

Noise Monitoring Assessment

Dargues Gold Mine
Majors Creek, NSW
Quarter Ending, June 2023

Document Information

Noise Monitoring Assessment

Dargues Gold Mine

Majors Creek, NSW

Quarter Ending, June 2023

Prepared for: Aurelia Metals Ltd

Dargues Gold Mine

920 Majors Creek Road

Majors Creek NSW 2622



Prepared by: Muller Acoustic Consulting Pty Ltd

PO Box 678, Kotara NSW 2289

ABN: 36 602 225 132

P: +61 2 4920 1833

www.mulleracoustic.com

Document ID	Date	Prepared By	Signed	Reviewed By	Signed
MAC201092-01RP14	30 May 2023	Nicholas Shipman		Oliver Muller	

DISCLAIMER

All documents produced by Muller Acoustic Consulting Pty Ltd (MAC) are prepared for a particular client's requirements and are based on a specific scope, circumstances and limitations derived between MAC and the client. Information and/or report(s) prepared by MAC may not be suitable for uses other than the original intended objective. No parties other than the client should use or reproduce any information and/or report(s) without obtaining permission from MAC. Any information and/or documents prepared by MAC is not to be reproduced, presented or reviewed except in full.

CONTENTS

1	INTRODUCTION.....	5
2	NOISE CRITERIA.....	7
2.1	OPERATIONAL NOISE CRITERIA.....	7
2.2	ROAD NOISE CRITERIA.....	9
3	METHODOLOGY.....	11
3.1	OPERATOR ATTENDED NOISE MEASUREMENT METHODOLOGY.....	11
4	RESULTS.....	13
4.1	METEOROLOGICAL CONDITIONS.....	13
4.2	ASSESSMENT RESULTS – LOCATION R20.....	14
4.3	ASSESSMENT RESULTS – LOCATION R27.....	15
4.4	ASSESSMENT RESULTS – LOCATION R29.....	16
4.5	ASSESSMENT RESULTS – LOCATION R34.....	17
4.6	ASSESSMENT RESULTS – LOCATION R108.....	18
5	DISCUSSION.....	19
5.1	DISCUSSION OF RESULTS – LOCATION R20.....	19
5.2	DISCUSSION OF RESULTS – LOCATION R27.....	19
5.3	DISCUSSION OF RESULTS – LOCATION R29.....	19
5.4	DISCUSSION OF RESULTS – LOCATION R34.....	20
5.5	DISCUSSION OF RESULTS – LOCATION R108.....	20
6	CONCLUSION.....	21

APPENDIX A – GLOSSARY OF TERMS

This page has been intentionally left blank

1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by Aurelia Metals Ltd to complete a quarterly Noise Monitoring Assessment (NMA) for Dargues Gold Mine, Majors Creek, NSW (the mine).

The monitoring has been conducted in accordance with Condition L2 of the Environmental Protection Licence (EPL) #20095, and in accordance with the site's Noise Management Plan (NMP) 20170123, at five representative monitoring locations. This assessment has been undertaken during Quarter 2, 2023 on Wednesday 24 May 2023 and forms part of the noise monitoring program to address relevant conditions.

The assessment has been conducted in accordance with the following documents:

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI), 2017;
- NSW Environment Protection Authority (EPA), Environment Protection Licence EPL #20095 (EPL);
- NSW Environment Protection Authority (EPA's), Approved methods for the measurement and analysis of environmental noise in NSW, 2022;
- Dargues Gold Mine Noise Management Plan (NMP) 20170123;
- Dargues Gold Mine Project Approval, 10_0054; and
- Australian Standard AS 1055:2018 - Acoustics - Description and measurement of environmental noise - General Procedures.

A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A**.

This page has been intentionally left blank

2 Noise Criteria

2.1 Operational Noise Criteria

Section L2 of the project's EPL (EPL #20095) outlines the applicable operational noise criteria for all privately owned residential receivers surrounding the mine. The criteria outlined in the EPL is reproduced below:

L2.1 Noise from the premises must not exceed the sound pressure level (noise) limits presented in the Table below. Note that the limits apply to the operation of the project and represent the sound pressure level (noise) contribution, at the nominated receiver locations in the table.

Table 1 summaries the applicable noise criteria at the five monitoring locations in accordance with the sites EPL and NMP.

Table 1 Noise Monitoring Program				
Monitoring Location	Noise Criteria, dBA LAeq(15min)			Noise Criteria, dB LA1(1min)
	Day	Evening	Night	Night
	(7am to 6pm)	(6pm to 10pm)	(10pm to 7am)	(10pm to 7am)
At any residence	35	35	35	45
Majors Creek State Conservation Area (when in use by any person)	35	35	35	45

L2.2 For the purpose of Noise Limit Conditions above:

'Day' is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays;

'Evening' is defined as the period from 6pm to 10pm on any day; and

'Night' is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and Public Holidays.

L2.3 The noise emission limits identified in the table above apply under meteorological conditions of:

a) wind speeds up to 3 m/s at 10m above ground level; or

b) temperature inversion conditions of up to 3 °C/100m and wind speeds up to 2 m/s at 10m above ground level.

L2.4 For the purpose of the Condition L4.3:

a) The meteorological data to be used for determining meteorological conditions is the data recorded by the meteorological weather station established at the premises for the purposes of this Environment Protection Licence ("Point 59" as outlined in Weather Monitoring conditions below); and

b) Stability category temperature inversion conditions are to be determined by the sigma-theta method referred to in Part E4 of Appendix E to the New South Wales Industrial Noise Policy (EPA 2000).

L2.5 Determining Compliance:

To determine compliance:

a) with the Leq(15 minute) noise limits in the Noise Limits table, the noise measurement equipment must be located:

i) approximately on the property boundary, where any dwelling is situated 30 meters or less from the property boundary closest to the premises;

ii) within 30 meters of a dwelling façade, but not closer than 3m, where any dwelling on the property is situated more than 30 meters from the property boundary closest to the premises; or, where applicable; or

iii) within approximately 50 meters of the boundary of a National Park, Nature Reserve or State Conservation Area.

b) with the LA1(1 minute) noise limits in the Noise Limits table, the noise measurement equipment must be located within 1 meter of a dwelling façade.

c) with the noise limits in the Noise Limits table, the noise measurement equipment must be located;

i) at the most affected point at a location where there is no dwelling at the location; or

ii) at the most affected point within an area at a location prescribed by part (a) or part (b) of this condition.

L2.6 For the purposes of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

L2.7A breach of this license will still occur where noise generated from the premises in excess of the appropriate limit is measured: i) at a location other than an area prescribed in part (a) and part (b) of Condition L4.5; and/or ii) at a point other than the most affected point at a location.

MAC Technical Note: For sleep disturbance, the LA1(1 minute) descriptor is meant to represent a maximum noise level measured under 'fast' time response. DEC will accept analysis based on either LA1(1 minute) or LA(max).

2.2 Road Noise Criteria

Section 2.2.2 of the NSW Road Noise Policy specifies noise criteria for principal haulage routes applicable to off-site traffic from the mine and are reproduced in **Table 2**.

Table 2 Traffic Noise Impact Assessment Criteria dB(A)		
Road	Assessment Criteria - dBA	
	Day (7am to 10pm)	Night (10pm to 7am)
Majors Creek Road, Araluen Road, Captains	60dBA	55dBA
Flat Road, Coghill Street and Wallace Street	LAeq(15hour)	LAeq(9hour)

Note: The noise generated by the project is to be measured in accordance with the relevant procedures in the NSW Road Noise Policy.

Section 8.7 of the Noise Management Plan regarding the traffic noise monitoring is reproduced below:

During the initial stages of the Project and annually thereafter, the Company would undertake a traffic noise monitoring program at 600 Majors Creek Road, the closest residence to Majors Creek Road, between the Project Site and the intersection with Araluen Road.

The traffic noise monitoring assessment has been completed during Quarter 1, 2023 and therefore is not included in this assessment.

This page has been intentionally left blank

3 Methodology

All attended noise surveys for this assessment were conducted in general accordance with the procedures described in Australian Standard AS 1055:2018, "Acoustics - Description and Measurement of Environmental Noise", the NMP and the EPL.

The acoustic instrumentation used carries appropriate and current NATA (or manufacturer) calibration certificates with records of all calibrations maintained by MAC as per Approved methods for the measurement and analysis of environmental noise in NSW (EPA, 2022) and complies with AS/NZS IEC 61672.1-2019-Electroacoustics - Sound level meters - Specifications. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed ± 0.5 dBA.

3.1 Operator Attended Noise Measurement Methodology

The locality surrounding the mine is primarily rural/residential. Operator attended noise monitoring was undertaken at five representative receivers outlined in the mine's NMP and are presented in **Table 3**.

Monitoring Location	Resident Identifier	Coordinates (GDA94-MGA55)	
		Easting	Northing
NM1	R29	748148	6061931
NM2	R108	747454	6062651
NM3	R20	748672	6061250
NM5	R27	748998	6061467
NM6	R34	751242	6064950

Note 1: As per the Mine's NMP.

The receiver locations and unattended noise measurement location are presented in **Figure 1**.

Attended measurements were carried out using a Svantek Type 1, 971 noise analyser on Wednesday 24 May 2023. Where possible throughout each survey the operator quantified the contribution of any significant noise sources.

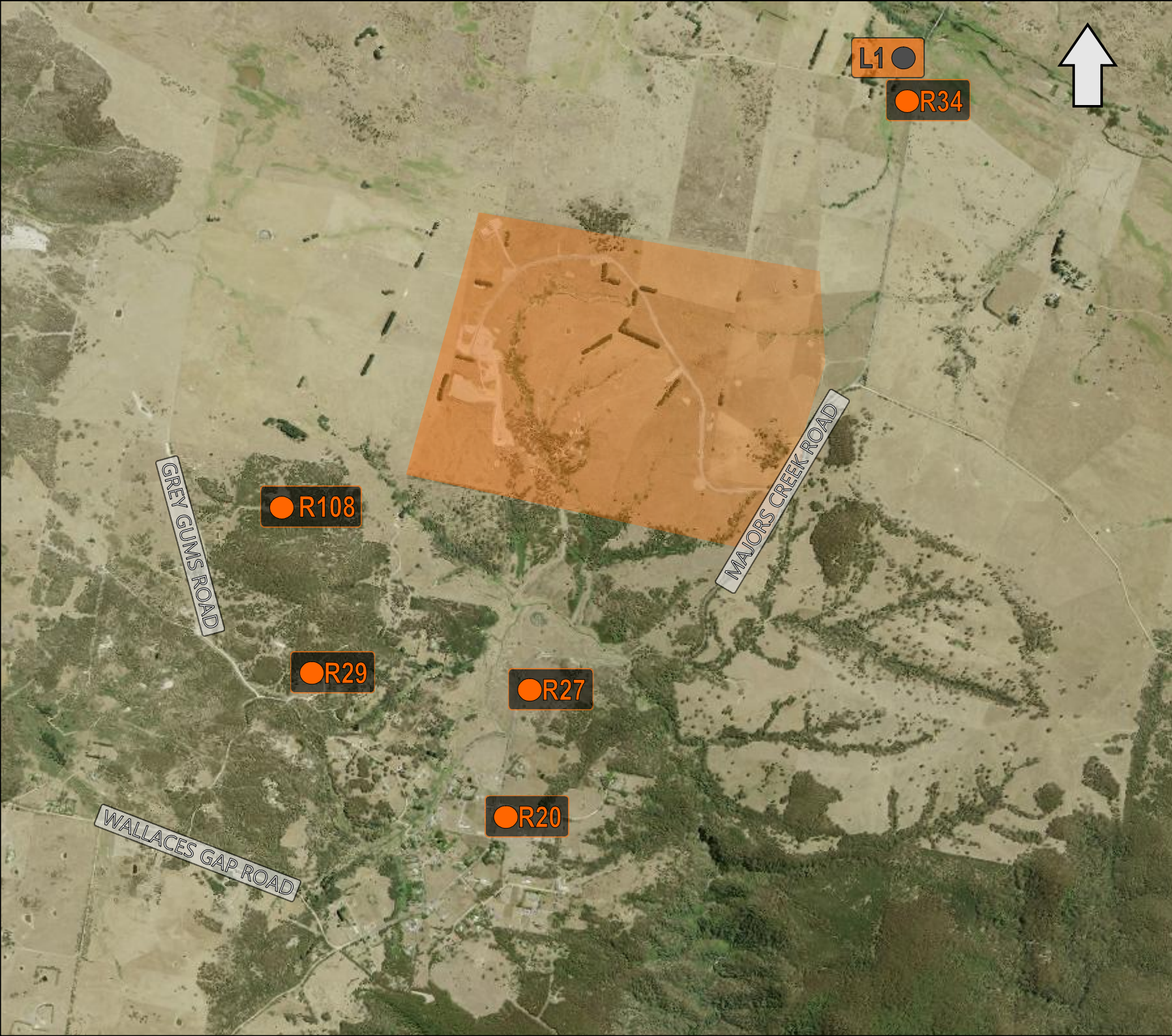


FIGURE 1
LOCALITY PLAN
REF: MAC201092



KEY	
	UNATTENDED LOCATION
	RECEIVER LOCATION
	SITE LOCATION



Imagery Source: Google Earth

4 Results

4.1 Meteorological Conditions

Weather data for the noise assessment was sourced from DGMs on-site meteorological station as well as operator measured conditions on site of EPL nominated receiver locations. The data was used to determine prevailing meteorological conditions at the time of the attended measurements, which are presented in **Table 4**. It is noted that as per Condition L2.3 of the EPL, noise emission limits are applicable for the monitoring period.

Table 4 Prevailing Meteorological Conditions

Time & Date	Operator Measured Weather			
	DGM on-site Meteorological Station		Monitoring Location (1.8m AGL)	
	Wind Direction	Wind (m/s)	Wind Direction	Wind (m/s)
16:13 24/05/2023	N	1.0	NW	0.1
16:33 24/05/2023	NNE	0.4	NW	0.1
16:56 24/05/2023	NNW	1.0	NW	0.1
17:14 24/05/2023	N	1.0	NW	0.1
17:36 24/05/2023	N	1.2	NW	0.1
20:11 24/05/2023	NW	1.1	NW	0.4
20:35 24/05/2023	NW	1.8	NW	0.6
20:55 24/05/2023	NNW	2.1	NW	0.1
21:19 24/05/2023	N	2.1	NW	0.6
21:38 24/05/2023	N	1.6	NW	1.0
22:00 24/05/2023	NNW	1.5	NW	1.0
22:18 24/05/2023	NW	1.3	NW	1.2
22:40 24/05/2023	WNW	1.7	NW	2.0
22:59 24/05/2023	WNW	1.8	NW	2.0
23:20 24/05/2023	WNW	1.6	NW	0.5

4.2 Assessment Results – Location R20

The results of the attended noise measurements at location R20 for the May 2023 survey are summarised in **Table 5** with the relevant EPL limits, the calculated mining noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 5 Operator-Attended Noise Survey Results – Location R20							
Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology ¹	Description and SPL, dBA
		L _{Amax}	L _{Aeq}	L _{A90}			
24/05/2023 (Day)	16:56	79	58	35	35		Traffic 32-79
						WD: NNW	Birds 37-45
						WS: 1.0m/s	Local residential noise 32-47
						Rain: Nil	Livestock 32-48
Dargues Site L _{Aeq} (15min) Contribution							<25
24/05/2023 (Evening)	20:55	82	54	25	35		Dogs barking 24-28
						WD: NNW	Traffic 21-82
						WS: 2.1m/s	Livestock 26-36
						Rain: Nil	DGM hum 24-26
Dargues Site L _{Aeq} (15min) Contribution							25
24/05/2023 (Night)	22:40	56	43	38	35		Wind in trees 41-56
						WD: WNW	Livestock 36-48
						WS: 1.7m/s	DGM inaudible
						Rain: Nil	
Dargues Site L _{Aeq} (15min) Contribution							<28
Dargues Site L _{Amax} Contribution							<28

Note 1: Meteorology data obtained from DGM onsite weather station.

4.3 Assessment Results – Location R27

The results of the attended noise measurements at location R27 for the May 2023 survey are summarised in **Table 6** with the relevant EPL limits, the calculated mining noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 6 Operator-Attended Noise Survey Results – Location R27							
Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology ¹	Description and SPL, dBA
		L _{Amax}	L _{Aeq}	L _{A90}			
24/05/2023 (Day)	17:14	78	55	27	35	WD: N	Traffic 23-78
						WS: 1.0m/s	Birds 34-58
						Rain: Nil	DGM hum 23-25
						Dargues Site L _{Aeq} (15min) Contribution	
24/05/2023 (Evening)	20:35	57	29	24	35	WD: NW	Creek flow <21
						WS: 1.8m/s	Traffic 21-38
						Rain: Nil	Wind in trees 26-36
						Dargues Site L _{Aeq} (15min) Contribution	
24/05/2023 (Night)	22:59	47	40	36	35	WD: WNW	Wildlife 30-57
						WS: 1.8m/s	DGM inaudible
						Rain: Nil	DGM inaudible
						Dargues Site L _{Aeq} (15min) Contribution	
Dargues Site L _{Amax} Contribution						<26	

Note 1: Meteorology data obtained from DGM onsite weather station.

4.4 Assessment Results – Location R29

The results of the attended noise measurements at location R29 for the May 2023 survey are summarised in **Table 7** with the relevant EPL limits, the calculated mining noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 7 Operator-Attended Noise Survey Results – Location R29														
Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology ¹	Description and SPL, dBA							
		L _{Amax}	L _{Aeq}	L _{A90}										
24/05/2023 (Day)	16:33	60	35	19	35	WD: NNE WS: 0.4m/s Rain: Nil	Birds 16-57							
							Dogs barking 22-60							
							Insects <16							
							Traffic 17-34							
DGM inaudible														
Dargues Site L _{Aeq} (15min) Contribution							<19							
24/05/2023 (Evening)	21:19	52	29	19	35	WD: N WS: 2.1m/s Rain: Nil	Dogs barking 16-52							
							Traffic 16-24							
							Wind in trees <24							
							DGM inaudible							
Dargues Site L _{Aeq} (15min) Contribution							<19							
24/05/2023 (Night)	22:18	47	33	30	35	WD: NW WS: 1.3m/s Rain: Nil	Wind in trees 29-47							
							DGM inaudible							
							Dargues Site L _{Aeq} (15min) Contribution							<20
							Dargues Site L _{Amax} Contribution							<20

Note 1: Meteorology data obtained from DGM onsite weather station.

4.5 Assessment Results – Location R34

The results of the attended noise measurements at location R34 for the May 2023 survey are summarised in **Table 8** with the relevant EPL limits, the calculated mining noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 8 Operator-Attended Noise Survey Results – Location R34							
Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology ¹	Description and SPL, dBA
		L _{Amax}	L _{Aeq}	L _{A90}			
24/05/2023 (Day)	17:36	79	57	16	35	WD: N	Traffic 15-79
						WS: 1.2m/s	Livestock 20-42
						Rain: Nil	DGM inaudible
Dargues Site L _{Aeq} (15min) Contribution							<16
24/05/2023 (Evening)	20:11	78	53	23	35	WD: NW	Traffic 20-78
						WS: 1.1m/s	Wind in trees 30-34
						Rain: Nil	Birds 29-39
Dargues Site L _{Aeq} (15min) Contribution							<20
24/05/2023 (Night)	23:20	54	28	19	35	WD: WNW	Livestock 17-54
						WS: 1.6m/s	DGM inaudible
						Rain: Nil	
Dargues Site L _{Aeq} (15min) Contribution							<19
Dargues Site L _{Amax} Contribution							<19

Note 1: Meteorology data obtained from DGM onsite weather station.

4.6 Assessment Results – Location R108

The results of the attended noise measurements at location R108 for the May 2023 survey are summarised in **Table 9** with the relevant EPL limits, the calculated mining noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 9 Operator-Attended Noise Survey Results – Location R108							
Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology ¹	Description and SPL, dBA
		L _{Amax}	L _{Aeq}	L _{A90}			
24/05/2023 (Day)	16:13	61	28	16	35	WD: N	Insects <13
						WS: 1.0m/s	Birds 13-61
						Rain: Nil	Livestock <18
							Traffic 13-34
Dargues Site L _{Aeq} (15min) Contribution							<16
24/05/2023 (Evening)	21:38	51	35	29	35	WD: N	Wind in trees 27-51
						WS: 1.6m/s	Livestock 27-32
						Rain: Nil	DGM inaudible
Dargues Site L _{Aeq} (15min) Contribution							<20
24/05/2023 (Night)	22:00	63	32	27	35	WD: NNW	Wind in trees 26-52
						WS: 1.5m/s	Livestock 26-34
						Rain: Nil	Wildlife 50-63
							DGM inaudible
Dargues Site L _{Aeq} (15min) Contribution							<20
Dargues Site L _{Amax} Contribution							<20

Note 1: Meteorology data obtained from DGM onsite weather station.

5 Discussion

5.1 Discussion of Results – Location R20

Operator attended measurement results at R20, on Wednesday 24 May 2023 identified that DGM emissions were measured at 25dB, LAeq(15min) during the evening period, therefore remained below the relevant criteria of 35dB, LAeq(15min). DGM emissions remained inaudible during the remaining periods. Generally, traffic, birds, local residential noise, livestock and dogs barking were audible throughout all three monitoring periods.

In summary, the noise contribution from the mine satisfied the relevant noise criteria for the attended measurements on Wednesday 24 May 2023.

5.2 Discussion of Results – Location R27

Operator attended measurement results at R27, on Wednesday 24 May 2023 identified that DGM emissions were measured between 23dB and 24dB, LAeq(15min) during the day and evening periods, therefore remained below the relevant criteria of 35dB, LAeq(15min). DGM emissions remained inaudible during the remaining period. Generally, traffic, birds, creek flow, wind in trees and wildlife were audible throughout all three monitoring periods.

In summary, the noise contribution from the mine satisfied the relevant noise criteria for the attended measurements on Wednesday 24 May 2023.

5.3 Discussion of Results – Location R29

Operator attended measurement results at R29, on Wednesday 24 May 2023 identified that DGM emissions remained inaudible during the measurement period, therefore remained below the relevant criteria. Generally, birds, dogs barking, insects, traffic and wind in trees were audible throughout all three monitoring periods.

In summary, the noise contribution from the mine satisfied the relevant noise criteria for the attended measurements on Wednesday 24 May 2023.

5.4 Discussion of Results – Location R34

Operator attended measurement results at R34, on Wednesday 24 May 2023 identified that DGM activities remained inaudible during the assessment periods and therefore remained below the relevant criteria. Generally, traffic, livestock, wind in trees and birds were audible sources throughout all three monitoring periods.

In summary, the noise contribution from the mine satisfied the relevant noise criteria for the attended measurements on Wednesday 24 May 2023.

5.5 Discussion of Results – Location R108

Operator attended measurement results at R108, on Wednesday 24 May 2023 identified that DGM activities remained inaudible during the assessment periods and therefore remained below the relevant criteria. Generally, insects, birds, livestock, traffic, wildlife and wind in trees were audible sources throughout all three monitoring periods.

In summary, the noise contribution from the mine satisfied the relevant noise criteria for the attended measurements Wednesday 24 May 2023.

6 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) on behalf of Aurelia Metals Ltd at Dargues Gold Mine, Majors Creek, NSW. The assessment was completed to quantify site noise emissions against relevant noise criteria pertaining to mine operations during Quarter 2, 2023.

Attended monitoring on Wednesday 24 May 2023 has identified that operational noise emissions generated by the mine comply with relevant $L_{Aeq(15min)}$ and L_{Amax} noise limits at all assessed receivers.

This page has been intentionally left blank

Appendix A – Glossary of Terms

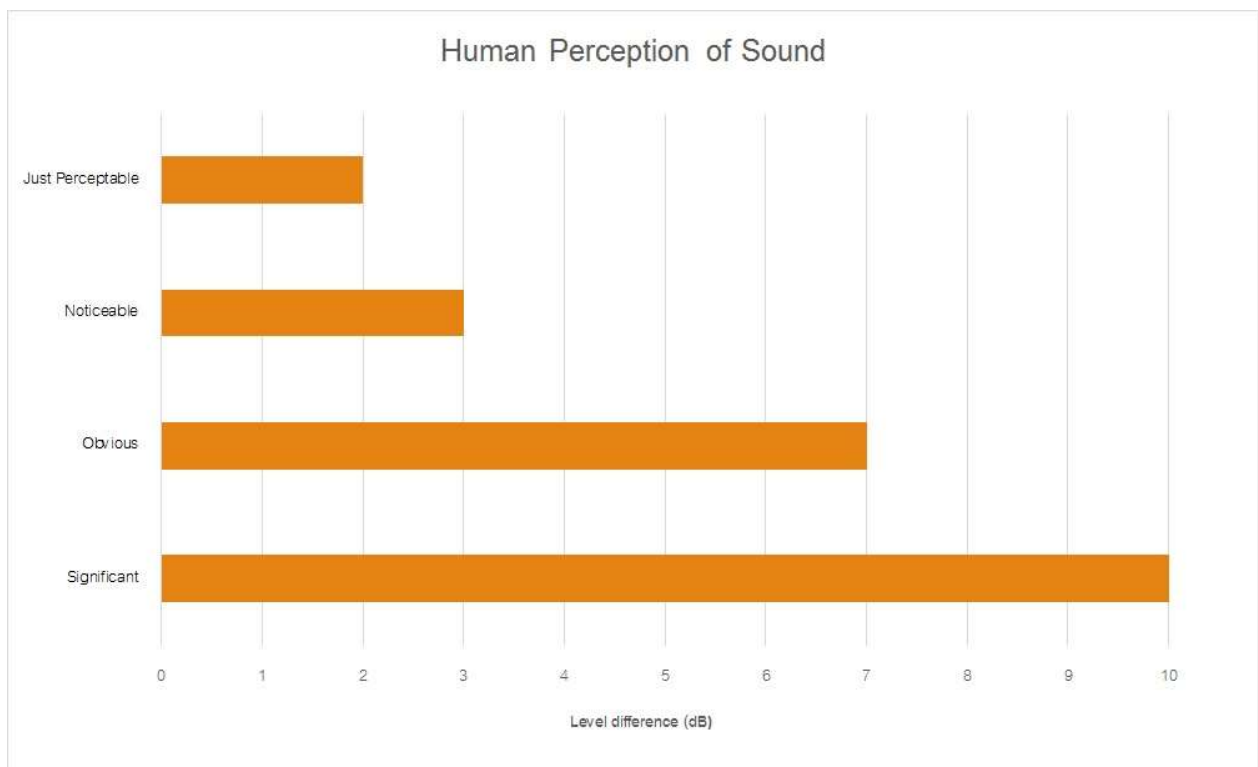
Table A1 provides a number of technical terms have been used in this report.

Table A1 Glossary of Terms	
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured LA90 statistical noise levels.
Adverse Weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient Noise	The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dBA	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dB(Z), dB(L)	Decibels Linear or decibels Z-weighted.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
LA90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
LAeq	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
LAm _{ax}	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (LW)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : $= 10 \cdot \log_{10} (W/W_0)$ Where : W is the sound power in watts and W ₀ is the sound reference power at 10-12 watts.

Table A2 provides a list of common noise sources and their typical sound level.

Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA	
Source	Typical Sound Level
Threshold of pain	140
Jet engine	130
Hydraulic hammer	120
Chainsaw	110
Industrial workshop	100
Lawn-mower (operator position)	90
Heavy traffic (footpath)	80
Elevated speech	70
Typical conversation	60
Ambient suburban environment	40
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound



Muller Acoustic Consulting Pty Ltd

PO Box 678, Kotara NSW 2289

ABN: 36 602 225 132

Ph: +61 2 4920 1833

www.mulleracoustic.com

