Monthly Noise Monitoring Assessment

Tomingley Gold Mine, January 2019

Prepared for: Tomingley Gold Operations Pty Limited
January 2019
MAC160270RP29

Muller Acoustic Consulting

Document Information

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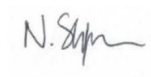
MAC160270RP29	Final	25 January 2019	Nicholas Shipman		Oliver Muller	

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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by Tomingley Gold Operations Pty Ltd (TGO) to complete a Noise Monitoring Assessment (NMA) for Tomingley Gold Mine ('the mine'), Tomingley, NSW.

The NMA involved quantifying the noise contribution of the mine by direct attended measurements to determine mining noise emissions so that effective management and controls can be implemented where required. The monitoring has been conducted in accordance with the TGO Noise Management Plan and in general accordance with Conditions L4.2 to L4.7 of the EPL at six representative receiver locations. It is noted that this assessment has been completed as part of an internal noise management initiative and does not form part of the annual noise monitoring program to address conditions of the Environmental Protection License (EPL).

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

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI) 2017;
- Environment Protection Licence EPL 20169 (EPL); 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**.

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2 Environmental Protection License Noise Limits

Historic assessments for the mine categorise receivers into Noise Assessment Groups (NAGs). The NAGs were derived based on ambient noise data that controlled receiver RBLs.

Table 1 reproduces the operational and sleep disturbance noise limits for assessed receivers referenced from the EPL that have been adopted for this NMA and are consistent with historic EPL monitoring locations.

Table 1 Noise Limits, dBA

Noise Assessment Group	Receivers	Day	Evening	Night	
		$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{A1(1min)}$
NAG A	R6, R4	36	36	36	45
	R5	37	37	37	45
NAG B	R2	36	36	36	45
NAG C	R3	49	40	40	45
	R29	48	40	40	45
NAG D	R23	43	39	39	46

Note: Refer to figure in Appendix 4 of Project Approval 09-0155 for noise locations. However, these criteria do not apply if the Proponent has an agreement with the relevant owner(s) of these residences / land to generate higher noise levels, and the Proponent has advised the Department of Planning and Infrastructure and EPA in writing of the terms of this agreement.

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3 Methodology

3.1 Locality

TGO is located to the south of the village of Tomingley, NSW. Receivers in the locality surrounding the mine are primarily rural/residential and for consistency the naming conventions for each receiver have been retained from historic noise assessments. The monitoring locations with respect to the mine are presented in the locality plan shown in **Figure 1.**

3.2 Assessment Methodology

The attended noise survey was conducted in general accordance with the procedures described in Australian Standard AS 1055:2018, "Acoustics - Description and Measurement of Environmental Noise" and the EPL. Measurements were carried out using Svantek Type 1, 977 noise analyser from Thursday 3 January 2019 to Saturday 5 January 2019. The acoustic instrumentation used carries current NATA calibration and complies with AS IEC 61672.1-2004-Electroacoustics - Sound level meters - Specifications. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed ±0.5dBA.

Both evening and night measurements were of 15 minutes duration. Where possible, throughout each survey the operator quantified the contribution of each significant noise source. Extraneous noise sources were excluded from the analysis to calculate the $LA_{eq(15min)}$ mine noise contribution for comparison against the relevant EPL limit.

Prevailing meteorological conditions for the monitoring period were sourced from TGO's meteorological station and analysed in accordance with Appendix E4 of the NPI to determine the stability category present at the time of each measured sample. This was undertaken to determine applicability of results in accordance with Condition L4.3 of the EPL. Results obtained during non-prevailing meteorological conditions (ie F Class Stability in conjunction with a 2m/s drainage 7 or a G Class Stability) are considered not applicable against the EPL criteria.

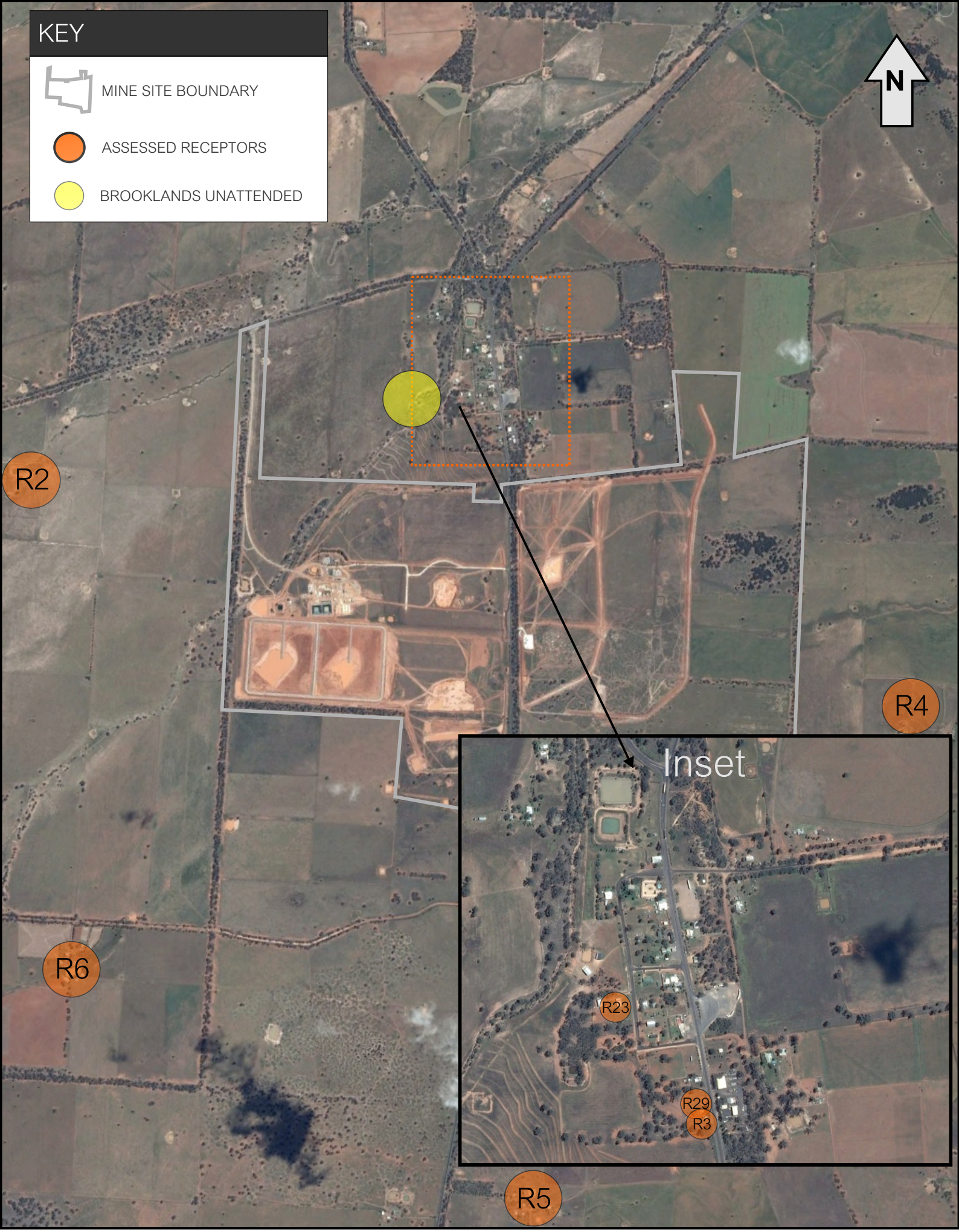

FIGURE 1 - LOCALITY PLAN AND ASSESSMENT LOCATIONS

TOMINGLEY GOLD MINE EPL NOISE MONITORING

REF: MAC160270

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4 Results

The monitoring and assessment results are presented in individual tables for each assessment location.

4.1 Assessment Results - Location R2

The results of the attended noise measurements at location R2 for Thursday 3 January 2019 to Saturday 5 January 2019 are summarised in **Table 2** with the relevant EPL limits, the calculated mining noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 2 Operator-Attended Noise Survey Results – Location R2

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}			
03/01/19	20:18	69	47	33	36	WD: NW WS: 1m/s Stab Class: D	Dog bark 36-38 Birds 40-42 TGO hum 33 Traffic 41-68
TGO Site $L_{Aeq(15min)}$ Contribution							33
03/01/19	22:48	55	42	35	36	WD: NW WS: 1m/s Stab Class: D	Insects 36-38 Wind 38-42
TGO Site $L_{Aeq(15min)}$ Contribution							TGO Inaudible
04/01/19	20:03	77	46	26	36	WD: NW WS: 2m/s Stab Class: E	Birds 28-40 Traffic 34-40
TGO Site $L_{Aeq(15min)}$ Contribution							TGO Inaudible
04/01/19	22:25	68	45	40	36	WD: NW WS: 2.5m/s Stab Class: D	Wind 40-52
TGO Site $L_{Aeq(15min)}$ Contribution							TGO Inaudible
Evening measurements on 05/01/19 were unable to be obtained due to unsuitable meteorology conditions as per AS1055.							
05/01/19	22:04	45	33	30	36	WD: NW WS: 1m/s Stab Class: D	Insects 32-40 TGO crushing plant 32-35
TGO Site $L_{Aeq(15min)}$ Contribution							34

Note 1: Meteorological data obtained from TGO's on-site weather station or by direct measurement by the operator.

4.2 Assessment Results - Location R3/R29

The results of the attended noise measurements at location R3/R29 Thursday 3 January 2019 to Saturday 5 January 2019 are summarised in **Table 3** with the relevant EPL limits, the calculated mining noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 3 Operator-Attended Noise Survey Results – Location R3/R29

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}			
03/01/19	20:59	83	63	37	40	WD: NW WS: 1m/s Stab Class: E	Traffic 36-80 Insects 32-36
		TGO Site $L_{Aeq(15min)}$ Contribution					TGO Inaudible
03/01/19	23:27	76	55	37	40	WD: NW WS: 1m/s Stab Class: D	Traffic 55-70 Idling traffic 38-40
		TGO Site $L_{Aeq(15min)}$ Contribution					TGO Inaudible
04/01/19	20:41	80	58	37	40	WD: NW WS: 1m/s Stab Class: E	Traffic 37-80 Idling traffic 39-50
		TGO Site $L_{Aeq(15min)}$ Contribution					TGO Inaudible
04/01/19	23:02	86	64	35	40	WD: NE WS: 1m/s Stab Class: D	Idling traffic 33-36 Wind 38-40 Insects 35-36 Traffic 35-80
		TGO Site $L_{Aeq(15min)}$ Contribution					TGO Inaudible
Evening measurements on 05/01/19 were unable to be obtained due to unsuitable meteorology conditions as per AS1055.							
05/01/19	22:43	82	63	32	40	WD: NW WS: 1m/s Stab Class: D	Traffic 35-80 Insects 30-35
		TGO Site $L_{Aeq(15min)}$ Contribution					TGO Inaudible

Note 1: Meteorological data obtained from TGO's on-site weather station or by direct measurement by the operator.

4.3 Assessment Results - Location R4

The results of the attended noise measurements at location R4 for Thursday 3 January 2019 to Saturday 5 January 2019 are summarised in **Table 4** with the relevant EPL limits, the calculated mining noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 4 Operator-Attended Noise Survey Results – Location R4

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}			
03/01/19	21:29	69	53	42	36	WD: SE WS: 2.5m/s Stab Class: D	Wind 40-60 Insects 36-38
		TGO Site $L_{Aeq(15min)}$ Contribution					TGO Inaudible
03/01/19	23:52	64	45	38	36	WD: NE WS: 2.5m/s Stab Class: D	Insects 40-48 Wind 40-48
		TGO Site $L_{Aeq(15min)}$ Contribution					TGO Inaudible
04/01/19	21:05	57	33	28	36	WD: W WS: 1m/s Stab Class: E	Insects 30-36 TGO exhaust 31-33
		TGO Site $L_{Aeq(15min)}$ Contribution					32
04/01/19	23:26	55	37	32	36	WD: NW WS: 1m/s Stab Class: D	Insects 32-37 TGO hum <33
		TGO Site $L_{Aeq(15min)}$ Contribution					<33
Evening measurements on 05/01/19 were unable to be obtained due to unsuitable meteorology conditions as per AS1055.							
05/01/19	23:27	61	35	32	36	WD: SE WS: 1m/s Stab Class: D	Traffic 32-36 Insects <33 TGO hum <30 Wind 33-35
		TGO Site $L_{Aeq(15min)}$ Contribution					<30

Note 1: Meteorological data obtained from TGO's on-site weather station or by direct measurement by the operator.

4.4 Assessment Results - Location R5

The results of the attended noise measurements at location R5 for Thursday 3 January 2019 to Saturday 5 January 2019 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 R5

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}			
03/01/19	21:53	81	56	44	37	WD: NE WS: 1m/s Stab Class: D	Traffic 55-65 Wind 42-47
		TGO Site $L_{Aeq(15min)}$ Contribution					TGO Inaudible
04/01/19	00:14	79	54	34	37	WD: NNE WS: 2m/s Stab Class: D	Wind 32-39 Traffic 55-79 TGO hum <32
		TGO Site $L_{Aeq(15min)}$ Contribution					<32
04/01/19	21:28	82	63	36	37	WD: NW WS: 1m/s Stab Class: E	Traffic 40-80 Insects 35-42
		TGO Site $L_{Aeq(15min)}$ Contribution					TGO Inaudible
04/01/19	23:49	78	60	31	37	WD: NW WS: 1m/s Stab Class: D	Traffic 38-78 Insects <36
		TGO Site $L_{Aeq(15min)}$ Contribution					TGO Inaudible
Evening measurements on 05/01/19 were unable to be obtained due to unsuitable meteorology conditions as per AS1055.							
05/01/19	23:45	85	65	34	37	WD: SE WS: 1m/s Stab Class: D	Traffic 38-80 Insects 35-36
		TGO Site $L_{Aeq(15min)}$ Contribution					TGO Inaudible

Note 1: Meteorological data obtained from TGO's on-site weather station or by direct measurement by the operator.

4.5 Assessment Results - Location R6

The results of the attended noise measurements at location R6 for Thursday 3 January 2019 to Saturday 5 January 2019 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 R6

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}			
03/01/19	19:51	64	42	34	36	WD: SW WS: 1m/s Stab Class: D	Insects 42-53 Birds 36-50 TGO hum 32-34 TGO track slaps 32-34
		TGO Site $L_{Aeq(15min)}$ Contribution					33
03/01/19	22:16	61	51	45	36	WD: SW WS: 2.5m/s Stab Class: D	Wind 40-45
		TGO Site $L_{Aeq(15min)}$ Contribution					TGO Inaudible
04/01/19	19:38	52	39	36	36	WD: SW WS: 1m/s Stab Class: D	Wind 34-36 Traffic 40-42 Livestock 33-35 Birds 36-40
		TGO Site $L_{Aeq(15min)}$ Contribution					TGO Inaudible
04/01/19	22:00	49	42	37	36	WD: NW WS: 1m/s Stab Class: E	Insects 33-37 Wind 33-35 TGO hum <33 Wind 42-48
		TGO Site $L_{Aeq(15min)}$ Contribution					<33
05/01/19	21:36	53	38	35	36	WD: NW WS: 1m/s Stab Class: D	TGO hum 33-35 Traffic 35-36 Wind in trees 36-40
		TGO Site $L_{Aeq(15min)}$ Contribution					34
05/01/19	23:05	43	33	27	36	WD: NW WS: 1m/s Stab Class: D	TGO crushing plant 28-32 Insects <33
		TGO Site $L_{Aeq(15min)}$ Contribution					30

Note 1: Meteorological data obtained from TGO's on-site weather station or by direct measurement by the operator.

4.6 Assessment Results - Location R23

The results of the attended noise measurements at location R23 for Thursday 3 January 2019 to Saturday 5 January 2019 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 R23

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}			
03/01/19	20:41	66	44	34	39	WD: NW WS: 1m/s Stab Class: E	Insects 32-35 Traffic 36-52 Birds 38-40
		TGO Site $L_{Aeq(15min)}$ Contribution					TGO Inaudible
03/01/19	23:10	67	44	38	39	WD: NW WS: 1m/s Stab Class: D	Wind 34-38 Traffic 40-42
		TGO Site $L_{Aeq(15min)}$ Contribution					TGO Inaudible
04/01/19	20:24	74	50	37	39	WD: NW WS: 1m/s Stab Class: E	Traffic 42-47 Birds 40-43
		TGO Site $L_{Aeq(15min)}$ Contribution					TGO Inaudible
04/01/19	22:45	64	42	37	39	WD: NW WS: 2.5m/s Stab Class: D	Dog bark 33-35 Wind 38-40 Traffic 40-45 Local residential noise 34-36
		TGO Site $L_{Aeq(15min)}$ Contribution					TGO Inaudible
Evening measurements on 05/01/19 were unable to be obtained due to unsuitable meteorology conditions as per AS1055.							
05/01/19	22:26	49	37	32	39	WD: NW WS: 1m/s Stab Class: D	Insects 36-38 Traffic 35-48 Dog bark <35
		TGO Site $L_{Aeq(15min)}$ Contribution					TGO Inaudible

Note 1: Meteorological data obtained from TGO's on-site weather station or by direct measurement by the operator.

5 Discussion

5.1 Discussion of Results - Location R2

Monitoring between Thursday 3 January 2019 to Saturday 5 January 2019 identified that TGO was audible during two of five measurements, with mining contributions measured at 33dBA and 34dBA during the evening period on 3 January 2019 and the night period on 5 January 2019. Therefore, the relevant noise limit of 36dBA $LA_{eq(15min)}$ was satisfied during this monitoring period. Extraneous sources such as dog bark, birds, traffic, insects and wind were audible during the survey periods. It is noted that due to unsuitable meteorology conditions (thunderstorm), the operator was unable to obtain the evening measurement for 05/01/19.

5.2 Discussion of Results - Location R3/R29

Monitoring results for R3/R29 were dominated by highway traffic that was constant for all five measurements conducted for the January 2019 survey. TGO mine noise was inaudible on all five occasions, which satisfied the noise limit of 40dBA $LA_{eq(15min)}$. Highway traffic, insects, idling highway traffic and wind were audible during the measurements at R3/R29. It is noted that due to unsuitable meteorology conditions (thunderstorm), the operator was unable to obtain the evening measurement for 05/01/19.

5.3 Discussion of Results - Location R4

TGO mine noise was audible during three of five measurements conducted from Thursday 3 January 2019 to Saturday 5 January 2019 at R4. TGO emissions ranged from <30dBA to 32dBA, therefore the relevant noise limit of 36dBA $LA_{eq(15min)}$ was satisfied during the January 2019 period. Distant traffic, insects and wind were audible during the measurements at R4. It is noted that due to unsuitable meteorology conditions (thunderstorm), the operator was unable to obtain the evening measurement for 05/01/19.

5.4 Discussion of Results - Location R5

TGO mine noise was audible during one of five attended noise measurements at R5 for the January 2019 period. TGO emissions were measured at <32dBA therefore, relevant noise limits of 37dBA $LA_{eq(15min)}$ were satisfied. Highway traffic was the dominant source at this receiver with the other non-mining sources including insects and wind. It is noted that due to unsuitable meteorology conditions (thunderstorm), the operator was unable to obtain the evening measurement for 05/01/19.

5.5 Discussion of Results - Location R6

TGO mine noise was audible during four of six occasions throughout the January 2019 monitoring period at R6. TGO mine contribution was measured between 30dBA and 34dBA, therefore satisfying the relevant EPL noise limit of 36dBA $LA_{eq(15min)}$. Non-mining sources included insects, birds, wind in trees and livestock during the attended surveys.

5.6 Discussion of Results - Location R23

TGO mine noise was inaudible during all five occasions at R23 during the January 2019 period and therefore remained in compliance with the relevant EPL criteria of 39dBA $LA_{eq(15min)}$. Audible sources included dog bark, highway traffic, insects, birds, local residential noise and wind. It is noted that due to unsuitable meteorology conditions (thunderstorm), the operator was unable to obtain the evening measurement for 05/01/19.

6 Comparison of Attended and Unattended Monitoring Results

To address Condition 6 of Schedule 3 of the Project Approval, a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results has been completed.

The validation compares monthly attended monitoring results against the closest assessed unattended monitoring location. Currently, TGO has one unattended real-time monitoring terminal installed at the Brooklands property (nearest to R23). Figure 1 identifies the location of the monitor with respect to the attended monitoring locations. It is noted that the Brooklands unattended monitor is situated 600m west of the attended noise monitoring location R23, therefore, background (L_{A90}) noise levels are significantly lower due to offset distance to highway traffic.

A comparison of mine noise contributions between attended and unattended noise monitoring demonstrates a general consistency between attended and unattended results. It was noted that highway traffic noise influenced measured noise levels for this assessment. Furthermore, for January 2019, results remained below the relevant criteria for both attended and unattended locations.

Table 8 provides a summary comparison of results between the attended and unattended noise surveys for R23.

Table 8 Comparison of Attended and Unattended Results – R23

Assessment Type	Time (hrs)	Descriptor (dBA re 20 µPa) LAmax	LAeq	LA90	Criteria	Mine Noise Contribution	Meteorology[1]	Description and SPL, dBA
Thursday 3 January 2019								
Attended	20:41	66	44	34	39	TGO Inaudible	WD: NW WS: 1m/s Stab Class: E	Insects 32-35 Traffic 36-52 Birds 38-40
Unattended	20:45	55	40	31	39	TGO Inaudible		Birds Traffic Livestock
Attended	23:10	67	44	38	39	TGO Inaudible	WD: NW WS: 1m/s Stab Class: D	Wind 34-38 Traffic 40-42
Unattended	23:15	89	61	41	39	TGO Inaudible		Traffic Wind
Friday 4 January 2019								
Attended	20:24	74	50	37	39	TGO Inaudible	WD: NW WS: 1m/s Stab Class: E	Traffic 42-47 Birds 40-43
Unattended	20:30	49	35	27	39	TGO Inaudible		Birds Traffic
Attended	22:45	64	42	37	39	TGO Inaudible	WD: NW WS: 2.5m/s Stab Class: D	Dog bark 33-35 Wind 38-40 Traffic 40-45 Local residential noise 34-36
Unattended	22:45	75	45	30	39	TGO Inaudible		Insects Traffic
Saturday 5 January 2019								
Evening measurements on 05/01/19 were unable to be obtained due to unsuitable meteorology conditions as per AS1055.								
Attended	22:26	49	37	32	39	TGO Inaudible	WD: NW WS: 1m/s Stab Class: D	Insects 36-38 Traffic 35-48 Dog bark <35
Unattended	22:30	54	41	31	39	TGO Inaudible		Birds Insects Traffic

Note 1: Meteorological data obtained from TGO's on-site weather station or by direct measurement by the operator.

7 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment on behalf of Tomingley Gold Operations (TGO). The assessment was completed to provide monthly monitoring data so that TGO can actively quantify and manage site noise emissions.

Attended monitoring conducted from Thursday 3 January 2019 to Saturday 5 January 2019, identified that TGO mine noise was audible on several occasions, although did not exceed relevant limits during the January 2019 assessment period.

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Appendix A - Glossary of Terms

Several technical terms have been used in this report and are explained in **Table A1**.

Table A1 Glossary of Terms

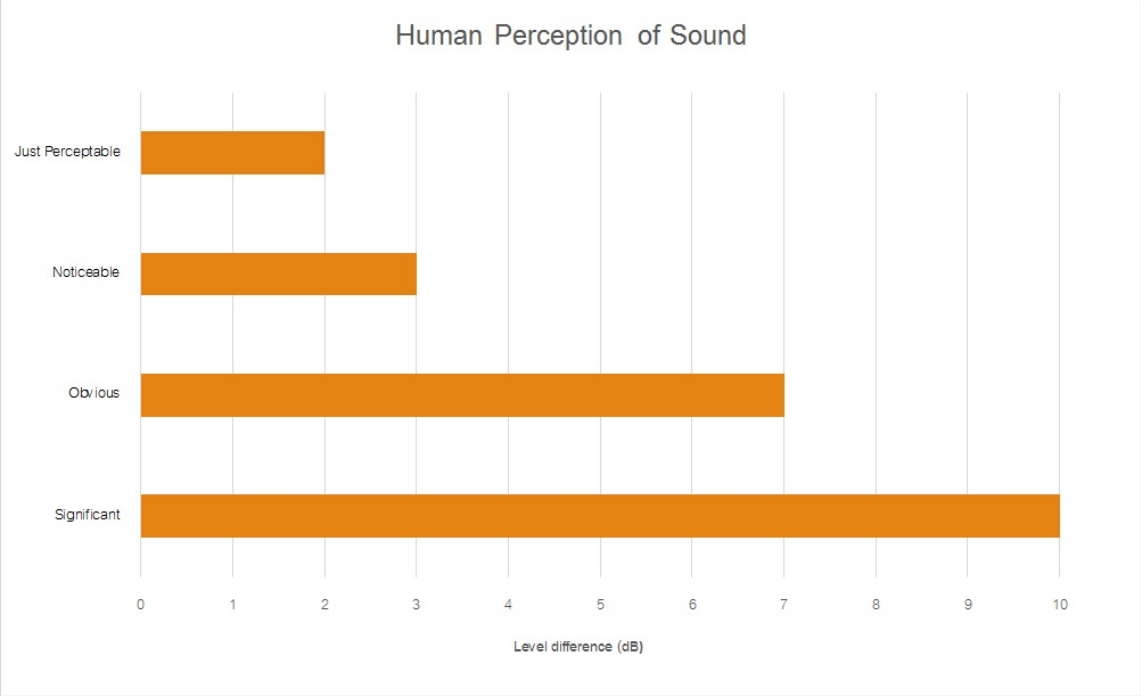
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured L90 statistical noise levels.
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)	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.
LAmax	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 (SWL)	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.log10 (W/Wo) Where : W is the sound power in watts and Wo 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



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