Noise Monitoring Assessment

Tomingley Gold Mine
Tomingley, NSW.
December 2019

Prepared for: Tomingley Gold Operations Pty Limited
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MAC160243RP5

Muller Acoustic Consulting

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1 Introduction

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

The NMA involved quantifying the noise contribution of the mine by direct attended measurements to determine mining noise emissions 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) at six representative 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
- Australian Standard AS 1055:2018 - Acoustics - Description and measurement of environmental noise - General Procedures.

A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A.**

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2 Environmental Protection License 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 RBLs.

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	
		$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{A1(1min)}$
NAG A	R4, R5, R6	35	35	35	45
NAG B	R2	36	35	35	45
NAG C	R3, R29	45	35	35	45
NAG D	R23	43	38	36	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 of 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 1055:2018, "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 12 November 2019 to Friday 15 November 2019 and by one MAC staff member from Tuesday 17 December 2019 to Thursday 19 December 2019. The acoustic instrumentation used carries current NATA calibration and complies with AS IEC 61672.1-2019-Electroacoustics - Sound level meters - Specifications. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed ±0.5dBA.

Day measurements consisted of six 15 minutes (ie 1 hour 30 minutes), evening measurements of two 15 minutes (ie 30 minutes) in duration and night measurements were of four 15 minute (ie 1 hour) durations at each location over three consecutive dates. Where possible, throughout each survey the operator quantified the contribution of each significant noise source. Where possible, extraneous noise sources were excluded from the analysis as to calculate the $LA_{eq(15min)}$ mine noise contribution for comparison against the relevant EPL limit. It is noted that day measurements were conducted on separate dates to evening and night measurements for this assessment.

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.

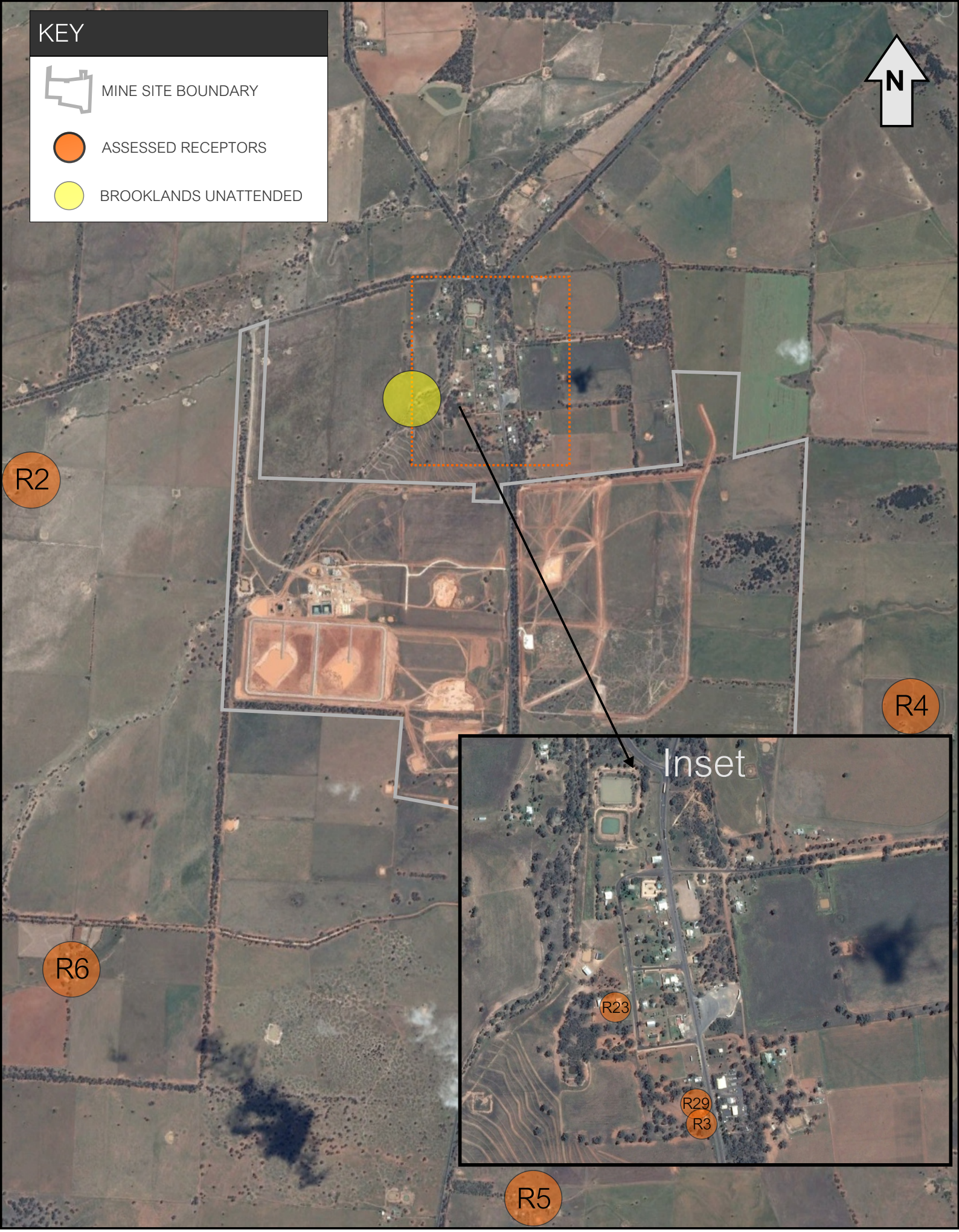

FIGURE 1 - LOCALITY PLAN AND ASSESSMENT LOCATIONS

TOMINGLEY GOLD MINE EPL NOISE MONITORING

REF: MAC160243

0 1000m

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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 the 2019 survey are summarised in **Table 2** with the relevant EPL limits, the calculated mining noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 2 Operator-Attended Noise Survey Results – Location R2

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}			
Day							
17/12/19	16:12	77	51	23	36	WD: SE WS: 1m/s Stab Class: C	Traffic 32-77 Insects 27-34 Wind 34-36 Birds 36-56
Average TGO Site $L_{Aeq(15min)}$ Contribution							TGO Inaudible
18/12/19	07:15	81	55	42	36	WD: E WS: 2m/s Stab Class: D	Wind 34-38 Traffic 34-81 Local Residential Noise 42-53 Birds 40-58
Average TGO Site $L_{Aeq(15min)}$ Contribution							TGO Inaudible
19/12/19	15:27	71	43	19	36	WD: NW WS: 2m/s Stab Class: B	Wind 34-38 Traffic 34-71 Insects <34 Birds 34-38 Aircraft 34-42
Average TGO Site $L_{Aeq(15min)}$ Contribution							TGO Inaudible
Evening							
12/11/19	20:08	75	62	58	35	WD: S WS: 6m/s Stab Class: D	Wind 56-75
Average TGO Site $L_{Aeq(15min)}$ Contribution							TGO Inaudible
13/11/19	19:59	63	47	43	35	WD: S WS: 2.5m/s Stab Class: D	Wind 46-53 Dog Bark 48-63 Livestock <48 Local Residential Noise 46-54
Average TGO Site $L_{Aeq(15min)}$ Contribution							TGO Inaudible

Table 2 Operator-Attended Noise Survey Results – Location R2							
14/11/19	19:49	72	35	31	35	WD: S WS: 1m/s Stab Class: E	Birds 28-72 Traffic 28-32 Insects <28 Livestock 36-44
Average TGO Site $LA_{eq(15min)}$ Contribution							TGO Inaudible
Night							
12/11/19	22:08	64	55	51	35	WD: S WS: 3m/s Stab Class: D	Wind 44-64
Average TGO Site $LA_{eq(15min)}$ Contribution							TGO Inaudible
13/11/19	22:05	60	34	28	35	WD: S WS: 1m/s Stab Class: E	Wind 33-38 Traffic 22-37 Dog Bark 36-60
Average TGO Site $LA_{eq(15min)}$ Contribution							TGO Inaudible
14/11/19	22:00	66	42	28	35	WD: S WS: 0.5m/s Stab Class: E	Dog Bark 30-66 Traffic <26 Local Residential Noise 26-32
Average TGO Site $LA_{eq(15min)}$ Contribution							TGO Inaudible

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

4.2 Assessment Results - Location R3/R29

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

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

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}			
Day							
17/12/19	12:56	93	70	43	45	WD: E WS: 0.5m/s Stab Class: A	Traffic 36-93 Insects <36 Birds 36-52
Average TGO Site $L_{Aeq(15min)}$ Contribution							TGO Inaudible
18/12/19	10:27	88	70	47	45	WD: E WS: 1.5m/s Stab Class: D	Traffic 38-88 Birds 46-52 Wind 34-46
Average TGO Site $L_{Aeq(15min)}$ Contribution							TGO Inaudible
19/12/19	12:10	88	68	48	45	WD: N WS: 1m/s Stab Class: C	Traffic 38-88 Birds 38-56 Wind <40 Insects <36
Average TGO Site $L_{Aeq(15min)}$ Contribution							TGO Inaudible
Evening							
12/11/19	21:25	88	65	45	35	WD: S WS: 3m/s Stab Class: D	Traffic 44-88 Wind 36-46
Average TGO Site $L_{Aeq(15min)}$ Contribution							TGO Inaudible
13/11/19	21:11	90	64	44	35	WD: S WS: 1.5m/s Stab Class: E	Traffic 36-90
Average TGO Site $L_{Aeq(15min)}$ Contribution							TGO Inaudible
14/11/19	21:02	86	65	43	35	WD: S WS: 1m/s Stab Class: E	Traffic 34-86 Insects <34 TGO Loader 34-36
Average TGO Site $L_{Aeq(15min)}$ Contribution							35

Table 3 Operator-Attended Noise Survey Results – Location R3/R29							
Night							
13/11/19	00:28	85	62	44	35	WD: S WS: 3m/s Stab Class: D	Traffic 48-85 Wind 44-52
Average TGO Site $LA_{eq(15min)}$ Contribution							TGO Inaudible
14/11/19	00:18	89	68	39	35	WD: S WS: 0.5m/s Stab Class: E	Traffic 36-89 Birds 38-48 Dog Bark 38-45
Average TGO Site $LA_{eq(15min)}$ Contribution							TGO Inaudible
15/11/19	00:10	92	64	41	35	WD: S WS: 0.5m/s Stab Class: E	Traffic 34-92 Local Residential Noise <32 TGO Loader 34-36
Average TGO Site $LA_{eq(15min)}$ Contribution							35

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

4.3 Assessment Results - Location R4

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

Table 4 Operator-Attended Noise Survey Results – Location R4

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}			
Day							
17/12/19	09:23	71	47	36	35	WD: E WS: 1.5m/s Stab Class: D	Wind 38-58 Birds 34-71
Average TGO Site $L_{Aeq(15min)}$ Contribution							TGO Inaudible
18/12/19	13:53	72	34	22	35	WD: E WS: 1m/s Stab Class: A	Birds 30-72 Wind 28-34 Insects <28 Aircraft 32-38
Average TGO Site $L_{Aeq(15min)}$ Contribution							TGO Inaudible
19/12/19	08:45	88	54	47	35	WD: NNW WS: 2m/s Stab Class: D	Wind 42-58 Birds <42 Local Traffic 88
Average TGO Site $L_{Aeq(15min)}$ Contribution							TGO Inaudible
Evening							
12/11/19	20:47	70	50	41	35	WD: SW WS: 4m/s Stab Class: D	Wind 38-70 Insects <30
Average TGO Site $L_{Aeq(15min)}$ Contribution							TGO Inaudible
13/11/19	20:24	64	36	29	35	WD: SW WS: 2m/s Stab Class: D	Insects 30-40 Traffic 34-40 Wind 30-36 Aircraft 33-37 Operator Vehicle 64
Average TGO Site $L_{Aeq(15min)}$ Contribution							TGO Inaudible
14/11/19	20:25	48	38	35	35	WD: W WS: 1m/s Stab Class: E	Insects 33-40 Offsite Drill Rig <36 Aircraft 40-43 Local Traffic 48
Average TGO Site $L_{Aeq(15min)}$ Contribution							TGO Inaudible

Table 4 Operator-Attended Noise Survey Results – Location R4							
Night							
12/11/19	23:15	65	42	32	35	WD: SW WS: 3m/s Stab Class: D	Wind 30-65 Offsite Drill Rig <30 Traffic 30-40 Birds <30
Average TGO Site $LA_{eq(15min)}$ Contribution							TGO Inaudible
13/11/19	23:15	57	32	24	35	WD: W WS: 0.5m/s Stab Class: E	Traffic 25-39 Insects <25 Dog Bark <25 TGO Mine Vehicle 25-28
Average TGO Site $LA_{eq(15min)}$ Contribution							28
14/11/19	23:13	50	33	25	35	WD: W WS: 0.5m/s Stab Class: E	Insects 25-30 Offsite Drill Rig <30 TGO Mine Vehicle 25-28 Local Traffic 50
Average TGO Site $LA_{eq(15min)}$ Contribution							28

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

4.4 Assessment Results - Location R5

The results of the attended noise measurements at location R5 for the 2019 survey are summarised in **Table 5** with the relevant EPL limits, the calculated mining noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 5 Operator-Attended Noise Survey Results – Location R5

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}			
Day							
17/12/19	07:43	83	67	56	35	WD: NE WS: 1.5m/s Stab Class: D	Traffic 48-83 Wind <48 Offsite Drill Rig 48-59 Birds <48
Average TGO Site $L_{Aeq(15min)}$ Contribution							TGO Inaudible
18/12/19	15:40	83	65	42	35	WD: E WS: 0.5m/s Stab Class: B	Traffic 46-83 Birds 46-54 Wind <42 Insects <42 Offsite Drill Rig 42-50 Livestock <42
Average TGO Site $L_{Aeq(15min)}$ Contribution							TGO Inaudible
19/12/19	07:06	79	65	46	35	WD: E WS: 1m/s Stab Class: D	Traffic 34-79 Birds 34-48 Wind <34 Offsite Drill Rig 36-48 Local Residential Noise <44
Average TGO Site $L_{Aeq(15min)}$ Contribution							TGO Inaudible
Evening							
12/11/19	21:24	84	66	48	35	WD: SW WS: 4m/s Stab Class: D	Wind 44-58 Traffic 51-84 Offsite Drill Rig 51-53
Average TGO Site $L_{Aeq(15min)}$ Contribution							TGO Inaudible
13/11/19	21:09	85	65	36	35	WD: SW WS: 2m/s Stab Class: E	Traffic 40-85 Wind 35-40 Insects 35-38 Offsite Drill Rig 35-38
Average TGO Site $L_{Aeq(15min)}$ Contribution							TGO Inaudible

Table 5 Operator-Attended Noise Survey Results – Location R5							
14/11/19	21:04	87	63	49	35	WD: SW WS: 1m/s Stab Class: E	Offsite Drill Rig 44-52 Traffic 48-87
Average TGO Site $LA_{eq(15min)}$ Contribution							TGO Inaudible
Night							
13/11/19	00:24	85	61	42	35	WD: SW WS: 4m/s Stab Class: D	Wind 38-55 Offsite Drill Rig 47-53 Traffic 47-85
Average TGO Site $LA_{eq(15min)}$ Contribution							TGO Inaudible
14/11/19	00:27	86	61	35	35	WD: SW WS: 0.5m/s Stab Class: E	Offsite Drill Rig 34-46 Livestock 34-36 Traffic 36-86 Insects 34-36
Average TGO Site $LA_{eq(15min)}$ Contribution							TGO Inaudible
15/11/19	00:22	85	61	36	35	WD: SW WS: 0.5m/s Stab Class: D	Offsite Drill Rig 33-48 Traffic 40-85 Dog Bark 40-48 Birds 38-43
Average TGO Site $LA_{eq(15min)}$ Contribution							TGO Inaudible

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

4.5 Assessment Results - Location R6

The results of the attended noise measurements at location R6 for the 2019 survey are summarised in **Table 6** with the relevant EPL limits, the calculated mining noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 6 Operator-Attended Noise Survey Results – Location R6

Date	Time (hrs)	Descriptor (dBA re 20 µPa) LAmax	LAeq	LA90	EPL Limit	Meteorology[1]	Description and SPL, dBA
Day							
17/12/19	11:06	75	43	32	35	WD: E WS: 1.5m/s Stab Class: C	Birds 36-56 Wind 36-44 Insects 36-40 Local Traffic 75
Average TGO Site $LA_{eq(15min)}$ Contribution							TGO Inaudible
18/12/19	12:13	78	44	30	35	WD: WS: m/s Stab Class: B	Wind 36-43 Birds 36-52 Traffic 36-38 Insects <30 Local Traffic 78
Average TGO Site $LA_{eq(15min)}$ Contribution							TGO Inaudible
19/12/19	10:24	66	48	41	35	WD: WS: m/s Stab Class: D	Wind 42-60 Insects <42 Traffic 46-48 Local Traffic 66
Average TGO Site $LA_{eq(15min)}$ Contribution							TGO Inaudible
Evening							
12/11/19	19:55	74	60	52	35	WD: SW WS: 4m/s Stab Class: D	Wind 47-71 Livestock <47 Local Traffic 74
Average TGO Site $LA_{eq(15min)}$ Contribution							TGO Inaudible
13/11/19	19:39	66	47	36	35	WD: SW WS: 4m/s Stab Class: D	Wind 34-51 Livestock 38-66 Birds 40-44
Average TGO Site $LA_{eq(15min)}$ Contribution							TGO Inaudible
14/11/19	19:42	56	34	25	35	WD: SW WS: 1m/s Stab Class: E	Birds 28-56 Wind 28-34 Livestock <25 Insects <25 Traffic 28-33
Average TGO Site $LA_{eq(15min)}$ Contribution							TGO Inaudible

Table 6 Operator-Attended Noise Survey Results – Location R6							
Night							
12/11/19	22:03	62	48	43	35	WD: SW WS: 4m/s Stab Class: D	Wind 39-56 Livestock <39 Local Traffic 62
Average TGO Site $LA_{eq(15min)}$ Contribution							TGO Inaudible
13/11/19	22:02	47	29	22	35	WD: SW WS: 2m/s Stab Class: E	Wind 30-47 Traffic <25 Insects 25-30
Average TGO Site $LA_{eq(15min)}$ Contribution							TGO Inaudible
14/11/19	22:01	49	30	27	35	WD: SW WS: 0.5m/s Stab Class: E	Insects 25-33 Traffic 25-33 Dog Bark 28-49 Offsite Drill Rig 30-38
Average TGO Site $LA_{eq(15min)}$ Contribution							TGO Inaudible

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

4.6 Assessment Results - Location R23

The results of the attended noise measurements at location R23 for the 2019 survey are summarised in **Table 7** with the relevant EPL limits, the calculated mining noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 7 Operator-Attended Noise Survey Results – Location R23

Date	Time (hrs)	Descriptor (dBA re 20 µPa) LAmax	LAeq	LA90	EPL Limit	Meteorology[1]	Description and SPL, dBA
Day							
17/12/19	14:31	70	44	36	43	WD: SE WS: 0.5m/s Stab Class: A	Traffic 38-70 Birds 38-44 Dog Bark <45 Insects <34 Wind <34
Average TGO Site $LA_{eq(15min)}$ Contribution							TGO Inaudible
18/12/19	08:52	77	52	47	43	WD: E WS: 1.5m/s Stab Class: D	Birds 46-58 Traffic 39-40 Wind 39-43 Dog Bark 38-77
Average TGO Site $LA_{eq(15min)}$ Contribution							TGO Inaudible
19/12/19	13:44	64	43	37	43	WD: NW WS: 1.5m/s Stab Class: B	Traffic 40-45 Insects <36 Birds 36-48 Wind <40 Local Traffic 64
Average TGO Site $LA_{eq(15min)}$ Contribution							TGO Inaudible
Evening							
12/11/19	20:49	72	51	46	38	WD: S WS: 3m/s Stab Class: D	Wind 46-56 Traffic 46-52 Dog Bark 48-72
Average TGO Site $LA_{eq(15min)}$ Contribution							TGO Inaudible
13/11/19	20:37	60	43	36	38	WD: S WS: 2m/s Stab Class: E	Traffic 35-50 Dog Bark 49-60 TGO Loading 32-36
Average TGO Site $LA_{eq(15min)}$ Contribution							34

Table 7 Operator-Attended Noise Survey Results – Location R23							
							Dog Bark 36-62
						WD: S	Traffic 34-46
14/11/19	20:26	62	42	35	38	WS: 1m/s	Aircraft 38-42
						Stab Class: E	Local Residential Noise 36-40
							TGO Processing Plant 34-36
Average TGO Site $LA_{eq(15min)}$ Contribution							35
Night							
						WD: S	Wind 38-46
12/11/19	23:19	62	43	37	36	WS: 3m/s	Traffic 38-50
						Stab Class: D	Dog Bark 38-62
Average TGO Site $LA_{eq(15min)}$ Contribution							TGO Inaudible
						WD: S	Traffic 31-45
13/11/19	23:15	68	42	35	36	WS: 0.5m/s	Dog Bark 52-68
						Stab Class: E	TGO Loader 31-37
Average TGO Site $LA_{eq(15min)}$ Contribution							33
						WD: S	Traffic 34-48
14/11/19	23:08	66	43	35	36	WS: 0.5m/s	Dog Bark 34-66
						Stab Class: E	TGO Processing Plant 32-35
Average TGO Site $LA_{eq(15min)}$ Contribution							34

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

5 Discussion

5.1 Discussion of Results – Location R2

Attended measurement results for monitoring conducted at R2, for the 2019 noise survey identified that TGO was inaudible during all measurements, and therefore remained below the relevant noise criteria. Generally, wind in trees, dogs barking, livestock, local residential noise, traffic, insects and birds were all audible during the monitoring period.

In summary, the noise contribution from TGO satisfied the relevant noise criteria ($L_{Aeq(15min)}$ and L_{Amax}) for all monitored assessment periods at Location R2.

5.2 Discussion of Results – Location R3/R29

Attended measurement results for monitoring conducted at R3/R29, for the 2019 noise survey identified that TGO was audible during two measurements, although remained below the relevant noise criteria. Generally, traffic, wind in trees, birds, dogs barking, insects and local residential noise were all audible during the monitoring period.

In summary, the noise contribution from TGO satisfied the relevant noise criteria ($L_{Aeq(15min)}$ and L_{Amax}) for all monitored assessment periods at Location R3/R29.

5.3 Discussion of Results – Location R4

Attended measurement results for monitoring conducted at R4, for the 2019 noise survey identified that TGO was audible during two measurements, although remained below the relevant noise criteria. Generally, wind in trees, insects, offsite drill rig, traffic, birds, aircraft and dogs barking were all audible during the monitoring period.

In summary, the noise contribution from TGO satisfied the relevant noise criteria ($L_{Aeq(15min)}$ and L_{Amax}) for all monitored assessment periods at Location R4.

5.4 Discussion of Results – Location R5

Attended measurement results for monitoring conducted at R5, for the 2019 noise survey identified that TGO was inaudible during all measurements, and therefore remained below the relevant noise criteria. Generally, wind in trees, traffic, offsite drill rig, insects, livestock, birds and dogs barking were all audible during the monitoring period.

In summary, the noise contribution from TGO satisfied the relevant noise criteria ($L_{Aeq(15min)}$ and L_{Amax}) for all monitored assessment periods at Location R5.

5.5 Discussion of Results – Location R6

Attended measurement results for monitoring conducted at R6, for the 2019 noise survey identified that TGO was inaudible during all measurements, and therefore remained below the relevant noise criteria. Generally, wind in trees, livestock, birds, traffic, insects, dogs barking, and an offsite drill rig were all audible during the monitoring period.

In summary, the noise contribution from TGO satisfied the relevant noise criteria ($L_{Aeq(15min)}$ and L_{Amax}) for all monitored assessment periods at Location R6.

5.6 Discussion of Results – Location R23

Attended measurement results for monitoring conducted at R23, for the 2019 noise survey identified that TGO was audible during four measurements, although remained below the relevant noise criteria. Generally, wind in trees, traffic, dogs barking, insects, birds, aircraft and local residential noise were all audible during the monitoring period.

In summary, the noise contribution from TGO satisfied the relevant noise criteria (LAeq(15min) and LAmax) for all monitored assessment periods at Location R23.

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, birds, and domestic/residential noise influenced measured noise levels for this assessment. Furthermore, for November 2019, results remained below the relevant criteria for both attended and unattended locations.

It is noted that daytime comparison was not conducted due to the high attended background levels measured at R23 between 12 December 2019 and 14 December 2019.

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)			Criteria	Mine Noise Contribution	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}				
Tuesday 12 November 2019								
Attended	20:49	72	51	46	38	TGO Inaudible	WD: S WS: 3m/s Stab Class: D	Wind 46-56 Traffic 46-52 Dog bark 48-72
Unattended	20:51	72	52	46	38	TGO Inaudible		Wind
Attended	23:19	62	43	37	36	TGO Inaudible	WD: S WS: 3m/s Stab Class: D	Wind 38-46 Traffic 38-50 Dog bark 38-62
Unattended	23:21	54	41	37	36	TGO Inaudible		Wind
Wednesday 13 November 2019								
Attended	20:37	60	43	36	38	34	WD: S WS: 2m/s Stab Class: E	Traffic 35-58 Dog bark 49-52 TGO Loading 32-36
Unattended	20:36	45	36	33	38	TGO Inaudible		Traffic Dog bark
Attended	23:15	68	42	35	36	33	WD: S WS: 0.5m/s Stab Class: E	Traffic 31-67 Dog bark 52-55 TGO Loader 31-37
Unattended	23:21	47	36	32	36	TGO Inaudible		Traffic
Thursday 14 November 2019								
Attended	20:26	62	42	35	38	35	WD: S WS: 1m/s Stab Class: E	Dog bark 36-61 Traffic 34-53 Aircraft 38-42 Local residential noise 36-40 TGO processing plant 34-36
Unattended	20:31	47	36	31	38	TGO Inaudible		Dog bark Traffic
Attended	23:08	66	43	35	36	34	WD: S WS: 0.5m/s Stab Class: E	Traffic 34-48 Dog bark 34-44 TGO processing plant 32-35
Unattended	23:01	52	38	32	36	TGO Inaudible		Traffic

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 (TGO). 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 12 November 2019 to 15 November 2019 and 17 December 2019 and 19 December 2019, identifies 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

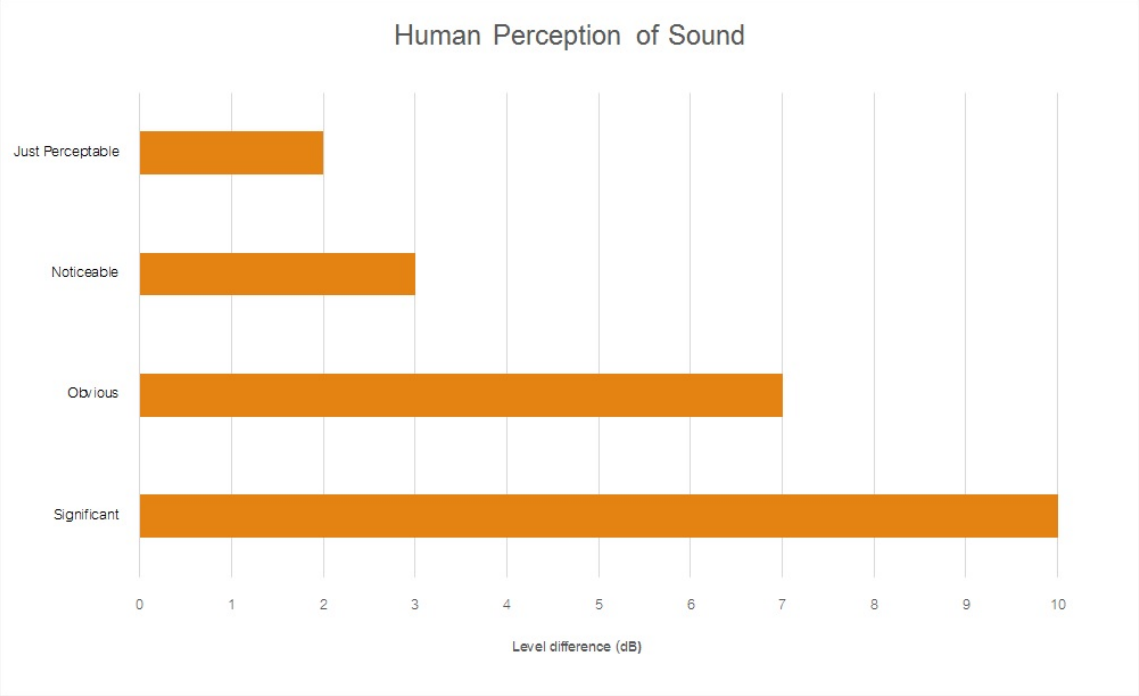
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured L90 statistical noise levels.
Ambient Noise	The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dBA	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dB(Z)	Decibels Linear or decibels Z-weighted.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
LA90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
LAeq	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
LAmax	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (SWL)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : = 10.log10 (W/Wo) Where : W is the sound power in watts and Wo is the sound reference power at 10-12 watts.

Table A2 provides a list of common noise sources and their typical sound level.

Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA

Source	Typical Sound Level
Threshold of pain	140
Jet engine	130
Hydraulic hammer	120
Chainsaw	110
Industrial workshop	100
Lawn-mower (operator position)	90
Heavy traffic (footpath)	80
Elevated speech	70
Typical conversation	60
Ambient suburban environment	40
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound



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