Monthly Noise Monitoring Assessment

Tomingley Gold Mine, August 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 to determine mining noise emissions 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	35	35	35	45
NAG B	R2	36	36	36	45
NAG C	R3	49	38	38	45
	R29	48	37	37	45
NAG D	R23	43	38	38	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 16 August 2016 to Thursday 18 August 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 assessment location.

4.1 Assessment Results - Location R2

The results of the attended noise measurements at location R2 for Tuesday 16 August 2016 to Thursday 18 August 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	L_{Aeq}	L_{A90}			
16/08/2016	19:47	67	36	33	36	Dir: E 2 m/s Stab Class: D	Mine hum barely audible. Insect hum, livestock constant, dog bark dominant.
TGO Site LAeq(15-min) Contribution							20
16/08/2016	23:19	61	32	29	36	Dir: NE 3 m/s Stab Class: E	Insects and livestock constant. Mine not audible.
TGO Site LAeq(15-min) Contribution							TGO Inaudible
17/08/2016	19:22	70	37	33	36	Dir: NE 1 m/s Stab Class: E	Insects, highway traffic, livestock and dog bark masked mine noise.
TGO Site LAeq(15-min) Contribution							TGO Inaudible
17/08/2016	23:14	60	34	30	36	Dir: NE 3 m/s Stab Class: E	Mine barely audible. Livestock and insects constant.
TGO Site LAeq(15-min) Contribution							29
18/08/2016	19:15	81	50	37	36	Dir: NE 2 m/s Stab Class: E	Dog bark, insects, farm animals and local residential noise.
TGO Site LAeq(15-min) Contribution							TGO Inaudible
18/08/2016	23:15	63	36	34	36	Dir: NE 4 m/s Stab Class: E	Mine hum and reversing noise barely audible. Highway traffic and insects constant.
TGO Site LAeq(15-min) Contribution							23

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 16 August 2016 to Thursday 18 August 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			
16/08/2016	20:33	84	66	64	37	Dir: E 3 m/s Stab Class: F	Insect hum barely audible, highway traffic mostly constant and dominant.
		TGO Site LAeq(15-min) Contribution					TGO Inaudible
16/08/2016	23:59	88	65	63	37	Dir: NE 2 m/s Stab Class: E	Highway traffic and insects masked mine noise.
		TGO Site LAeq(15-min) Contribution					TGO Inaudible
17/08/2016	20:03	85	68	66	37	Dir: NE 3 m/s Stab Class: F	Highway traffic and insects constant.
		TGO Site LAeq(15-min) Contribution					TGO Inaudible
17/08/2016	23:53	84	62	60	37	Dir: NE 3 m/s Stab Class: F	Highway traffic and insects constant.
		TGO Site LAeq(15-min) Contribution					TGO Inaudible
18/08/2016	19:56	84	65	63	37	Dir: NE 2 m/s Stab Class: E	Highway traffic and constant insects masked mine noise.
		TGO Site LAeq(15-min) Contribution					TGO Inaudible
18/08/2016	23:56	88	64	61	37	Dir: NE 4 m/s Stab Class: E	Highway hum constant, masked all mine noise.
		TGO Site LAeq(15-min) Contribution					TGO Inaudible

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 16 August 2016 to Thursday 18 August 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			
16/08/2016	18:48	66	41	38	35	Dir: NE 1 m/s Stab Class: F	Mine hum, reversing noise and dumping audible. Residential noise constant and dominant.
		TGO Site LAeq(15-min) Contribution					35
16/08/2016	22:33	54	41	40	35	Dir: NE 2 m/s Stab Class: F	Reversing noise and dumping audible. Insects, and highway traffic mostly constant.
		TGO Site LAeq(15-min) Contribution					35
17/08/2016	18:30	71	36	29	35	Dir: E 1 m/s Stab Class: D	Mine hum audible. Local residential noise, highway way traffic and insects mostly constant.
		TGO Site LAeq(15-min) Contribution					27
17/08/2016	22:25	66	38	35	35	Dir: E 2 m/s Stab Class: F	Loading and mine hum audible. Insects constant.
		TGO Site LAeq(15-min) Contribution					34
18/08/2016	18:26	55	36	35	35	Dir: N 2 m/s Stab Class: E	Mine hum, reversing noise and dumping audible. Highway traffic and insects constant.
		TGO Site LAeq(15-min) Contribution					35
18/08/2016	22:26	63	44	42	35	Dir: NE 3 m/s Stab Class: E	Mine hum and dumping audible. Highway traffic and insects constant.
		TGO Site LAeq(15-min) Contribution					34

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 16 August 2016 to Thursday 18 August 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			
16/08/2016	19:17	76	58	57	37	Dir: NE 2 m/s Stab Class: F	Mine noise masked by traffic noise and constant insects.
		TGO Site LAeq(15-min) Contribution					TGO inaudible
16/08/2016	22:57	78	59	58	37	Dir: NE 3 m/s Stab Class: F	Mine hum audible. Highway traffic and insects constant.
		TGO Site LAeq(15-min) Contribution					32
17/08/2016	18:55	78	62	61	37	Dir: NE 1 m/s Stab Class: D	Mine hum audible. Dog bark, highway traffic and insects mostly constant.
		TGO Site LAeq(15-min) Contribution					30
17/08/2016	22:48	77	60	58	37	Dir: NE 3 m/s Stab Class: E	Mine hum audible. Highway traffic and insects constant.
		TGO Site LAeq(15-min) Contribution					34
18/08/2016	18:51	79	61	59	37	Dir: N 2 m/s Stab Class: E	Highway traffic and insects mask mine noise.
		TGO Site LAeq(15-min) Contribution					TGO Inaudible
18/08/2016	22:50	76	56	55	37	Dir: NE 4 m/s Stab Class: E	Highway traffic and insects constant, masked all mine noise.
		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 16 August 2016 to Thursday 18 August 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			
16/08/2016	18:11	73	39	34	36	Dir: N 2 m/s Stab Class: E	Mine hum and dumping audible. Insects, birds and livestock constant.
TGO Site LAeq(15-min) Contribution							34
16/08/2016	22:07	60	37	36	36	Dir: NE 2 m/s Stab Class: F	Mine hum and dumping audible. Insects constant.
TGO Site LAeq(15-min) Contribution							33
17/08/2016	18:00	69	44	35	36	Dir: N 1 m/s Stab Class: E	Mine hum audible. Birds and insect hum mostly constant.
TGO Site LAeq(15-min) Contribution							26
17/08/2016	22:00	60	39	37	36	Dir: NE 2 m/s Stab Class: E	Mine hum, loading and site trucks audible. Insects constant.
TGO Site LAeq(15-min) Contribution							34
18/08/2016	18:00	62	37	35	36	Dir: N 2 m/s Stab Class: E	Mine hum audible. Birds and insects constant.
TGO Site LAeq(15-min) Contribution							33
18/08/2016	22:00	72	42	38	36	Dir: NE 3 m/s Stab Class: F	Mine hum audible. Highway traffic and insects constant.
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 16 August 2016 to Thursday 18 August 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			
16/08/2016	20:15	65	42	41	38	Dir: NE 2 m/s Stab Class: G	Mine hum barely audible. Highway traffic dominant and insects constant.
TGO Site LAeq(15-min) Contribution							28
16/08/2016	23:41	59	44	43	38	Dir: NE 3 m/s Stab Class: E	Mine barely audible. Highway traffic and insects constant.
TGO Site LAeq(15-min) Contribution							23
17/08/2016	19:46	68	46	45	38	Dir: NE 2 m/s Stab Class: E	Mine hum, reversing noise and dumping audible. Highway traffic and insects mostly constant.
TGO Site LAeq(15-min) Contribution							34
17/08/2016	23:36	61	45	44	38	Dir: NE 3 m/s Stab Class: F	Highway traffic and insects mask mine noise.
TGO Site LAeq(15-min) Contribution							TGO Inaudible
18/08/2016	19:39	68	49	46	38	Dir: NE 2 m/s Stab Class: E	Highway traffic, insects and livestock audible.
TGO Site LAeq(15-min) Contribution							TGO Inaudible
18/08/2016	23:37	59	43	42	38	Dir: NE 3 m/s Stab Class: E	Mine barely audible. Highway traffic and insects constant.
TGO Site LAeq(15-min) Contribution							23

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

5 Discussion

5.1 Discussion of Results – Location R2

Monitoring between 16 August 2016 to 18 August 2016, identified that TGO noise was either inaudible or barely audible as it was masked by insects and livestock which were constant and dominant during all measurements. Notwithstanding, the noise contribution from TGO was generally between 20dBA to 29dBA and satisfied the relevant evening and night noise limits of 36dBA $LA_{eq(15min)}$ for all measurements. LA_{max} emissions from the mine remained below the sleep disturbance criterion.

5.2 Discussion of Results – Location R3/R29

Monitoring results for R3/R29 were dominated by highway traffic, heavy vehicles and constant insect noise that were audible throughout all measurements. Mine noise was inaudible during the three-day monitoring period satisfying the relevant evening and noise criteria of 37dBA $LA_{eq(15min)}$ for all measurements.

5.3 Discussion of Results – Location R4

Mine noise was audible during all attended surveys at R4. The $LA_{eq(15\text{-}min)}$ mine noise contribution ranged between 27dBA to 35dBA which satisfied the EPL criteria during the attended measurements throughout the August 2016 survey period. Non mining noise sources included highway traffic (and road trucks), local residential noise, dogs and insects noise. LA_{max} emissions from the mine remained below the sleep disturbance criterion for all assessed periods.

5.4 Discussion of Results – Location R5

Mining noise emissions were perceptible during three of the six attended noise monitoring surveys at this location. Highway traffic noise was the dominant source at this receiver during the August 2016 assessment period on most occasions and generally masked mining emissions. When audible, the $LA_{eq(15\text{-}min)}$ mine noise contribution was between 30dBA and 34dBA and satisfied the EPL noise limit of 37dBA. LA_{max} emissions from the mine also remained below the sleep disturbance criterion for all assessed periods.

5.5 Discussion of Results – Location R6

TGO was audible on three consecutive days throughout the August 2016 monitoring period at R6. When audible, $LA_{eq(15\text{-}min)}$ mine noise contribution ranged between 26dBA and 34dBA which satisfied the relevant EPL noise limit of 36dBA $LA_{eq\ (15\text{-}\ min)}$. LA_{max} emissions from the mine also remained below the sleep disturbance criterion for all assessed periods.

5.6 Discussion of Results – Location R23

Mining noise was audible at this location during breaks in highway traffic on four of six monitoring events. Generally, the noise contribution of the mine ranged between 23dBA to 34dBA. In summary, mining noise emissions complied with the relevant EPL $LA_{eq\ (15\text{-}\ min)}$ noise criteria of 38$_{dBA}$ on all occasions.

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 that TGO can actively quantify and manage site noise emissions.

Attended monitoring for three consecutive days, from 16 August 2016 to 18 August 2016, has identified that noise emissions generated by TGO generally comply with relevant statutory noise limits specified in EPL conditions at all assessed locations.

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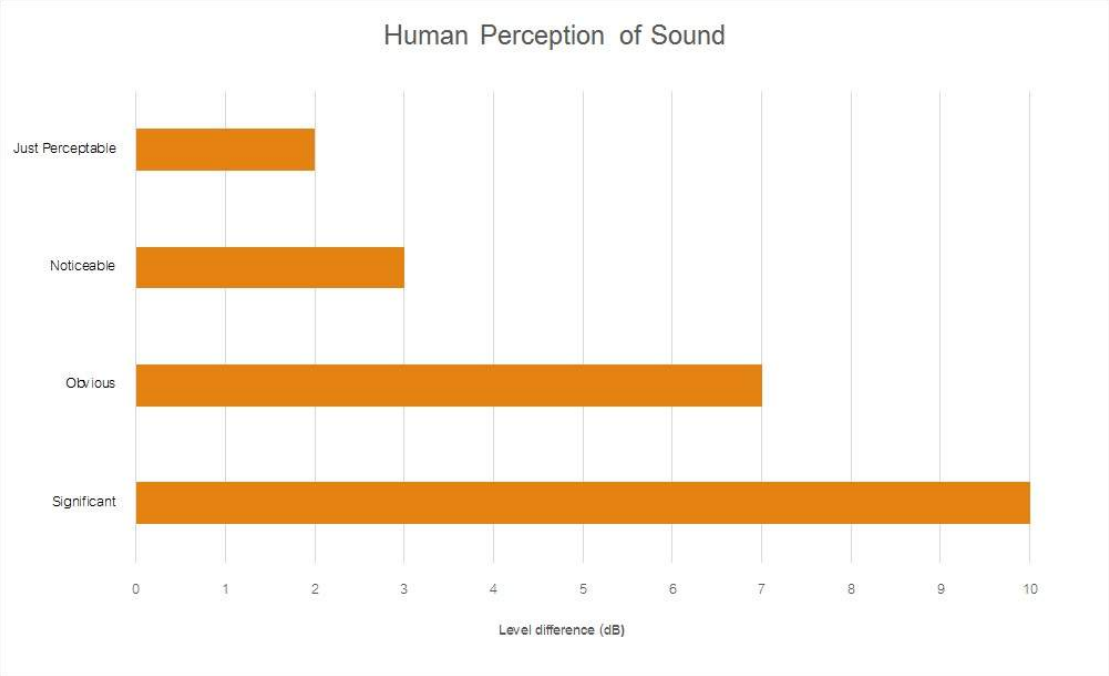
Appendix A - Glossary of Terms

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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