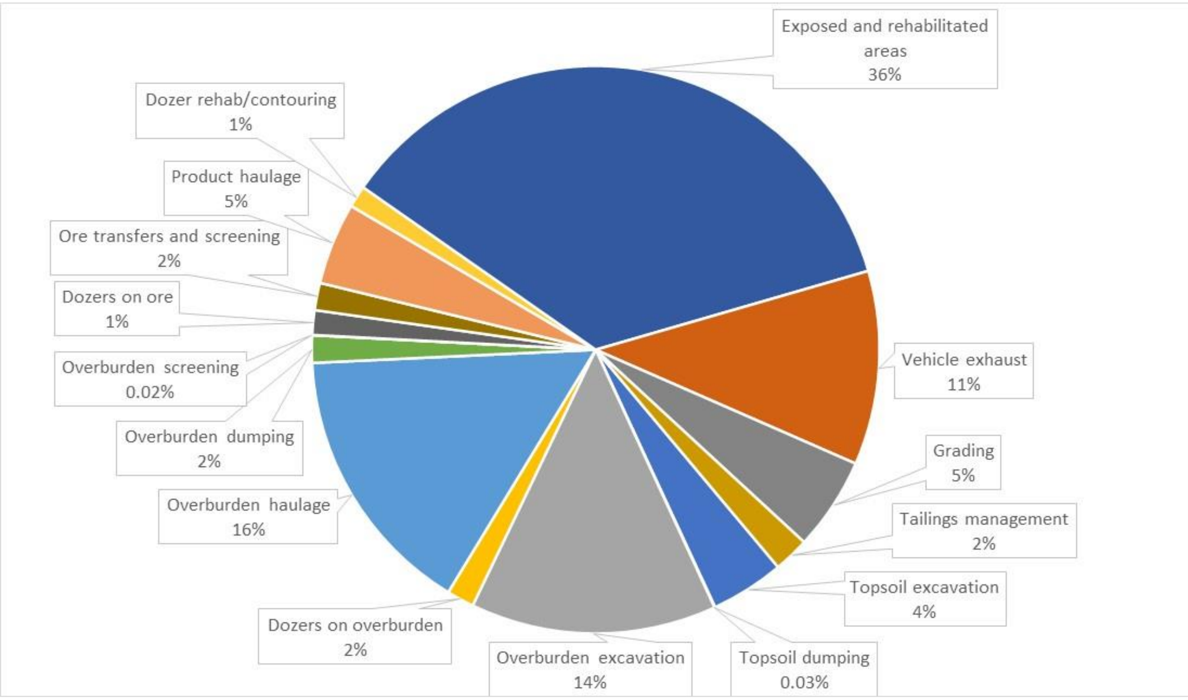

Figure 8 **Year 12 - Breakdown of PM_{10} emissions by activity excluding HMC stockpiles**

Background information about how emissions from mining activities were estimated

Table 18 to Table 20 of the EES Air Quality Assessment present the emission rates of TSP, PM_{10}, $PM_{2.5}$, respirable crystalline silica and arsenic estimated for Years 5, 8 and 12, respectively, of operations of the Fingerboards Project. Emission rates have been calculated on a per activity basis using information derived from the mine plans. In general, emission rate calculations for each activity follow the following general algorithm:

$$E_R = EF \, . \mathrm{A}$$

Where:

E_R is the emission rate in units of mass per time (e.g. grams per second (g/s) or kilograms per year (kg/year)

EF is the emission factor for the particular activity (e.g. for stockpiles the emission factor is in terms of mass of dust per area subject to wind erosion (g/ha or g/m^2))

A is the activity rate for the particular activity (e.g. for stockpiles, the activity rate is the area of the stockpile that is subject to wind erosion in units of hectares (ha) or square metres (m^2))

Appendix B, Section B2 of the EES Air Quality Assessment provides details of the methods used to calculate emission rates for each separate activity occurring on-site. Emission factors were used along with operating information to calculate emission rates of TSP, PM_{10} and $PM_{2.5}$. Where available, parameters such as silt and moisture content for the ore, overburden, or topsoil were used to characterise emissions from activities that reflected the material type involved.

Appendix B, Table B3 of the EES Air Quality Assessment presents the percentages of respirable crystalline silica, arsenic, and the suite of metals sampled in topsoil, overburden, ore, and fine tailings. Emissions of these indicators due to activities involving HMC were calculated using the composition data for ore. Emissions of respirable crystalline silica, arsenic, and heavy metals due to the entire project were estimated from the PM_{10} (for arsenic and metals) or $PM_{2.5}$ (for respirable crystalline silica) for each individual activity and the composition data in Table B3 for the material type involved in that activity. Table B6 to Table B8 of the EES Air Quality Assessment present emissions of arsenic and metals, calculated for each activity.

The same emission estimation methodologies and composition data have been used to estimate the emissions presented in Table 1 to Table 3 of the Supplementary Expert Witness Statement of Simon Welchman for operation of the project using centrifuges.

As noted on page 42 of the EES Air Quality Assessment, Figure 19 to 21 illustrate the spatial distribution of emission sources in the dispersion model. These layouts have been used to model emissions of TSP, PM_{10}, $PM_{2.5}$ and respirable crystalline silica. Ground-level concentrations of arsenic and each heavy metal were estimated based on the dispersion modelling results for PM_{10}, and the ratio of the heavy metal to PM_{10} emissions for the entire Project for each operational year.

Dust potential of HMC

Katestone understands that there have been discussions around the dust potential of HMC e.g. in the context of potential spills during transport to port and rehandling and storage at ports. The size distribution of HMC concentrate shows that 80% of the material is larger than 105 µm. Less than 2% of material is less than 38 µm because of removal of fines during processing. The material that is less than 38 µm and is more likely to be emitted as dust if it is exposed to the wind. Consequently, the HMC will have a very low dustiness potential.