Monthly Noise Monitoring Assessment

Tomingley Gold Mine, October 2016

Prepared for : Tomingley Gold Operations Pty Limited

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MAC
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 involved quantifying the noise contribution of the mine by direct attended measurements so that effective management and controls can be implemented to minimise noise levels within the surrounding community. 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 not been completed as 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), Industrial Noise Policy (INP), 2000;
- Environment Protection Licence EPL 20169 (EPL); 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 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	
		LAeq(15-min)	LAeq(15-min)	LAeq(15-min)	LA1(1-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.

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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 has been retained from historic noise assessments. The monitoring location with respect to the mine is 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 1055-1997, "Acoustics - Description and Measurement of Environmental Noise" and the EPL. The measurements were carried out using Svantek Type 1, 971 noise analyser from Tuesday 11 October 2016 to Thursday 13 October 2016. 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 in duration at each location over three consecutive dates. Where possible, throughout each survey the operator quantified the contribution of each significant noise source. Extraneous noise sources were excluded from the analysis as to calculate the $L_{Aeq(15\text{-}min)}$ 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 INP 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 wind 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

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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 Tuesday 11 October 2016 to Thursday 13 October 2016 are summarised in **Table 2** along with prevailing meteorological conditions at the time of each survey, relevant EPL limits and the mining noise contribution.

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
		LAmax	LA_{eq}	LA_{90}			
11/10/2016	21:50	57	34	29	36	Dir: SW 0-1 m/s Stab Class: E	Birds, mine barely audible
		TGO Site LAeq(15-min) Contribution					27
11/10/2016	22:14	58	27	22	36	Dir: SW 0-1 m/s Stab Class: E	Birds and mine noise barely audible
		TGO Site LAeq(15-min) Contribution					21
12/10/2016	21:33	59	37	33	36	Dir: SW 0-1 m/s Stab Class: D	Dog, birds, distant traffic and mine barely audible
		TGO Site LAeq(15-min) Contribution					23
12/10/2016	22:09	62	37	26	36	Dir: SW 0-1 m/s Stab Class: D	Distant traffic, mine hum barely audible, wind in grass audible
		TGO Site LAeq(15-min) Contribution					23
13/10/2016	21:31	57	38	36	36	Dir: S 0-1 m/s Stab Class: D	Mine hum, highway traffic and birds audible
		TGO Site LAeq(15-min) Contribution					33
13/10/2016	22:01	56	40	38	36	Dir: S 1-2 m/s Stab Class: E	Mine hum, tipping, birds and highway traffic audible
		TGO Site LAeq(15-min) Contribution					35

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

4.2 Assessment Results - Location R3/R29

The results of the attended noise measurements at location R3/R29 for Tuesday 11 October 2016 to Thursday 13 October 2016 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.

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
		LAmax	LAeq	LA90			
11/10/2016	21:08	87	62	59	40	Dir: SW 0-1 m/s Stab Class: E	Road traffic, reversing noise, hydraulic hammer and tipping audible
		TGO Site LAeq(15-min) Contribution					43
11/10/2016	22:57	73	53	51	40	Dir: SW 0-1 m/s Stab Class: E	Road traffic, reversing noise, hydraulic hammer and tipping audible
		TGO Site LAeq(15-min) Contribution					51
12/10/2016	20:51	72	51	50	40	Dir: SW 0-1 m/s Stab Class: D	Highway traffic, mine hum, tipping, hydraulic hammer and reversing noise audible
		TGO Site LAeq(15-min) Contribution					41
12/10/2016	22:54	86	59	58	40	Dir: SW 0-1 m/s Stab Class: D	Mine hum, reversing noise, hydraulic hammer and highway traffic audible
		TGO Site LAeq(15-min) Contribution					38
13/10/2016	20:47	79	59	57	40	Dir: S 1-2 m/s Stab Class: D	Mine hum, reversing noise, hydraulic hammer, highway traffic and tipping audible
		TGO Site LAeq(15-min) Contribution					46
13/10/2016	22:45	85	59	57	40	Dir: SW 0-1 m/s Stab Class: E	Birds, highway traffic mine hum and reversing noise audible
		TGO Site LAeq(15-min) Contribution					34

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

4.3 Assessment Results - Location R4

The results of the attended noise measurements at location R4 for Tuesday 11 October 2016 to Thursday 13 October 2016 are summarised in **Table 4** along with prevailing meteorological conditions at the time of each survey, relevant EPL limits and the mining noise contribution.

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
		LAmax	LAeq	LA90			
11/10/2016	20:12	77	45	35	36	Dir: SW 0-1 m/s Stab Class: D	Site trucks, highway traffic, tipping and dog audible
TGO Site LAeq(15-min) Contribution							36
11/10/2016	23:58	63	38	36	36	Dir: SW 0-1 m/s Stab Class: E	Mine hum audible
TGO Site LAeq(15-min) Contribution							33
12/10/2016	19:53	86	53	34	36	Dir: SW 0-2 m/s Stab Class: D	Highway traffic, mine hum, tipping and dog audible
TGO Site LAeq(15-min) Contribution							34
12/10/2016	23:52	86	48	32	36	Dir: SW 0-1 m/s Stab Class: D	Livestock audible, mine barely audible
TGO Site LAeq(15-min) Contribution							29
13/10/2016	19:59	85	51	30	36	Dir: S 1-3 m/s Stab Class: D	Insects barely audible, mine hum, tipping and livestock audible
TGO Site LAeq(15-min) Contribution							30
13/10/2016	23:33	68	41	39	36	Dir: SW 1-2 m/s Stab Class: D	Mine hum, wind in trees and grass audible
TGO Site LAeq(15-min) Contribution							35

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

4.4 Assessment Results - Location R5

The results of the attended noise measurements at location R5 for Tuesday 11 October 2016 to Thursday 13 October 2016 are summarised in **Table 5** along with prevailing meteorological conditions at the time of each survey, relevant EPL limits and the mining noise contribution.

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
		LAmax	LAeq	LA90			
11/10/2016	19:43	72	51	50	37	Dir: SW 0-1 m/s Stab Class: D	Highway traffic, insects and birds audible
		TGO Site LAeq(15-min) Contribution					TGO Inaudible
12/10/2016	00:24	59	42	28	37	Dir: SW 0-1 m/s Stab Class: E	Highway traffic and birds audible
		TGO Site LAeq(15-min) Contribution					TGO Inaudible
12/10/2016	19:25	71	52	50	37	Dir: SW 0-1 m/s Stab Class: D	Highway traffic, wind in trees audible
		TGO Site LAeq(15-min) Contribution					TGO Inaudible
13/10/2016	00:19	80	53	51	37	Dir: SW 0-1 m/s Stab Class: D	Birds and highway traffic audible
		TGO Site LAeq(15-min) Contribution					TGO Inaudible
13/10/2016	19:32	76	58	57	37	Dir: S 1-3 m/s Stab Class: E	Highway traffic, insects, livestock and birds audible
		TGO Site LAeq(15-min) Contribution					TGO Inaudible
13/10/2016	23:57	79	55	53	37	Dir: SW 1-2 m/s Stab Class: D	Wind in trees and highway traffic audible
		TGO Site LAeq(15-min) Contribution					TGO Inaudible

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

4.5 Assessment Results - Location R6

The results of the attended noise measurements at location R6 for Tuesday 11 October 2016 to Thursday 13 October 2016 are summarised in **Table 6** along with prevailing meteorological conditions at the time of each survey, relevant EPL limits and the mining noise contribution.

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
		LAmax	LAeq	LA90			
11/10/2016	20:44	56	26	19	36	Dir: SW 0-1 m/s Stab Class: D	Highway traffic barely audible
		TGO Site LAeq(15-min) Contribution					TGO Inaudible
11/10/2016	23:22	52	27	26	36	Dir: SW 0-1 m/s Stab Class: F	Mine hum, insects and tipping audible
		TGO Site LAeq(15-min) Contribution					31
12/10/2016	20:24	51	27	26	36	Dir: SW 0-1 m/s Stab Class: D	Mine hum barely audible, wind in grass and trees audible
		TGO Site LAeq(15-min) Contribution					24
12/10/2016	23:19	48	24	23	36	Dir: SW 0-1 m/s Stab Class: D	Highway traffic audible, mine barely audible
		TGO Site LAeq(15-min) Contribution					17
13/10/2016	20:26	52	33	31	36	Dir: S 1-3 m/s Stab Class: D	Insects audible, mine barely audible
		TGO Site LAeq(15-min) Contribution					27
13/10/2016	23:06	53	42	41	36	Dir: S 1-2 m/s Stab Class: E	Drilling and mine hum audible
		TGO Site LAeq(15-min) Contribution					34

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

4.6 Assessment Results - Location R23

The results of the attended noise measurements at location R23 for Tuesday 11 October 2016 to Thursday 13 October 2016 are summarised in **Table 7** along with prevailing meteorological conditions at the time of each survey, relevant EPL limits and the mining noise contribution.

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
		LAmax	LAeq	LA90			
11/10/2016	21:28	55	46	45	39	Dir: SW 0-1 m/s Stab Class: D	Hydraulic hammer and site trucks audible
		TGO Site LAeq(15-min) Contribution					44
11/10/2016	22:38	53	44	43	39	Dir: SW 0-1 m/s Stab Class: E	Tipping, reversing noise and site trucks audible
		TGO Site LAeq(15-min) Contribution					42
12/10/2016	21:09	54	44	43	39	Dir: SW 0-1 m/s Stab Class: D	Mine hum, highway traffic, tipping and reversing noise audible
		TGO Site LAeq(15-min) Contribution					37
12/10/2016	22:34	52	45	44	39	Dir: SW 0-1 m/s Stab Class: D	Highway traffic, mine hum, tipping and reversing noise audible
		TGO Site LAeq(15-min) Contribution					37
13/10/2016	21:08	60	48	47	39	Dir: S 1-2 m/s Stab Class: E	Mine hum, reversing noise and highway traffic audible
		TGO Site LAeq(15-min) Contribution					45
13/10/2016	22:25	53	40	39	39	Dir: SW 1-2 m/s Stab Class: D	Mine hum, reversing noise, birds and tipping audible
		TGO Site LAeq(15-min) Contribution					34

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

5 Discussion

5.1 Discussion of Results – Location R2

Monitoring between the 11 October 2016 to 13 October 2016, identified that TGO noise was either barely audible or satisfied criteria at all receivers with the exception of R3/29 and R23. It was noted that hydraulic impact hammering was occurring throughout the noise monitoring assessment period, which is not a common source or activity that regularly occurs at the mine. Furthermore, due to local flooding, the Newell Highway was closed to all but local traffic. Typically, the Newell Highway is a significant contributor to the noise environment within Tomingley Village and masks mining noise, so results for R3/R29 and R23 should be considered atypical taking into account hydraulic hammering and coincidence of the Newell Highway Road closure.

5.2 Discussion of Results – Location R3/R29

Monitoring results for R3/R29 were dominated by intermittent highway traffic that was audible during all measurements. Four of the six attended results were above relevant criteria with a contribution of between 41dBA to 51dBA during drilling and impact hammering. Mine hum was audible when hydraulic hammer operations were not occurring resulting in a TGO noise contribution of between 34dBA to 38dBA. It is noted that the Newell Highway was temporarily closed due to flooding south of Tomingley and significantly influenced ambient traffic noise levels which have historically dominated at this location.

5.3 Discussion of Results – Location R4

Mine noise was audible during all attended surveys at R4 although remained below relevant criteria. The $LA_{eq(15\text{-}min)}$ mine noise contribution ranged between 29dBA to 36dBA which satisfied the EPL criteria. Non-mining noise sources included intermittent highway traffic (and road trucks), local residential noise, a dog and livestock.

5.4 Discussion of Results – Location R5

Mining noise emissions were inaudible during all attended noise monitoring surveys at this location during the October period. Intermittent highway traffic noise was the dominant source at this receiver during the October 2016 assessment period on most occasions. Non-mining sources include birds, insects and livestock.

5.5 Discussion of Results – Location R6

TGO was audible on five of the six occasions throughout the October 2016 monitoring period at R6. When audible, $LA_{eq(15\text{-}min)}$ mine noise contribution ranged between 17dBA and 31dBA which satisfied the relevant EPL noise limit of 36dBA $LA_{eq\ (15\text{-}\ min)}$.

5.6 Discussion of Results – Location R23

Mining noise was audible at this location during all monitoring events, with three of the six measurements resulting in exceedances of criteria. Exceedances ranged from 42dBA to 45dBA with the EPL noise criteria of 39$LA_{eq\ (15\text{-}\ min)}$. During measurements where the noise level was below criteria, the TGO noise contribution ranged from 37dBA to 34dBA.

6 Conclusion

MAC has completed a noise monitoring assessment on behalf of Tomingley Gold Operations. The assessment was completed to provide monthly monitoring data so TGO can actively quantify and manage site noise emissions.

Attended monitoring for three consecutive days, from 11 October 2016 to 13 October 2016, has identified that noise emissions generated by TGO generally comply with relevant statutory noise limits specified in EPL conditions at all assessed locations with the exception of R3/29 and R23 where hydraulic hammer and tipping operations were audible. It is noted that the level of exceedance should be considered atypical for Tomingley Village (R3/29 and R23) due to impact hammering occurring in conjunction with Newell Highway road closures that traditionally masks mining noise at these locations.

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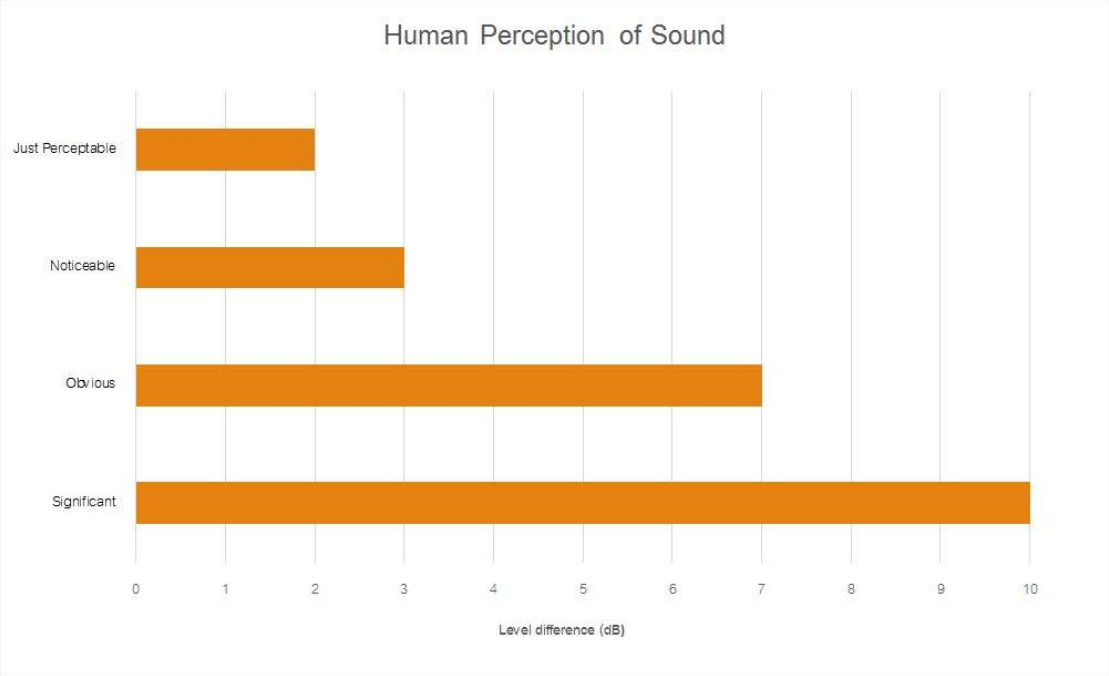
Appendix A - Glossary of Terms

A number of technical terms have been used in this report and are explained in the following table.

Glossary of Terms

Term	Description
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
dBA	A-weighted decibel - A-weighting refers to a standardised frequency response used in sound measuring instruments and corresponds to approximately the human ear response at normal sound levels.
dBZ	Z-weighted decibel – Z-weighting refers to a 'linear' spectrum with no weighting applied
SPL	Sound Pressure Level - The incremental variation of sound pressure above and below atmospheric pressure and expressed in decibels. The human ear responds to pressure fluctuations, resulting in sound being heard.
LAeq	Equivalent Noise Level - the average continuous noise level having the same energy over the measuring period as the measured, fluctuating noise.
Lpk dB(C) or Lc,pk	The C-weighted maximum instantaneous noise level to which a person is exposed. C-weighting refers to a standardised frequency response used in sound measuring instruments and corresponds to approximately the human ear response at high sound levels.
EA,T	A-weighting noise exposure - in Pascal-squared-hours (Pa2h), is the time integral of the squared, instantaneous A-weighted sound pressure over a particular time period.
SLC_{80}	Sound Level Conversion. Is a rating system used in Australia and New Zealand that estimates the amount of hearing attenuation provided to 80% of users wearing a specific type of PHP.

Figure A1 – Human Perception of Sound



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