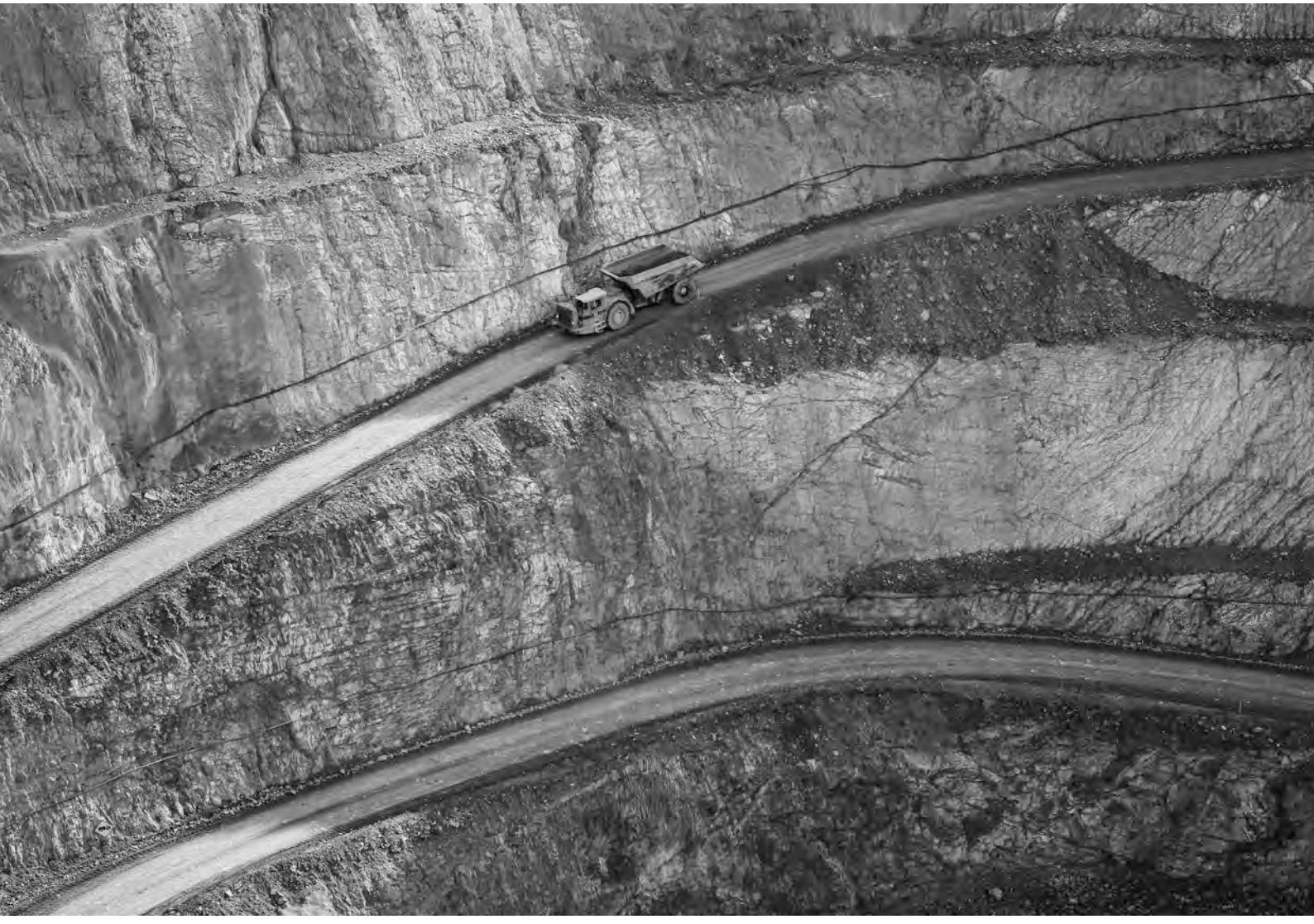
Appendix C

Addendum to the noise and vibration impact assessment



EMM
creating opportunities

aurelia
METALS Ltd.

Level 3, 175 Scott Street
Newcastle NSW 2300

T 02 4907 4800
E info@emmconsulting.com.au

www.emmconsulting.com.au

20 August 2021

Jonathon Thompson
Group Manager - Environment
Peak Gold Mines Pty Ltd

Re: New Cobar Complex Project Response to Submissions - Noise and vibration

Dear Jonathon,

1 Background

EMM Consulting Pty Limited (EMM) was engaged by Peak Gold Mines Pty Ltd (PGM) to undertake a noise and vibration impact assessment (NVIA) (EMM 2020) to support the Environmental Impact Statement (EIS) (EMM 2021a) for the New Cobar Complex Project (the Project).

The Project EIS was publicly exhibited from 25 February to 24 March 2021, and the NSW Department of Planning, Industry and Environment (DPIE) wrote to PGM on 31 March 2021 requesting responses to the matters raised by NSW Government agencies, local government authorities and the community that were received during the public exhibition of the EIS.

The NSW Environment Protection Authority (EPA), the Cobar Shire Council (CSC), the Cobar District Rugby Union Club (CDRUC) and members of the community made a submission on the Project, which requested further clarification on elements of the NVIA.

2 EPA submission

2.1 EPA submission request 1

2.1.1 Comment

The EPA requests that the Proponent revise the Noise and Vibration Impact Assessment (NVIA) to show the actual predicted noise levels at each receiver in Tables 6.1, 6.2 and 6.3.

The NVIA provides the results of the construction and operational noise assessment in Section 6. While the EPA notes that the NVIA predicts compliance with the relevant criteria, Tables 6.1, 6.2 and 6.3 generally only show the predicted noise levels as being a value less than the criterion (e.g. <40 dBA) rather than the actual predicted value (e.g. 32 dBA) at the assessment point. This approach Page 2 does not provide the EPA with sufficient information about the available noise level margin between the predicted level and the criterion, or the relative predicted noise levels at different receiver locations, which makes a full and proper review difficult.

2.1.2 Response

Modelled existing operational noise levels and predicted proposed future operational noise levels are shown in Table 2.1. Operational noise levels are predicted to satisfy the relevant PNTLs during the day, evening and night periods at all assessment locations. When comparing modelled existing and predicted future noise levels for the day, evening and night periods, no material increase (that exceeds the relevant PNTL) is predicted at all assessment locations. Therefore, no noise impact is anticipated from the Project. This outcome is consistent with that of the NVIA.

Table 2.1 Predicted future operational noise levels

Assessment location	Modelled existing $L_{Aeq,15min}$ noise levels, dB			Predicted future $L_{Aeq,15min}$ noise levels, dB			PNTLs, $L_{Aeq,15min}$, dB			Future exceedance, dB		
	ISO 9613			ISO 9613						ISO 9613		
	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
R1 (industrial)	25	25	25	35	35	35	68	68	68	Nil	Nil	Nil
R2 (PGM)	28	29	29	48	48	48	N/A	N/A	N/A	N/A	N/A	N/A
R3 (industrial)	28	29	29	36	36	36	68	68	68	Nil	Nil	Nil
R4 (residential)	24	24	24	31	31	31	40	35	35	Nil	Nil	Nil
R5 (school)	25	25	25	30	30	30	40	N/A	N/A	Nil	N/A	N/A
R6 (school)	22	22	22	28	28	28	40	N/A	N/A	Nil	N/A	N/A
R7 (school)	23	23	23	30	31	31	40	N/A	N/A	Nil	N/A	N/A
R8 (commercial)	23	23	23	27	27	27	63	63	63	Nil	Nil	Nil
R9 (hospital)	25	25	25	29	29	29	48	48	48	Nil	Nil	Nil
R10 (nursing home)	24	24	24	29	29	29	53	48	43	Nil	Nil	Nil
R11 (commercial)	24	24	24	30	31	31	63	63	63	Nil	Nil	Nil
R12 (recreation)	24	25	25	30	30	30	53	53	53	Nil	Nil	Nil
R13 (recreation)	24	24	24	30	30	30	48	48	48	Nil	Nil	Nil
R14 (recreation)	25	25	25	33	33	33	53	53	53	Nil	Nil	Nil
R15 (caravan park)	21	21	21	26	27	27	53	48	43	Nil	Nil	Nil
R16 (mine camp)	28	28	28	30	31	31	53	48	43	Nil	Nil	Nil
R17 (recreation)	23	23	23	26	27	27	53	53	53	Nil	Nil	Nil
R18 (recreation)	28	28	28	40	40	40	53	53	53	Nil	Nil	Nil
R19 (recreation)	20	20	20	26	26	26	53	53	53	Nil	Nil	Nil
R20 (commercial)	24	24	24	29	30	30	63	63	63	Nil	Nil	Nil
R21 (commercial)	22	22	22	26	26	26	63	63	63	Nil	Nil	Nil
R22 (commercial)	19	19	19	22	22	22	63	63	63	Nil	Nil	Nil
R23 (recreation)	25	25	25	31	31	31	48	48	48	Nil	Nil	Nil
R24 (recreation)	18	18	18	21	21	21	48	48	48	Nil	Nil	Nil
R25 (recreation)	35	35	35	35	35	35	48	48	48	Nil	Nil	Nil
R26 (industrial)	33	33	33	33	34	34	68	68	68	Nil	Nil	Nil
R27 (industrial)	29	29	29	34	35	35	68	68	68	Nil	Nil	Nil
R28 (industrial)	28	29	29	35	35	35	68	68	68	Nil	Nil	Nil
R29 (industrial)	28	28	28	36	36	36	68	68	68	Nil	Nil	Nil

Table 2.1 Predicted future operational noise levels

Assessment location	Modelled existing $L_{Aeq,15min}$ noise levels, dB ISO 9613			Predicted future $L_{Aeq,15min}$ noise levels, dB ISO 9613			PNTLs, $L_{Aeq,15min}$, dB			Future exceedance, dB ISO 9613		
	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
R30 (commercial)	25	25	25	30	31	31	63	63	63	Nil	Nil	Nil
R31 (residential)	33	33	33	34	33	33	40	35	35	Nil	Nil	Nil
R32 (commercial)	23	23	23	27	27	27	63	63	63	Nil	Nil	Nil
R33 (recreation)	27	27	27	36	36	36	53	53	53	Nil	Nil	Nil
R34 (commercial)	24	24	24	29	29	29	63	63	63	Nil	Nil	Nil
R35 (residential)	21	21	21	24	24	24	40	35	35	Nil	Nil	Nil
R36 (residential)	24	24	24	31	31	31	40	35	35	Nil	Nil	Nil
R37 (Industrial)	26	27	27	33	33	33	68	68	68	Nil	Nil	Nil
R38 (residential)	23	23	23	27	27	27	43	38	35	Nil	Nil	Nil
R39 (residential)	23	23	23	28	28	28	40	35	35	Nil	Nil	Nil
R40 (residential)	22	22	22	25	25	25	40	35	35	Nil	Nil	Nil
R41 (residential)	23	24	24	29	29	29	43	38	35	Nil	Nil	Nil

Notes: 1. Day period: 7 am to 6 pm Monday to Saturday and 8 am to 6 pm on Sunday and public holidays.
2. Evening period: 6 pm to 10 pm on any day.
2. Night period: 10 pm to 7 am Monday to Saturday and 10 pm to 8 am on Sunday and public holidays.

Maximum noise levels from proposed future night operations with the potential to cause sleep disturbance at nearby residences are shown in Table 2.2. Noise modelling results show that maximum L_{Aeq} and L_{Amax} noise levels are predicted to satisfy the NPfI screening criteria for sleep disturbance at all residential assessment locations. Therefore, it is unlikely that the proposed future mining operations will cause sleep disturbance at any residential receivers. This outcome is consistent with that of the NVIA.

Table 2.2 Predicted night-time maximum noise levels at residential assessment locations

Residential assessment location	Predicted night-time maximum noise levels, dB ISO 9613		Sleep disturbance screening criteria, dB		Exceedance, dB ISO 9613	
	$L_{Aeq,15min}$	L_{Amax}	$L_{Aeq,15min}$	L_{Amax}	$L_{Aeq,15min}$	L_{Amax}
R4	31	39	40	52	Nil	Nil
R31	33	46	40	52	Nil	Nil
R35	24	33	40	52	Nil	Nil
R36	31	37	40	52	Nil	Nil
R38	27	35	40	52	Nil	Nil
R39	28	32	40	52	Nil	Nil
R40	25	33	40	52	Nil	Nil
R41	29	37	40	52	Nil	Nil

Notes: 1. Night: 10 pm to 7 am Monday to Saturday, 10 pm to 8 am Sundays and public holidays.

Predicted noise levels for the construction of the power line and substation for the relevant periods are shown in Table 2.3. Construction noise levels combined with noise from approved existing operations are predicted to satisfy the relevant PNTLs during the day and night periods at all assessment locations. This outcome is consistent with that of the NVIA.

Table 2.3 Predicted construction noise levels

Assessment location	Predicted construction $L_{Aeq,15min}$ noise levels, dB ISO 9613		PNTLs, $L_{Aeq.15min}$, dB		Exceedance, dB ISO 9613	
	Day[1]	Night[2]	Day[3]	Night[4]	Day[3]	Night[4]
R1 (industrial)	41	41	68	68	Nil	Nil
R2 (PGM)	57	57	N/A	N/A	N/A	N/A
R3 (industrial)	42	41	68	68	Nil	Nil
R4 (residential)	35	35	40	35	Nil	Nil
R5 (school)	34	34	40	N/A	Nil	N/A
R6 (school)	29	30	40	N/A	Nil	N/A
R7 (school)	33	32	40	N/A	Nil	N/A
R8 (commercial)	29	29	63	63	Nil	Nil
R9 (hospital)	29	30	48	48	Nil	Nil
R10 (nursing home)	29	29	53	43	Nil	Nil
R11 (commercial)	36	35	63	63	Nil	Nil
R12 (recreation)	34	34	53	53	Nil	Nil
R13 (recreation)	35	34	48	48	Nil	Nil
R14 (recreation)	36	36	53	53	Nil	Nil
R15 (caravan park)	26	26	53	43	Nil	Nil
R16 (mine camp)	33	32	53	43	Nil	Nil
R17 (recreation)	29	30	53	53	Nil	Nil
R18 (recreation)	45	44	53	53	Nil	Nil
R19 (recreation)	25	25	53	53	Nil	Nil
R20 (commercial)	34	34	63	63	Nil	Nil
R21 (commercial)	28	28	63	63	Nil	Nil
R22 (commercial)	22	22	63	63	Nil	Nil
R23 (recreation)	32	33	48	48	Nil	Nil
R24 (recreation)	21	21	48	48	Nil	Nil
R25 (recreation)	35	35	48	48	Nil	Nil
R26 (industrial)	34	34	68	68	Nil	Nil
R27 (industrial)	40	39	68	68	Nil	Nil
R28 (industrial)	41	40	68	68	Nil	Nil
R29 (industrial)	42	42	68	68	Nil	Nil
R30 (commercial)	35	35	63	63	Nil	Nil
R31 (residential)	33	33	40	35	Nil	Nil
R32 (commercial)	30	30	63	63	Nil	Nil

Table 2.3 Predicted construction noise levels

Assessment location	Predicted construction $L_{Aeq,15min}$ noise levels, dB ISO 9613		PNTLs, $L_{Aeq.15min}$, dB		Exceedance, dB ISO 9613	
	Day[1]	Night[2]	Day[3]	Night[4]	Day[3]	Night[4]
R33 (recreation)	39	39	53	53	Nil	Nil
R34 (commercial)	33	33	63	63	Nil	Nil
R35 (residential)	25	25	40	35	Nil	Nil
R36 (residential)	33	33	40	35	Nil	Nil
R37 (Industrial)	38	37	68	68	Nil	Nil
R38 (residential)	29	30	43	35	Nil	Nil
R39 (residential)	27	27	40	35	Nil	Nil
R40 (residential)	27	27	40	35	Nil	Nil
R41 (residential)	33	33	43	35	Nil	Nil

Notes: 1. Modelling scenario includes the power line construction, the substation construction and existing modelled mining operations.
2. Modelling scenario includes the power line construction and existing modelled mining operations.
3. NPfI day period: 7 am to 6 pm Monday to Saturday and 8 am to 6 pm on Sunday and public holidays.
4. NPfI night period: 10 pm to 7 am Monday to Saturday and 10 pm to 8 am on Sunday and public holidays.

2.2 EPA submission request 2

2.2.1 Comment

The EPA requests that the Proponent clarify the text within Section 3.5.2 of the NVIA to reflect the findings of the meteorological assessment as appropriate following the detailed comments below.

The NVIA states in Section 3.5.2 that stability category F and G combined temperature inversions 'did occur for 30% or greater of the night-time period' and then goes on to state that 'temperature inversion conditions are not considered significant in accordance with the Noise Policy for Industry (EPA, 2017). While the EPA acknowledges that the ISO9613 prediction method reflects noise propagation under a moderate temperature inversion condition, Section 3.5.2 of the NVIA needs to be updated to clarify the findings.

2.2.2 Response

A review of Section 3.5.2 of the NVIA identified a typographical error. The NVIA should have stated “It was found from the analysis of the data that F stability category and G stability category temperature inversions (F and G combined) did **not** occur for 30% or greater of the night period, and hence stability category F or G temperature inversion conditions are not considered significant in accordance with the NPfI.”

Notwithstanding, as stated in Section 5.4 of the NVIA, as a conservative approach, meteorological conditions within the ISO 9613-2:1996 ‘Acoustics – Attenuation of sound during propagation outdoors’, which account for the influence of wind and temperature inversion conditions were adopted for the assessment.

3 CSC submission

3.1 CSC submission request 4. a) Noise - General

3.1.1 Comment

Council concurs with the EPA's requests addressed in Section 2 of this letter.

3.1.2 Response

Refer to Section 2.1 and Section 2.2 for EMM’s responses.

3.2 CSC submission request 4. b) Noise and Vibrations from Blasting causing Amenity and Property Damage Issues

3.2.1 Comment

Whilst PGM currently manages the potential impacts from blast vibration at off-site receivers, the results from the NVIA and the SIA consultation reveal a disconnect in the measurement and technical standards related to blast monitoring and management, and the experiences of local stakeholders.

As is acknowledged, blast ground vibration can impact nearby, off-site receivers by generating a startle response and possibly negative physical and mental responses occurring as a result of the body's response to stress.

Council recommends any consent include a condition requiring the development and implementation of a blasting notification procedure that informs the community in advance as to when blasts are planned, so they can anticipate them and the element of surprise is removed and habituation will occur.

The blasting notification procedure should remain consistent and appropriately timed to ensure that the local community comes to trust and accept the notification procedure. The notification procedure could incorporate methods such as texts, calls, and/or email alerts that blasting will take place.

Whilst PGM already notifies the Water Treatment Plant and Cobar Heritage Centre prior to blasting, it is recommended additional residential and commercial property owners and Council's main office be added to this notification process.

Open and transparent measures are also required to address property owner's concerns regarding impacts to the structural integrity of homes and buildings.

In addition, Council requests any consent include:

- conditions that limit ground vibration caused by blasting to the tightest standards reasonably possible;
- a condition for the most up-to-date blast and noise monitoring equipment to be installed and maintained at Fort Bourke Hill and adjacent to "Dellavale" to assist in the management of blast and noise impacts; and
- data from blast monitoring be made available live and in real time on a website and recorded in future AEMRs.

3.2.2 Response

The potential impacts from blast ground vibration (vibration) at nearest residential receivers were assessed in the NVIA based on relevant standards and guidelines. No impacts from vibration at the proposed Great Cobar and the Gladstone underground mines are anticipated at the nearest residential receivers.

Potential impacts from vibration at nearest residential receivers is currently managed by PGM in accordance with the limits provided in Environment Protection Licence 3596 (EPL). PGM will continue to implement management and mitigation measures currently in place to reduce the potential impact of vibration at nearby residential and non-residential receivers, including through blast monitoring.

There are two main categories of assessable impacts from vibration, human comfort and building damage. These are discussed in the following sections.

i Human comfort

Compliance with the EPL vibration limits aims to ensure that vibration effects from underground blasting are acceptable to people. It should be noted that vibration levels that are deemed acceptable to residents (relating to human comfort) do not necessarily mean that these levels are imperceptible. Vibration limits for blasting in relation to human comfort are drawn from the following documents:

- Australian and New Zealand Environment and Conservation Council (ANZECC) 1990, *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration*.

- Standards Australia, AS 2187.2-2006 'Explosives – Storage and use – Part 2: Use of explosives'.

The ANZECC guidelines are amongst the most restrictive applied to extractive operations. The ANZECC states:

> A maximum level for ground vibration of 5mm/s (peak particle velocity). The level of 5mm/s may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level should not exceed 10mm/s.

AS 2187 provides a table listing recommended maximum peak particle velocities for different types of structures. The standard suggests that for houses and low-rise residential buildings and commercial buildings not of reinforced concrete or steel construction, a peak particle velocity of 5 mm/s is appropriate.

The NVIA has assessed the potential impacts from vibration on human comfort by adopting the EPL vibration limits as the impact assessment criteria. Hence, based on the preceding information, potential vibration impacts related to human comfort from future underground blasting have been appropriately assessed in the NVIA.

PGM acknowledges that the perceptions of some local residents related to blast vibration may not align with compliance with technical standards. However, blasting vibration limits in the EPL are based on the technical guidelines and conditions placed by the EPA. PGM will continue to comply with these standards.

ii Building damage

AS 2187 also addresses "safe" vibration levels for the control of damage from blasting activities. AS 2187 recommends that the frequency dependent guideline values and assessment methods given in British Standard BS 7385.2-1993 'Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration' be used as they are "applicable to Australian conditions".

AS 2187 sets guide values for building vibration based on the lowest vibration levels above which damage has been credibly demonstrated. These levels are judged to give a minimum risk of vibration induced damage, where minimal risk for a named effect is usually taken as a 95% probability of no effect.

Sources of vibration that are considered in AS 2187 include demolition, blasting, piling, ground treatments, construction equipment, tunnelling, road and rail traffic and industrial machinery.

The recommended Peak Particle Velocity (PPV) guide values for transient vibration to manage minimal risk of cosmetic damage to residential and industrial buildings are presented numerically in Table 3.1 and graphically in Figure 3.1.

Table 3.1 Transient vibration guide values – minimal risk of cosmetic damage

Line[1]	Type of building	PPV in frequency range of predominant pulse	
		4 Hz to 15 Hz	15 Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s	50 mm/s
2	Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Notes: 1. Refers to the "Line" illustrated in Figure 3.1.

AS 2187 notes that the guide values in Table 3.1 relate predominantly to transient vibration which does not give rise to resonant responses in structures and low-rise buildings.

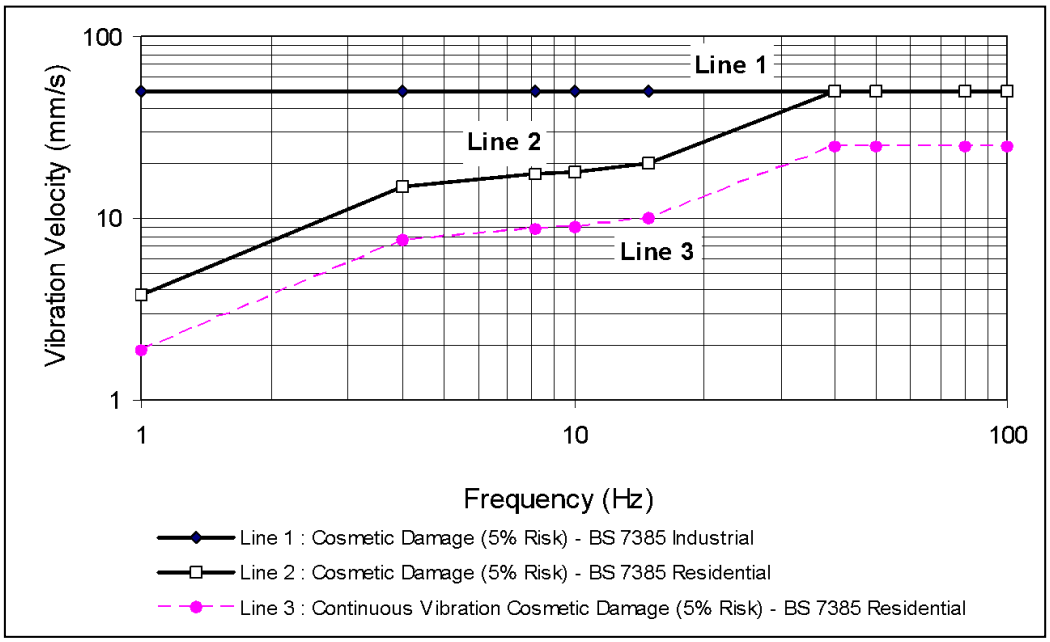


Figure 3.1 Graph of transient vibration guide values for cosmetic damage

In the lower frequency region where strains associated with a given vibration velocity magnitude are higher, the guide values for building types corresponding to Line 2 are reduced. Below a frequency of 4 Hz where a high displacement is associated with the relatively low PPV value, a maximum displacement of 0.6 mm (zero to peak) is recommended. This displacement is equivalent to a vibration velocity of 3.7 mm/s at 1 Hz (as shown in Figure 3.1).

Fatigue considerations are also addressed in AS 2187, which concluded that unless calculation indicates that the magnitude and number of load reversals is significant (in respect of the fatigue life of building materials) then the guide values in Table 3.1 should not be reduced for fatigue considerations.

In order to assess the likelihood of cosmetic damage due to vibration, AS 2187 specifies that vibration measurements should be undertaken at the base of the building and the highest of the orthogonal vibration components (transverse, longitudinal and vertical directions) should be compared with the criteria curves presented in Table 3.1.

It is important to note that in addition to the guide values nominated in Table 3.1, AS 2187 states the following:

> Some data suggests that the probability of damage tends towards zero at 12.5 mm/s PPV. This is not inconsistent with an extensive review of the case history information available in the UK.

The NVIA has assessed the potential impacts from vibration on building structures by adopting the more stringent EPL vibration limits applicable at residential receivers (ie 5 mm/s PPV) as the impact assessment criteria. Therefore, based on the preceding information, potential vibration impacts related to building damage from future underground blasting have been appropriately assessed in the NVIA.

4 CDRUC submission

4.1 Comment

The CDRUC would like to support the project "with concerns". These concerns have yet to be adequately covered by the "make good" clause that we believe is included in the submission. The concerns relate to:

1. Vibration from blasting and the damage it may cause to the clubhouse building.

2. The impact on ground water – namely our registered bore.

3. Land value dropping as a result of adjoining the development.

4. Dust and emissions from vent rises.

As it stands the "make good" clause only covers the replacement of water should our bore be drained, which is not guaranteed in times of drought if town water is unavailable. We would like the opportunity to negotiate and enter into an agreement with the company that includes guaranteed provisions that covers the impact on the rugby club for all 4 of the points that I have mentioned.

4.2 Response

Concerns expressed by the CDRUC in regard to ground vibration from blasting were considered in this response. The other comments are outside our expertise and are for others to address.

The potential impacts from blast ground vibration were assessed in the NVIA. Based on measured data, the allowable maximum instantaneous charges (MICs) to achieve the relevant ground vibration criteria at the nearest residential receivers and non-residential receivers (eg items of historic heritage significance) were calculated. No impacts from blasting (ie ground vibration) at the proposed Great Cobar and the Gladstone underground mines are anticipated (including structural damage to buildings) if the limiting MICs provided are followed. This include the CDRUC clubhouse building.

As part of PGM's management practices, all blasting will be monitored.

5 References

EMM 2021a, *New Cobar Complex Project, State Significant Development (SSD10419) – Environmental Impact Assessment*. Prepared by EMM on behalf of PGM.

EMM 2020, *New Cobar Complex Project, State Significant Development (SSD10419) – Noise and vibration impact assessment*. Prepared by EMM on behalf of PGM.

Australian and New Zealand Environment and Conservation Council (ANZECC) 1990, *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration*.

Standards Australia 2006, AS 2187.2-2006 'Explosives – Storage and use – Part 2: Use of explosives'.

British Standard 1993, BS 7385.2-1993 'Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration'.

International Organization for Standardization 1996, ISO 9613-2:1996 'Acoustics – Attenuation of sound during propagation outdoors'.

Yours sincerely

Teanuanua Villierme
Senior Acoustic Consultant
tvillierme@emmconsulting.com.au

Reviewed by Najah Ishac on 22 July 2021