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Environmental Noise Assessment

Robe Mesa Project

Reference: 23027867-01

Prepared for:
CZR Resources

Association of Australasian Acoustical Consultants

Reference: 23027867-01

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EXECUTIVE SUMMARY

Lloyd George Acoustics was engaged by CZR Resources to undertake a noise assessment for a proposed iron ore mining operation (drill and blast) to be located at the Robe Mesa Project in the West Pilbara of Western Australia.

This report considered noise emissions from the proposed operations to surrounding local fauna habitats, namely Ghost Bat, by way of noise modelling. Two Ghost Bat sites are identified as receptors nearest to the mining site. The other sensitive noise receptor is the Robe Mesa worker camp.

Noise emissions were predicted from the proposed mine by way of computer modelling. The predicted noise levels are demonstrated to be compliant with project criteria levels, noting that these are based on suggested fauna limit levels pertaining to Ghost, Bats as well as Department of Water and Environmental Regulation (DWER) Guidelines for worker accommodation.

1. INTRODUCTION

Lloyd George Acoustics was engaged by CZR Resources to undertake a noise assessment for a proposed iron ore mining operation (drill and blast) to be located at the Robe Mesa Project in the West Pilbara of Western Australia - refer *Figure 1-1*. As part of the agreement with traditional owners of the land, a minimum 50m buffer zone is established, and an infrastructure area (including ROM, processing and load out areas) is also defined – refer *Figure 1-2.*

The two main receiver groups of concern are those of local fauna (Ghost Bats) and their observed habitats, as well as the Robe Mesa Worker Village. No other noise sensitive premises are within range to be impacted by the site.

Noise emissions are predicted from the proposed operations by way of computer noise modelling and assessed against noise level limits in accordance with relevant criteria. Noise and vibration calculations regarding blasting have also been undertaken, to provide guidance for managing this activity close to the sensitive fauna receptors.

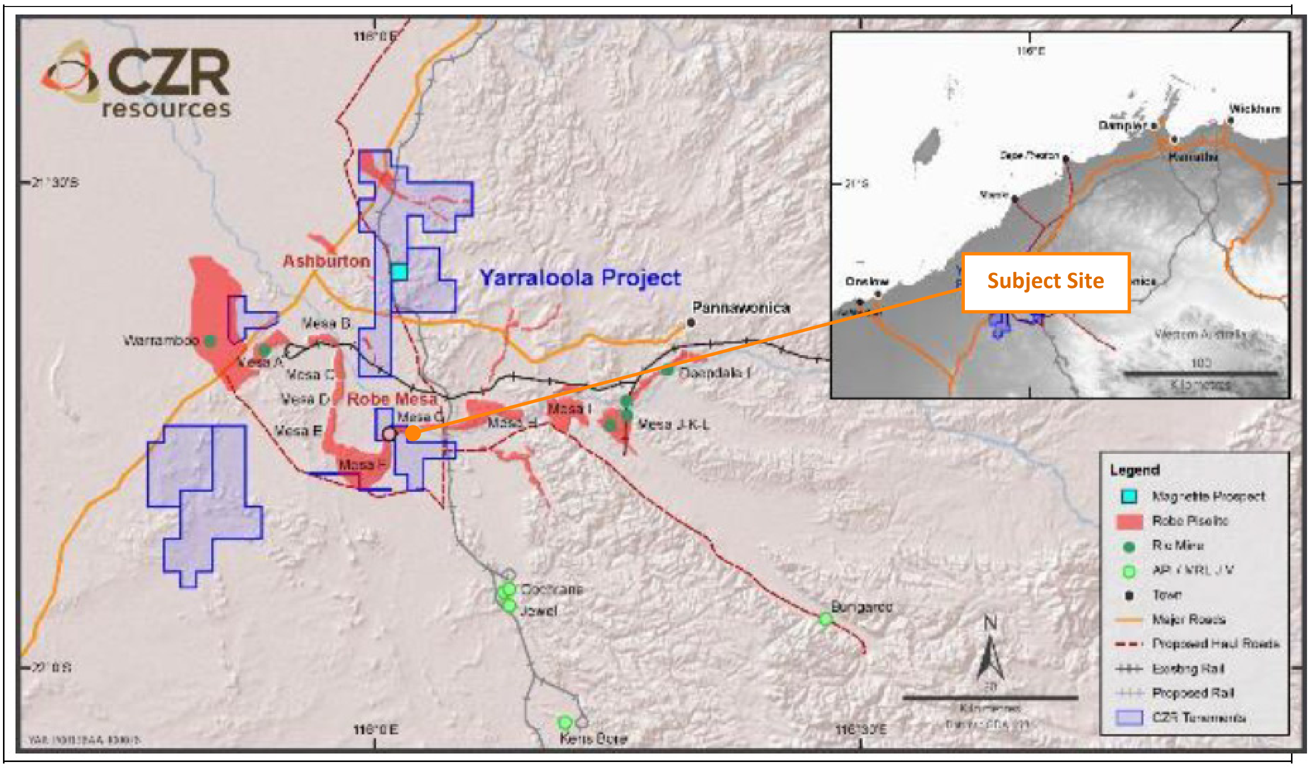


Figure 1-1: Subject Site Location (Source: CZR Resources)

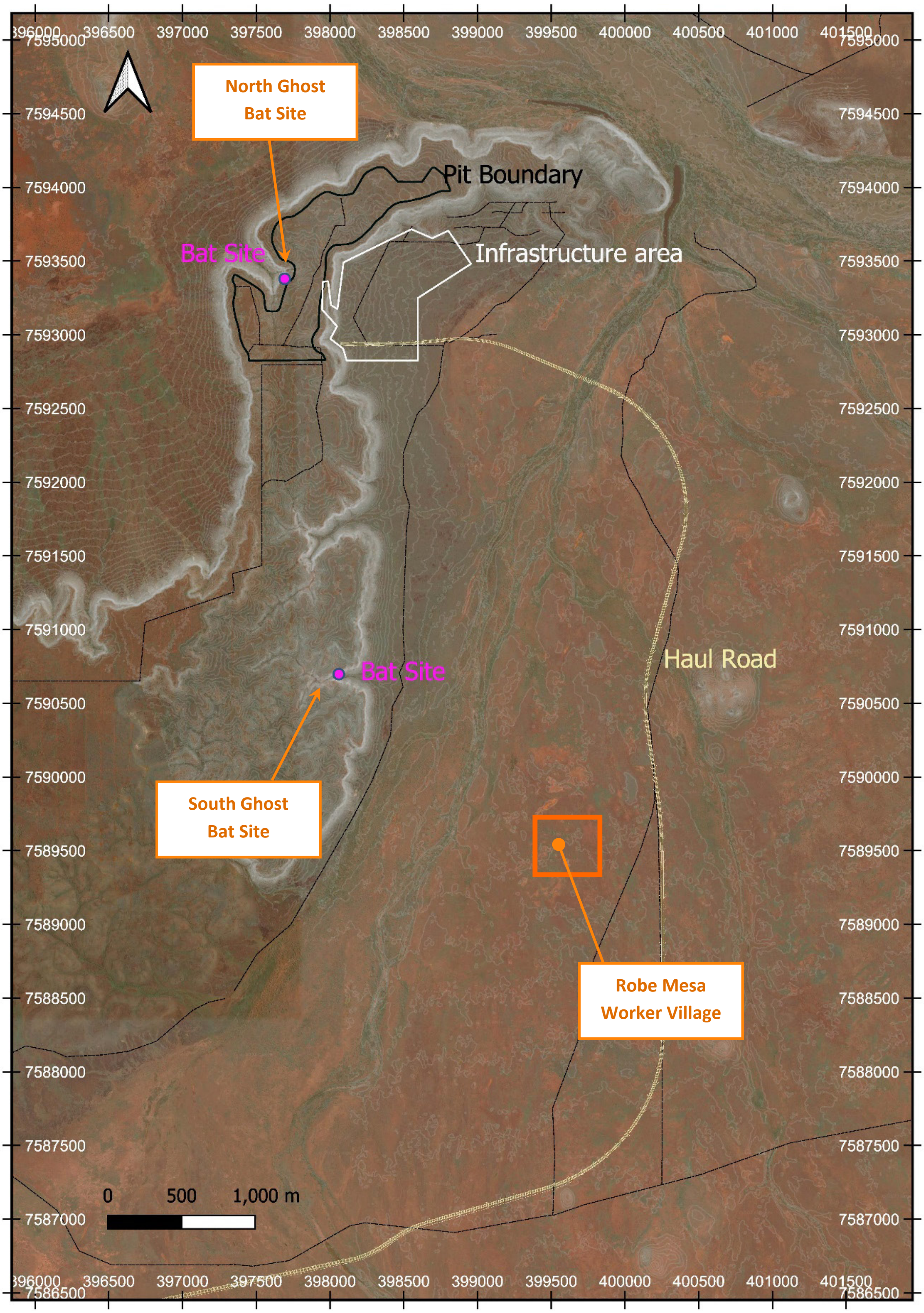


Figure 1-2: Site Layout (Source: CZR Resources)

Appendix A contains a description of some of the terminology used throughout this report.

2. CRITERIA

Environmental noise in Western Australia is governed by the *Environmental Protection Act 1986*, through the *Environmental Protection (Noise) Regulations 1997* (the Regulations). Noting the prescribed standard for noise emission of the Regulations applies to other receiving premises, it should be noted that there are no nearby noise sensitive premises other than those of the Robe Mesa worker village (180 persons) and the identified fauna sites for the Ghost Bats.

2.1. Noise to Worker Village

As the worker village is on the same site as the prescribed activity, the standard assigned noise levels do not apply. In these cases, the *Guideline – Assessment of Environmental Noise Emissions*, produced by Department of Water and Environmental Regulation (DWER), states that at a minimum, accommodation will be designed to achieve a level of L_{Aeq} 40 dB, based on indoor levels inside the village sleeping areas. Assuming a 15 dB increase in level when assessing outdoors, this equates to a level of 55 dB L_{Aeq} outside sleeping areas.

2.2. Airblast Noise

With regard to airblast level, regulation 11 of the Regulations prescribes that:

(4) *Subject to subregulation (5), no airblast level resulting from blasting on any premises or public place, when received at any other premises between 0700 hours and 1800 hours on any day, may exceed -*

(a) for an airblast level received at noise sensitive premises —

(i) when received at a sensitive site — 120 dB $L_{Z\ peak}$*; or*

(ii) when received at a location other than a sensitive site — 125 dB $L_{Z\ peak}$*;*

or

(b) for an airblast level received at any other premises — 125 dB $L_{Z\ peak}$*.*

(5) *The levels specified in subregulation (4) do not apply in respect of an airblast level when received at premises, or a part of premises, on which the blaster believes on reasonable grounds no person is present at the time of the blast.*

(6) *Despite subregulation (4), airblast levels for 9 in any 10 consecutive blasts (regardless of the interval between each blast), when received at any other single premises between 0700 hours and 1800 hours on any day, must not exceed —*

(a) for airblast levels received at noise sensitive premises —

(i) when received at a sensitive site — 115 dB $L_{Z\ peak}$*; or*

(ii) when received at a location other than a sensitive site — 120 dB $L_{Z\ peak}$*;*

or

(b) for airblast levels received at any other premises — 120 dB $L_{Z\ peak}$*.*

(8) *Subject to subregulation (9), no airblast level resulting from blasting on any premises or public place, when received at other premises outside the periods between 0700 hours and 1800 hours on any day, may exceed 90 dB LZ peak except where that blasting is carried out in accordance with the* Mines Safety and Inspection Regulations 1995 *regulation 8.28(4).*

2.3. Noise and Vibration to Fauna – Ghost Bats

The mine site is located close to areas where Ghost Bats are observed to inhabit. Two main sites are noted, with the northern most Bat site being within 50m of the agreed buffer zone on the top of the mesa. While there is no legislated noise criteria, the noise levels will be assessed based on relevant studies on the impact of noise on these animals. While the response to noise and vibration vary among vertebrate fauna species and individuals according to a number of factors (Busnel and Fletcher[1]), a study undertaken by Bullen and Creese [2] suggested that sound levels up to 70 dB(A) are unlikely to result in ghost bats leaving their roost. Therefore, this criterion will be applied to the Ghost bat sites when assessing the operational noise (non-blasting) from the mine site.

Relating the airblast criteria of the Regulations to the Ghost Bats is similarly undefined, such that there is no known airblast level for which disruption to their habitat or behaviour might occur. As such the noise level will be calculated for a range of blast cases and provided as guidance only.

While there are no legislated criteria regarding ground vibration levels at biological sensitive receivers, Appendix J of *AS 2187.2-2006 Explosives - Storage and use - Use of explosives* provides guidance on the possibility of cosmetic damage to buildings from transient vibration sources. This guidance is reproduced below:

TABLE J4.4.2.1

TRANSIENT VIBRATION GUIDE VALUES FOR COSMETIC DAMAGE (BS 7385-2)

Line	Type of building	Peak component particle velocity 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 at 4 Hz and above	
2	Unreinforced or light framed structure. 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

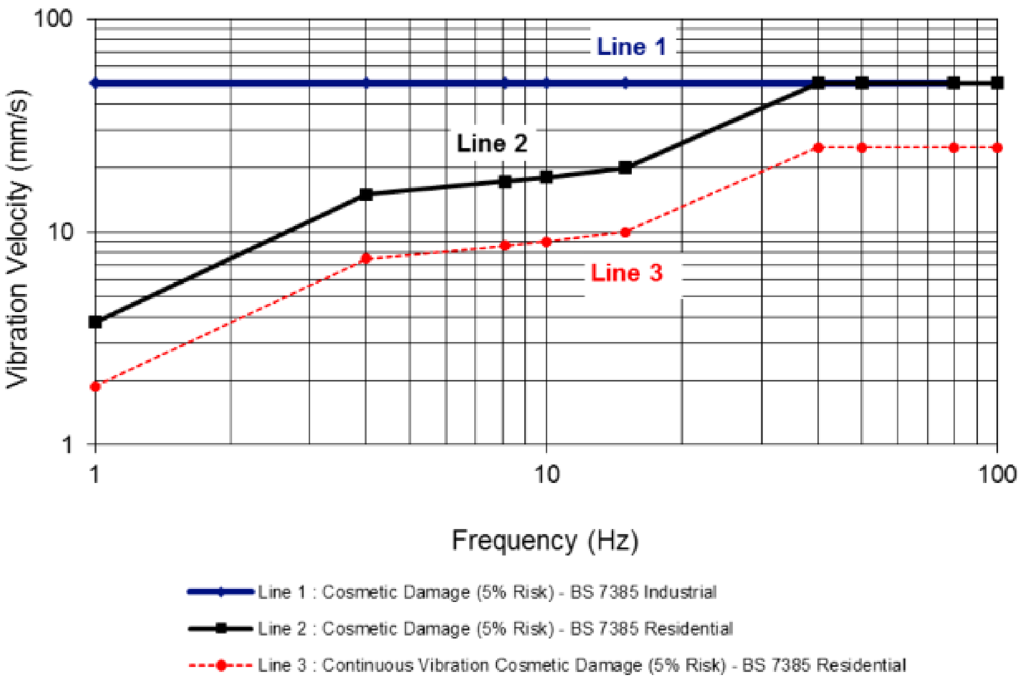
NOTES:

1 Values referred to are at the base of the building.

2 For line 2, at frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) should not be exceeded.

[1] *Busnel, R.G. and Fletcher, J.L. (Eds.) (1978). Effects of Noise on Wildlife. Academic Press, New York.*

[2] Bullen, R. and Creese, S. (2014). A note on the impact on Pilbara leaf-nosed and Ghost Bat activity from cave sound and vibration levels during drilling operations. *The Western Australian Naturalist* 29: 145-154.



Peak ground vibration levels can be calculated using the following algorithm (assuming free face -average Rock):

$$PPV = 1140\left(\frac{\sqrt{m}}{D}\right)^{1.6}$$

Where:

PPV = Peak particle velocity (mm/s)

m = Charge mass per hole or per delay (kg)

D = Distance from blast (m)

The structural integrity of the nearest bat roost site is not easily assessed, however, and the effects of vibration both transient and constant are difficult to predict. Therefore, guidance levels have been provided within this report and conservative strategies can be adopted from these as needed.

3. METHODOLOGY

3.1. Noise Modelling Normal Operations

Computer modelling has been used to predict the noise emissions from the mine to identified receivers. The software used was *SoundPLAN 8.2* with the ISO 9613 algorithms (ISO 171534-3 improved method) selected, as they include the influence of meteorological conditions. This algorithm was considered most suitable due to the northern bat roost being approximately 50m away and to better predict noise to the internal cave locations. Input data required in the model are listed below and discussed in *Section 3.2.1* to *Section 3.2.4*:

- Meteorological Information;
- Topographical data;
- Ground Absorption; and
- Source sound power levels.

3.1.1. Meteorological Conditions

Meteorological information utilised is provided in *Table 3-1* and is considered to represent worst-case conditions for noise propagation. At wind speeds greater than those shown, sound propagation may be further enhanced, however background noise from the wind itself and from local vegetation is likely to be elevated and dominate the ambient noise levels.

Table 3-1: Modelling Meteorological Conditions

Parameter	Day (7.00am to 7.00pm)	Night (7.00pm to 7.00am)
Temperature (^oC)	20	15
Humidity (%)	50	50
Wind Speed (m/s)	Up to 5	Up to 5
Wind Direction*	All	All

* The modelling package allows for all wind directions to be modelled simultaneously.

Alternatives to the above default conditions can be used where one year of weather data is available and the analysis considers the worst 2% of the day and night for the month of the year in which the worst-case weather conditions prevail (source: *Draft Guideline on Environmental Noise for Prescribed Premises*, May 2016). In most cases, the default conditions occur for more than 2% of the time and therefore must be satisfied.

3.1.2. Topographical Data

Topographical data was provided by CZR Resources in the form of high density LIDAR spot height information. This accurately imported the features of the mesa (existing ground). Progressive pit depth drawings were also provided and imported into the modelling software as necessary for those scenarios.

The topography information progresses south to the worker village and the buildings here are all assumed to be 3.5m high.

3.1.3. Ground Absorption

The ground absorption has been assumed to be 0.0 (0%) for the roads, 1.0 (100%) for the pit and 0.5 (50%) elsewhere, noting that 0.0 represents hard reflective surfaces such as water and roads, and 1.0 represents absorptive surfaces such as grass and quarry areas.

3.1.4. Source Sound Levels

The source sound power levels used in the modelling, are provided in *Table 3-2*. It should be noted that much of the fleet has yet to be selected in finality, but the following were provided by CZR Resources as guidance based on site requirements.

Table 3-2: Source Sound Power Levels, dB

Description	Octave Band Centre Frequency (Hz)								Overall dB(A)
	31.5	63	125	250	500	1k	2k	4k	
Front End Loader Cat 980 or 990	113	115	106	100	110	110	106	100	**113**
Dozer Cat D10	104	106	111	109	109	107	105	98	**112**
Cat 777 Haul Truck	115	114	114	114	117	112	111	104	**117**
Grader Cat 16H	101	102	111	104	109	110	105	100	**113**
CAT Genset 500KVA	86	90	89	86	86	89	89	87	**94**
Excavator Komatsu PC1250	97	104	112	111	112	105	99	94	**111**
Kenworth C509 with 4 trailers at 60km/h	110	107	109	112	109	106	105	101	**112**
Rock Breaker	111	118	115	110	112	112	108	103	**116**
Cone Crusher Module	110	109	107	106	108	106	101	96	**110**
Jaw Crusher Module	104	104	116	113	111	108	105	99	**113**
Screener Module	114	110	111	112	111	110	110	110	**116**
Drilling Rig Typical	114	120	123	116	113	112	112	105	**118**

The following is noted in relation to *Table 3-2*:

- Levels are based on file data retained by Lloyd George Acoustics from similar scale projects and is a mixture of site measured data and manufacturers specifications.
- Where the Kenworth Prime Movers are moving at a slower speed on the mine site, the noise level has been reduced by 5 dB, assumed at 20km/h.
- Sources are generally modelled as point sources at 2.0m to 3.0m above ground level (AGL). All Screening and crushing modules are elevated with assumed acoustic centres of 4.0m AGL.

3.2. Noise Calculations - Airblast

Airblast is calculated using equations provided in Australian Standard A*S 2187.2-2006 Explosives - Storage and use*.

The accurate estimation of airblast levels is a complex task. The blasting process is highly non-linear and the variability of most rock types also contributes to the difficulty in accurate predictions of the environmental outcomes. In the absence of either field data or the opportunity to conduct blasting trials in the region of interest, it is possible to estimate likely airblast levels using simple charge weight scaling laws. Such laws incorporate the charge weight per delay and the distance from the blast to the monitoring location. The prediction formula is detailed below:

$$P = K_a \left(\frac{R}{Q^{1/3}} \right)^a$$

where

P = pressure, in kilopascals

Q = explosives charge mass, in kilograms

R = distance from charge, in metres

K_a = site constant

a = site exponent

It is noted that Q is also referred to as the Maximum Instantaneous Charge (MIC), which is the mass of explosives detonating within a defined time period, usually approximately 8 milliseconds. Therefore, when delay blasting occurs, the MIC (or Q) may be relatively small compared to the overall amount of explosive used for each blast.

For confined blast hole charges, assumed to be the primary type used on this project, a site exponent a of −1.45 is used, and the site constant K_a is commonly in the range 10 to 100.

4. RESULTS

4.1. Operational Noise Modelling

The noise levels of mining operations have been predicted by way of noise modelling based on the following plant (mobile and fixed) arrangement on site:

Mobile Plant

- 5x Cat 777 dump trucks traversing the pit and ROM pad
- 1x PC1250 Excavator working in the pit
- 1x D10 Dozer working in the pit
- 1x Drilling Rig for Drill and Blast activities
- Water cart and grader working between pit areas

Fixed Plant (infrastructure)

- 3x Gensets in nominated area near infrastructure
- Primary, secondary and tertiary crushing and screening modules
- 2x Front end Loaders (FEL) Cat 980 to load Haulage Fleet Trucks
- 2x Slow moving Kenworth Haulage Trucks at processed stockpiles
- 2x FEL Cat 990 on ROM pad
- 1x Rock Breaker on ROM pad

Mobile plant have been modelled at or near the western edge of the 50m buffer zone, closest to the Ghost Bat site. It is noted that the bat site consists of a cave approximately 10m deep horizontally, and 5-10m under the mesa top surface level. As such, noise levels are predicted to the outer mouth of the cave as well as internally with the results presented in *Table 4-1.* All noise sources are assumed to be continuous and therefore have been modelled as an L_{A10} level.

Table 4-1: Predicted External Noise Levels Mining Operations, dB L_{A10}

Location	Predicted Level	Limit Level	Compliance
Bat Site Cave Entrance (north)	55	70 dB (A)	***Complies***
Bat Site Cave Internal (north)	45	70 dB (A)	***Complies***
Bat Site (south)	18	70 dB (A)	***Complies***
Worker Village	28	*55 dB (A)	***Complies***

*Based on an internal level of 40 dB(A), a 15 dB(A) reduction is assumed when estimating noise internally

The noise modelling of continuous mining operations (not including blasting) is demonstrated to comply with the fauna site criteria level of 70 dB(A) at both the entrance and inside the nearest Ghost Bat cave. Compliance at the worker village 3.5km to the south is also demonstrated.

4.2. Haulage Truck Fleet

The noise levels from the Haul truck fleet have been predicted by way of noise modelling. At the nearest point, the haul route passes within 800m of Village accommodation, and it is estimated that 6 truck passes will occur per hour (3 loaded and 3 empty). As such, the noise was conservatively modelled as an L_{eq} level and assumed that the truck passing by the nearest point to the camp provided the entire average level (as if present continuously in this location). In reality the truck sources are moving and there will be periods of time where the trucks are farther away or inaudible. Therefore, the results presented in *Table 4-2* should be interpreted as conservative.

Table 4-2: Predicted External Noise Levels Haulage Fleet, dB L_{Aeq}

Location	Predicted Level	Limit Level	Compliance
Bat Site Cave Entrance (north)	17	70 dB (A)	***Complies***
Bat Site Cave Internal (north)	17	70 dB (A)	***Complies***
Bat Site (south)	22	70 dB (A)	***Complies***
Worker Village Accommodation	37	*55 dB (A)	***Complies***

*Based on an internal level of 40 dB(A), a 15 dB(A) reduction is assumed when estimating noise internally

The maximum levels of trucks along the entire haul route are also presented figuratively in *Figure 4-3* – noting that this is a non-cumulative level of multiple truck locations for illustrative purposes.

The noise modelling demonstrates that compliance at Ghost Bat sites and the mine worker village is achieved with respect to noise from truck haulage.

Figure 4-1 Mining Operations Noise (1.5m AGL), dB L_{A10}

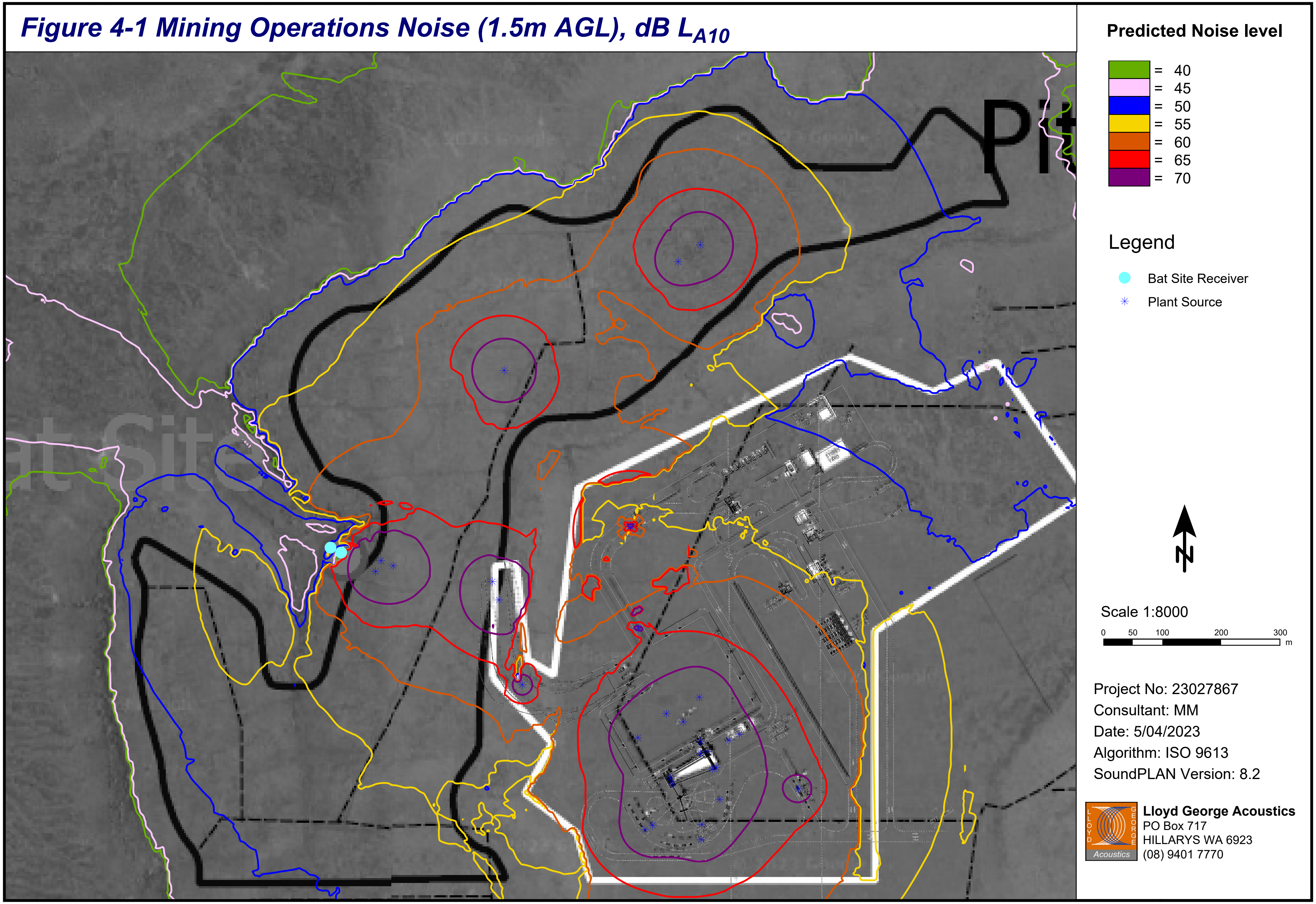
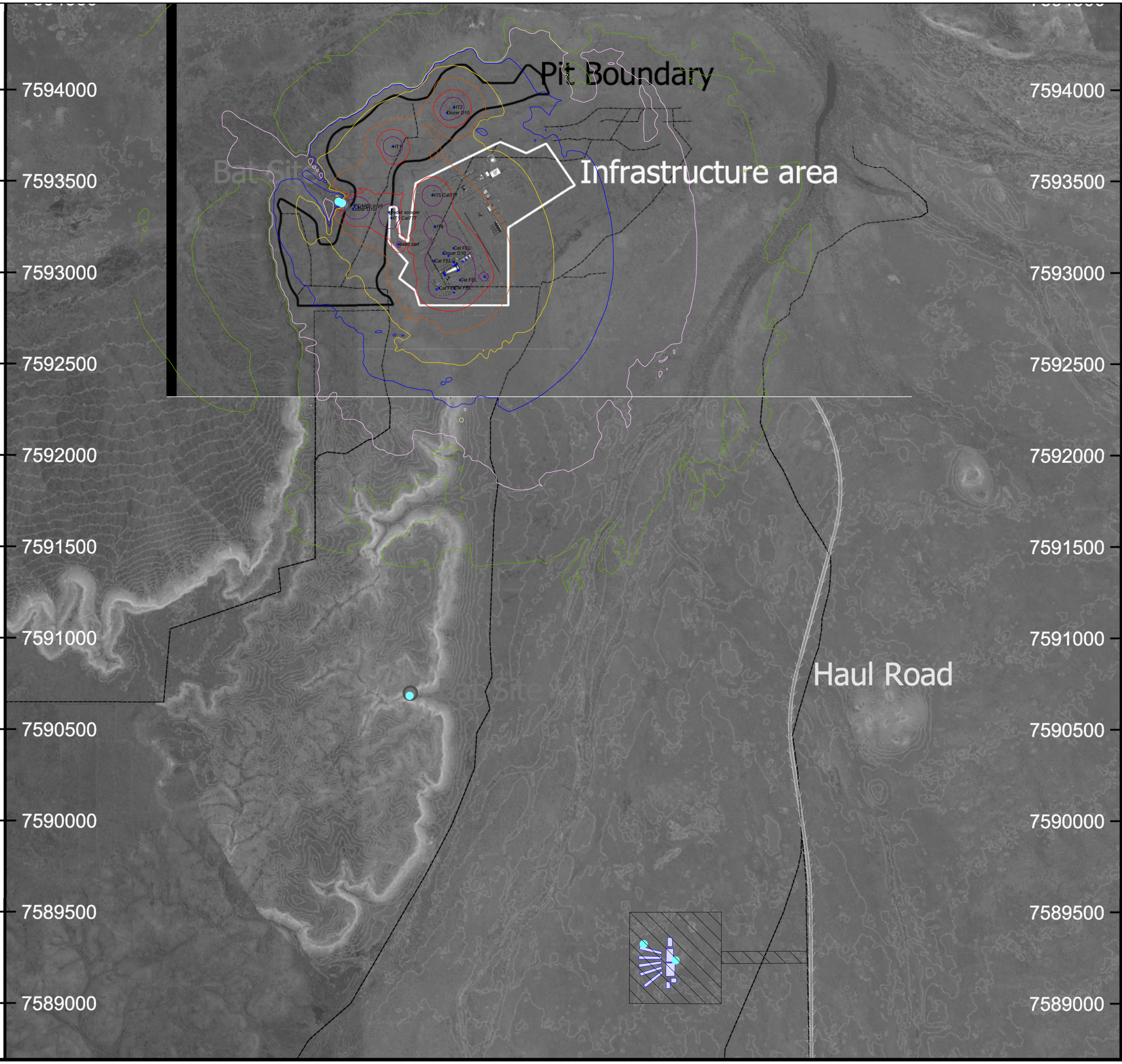


Figure 4-2 Mining Operations Noise (1.5m AGL), dB L_{A10}



Predicted Noise level

Green	= 40
Pink	= 45
Blue	= 50
Yellow	= 55
Orange	= 60
Red	= 65
Purple	= 70

Legend

- Sensitive Receiver
- Mobile Plant Source
- Village Buildings
- Worker Village Area

N

Scale 1:32000

0 200 400 800 1200 m

Project No: 23027867
Consultant: MM
Date: 5/04/2023
Algorithm: ISO 9613
SoundPLAN Version: 8.2

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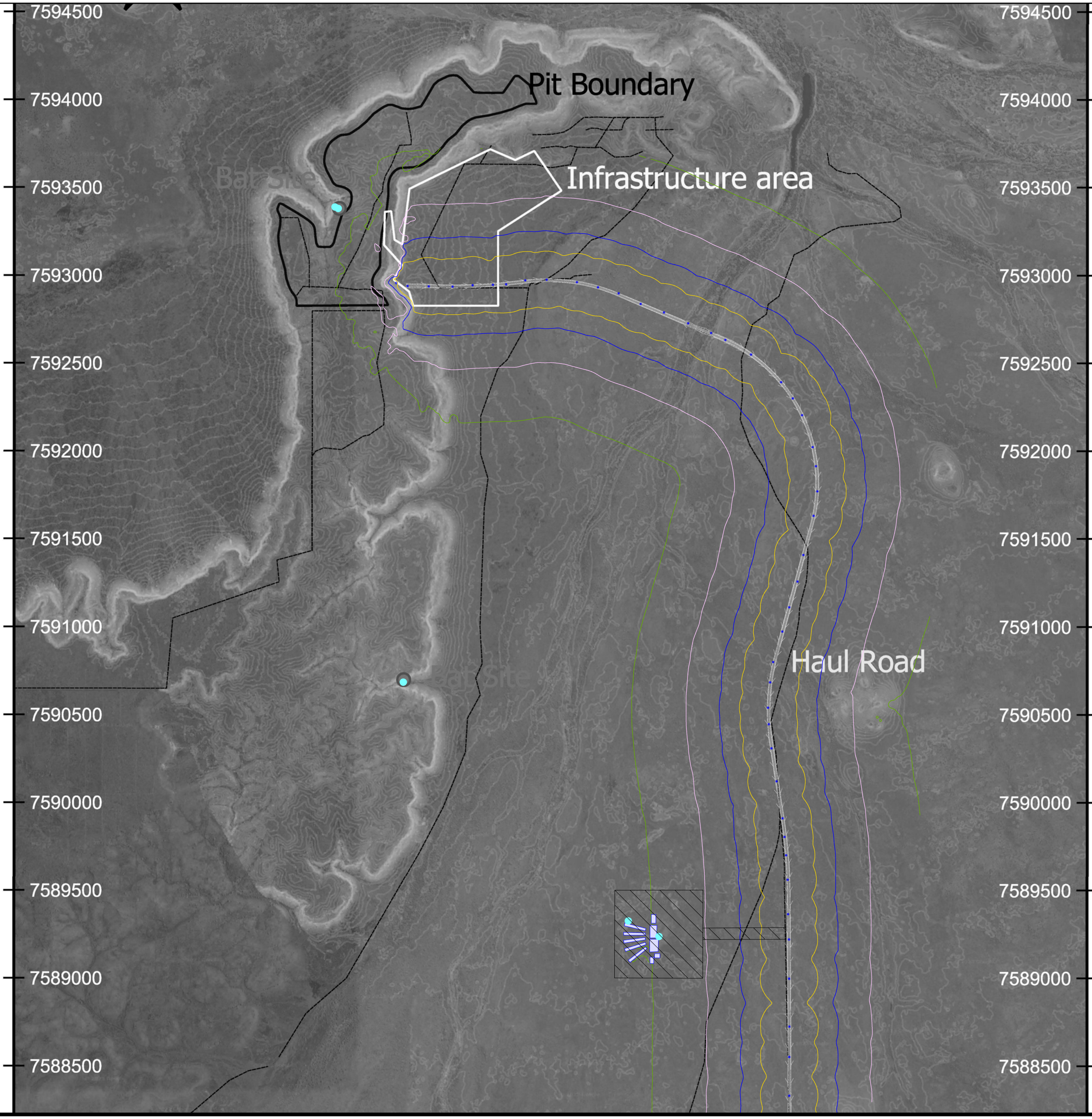
Figure 4-3 Truck Haulage Fleet Noise (1.5m AGL), dB L_{Aeq}



Predicted Noise Level

- = 40
- = 45
- = 50
- = 55

Legend

- Sensitive Receiver
- Road Train Source (Max)
- Village Buildings
- Worker Village Area

N

Scale 1:35000

0 200 400 800 1200 m

Project No: 23027867
Consultant: MM
Date: 5/04/2023
Algorithm: ISO 9613
SoundPLAN Version: 8.2

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4.3. Airblast Levels

Airblast noise and vibration levels have been predicted to the north Ghost Bats site only, being the closest and therefore most critical receptor.

Table 4-3 presents the charge mass per hole (kg) for a given target peak ground vibration velocity (mm/s). This can be used as guidance when planning blasting within 50m to 200m of the Ghost Bats site, noting that the type of rock and/or location influences the outcome considerably.

Table 4-3: Permitted Charge Mass Per Delay (kg) for Various Vibration Velocity

Distance to Receptor	Charge Mass per Hole (kg) to Achieve Peak Ground Vibration Velocity Level (mm/s)								
	Free Face – Hard/Highly Structured Rock			Free Face – Average Rock			Heavily Confined		
	25 mm/s	50 mm/s	100 mm/s	25 mm/s	50 mm/s	100 mm/s	25 mm/s	50 mm/s	100 mm/s
50m	61	140	250	21	50	84	4	8	13
100m	240	565	940	85	204	335	14	32	53
200m	950	2270	3750	340	810	1350	54	126	210

Table 4-4 presents the noise levels of an airblast predicted for a given charge mass-per-hole (kg). This can be used as a guideline when planning the blasting at known distances from the Bat site. The table highlights complying with a 125 $dB_{Lin\ Peak}$ limit level, though this is not necessarily to be taken as a limit for Ghost Bats.

Table 4-4: Calculated Airblast Noise Levels (Confined blast)

Charge Mass per Hole (kg)	Airblast Level (dB $L_{Linear\ peak}$) at Distance (metres)				
	50m	100m	200m	300m	500m
1	124	116	107	102	96
5	130	123	114	109	102
10	134	126	119	112	105
20	137	129	120	114	108
30	139	130	122	116	110
40	140	131	123	117	111
50	141	132	124	118	112
60	142	133	124	119	113
70	143	134	125	120	114
80	143	134	126	120	114
90	144	135	126	121	115
100	144	135	127	121	115
110	144	136	127	121	115
120	145	136	127	122	116

5. CONCLUSION

Operational noise from the proposed Robe Mesa Project, including that of haulage trucks, when received at the mine worker village, is predicted to comply with the criterion provided in the *Guideline – Assessment of Environmental Noise Emissions* produced by DWER.

The operational noise to the nearby fauna sites (Ghost Bats) is predicted to comply with the criterion of 70 dB(A), at which it is considered unlikely for noise to result in Ghost Bats leaving their roost (Bullen and Creese[3]).

Guidance on airblast noise and vibration levels to address the north Ghost Bat site has been provided in this report. There is no known airblast criteria for Ghost Bats. Therefore, it is recommended that blasting strategies take into account the information herein, in conjunction with monitoring to minimise impact on the fauna sites.

Whilst there are no criteria for airblast to mine accommodation camps, where these levels are minimised for the fauna sites, the subsequent impact on the worker village (~3.5km away) is expected to be below criterion in the Regulations for 9 out of 10 blasts.

[3] Bullen, R. and Creese, S. (2014). A note on the impact on Pilbara leaf-nosed and Ghost Bat activity from cave sound and vibration levels during drilling operations. *The Western Australian Naturalist* 29: 145-154.

Appendix A – Terminology

The following is an explanation of the terminology used throughout this report:

- **Decibel (dB)**

The decibel is the unit that describes the sound pressure levels of a noise source. It is a logarithmic scale referenced to the threshold of hearing.

- **A-Weighting**

An A-weighted noise level has been filtered in such a way as to represent the way in which the human ear perceives sound. This weighting reflects the fact that the human ear is not as sensitive to lower frequencies as it is to higher frequencies. An A-weighted sound level is described as L_A, dB.

- **Sound Power Level (L_w)**

Under normal conditions, a given sound source will radiate the same amount of energy, irrespective of its surroundings, being the sound power level. This is similar to a 1kW electric heater always radiating 1kW of heat. The sound power level of a noise source cannot be directly measured using a sound level meter but is calculated based on measured sound pressure level at known distances. Noise modelling incorporates source sound power levels as part of the input data.

- **Sound Pressure Level (L_p)**

The sound pressure level of a noise source is dependent upon its surroundings, being influenced by distance, ground absorption, topography, meteorological conditions etc. and is what the human ear actually hears. Using the electric heater analogy above, the heat will vary depending upon where the heater is located, just as the sound pressure level will vary depending on the surroundings. Noise modelling predicts the sound pressure level from the sound power levels taking into account ground absorption, barrier effects, distance etc.

- **L_{ASlow}**

This is the noise level in decibels, obtained using the A-frequency weighting and the S (slow) time weighting. Unless assessing modulation, all measurements use the slow time weighting characteristic.

- **L_{AFast}**

This is the noise level in decibels, obtained using the A-frequency weighting and the F (fast) time weighting. This is used when assessing the presence of modulation.

- **L_{APeak}**

This is the greatest absolute instantaneous sound pressure level in decibels using the A-frequency weighting.

- **L_{Amax}**

An L_{Amax} level is the maximum A-weighted noise level during a particular measurement.

- **L_{A1}**

The L_{A1} level is the A-weighted noise level exceeded for 1 percent of the measurement period and is considered to represent the average of the maximum noise levels measured.

- **L_{A10}**

The L_{A10} level is the A-weighted noise level exceeded for 10 percent of the measurement period and is considered to represent the "intrusive" noise level.

- **L_{A90}**

The L_{A90} level is the A-weighted noise level exceeded for 90 percent of the measurement period and is considered to represent the "background" noise level.

- **L_{Aeq}**

The equivalent steady state A-weighted sound level ("equal energy") in decibels which, in a specified time period, contains the same acoustic energy as the time-varying level during the same period. It is considered to represent the "average" noise level.

- **One-Third-Octave Band**

Means a band of frequencies spanning one-third of an octave and having a centre frequency between 25 Hz and 20000 Hz inclusive.

- **Representative Assessment Period**

Means a period of time not less than 15 minutes, and not exceeding four hours, determined by an inspector or authorised person to be appropriate for the assessment of a noise emission, having regard to the type and nature of the noise emission.

- **L_{Amax} assigned level**

Means an assigned level, which, measured as a L_{ASlow} value, is not to be exceeded at any time.

- **L_{A1} assigned level**

Means an assigned level, which, measured as a L_{ASlow} value, is not to be exceeded for more than 1 percent of the representative assessment period.

- **L_{A10} assigned level**

Means an assigned level, which, measured as a L_{ASlow} value, is not to be exceeded for more than 10 percent of the representative assessment period.

- **Tonal Noise**

A tonal noise source can be described as a source that has a distinctive noise emission in one or more frequencies. An example would be whining or droning. The quantitative definition of tonality is:

- the presence in the noise emission of tonal characteristics where the difference between -
  - (a) the A-weighted sound pressure level in any one-third octave band; and
  - (b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands,

  is greater than 3 dB when the sound pressure levels are determined as $L_{Aeq,T}$ levels where the time period T is greater than 10% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as $L_{A\ Slow}$ levels.

This is relatively common in most noise sources.

- **Modulating Noise**

A modulating source is regular, cyclic and audible and is present for at least 10% of the measurement period. The quantitative definition of modulation is:

- a variation in the emission of noise that —
  - (a) is more than 3 dB $L_{A\ Fast}$ or is more than 3 dB $L_{A\ Fast}$ in any one-third octave band; and
  - (b) is present for at least 10% of the representative assessment period; and
  - (c) is regular, cyclic and audible.

- **Impulsive Noise**

An impulsive noise source has a short-term banging, clunking or explosive sound. The quantitative definition of impulsiveness means:

- a variation in the emission of a noise where the difference between L_{Apeak} and L_{Amax} is more than 15 dB when determined for a single representative event.

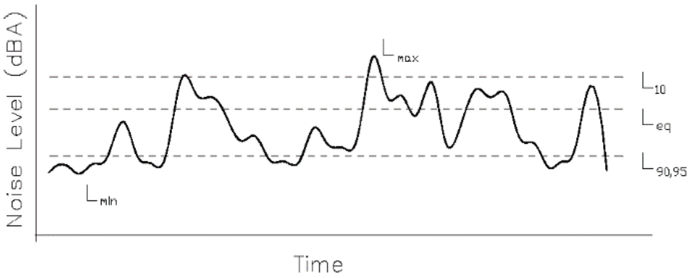
- **Major Road**

Is a road with an estimated average daily traffic count of more than 15,000 vehicles.

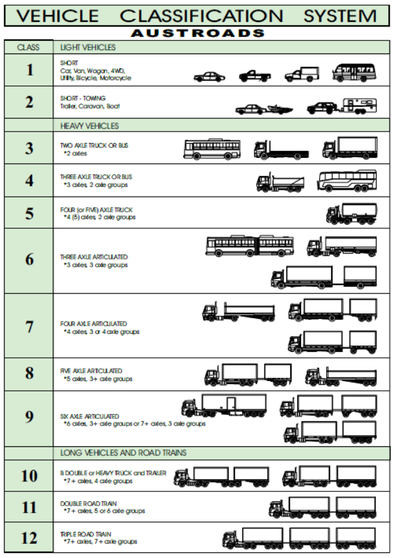
- **Secondary / Minor Road**

Is a road with an estimated average daily traffic count of between 6,000 and 15,000 vehicles.

- **Chart of Noise Level Descriptors**



- **Austroads Vehicle Class**



- **Typical Noise Levels**