Monthly Noise Monitoring Assessment

Tomingley Gold Mine, July 2016

Prepared for : Tomingley Gold Operations Pty Limited

August 2016

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 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 26 July 2016 to Friday 29 July 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 day of consecutive monitoring.

4.1 Assessment Results - Location R2

The results of the attended noise measurements at location R2 for Tuesday 26 July 2016 to Friday 29 July 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) LAmax	LAeq	LA90	EPL Limit	Meteorology[1]	Description and SPL, dBA
26/07/2016	19:39	64	37	30	36	Dir: NW 2 m/s Stab Class: D	Mine just perceptible. Insects and dog bark audible.
		TGO Site LAeq(15-min) Contribution					TGO inaudible
27/07/2016	00:12	80	48	41	36	Dir: NW 4 m/s Stab Class: E	Mine not audible. Wind and traffic audible.
		TGO Site LAeq(15-min) Contribution					TGO inaudible
27/07/2016	19:36	60	31	26	36	Dir: SW 3 m/s Stab Class: E	Mine not audible. Insects and highway traffic hum constant. Dog bark dominant.
		TGO Site LAeq(15-min) Contribution					TGO inaudible
27/07/2016	23:46	57	32	31	36	Dir: SW 3 m/s Stab Class: E	Mine not audible. Wind, insects and highway traffic constant.
		TGO Site LAeq(15-min) Contribution					TGO inaudible
28/07/2016	19:25	61	33	30	36	Dir: SW 2 m/s Stab Class: F	Mine hum audible. Traffic and insects constant.
		TGO Site LAeq(15-min) Contribution					28
28/07/2016	23:44	58	31	29	36	Dir: SW 3 m/s Stab Class: D	Mine just perceptible. Wind and traffic constant.
		TGO Site LAeq(15-min) Contribution					26

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 26 July 2016 to Friday 29 July 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			
26/07/2016	21:36	83	64	63	37	Dir: NW 3 m/s Stab Class: D	Mine just perceptible. Highway traffic constant effecting the LAeq. Dog barking dominant.
TGO Site LAeq(15-min) Contribution							TGO inaudible
27/07/2016	00:54	84	63	61	37	Dir: NW 2 m/s Stab Class: E	Mine not audible. Highway traffic dominant.
TGO Site LAeq(15-min) Contribution							TGO inaudible
27/07/2016	20:21	86	68	66	37	Dir: SW 2 m/s Stab Class: D	Mine hum audible. Highway traffic and wind are constant and dominant.
TGO Site LAeq(15-min) Contribution							36
28/07/2016	00:30	85	64	62	37	Dir: SW 4 m/s Stab Class: D	Mine hum and loading audible. Wind and insects constant, near traffic is dominant.
TGO Site LAeq(15-min) Contribution							32
28/07/2016	20:07	83	64	62	37	Dir: SW 1 m/s Stab Class: D	Mine hum audible and highway traffic constant.
TGO Site LAeq(15-min) Contribution							32
29/07/2016	00:29	78	56	54	37	Dir: SW 4 m/s Stab Class: D	Mine hum audible, wind and highway traffic constant.
TGO Site LAeq(15-min) Contribution							32

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 26 July 2016 to Friday 29 July 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			
26/07/2016	18:31	66	40	37	35	Dir: NW 2 m/s Stab Class: E	Mine hum and dumping audible. Dog bark and local residential noise. Constant traffic hum noted.
TGO Site LAeq(15-min) Contribution							35
26/07/2016	22:55	61	40	39	35	Dir: NW 2 m/s Stab Class: D	Mine hum audible. Traffic and insects are constant and dominant influencing the LAeq.
TGO Site LAeq(15-min) Contribution							34
27/07/2016	18:38	66	37	35	35	Dir: SW 2 m/s Stab Class: E	Mine hum and mobile plant reversing sound audible. Insects and highway traffic constant.
TGO Site LAeq(15-min) Contribution							33
27/07/2016	22:29	62	37	36	35	Dir: SW 2 m/s Stab Class: E	Mine hum and truck dumping audible. Insects, wind and highway traffic constant.
TGO Site LAeq(15-min) Contribution							32
28/07/2016	18:28	64	40	38	35	Dir: SW 2 m/s Stab Class: D	Mine not audible. Wind noise, highway traffic and local residential noise audible.
TGO Site LAeq(15-min) Contribution							TGO inaudible
28/07/2016	22:31	61	32	30	35	Dir: SW 5 m/s Stab Class: D	Truck dumping audible. Wind and highway traffic hum constant.
TGO Site LAeq(15-min) Contribution							28

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 26 July 2016 to Friday 29 July 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			
26/07/2016	18:56	70	48	47	37	Dir: NW 2 m/s Stab Class: E	Truck dumping audible. Highway traffic and insect hum dominant and constant
TGO Site LAeq(15-min) Contribution							32
26/07/2016	23:43	66	49	48	37	Dir: NW 3 m/s Stab Class: D	Mine just perceptible. Wind and insect hum constant and dominant.
TGO Site LAeq(15-min) Contribution							TGO inaudible
27/07/2016	19:08	63	51	50	37	Dir: SW 3 m/s Stab Class: E	Mine not audible. Traffic constant.
TGO Site LAeq(15-min) Contribution							TGO inaudible
27/07/2016	23:19	58	44	43	37	Dir: SW 3 m/s Stab Class: E	Mine hum just perceptible. Wind and highway traffic constant.
TGO Site LAeq(15-min) Contribution							29
28/07/2016	18:55	66	50	43	37	Dir: SW 2 m/s Stab Class: D	Mine not audible. Dog barking dominant and constant.
TGO Site LAeq(15-min) Contribution							TGO inaudible
28/07/2016	23:16	61	32	30	37	Dir: SW 2 m/s Stab Class: D	Mine hum audible. Highway traffic and wind constant and dominant.
TGO Site LAeq(15-min) Contribution							26

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 26 July 2016 to Friday 29 July 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			
26/07/2016	18:01	65	34	31	36	Dir: NW 1 m/s Stab Class: E	Mine hum, dumping and track slap audible. Farm animals audible.
TGO Site LAeq(15-min) Contribution							32
26/07/2016	22:24	60	36	34	36	Dir: NW 2 m/s Stab Class: E	Mine hum, dumping and track slap.
TGO Site LAeq(15-min) Contribution							33
27/07/2016	18:04	71	38	30	36	Dir: SW 3 m/s Stab Class: E	Mine not audible. Insects constant.
TGO Site LAeq(15-min) Contribution							TGO inaudible
27/07/2016	22:00	57	33	31	36	Dir: SW 2 m/s Stab Class: E	Mine not audible. Highway traffic and insects constant.
TGO Site LAeq(15-min) Contribution							TGO inaudible
28/07/2016	18:00	64	36	34	36	Dir: SW 2 m/s Stab Class: D	Mine not audible. Wind insects and highway traffic are constant.
TGO Site LAeq(15-min) Contribution							TGO inaudible
28/07/2016	22:05	64	36	34	36	Dir: SW 5 m/s Stab Class: D	Mine not audible. Wind insects and highway traffic are constant.
TGO Site LAeq(15-min) Contribution							26

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 26 July 2016 to Friday 29 July 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			
26/07/2016	17:18	57	44	43	38	Dir: NW 2 m/s Stab Class: E	Mine not audible. Highway traffic dominant.
		TGO Site LAeq(15-min) Contribution					TGO inaudible
27/07/2016	00:36	50	37	36	38	Dir: NW 3 m/s Stab Class: D	Mine hum audible. Insects and farm animals audible.
		TGO Site LAeq(15-min) Contribution					30
27/07/2016	20:04	68	48	47	38	Dir: SW 2 m/s Stab Class: E	Mine hum and track slap audible. Insects and highway traffic hum constant.
		TGO Site LAeq(15-min) Contribution					36
28/07/2016	00:13	59	44	43	38	Dir: SW 3 m/s Stab Class: D	Mine hum and machine reversing audible. Wind and highway traffic are constant and mostly dominant.
		TGO Site LAeq(15-min) Contribution					38
28/07/2016	19:50	67	44	43	38	Dir: SW 2 m/s Stab Class: D	Mine loading and track slap audible. Traffic constant.
		TGO Site LAeq(15-min) Contribution					36
29/07/2016	00:08	57	43	42	38	Dir: SW 5 m/s Stab Class: D	Mine hum and dumping audible. Wind and traffic dominant.
		TGO Site LAeq(15-min) Contribution					37

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

4.7 Assessment Results - Additional Location

In addition to the standard EPL noise monitoring locations, one location (341 Kyalite Road) was included in the July 2016 noise monitoring assessment.

The additional location was assessed during the night period on three consecutive dates from Tuesday 26 July 2016 to Friday 29 July 2016. The results are summarised in **Table 8** along with prevailing meteorological conditions at the time of each survey, relevant EPL limits and the mining noise contribution.

Table 8 Operator-Attended Noise Survey Results – Additional Noise Monitoring Location

Date	Location	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
			LAmax	LAeq	LA90			
26/07/2016	341 Kyalite Road	23:20	55	36	35	35	Dir: NW 3 m/s Stab Class: E	Mine just perceptible. Wind and insect hum audible.
TGO Site LAeq(15-min) Contribution								28
27/07/2016	341 Kyalite Road	22:57	54	33	31	35	Dir: SW 2 m/s Stab Class: E	Mine hum audible. Insects and wind constant effecting the LAeq, dog bark is dominant.
TGO Site LAeq(15-min) Contribution								28
28/07/2016	341 Kyalite Road	22:54	60	36	35	35	Dir: SW 2 m/s Stab Class: D	Mine not audible. Highway traffic, insects and wind constant.
TGO Site LAeq(15-min) Contribution								TGO inaudible

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

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5 Discussion

5.1 Discussion of Results – Location R2

Monitoring on the 26 July 2016 and 27 July 2016, identified that TGO noise was masked by distant highway traffic and insect hum which was constant and dominant during all measurements. Attended measurement results for monitoring conducted at R2 identified that mine noise was audible only on 28 July. Notwithstanding, the noise contribution from TGO was measured at between 26dBA to 28dBA 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 and heavy vehicles that were constantly audible during all measurements. Mine noise was audible during breaks in traffic on all but one occasion and contributed to noise levels of between 32dBA to 36dBA over 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 apart from one period where mining remained inaudible. The $LA_{eq(15\text{-}min)}$ mine noise contribution ranging between 28dBA to 35dBA which satisfied the EPL criteria during all attended measurements throughout the July 2016 survey period. Non mining noise sources included highway traffic (and road trucks), local residential noise, dogs and wind 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 just perceptible during all but three attended noise monitoring surveys at this location. Highway traffic noise was the dominant source at this receiver during the July 2016 assessment period on most occasions and masked mining emissions. When audible the $LA_{eq(15\text{-}min)}$ mine noise contribution was between 26dBA and 32dBA 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 occasions throughout the July 2016 monitoring period at R6. When audible, $LA_{eq(15\text{-}min)}$ mine noise contribution ranged between 26dBA and 33dBA 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 five of six monitoring events. Generally, the noise contribution of the mine ranged between 30dBA to 38dBA although it was noted that when this occurred winds were directly from the mine to this monitoring location. In summary, mining noise emissions complied with the relevant EPL noise criteria of 38$LA_{eq\ (15\text{-}\ min)}$ on all occasions.

5.7 Discussion of Results – Additional Location

Attended measurements were completed at an additional location; 341 Kyalite Road, during the July 2016 attended noise surveys. The monitoring location was at the front gate of the property to minimise disturbance to the residence. In summary, mining noise from TGO was just audible on each occasion but the noise contributions remained at or below 28dBA when audible.

Therefore, the relevant evening and night noise limits of 35dBA $LA_{eq(15min)}$ were satisfied at this location for all measurements. LA_{max} emissions from the mine also remained below the sleep disturbance criterion.

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 26 July 2016 to 29 July 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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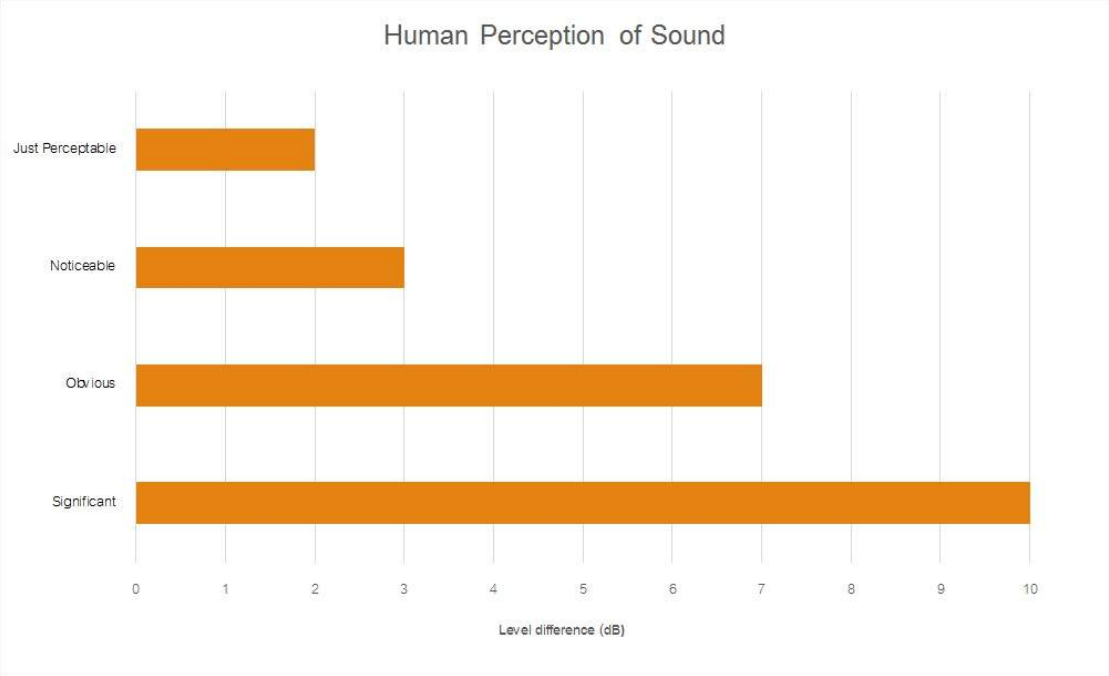
Appendix A - Glossary of Terms

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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