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21st September 2021 **Rep No. 21066.2**

Mr John Sambell
Health, Safety and Environmental Management
D&R Henderson
42 Benalla-Yarrawonga Rd
Benalla VIC 3672

RE: Environmental noise assessment – computed effective noise levels of main noise sources including WESP (Waste Gas Cleaning System) at noise sensitive receivers to Monsbent operation

We have undertaken noise measurements of the site to identify noise sources relevant to the D&R Henderson operation on Tuesday, 29th June 2021 between 1500 and 1600 hours.
The following major noise sources have been identified, presented in the Table 1.
In addition to those noise sources, we have added WESP (Waste Gas Cleaning System) as per your request. We have estimated, based on the literature provided in your request, that the sound power of the proposed cleaning system is L_w 96dB.

Table 1: Sound power levels of identified noise sources including WESP

Noise source	Sound pressure power, dB
Kombi Chipper	103
Wood Yard Grinder	106
Air Graders	97
Cyclone area	97
Dryers' area	95
Reject blower	102
WESP	96
Presslines' exhausts	94

There are nine in total presslines' exhaust each at L_w 94 dB.

For computed effective noise levels in dB(A) at noise sensitive receivers identified as NSR 1 (north-east) and NSR 2 (south-west) of the D&R Henderson premise (please see Figures 1 and 2 for details) we have used a noise prediction model MAS Environmental – Version 3.6, 2021.

Assumptions for a prediction of sound pressure levels at noise sensitive receivers are as follows:

1. At a distance, the D&R Henderson operation is assumed as one noise source.
2. Noise sources are 1.5 m to 7m off the ground level
3. Ground is assumed mix of hard and soft ground
4. Terrain is relatively flat.
5. Air temperature 20^0C
6. Humidity 70%
7. Octave band for a sound pressure levels prediction has been used from the field noise measurement for each noise source.
8. Sound prediction model accuracy is ± 3 dB

The sound pressure prediction model, MAS Environmental 2021 (version 3.6) uses ISO 9613-1:1996 (barrier and air absorption), and ISO 9613-2:1996 (ground reflection and absorption) Standards for calculation.

Note that the dominant noise sources are listed above, which are in operation from 0700 – 2200 hours.

We have modelled sound pressure levels of the D&R Henderson main noise sources at noise sensitive receivers NSR 1 and NSR 2 and presented them in the Figure 1 below.

For the modelling purposes we have assumed that all sources are running at the same time.

This is in the interests of presenting the worst likely scenario.

Figure 1: Predicted sound pressure level in dB(A) at NSR 1 – north-east

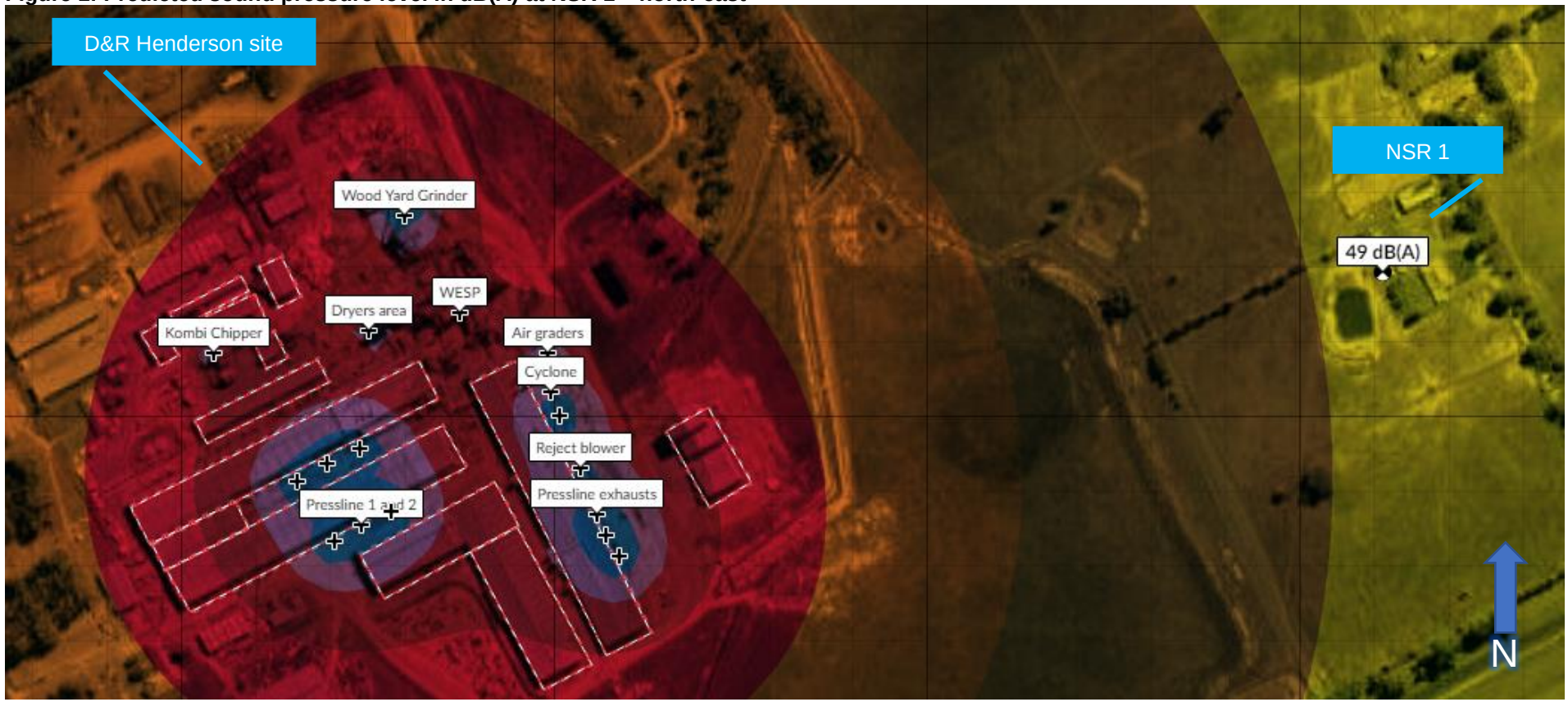
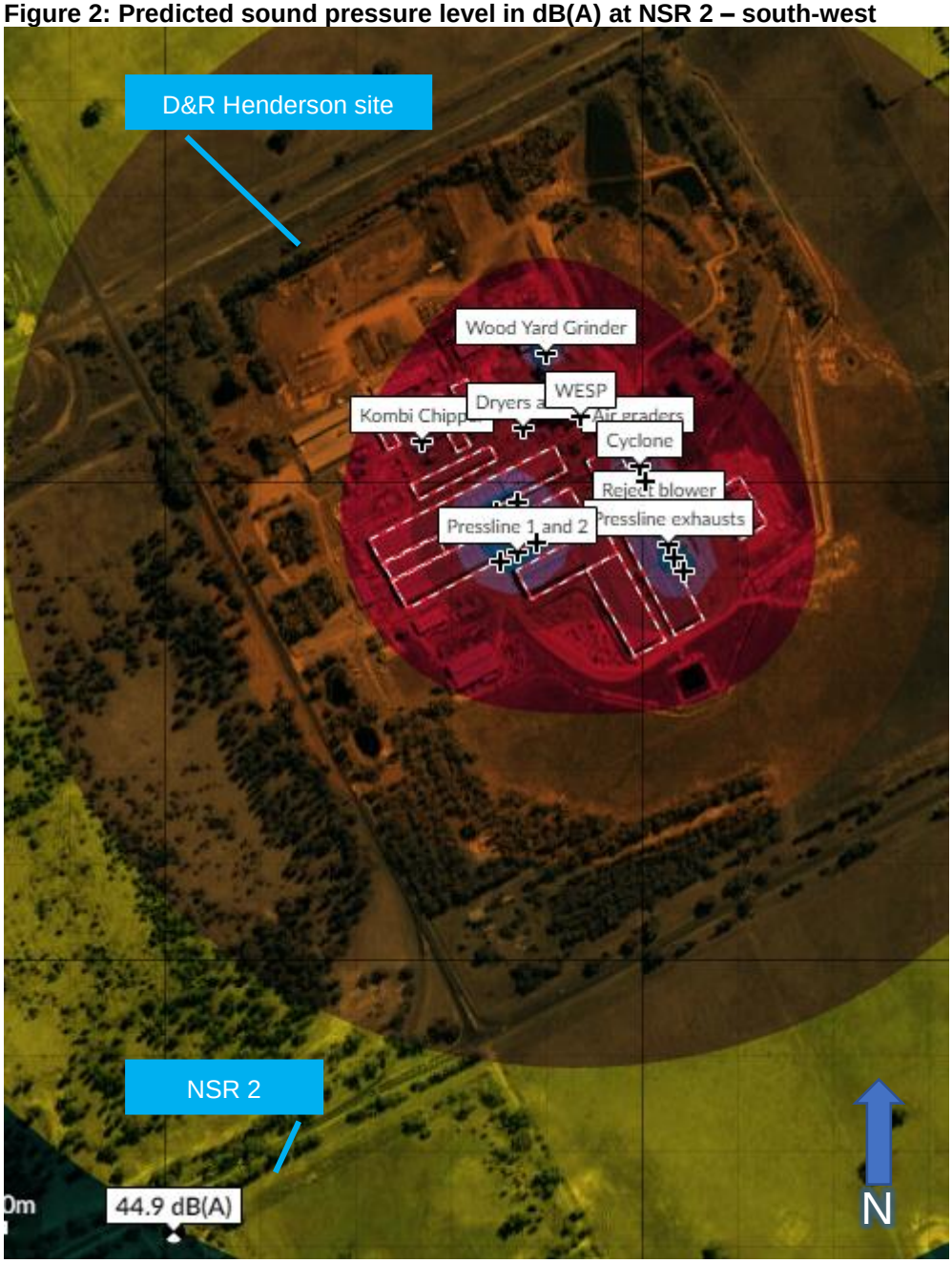


Figure 2: Predicted sound pressure level in dB(A) at NSR 2 – south-west



Predicted sound pressure level at NSR 1 is 49 dB(A) ± 3 dB

Predicted sound pressure level at NSR 2 is 45 dB(A) ± 3 dB

The accuracy of the model is ±3 dB for more than 100m distance of the source and is in accordance with the ISO 9613-2 – Acoustics: Attenuation of sound during propagation, Part 2 General method of calculation.

EPA Publication 1826.4 – the Protocol and Effective Noise Level

The VIC EPA Publication 1826.4, the Protocol, dictates a cumulative adjustment to the L_{Aeq} shall be made, when required, for noise character, duration and measurement position to determine the effective noise level according to the following formula:

Effective noise level = $L_{Aeq} + A_{tone} + A_{dur} + A_{int} + A_{ref} + A_{ind} + A_{imp}$

Impulse adjustment A_{imp} only applies to minor premises.

The predicted effective noise level at NSRs of the D&R Henderson's operation would be as follows:

Table 2: Calculation of D&R Henderson's operation effective noise levels (modelled)

NSR 1 - north-east	Model	Adjustment	Effective noise level, dB(A)
Modeled (L_{Aeq})	49 dB(A)	49	
Tonality (A_{tone})	Minor premise	5	
Model adjustment	Adjustment	3	
Duration (A_{dur})	Audible 30 min	0	
Intermittency (A_{int})	Continuous	0	
Reflection (A_{ref})	>3m	0	
Indoor (A_{ind})	Outside	0	
Effective noise level (L_{Aeq})			**57**
NSR 2 - south-west	**Model**	**Adjustment**	**Effective noise level, dB(A)**
Measurement (L_{Aeq})	45 dB(A)	45	
Tonality (A_{tone})	Minor premise	5	
Model adjsutment	Adjustment	3	
Duration (A_{dur})	Audible 30 min	0	
Intermittency (A_{int})	Continuous	0	
Reflection (A_{ref})	>3m	0	
Indoor (A_{ind})	Outside	0	
Effective noise level (L_{Aeq})			**53**

We have added 5 dB for tonality due to the forklift reverse beepers and occasional banging and grinding noises.

We have compared the modelled effective noise level of the D&R Henderson operation with the Protocol's noise limits in the Table 3 below.

Table 3: Effective noise levels compared with the Protocol's noise limits

NSR 1 - north-east	Time period	Modeled	Noise limit, dB(A)	Compliance
Day period	07:00 - 18:00	57	62	Yes
Evening period	18:00 - 22:00	57	58	Margin
Night period	22:00 - 07:00	56	55	Margin
NSR 2 - south-west	**Time period**	**Modeled**	**Noise limit, dB(A)**	**Compliance**
Day period	07:00 - 18:00	53	62	Yes
Evening period	18:00 - 22:00	53	58	Yes
Night period	22:00 - 07:00	53	55	Yes

Night period: Kombi Chipper and Wood Yard Grinder are not computed.

Please NOTE that the Noise Limit is calculated as per background levels determined on 30th June 2021, A&AS report 21066.

Discussion

The effective noise level using the computed model of the D&R Henderson operation at the NSR 1 is 49 dB(A). We have added 3 dB for computer model adjustments, which increases sound pressure levels to 52 dB(A). Also, we have added 5 dB for a tonal character due to reverse beepers of forklift operations, and occasional grinding and banging noises associated with the operation and came up with 57 dB(A) as the predicted effective noise level of the D&R Henderson operation at the NSR 1 (north-east).

Similarly, for the NSR 2 noise sensitive receiver, the computed noise level is 45 dB(A), by adding 3 dB for adjustment, it increases to 48 dB(A); and adding 5 dB for tonal character due to reverse beepers for forklift operations we came up with 53 dB(A) as the predicted effective noise level of the D&R Henderson operation at the NSR 2 (south-west).

For the night period (2200 – 0700) we have not computed Kombi Chipper and Wood Yard Grinder sound pressure levels.

The computed effective noise level of the D&R Henderson operation for the night period at the NSR 1 is 56 dB(A), and for the NSR 2 is 53 dB(A).

By taking off the Kombi Chipper and Wood Yard Grinder of the computed model we have reduced sound pressure level at NSR 1 only for 1 dB(A) while there is no difference at NSR 2.

Also, the WESP operation does not increase the overall noise impact at nearest noise sensitive receivers, at northeast nor southwest.

We came to conclusion that the main noise contributors of the D&R Henderson operation are humming noises of Presslines' 1, 2 and 3 exhaust fans, Cyclone of the Pressline 3, Air Graders fans, forklift operations with reverse beepers, and grinding and banging noises associated with the operation activities.

We recommend that forklift reverse beepers should be replaced with broadband reversing beepers. The broadband beepers generate white sound which dissipates quickly outside the hazard zone eliminating noise complaints at noise sensitive receivers to the industrial site. In addition, they do not compromise the safety features of tonal reverse beepers.

By installing broadband beepers, the effective sound pressure levels at noise sensitive receivers would be reduced for at least 2 – 4 dB, which will bring the effective noise levels at NSR 1 between 52 dB(A) to 54 dB(A) in the worst-case scenarios.

Humming noise can be perceived louder during the night then during the day.

The humming noise is very hard to attenuate unless there are silencers installed at presslines' exhaust stacks to reduce noise of passing air pushed by axial fans.

We recommend better tuning of electrical motors, and cleaning of fans' blades at Air Graders' centrifugal fans to reduce noise associated with their operation.

Please feel free to contact us should any additional detail be required. This applies to any parties that have legitimate access to this report.

Respectfully,

Svetimir Ristic, BEng (Env & Safety Work), GradDiplEnvSc
Acoustic Consultant

Attachment:

APPENDIX I - Sound pressure impact of the WESP (Waste Gas Cleaning System)

APPENDIX I - Sound pressure impact of the WESP (Waste Gas Cleaning System) only– no influence from other noise sources at NSR 1

Figure 3: WESP – sound pressure level impact at nearest noise sensitive receiver

The supplied noise data for the WESP system is less than 80 dB(A) (<80 dB(A)). This is vaguely an accurate data since there is no octave band data of the noise source from which the sound power and thus the sound pressure level in dB(A) calculated at any given distance.

噪音	dB（A）	<80
Noise		

For our prediction model we used sound power level of L_w 96 dB, which would correspond to sound pressure level of 85 dB(A) at 1m distance in a free filed.

Our prediction model uses a semi-sphere calculation formula for WESP noise impact with a combination of hard and soft ground to reflect as much as possible situation of the field. In the Table 4 below we have presented the estimated sound power level across frequencies for WESP used in the model.

Table 4: Estimated octave band sound power in dB and sound pressure in dB(A) levels across frequencies for WESP

Sound Power Levels

Frequency	31.5	63	125	250	500	1k	2k	4k	8k	16k	Hz
Level	55	65	75	85	85	95	85	75	65	55	dB
Total	96.2										
A-weighted	15.6	38.8	58.9	76.4	81.8	95	86.2	76	63.9	48.4	dB(A)
Total	95.8										

Based on our calculation and predicted noise impact at nearest noise sensitive receiver we can say that the WESP (Waste Gas Cleaning System) does not increase overall noise levels received at nearest noise sensitive receivers relevant to the Monsbent site.
Observed as a single noise source its noise impact is below the EPA's zoning level for the noise sensitive receiver.

The zoning levels do not represent EPA's noise limits for the noise sensitive receiver. However, they are used here as an illustration of a negligible noise impact of the WESP system at nearest noise sensitive receivers relevant to the Monsbent's site.

We have added 3 dB to the predicted noise level to compensate for model inaccuracy for distances longer than 100m from noise source.

NSR 1 - north-east		Zoning level, dB(A)	WESP noise impact	Compliance
Day period	07:00 - 18:00	**50**	**34**	**Yes**
Evening period	18:00 - 22:00	**44**	**34**	**Yes**
Sunday	07:00 - 22:00	**44**	**34**	**Yes**
Night period	22:00 - 07:00	**39**	**34**	**Yes**

NSR 2 – south-west		Zoning level, dB(A)	WESP noise impact	Compliance
Day period	07:00 - 18:00	**50**	**30**	**Yes**
Evening period	18:00 - 22:00	**44**	**30**	**Yes**
Sunday	07:00 - 22:00	**44**	**30**	**Yes**
Night period	22:00 - 07:00	**39**	**30**	**Yes**

Respectfully

Svetimir Ristic, BEng (Env & Safety Work) GradDiplEnvSc, Acoustic Consultant
Date: 21st September 2021