Noise Monitoring Assessment

Tomingley Gold Mine, Tomingley, NSW.

Prepared for: Tomingley Gold Operations Pty Limited

December 2017

Muller Acoustic Consulting

Document Information

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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'). The NMA has been completed to address Condition M4.1 their Environment Protection License 20169 ('the EPL') from NSW Environment Protection Authority (EPA) and Condition 6 of Schedule 3 of the Project Approval (PA) number 09_0155 issued by the Department of Planning and Environment (DPE).

The monitoring assessment involves quantifying the noise contribution of the mine by direct attended measurements as per the EPL at the nearest affected receivers.

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);
- Project Approval 09_0155 (PA); and
- Standards Australia AS 1055.1:1997 - 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 and Project Approval Noise Limits

2.1 Environmental Protection License (EPL)

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

Table 1 reproduces the noise limits for assessed receivers referenced from the EPL, adopted for this NMA and are consistent with historic EPL monitoring locations.

Table 1 Noise Limits, dBA

Noise Assessment Group	Receivers	Day	Evening	Night	
		$L_{Aeq(15\text{-}min)}$	$L_{Aeq(15\text{-}min)}$	$L_{Aeq(15\text{-}min)}$	$L_{A1(1\text{-}min)}$
NAG A	R1, R6	36	36	36	45
	R5	37	37	37	45
	R4	36	36	36	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.

Conditions L4.3 to L4.8 of the EPL set out the conditions under which the noise limits apply and are reproduced below.

L4.3 For the purpose of condition L3.1:

- 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 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and Public Holidays.

L4.4 The noise limits set out in condition L3.1 apply under all meteorological conditions except for the following:

- Wind speeds greater than 3m/second at 10 metres above ground level;
- Stability category F temperature inversion conditions and wind speeds greater than 2m/second at 10 metres above ground level; or

- Stability category G temperature inversion conditions.

L4.5 For the purposes of condition L3.3:

- Data recorded by a meteorological station installed on site must be used to determine meteorological conditions; and
- Temperature inversion conditions (stability category) are to be determined by the sigma-theta method referred to in Part D1.4 of Appendix D of the NSW Industrial Noise Policy (INP).

L4.6 To determine compliance:

a) with the $LA_{eq(15min)}$ noise limits in condition L3.1, the noise measurement equipment must be located:

- approximately on the property boundary, where any dwelling is situated 30 metres or less from the property boundary closest to the premises; or
- within 30 metres of a dwelling façade, but not closer than 3 metres, where any dwelling on the property is situated more than 30 metres from the property boundary closest to the premises; or, where applicable within approximately 50 metres of the boundary of a National Park or a Nature Reserve.

b) with the $LA_{1(1\ minute)}$ noise limits in condition L3.1:

- the noise measurement equipment must be located within 1 metre of a dwelling façade.

c) with the noise limits in condition L3.1 the noise measurement equipment must be located:

- at the most affected point at a location where there is no dwelling at the location; or
- at the most affected point within an area at a location prescribed by conditions L3.5(a) or L3.5(b).

L4.7 A non-compliance of condition L3.1 will still occur where noise generated from the premises in excess of the appropriate limit is measured:

- at a location other than an area prescribed by conditions L3.5(a) and L3.5(b); and/or
- at a point other than the most affected point at a location.

L4.8 For the purposes of determining the noise generated at the premises the modification factors in Appendix C of the NSW Industrial Noise Policy (INP) must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

Condition M4.1 of the EPL identifies that to assess compliance with Condition L3.1, attended noise monitoring must be undertaken in accordance with Conditions L3.5 and:

a) At each one of the locations listed in Condition L3.1;

b) Occur annually in a reporting period;

c) Occur during each day, evening and night period as defined in the NSW Industrial Noise Policy for a minimum of:

- 1.5 hours during the day;
- 30 minutes during the evening; and
- 1 hour during the night.

d) Occur for three consecutive days.

2.2 Project Approval 09_0155

Condition 6 of Schedule 3 of the Project Approval states:

(c) include a monitoring program that:

i. uses a combination of real-time and supplementary attended monitoring measures to evaluate the performance of the project;

ii. adequately supports the proactive and reactive noise management system on site;

iii. defines what constitutes a noise incident, and includes a protocol for identifying noise incidents and notifying the Department and relevant stakeholders of any such incident;

iv. evaluates and reports on the effectiveness of the noise management system on site;

v. includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real time monitoring program can be used as a better indicator of compliance with the noise criteria in this approval and a trigger for further attended monitoring); and

(d) include a noise reduction strategy for progressively reducing mine noise during open cut mining operations, consistent with the noise scenarios described in the document 'Tomingley Gold Mine Environmental Assessment – Project Approval No. 09_0155 Modification 3' dated November 2015.

A comparison on attended versus unattended data has been completed as part of this assessment with results presented in Section 6.

3 Methodology

3.1 Locality

The mine 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 convention for each receiver has 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 surveys were conducted in general accordance with the procedures described in Australian Standard AS 1055-1997, "Acoustics - Description and Measurement of Environmental Noise" and the EPL. The measurements were carried out simultaneously by two MAC staff members at separate locations using Svantek Type 1, 971 noise analysers from Tuesday 14 November 2017 to Thursday 16 November 2017. 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.

Evening measurements consisted of two 15 minutes (ie 30 minutes) in duration and night measurements were four 15 minutes (ie 1 hour) in duration at each location over three consecutive dates. Where possible, throughout each survey the operator quantified the contribution of each significant noise source and included a review of octave data to quantify low frequency or tonal contributions. Where possible, extraneous noise sources were excluded from the analysis as to calculate the $LA_{eq(15\text{-}min)}$ mine noise contribution for comparison against the relevant EPL limit. It is noted that due to adverse weather conditions several measurements were unable to be captured.

Prevailing meteorological conditions for the monitoring period were sourced from TGO's meteorological station and handheld weather meters and therefore analysed in accordance with Appendix D 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 L4.4 of the EPL. Results obtained during non-prevailing meteorological conditions (ie F Class in conjunction with a 2m/s drainage wind or a G class inversion) are considered not applicable against the EPL criteria.

Furthermore, a 2dB field tolerance as per Table 4.1 of the NPI is also applicable to reported levels and has been applied in this NMA report.

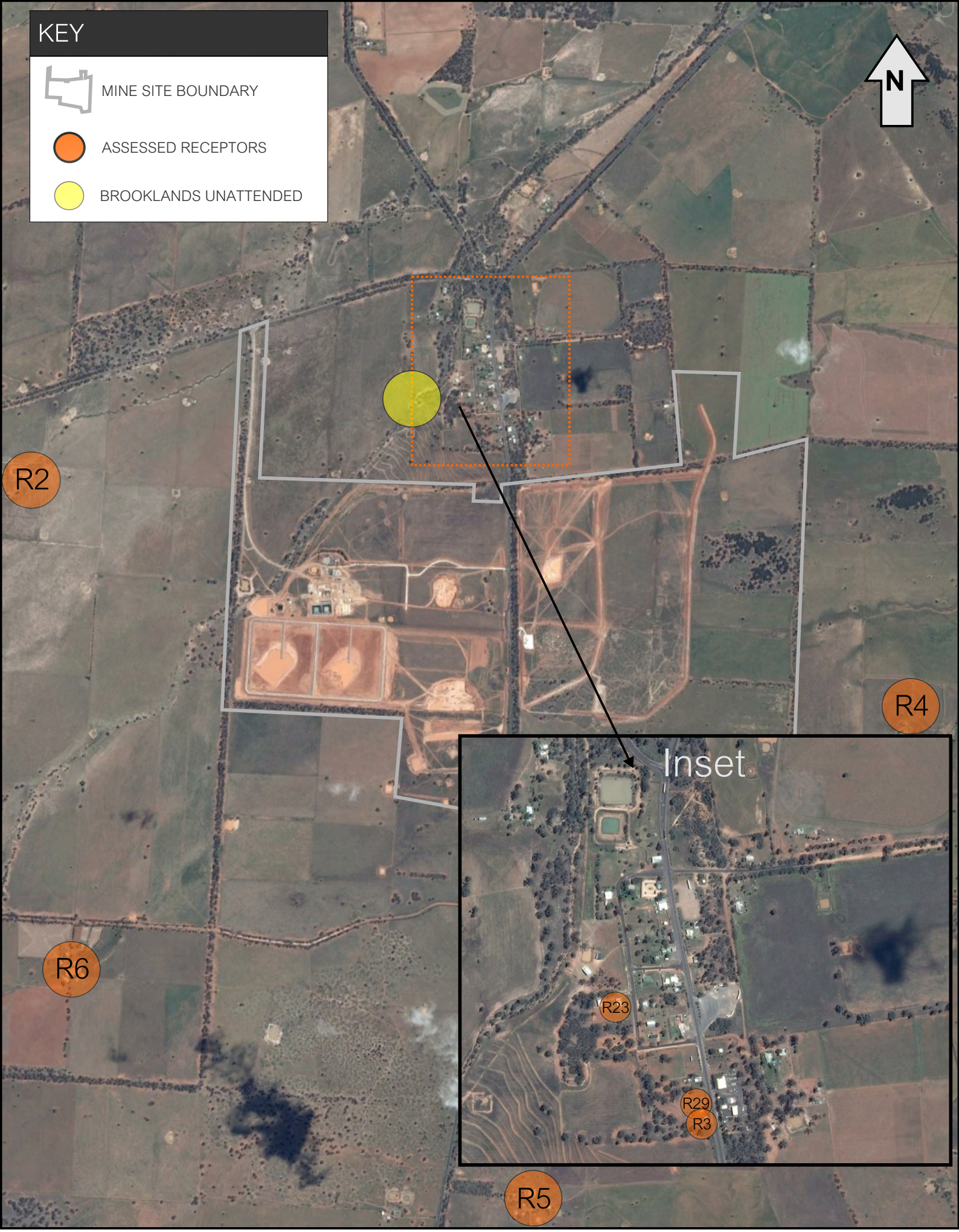

FIGURE 1 - LOCALITY PLAN AND ASSESSMENT LOCATIONS

TOMINGLEY GOLD MINE EPL NOISE MONITORING

REF: MAC160243

0 1000m

MAC
Muller Acoustic Consulting

4 Results

4.1 Location R2 – Assessment Results

The monitoring and assessment results are presented in individual tables for each day of consecutive monitoring. The results of the attended noise measurements at location R2 for 14 November 2017 to 16 November 2017 are summarised in **Table 2** along with prevailing meteorological conditions at the time of each survey, relevant EPL limits and the mining noise contribution. It is noted that the last attended measurement (22:06) on 16/11/2017 was influenced by wind and rain, however a 15-minute sample was completed without any influence from adverse weather conditions.

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}			
14/11/17	19:57	59	41	35	36	Dir W 0.2 m/s Stab Class: E	Birds 40-42 Local residential noise 39-58 Crushing plant <35
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							<33
14/11/17	22:33	59	40	29	36	Dir W 0.2 m/s Stab Class: F	General mine noise <32 Wind in trees 37-50
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							<30
15/11/17	19:52	61	38	34	36	Dir NE 0.5 m/s Stab Class: D	Insects 30-33 Birds 41-43 Wind in trees 33-39
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							TGO Inaudible
15/11/17	22:08	67	45	30	36	Dir N 0.1 m/s Stab Class: D	Distant traffic 27-34 Local traffic 36-64 Wind in trees 36-40
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							TGO Inaudible
16/11/17	19:44	68	50	43	36	Dir NE 2 m/s Stab Class: D	Birds 47-48 Wind in trees 36-42
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							TGO Inaudible
16/11/17	22:06	72	48	39	36	Dir N 4 m/s Stab Class: D	Wind in trees 38-54 Thunder 39-40
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							TGO Inaudible

Note 1: Meteorological data obtained from TGO's on-site weather station.

4.2 Location R3/29 – Assessment Results

The results of the attended noise measurements at location R3/R29 for 14 November 2017 to 16 November 2017 are summarised in **Table 3** along with prevailing meteorological conditions at the time of each survey, relevant EPL limits and the mining noise contribution. It is noted that both locations R3 and R29 are within 10m of each other and therefore have been assessed simultaneously It is noted that the attended measurements (00:31) on 16/11/2017 and (22:45) on 16/11/2017 were influenced by wind and rain, however either as a minimum 15-minute or 30-minute samples were completed without any influence from adverse weather conditions.

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}			
14/11/17	21:16	90	66	33	40	Dir W 0.1 m/s Stab Class: D	Distant traffic 32-36 Livestock 32-51 Birds 56-58 Dog bark 44-46 Highway traffic 34-89
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							TGO Inaudible
15/11/17	00:46	89	61	40	40	Dir NE 4 m/s Stab Class: D	Wind in trees 40-44 Highway traffic 39-83
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							TGO Inaudible
15/11/17	21:09	88	67	37	40	Dir NE 1 m/s Stab Class: E	Highway traffic 69-84
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							TGO Inaudible
16/11/17	00:31	86	64	30	40	Dir N 0.1 m/s Stab Class: E	Highway traffic 26-84 Wind in trees 26-31
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							TGO Inaudible
16/11/17	20:20	91	65	41	40	Dir NE 1 m/s Stab Class: D	Highway traffic 24-89
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							TGO Inaudible
16/11/17	22:45	86	66	45	40	Dir N 3 m/s Stab Class: D	Highway traffic 43-82 Thunder 49-51 Wind in trees 43-51
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							TGO Inaudible

Note 1: Meteorological data obtained from TGO's on-site weather station.

4.3 Location R4 – Assessment Results

The results of the attended noise measurements at location R4 for 14 November 2017 to 16 November 2017 are summarised in **Table 4** along with prevailing meteorological conditions at the time of each survey, relevant EPL limits and the mining noise contribution. It is noted that the attended measurement (00:02) on 16/11/2017was influenced by wind and rain, however a 30-minute sample was completed without any influence from adverse weather conditions, while night measurements on 16 November 2017 were unable to be obtained due to adverse meteorological conditions.

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}			
14/11/17	20:30	63	31	25	36	Dir W 0.1 m/s Stab Class: D	General mine noise <30 Insects 31-32 Distant traffic 24-28
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							<28
14/11/17	23:39	72	54	46	36	Dir W 2.5 m/s Stab Class: D	Wind in trees 39-64
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							TGO Inaudible
15/11/17	20:42	59	37	31	36	Dir N 1.5 m/s Stab Class: D	Wind in trees 41-56 Distant traffic <35
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							TGO Inaudible
16/11/17	00:02	62	31	24	36	Dir N 3.5 m/s Stab Class: D	Light rain 23-24 Wind in trees 44-56
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							TGO Inaudible
16/11/17	20:30	68	48	42	36	Dir N 3 m/s Stab Class: D	Wind in trees 36-54
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							TGO Inaudible
Night measurements on 16/11/17 at R4 were unable to be obtained due to unsuitable meteorological conditions as per AS1055							

Note 1: Meteorological data obtained from TGO's on-site weather station.

4.4 Location R5 – Assessment Results

The results of the attended noise measurements at location R5 for 14 November 2017 to 16 November 2017 are summarised in **Table 5** along with prevailing meteorological conditions at the time of each survey, relevant EPL limits and the mining noise contribution. It is noted that the attended measurement (00:43) on 16/11/2017 was influenced by wind and rain, however a 30-minute sample was able to be completed without any influence from adverse weather conditions, while night measurements on 16 November 2017 were unable to be obtained due to adverse meteorological conditions.

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}			
14/11/17	19:45	79	59	32	37	Dir W 0.1 m/s Stab Class: E	General mine hum 30-34 Highway traffic 72-60
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							30
15/11/17	00:50	94	62	47	37	Dir W 2.5 m/s Stab Class: D	Wind in trees 48-56 Highway traffic 48-84
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							TGO Inaudible
15/11/17	19:58	87	65	33	37	Dir NW 0.2 m/s Stab Class: D	Highway traffic 38-82 Local traffic 58-60 Livestock <34 Birds <38
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							TGO Inaudible
16/11/17	00:43	81	61	29	37	Dir NE 0.1 m/s Stab Class: D	Highway traffic 33-78 Insects 30-32 General mine noise <30
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							<28
16/11/17	19:50	87	66	46	37	Dir NE 2.5 m/s Stab Class: D	Wind in trees 38-42 Birds <42 Highway traffic 42-84 Local traffic 38-66
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							TGO Inaudible
Night measurements on 16/11/17 at R5 were unable to be obtained due to unsuitable meteorological conditions as per AS1055							

Note 1: Meteorological data obtained from TGO's on-site weather station.

4.5 Location R6 – Assessment Results

The results of the attended noise measurements at location R6 for 14 November 2017 to 16 November 2017 are summarised in **Table 6** along with prevailing meteorological conditions at the time of each survey, relevant EPL limits and the mining noise contribution. It is noted that the last attended measurement (22:05) on 16/11/2017 was influenced by wind and rain, however a 15-minute sample was completed without any influence from adverse weather conditions.

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}			
14/11/17	21:25	60	33	30	36	Dir W 0.1 m/s Stab Class: E	Mine plant <31 Dozer 33-34 Haul truck 31-33 Distant traffic 32-34 Insects 32-34
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							<33
14/11/17	22:24	67	47	33	36	Dir W 2.5 m/s Stab Class: F	Haul trucks 30-34 General mine hum 31-33 Wind in trees 36-51 Highway traffic <47
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							33
15/11/17	21:24	64	37	30	36	Dir NE 0.1 m/s Stab Class: E	Insects <32 Distant traffic 32-38
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							TGO Inaudible
15/11/17	22:10	78	43	32	36	Dir NE 1 m/s Stab Class: E	Mine plant 33-34 Rock crusher 35-36 Wind and rain 36-48
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							33
16/11/17	21:10	66	54	50	36	Dir N 3 m/s Stab Class: D	Wind in trees 42-56 Distant highway traffic 46-52
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							TGO Inaudible
16/11/17	22:05	61	54	50	36	Dir NE 5 m/s Stab Class: D	Wind in trees 50-55
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							TGO Inaudible

Note 1: Meteorological data obtained from TGO's on-site weather station.

4.6 Location R23 – Assessment Results

The results of the attended noise measurements at location R23 for 14 November 2017 to 16 November 2017 are summarised in **Table 7** along with prevailing meteorological conditions at the time of each survey, relevant EPL limits and the mining noise contribution. It is noted that the attended measurements (23:53) on 15/11/2017 and (22:27) on 16/11/2017 were influenced by wind and rain, however either 15-minute or 30-minute samples were completed without any influence from adverse weather conditions.

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}			
14/11/17	20:40	82	51	37	39	Dir W 0.1 m/s Stab Class: D	Idling trucks 39-44 Highway traffic 39-78 Dog bark 43-57 Local residential noise 49-54
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							TGO Inaudible
14/11/17	23:39	70	46	36	39	Dir NE 3 m/s Stab Class: D	Wind in trees 35-42 Livestock 42-45 Highway traffic 37-59
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							TGO Inaudible
15/11/17	20:30	59	43	36	39	Dir NE 2 m/s Stab Class: D	Highway traffic 34-54 Insects 42-43
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							TGO Inaudible
15/11/17	23:53	58	42	30	39	Dir N 0.1 m/s Stab Class: D	Light rain <38 Highway traffic 38-48
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							TGO Inaudible
16/11/17	20:51	79	49	39	39	Dir NE 2.5 m/s Stab Class: D	Wind in trees 44-48
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							TGO Inaudible
16/11/17	22:27	66	45	41	39	Dir N 2.5 m/s Stab Class: D	Wind in trees 38-46 Highway traffic 38-50
Average TGO Site $L_{Aeq(15\text{-}min)}$ Contribution							TGO Inaudible

Note 1: Meteorological data obtained from TGO's on-site weather station.

5 Discussion

5.1 Discussion of Results – Location R2

Monitoring between Tuesday 14 November 2017 to Thursday 16 November 2017 identified that TGO mine noise was audible on two of six occasions, with TGO mine contributions ranging between <30dBA and <33dBA with both the crushing plant and general mine noise being audible. Therefore, the relevant noise limit of 36dBA $LA_{eq(15\text{-}min)}$ was satisfied during this monitoring period. Extraneous sources such as distant highway traffic, wind in trees, birds, insects, local residential noise, and thunder were audible during the survey. It is reaffirmed that the night measurement during 16 November 2017 was measured at a duration of 15-minutes due to unsuitable meteorological conditions.

5.2 Discussion of Results – Location R3/R29

Monitoring results for R3/R29 were dominated by highway traffic that was constant during November 2017 measurements. TGO mine noise was inaudible on all six occasions, therefore satisfying the relevant noise limit of 40dBA $LA_{eq(15\text{-}min)}$. Highway traffic, wind in trees, livestock, birds, dog bark and thunder were all audible during the measurements at R3/R29. It is reaffirmed that the night measurement during 15 November 2017 was measured at a duration of 30-minutes and the night measurement on 16 November 2017 was measured at a duration of 15-minutes due to unsuitable meteorological conditions.

5.3 Discussion of Results – Location R4

TGO mine noise was audible on one of five occasions during the November 2017 survey period, with the single contribution being general mine noise measured at <28dBA. The relevant noise limit of 36dBA $LA_{eq(15\text{-}min)}$ was not exceeded during the November 2017 period and therefore satisfies relevant criteria. Non-mining noise sources included highway traffic, insects, light rain and wind in trees. It is reaffirmed that the night measurement during 15 November 2017 were measured at a duration of 30-minutes, while measurements were unable to be obtained for the night period on 16 November 2017 due to unsuitable meteorological conditions.

5.4 Discussion of Results – Location R5

TGO mine noise was audible on two of five occasions throughout the November 2017 monitoring period at R6, with contributions ranging from <28dBA to 30dBA. TGO mine noise therefore satisfied the relevant EPL noise limit of 36dBA $LA_{eq(15\text{-}min)}$. Non-mining sources included highway traffic, insects, livestock, birds, local residential traffic and wind in trees. It is reaffirmed that the night measurement during 15 November 2017 were measured at a duration of 30-minutes, while measurements were unable to be obtained for the night period on 16 November 2017 due to unsuitable meteorological conditions.

5.5 Discussion of Results – Location R6

TGO mine noise was audible during three of six occasions throughout the November 2017 monitoring period at R6, with contributions ranging from <33dBA to 33dBA as haul trucks, dozers, crushing and general mine noise was audible. TGO mine noise therefore satisfied the relevant EPL noise limit of 36dBA $LA_{eq(15\text{-}min)}$. Non-mining sources included distant highway traffic, insects, rain and wind in trees. It is reaffirmed that the night measurement during 16 November 2017 was measured at a duration of 15-minutes due to unsuitable meteorological conditions.

5.6 Discussion of Results – Location R23

TGO mine noise was inaudible on all six occasions at this location and therefore remained in compliance with the relevant EPL criteria of 39dBA $LA_{eq(15\text{-}min)}$. Non-mining sources included idling trucks, highway traffic, dog bark, local residential noise, wind in trees, livestock, insects and light rain. It is reaffirmed that the night measurement during 15 November 2017 was measured at a duration of 30-minutes, while the night measurement during 16 November 2017 was measured at a duration of 15-minutes due to unsuitable meteorological conditions.

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 (LA90) 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 November 2017, results remained below the relevant criteria for both attended and unattended locations.

Table 8 provides a summary of comparisons or 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
Tuesday 14 November 2017								
Attended	20:40	82	51	37	39	TGO Inaudible	Dir W 0.1 m/s Stab Class: D	Idling trucks 39-44 Highway traffic 39-78 Dog bark 43-57 Local residential noise 49-54
Unattended	20:34	56	44	39	39	TGO Inaudible		Wind Insects Highway traffic
Attended	23:39	70	46	36	39	TGO Inaudible	Dir NE 3 m/s Stab Class: D	Wind in trees 35-42 Livestock 42-45 Highway traffic 37-59
Unattended	23:34	59	44	39	39	TGO Inaudible		Wind
Wednesday 15 November 2017								
Attended	20:30	59	43	36	39	TGO Inaudible	Dir NE 2 m/s Stab Class: D	Highway traffic 34-54 Insects 42-43
Unattended	20:34	51	36	26	39	TGO Inaudible		Wind Insects Highway traffic
Attended	23:53	58	42	30	39	TGO Inaudible	Dir N 0.1 m/s Stab Class: D	Light rain <38 Highway traffic 38-48
Unattended	23:49	54	41	28	39	TGO Inaudible		Insects Birds Highway traffic
Thursday 16 November 2017								
Attended	20:51	79	49	39	39	TGO Inaudible	Dir NE 2.5 m/s Stab Class: D	Wind in trees 44-48
Unattended	20:49	58	44	39	39	TGO Inaudible		Wind
Attended	22:27	66	45	41	39	TGO Inaudible	Dir N 2.5 m/s Stab Class: D	Wind in trees 38-46 Highway traffic 38-50
Unattended	22:34	59	41	33	39	TGO Inaudible		Wind

Note 1: Meteorological data obtained from TGO's on-site weather station.

7 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment on behalf of Tomingley Gold Operations. The assessment was completed to quantify site noise emissions in accordance with relevant Environment Protection License EPL20169 (EPL) conditions pertaining to mine noise emissions.

Attended monitoring for three consecutive days between 14 November 2017 to 16 November 2017, has identified that noise emissions generated by TGO comply with relevant statutory noise limits specified in EPL conditions at all assessed locations.

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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

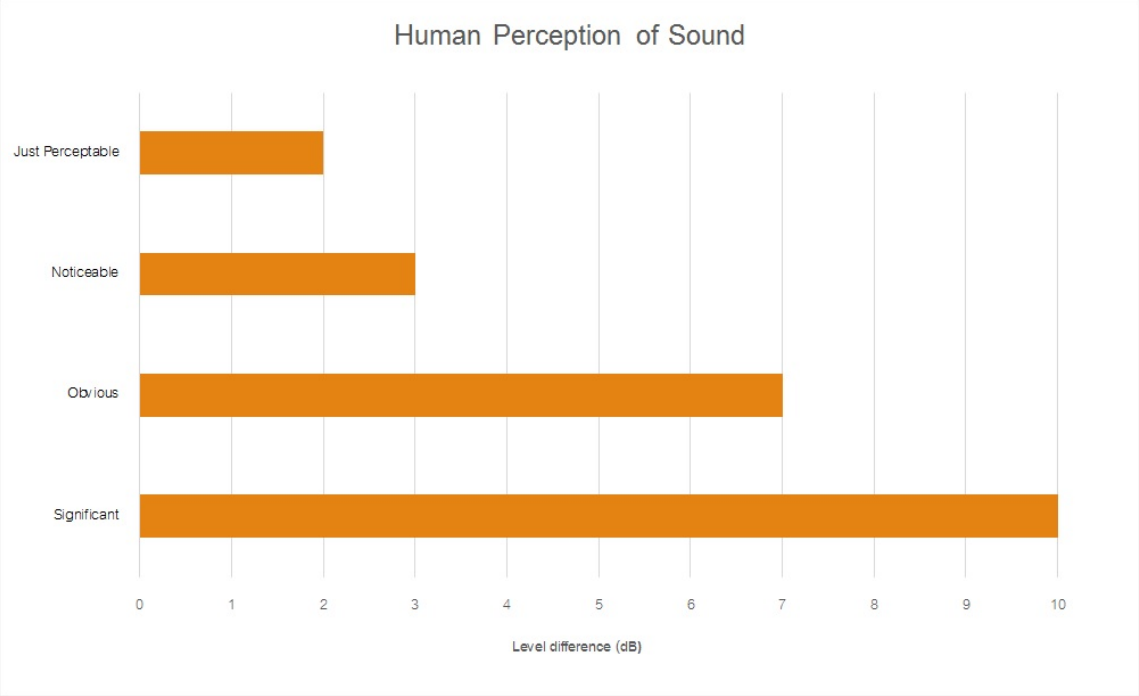
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the INP as a single figure background level for 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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