Noise Monitoring Assessment

Tomingley Gold Mine
Tomingley, NSW
November, 2020

Prepared for: Tomingley Gold Operations Pty Limited
December 2020
MAC160243RP5

Muller Acoustic Consulting

Document Information

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Tomingley Gold Mine, November 2020

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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	45

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 17 November 2020 to Friday 20 November 2020. 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.

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.

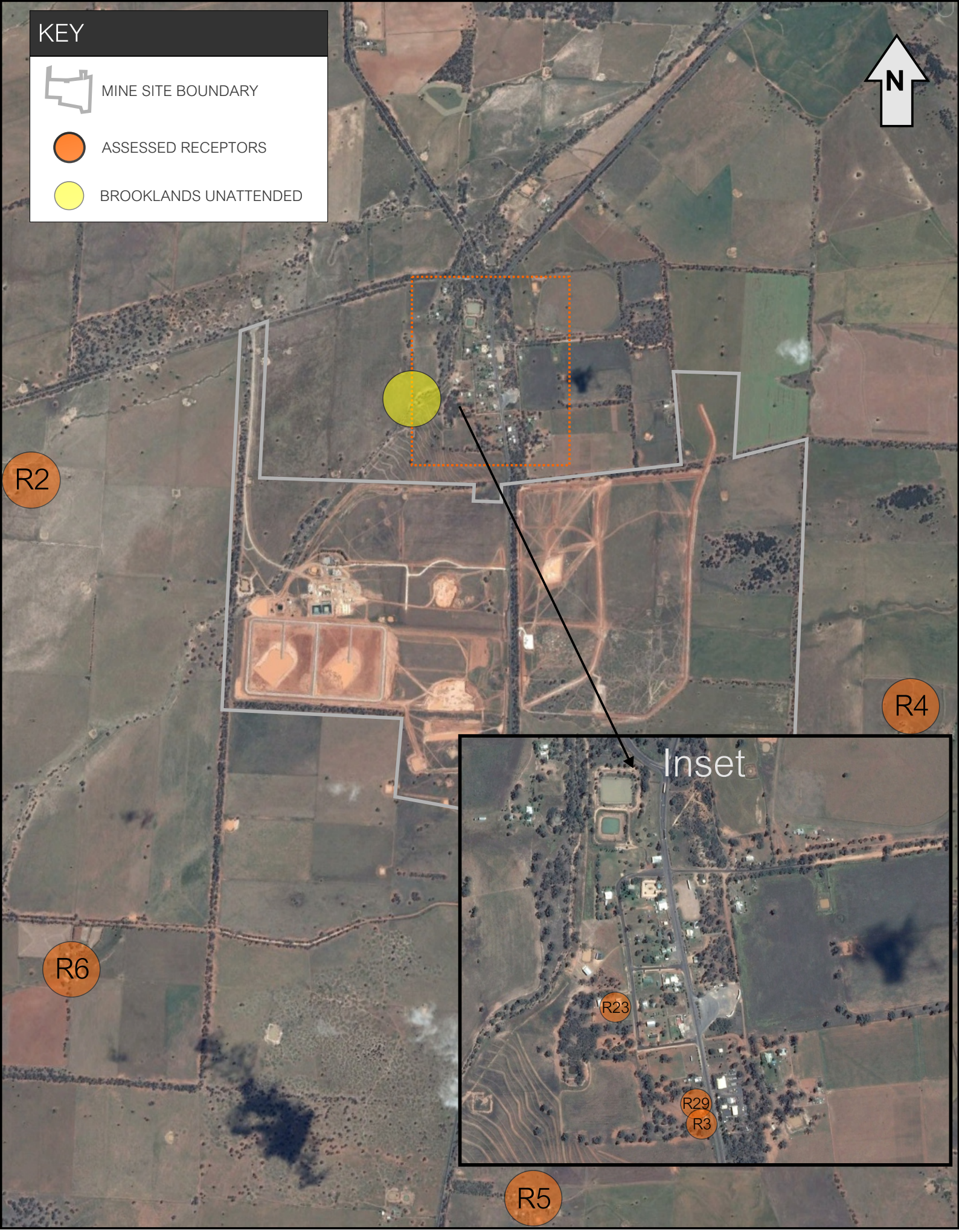

FIGURE 1 - LOCALITY PLAN AND ASSESSMENT LOCATIONS

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 2020 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							
17/11/2020	08:47	76	53	45	36	WD: SE WS: 2.5m/s Stab Class: C	Wind 39-61 Birds 35-60 Traffic 35-76 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<35
18/11/2020	09:49	77	51	38	36	WD: E WS: 2.5m/s Stab Class: D	Wind 35-59 Traffic 30-77 Birds 32-57 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<30
19/11/2020	09:45	74	47	38	36	WD: NE WS: 2m/s Stab Class: D	Birds 32-74 Wind 34-48 Traffic 32-70 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<30
Evening							
17/11/2020	20:11	77	51	28	35	WD: SE WS: 0.5m/s Stab Class: E	Traffic 27-77 Dogs 30-44 Birds 28-48 Insects 30-51 TGO Hum 23-28
Average TGO Site $L_{Aeq(15min)}$ Contribution							27

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}			
18/11/2020	19:59	80	52	29	35	WD: E WS: 0.5m/s Stab Class: E	Birds 30-54 Insects 30-53 Traffic 27-80 Livestock 23-32 Dogs 26-45 TGO Mobile Plant 32-30
Average TGO Site $L_{Aeq(15min)}$ Contribution							27
19/11/2020	20:09	76	49	35	35	WD: N WS: 0.5m/s Stab Class: F	Insects 27-44 Traffic 27-70 Birds 30-40 Local residential noise 50-76 Agriculture 30-47 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<30
Night							
17/11/2020	22:06	86	47	25	35	WD: S WS: 0.5m/s Stab Class: E	Insects 30-50 Traffic 21-71 Local residential noise 50-86 Dogs 30-41 TGO Hum 23-28
Average TGO Site $L_{Aeq(15min)}$ Contribution							25
18/11/2020	22:00	75	49	35	35	WD: SE WS: 1.5m/s Stab Class: D	Insects 32-53 Traffic 28-75 Wind 31-46 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<30
19/11/2020	22:00	76	49	35	35	WD: N WS: 0.5m/s Stab Class: E	Insects 27-47 Agriculture 25-56 Traffic 27-76 Local residential noise 50-63 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<30

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 2020 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							
17/11/2020	12:02	89	69	42	45	WD: S WS: 1.5m/s Stab Class: A	Traffic 32-89 Birds 32-51 Wind 32-45 Local residential noise 40-44 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<30
18/11/2020	13:02	89	67	38	45	WD: N WS: 1m/s Stab Class: A	Traffic 32-89 Birds 30-49 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<30
19/11/2020	12:57	87	69	46	45	WD: N WS: 1m/s Stab Class: B	Traffic 37-87 Birds 37-63 Industrial noise 43-51 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<36
Evening							
17/11/2020	21:26	83	65	41	35	WD: S WS: 0.5m/s Stab Class: E	Traffic 36-83 Insects <37 TGO Mobile Plant 33-36
Average TGO Site $L_{Aeq(15min)}$ Contribution							35
18/11/2020	21:11	88	67	39	35	WD: NE WS: 0.5m/s Stab Class: E	Traffic 31-88 Insects <34 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<30
19/11/2020	21:20	88	66	42	35	WD: N WS: 0.5m/s Stab Class: E	Traffic 35-88 Insects <35 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<32

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}			
Night							
18/11/2020	00:19	84	61	26	35	WD: S WS: 0.5m/s Stab Class: D	Traffic 22-84 Insects 20-41 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<30
19/11/2020	00:13	88	61	45	35	WD: NE WS: 2.5m/s Stab Class: D	Traffic 38-88 Wind 41-57 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<35
20/11/2020	00:11	87	62	37	35	WD: N WS: 1.5m/s Stab Class: D	Traffic 33-87 Wind 33-44 Insects <33 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<30

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 2020 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							
17/11/2020	10:49	80	46	33	35	WD: S WS: 2m/s Stab Class: C	Wind 39-58 Offsite drilling 44-55 Birds 44-58 Traffic 38-80 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<30
18/11/2020	11:05	82	50	31	35	WD: NE WS: 2.5m/s Stab Class: C	Wind 38-63 Birds 38-58 Insects 28-34 Traffic 24-82 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<30
19/11/2020	11:38	82	50	33	35	WD: N WS: 1.7m/s Stab Class: C	Birds 29-54 Wind 29-42 Insects <30 Traffic 30-82 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<30
Evening							
17/11/2020	20:57	55	33	20	35	WD: E WS: 0.2m/s Stab Class: E	Traffic 20-55 Insects <20 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<20
18/11/2020	20:40	59	38	33	35	WD: NE WS: 1m/s Stab Class: E	Wind 32-42 Traffic 32-36 Insects <32 Operator 46-59 Local residential noise <34 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<30

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}			
19/11/2020	20:51	57	32	29	35	WD: NE WS: 0.1m/s Stab Class: E	Traffic 27-57 Insects <32 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<30
Night							
17/11/2020	23:17	54	25	15	35	WD: E WS: 0.1m/s Stab Class: E	Traffic 17-54 Insects <17 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<15
18/11/2020	23:10	63	47	41	35	WD: E WS: 2.5m/s Stab Class: D	Wind 38-63 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<31
19/11/2020	23:09	62	45	41	35	WD: NE WS: 2m/s Stab Class: D	Wind 38-62 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<31

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 2020 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							
17/11/2020	09:07	80	64	46	35	WD: E WS: 2m/s Stab Class: C	Traffic 41-80 Wind 38-58 Birds 44-51 Insects <38 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<35
18/11/2020	09:27	77	60	43	35	WD: NE WS: 2m/s Stab Class: D	Wind 37-54 Birds 40-58 Traffic 37-77 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<33
19/11/2020	09:59	77	61	40	35	WD: E WS: 1.8m/s Stab Class: C	Traffic 38-77 Wind 36-56 Birds 37-54 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<30
Evening							
17/11/2020	20:20	80	61	36	35	WD: E WS: 0.3m/s Stab Class: E	Birds 33-48 Traffic 33-80 Livestock 33-37 Offsite drilling <33 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<30
18/11/2020	20:03	79	62	31	35	WD: NE WS: 0.7m/s Stab Class: E	Traffic 29-79 Livestock 29-34 Insects <27 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<30

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}			
19/11/2020	20:14	81	62	30	35	WD: N WS: 0.1m/s Stab Class: F	Aircraft 35-43 Livestock 35-44 Insects <35 Traffic 35-81 Birds 35-42 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<30
Night							
18/11/2020	00:23	80	57	30	35	WD: E WS: 0.1m/s Stab Class: D	Traffic 32-80 Dogs 33-41 Insects <34 Livestock 32-36 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<30
19/11/2020	00:16	80	58	42	35	WD: E WS: 2m/s Stab Class: D	Wind 38-54 Traffic 38-80 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<32
20/11/2020	00:16	79	58	40	35	WD: NE WS: 2.5m/s Stab Class: D	Wind 41-54 Traffic 44-79 Insects 41-47 Livestock 41-46 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<30

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 2020 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)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}			
Day							
17/11/2020	12:30	65	46	38	35	WD: SE WS: 2m/s Stab Class: A	Wind 42-60 Birds 37-65 Insects 36-44 Livestock <36 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<30
18/11/2020	13:01	71	40	35	35	WD: NE WS: 1.2m/s Stab Class: A	Birds 31-71 Traffic 31-42 Insects 33-38 Wind 31-48 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<30
19/11/2020	13:28	70	45	38	35	WD: NE WS: 1.5m/s Stab Class: A	Birds 37-70 Insects 34-37 Wind 34-42 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<30
Evening							
17/11/2020	21:30	51	30	24	35	WD: E WS: 0.2m/s Stab Class: E	Traffic 21-51 Insects 21-24 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<24
18/11/2020	21:18	53	38	35	35	WD: NNE WS: 0.8m/s Stab Class: E	Traffic 34-38 Insects <34 Wind 32-53 Livestock 34-42 TGO Processing 32-36
Average TGO Site $L_{Aeq(15min)}$ Contribution							34

Table 6 Operator-Attended Noise Survey Results – Location R6							
Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}			
19/11/2020	21:29	54	36	34	35	WD: N WS: 0.4m/s Stab Class: E	Livestock 32-54 Insects <33 TGO Processing 32-36
Average TGO Site $L_{Aeq(15min)}$ Contribution							34
Night							
17/11/2020	22:05	59	28	21	35	WD: E WS: 0.1m/s Stab Class: E	Traffic16-48 Insects 16-28 Livestock 19-34 Operator 56-59 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<21
18/11/2020	22:00	57	45	39	35	WD: NE WS: 2m/s Stab Class: D	Wind 35-57 Insects <35 TGO Processing 33-35
Average TGO Site $L_{Aeq(15min)}$ Contribution							34
19/11/2020	22:00	75	43	36	35	WD: NE WS: 1m/s Stab Class: E	Insects 33-34 Livestock 33-43 Traffic 34-75 Wind 34-45 TGO Processing 32-36
Average TGO Site $L_{Aeq(15min)}$ Contribution							34

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 2020 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							
17/11/2020	10:27	67	47	41	43	WD: SE WS: 2m/s Stab Class: D	Traffic 40-67 Birds 32-53 Wind 35-52 Local residential noise 40-65 TGO Inaudible
Average TGO Site $LA_{eq(15min)}$ Contribution							<31
18/11/2020	11:28	79	47	40	43	WD: NE WS: 2m/s Stab Class: B	Wind 31-46 Traffic 34-66 Birds 31-79 Dogs 38-44 TGO Inaudible
Average TGO Site $LA_{eq(15min)}$ Contribution							<30
19/11/2020	11:22	74	49	43	43	WD: NE WS: 1.5m/s Stab Class: B	Wind 37-50 Traffic 38-74 Birds 36-73 Dogs 38-54 Local residential noise 43-61 TGO Inaudible
Average TGO Site $LA_{eq(15min)}$ Contribution							<33
Evening							
17/11/2020	20:51	69	47	39	38	WD: S WS: 0.5m/s Stab Class: E	Traffic32-69 Insects 32-38 TGO Mobile Plant 32-38
Average TGO Site $LA_{eq(15min)}$ Contribution							35
18/11/2020	20:37	61	46	41	38	WD: NE WS: 0.5m/s Stab Class: E	Traffic 35-61 Insects <35 TGO Inaudible
Average TGO Site $LA_{eq(15min)}$ Contribution							<31

Table 7 Operator-Attended Noise Survey Results – Location R23							
Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}			
19/11/2020	20:46	58	43	34	38	WD: N WS: 0.5m/s Stab Class: E	Traffic 31-58 Insects 28-38 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<30
Night							
17/11/2020	23:15	59	44	34	36	WD: S WS: 0.5m/s Stab Class: E	Traffic 30-59 Birds 30-43 TGO Mobile Plant 28-37
Average TGO Site $L_{Aeq(15min)}$ Contribution							33
18/11/2020	23:09	66	52	47	36	WD: E WS: 2.5m/s Stab Class: D	Traffic 41-66 Wind 44-60 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<35
19/11/2020	23:07	60	44	40	36	WD: NE WS: 2m/s Stab Class: D	Traffic 34-60 Wind 34-49 TGO Inaudible
Average TGO Site $L_{Aeq(15min)}$ Contribution							<30

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

5 Discussion

5.1 Discussion of Results - Location R2

Monitoring between Tuesday 17 November 2020 and Thursday 19 November 2020 identified that TGO was audible during three measurements at location R2, although the estimated mining contribution remained below 30dBA, therefore the relevant noise limits were satisfied. Extraneous sources such as wind in trees, traffic, livestock, birds, dogs barking, agricultural noise, local residential noise, and insects were audible during the survey periods.

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

Monitoring between Tuesday 17 November 2020 and Friday 20 November 2020 identified that TGO was audible during one measurement at location R3. The estimated mining contribution remained below 35dBA, therefore, the relevant noise limits were satisfied. Extraneous sources such as traffic, birds, wind in trees, local residential noise, industrial noise, and insects were audible during the measurements.

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 R3/29.

5.3 Discussion of Results - Location R4

Monitoring between Tuesday 17 November 2020 and Thursday 19 November 2020 identified that TGO was inaudible during all measurements at location R4. The estimated mining contribution remained below 30dBA, therefore, the relevant noise limits were satisfied. Extraneous sources such as wind in trees, offsite drilling, birds, traffic, insects, operator noise, and local residential noise were audible during the measurements.

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

Monitoring between Tuesday 17 November 2020 and Friday 20 November 2020 identified that TGO was inaudible during all measurements at location R5. The estimated mining contribution remained below 30dBA, therefore the relevant noise limits were satisfied. Extraneous sources such as traffic, wind in trees, birds, insects, livestock, aircraft, and offsite drilling were audible during the measurements.

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

Monitoring between Tuesday 17 November 2020 and Thursday 19 November 2020 identified that TGO was audible during three measurements at location R6. Notwithstanding, the estimated mining contribution remained below 35dBA, therefore the relevant noise limits were satisfied. Extraneous sources such as wind in trees, birds, insects, livestock, traffic, and operator noise were audible during the measurements.

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

Monitoring between Tuesday 17 November 2020 and Thursday 19 November 2020 identified that TGO was audible during two measurements at location R23. Notwithstanding, the estimated mining contribution remained below 35dBA, therefore the relevant noise limits were satisfied. Extraneous sources such as traffic, birds, wind in trees, local residential noise, dogs barking were audible during the survey periods.

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 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 insect noise influenced measured noise levels for this assessment. Furthermore, for November 2020, results remained below the relevant criteria for both attended and unattended locations.

Table 8 provides a summary of comparisons or results between the attended and unattended noise surveys for R23.

Table 8 Comparison of Attended and Unattended Results – R23								
Assessment Type	Time (hrs)	Descriptor (dBA re 20 µPa)			Criteria	Mine Noise Contribution	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}				
Tuesday 17 November 2020								
Attended	10:27	67	47	41	43	<31	WD: SE WS: 2m/s Stab Class: D	Traffic 40-67 Birds 32-53 Wind 35-52 Local residential noise 40-65 TGO Inaudible
Unattended	10:30	56	42	37	43	<30		Wind Birds TGO Inaudible
Attended	20:51	69	47	39	38	35	WD: S WS: 0.5m/s Stab Class: E	Traffic32-69 Insects 32-38 TGO Mobile Plant 32-38
Unattended	20:49	52	39	31	38	<30		Traffic TGO Inaudible
Attended	23:15	59	44	34	36	33	WD: S WS: 0.5m/s Stab Class: E	Traffic 30-59 Birds 30-43 TGO Mobile Plant 28-37
Unattended	23:19	50	37	26	36	<26		Traffic TGO Inaudible
Wednesday 18 November 2020								
Attended	11:28	79	47	40	43	<30	WD: NE WS: 2m/s Stab Class: B	Wind 31-46 Traffic 34-66 Birds 31-79 Dogs 38-44 TGO Inaudible
Unattended	11:30	61	43	35	43	<30		TGO Inaudible
Attended	20:37	61	46	41	38	<31	WD: NE WS: 0.5m/s Stab Class: E	Traffic 35-61 Insects <35 TGO Inaudible
Unattended	20:32	68	46	35	38	<30		Insects Birds TGO Inaudible
Attended	23:09	66	52	47	36	<35	WD: E WS: 2.5m/s Stab Class: D	Traffic 41-66 Wind 44-60 TGO Inaudible

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}				
Unattended	23:17	63	44	39	36	<30		Insects TGO Inaudible
Thursday 19 November 2020								
Attended	11:22	74	49	43	43	<33	WD: NE WS: 1.5m/s Stab Class: B	Wind 37-50 Traffic 38-74 Birds 36-73 Dogs 38-54 Local residential noise 43-61 TGO Inaudible
Unattended	11:30	53	41	32	43	<30		Birds TGO Inaudible
Attended	20:46	58	43	34	38	<30	WD: N WS: 0.5m/s Stab Class: E	Traffic 31-58 Insects 28-38 TGO Inaudible
Unattended	20:45	61	44	34	38	<30		Traffic Insects TGO Inaudible
Attended	23:07	60	44	40	36	<30	WD: NE WS: 2m/s Stab Class: D	Traffic 34-60 Wind 34-49 TGO Inaudible
Unattended	23:15	53	39	32	36	<30		Insects TGO Inaudible

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

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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 17 November 2020 to 20 November 2020, identifies that noise emissions generated by TGO comply with relevant 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

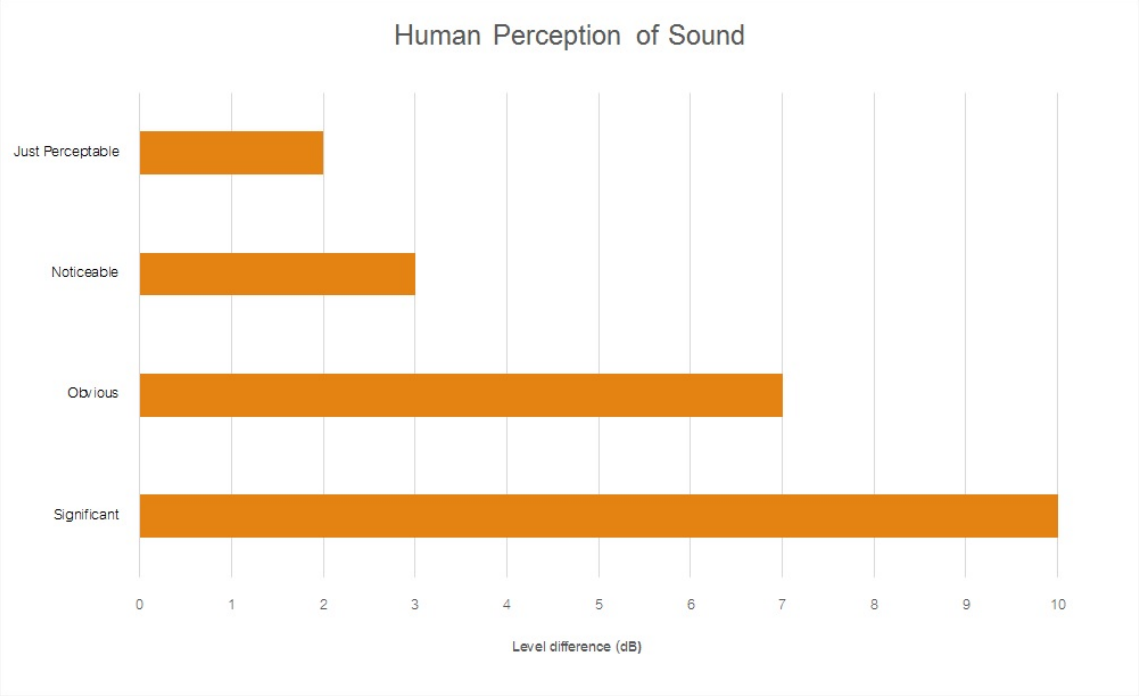
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for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