MARSHALL DAY Acoustics

## INQUIRY AND ADVISORY COMMITTEE

# FINGERBOARDS MINERAL SANDS
# Project Environment Effects Statement

## Statement of Evidence of Christophe Frédéric Delaire

| | |
|---|---|
| Prepared for: | Kalbar Operations Pty Ltd |
| Instructed by: | White & Case |
| Date of last site inspection: | 9 November 2020 |
| Date of Statement of Evidence: | 30 January 2021 |
| Document reference: | Ev 001 R01 20200942 |

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## 1.0 NAME AND ADDRESS

1.1 CHRISTOPHE FREDERIC DELAIRE

Co-CEO of Marshall Day Acoustics Pty Ltd

1.2 6 Gipps Street, Collingwood Victoria 3066

## 2.0 AREA OF EXPERTISE

2.1 For over 18 years I have worked in the field of acoustics and noise control.

2.2 I am a member of the Australian Acoustical Society (MAAS)

2.3 My qualifications and experience are detailed in Appendix A.

2.4 I am sufficiently expert to make this statement because I have been involved in numerous environmental noise impact assessments for major environmental projects such as quarries, mines, landfills, wind farms and industrial plants.

## 3.0 SCOPE

3.1 Kalbar Operations Pty Ltd (Kalbar) commissioned Marshall Day Acoustics Pty Ltd (MDA) to undertake a technical noise and vibration study to be included in the Environment Effects Statement (EES) for the Fingerboards Mineral Sands Project in southeast Victoria (the Project).

3.2 MDA Report Rp 001 R12 20170182 *Fingerboards Mineral Sands – EES Noise and Vibration Assessment* dated 25 August 2020 (the MDA Report) considered environmental noise and vibration levels associated with the Project and was published within Appendix A010 of the EES.

3.3 A glossary of acoustic terminology is provided in Appendix B.

3.4 I have been instructed by White & Case, on behalf of Kalbar, to undertake the following in regard to the matter:

> *(a) prepare an expert witness statement in which you:*
>
> *(i) set out your background and relevant expertise;*
>
> *(ii) briefly describe and summarise the Marshall Day Acoustics noise study* [the MDA Report] *and your role in preparing it. In particular, we ask that you detail whether there is anything in the report that you disagree with or wish to elaborate on and set out any additional information that you consider necessary to include, including any additional assumptions;*
>
> *(iii) consider the submissions that are relevant to your area of expertise and respond to any issues raised; and*
>
> *(b) if required, prepare and present expert evidence at the inquiry hearing.*

3.5 The letter of instructions from White & Case, dated 15 September 2020, is attached for reference in Appendix C.

3.6 I adopt the MDA Report, of which I was the reviewer of an early version, as the basis for my expert witness statement and evidence, subject to the corrections noted in Appendix D.

3.7 I note that an earlier version of the MDA report was separately submitted with the EPA Works Approval Application for the Project; specifically, MDA Report Rp 001 R11 20170182 *Fingerboards Mineral Sands – EES Noise and Vibration Assessment* dated 21 July 2020.

The only changes from this earlier version and the MDA Report referred to in my evidence were:

- The inclusion of predicted noise contour maps for the preferred off-site material transport option
- Minor corrections to the emission data tabulated for the Amphirol plant
- Minor corrections to the tabulated predicted noise contributions in Appendix J (but no changes to any of the total predicted environmental noise levels).

The two reports are therefore effectively equivalent. Throughout this report, no further reference is made to the earlier report version submitted with the EPA Works Approval Application.

Chapter 9 of the EES addresses noise and vibration from the Project and was prepared by Coffey. While this chapter was based on the content of the MDA Report, and MDA provided targeted input into the preparation this document, I have based my evidence solely on the MDA report as the primary reference for noise and vibration assessments for the Project.

3.8 In the time since the MDA Report was prepared, a noise assessment was undertaken for the pumping station located separately, to the north of the mine site. A summary of our findings, together with a summary of background noise levels measured at Receiver R6, are presented in Appendix E. This is further addressed in Section 5.17 of my evidence statement.

3.9 In preparation of my witness statement, I have reviewed relevant sections of the documents listed in Appendix F.

3.10 I prepared this statement of evidence with the assistance of the MDA staff members listed in Table 1. Other staff members not listed below have had minor input in the preparation of the MDA Noise Report.

**Table 1: Assisting MDA staff members**

| Staff member | Title | Tasks | Qualification |
|---|---|---|---|
| Gillian Lee | Associate | Noise modelling<br>Preparation of noise report | B.Mus Tech |
| Justin Adcock | Associate | Review of calculations<br>Review of noise report<br>Preparation of Mm 001 20200942<br>Review of statement of evidence | B. Eng Mech |

3.11 All opinions presented in this statement of evidence are my own.

## 4.0 LEGISLATIVE CONTEXT AND STANDARDS

4.1 A brief outline of the source of assessment criteria for each aspect of the Project addressed in the MDA Report is presented in Table 2. In general terms, Victorian policy and guidelines have been referenced where available. For the aspects not addressed by Victorian policy or guidelines, reference has been made to alternative guidance commonly referenced in Victoria.

**Table 2: Source of assessment criteria**

| Consideration | Basis |
|---|---|
| Operational noise (continuous noise) | Victorian guideline which sets recommended noise levels for different times of day.<br>Relevant document: EPA Publication 1411 *Noise from Industry in Regional Victoria* described in section 2.4 of the MDA report. |
| Operational noise (short term events) | NSW policy which sets a range of maximum noise levels which are unlikely to cause awakening reactions<br>Relevant document: NSW *Road Noise Policy* described in Section 2.6 of the MDA report |
| Operational noise (off-site vehicle movements) | NSW policy which provides non-mandatory criteria for existing residences affected by additional traffic on existing roads generated by land use developments and sets thresholds above which mitigation measures must be considered with the aim to select the most feasible and reasonable measures<br>Relevant document: NSW *Road Noise Policy* described in Section 2.6 of the MDA report |
| Construction noise | Victorian guideline which refers to managerial controls for normal working hours, and provides guideline criteria for construction activity during the evening and night period<br>Relevant document: EPA Publication 1254 *Noise Control Guidelines* described in Section 2.5 of the MDA report |
| Operational & construction vibration | Australian and international standards and guidelines which set vibration criteria with respect to both human response and structural damage for different building usage<br>Relevant document: various guidelines described in Section 2.3 of the MDA report |

4.2 In the time since the MDA Report was prepared, the Victorian EPA issued:

- a new guideline for the control of construction noise; and
- a new guideline which will apply to the operational noise of commercial, industrial and entertainment premises later this year

Neither of these new guidelines materially alter the noise criteria or assessment outcomes for the Project. However, further details on the two new guidelines, and the consequence of their application to the Project, are presented in subsequent sections of this statement of evidence.

## 5.0 SUMMARY OF OPINIONS

5.1 The noise and vibration assessment accounts for the following:

- Existing noise sensitive areas (receivers) in the vicinity of the Project
- Noise measurements of existing ambient and traffic noise levels
- Vibration measurements of existing ambient (residential) and road/rail levels
- Terrain profiles for construction and operation scenarios for the subject site and surrounds
- Noise data to represent activities undertaken as part of the construction and operation of the Project, obtained from measurements, manufacturer data and current Australian and British standards
- Development of key worst-case construction and operational scenarios to represent the Project stages expected to result in the highest levels at nearby noise-sensitive receivers

  At times when the weather conditions are less favourable for sound propagation, and during non-peak operations, noise levels are likely to be lower than modelling results presented in the MDA report.
- Noise mitigation strategies developed from iterative noise modelling of the Project, in consultation with industry experts (Hushpak, Minetek) and Kalbar
- Prediction of noise levels at receivers in the vicinity of the Project for the nominated operational and construction scenarios
- Off-site material transportation options, including new rail-siding infrastructure proposed within the site boundary for the preferred rail transportation option
- Prediction of vibration levels at distances from the Project site for select items of heavy machinery that would be used during the construction and operational phases
- Best practice strategies for minimising the impacts of noise and vibration for the Project.

*Operational noise of site activities*

5.2 The Project is generally proposed to operate 24 hours a day, 7 days a week. However, some equipment items are proposed to not operate at night for noise mitigation reasons.

5.3 Recommended maximum noise levels (recommended levels) for the Project were determined in accordance with EPA Publication 1411 *Noise from Industry in Regional Victoria* (NIRV), the applicable guideline document for assessing the noise of extractive industries in regional Victoria.

5.4 In the time since the MDA Report was prepared, the Victorian EPA issued a new guideline which will apply to the operational noise of commercial, industrial and entertainment premises later this year.

EPA Publication 1826.2 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* (the Noise Protocol) was published on 20 November 2020, and is intended to apply from 1 July 2021.

The recommended levels and assessment procedures of NIRV are consistent with the Noise Protocol. Demonstrating compliance with the NIRV recommended levels therefore also demonstrates compliance with the criteria of the Noise Protocol. Further information is provided in Appendix D of my evidence.

5.5 In accordance with NIRV, the recommended levels were defined separately for day, evening, and night periods, as well for the different stages of the Project, based on NIRV guidance that is specific to extractive industries.

5.6 Preliminary noise modelling of the site identified environmental noise as an important design parameter for the Project. An iterative design and modelling process was therefore required to identify conceptual operation and design measures to manage noise emissions from the site.

5.7 Noise management and mitigation measures have been proposed to reduce noise levels, with a minimum objective of achieving compliance with the NIRV recommended levels for the day, evening, and night periods. During the detailed design for the Project, all practical measures for the reduction of noise would be considered, including options to achieve noise levels lower than the recommended levels where reasonably achievable with good practice measures.

5.8 Noise management measures (in contrast to mitigation measures) primarily involve restriction of night activities when operations are located closest to dwellings. Appendix G3 of the MDA report provides full details of the equipment included in the day, evening, and night worst case scenarios, and provides an indication of the extent of management measures that will require consideration during the detailed design of the Project in order to achieve compliance with the NIRV recommended levels.

5.9 The proposed noise mitigation includes the following types of measures:

- Plant-based noise reduction packages (i.e. muffler upgrades, intake and exhaust silences, radiator attenuation etc)
- Screening of mobile plant where practical using noise bunds or cuttings for haul routes
- Cladding or screening of the Wet Concentrator Plant (WCP)
- Use of broadband reversing alarms (i.e. to avoid the intrusive characteristics of tonal reversing alarms).

5.10 Details of the proposed noise mitigation measures for both operations and construction of the Project are detailed in Section 10 of the MDA report and in Appendix H *Mitigation Register* of the EES.

It is important to note that these measures were primarily developed and documented to demonstrate that noise levels could be feasibly and appropriately controlled, with particular emphasis on demonstrating compliance with the NIRV recommended levels. The general noise mitigation and management detailed in the MDA report will be incorporated into, and inform, the noise management plan. All requirements for the control of environmental noise and vibration will however need to be reviewed and specified during the detailed design stage of the Project to verify compliance with the noise requirements for the final configuration and staging of the Project.

5.11 With the recommended noise mitigation and management measures, noise levels at all receivers around the subject site are predicted to be within the NIRV recommended levels for the day, evening, and night, accounting for operations of the worst case scenarios modelled.

These worst case scenarios were developed to account for the years when operations should occur nearest to noise sensitive locations (years 1 and 5) and the years when equipment intensity peaked (years 8 and 12). Further details of these selections are provided in section 7.2 of the MDA report.

5.12 The empirical data for mining operations predominantly relates to average noise emissions that are relevant for the assessment of compliance with the NIRV recommended levels. While the NIRV guidelines are specifically stated to *promote normal domestic use of the home and sleep at night*, further consideration was given to the potential sleep disturbance by short term noise events.

Short term noise levels for the types of operations proposed would typically not be more than 15 to 20 dB greater than the average (equivalent) noise levels of the source (based on limited empirical data from MDA measurements and international guidance). In this instance, the recommended level for the night period is set relatively low, to account for the low background noise levels and the zoning of the area. This means that achieving compliance with the NIRV recommended level for the night period would result in noise levels that are expected to be lower than the sleep disturbance criterion.

5.13 As an example, the highest noise contribution at receiver R21 for the year 1 night scenario is from the CAT 6030 excavator (35 dB $L_{Aeq}$, the highest noise contribution for any of the modelled equipment for night scenarios).

Although I am not aware of $L_{Amax}$ sound power level for this particular equipment, the MDA noise database includes two (2) excavators with both $L_{Aeq}$ and $L_{Amax}$ data. For these two measured excavator models, the $L_{Amax}$ is 12-14 dB higher than the $L_{Aeq}$ noise level.

Based on the highest difference, the $L_{Amax}$ predicted noise level from the modelled year 1 night operation at R21 would be approximately 49 dB, comfortably below the sleep disturbance criteria.

This prediction is conservative (i.e. overestimate the maximum levels), as it assumes that the frequency characteristics of the average noise level ($L_{Aeq}$) and maximum noise level ($L_{Amax}$) are the same. However, the actual available frequency data for this example indicates that the attenuation of noise levels as the sound propagates would be greater for the maximum noise levels (specifically, due to the maximum noise level data containing a greater contribution of high frequencies which attenuate more rapidly than lower frequencies).

5.14 The MDA report therefore concluded that the risk of sleep disturbance at night was low. However, in accordance with the general guidance of NIRV, all reasonable and practical measures are recommended to be implemented for the control of short term increases at night. This includes measures such as the use of broad-band reversing signals and maintenance of haul roads to avoid excessive impact noise from vehicles passing over surface imperfections.

5.15 All noise mitigation measures required to achieve compliance with NIRV would be refined and specified in detail during the detailed designs stage of the Project.

5.16 The preparation of a dedicated noise management plan is recommended, formally documenting all of the managerial and engineering measures to be implemented to control noise from the site.

The noise management plan would also document the noise testing plans which would be implemented to assess compliance during the construction and operation of the Project.

*Operational noise of site activities – design update*

5.17 The EES identified two options for pumping water from the Mitchell River.

Kalbar has advised that it now only proposes to build and operate a purpose-built pump station located close to the mine on the southern side of the Mitchell River. Noise modelling undertaken for this option has confirmed that predicted noise levels are within the NIRV day, evening, and night recommended levels at the nearest receiver.

Further information is provided in Appendix E of my evidence.

*Off-site material transportation*

5.18 The preferred material transport option for the site involves the development of a dedicated rail siding, at Fernbank to the south of the mine, which would avoid the introduction of truck movements on local roads for material transport from the site.

5.19 All truck movements associated with this preferred option would occur during the day and evening along an on-site haul route via the infrastructure options area. Accordingly, all truck movements associated with the preferred option fall within the scope of the assessment of operational noise summarised above in 5.2 to 5.16, and documented in Section 11.1.3 of the MDA report.

5.20 The onsite activities associated with the preferred material transportation option comprise truck movements, locomotive movements adjacent to the rail siding, and material loading activities. Noise levels from this arrangement were predicted to be within the NIRV recommended levels, lending support to this option as the preferred material transportation route.

5.21 The assessment of this option in the MDA report accounted for locomotive movements occurring at the rail siding during the night period. In the time since the MDA report was prepared, Kalbar has instigated further investigations concerning the timing of freight movements at the rail siding.

5.22 Subsequently, V/line, in concert with Metro, has provided Kalbar with an indicative timetable for the use of five (5) freight train cycles per week (each cycle comprising a freight movement from the Project rail siding to the Port of Melbourne, and then back to the Project rail siding) for the duration of the Project.

5.23 This timetable would limit freight movements at the rail siding, and on the rail network east of Rosedale, to the day and evening periods (0700 to 2200 hrs).

5.24 Based on this timetable, Kalbar propose to limit loading and unloading operations to daylight hours only. To support this, the logistics operator has nominated four (4) reach stackers be used for container handling while the locomotives move around the siding to reposition for the return journey to the Port. The train cycle has further been designed to operate outside of the Melbourne Metro morning and afternoon peak periods, therefore necessitating nighttime operations to occur at the Port. It is understood this timetable will be locked-in once the rail access agreement is executed. V-Line advised indicative pathing times for the Fingerboards Project will be:

- 0500 hrs Estimated Time of Departure (ETD) at Melbourne
- 1200 hrs Estimated Time of Arrival (ETA) at Fernbank
- 2030 hrs ETD at Fernbank
- 0300 hrs ETA at Melbourne.

5.25 This timetable provides the benefit of avoiding Project-related nighttime freight movements at the rail siding or within towns east of Rosedale. The proposed scheduling also avoids unloading and loading activities at the rail siding during the night.

5.26 The proposed operations with this timetable would involve a greater number of reach stackers being used than was accounted for in the modelling results presented in the MDA report (i.e. four reach stackers in lieu of one reach stacker accounted for the in the MDA report). However, the assessment presented in the MDA report was based on a more conservative scenario involving rail siding activity occurring during the night. With the restriction of hours, predicted noise levels, accounting for the increased number of reach stackers, are estimated to remain within the NIRV recommended levels (based on a review of the noise contribution of the reach stackers to the overall predictions presented in the MDA report).

5.27 For completeness, the assessment has also considered the potential noise associated with the introduction of trucks onto local roads if the preferred option did not proceed.

5.28 This alternative option would involve the introduction of trucks on local roads for the transport of material from the site. Truck movements associated with this alternative option could occur during the day, evening, and night.

5.29 In the absence of Victorian legislation or guidelines relating to noise from vehicles associated with a new project travelling on local roads, predicted noise levels from project-related truck traffic has been compared to related guidance outlined in the NSW Road Noise Policy.

5.30 The introduction of B-Double trucks on local roads due to the Project would result in an increase in activity that would be noticeable, particularly at night. However, the change in noise level is less than the relative threshold criteria provided by NSW guidance referenced in the assessment. The MDA report assessment of predicted future traffic noise levels for this option primarily considered the relative change criterion of the NSW guidance. However, it is likely that an assessment based on the fixed level criteria would indicate a similar finding (accounting for the estimated contribution of traffic measured range of night-time noise levels at the site and the predicted change).

5.31 The MDA report was based on an assumption that there may be limited truck movements on the haul routes at night (without available detailed hourly traffic volumes), and thus the potential for noise induced sleep disturbance.

5.32 Irrespective of the findings with respect to the NSW guidance document, it was found that the alternative option has the potential to result in increased sleep disturbance relative to that of existing heavy goods movements in the area, which lends support to the preferred option (i.e. a measure which addresses changes to road traffic noise levels by removing haulage from surrounding roads).

5.33 A road traffic survey subsequently commissioned by Kalbar provided a sample of measured movement numbers for different vehicle classifications on a daily and hourly basis. The survey demonstrated that truck movements do occur during the night, but the numbers are low relative to the movements predicted to occur if the preferred rail transportation option did not proceed. The survey results are therefore consistent with the assumption and assessment findings presented in the MDA report.

5.34 Measures for the management of off-site truck noise, including instructions for driving practices that minimise noise impacts and regular maintenance of the trucks have been documented for the alternative transport option.

5.35 Consistent with the advice provided by the NSW guidelines, available options to control the noise associated with increased traffic on existing roads are limited. This further lends support to the preferred material transport option.

*Construction noise*

5.36 The construction noise assessment is mostly based on the activities undertaken prior to commencement of concentrate production at the site.

The exception to this is stripping of overburden and earthmoving to access the ore.

Section 7.4 of the MDA report states that both of these will occur prior to commencement of production but are activities that are inherent to the operational stage of the Project. Accordingly, stripping of overburden and earthmoving to access the ore was included in the operation noise modelling scenarios instead of the construction scenarios, and therefore assessed using the NIRV recommended levels.

Addressing these activities separately from construction is supported by:

- the equipment, activities, and noise emissions of overburden removal and earthmoving to access the ore being identical to those which would occur subsequently as part of the operation of the Project; and
- the NIRV guidance which specifically excludes overburden removal from the exemptions that are defined for site clearing and preparation i.e. the NIRV guidance is that the types of exemptions afforded to site clearing do not apply to overburden removal on account if it being part of the normal operation of a mine which should be assessed using the NIRV recommended levels.

5.37 EPA Publication 1254 *Noise Control Guidelines* (EPA Publication 1254) was referenced as the applicable guidance for the assessment of construction noise when the MDA report was prepared.

5.38 In the time since the MDA Report was prepared, the Victorian EPA issued a new guideline for the control of construction noise. EPA Publication 1834 *Civil construction, building and demolition guide* (EPA Publication 1834), dated 26 November 2020 supersedes the content of Section 2 from EPA Publication 1254, dated October 2008.

5.39 The assessment presented in the MDA report based on EPA Publication 1254 meets the assessment requirements of EPA Publication 1834. In particular, with respect to night-time construction work, the assessment in the MDA report adopts a more stringent definition of audibility than suggested by EPA Publication 1834. The construction noise findings of the MDA report therefore remain valid with respect to EPA Publication 1834. See Appendix D2 for further details.

Given the above, and for consistency with the MDA report, my evidence continues to refer to the guidance of EPA Publication 1254 instead of the updated guidance of EPA Publication 1834.

5.40 Construction activities are proposed to occur over a six-day week between 0700-1900 hrs. Outside these times, overburden removal (assessed separately from construction), sub soil removal and reduced-intensity construction activities such as construction of the freshwater storage areas are proposed to occur on a 24-hour basis.

5.41 EPA Publication 1254 provides separate guidance for different days and hours as follows:

- Monday-Friday 0700-1800 hrs and Saturdays 0700-1300 hrs (normal working hours)

  Construction noise managed through best practical measures – noise limits are not defined for construction during these hours

- Monday-Friday 1800-2200 hrs, Saturday 1300-2200 hrs & Sunday/Public holidays 1800-2200hrs

  Noise criteria are set at 5 – 10 dB above background, depending on the duration of construction

- Monday-Sunday 2200-0700 hrs (night period)

  Noise to be inaudible inside a habitable room. A criterion for inaudibility is not defined.

5.42 Typical scenarios of construction activity for the Project were defined in Section 7.3 of the MDA report to provide a basis for noise modelling. These scenarios included details of construction plant and work locations for the day, evening, and night periods.

5.43 Construction noise levels at neighbouring receiver locations are predicted to be relatively low. In particular, the predicted noise construction noise levels are below the day, evening, and night NIRV recommended levels that apply to the noise of the operational phase of the Project.

5.44 Comparison of predicted construction noise levels during the evening period with EPA Publication 1254 criteria indicates 4 of the 13 receivers are likely to receive noise levels below the criterion. At 9 locations, there is a risk that noise could be higher than the criterion when background noise is at the low end of the measured range.

5.45 Predicted noise levels from construction activities at night are lower and broadly similar to the range of background noise levels measured for the Project. However, noise from construction activities may be above the background noise level at some dwellings. As a result, comparison of predicted construction noise levels during the night period with EPA Publication 1254 criteria for general construction activity indicates that noise is likely to be inaudible at 7 of the 13 noise-sensitive receivers. At 6 locations, there is a risk that noise could be higher than the night criteria of inaudibility inside dwellings, however this risk depends on a number of conservative assumptions.

5.46 Mitigation measures for construction during the evening and night periods are therefore required. In accordance with EPA Publication 1254, noise reduction measures and recommendations for a noise management plan for the construction phase have been outlined. All managerial and engineering noise control measures would need to be fully documented in the noise management plan prior to commencement of construction

5.47 However, the evening and night-time EPA 1254 guidelines are significantly more stringent than the NIRV recommended levels which apply to the operation of the Project, particularly the inaudibility guideline for the night period.

This is an important point of context for a mine project which involves very similar noise generating activities during the construction and operation phases of the Project. To demonstrate this point, an activity which involves equipment which is used during both construction and operation of the mine would need to be inaudible at night, but once long-term operation commences, the same activity would be acceptable provided it is within the NIRV recommended levels.

This is counterintuitive, as common noise assessment practices usually apply more stringent criteria to operations rather than construction, because operations occur for much longer periods than construction. For example, former Victorian guidelines for construction activity in rural areas, as detailed in EPA Publication N3/89, previously recommended the day time noise criterion for construction should be 10 dB higher than the limit which applied to operational noise, and the evening and night criteria for construction should be equal to the criteria for operational noise.

However, in this case, as a result of low background noise levels in the area, the EPA 1254 guidelines for the evening and night periods equate to much lower (more stringent) noise criteria than for operational periods, and would also be more stringent than for construction in built-up areas.

5.48 If the EPA 1254 guideline criteria for evening and night operations are referenced in the planning permit or work plan, and are required to be adhered to, it is likely that significant managerial restrictions would apply, including significant curtailment of evening and night work, despite comparable activities associated with long term operation being permissible under less stringent evening and night NIRV criteria.

These restrictions could therefore potentially extend the overall duration of construction.

5.49 Based on the above, there is merit to the adoption of a more pragmatic approach to controlling construction noise than applying the standard inaudibility requirements which are commonly applied to urban area projects which involve very different sources of noise during construction and operation.

*Vibration*

5.50 During construction, operation, and rehabilitation phases of the Project, there are not proposed to be any activities that might typically generate significant ground vibration, such as piling or blasting.

5.51 To assess potential vibration from the Project, criteria were sourced from Australian and International standards and guidelines.

5.52 The vibration assessment presents predicted ground vibration levels from typical heavy machinery items that would be operating at site during the construction and operational phases.

5.53 The predictions demonstrate that compliance with the most stringent ground vibration criteria is expected to be achieved at distances greater than 100 m. As the nearest sensitive receiver is located 145 m from the Project boundary, vibration from the Project is expected to be well within guideline and standard criteria ranges.

*Summary*

5.54 The assessment has identified that noise is an important environmental consideration that will need to be carefully managed during the design, construction and operation states of the Project and will require ongoing design and management measures throughout the Project.

5.55 The findings demonstrate that noise levels can be managed in accordance with relevant guidelines and assessment criteria. However, significant restrictions may apply to construction during the evening and night, depending on the nature of any approval requirements for this aspect of the Project.

5.56 Based on the above, the assessment demonstrates that the proposed mineral sands operation can be accommodated at the site and address all relevant noise and vibration considerations.

## 6.0 RESPONSE TO KEY SUBMISSIONS

6.1 I have reviewed key submissions that raise issues relating to noise that are specific to the Project. Health related issues raised in the submissions have not been addressed in this document as it is outside of my area of expertise.

6.2 The submissions considered are listed in Appendix G, together with an outline of the issues raised and my responses.

## 7.0 DECLARATION

7.1 I have made all the inquiries that I believe are desirable and appropriate and no matters of significance which I regard as relevant have to my knowledge been withheld from the Inquiry and Advisory Committee.

Signed .....

Dated 30 January 2021

## APPENDIX A CURRICULUM VITAE

CHRISTOPHE FREDERIC DELAIRE
Co-CEO, Marshall Day Acoustics, Melbourne, Australia

Master's Degree in Engineering (French equivalent), France 2001

**Membership**

Member of the Australian Acoustical Society, (MAAS)

**Project Experience**

Christophe Delaire graduated with a Masters Degree in Engineering (French equivalent) from Ecole Supérieure d'Ingénieurs de Poitiers (France) in 2001 and joined Marshall Day Acoustics the following year.

Christophe has acquired wide-ranging experience in environmental projects and residential developments. He has particularly developed his skill set in environmental acoustics and has been involved in the noise assessment of numerous extractive industry projects and wind farms.

Christophe has given evidence at many hearings (VCAT and Panels Victoria) and is the author of several papers presented at International Wind Turbine Noise Conferences.

**Employment**

| | |
|---|---|
| 2017 - Present | Co-CEO, Marshall Day Acoustics, Melbourne |
| 2002 – 2017 | Associate, Marshall Day Acoustics, Melbourne |
| 2001 | Vacation employment, Marshall Day Acoustics, Melbourne |

## APPENDIX B GLOSSARY OF TERMINOLOGY

| | |
|---|---|
| **dB** | Decibel<br>The unit of sound level. |
| **A-weighting** | The process by which noise levels are corrected to account for the frequency response of the human ear. |
| **Hertz (Hz)** | Vibration can occur over a range of frequencies extending from the very low, such as the rumble of thunder, up to the very high such as the crash of cymbals. The frequency of vibration and sound is measured in hertz (Hz). Once hertz is one cycle per second. Structural Vibration is generally measured over the frequency range from 1 Hz to 500 Hz (0.5 kHz). |
| **$L_{A90}$** | The A-weighted noise level equalled or exceeded for 90% of the measurement period. This is commonly referred to as the background noise level. |
| **$L_{Aeq}$** | The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level. |
| **$L_{eff}$** | The effective noise level of commercial or industrial noise determined in accordance with *State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No. N-1* (SEPP N-1). This is the $L_{Aeq}$ noise level over a half-hour period, adjusted for the character of the noise. Adjustments are made for tonality, intermittency and impulsiveness. |
| **$L_{Amax}$** | The A-weighted maximum noise level. The highest noise level which occurs during the measurement period. |

## APPENDIX C LETTER OF INSTRUCTIONS

WHITE & CASE

15 September 2020

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

GPO Box 2756
Melbourne VIC 3001
Australia

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ABN 17 847 592 731

whitecase.com

Christophe Delaire
Marshall Day Acoustics
6 Gipps Street
Collingwood, Victoria 3066

By email: cdelaire@marshallday.com

**Confidential and subject to legal professional privilege**

Dear Mr Delaire

**Fingerboards mineral sands project**

We act as legal advisors to Kalbar Operations Pty Ltd (**Kalbar**), the proponent of the Fingerboards mineral sands project (**Project**).

This letter confirms and sets out the scope of your retainer to prepare an expert witness statement and potentially also present evidence at the inquiry hearing to be held in relation to the environment effects statement (**EES**) prepared for the Project pursuant to the *Environment Effects Act 1978* (Vic).

### 1. The Project

Kalbar proposes to develop the Project on an area of approximately 1,675 hectares within the eastern part of the Glenaladale mineral sands deposit in East Gippsland, Victoria. The Project site is located near the Mitchell River, approximately 2 km south of Glenaladale, 4 km south-west of Mitchell River National Park and 20 km north-west of Bairnsdale.

The Project includes the development of an open cut mineral sands mine and associated infrastructure. It is expected to have a mine life of 15–20 years and involve extraction of approximately 170 Mt of ore to produce approximately 6 Mt of mineral concentrate for export overseas.

### 2. Panel and EES inquiry

The EES and the studies and assessments that underpin it (together with a draft planning scheme amendment and application for an EPA works approval) are presently on public exhibition until the end of October 2020.

The inquiry is scheduled to convene its directions hearing on 13 November 2020, and the inquiry hearing is scheduled to commence on 7 December 2020. We will keep you informed of any relevant directions, including the timetable for filing evidence and, if required, any expert conferences.

### 3. Scope

This letter is confirmation of your engagement as an independent expert to:

(a) prepare an expert witness statement in which you:

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(i) set out your background and relevant expertise;

(ii) briefly describe and summarise the Marshall Day Acoustics noise study and your role in preparing it. In particular, we ask that you detail whether there is anything in the report that you disagree with or wish to elaborate on and set out any additional information that you consider necessary to include, including any additional assumptions;

(iii) consider the submissions that are relevant to your area of expertise and respond to any issues raised; and

(b) if required, prepare and present expert evidence at the inquiry hearing.

We will provide further instructions on the scope of your engagement and any new instructions as necessary.

**4. Form of your expert witness statement**

The form and content of your expert witness statement should be prepared in accordance with Planning Panel Victoria's *Guide to Expert Evidence* (**Guide**). We enclose a copy of the Guide for your reference. Please review the Guide and ensure your witness statement addresses the matters set out in it, in particular those matters listed under the heading 'The expert witness statement'. Please contact us if there is anything in the Guide that you do not understand, or if you have questions in relation to it.

Until your expert witness statement is in final form it should not be signed. You should, however, be aware that unsigned documents may need to be disclosed to other parties.

**5. Your duties and responsibilities as an expert witness**

Even though you are engaged by Kalbar, you are retained as an expert to assist the inquiry, and you have an overriding duty to it. The inquiry will expect you to be objective, professional and form an independent view as to the matters in respect to which your opinion is sought.

**6. Timing**

The timing for completion of your expert witness statement is to be advised. We will let you know as soon as we can.

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**7. Conflict of interest**

It is important that you are free from any possible conflict of interest in providing your advice. You should ensure that you have no connection with any potential party to this matter that could preclude you from providing your opinion in an objective and independent manner.

**8. Costs and invoicing**

Marshall Day Acoustics will continue to be contractually engaged by Kalbar and Kalbar will continue to be responsible for the payment of your fees. Your accounts should be sent directly to the appropriate person nominated by Kalbar.

**9. Confidentiality**

Your engagement and any documents you prepare under it should be marked "Confidential and subject to legal professional privilege".

If anyone other than ourselves, Kalbar or its technical advisers contact you about this engagement or the work you are undertaking under this engagement, please contact us immediately.

If you have any questions about this letter or require any additional information, please contact us.

Yours sincerely,

Tim Power

**Tim Power**
Partner

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Kirsty Campbell

**Kirsty Campbell**
Senior Associate

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cc Justin Adcock

Enc: Planning Panel Victoria's *Guide to Expert Evidence* - April 2019

# APPENDIX D CORRECTIONS AND UPDATED GUIDELINE

## D1 Erratum

*Noise modelling assumptions*

The noise modelling assumptions presented in the MDA report were reviewed for consistency and technical accuracy to support the preparation of this statement of evidence.

The review confirmed that the overall noise emissions of the site for the different time periods and assessment years had been appropriately represented using conservative estimates.

The review did however identify errors in the noise emissions of individual plant items, predominantly in the modelling the Year 1 scenario, but also some minor errors for a limited number of sources in the modelling of years 5 and 12.

In the majority of cases, the errors meant that the noise emission of some activities were overestimated. In a small number of cases, it meant that the noise emission of an individual equipment item was underestimated.

The noise modelling was recalculated with all of these errors corrected for all of the scenarios presented in the MDA Report. The net effect of the corrections was to reduce the overall noise emissions of the site. Specifically, at every receiver where the predicted total noise level changed as a result of the corrections, the corrected predicted noise level was lower than presented in the MDA report. The reduction in predicted noise level was generally approximately 1 dB, with some limited locations and scenarios where predictions were up to approximately 3 dB lower.

The corrected modelling therefore confirmed the minor effect of the identified errors and the conservative nature of the assessment, and that their effect was inconsequential to the findings presented in the MDA report.

For completeness, Table 3 provide full details of the corrections to the noise emission data for Year 1, and Table 4 details the changes for years 5 and 12. The recalculated predicted noise levels for Year 1 are subsequently provided in Table 5. The recalculated predicted noise levels for Years 5 and 12 indicated no change to the overall predicted noise levels; this is consistent with expectations given the small number of corrected sources, and the small magnitude of the change in corrected noise emission.

**Table 3: Sound power level corrections – modelling of Year 1**

| Noise source | Time period | Model sound power level, dB $L_{WA}$ | | | Explanation |
|---|---|---|---|---|---|
| | | MDA report | Corrected | Change | |
| Amphirol | Day & evening | 108.7 | 109.7 | +1.0 | The corrected model sound power level is based on equipment sound power level of 110.9 dB $L_{WA}$, minus a duration adjustment of 1.2 dB to account for operation for 75 % of an assessment period.<br>The equipment sound power level for the Amphirol is based on MDA measurement data for dozers of comparable specification. However, the MDA report was based incorrectly on data for a D9 Dozer instead of a D10 Dozer, the latter being 1.0 dB higher. |
| CAT 6030 Backhoe Excavator | All | 117.0 | 112.0 | -5.0 | The corrected model sound power level is based on an equipment sound power level of 117.0 dB $L_{WA}$, minus 5 dB for the effect of a proprietary mitigation package.<br>The MDA report was based on modelling Year 1 without mitigation, as the mitigation was not required to achieve compliance for this year. Subsequent modelling for other years indicated the mitigation requirement, but it was not retrospectively introduced into the Year 1 model. |
| CAT 785 Haul truck to overburden dump | Day & evening | 120.0 | 111.8 | -8.2 | The corrected model sound power level is based on an equipment sound power level of 119.8 dB $L_{WA}$, minus a 2.0 dB duration adjustment (based on the movement pattern of the vehicles) and minus 6 dB for the effect of a proprietary mitigation package.<br>The MDA report was based on modelling Year 1 with a rounded equipment sound power level of 120.0 dB and without mitigation, as the mitigation was not required to achieve compliance for this year. Subsequent modelling for other years indicated the mitigation requirement, but it was not retrospectively introduced into the Year 1 model. |
| Front end loader at overburden | Day & evening | 105.0 | 108.0 | +3.0 | The corrected model sound power level is based on an equipment sound power level of 111.0 dB $L_{WA}$ minus a duration adjustment of 3.0 dB to account for operation 50 % of an assessment period.<br>The MDA report modelling for Year 1 was based on subtraction of a 6.0 dB adjustment to account for operation for 25 % of an assessment period. The increase to 50 % for the corrected model sound power level aligns assumptions applied to other scenarios. |

| Noise source | Time period | Model sound power level, dB $L_{WA}$ | | | Explanation |
|---|---|---|---|---|---|
| | | MDA report | Corrected | Change | |
| Generator for lights | Night | 87.6 | 100.0 | +12.4 | The corrected model sound power level is based on an equipment sound power level capped at a maximum specification value of 100 dB $L_{WA}$ which was determined after the Year 1 model scenario was developed.<br>The MDA report modelling for Year 1 was based on a lower sound power level of 87.6 dB $L_{WA}$ for a different generator model (7 kVA) which was considered at the time this model scenario was prepared, and the updated 100 dB $L_{WA}$ value was not retrospectively applied to the Year 1 modelling. |
| Grader truck fleet to overburden dump | Day & evening | 109.5 | 107.2 | -2.3 | The corrected model sound power level is based on an equipment sound power level of 109.5 dB $L_{WA}$, minus a 2.3 dB duration adjustment to account for the vehicle completing one return journey in a 30 minute assessment period.<br>The MDA report modelling for the Year 1 scenario did not include a duration adjustment as was accounted for in the modelling for subsequent assessment years. |
| Haulage B-Doubles | Day & evening | 108.8 | 108.2 | -0.6 | The corrected model sound power level is based on an equipment sound power level of 108.8 dB $L_{WA}$, plus 4.8 dB to account for three vehicles, minus a 5.4 dB duration adjustment to account for the movement path traversed.<br>The MDA report modelling was based on modelling without correction for the number of vehicles, but conversely without any adjustment for the duration that each vehicle is generating noise in an assessment period. |
| Haulage B-Doubles | Night | 103.8 | 108.2 | +4.4 | The corrected model sound power level is based on an equipment sound power level of 108.8 dB $L_{WA}$, plus 4.8 dB to account for three vehicles, minus a 5.4 dB duration adjustment to account for the movement path traversed.<br>The MDA report modelling was based on an incorrectly entered equipment sound power level which was 5 dB too low, and did not account for vehicle numbers or duration adjustments. |

| Noise source | Time period | Model sound power level, dB $L_{WA}$ | | | Explanation |
|---|---|---|---|---|---|
| | | MDA report | Corrected | Change | |
| Scraper - Ore | Day & evening | 111.0 | 109.6 | -1.4 | The corrected model sound power level is based on an equipment sound power level of 115.6 dB $L_{WA}$ minus 6.0 dB for a proprietary mitigation package.<br>The MDA report modelling was based on a rounded sound power level of 116.0 dB minus 5.0 dB for a proprietary mitigation package. The 5.0 dB reduction was based on an initial estimate of the mitigation package, while modelling of subsequent years was based on a confirmed reduction of 6.0 dB for the package. However, the updated data for the mitigation package was not retrospectively incorporated into the Year 1 modelling. |
| Scraper - Overburden | All | 111.0 | 109.6 | -1.4 | The corrected model sound power level is based on an equipment sound power level of 115.6 dB $L_{WA}$ minus 6.0 dB for a proprietary mitigation package.<br>The MDA report modelling was based on a rounded sound power level of 116.0 dB minus 5.0 dB for a proprietary mitigation package. The 5.0 dB reduction was based on an initial estimate of the mitigation package, while modelling of subsequent years was based on a confirmed reduction of 6.0 dB for the package. However, the updated data for the mitigation package was not retrospectively incorporated into the Year 1 modelling. |
| Water truck | Day & evening | 102.5 | 104.8 | +2.3 | The corrected model sound power level is based on an equipment sound power level of 108.5 dB $L_{WA}$ minus a 3.7 dB duration adjustment for the path traversed by the vehicle in an assessment period.<br>The MDA report modelling was based on a minus 6.0 dB duration adjustment which had been alternatively calculated on the assumption of the vehicle being present for 25 % of an assessment period. Subsequent modelling of other years was based on the more detailed approach which accounts for the duration adjustment for the path traversed by the vehicle which, in this case, results in a smaller value of duration adjustment. This alternative approach was however not retrospectively applied to the Year 1 modelling scenario. |

| Noise source | Time period | Model sound power level, dB $L_{WA}$ | | | Explanation |
|---|---|---|---|---|---|
| | | MDA report | Corrected | Change | |
| Water truck to overburden dump | Day & evening | 102.5 | 106.2 | +3.7 | The corrected model sound power level is based on an equipment sound power level of 108.5 dB $L_{WA}$ minus a 2.3 dB duration adjustment for the path traversed by the vehicle in an assessment period.<br>The MDA report modelling was based on a minus 6.0 dB duration adjustment which had been alternatively calculated on the assumption of the vehicle being present for 25 % of an assessment period. Subsequent modelling of other years was based on the more detailed approach which accounts for the duration adjustment for the path traversed by the vehicle which, in this case, results in a smaller value of duration adjustment. This alternative approach was however not retrospectively applied to the Year 1 modelling scenario. |

**Table 4: Model sound power level corrections – modelling years 5 and 12**

| Noise source | Time period | Model sound power level, dB $L_{WA}$ | | | Explanation |
|---|---|---|---|---|---|
| | | MDA report | Corrected | Change | |
| D8 Dozer - Ore Mining | Day & evening | 105.9 | 104.9 | -1.0 | The corrected model sound power level is based on an equipment sound power level of 112.9 dB $L_{WA}$ minus a 3.0 dB duration adjustment to account for operation for 50 % of an assessment period, and minus 5.0 dB for a proprietary mitigation package.<br>The MDA report was based on modelling with an incorrect entered equipment sound power level of 113.9 dB $L_{WA}$. |
| Haul truck CAT 785 MUP west | Night | 114.7 | 115.7 | +1.0 | The model sound power level is based on an equipment sound power level of 114.7 dB $L_{WA}$ plus 3.0 dB to account for two vehicles, minus a duration adjustment of 1.1 dB to account for the path traversed in a 30 minute period, and minus 6.0 dB for a proprietary mitigation package.<br>The MDA report modelling was based on an incorrectly entered value of 2.1 dB (instead of the correct 1.1 dB value) for the duration correction. |
| Haul truck in pit | Night | 114.8 | 113.8 | -1.0 | The corrected model sound power level is based on an equipment sound power level of 119.8 dB $L_{WA}$ minus 6 dB for a proprietary mitigation package.<br>The MDA report modelling was based on assignment of a lower and incorrect equipment sound power level for the truck (5.0 dB lower value), but conversely did not apply the 6.0 dB reduction of the proprietary mitigation package. |
| Haul truck in pit | Day & evening | 115.0 | 113.8 | -1.2 | The corrected model sound power level is based on an equipment sound power level of 119.8 dB $L_{WA}$ minus 6 dB for a proprietary mitigation package.<br>The MDA report modelling was based on assignment of a lower and incorrect equipment sound power level for the truck (5.0 dB lower value and rounded), but conversely did not apply the 6.0 dB reduction of the proprietary mitigation package. |
| Haul Truck CAT 785 MUP west | Day & evening | 116.8 | 115.6 | -1.2 | The corrected model sound power level is based on an equipment sound power level of 119.8 dB $L_{WA}$ plus 3.0 dB for two vehicles, minus a 1.2 dB duration adjustment for the path traversed by the vehicle and minus 6 dB for a proprietary mitigation package.<br>The MDA report modelling did not incorporate the applicable duration correction. |

**Table 5: Year 1 predicted noise levels, dB $L_{Aeq}$ – MDA report & corrected values**

| Receiver | Day & evening | | | Night | | |
|---|---|---|---|---|---|---|
| | MDA report | Corrected | Change | MDA report | Corrected | Change |
| R1 | 39 | 38 | - * | 33 | 33 | - |
| R5 | 38 | 37 | -1 | 33 | 31 | -2 |
| R6 | 35 | 34 | -1 | 30 | 29 | -2 * |
| R7 | 32 | 31 | -1 | 26 | 25 | -1 |
| R15 | 29 | 28 | -1 | 25 | 23 | -1 |
| R16 | 27 | 25 | -2 | 23 | 22 | -1 |
| R21 | 39 | 36 | -3 | 36 | 33 | -3 |
| R23 | 34 | 34 | - | 31 | 31 | 0 |
| R29 | 24 | 22 | -2 | 20 | 19 | -1 |
| R30 | 25 | 24 | -1 | 21 | 20 | -1 |
| R31 | 29 | 29 | -1 | 24 | 24 | -1 |
| R43 | 35 | 33 | -2 | 31 | 29 | -2 |
| R44 | 30 | 29 | -1 | 27 | 27 | 0 |
| R45 | 31 | 30 | -1 | 27 | 26 | -1 |
| R47 | 26 | 26 | -1 | 22 | 22 | -1 |
| R52 | 37 | 37 | - | 35 | 35 | - |
| R53 | 36 | 36 | - | 34 | 34 | - |
| R58 | 30 | 29 | - * | 26 | 26 | - |
| R60 | 37 | 37 | - | 34 | 34 | - |

* The rounded values of calculated decimal changes differ from the apparent difference of the integer predicted levels

### *Construction activity – 'managed-impact' works*

The conclusion of the MDA report presents text indicating that construction activities may be described as 'managed-impact' for the Project.

This text is not consequential to the assessment, but the potential for the construction work to be considered 'managed-impact' according to EPA Publication 1254 had been removed from all other sections of the report during prior revisions of the report, and was intended to have been removed from the conclusion of the MDA report. While the retained text notes relevant considerations concerning 'managed-impact' works, the decision to approve works on the basis that they are 'managed-impact' ultimately rests with the responsible authority.

## D2 Updated Victorian construction noise guideline

In the time since the MDA Report was prepared, the Victorian EPA issued a new guideline for the control of construction noise. EPA Publication 1834 *Civil construction, building and demolition guide*, dated 26 November 2020 supersedes the content of Section 2 from EPA Publication 1254 *Noise Control Guidelines*, dated October 2008.

Although the content of Section 2 of EPA Publication 1254 is generally reflected in EPA Publication 1834, Section 4.4 of the new guideline provides the following comment on the concept of inaudibility:

> *What is inaudibility?*
>
> *Inaudibility is the quality of not being perceptible by ear (i.e. cannot be heard) and cannot be measured in decibels (dB). The requirement for inaudibility relates primarily to adequate scheduling of works.*
>
> *Adequate scheduling would mean, for example, undertaking noisy activities at less sensitive hours, and inherently quiet activities, that would be inaudible to people, in the night period.*
>
> *Inaudibility is not meant to be a measurable criterion in dB.*
>
> *To predict construction noise, a reference level set at background level +0 dB could be used as a suitable reference level for inaudible. Where this approach is used, apply adjustments to consider the potential character of the noise that increases its impacts (e.g. tonality, impulsiveness).*
>
> *You should not use this approach for compliance purposes, but only to inform risk assessment regarding the scheduling of works*

Considering the lack of guidance with regard to the definition of audibility in EPA Publication 1254, the noise assessment of night-time construction activities presented in the MDA report is more stringent compared to an assessment using the definition of audibility from EPA Publication 1834.

## D3 Updated Victorian operational noise requirements

In the time since the MDA Report was prepared, the Victorian EPA issued a new guideline which will apply to the operational noise of commercial, industrial and entertainment premises later this year.

EPA Publication 1826.2 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* (the Noise Protocol) was published on 20 November 2020, and is intended to apply from 1 July 2021. The publication provides a protocol for determining noise limits for new and existing commercial, industrial and trade premises and entertainment venues. It also sets the methodology for assessing the effective noise level to determine unreasonable noise under the proposed new Environment Protection Regulations.

The Noise Protocol will replace the NIRV guidelines that were referenced in the MDA report to assess the operational noise levels of the Project. However, the changes introduced by the Noise Protocol are inconsequential to the assessment presented in the MDA report. Specifically, the NIRV recommended levels used to assess the Project are identical to the noise criteria defined by the Noise Protocol for the day, evening, and night periods. The method of assessing the effective noise level of the Project also remains identical, both in terms of the noise metrics that are evaluated, and the conditions in which they are to be evaluated. The only change introduced by the Noise Protocol relates to the definition of evening periods. In accordance with NIRV, Saturday afternoons between 1 pm and 7 pm are treated as evening periods for the purpose of defining the recommended levels. However, the Noise Protocol defines this period as the day time for setting the noise criteria. Accordingly, the noise criterion for Saturday afternoon periods is higher under the Noise Protocol than under the NIRV guidelines referenced in the assessment of the Project.

Demonstrating compliance with the NIRV recommended levels therefore also demonstrates compliance with the criteria of the Noise Protocol.

## APPENDIX E PUMPING STATION ASSESSMENT

This section of the Appendix reproduces Marshall Day Acoustics' correspondence with Kalbar detailing the results of an assessment of the proposed pumping station (MDA memo Mm 001 20200942 dated 28 January 2021).

MEMO

MARSHALL DAY Acoustics

| | | | | | |
|---|---|---|---|---|---|
| **Project:** | Fingerboards Mineral Sands | **Document No.:** | Mm 001 | | |
| **To:** | Kalbar | **Date:** | 28 January 2021 | | |
| **Attention:** | Chris Cook | **Cross Reference:** | Rp 001 R12 20170182 (the MDA report) | | |
| **Email:** | chris.cook@kalbarresources.com.au | **Project No.:** | 20200942 | | |
| **From:** | Justin Adcock | **No. Pages:** | 12 | **Attachments:** | No |
| **Subject:** | Receptor R6 - Background noise levels & pumping station assessment | | | | |

Dear Chris,

This document provides:

- The results of background noise monitoring carried out at receptor R6
- Noise level predictions for the pumping station proposed to be located approximately 340 m east-southeast of receptor R6.

## BACKGROUND NOISE SURVEY

A survey of background noise levels was carried out at receptor R6 via unattended logging between Monday 9 November and Monday 23 November 2020.

The data was used to determine the dB $L_{A90}$ background noise levels over 30 minute periods, representing the quietest 10 % of each half-hour period. This corresponds to the noise level during quiet lulls in ambient noise, and excludes short term increases in noise level (e.g. vehicle pass-by or wind gusts).

The measurements were carried out using a class 1 measurement analyser (highest accuracy class used for environmental noise measurements). The instrument is laboratory calibrated ever 2 years in accordance with AS 1055:2018[1], and field calibration was carried out before and after the measurements to confirm the accuracy of the measurement system.

Weather data for the survey period was sourced from the Australian Bureau of Mereology (BoM) monitoring station for Bairnsdale.

Time history charts for each day of the survey are provided in Appendix A.

The results of the survey confirmed that background noise levels at receptor R6 are relatively low. The following key observations are noted:

- Background noise levels illustrate a wide range of variation – this will relate to a range of factors such as the time of day, the presence of local sources of noise near the monitor, bird and insect sounds, wind and rainfall
- Night-time background noise levels are typically in the range of 20–25 dB $L_{A90}$
- Daytime background noise levels are typically in the range of 25–30 dB $L_{A90}$, with days of increased noise in the range of 30–40 dB $L_{A90}$.

The results are consistent with the findings of previous background noise surveys carried out at other receptor locations around the Fingerboards Mineral Sands project. Specifically, background noise levels are consistently low.

[1] AS 1055:2018 *Acoustics – Description and measurement of environmental noise*

Certified System ISO 9001

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As a result, in accordance with the EPA Publication 1411 *Noise from Industry in Regional Victoria* (NIRV), the recommended maximum noise levels (recommended levels) for the project are set on the basis of the location being a quiet rural area i.e. the background noise adjustments which increase the recommended levels in environments where background noise levels are elevated are not applicable to R6 (note – background noise levels are assessed using period-averages of the hourly noise levels – data is presented in this memo in 30 minute periods to provide an illustration of noise level variations throughout the day).

## PUMPING STATION NOISE LEVELS

The design of the pumping station is understood to comprise the following noise generating plant:

- Four booster pumps – three (3) operational and one (1) standby (i.e. up to three pumps could operate simultaneously)
- Transformer – one (1) 1500 kVA transformer.

Noise emission data (sound power levels) for the pumps has been sourced from manufacturer data for the pumps[2]. Noise emission data for the transformers is based on empirical noise data determined in accordance with AS/NZS 60076-10:2009 *Power transformers - Determination of sound levels*.

A summary of the sound power levels used to predict environmental noise levels (sound pressure levels) is provided in Table 1. The sound power level is a measure of the total sound energy produced the equipment. Despite sound power level also being expressed in decibels (dB), it is not the same as the sound pressure level; the latter depends on a range of factors such the number of equipment items that are present and the separating distance.

**Table 1: Pumping station sound power level data, dB $L_W$**

| Equipment item | 63 Hz | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | A-weighted total |
|---|---|---|---|---|---|---|---|---|
| Pumps (per pump) | 86 | 91 | 91 | 89 | 84 | 78 | 74 | 90 |
| Transformer 1500 kVA (one unit) | 66 | 77 | 74 | 65 | 56 | 47 | 40 | 68 |

The sound power levels tabled above have been used to predict operational noise levels at receptor R6. The equipment has been modelled without any barriers or enclosing structures.

The predictions are based on the same international standard and modelling methodology detailed in the MDA report. The following provides a brief summary of the method:

- Calculation standard: ISO 9613-2:1996 A*ttenuation of sound during propagation outdoors – Part 2: General method of calculation* (ISO 9613-2)

  The ISO 9613-2 standard provides calculations for atmospheric conditions which increase the level of noise at a receptor location i.e. a moderate wind directed from the noise source to the receptor, or equivalently, a well-developed moderate ground based temperature inversion (i.e. increasing air temperature with height above ground, as may commonly occur at night).
- Modelling software: SoundPLAN version 8.2 (current release) proprietary 3D modelling software
- Terrain: digital terrain elevation data provided by Kalbar, modified by MDA to reflect the proposed hard stand where the pumping station equipment will be located
- Noise source modelling heights: pumps and transformer modelled at 0.5 m and 2.0 m above the finished surface height of the proposed pad for the pumping station (simplified/conservative assumptions for noise modelling purposes)

[2] Source document: Lowara specification sheet received 5 November 2020, file name 'Lowara_MP_Noise Level_emp-50hz_en' – data referenced for a 250 kW pump including motor, operating at rotational speed of 2,950 rpm

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- Receptor calculation height: 1.5 m above ground level
- Ground effect: G = 0.5

  This represents a mix of soft and hard ground between receptor R6 and the proposed pumping station
- Atmospheric conditions: 10 °C and 70 % relative humidity

  This corresponds to relatively low levels of atmospheric absorption i.e. increasing the predicted sound level because less of the sound is absorbed by the atmosphere. This mainly affects high frequencies of sound.

### Predicted pumping station noise levels

The predicted total noise level of the pumping station is 28 dB $L_{Aeq}$ at receptor R6. The noise of the pumping station is therefore predicted to be well below the NIRV recommended levels of 46, 41 and 36 dB for the day, evening and night respectively.

The noise emissions of pumps and transformer equipment can be characterised by tonality (distinctive audible frequencies). While such characteristics can be evident near to the source, these characteristics are less likely to be evident or clearly audible at a distant receptor location for two reasons. Firstly, high frequency tones are rapidly reduced by atmospheric absorption. Secondly, while low frequency tones can persist at distance, the predicted noise level of the pumping station at receptor R6 is low, and would frequently be comparable to, or below, the background noise. A penalty for tonality is therefore not warranted in this case. However, irrespective, the predicted noise level of the pumping station is well below the NIRV recommended levels by a margin of at least 8 dB. This means that even if a penalty was applied for tonality, the effective noise level (i.e. the noise level of the pumping station adjusted by the addition of 2 to 5 dB for tonality) would still be well below the most stringent NIRV recommended level for the night.

Notwithstanding this finding, it is recommended that the pumps and transformers are specified to avoid emissions which could result in tonality at receptor locations. This will require equipment vendors to supply frequency band information for their equipment for review as part of the detailed design of the project.

### Predicted cumulative noise levels

The preceding section assesses the predicted noise contribution solely attributable to the operation of the proposed pumping stations. However, the NIRV recommended levels apply to total industry noise levels. The combined noise of the main operations of the project and the pumping station must therefore be assessed.

Sections 8.1 and 8.2 of the MDA report[3] details the predicted noise levels of the main operations of the project for the worst case years of operation; years 1, 5, 8 and 12. The predicted cumulative noise levels for receptor R6 are reproduced in Table 2 and Table 3 for day/evening and night operations respectively, along with the combined total noise level accounting for the operating of the pumping station.

**Table 2: R6 predicted noise levels – day/evening period, dB $L_{Aeq}$**

| Ref | Year 1 | Year 5 | Year 8 | Year 12 |
|---|---|---|---|---|
| Main site operations (data from Table 20 in Section 8.1 of MDA report) | 35 | 33 | 33 | 30 |
| Pumping station | 28 | 28 | 28 | 28 |
| Combined total noise level – main site operations and pumping station | 36 | 34 | 34 | 32 |
| NIRV day/evening recommended levels | 46/41 | 46/41 | 46/41 | 46/41 |

[3] MDA Report Rp 001 R12 20170182 *Fingerboards Mineral Sands – EES Noise and Vibration Assessment* dated 25 August 2020, published within Appendix A010 of the Environment Effects Statement

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**Table 3: R6 predicted noise levels – night period, dB $L_{Aeq}$**

| Ref | Year 1 | Year 5 | Year 8 | Year 12 |
|---|---|---|---|---|
| Main site operations (data from Table 20 in Section 8.2 of MDA report) | 30 | 30 | 29 | 28 |
| Pumping station | 28 | 28 | 28 | 28 |
| Combined total noise level – main site operations and pumping station | 32 | 32 | 32 | 31 |
| NIRV day/evening recommended levels | 36 | 36 | 36 | 36 |

Tonality adjustments are not warranted for the reasons noted in the previous section. Also, given that the pumping stations noise levels are comparable to, or less than, that of the main site operations, tonality of the pumping station is even less likely to be evident.

The predictions demonstrate that cumulative noise levels are also predicted to be well below the NIRV recommended levels for the day, evening and night periods.

These findings are presented for planning purposes and demonstrating whether the noise is able to comply with the NIRV recommended levels. The predictions will need to be verified by as part of the detailed design stage of the project, using vendor data for final equipment selections and the final operating configuration of the plant.

Trusting the above information is suitable for your immediate purposes. Please contact us if you require further information.

Justin Adcock

**Associate**

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## APPENDIX A BACKGROUND NOISE MEASUREMENT RESULTS

The charts presented in this data Appendix illustrate half-hourly noise level and weather data. The weather data is annotated by periods designated as 'potentially weather affected', meaning that the rain fall or an average wind speed greater than 5 m/s was recorded in the corresponding half-hour periods.

**Figure 1: Receptor R6 background noise levels – Monday 09 November 2020**

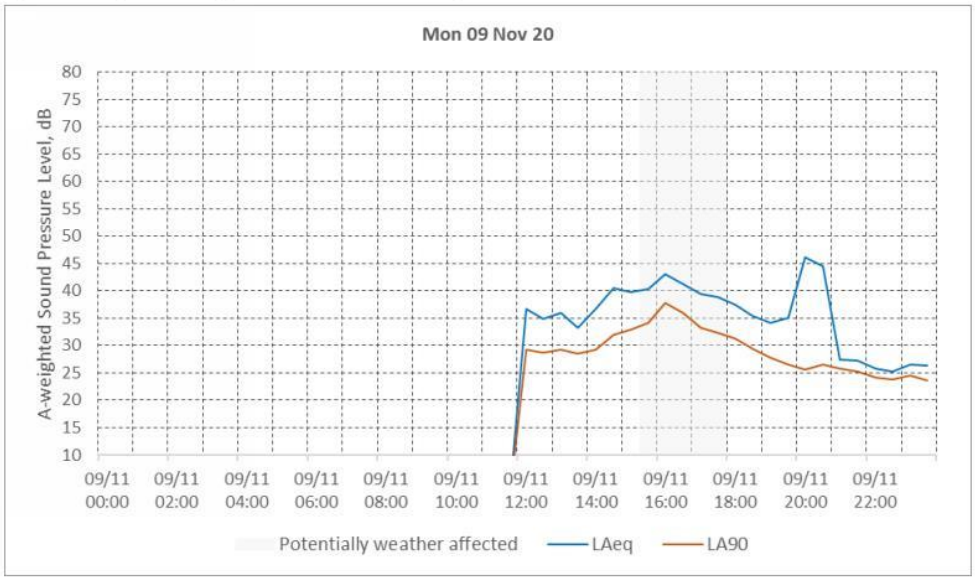
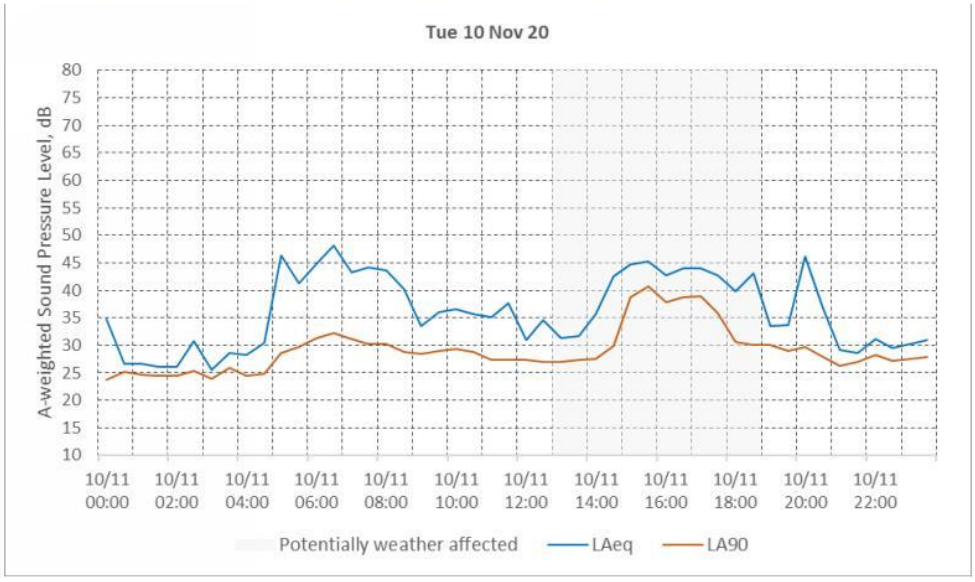



**Figure 2: Receptor R6 background noise levels – Tuesday 10 November 2020**



MARSHALL DAY Acoustics

Figure 3: Receptor R6 background noise levels – Wednesday 11 November 2020

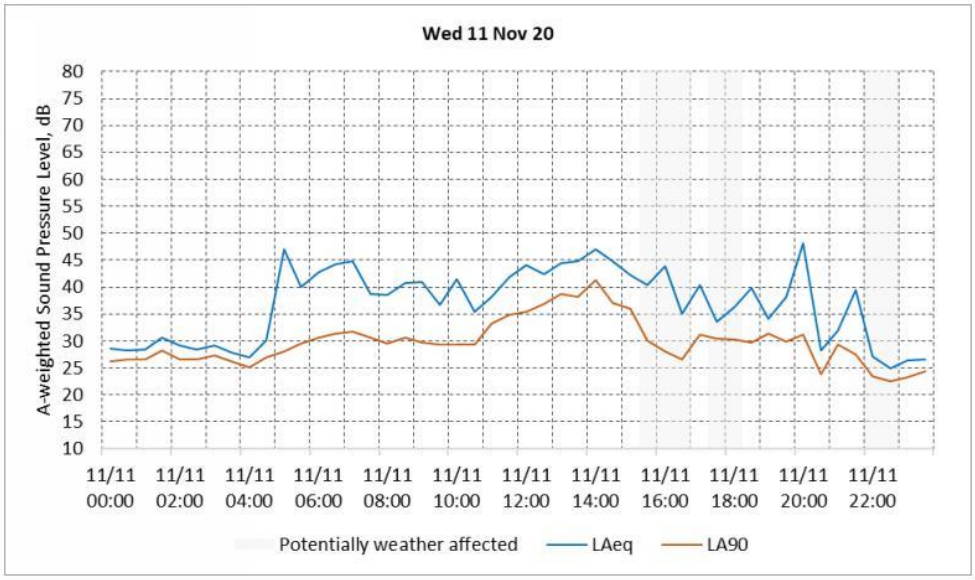
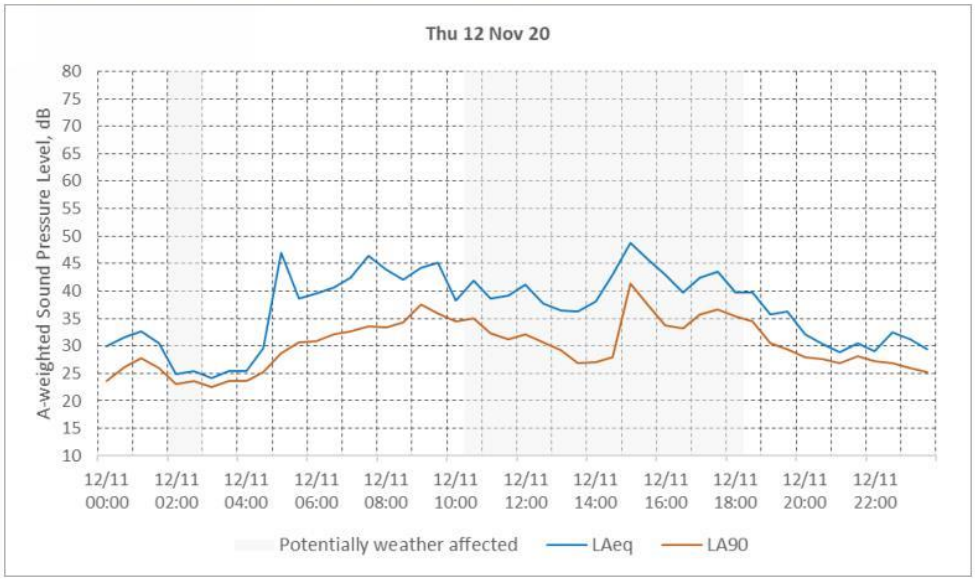



Figure 4: Receptor R6 background noise levels – Thursday 12 November 2020



MARSHALL DAY Acoustics

Figure 5: Receptor R6 background noise levels – Friday 13 November 2020

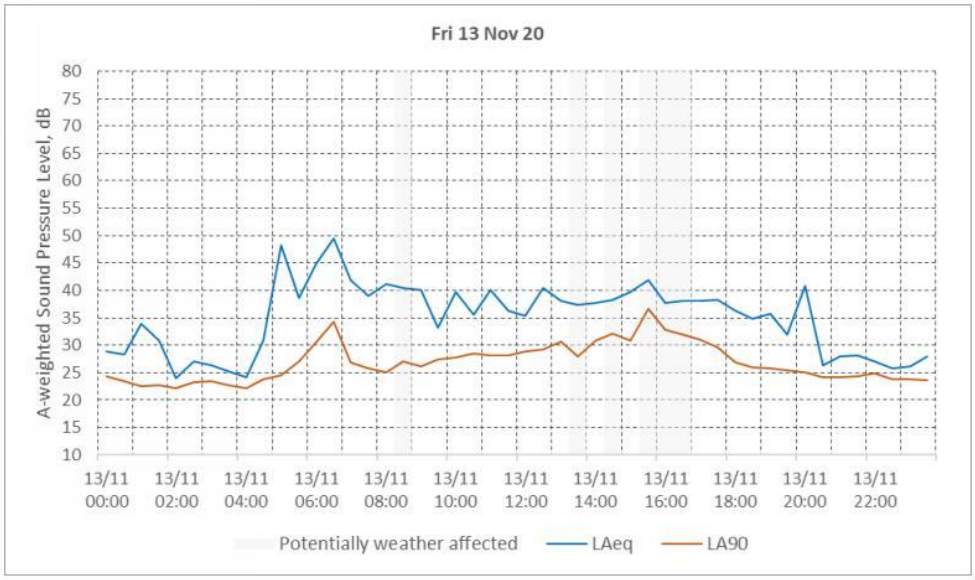
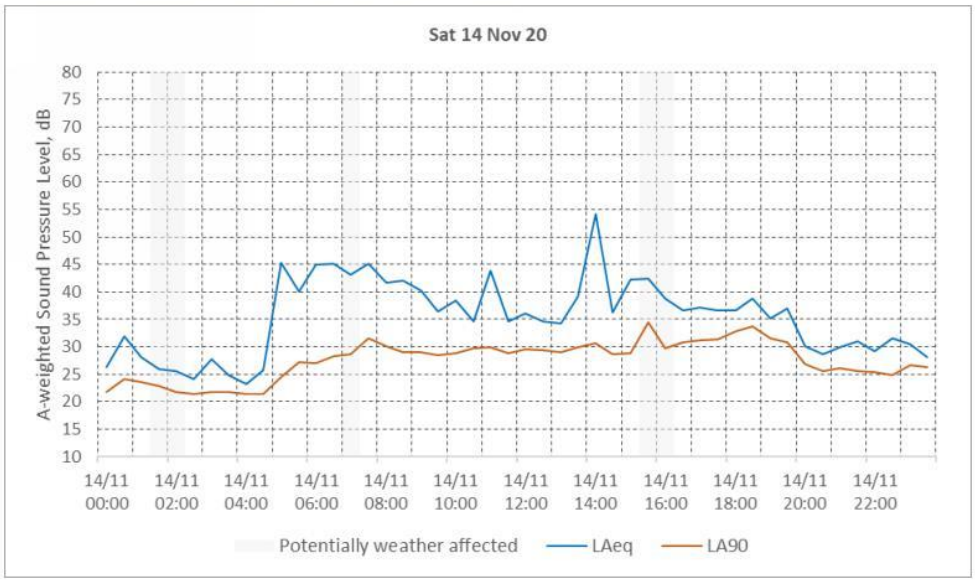



Figure 6: Receptor R6 background noise levels – Saturday 14 November 2020



MARSHALL DAY Acoustics

Figure 7: Receptor R6 background noise levels – Sunday 15 November 2020

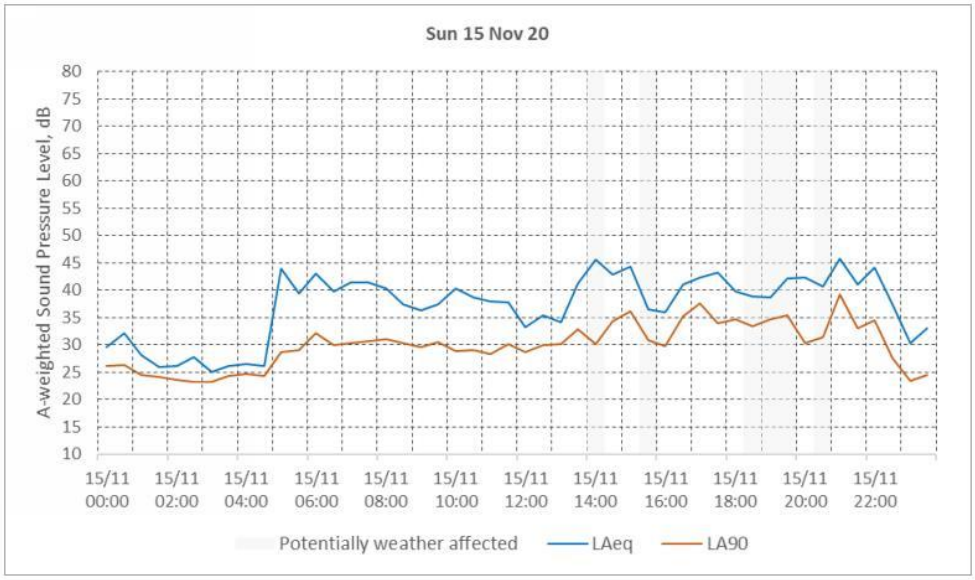
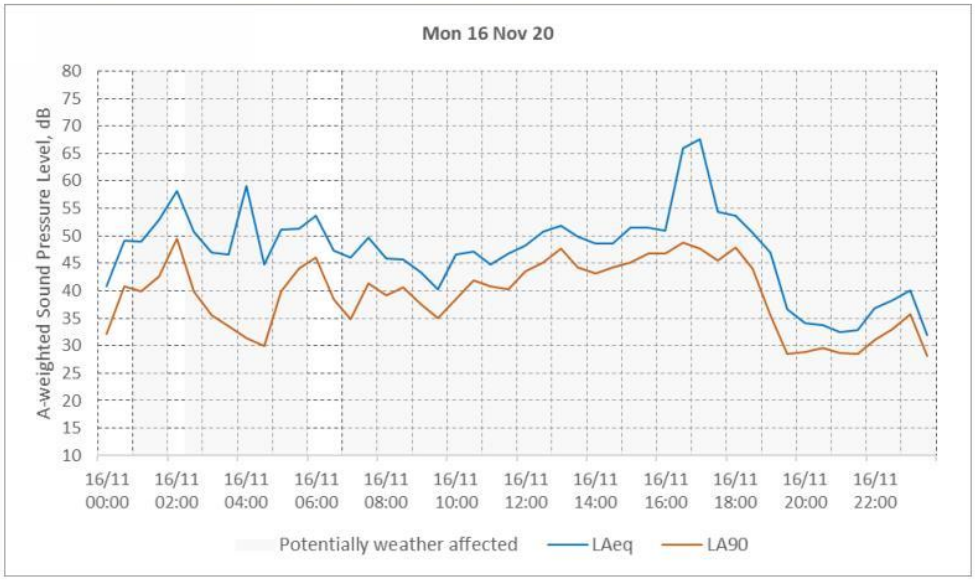



Figure 8: Receptor R6 background noise levels – Monday 16 November 2020



MARSHALL DAY Acoustics

Figure 9: Receptor R6 background noise levels – Tuesday 17 November 2020

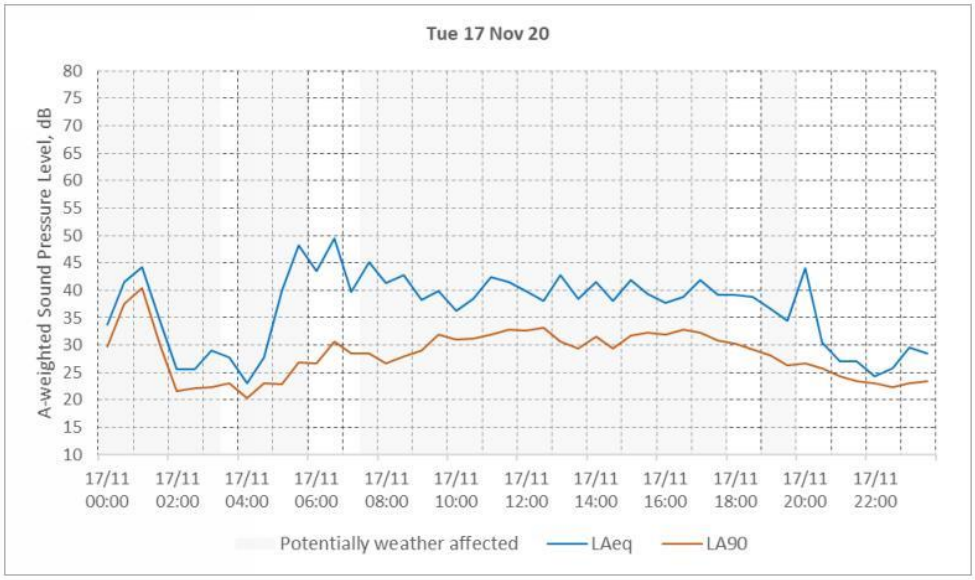
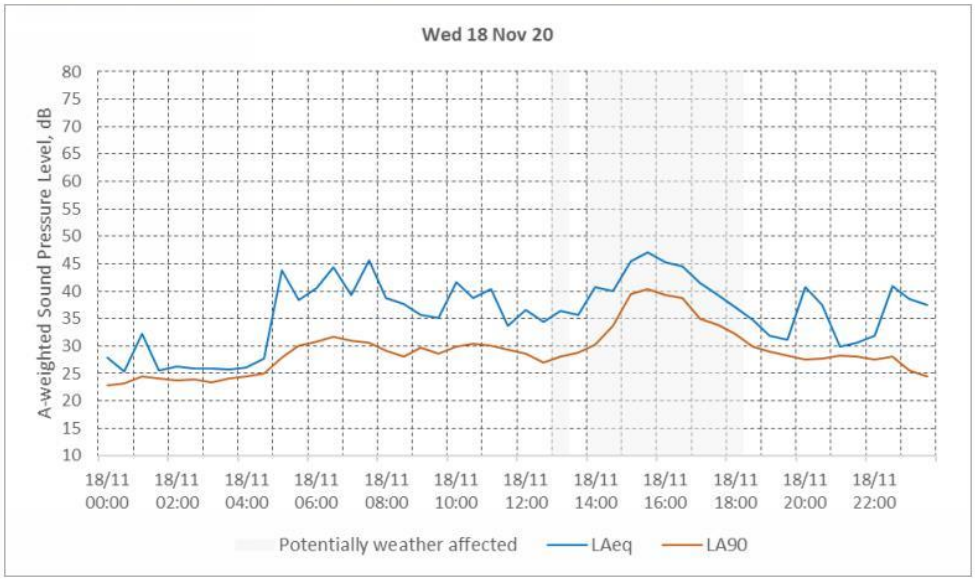



Figure 10: Receptor R6 background noise levels – Wednesday 18 November 2020



MARSHALL DAY Acoustics

Figure 11: Receptor R6 background noise levels – Thursday 19 November 2020

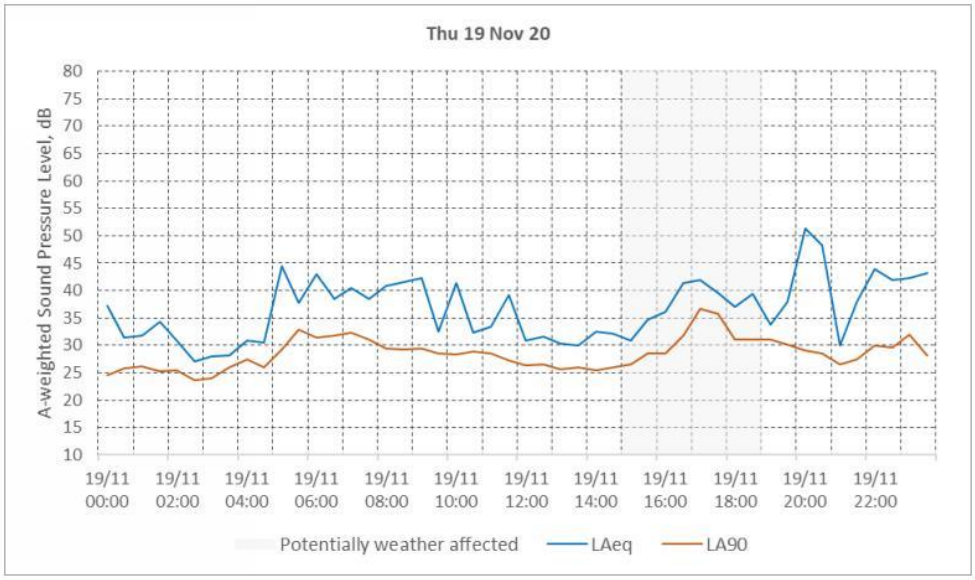
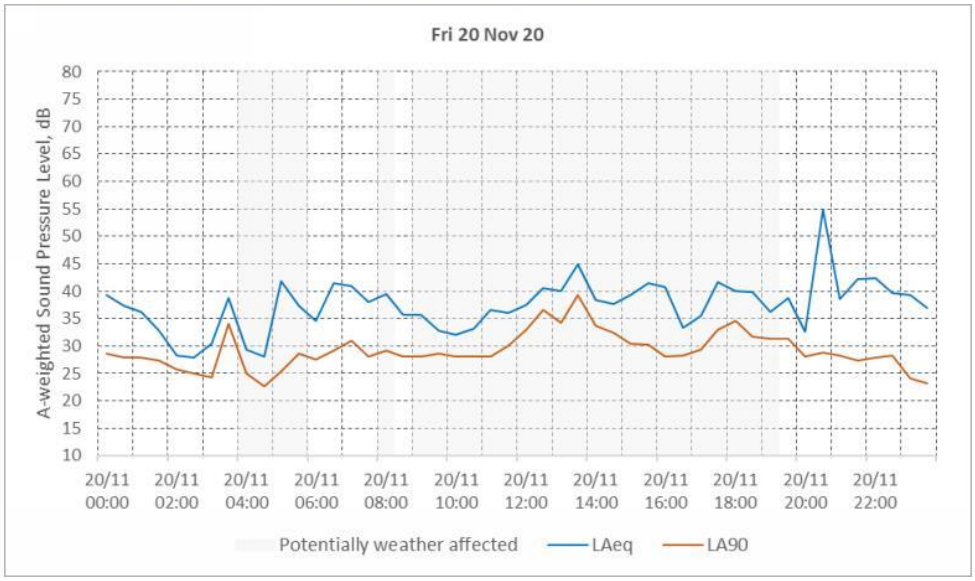



Figure 12: Receptor R6 background noise levels – Friday 20 November 2020



MARSHALL DAY Acoustics

Figure 13: Receptor R6 background noise levels – Saturday 21 November 2020

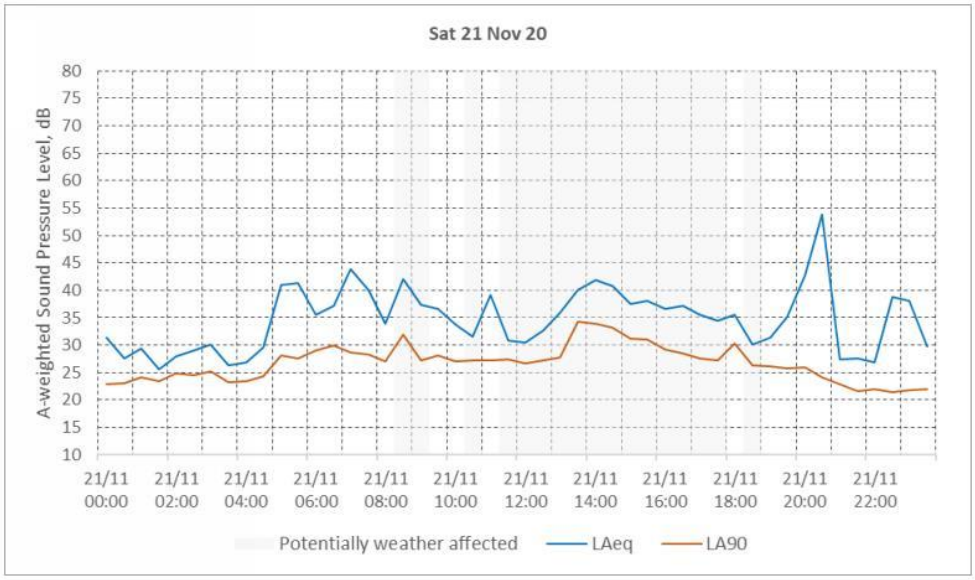
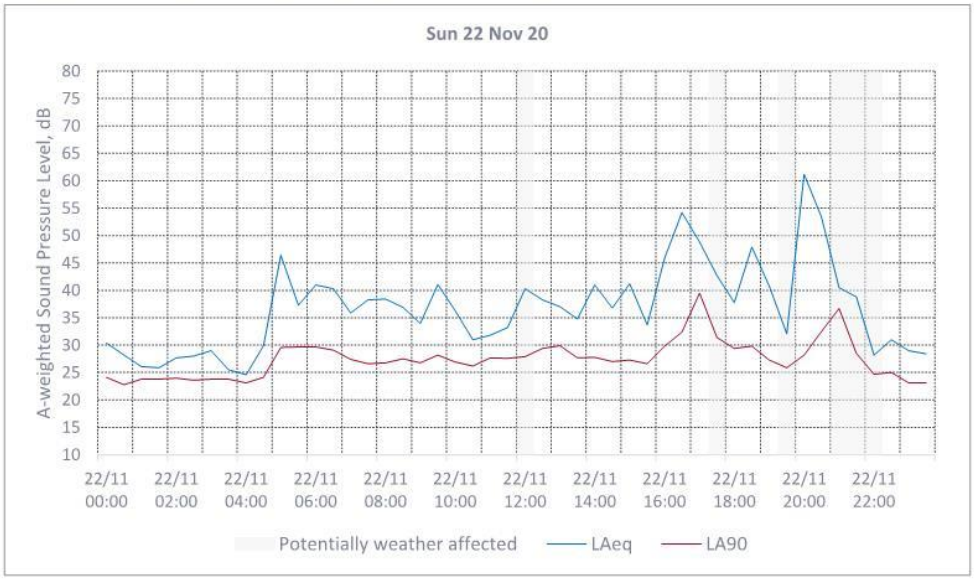
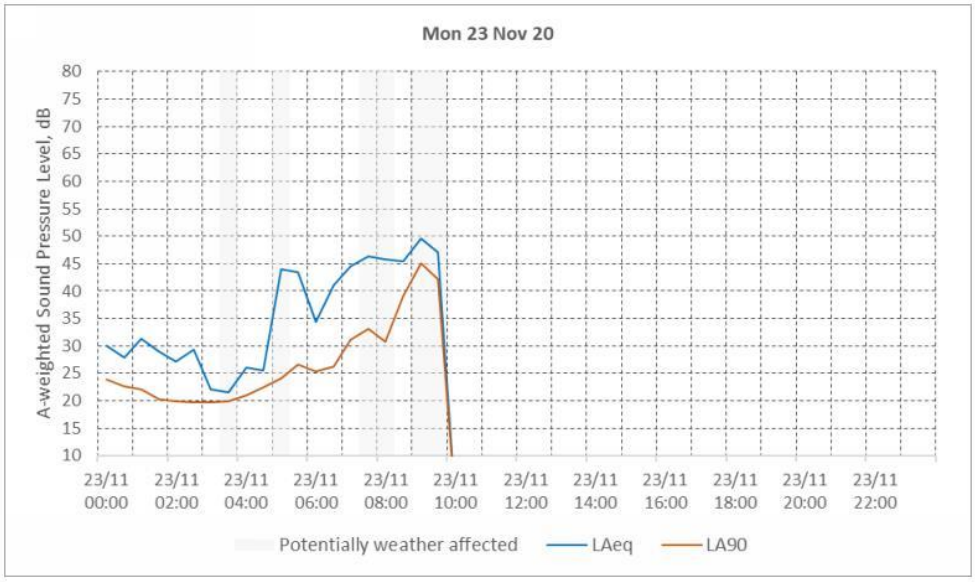



Figure 14: Receptor R6 background noise levels – Sunday 22 November 2020



MARSHALL DAY Acoustics

**Figure 15: Receptor R6 background noise levels – Monday 23 November 2020**



## APPENDIX F DOCUMENTS REVIEWED AND TAKEN INTO ACCOUNT

I have reviewed the following documents to the extent necessary to prepare this statement of evidence:

- *State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No. N-1*
- EPA Publication 480 *Environmental Guidelines for Major Construction Sites*
- EPA Publication 1254 *Noise Control Guidelines (superseded)*
- EPA Publication 1411 *Noise from Industry in Regional Victoria (NIRV)*
- EPA Publication 1412 *SEPP N-1 and NIRV explanatory notes*
- EPA Publication 1413 *Applying NIRV to Proposed and Existing Industries*
- EPA Publication 1826.2 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* (applicable from 1 July 2021)
- EPA Publication 1834 *Civil construction, building and demolition guide*
- EPA Publication N3/89 *Interim guidelines for control of noise from industry in country Victoria* (superseded)
- *NSW Road Noise Policy*
- *NSW Roads and Traffic Authority Environmental Noise Management Manual*
- AS 1055:2018 *Acoustics – Description and measurement of environmental noise*
- AS 2187.2-1983 *Explosives - Storage, transport and use (known as the SAA Explosives Code) Use of explosives* (superseded)
- AS 2436:2010 *Guide to noise and vibration control on construction, demolition and maintenance sites*
- ISO 2631-2:2003 *Mechanical vibration and shock - Evaluation of human exposure to whole-body vibration - Part 2: Vibration in buildings (1 Hz to 80 Hz)*
- ISO-9613-2:1996 *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*
- ISO 10137 Annex C Second edition 2007 *Bases for design of structures – Serviceability of buildings and walkways against vibrations*
- BS 5228–1:2009 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*
- BS 5228-2:2009 *Code of Practice for noise and vibration control on construction and open sites – Part 2: Vibration*
- DIN 4150-3 (1999-02) *Structural vibration – Effects of vibration on structure*
- ANZEC *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration*, dated September 1990
- ASHRAE *Fundamentals Handbook* 2015
- SLR Report 640.30078.00000-R01 v2.0 *Fingerboards Mineral Sands Project - Kalbar Operations Pty Ltd - EES Targeted Technical Review* dated 13 November 2020
- EMGA Mitchell McLennan (EMM) report No. 1305945 *Balranald Mineral Sands Project*, dated 1 May 2015

- WSP Parsons Brinckerhoff *Environmental Noise Impact Assessment – Thunderbird Mineral Sands Project*, dated 3 November 2016
- Regional Rail Link Authority *Noise Management Plan Rev 0*, dated 13 April 2012
- Defra Report NANR 116 *Open/Closed Window Research – Sound Insulation through Ventilated Domestic open Windows*

## APPENDIX G RESPONSE TO KEY SUBMISSIONS

**Table 6: EES submissions documented in the SLR report[1] prepared for the East Gippsland Shire Council**

| Report reference | SLR review | MDA response |
|---|---|---|
| Appendix 010: Section 3.7 | *High level summary:*<br>There appears to be some commercial accommodation places not included in the assessment, however, as there are assessment receivers in closer proximity, this omission does not impede the assessment.<br>*Gaps / comments:*<br>Receptors extend a reasonable distance from the Project.<br>The receptors closer to the Project will drive the need for any mitigation, noting that compliance at these closer locations will result in compliance at further locations. | It is accepted and agreed that the assessment criteria apply to places of commercial accommodation.<br>Per the SLR review comment, compliance with the noise criteria at the nearest residential receiver locations will afford compliance to more distant receivers, including commercial accommodation. |
| EES Chapter 9,10 | Fauna impact related comments. | The effect of noise and vibration on fauna is outside of my area of expertise. |
| Appendix 010 | *High level summary:*<br>There is no statement that the noise or vibration monitoring equipment was covered by current calibration certificates.<br>*Gaps / comments:*<br>Whilst calibration certificates are not required to be included in the report, a statement stating the equipment is covered by a current calibration from a NATA calibrated laboratory should be included. | I confirm that all noise and vibration monitoring equipment was covered by calibration certificates at the time of the surveys.<br>Specifically, in accordance with AS 1055:2018, the independent (laboratory) calibration date is to be within 2 years of the measurement period.<br>I have reviewed the calibration certificates either produced by the equipment manufacturer or a NATA accredited laboratory and can confirm that all noise monitoring surveys for the Project were undertaken within 2 years of the relevant calibration certificates being issued.<br>Calibration certificates are available upon request. |

[1] SLR Report 640.30078.00000-R01 v2.0 *Fingerboards Mineral Sands Project - Kalbar Operations Pty Ltd - EES Targeted Technical Review*

| Report reference | SLR review | MDA response |
|---|---|---|
| Appendix 010<br>Section 5 | *High level summary:*<br>The background noise levels are not presented or analysed as required by the NIRV.<br>*Gaps / comments:*<br>NIRV requires 'The background level should be assessed following the procedures of SEPP N-1, Schedule C, C3' – which the report does not present, instead the report provides the range in the background noise levels.<br>It is noted that the background noise does not feed into the determination of the NIRV criterion.<br>The manner in which the background levels are reported, may affect the perception of the background noise environment. | Unattended background noise monitoring was undertaken to quantify the existing noise environment in the area.<br>As detailed in Table 39 (Section D1.3 of Appendix D) of the MDA Report, background noise levels were reviewed as required by NIRV. Consistent with observations in the area, the background noise monitoring confirmed that background noise levels are low. As a result, the background noise adjustments to recommended noise levels which would apply in areas where background noise levels are elevated are not applicable to this site. In accordance with NIRV, the recommended levels for the Project were therefore not increased by way of background noise adjustments. |
| Appendix 010<br>Figure 8 | *High level summary:*<br>There appears to be an inconsistency in the vibration data<br>*Gaps / comments:*<br>The 'average level' appears to be higher than the highest 10th percentile of the dataset - which is an unusual situation. Some clarification on the prevailing activities that resulted in this condition should be provided. | The data in Figure 8 is correct.<br>The SLR review commentary appears to confuse the $10^{th}$ percentile as a measure of the upper vibration levels, whereas the $10^{th}$ percentile represents the lower vibration levels. Specifically, the $10^{th}$ percentile of the data represents the vibration level that only 10 % of the dataset is below. It is therefore appropriate that the $10^{th}$ percentile is below the average vibration level. |
| Appendix 010 | *High level summary:*<br>Figures 32 and 33 should reference the monitoring location<br>*Gaps / comments:*<br>The figures have a lack of clarity, of the location they represent. | The data illustrated in Figure 32 and Figure 33 are for locations V3 and V4 respectively, as stated on page 121 of the MDA report.<br>It is agreed that a reference to the location in the title of the figure would provide further clarity. |

| Report reference | SLR review | MDA response |
|---|---|---|
| Appendix 010<br>Section 6.1 | *High level summary:*<br>For vibration monitoring locations V3 and V4 there is no ASHRAE curves are provided (as was provided for locations V1 and V2).<br>*Gaps / comments:*<br>Review of the data is not possible without this information. | The vibration data for locations V1 and V2 was compared with the ASHRAE curves, on account of the monitoring being carried out at locations which were representative of the baseline vibration levels expected at sensitive locations in the vicinity of the Project.<br>In contrast, locations V3 and V4 were located at a reference distance of approximately 5 m from the existing rail line (V3) to the south of the Project, and approximately 5 m from the edge of a 100 km/h section of Lindenow-Glenaladale Road (part of the proposed haul route of the least preferred material transportation option). With the exception of two (2) identified dwellings located along Lindenow-Glenaladale Road, all other sensitive receivers are located at greater separating distances from the road edge.<br>The two dwellings that are located at distances of approximately 5 m from the road edge are within a 60 km/h zone and are additionally separated from traffic movements by a parking zone. The vibration data measured at the 5 m reference distances of V3 and V4 are not representative of transportation vibration levels expected at these dwellings along the least-preferred transport option.<br>Accordingly, the data was not presented on ASHRAE curves. The primary purpose of the measurements was to gauge whether the vibration generated by vehicle pass-by on these routes was consistent with empirical data. Section 6.3 of the MDA report confirms that the results were consistent with measurement results carried out at equivalent separating distances from other routes measured by MDA. |
| Appendix A010<br>Appendix G4 | *High level summary:*<br>The duration adjustments are not transparent. For some mobile plant specific duration adjustments are detailed, for others it is implied.<br>*Gaps / comments:*<br>The duration adjustment is a correction applied to the predicted levels which acts to reduce it, to account for plant what does not operate continuously. All duration adjustments should be clearly documented. | Details of applicable duration adjustments are outlined in Appendix G4 of the MDA report. This contains details of the decibel corrections that have been applied for duration, where applicable, or details of the way a mobile source will operate which determines the duration correction accounted for in the model. |

| Report reference | SLR review | MDA response |
|---|---|---|
| Appendix A010<br>Section 8.4.3 | *High level summary:*<br>The assessment assumed a 10 dBA transfer function between noise outdoor to within the house. Whilst frequently used, it is valid for traffic or construction occurring in close proximity of dwelling (where there is a considerable high-frequency component). The correction, however, may not be valid for noise which has travelled a large distance, and is predominantly low-frequency in nature (as indicated in Appendix I).<br>*Gaps / comments:*<br>Justification to the use of the assumed 10dBA transfer is required, as it may under-estimate the internal noise levels (and therefore the impacts) at night. | The 10 dB reduction from outdoor to indoor noise levels, as referenced in the MDA report, is supported by test data from international research.<br>An important point of context is that the 10 dB assumed reduction is for a dwelling with a slightly open window, and is relevant irrespective of the type of external noise. Another point of context is that the 10 dB reduction assumed in the MDA report is conservative relative to the higher value of 15 dB assumed in World Health Organization noise guidelines.<br>The SLR review queries the relevance of the 10 dB reduction to noise levels at distant sources where the remaining frequencies are predominantly the lower sound frequencies. However, the additional sound transmitted via a slightly open window has a greater effect on the higher sound frequencies of sound; primarily because a dwelling's sound insulation is much better at high frequencies, meaning that the introduction of a weakness, such as an open window, has a much greater effect at these frequencies. Also, lower frequencies transmit via window openings less readily than high frequencies of sound (primarily because the wavelengths of the lower frequencies are comparable to, or much larger than, the dimension of a typical open window).<br>In terms of supporting evidence, the subject of outdoor to indoor reductions with partially open windows was extensively evaluated in a study commissioned by the UK government in 2007 (UK Department of Food and Rural Affairs study NANR 116 undertaken by Napier University) The study evaluated the frequency band insulation of different partially open window configurations. The results validated that outdoor to indoor reductions are typically well above 10 dB across the lower frequency ranges, even for the largest open areas assessed. Below certain lower frequencies, the results also showed increasing reductions with decreasing frequencies. This is consistent with expectations given the factors described above. |

| Report reference | SLR review | MDA response |
|---|---|---|
| Appendix A010<br>Section 2.3.2 & Section 9 | *High level summary:*<br>No assessment of vibration to in-ground (or above ground) services has been undertaken, this may include high pressure gas pipes, telecoms, water, high voltage towers etc, if present in the area.<br>*Gaps / comments:*<br>Impacts to services may be significant, dependent on where they are located. | The locations of potential underground services or infrastructure in the vicinity of the Project was not reviewed as part of the assessment carried out to inform the MDA report.<br>Vibration impacts to underground infrastructure is unlikely to represent a significant constraint for the Project, or be of material consequence to the planning stage of the Project.<br>Notwithstanding the above, the construction management plan is expected to include details of measures to be implemented to avoid direct or indirect damage of underground infrastructure in the Project, whether as part of excavation activities associated with the construction or operation stages of the Project. These measures are also recommended to address indirect damage to underground services and infrastructure caused by vibration. Suitable criteria for vibration impacts to underground services are detailed in German Standard DIN 4150-3:2016 *Vibrations in buildings – Part 3: Effects on structures*, and British Standard BS 5228-2:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Vibration*. |
| Appendix A010<br>Section 11.3 | *High level summary:*<br>The German Standard DIN 4150-3 (1999) Structural vibration – Effects of vibration on structure, was updated in 2016 and this document should be used for assessment purposes.<br>*Gaps / comments:*<br>Given the large offset distances to residences, this may not significantly change the assessment. | I agree that the 2016 version of the standard is the most appropriate reference.<br>Vibration is not predicted to be a significant consideration for the Project and, as per the SLR review comment, the updates introduced in 2016 are of no material consequence to the outcomes of the assessment presented in the MDA report. |
| Appendix A010<br>Figure 12 | *High level summary:*<br>A compass direction on Figure 12, would be beneficial in reviewing the orientating the cladding arrangement.<br>*Gaps / comments:*<br>Incorrect alignment of the drawing, may result in cladding on the wrong facades of the building. | I agree with the merit of the suggested formatting edit.<br>However, the mitigation measures described in the MDA report are conceptual for planning stage assessments only, and are therefore not presented to a level that is appropriate for tender or construction purposes.<br>All mitigation measures, including cladding of structures will need to be specified during the detailed design for tender and construction purposes. |

| Report reference | SLR review | MDA response |
|---|---|---|
| Appendix A010<br>Table 37 | *High level summary:*<br>The colours on the legend of Table 37, appears to be incorrect.<br>*Gaps / comments:*<br>This should be corrected as it could result in an inadvertent misinterpretation of the data. | I agree that there is an error in the formatting i.e. the labels of the legend were inadvertently reversed.<br>The formatting error is however inconsequential to the assessment findings. |
| Appendix A010<br>Section 10.2.3 | *High level summary:*<br>The report recommends that acoustic (absorptive) screens around the 28 transformer and booster pumps sets, when located within 800 m of a dwelling. It is not clear:<br>(a) Whether each individual set requires screening, or one screen is required around the entire group of transformer/pump sets.<br>(b) What is the maximum separation from the screen to the transformer sets?<br>(c) Does the screen need to extend beyond the transformer set?<br>No acoustic specification for the screen is provided.<br>*Gaps / comments:*<br>The requirement for the screens is ambiguous, and could easily be misinterpreted by a contractor, resulting little or no acoustic benefit. | The mitigation measures described in the MDA report are conceptual for planning stage assessments only, and are therefore not presented to a level that is appropriate for tender or construction purposes.<br>All mitigation measures, including cladding of structures will need to be specified during the detailed design for tender and construction purposes. |

| Report reference | SLR review | MDA response |
|---|---|---|
| CH 11, EES Report | *High level summary:*<br>The EES scoping requires consideration of noise emissions, regarding the amenity and environmental quality, during closure.<br>*Gaps / comments:*<br>There does not appear to be any reference to a Strategy or Actions in relation to noise emissions, in the Amenity and Environmental Quality section. | All noise mitigation and management measures are recommended to be consolidated and documented in a single reference, the proposed Noise Management Plan. This will need to address the measures to be implemented throughout the lifetime of the Project, including the decommissioning and closure stages of the Project.<br>I have not carried out a review of broader EES documentation such as the content of Chapter 11 of the EES report. However, all plans for the protection of Amenity and Environmental Quality are recommended to refer to noise, and cross-reference the Noise Management Plan for relevant guidance and requirements. |
| Chapter 12<br>Table 12.9 | *High level summary:*<br>The proposed noise and vibration monitoring seem to be reasonable, given the degree of expected impacts.<br>*Gaps / comments:*<br>Emissions should be analysed in terms of the common NIRV and SEPP N1 procedures. | I agree that noise level of the Project will need to be evaluated using the procedures that are currently defined in NIRV and SEPP N-1, and subsequently in EPA Publication 1826.2 which is scheduled to replace NIRV and SEPP N-1 on 1 July 2021. |

| Report reference | SLR review | MDA response |
|---|---|---|
| Section 9.6.2.3 of Chapter 9 | *High level summary:*<br>The predicted exceedances of the construction noise levels at numerous sensitive properties, are demonstrated to give rise to non-conformance of the criterion. Additionally, there is some questions whether the process has under-estimated the internal noise level.<br>*Gaps / comments:*<br>The report's approach is to wait for the Project to commence and subsequent monitoring results to trigger further mitigation. This is not a common approach, usually mitigation is triggered on the predicted levels.<br>If the report's author, does not consider mitigation is warranted, for example, as impacts would be low (or significantly lower level but of the same character as future operational noise), it should clearly state that in the report. | The SLR review comments refer to the noise content of Chapter 9 of the EES. The content of Chapter 9 is based on, and broadly similar, to the MDA report. However, my response to this item is based on the content presented in MDA report which is the primary reference for the noise and vibration assessment of the Project.<br>The assessment presented in the MDA report demonstrated that predicted construction noise levels with the proposed mitigation measures were relatively low; in particular, the predicted construction noise levels for the evening and night periods are lower than the criteria that apply to the operations stage.<br>However, as a result of the onerous Victorian criteria which apply to any work categorised as construction, the noise levels of construction during the evening are predicted to be above guidelines indicated by EPA Publication 1254; despite the predictions being below the NIRV recommended levels which apply to the operations stage of the Project, and despite the construction activities in question being similar to the type of activities associated with construction of the Project.<br>Accordingly, the MDA report states that, if compliance with EPA Publication 1254 at all times was specified as an approval requirement of the Project, it is likely that significant managerial restrictions would apply. This would include significant curtailment of evening and night work, despite comparable activities associated with long term operation being permissible under less stringent evening and night NIRV criteria. These restrictions could therefore potentially extend the overall duration of construction.<br>Given the above, and per the summary of opinions in my evidence, there is merit to the adoption of a more pragmatic approach to controlling construction noise than applying the standard inaudibility requirements which are commonly applied to urban area projects which involve very different sources of noise during construction and operation.<br>Notwithstanding the above, if compliance with EPA 1254 (or its replacement) was a specified approval requirement for evening and night construction, then the additional managerial measures would need to be developed and implemented in advance of commencing construction. All such measures would need to be fully documented in the Noise Management Plan. |

**Table 7: EES submissions made by residents**

| Issue # | Submission number # | Issue description (White & Case) | MDA Response |
|---|---|---|---|
| 1 | Multiple | Concern that noise and vibration generated by all elements of the Project (including but not limited to construction, mining operations, transport, etc), will negatively impact amenity, human health (including sleep disruption), livestock and wildlife.<br>Some submissions express particular concern about night time noise within a low ambient noise setting. | The applicable regulations and standards used to define noise criteria for the Project have been developed by the relevant authorities to protect the amenity of residents in the vicinity of the Project.<br>Predicted operational noise levels demonstrate compliance with both NIRV and the sleep disturbance criteria.<br>I do not have the expertise to comment on effects of noise and vibration on human health, livestock and wildlife.<br>Discussion on how environmental noise policies used to assess noise from the Project relate to the effects of noise on health is provided in Section 2.7 of the MDA Report. |
| 2 | 303, 484, 506, 813 | Concern that baseline monitoring for noise and vibration was not appropriately conducted<br>(including the under-reporting of sensitive receptors, noise logging at inappropriate locations for an insufficient period of time, in particular L4 in Lucas Gully, or when "one-off" harvesting activities were taking place) | Background noise monitoring results demonstrate that the noise environment is relatively quiet which results in background adjustment not being warranted in accordance with NIRV<br>Ambient noise monitoring at L4 was undertaken approximately 30 m south of Bairnsdale-Dargo Road, suitable for measuring traffic noise |
| 3 | 54, 299, 481, 813 | Concern noise from operations may not have been properly assessed<br>(including by not undertaking Australian Noise Exposure Forecast mapping)<br>Noise from water pumps, Fernbank rail siding, and road and rail traffic have not been adequately considered.<br>Concern about the assumptions used in the noise assessment about the speed of trucks on haul roads, and on the reliance of noise emission and terrain data provided by Kalbar. | Operational noise has been assessed using standard contemporary industry practices, comprising empirical noise emission data for all plant items, detailed 3D noise modelling of the site using internationally accepted standards, and recommended levels established by the applicable Victorian guideline.<br>An approval for the Project would ultimately include noise criteria in accordance with Victorian requirements, and the Project would be required to demonstrate compliance with these requirements; based on both revised modelling prior to operation, and based on compliance measurements when the works commence. |

| Issue # | Submission number # | Issue description (White & Case) | MDA Response |
|---|---|---|---|
| 4 | 813 | Comment that the noise impact assessment does not comply with the scoping requirements in various respects, including:<br>• diminished social wellbeing;<br>• public health; and<br>• impacts to flora and fauna | I do not have the expertise to comment on effects of noise and vibration on social wellbeing, public health, and fauna and flora.<br>Discussion of how environmental noise policies used to assess noise from the Project relate to the effects of noise on health is provided in Section 2.7 of the MDA Report. |
| 5 | 813 | Comment that that different equipment types in different soil types will vary noise effects and emissions, and that tonal variances are relevant to the effects of noise on people, citing experiences at Bendigo and Keysbrook. | Noise emissions from construction and operational plant can vary significantly according to a range of factors, including the operating and environmental conditions in which the plant is used. Similarly, the frequency characteristics of the plant will also vary according to these conditions.<br>The predicted noise levels are based on noise emission data from empirical sources, including Australian and international standards, which describe the potential range of variation in noise emissions.<br>In recognition of the range of variation, the noise emissions have generally been chosen from the upper range of the available data; the exception being instances where manufacturer data is available for the specific model of plant that is being considered. Similarly, when assigning frequency spectra to the noise emissions, the spectra representing the upper values of the low frequencies have been assigned when a range of values are available. These choices provide for a conservative assessment of the variations in plant noise emissions.<br>I am not aware of any matters from other projects, such as the Bendigo and Keysbrook projects cited in the submission, which would alter the suitability of the modelling approach adopted for the Project. |
| 6 | 202, 476, 481, 506, 813 | Concern that mitigation measures will not be implemented, or that monitoring and non- conformance reporting will not occur, to the required standard | The project would be required to demonstrate compliance with these requirements; based on both revised modelling prior to operation, and based on compliance measurements when the works commence |