koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

Commercial 1 (Unit 27)
637-645 Forest Road
Bexley NSW 2207

+612 9587 9702
office@koikasacoustics.com
www.koikasacoustics.com

DELIVERING SOUND ADVICE

ABN: 12 058 524 771

ACOUSTICAL REPORT

PROPOSED RESIDENTIAL DEVELOPMENT

20 & 22 MINDARIE STREET AND 30 PINAROO PLACE, LANE COVE NORTH NSW

Date: Friday, 13 November 2020

File Reference: 4060R20200226pd20-22MindarieSt&30PinarooPlLaneCove_DA_V3

DOCUMENT CONTROL

Project title	Acoustical Report Proposed residential development 20 & 22 Mindarie Street and 30 Pinaroo Place, Lane Cove
Project number	4060
Document reference	4060R20200226pd20-22MindarieSt&30PinarooPlLaneCove_DA_V3
Document path	G:\Shared drives\KA Acoustics 2020\REPORT\Building General\4060 - 20-22 Mindarie St & 30 Pinaroo Pl, Lane Cove North\4060R20200226pd20-22MindarieSt&30PinarooPlLaneCove_DA_V3.docx

Version	Date	Author	Review	Notes
V1	08/04/2020	PD	NK	Report version 1 available for issue
V2	13/05/2020	PD	NK	Report version 2 available for issue
V3	13/11/2020	PD	NK	Updated drawings

Approved by	Nick Koikas M.A.A.S Principal Consultant
Client	BCL2 Limited Attention: Pau-Lahi Haangana – pau-lahi.haangana@bluechp.com.au

ACOUSTICAL REPORT

PROPOSED RESIDENTIAL DEVELOPMENT

20 & 22 MINDARIE STREET AND 30 PINAROO PLACE, LANE COVE NORTH NSW

CONTENTS

TABLE OF APPENDICES

1.0 INTRODUCTION

Koikas Acoustics Pty Ltd was engaged by BCL2 Limited to prepare a noise impact assessment for the proposed development at 20 & 22 Mindarie Street and 30 Pinaroo Place, Lane Cove North seeking approval for the construction of a new 30-unit residential apartment building with associated basement level parking.

For the DA proposal, the acoustic adequacy of the proposed design must be assessed in terms of standard planning guidelines issued by Lane Cove Municipal Council in their Local Environment Plan (LEP) and Development Control Plan (DCP), and also in terms of other standard planning guidelines related to common sources of noise.

In accordance with Council guidelines and other standard planning instruments, Koikas Acoustics has determined the following acoustical components require assessment at the current DA stage:

1. **Mechanical plant** noise emission from the proposed development to neighbouring dwellings (criteria only at the DA stage).
2. **Inter-tenancy sound insulation** requirements for shared partitions within the building.

This report presents the results and findings of an acoustic assessment for the subject proposal. In-principle acoustic treatments and noise control recommendations are included (where required) so that the premises may operate in compliance with the nominated acoustic planning levels.

2.0 THE PROPOSAL

The development is proposed to occupy the site at 220 & 22 Mindarie Street and 30 Pinaroo Place, Lane Cove North.

The application is for a multi-storey residential building consisting of:

- 2 basement parking levels and
- 30 residential units within 6 above-ground floor levels.

The current development design can be seen in architectural drawings as prepared by Stanton Dahl Architects, detailed in Table 1. All calculations and noise modelled scenarios conducted for this assessment are referenced to these architectural drawings.

Table 1. Design drawings used in the assessment

Drawing Title	Drawing No.	Revision	Date	Project No.
Site & External Works Plan	DA03	-	12/11/2020	2088.16
Floor Plan – Basement L2	DA06	01 - WIP	12/11/2020	2088.16
Floor Plans – Basement L1	DA07	01 - WIP	12/11/2020	2088.16
Floor Plans – Ground Floor	DA08	01 - WIP	12/11/2020	2088.16
Floor Plans – Level 1	DA09	01 - WIP	12/11/2020	2088.16
Floor Plans – Level 2	DA10	01 - WIP	12/11/2020	2088.16
Floor Plans – Level 3	DA11	01 - WIP	12/11/2020	2088.16
Floor Plans – Level 4	DA12	01 - WIP	12/11/2020	2088.16
Floor Plans – Level 5	DA13	01 - WIP	12/11/2020	2088.16
Roof Floor Plan	DA14	01 - WIP	12/11/2020	2088.16
Section S01	DA16	01 - WIP	12/11/2020	2088.16
Section S02	DA17	01 - WIP	12/11/2020	2088.16

Notes
1. Detailed above are the plans and drawings available at the time of assessment. Where design changes are made without the prior knowledge of Koikas Acoustics, our assessment results and conclusions published within this report may be incorrect.

The development location is situated in a primarily urban residential area. The subject site and surrounding properties are identified on the aerial photograph included as Figure 1.
Prevailing ambient noise conditions on-site and in the local area are generally the result of typical environmental noise such as distant traffic and localised domestic noise sources.

Figure 1. Aerial photo of the subject site and surrounding area (Image source – SixMaps)

3.0 AMBIENT NOISE SURVEY

Existing external ambient noise levels were measured by installing a sound level meter data logger in the rear yard of 30 Pinaroo Place.

A Type 1 precision Svantek 949 noise logger was used for the survey. The installed location in the yard meant that the microphone was approximately 1.5 metres above the ground level and in free field conditions. This meter was placed to measure existing background noise levels that would be common for the residential area. Noise logger location is shown in figure 1.

The instrument was set-up to measure A-frequency and 'Fast' time-weighted noise levels. Noise level data was stored within the logger memory at 15-minutes intervals for one week between Tuesday 18th and Monday 24th February 2020.

Calibration readings were taken before and after each survey with a NATA calibrated and certified Larson Davis CAL200 precision acoustic calibrator. No system drifts was observed for this meter.

BOM weather records for the nearest available weather station indicate that inclement weather conditions adversely impacted the noise survey. All extraneous noise and inclement weather events were removed from the survey. Bureau of Meteorology weather reports are attached as **Appendix A**.

Table 2. Summary of noise logger results [dB]

Location	Period, T [1]	Ambient noise level LAeq	Rating Background Level LA90
30 Pinaroo Place	Day	53	38
	Evening	52	37
	Night	47	33

Notes
1: The NSW EPA NPI refers to Night as 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and public holidays.

Noise logger graphs are attached as **Appendix B**.

4.0 ACOUSTICAL REQUIREMENTS

4.1 EPA NOISE POLICY FOR INDUSTRY

Noise emission design targets have been referenced from the NSW Environmental Protection Authority Noise Policy (EPA) for Industry (NPfI). The NPfI replaces the former Industrial Noise Policy, also prepared by the EPA.

The NPfI is designed to assess environmental noise impacts associated with scheduled activities prescribed within the Protection of the Environment Operations Act 1997, Schedule 1. It is also commonly used as a reference tool for establishing suitable planning levels for noise generated by mechanical plant and equipment and noise emission from commercial operations.

The guideline applies limits on the short term intrusive nature of a noise or noise generating development (project intrusive noise level), as well as applying an upper limit on cumulative industrial noise emissions from all surrounding development/industry (project amenity noise level).

The most stringent of the project intrusive noise level and project amenity noise level is applied as the **project noise trigger level**. The project noise trigger level is the point, above which noise emission from a source or development site would trigger a management response.

To be able to define the more stringent of the intrusive and amenity noise levels, the underlying noise metrics must be the same. As the intrusive noise level is defined in terms of a $L_{Aeq\ 15\ minutes}$ and the amenity noise level is defined in terms of a $L_{Aeq\ Period}$, a correction +3dB correction is applied to the project amenity noise level to equate the $L_{Aeq\ Period}$ to $L_{Aeq\ 15\ minutes}$.

4.1.1 Protection of the Environment Operations (Noise Control) Regulation 2017

Clause 45 of the regulation requires that air conditioning units installed on residential premises must not emit noise that is audible within a habitable room in any other residential premises between the hours of 10pm and 7am (Monday to Friday) or 10pm and 8am (Saturday, Sunday and public holidays).

4.2 INTER-TENANCY NOISE

In Class 2 or 3 buildings, the BCA acoustical Performance Requirements state that separating walls and floors must provide insulation against the transmission of airborne or impact generated sound sufficient to prevent illness or loss of amenity for the occupants.

A wall or floor partition is considered to satisfy BCA Performance Requirements where it is shown to:

- Have a laboratory tested acoustic rating that meets or exceeds the Deemed-to-Satisfy provisions of F5.4 to F5.7, or
- Complies with Specification F5.2, or
- Is tested on-site to achieve the minimum acoustic performance as defined within *Verification Methods* FV5.1 and FV5.2.

The Deemed-to-Satisfy provisions applying to this specific development are summarised below:

Table 3. BCA acoustic design requirements

Partition	Detail	Airborne sound	Impact sound
Floor	Separating SOU's, or an SOU from a plant room, lift shaft, stairway, public corridor, public lobby or the like, or part of a different classification	Rw + Ctr ≥ 50	Ln,w ≤ 62
Wall *See notes 1 and 2*	Separating SOU's	Rw + Ctr ≥ 50	Not applicable
	Separating a habitable room (other than a kitchen) in one SOU from a bathroom, sanitary compartment, laundry, kitchen in another SOU	Rw + Ctr ≥ 50	Discontinuous construction
	Separating an SOU from a plant room or lift shaft	Rw ≥ 50	Discontinuous construction
	Separating an SOU from a stairway, public corridor, public lobby or the like, or part of a different classification	Rw ≥ 50	Not applicable
Door	Located in a wall separating an SOU from a stairway, public corridor, public lobby or the like	Rw ≥ 30	Not applicable
Services	Duct, soil, waste or water supply pipes located in a wall or floor cavity and serves or passes through more than one SOU (including a stormwater pipe)	Rw + Ctr ≥ 40 (habitable) Rw + Ctr ≥ 25 (other)	Not applicable
Pumps	A flexible coupling must be used at the point of connection between the service's pipes in a building and any circulating or another pump.		
Notes 1.	Where a wall is to achieve a sound insulation rating and has a floor above, the wall must continue to either the underside of the floor or to the ceiling which has a comparable sound insulation rating to the wall.		
2.	Where a wall is to achieve a sound insulation rating and has a roof above, the wall must continue to either the underside of the roof or to the ceiling which has a comparable sound insulation rating to the wall.		
3.	As defined by the BCA, a 'habitable room' means a room used for normal domestic activities such as, bedroom, living room, lounge room, music room, television room, kitchen dining room, study, playroom, family room, home theatre and sunroom.		

5.0 MECHANICAL PLANT AND BUILDING USE NOISE IMPACTS

Mechanical plant and equipment on this project could include air conditioning condensers units where they are installed in the development and other ventilation plant required for basement levels and garbage rooms etc.

5.1 PROJECT NOISE TARGETS

This noise is assessed to the planning levels contained within the NPfI. Acoustic planning levels are largely determined to the existing environmental noise levels. Noise surveys conducted for this assessment show that environmental noise levels can differ based on the location of a particular receiver and its orientation to major contributors of noise in the area, such road corridors and commercial operations. The following NPfI planning levels apply for this project:

Table 4. NPfI planning levels

Period, T (Note 1)	Pinaroo Place location							
	Intrusive		Amenity					
	RBL	RBL + 5	Area classification	Recommended amenity noise level	High traffic area	Project amenity noise level	+3dB correction	Project noise trigger level
Day	38	43	Suburban	55	No	50	53	43
Evening	37	42	Suburban	45	No	40	43	42
Night	33	38	Suburban	40	No	35	38	38

Notes

1. The NSW EPA Industrial Noise Policy refers to the following periods,
   Day – 7 am to 6 pm Monday to Saturday and 8 am to 6 pm Sunday and public holidays,
   Evening – 6 pm to 10 pm Monday to Sunday,
   Night – 10 pm to 7 am Monday to Saturday and 10 pm to 8 am Sunday and public holidays.
2. The amenity criterion is based on the area classification of the site as being 'urban' and has been corrected for an assessment in areas of high traffic and for existing industrial noise where applicable.
3. Project noise amenity level = recommended noise amenity level – 5dB, except where specific circumstances are met, such as high traffic.

Surrounding commercial properties must also not be exposed to noise that exceeds $L_{Aeq,\ Period\ (business\ hours)}$ 60dB during business hours.

5.2 DESIGN SCENARIOS

At this stage, a mechanical design is yet to be completed. A detailed mechanical plant noise impact assessment is to be provided once the final mechanical design and specification have been completed.

6.0 INTER-TENANCY NOISE

The following recommendations are expected to satisfy the relevant provisions of the BCA sound insulation requirements between tenancies. Options have been provided in all cases that consider a range of standard constructions.

All wall systems should be installed in accordance with general installation guidelines included in the BCA and as per relevant manufacturer installation guidelines/requirements.

Alternate systems and design may be considered to those recommended within this report provided that they are approved by an appropriately qualified acoustical engineer/consultant.

6.1 RECOMMENDED PARTITION WALLS

Table 6 recommends a number of partition wall systems that are capable of achieving the required acoustic performance.

Table 5. Recommended partition wall systems		
Wall type	**BCA design standard**	**Construction**
Inter-tenancy wall	Rw + Ctr ≥ 50 Discontinuous	*Partition wall between sole-occupancy units – Separating a habitable room (other than a kitchen) in one unit from a bathroom, sanitary compartment, laundry or kitchen in an adjoining unit* **[AFS]** AFS 162 Logicwall, 20mm cavity, 64mm steel studs with 75mm thick Tontine TSB4 insulation within the stud cavity, 10mm Soundcheck. **[Masonry]** Two leaves of 110mm clay brick masonry, 50mm cavity between the leaves (where brick ties are used they are to be of the resilient type), 13mm cement render to each side. *BCA D.T.S.* **[Concrete]** 125mm concrete panel, 20mm cavity, 64mm steel studs, 70mm polyester insulation (9kg/m^3) between the studs, 13mm plasterboard fixed to studs. *BCA D.T.S.* **[Hebel]** 13mm Fyrchek, 75mm Hebel Powerpanel, 35mm cavity, 64mm steel studs with 100mm S6 polyester insulation, 13mm Fyrchek/Aquachek. **[Lightweight]** 2x64mm steel studs, 20mm cavity, 60mm polyester insulation (11kg/m3) positioned between one row of studs, 2x13mm fire resistant plasterboard each side.
	Rw + Ctr ≥ 50	*Partition wall between sole-occupancy units* **[AFS]** AFS 162 Logicwall panel, paint or render finish. **[AFS]** AFS 162 Logicwall panel, 28mm furring channel, Tontine TSB2 insulation within the framing cavity, 13mm plasterboard. **[Masonry / Hebel / Lightweight]** As above. **[Concrete]** 200mm concrete panel, 13mm cement render of each face. *BCA D.T.S.*
Common wall	Rw ≥ 50 Discontinuous	*Partition wall between sole-occupancy unit and plant room or lift shaft* As above for inter-tenancy wall partitions that satisfy discontinuous construction
	Rw ≥ 50	*Partition wall between sole-occupancy unit and stairway, public corridor, public lobby or the like or part of a different classification* **[AFS]** AFS 150 Logicwall panel, paint or render finish. **[AFS]** AFS 162 Logicwall panel, paint or render finish. **[Masonry]** Single leaf 150mm brick masonry with 13mm cement render on each face. **[Concrete]** 125mm thick concrete panel. **[Hebel]** 13mm Gyprock CD, 75mm Hebel Powerpanel, minimum 20mm cavity, 64mm steel framing with 50mm glasswool insulation, 13mm Gyprock CD. **[Lightweight]** 92mm steel studs, 60mm polyester insulation (11kg/m3) positioned between the studs, 2x13mm fire resistant plasterboard each side.
Services shaft wall	Rw+Ctr ≥40	*Services shaft wall to habitable room within unit* **[Masonry]** 110mm brick masonry with 13mm cement render on each face. *BCA D.T.S.* **[Concrete]** 100mm thick concrete panel. *BCA D.T.S.* **[Lightweight]** 2x13mm plasterboard, pipe lagging (Soundlag 4525C, Acoustilag 45)
	Rw+Ctr ≥25	*Services shaft wall to non-habitable room within unit* **[Lightweight]** 2 layers of 13mm plasterboard

Notes:

1. Recommendations within the above table are based on published acoustic data obtained from the manufacturer's website.
2. Laboratory tests of the AFS 162 Logicwall on its own showed non-compliance with the BCA requirement of Rw + Ctr 50. However, an investigation by PKA Consulting concludes that the poor acoustic performance was due to factors not related to the wall system, but rather the test facility. It is expected that the acoustic performance will satisfy the BCA condition. This conclusion is supported by numerous field tests that indicate compliance with the BCA verification methods rating.
3. All installation of proprietary type wall systems must be in accordance with the relevant installation guidelines and manuals.
4. *BCA D.T.S.* = BCA Deemed-to-Satisfy construction. These wall systems are to be installed as per "Construction Deemed-to-Satisfy" notes included within Specification F5.2 of Volume One of the BCA. Where these systems are installed correctly in accordance with the BCA they do not require compliance testing to verify acoustic performance.

6.2 RECOMMENDED PARTITION FLOOR/CEILING

The following floor/ceiling assemblies are recommended to achieve the BCA minimum acoustic rating requirements.

Table 6. Floor system recommendations	
System 1 – Tile floor	
Floor covering:	Selected tiles
Additional layers:	n/a
Underlay:	Regupol 4515 (4.5 mm), A1 Rubber Acoustamat 3mm, Damtec Standard 2-4 mm, Uniroll RF700 (5mm) under screed or RFC750 (4.5 mm) under direct-stick tile, or other approved products
Floor slab:	200mm concrete
Ceiling cavity:	Minimum 70mm **(Note 1)**
Cavity insulation:	n/a
Ceiling material:	10mm Superchek or 13mm Soundcheck (Note 2)
System 2 – Timber floor	
Floor covering:	Engineered timber or laminate timber
Additional layers:	n/a
Underlay:	Regupol 4515 (4.5mm), A1 Rubber Acoustamat 3mm, Damtec Standard 2-4mm, Uniroll RF700 (5mm), or other approved products
Floor slab:	200mm concrete
Ceiling cavity:	Minimum 70mm **(Note 1)**
Cavity insulation:	n/a
Ceiling material:	10mm Superchek or 13mm Soundcheck (Note 2)
System 3 – Carpet floor	
Floor covering:	Carpet
Additional layers:	n/a
Underlay:	Carpet underlay such as Dunlop Carpetmate Standard or similar
Floor slab:	200mm concrete
Ceiling cavity:	100mm **(Note 1)**
Cavity insulation:	n/a
Ceiling material:	10mm Superchek or 13mm Soundcheck (Note 2)
Notes 1. 2.	 The suspended ceiling must be fixed to light steel grid type system such as Rondo Key-lock or similar. With ceiling cavities in excess of 100mm, standard 13mm plasterboard could be used.

The impact isolation requirements and floor system recommendations also apply to external balconies that are situated above internal areas of another SOU below. The BCA also does not distinguish between habitable or non-habitable spaces, therefore, the above recommendations also apply to wet areas such as bathrooms etc.

Hard floor coverings such as tiles must not make contact with any walls or joinery such as kitchen benches, cupboards etc. Temporary spacers of 5-10mm should be used to isolate the floor covering from walls and/or joinery with the resulting gaps filled with a suitable mastic type sealant or off-cut of rubber underlay material.

Alternative floor/ceiling systems could be considered provided that the acoustic performance is tested or assessed by a consulting acoustical engineer to be compliant with the sound insulation performance requirements of the BCA.

The above floor systems have been assessed to comply with the BCA airborne and impact sound insulation requirements. **The 'for construction' floor systems should be re-assessed at the detailed design stage.**

Verification of installed acoustic performance should also be determined in accordance with the recommendations of Section 7.5 of this report.

6.3 SOIL, WASTE, WATER SUPPLY PIPES

Where a duct, soil, waste or water supply pipe is located within a wall or ceiling cavity and serves or passes through one or more SOU's, the following separation details may be used to comply with the required acoustic rating:

Table 7. Services in cavity wall or ceiling			
Option	**Rating**	**Documented source**	**System detail**
1	Rw + Ctr 25	CSR Red Book, Koikas Acoustics opinion	2 layers of 10mm plasterboard
2	Rw + Ctr 25	CSR Red Book	Acoustilag 45 and 13mm plasterboard wall/ceiling lining
3	Rw + Ctr 25	CSR Red Book	Unlagged pipes and 13mm Soundchek wall/ceiling lining. Alternatively, 2 layers of 16mm Fychek may be used as wall/ceiling lining
4	Rw + Ctr 40	CSR Red Book	Acoustilag 45 and 13mm Soundchek wall/ceiling lining. Alternatively, 2 layers of 16mm Fychek may be used as wall/ceiling lining
5	Rw + Ctr 40	Pyrotech Soundlag 4525C brochure	Soundlag 4525C and minimum 10mm plasterboard wall/ceiling lining
Notes: 1. 2. 3.	The acoustic lagging material may be excluded by using Rehau Raupiano Plus pipe system. All works should adhere to relevant manufacturers' specifications and requirements. Incorporating downlights into ceilings will impact on the acoustic rating of the partition system. Consultation should be made with an acoustic consultant in the event of downlights being proposed in the ceiling. The CSR Red Book provides some guidance on downlights being installed in a services partition system.		

The BCA further qualifies the acoustic requirements of services partitions with the following:

- Services must not be chased into concrete or masonry elements,
- An access door or panel must be firmly fixed to overlap the frame or rebate the frame by not less than 10mm and be fitted with proper sealing gasket along all edges and constructed of:
- Wood, particle board or block board not less than 38mm thick; or
- Compressed fibre reinforced cement sheeting not less than 9mm thick; or
- Other suitable material with a mass per unit area not less than 24kg/m2.
- A water supply pipe must only be installed in the cavity of discontinuous construction, and in the case of a pipe that serves only one SOU, must not be fixed to the wall leaf on the side adjoining any other SOU and have a clearance not less than 10mm to the other wall leaf.

6.4 SOUND ISOLATION OF PUMPS

A flexible coupling must be used at the point of connection between the service's pipes in a building and any circulation or another pump.

6.5 VERIFICATION OF ACOUSTIC PERFORMANCE

It is common for comparable floor/ceiling systems designs to achieve varying acoustic insulation and isolation ratings between buildings. This can be due to the quality of workmanship, attention to detail in sealing any penetrations, and the emergence of flanking sound transmission paths within a building. For this reason, one cannot categorically state that any partition will achieve a specific acoustic rating without conducting in-situ testing.

Koikas Acoustics recommend that in-situ testing is conducted on a representative, and fully installed floor/ceiling assembly (for all types of floor coverings – timber, tiles, carpet) to ensure adequate acoustic insulation and isolation is achieved, prior to installing all floors on all floor levels of the building.

7.0 CONCLUSION

Koikas Acoustics was requested to prepare an acoustic report for the proposed residential unit development at 20 & 22 Mindarie Street and 30 Pinaroo Place, Lane Cove North. The acoustic report is to accompany a development application being submitted to Lane Cove Municipal Council.

The assessment considers potential noise impacts to future occupants of the development, and to surrounding residents such that acceptable acoustic amenity for the area is maintained.

Acoustic planning levels have been referenced from current EPA, and BCA acoustic planning guidelines and requirements.

The included recommendations are based on designs prepared by Stanton Dahl Architects.

The conclusions reached in this report should assist the Council in making their determination of the proposal in terms of compliance with the necessary acoustic design requirements. A further detailed acoustic report may be required for the CC submission should the building design be amended, or as required by Council.

Of the assessed components of noise, the following conclusions have been reached:

1. A detailed assessment of mechanical plant noise should be prepared for the subject development prior to construction.
2. Acoustic treatment options for the common floors and services partitions included within this report would be adequate for satisfying the sound insulation provisions of the BCA.

In our professional opinion, there is sufficient scope within the proposed building design to achieve the applied acoustic planning guidelines.

APPENDIX A

APPENDIX A

APPENDIX A

Daily Rainfall (millimetres)

CHATSWOOD BOWLING CLUB

Station Number: 066011 · State: NSW · Opened: 1951 · Status: Open · Latitude: 33.80°S · Longitude: 151.18°E · Elevation: Unknown m

2020	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1st	*0*	*0*										
2nd	*0*	*0*										
3rd	*1.0*	*12.0*										
4th	*0*	*2.0*										
5th	*0*	*0*										
6th	*0*	*1.0*										
7th	*7.0*	*56.0*										
8th	*0*	*70.0*										
9th	*0*	*83.0*										
10th	*0*	*206.0*										
11th	*0*	*0*										
12th	*0*	*0*										
13th	*2.0*	*4.0*										
14th	*0*	*10.0*										
15th	*0*	*1.0*										
16th	*1.0*	*1.0*										
17th	*24.0*	*0*										
18th	*28.0*	*1.0*										
19th	*7.0*	*9.0*										
20th	*0*	*0*										
21st	*0*	*0*										
22nd	*0*	*0*										
23rd	*0*	*0*										
24th	*0*	*2.0*										
25th	*2.0*	*0*										
26th	*0*	*0*										
27th	*0*											
28th	*0*											
29th	*0*											
30th	*0*											
31st	*0*											
Highest daily	*28.0*	*206.0*										
Monthly Total	*72.0*											

↓ This day is part of an accumulated total
Quality control: 12.3 Done & acceptable, *12.3* Not completed or unknown

Product code: IDCJAC0009 reference: 57968876

Australian Government
Bureau of Meteorology

Daily Rainfall (millimetres)

CHATSWOOD BOWLING CLUB

Station Number: 066011 · State: NSW · Opened: 1951 · Status: Open · Latitude: 33.80°S · Longitude: 151.18°E · Elevation: Unknown m

Statistics for this station calculated over all years of data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	98.2	156.8	131.5	97.6	93.4	130.6	76.1	77.8	51.8	88.6	102.4	76.8
Median	72.4	131.0	106.0	64.5	48.6	102.0	54.5	51.6	44.0	59.0	62.7	69.0
Highest daily	*132.0*	*206.0*	153.7	*131.0*	166.4	131.6	122.4	*104.0*	*69.0*	123.2	178.3	71.6
Date of highest daily	29th 2013	10th 2020	10th 1958	21st 2015	2nd 1953	15th 1952	21st 1959	20th 2007	15th 2010	22nd 1960	19th 1961	19th 1955

1) Calculation of statistics

Summary statistics, other than the Highest and Lowest values, are only calculated if there are at least 20 years of data available.

2) Gaps and missing data

Gaps may be caused by a damaged instrument, a temporary change to the site operation, or due to the absence or illness of an observer.

3) Further information

http://www.bom.gov.au/climate/cdo/about/about-rain-data.shtml.

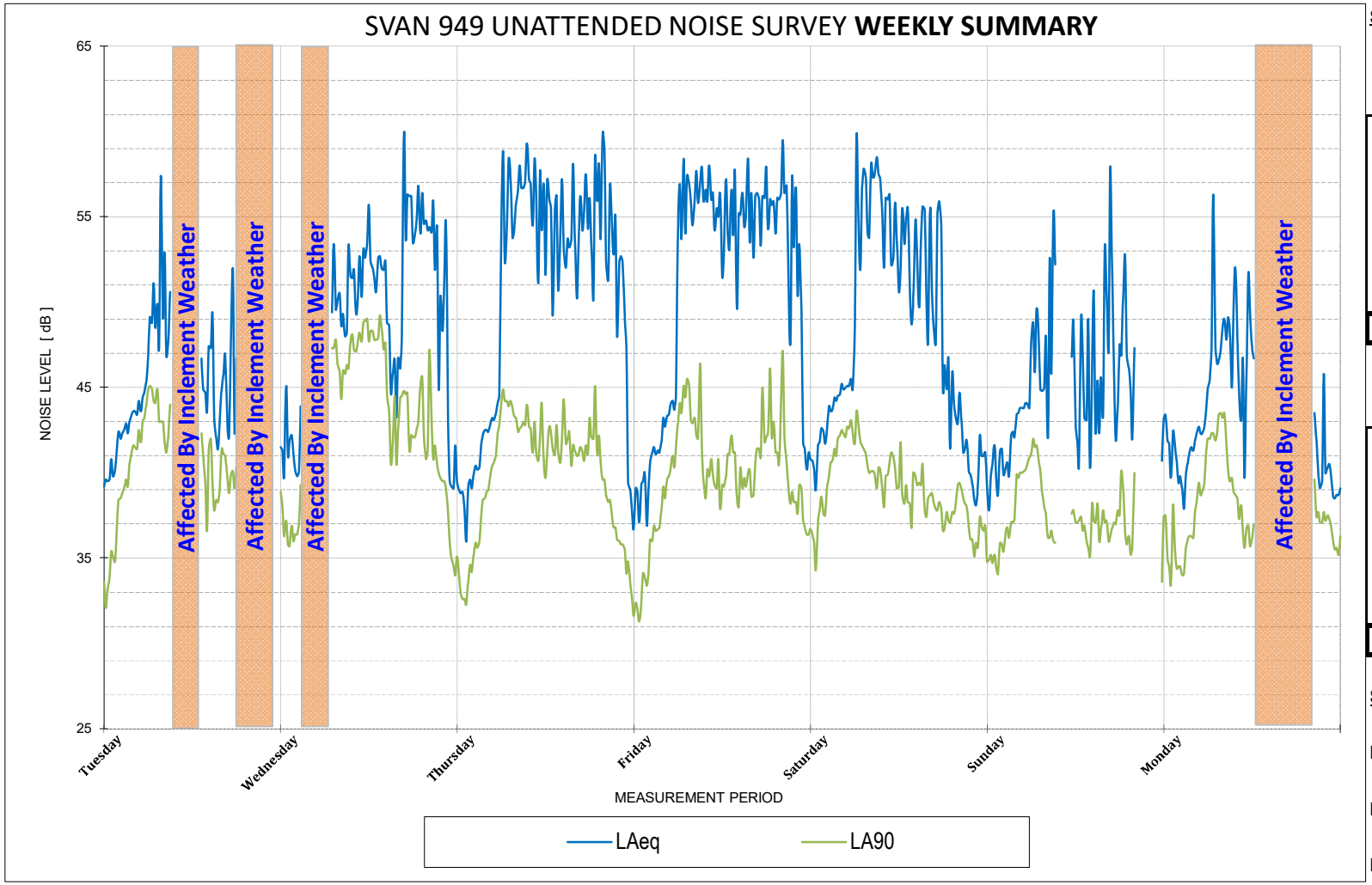
Product code: IDCJAC0009 reference: 57968876 Created on Wed 26 Feb 2020 16:30:17 PM EST

APPENDIX B

APPENDIX B

APPENDIX B

WEEKLY SUMMARY **LOGGER LOCATION:** 30 Pinaroo Place, Lane Cove North (Rear) **PERIOD:** 18th to the 24th February 2020



Sundays and Public Holidays the hours change to 0800

SUMMARY OF AMBIENT LEVELS

	LA90 Daytime	*LA90* Evening	*LA90* Night-time
Day 1	38	40	32
Day 2	42	40	35
Day 3	41	37	33
Day 4	38	38	31
Day 5	38	36	36
Day 6	36	35	34
Day 7	36	36	33
RBL	**38**	**37**	**33**

	LAeq Daytime	*LAeq* Evening	*LAeq* Night-time
Day 1	49	47	44
Day 2	52	54	42
Day 3	56	56	48
Day 4	56	56	49
Day 5	55	44	50
Day 6	49	48	43
Day 7	48	42	45
Average	**53**	**52**	**47**

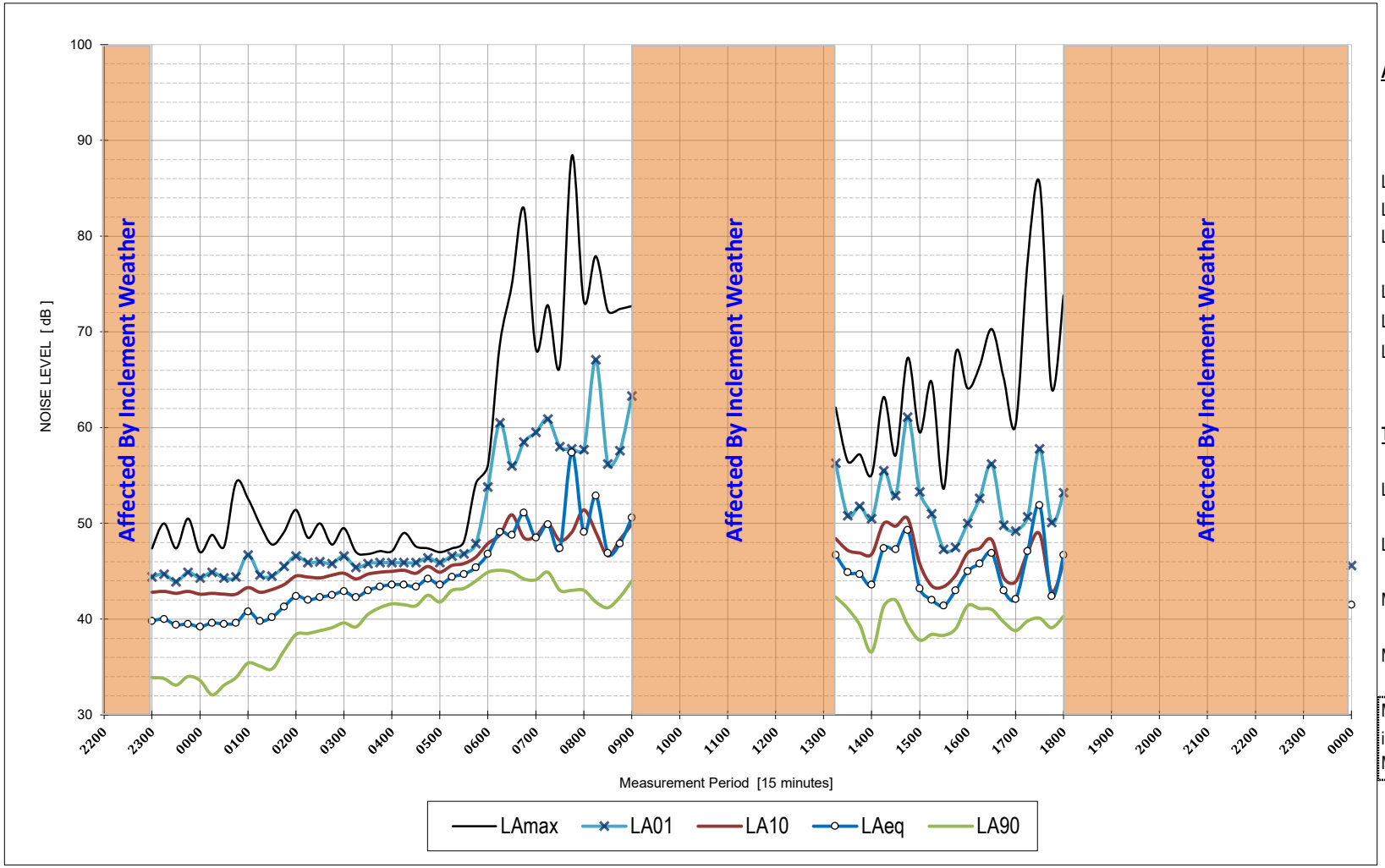
SUMMARY OF TRAFFIC LEVELS

LAeq 15 hrs	0700-2200	53	dB
LAeq 9 hrs	2200-0700	47	dB
Max LAeq 1 hr	0700-2200	55	dB
Max LAeq 1 hr	2200-0700	45	dB

Maximum noise events as defined in the Environmental Noise Management Manual 7 day average - [LAmax - LAeq ≥ 15]	6

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 1 **LOGGER LOCATION:** 30 Pinaroo Place, Lane Cove North (Rear) **DATE:** Tuesday, 18 February 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	38	dB
LA90 Evening	1800-2200	40	dB
LA90 Night-time	2200-0700	32	dB
LAeq Daytime	0700-1800	49	dB
LAeq Evening	1800-2200	47	dB
LAeq Night-time	2200-0700	44	dB

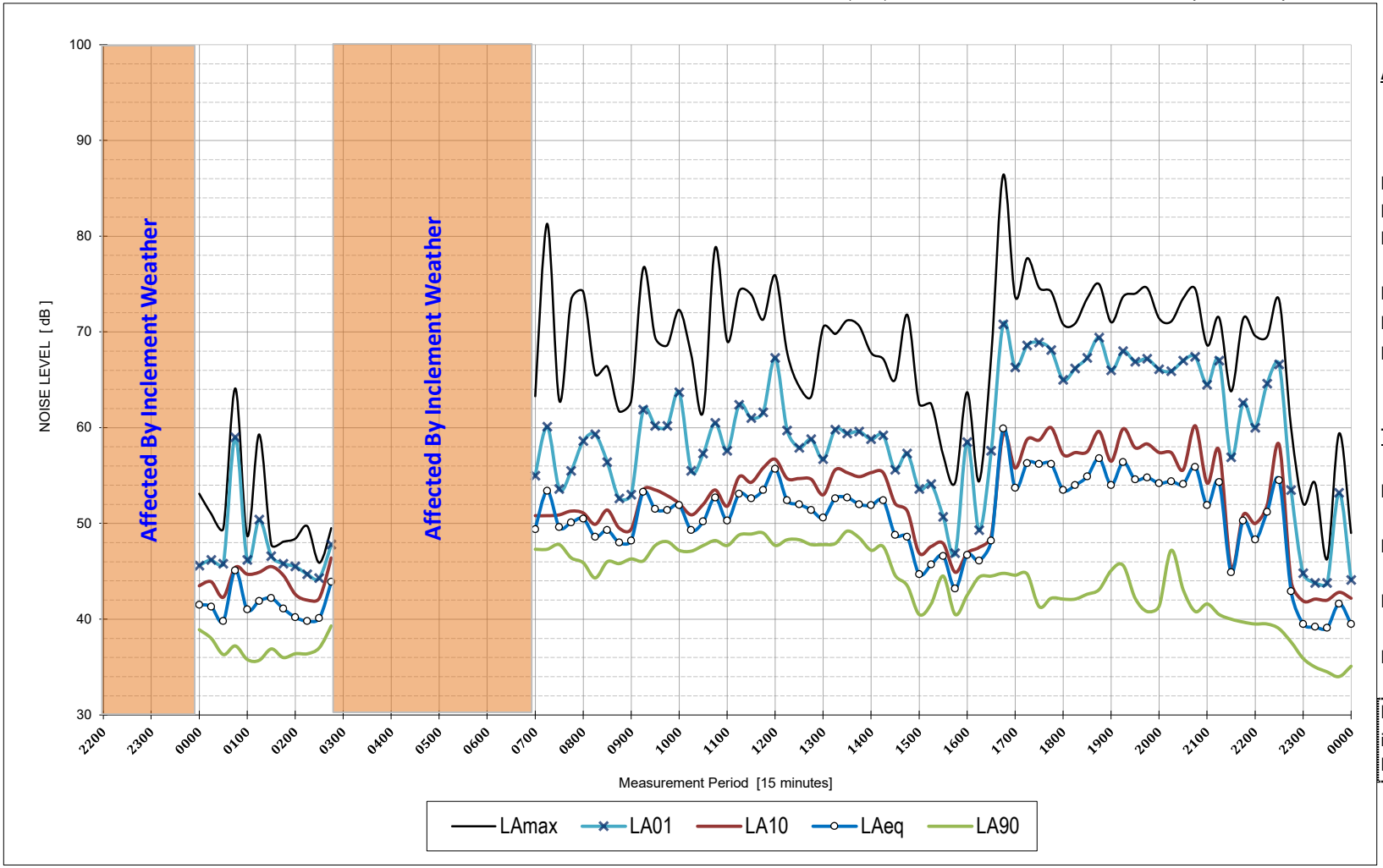
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	49	dB
LAeq 9 hours	2200-0700	44	dB
Max LAeq 1 hour	0700-2200	53	dB
Max LAeq 1 hour	2200-0700	45	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	3

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 2 **LOGGER LOCATION:** 30 Pinaroo Place, Lane Cove North (Rear) **DATE:** Wednesday, 19 February 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	42	dB
LA90 Evening	1800-2200	40	dB
LA90 Night-time	2200-0700	35	dB
LAeq Daytime	0700-1800	52	dB
LAeq Evening	1800-2200	54	dB
LAeq Night-time	2200-0700	42	dB

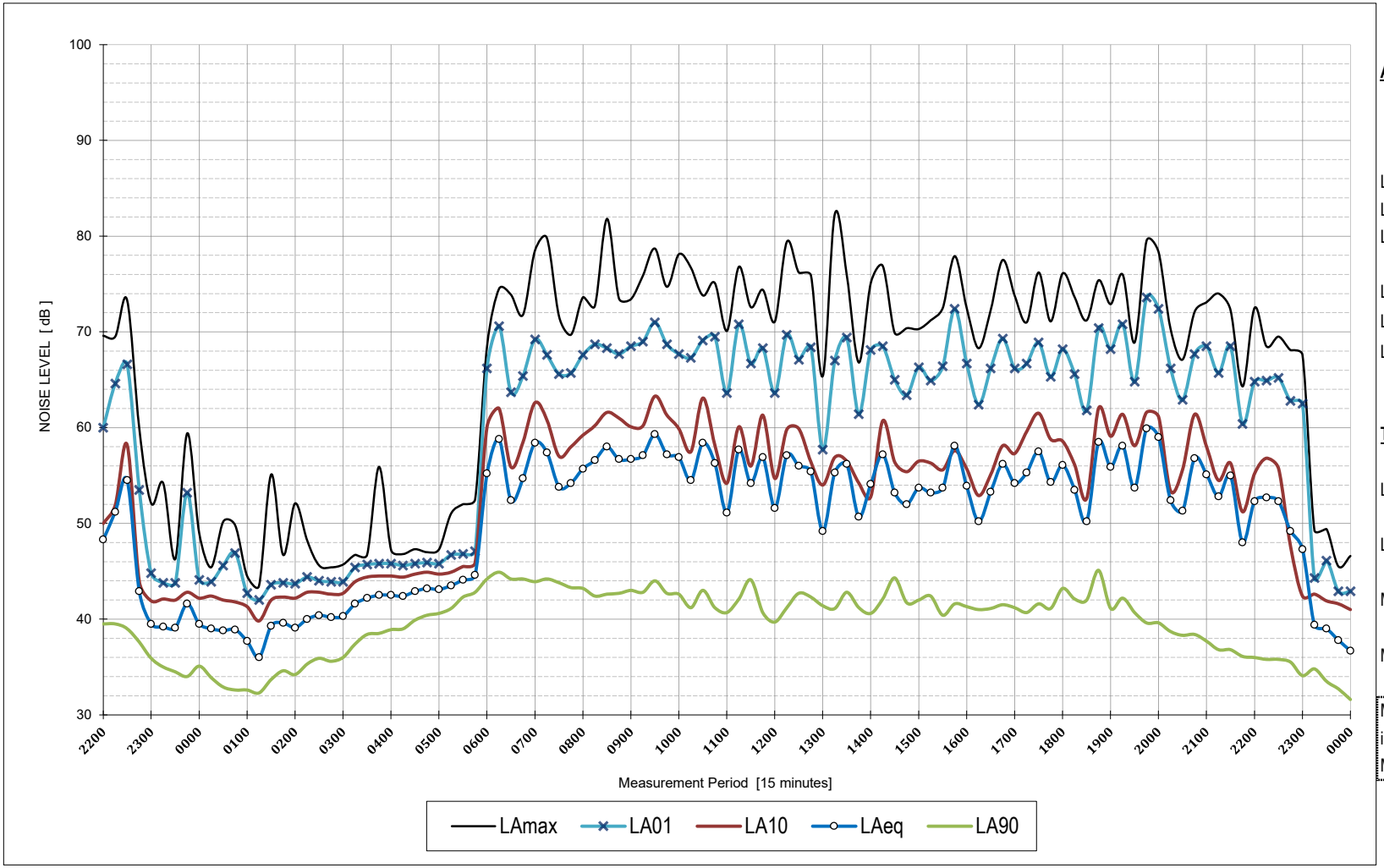
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	53	dB
LAeq 9 hours	2200-0700	42	dB
Max LAeq 1 hour	0700-2200	55	dB
Max LAeq 1 hour	2200-0700	42	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	2

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 3 **LOGGER LOCATION:** 30 Pinaroo Place, Lane Cove North (Rear) **DATE:** Thursday, 20 February 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	41	dB
LA90 Evening	1800-2200	37	dB
LA90 Night-time	2200-0700	33	dB
LAeq Daytime	0700-1800	56	dB
LAeq Evening	1800-2200	56	dB
LAeq Night-time	2200-0700	48	dB

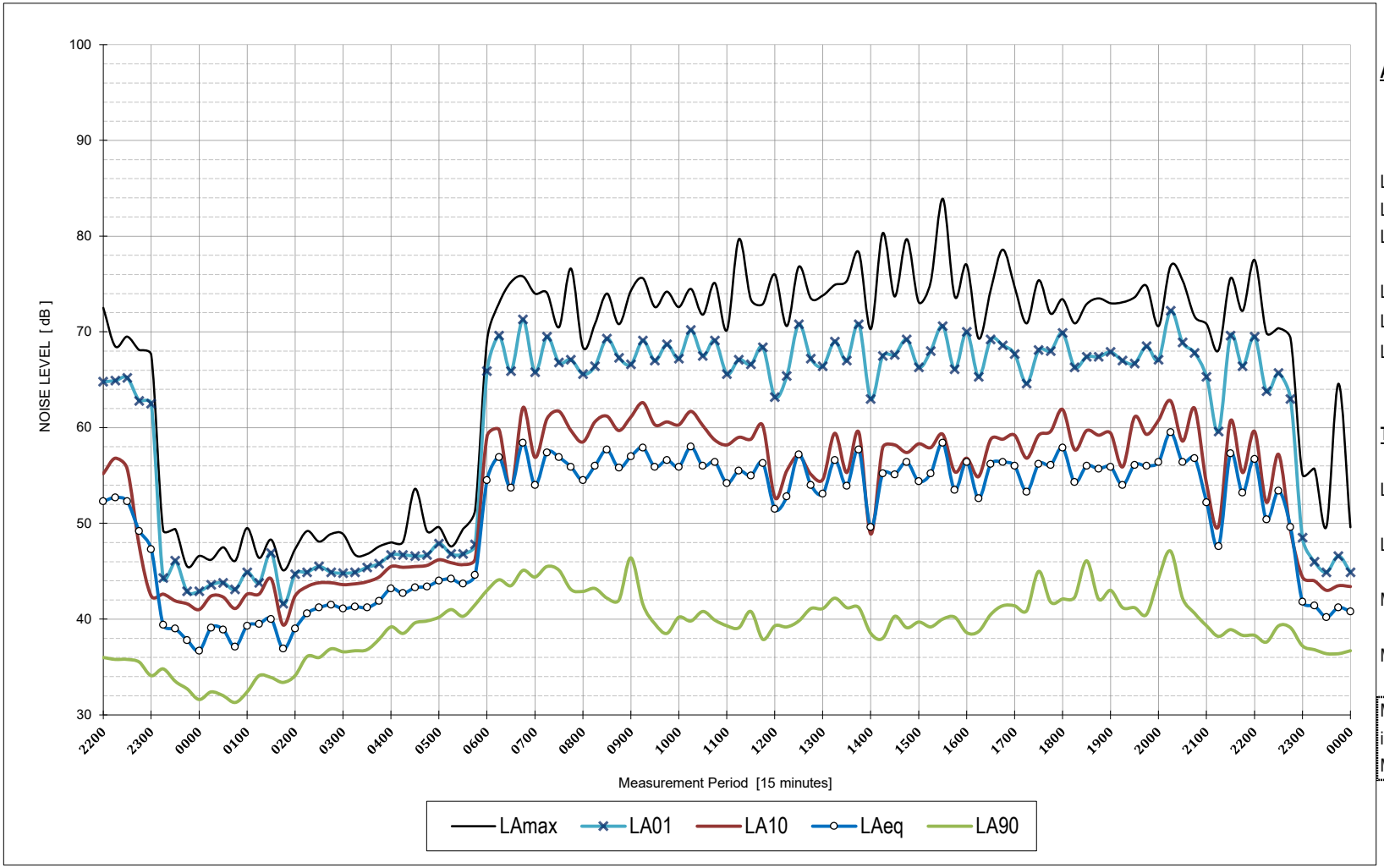
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	56	dB
LAeq 9 hours	2200-0700	48	dB
Max LAeq 1 hour	0700-2200	57	dB
Max LAeq 1 hour	2200-0700	51	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	10

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 4 **LOGGER LOCATION:** 30 Pinaroo Place, Lane Cove North (Rear) **DATE:** Friday, 21 February 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0800-1800	38	dB
LA90 Evening	1800-2200	38	dB
LA90 Night-time	2200-0800	31	dB
LAeq Daytime	0700-1800	56	dB
LAeq Evening	1800-2200	56	dB
LAeq Night-time	2200-0700	49	dB

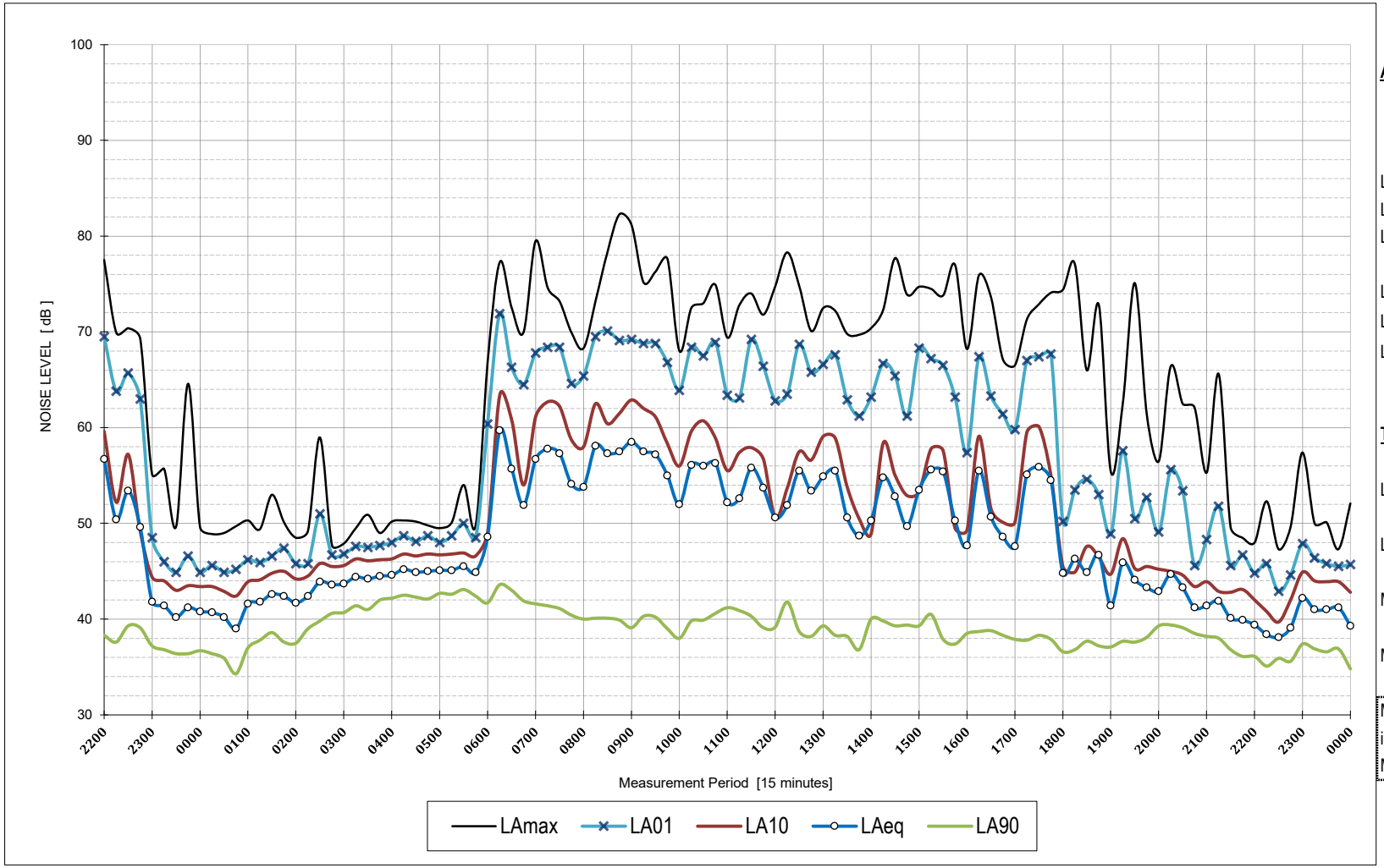
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	56	dB
LAeq 9 hours	2200-0700	49	dB
Max LAeq 1 hour	0700-2200	57	dB
Max LAeq 1 hour	2200-0700	52	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	8

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 5 **LOGGER LOCATION:** 30 Pinaroo Place, Lane Cove North (Rear) **DATE:** Saturday, 22 February 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	38	dB
LA90 Evening	1800-2200	36	dB
LA90 Night-time	2200-0700	36	dB
LAeq Daytime	0700-1800	55	dB
LAeq Evening	1800-2200	44	dB
LAeq Night-time	2200-0700	50	dB

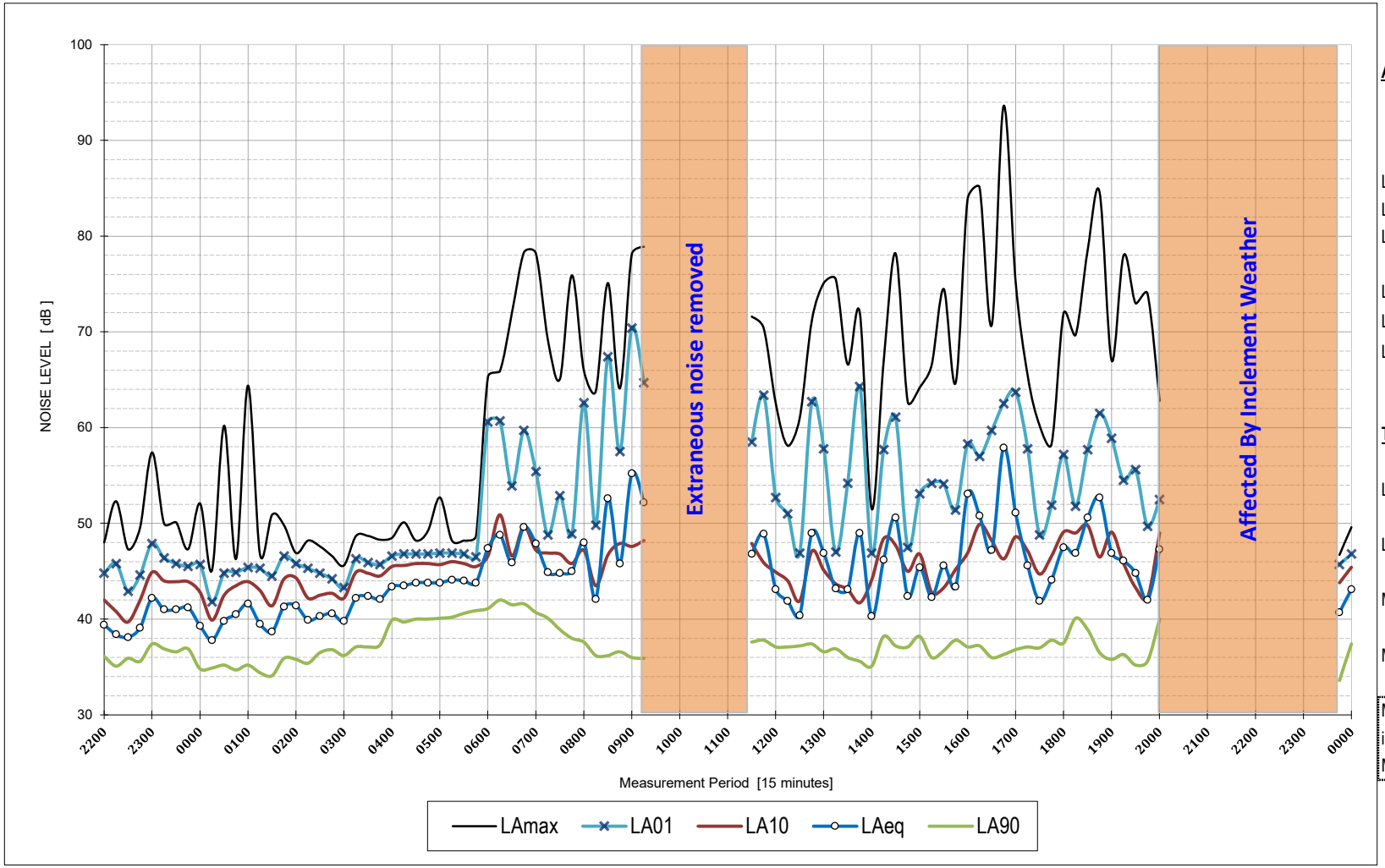
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	54	dB
LAeq 9 hours	2200-0700	50	dB
Max LAeq 1 hour	0700-2200	56	dB
Max LAeq 1 hour	2200-0700	53	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	10

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 6 **LOGGER LOCATION:** 30 Pinaroo Place, Lane Cove North (Rear) **DATE:** Sunday, 23 February 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	36	dB
LA90 Evening	1800-2200	35	dB
LA90 Night-time	2200-0700	34	dB
LAeq Daytime	0800-1800	49	dB
LAeq Evening	1800-2200	48	dB
LAeq Night-time	2200-0800	43	dB

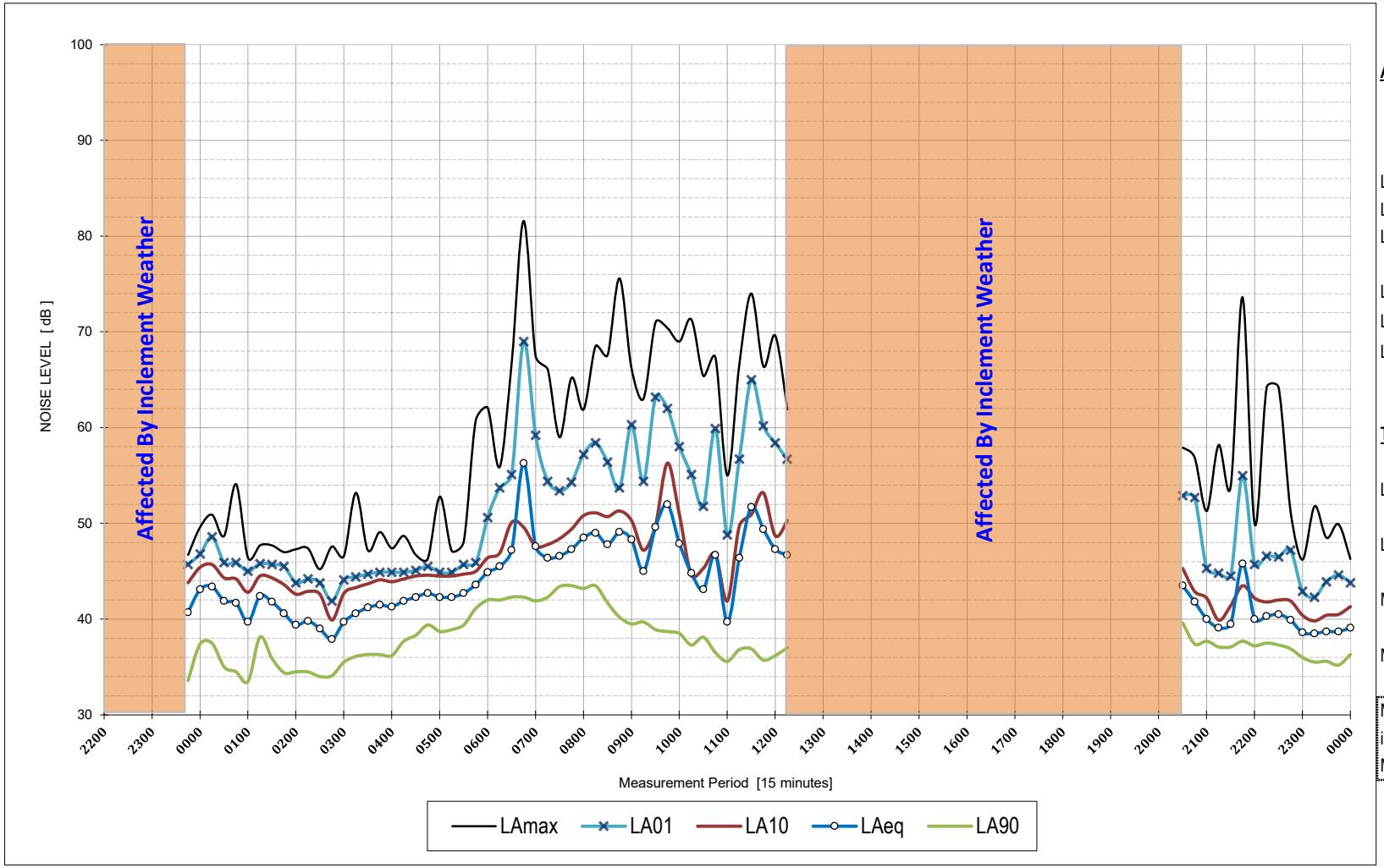
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	49	dB
LAeq 9 hours	2200-0700	43	dB
Max LAeq 1 hour	0700-2200	52	dB
Max LAeq 1 hour	2200-0700	45	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	7

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 7 **LOGGER LOCATION:** 30 Pinaroo Place, Lane Cove North (Rear) **DATE:** Monday, 24 February 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	36	dB
LA90 Evening	1800-2200	36	dB
LA90 Night-time	2200-0700	33	dB
LAeq Daytime	0700-1800	48	dB
LAeq Evening	1800-2200	42	dB
LAeq Night-time	2200-0700	45	dB

TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	47	dB
LAeq 9 hours	2200-0700	45	dB
Max LAeq 1 hour	0700-2200	49	dB
Max LAeq 1 hour	2200-0700	44	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	4

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

Commercial 1 (Unit 27)
637-645 Forest Road
Bexley NSW 2207

+612 9587 9702
office@koikasacoustics.com
www.koikasacoustics.com

DELIVERING SOUND ADVICE

ABN: 12 058 524 771

ACOUSTICAL REPORT – DA STAGE

(SUPPLEMENTARY DOCUMENT)

20-22 MINDARIE STREET & 30 PINAROO PLACE, LANE COVE NORTH NSW

Date: Tuesday, 15 December 2020

File Reference: 4060R20201215mfc20-22MindarieSt&30PinarooPlLaneCoveNorth_Additional_DAv2.docx

DOCUMENT CONTROL

Project title	Acoustical Report – DA Stage 20-22 Mindarie Street & 30 Pinaroo Place, Lane Cove North NSW
Project number	4060
Document reference	4060R20201215mfc20-22MindarieSt&30PinarooPlLaneCoveNorth_Additional_DAv2.docx
Document path	G:\Shared drives\KA Acoustics 2020\REPORT\Building General\4060 - 20-22 Mindarie St & 30 Pinaroo Pl, Lane Cove North\4060R20201215mfc20-22MindarieSt&30PinarooPlLaneCoveNorth_Additional_DAv2.docx

Version	Date	Author	Review	Notes
V1	11/12/2020	MFC	NK	Report available for DA issue (Supplementary DA document)
V2	15/12/2020	MFC	NK	Report available for DA issue (Supplementary DA document)

Approved by	Michael Fan Chiang, MAAS Acoustical Consultant
Client	BCL2 Limited Attention: Pau-Lahi Marshall E: pau.marshall@bluechp.com.au

ACOUSTICAL REPORT – DA STAGE

20-22 MINDARIE STREET & 30 PINAROO PLACE, LANE COVE NORTH

CONTENTS

TABLE OF APPENDICES

1.0 INTRODUCTION

Koikas Acoustics Pty Ltd was requested by BCL2 Limited to address the potential acoustic related issues raised by Lane Cove Council for the subject residential development at 20-22 Mindarie Street & 30 Pinaroo Place, Lane Cove North NSW.

As the supplementary supporting document for the Development Application (DA), the acoustic adequacy of the proposed design must be assessed in terms of standard planning guidelines issued by Council in their Local Environment Plan (LEP) and Development Control Plan (DCP), and also in terms of other standard planning guidelines related to common sources of noise.

As per the pre-DA lodgement Meeting Minutes – 6 July 2020, Koikas Acoustics has determined the following potential sources of noise and vibration require an acoustical assessment for the design stage:

1. **Traffic noise** associated with Epping Road (to the south) and its impact on future occupants of the development.
2. Noise emission from the **Rooftop Communal Open Space (COS)** and the resulting impact on the existing acoustical amenity of the local area.
3. **Construction noise & vibration management plan (CNVMP)** for minimising noise and vibration impact during construction.

This acoustical report presents the results and findings for the subject proposal. In-principle noise control recommendations are included (as required) so that the premises may operate in compliance with the nominated acoustical planning levels.

This acoustical report (to be submitted as a supplementary DA document) should be read in conjunction with the previous DA acoustical report prepared by Koikas Acoustics. Report references are provided below:

Report Ref: *4060R20200226pd20-22MindarieSt&30PinarooPlLaneCove_DA_V3*

Date: *13/11/2020*

Version: *V3*

Hereafter referred to as the DA acoustical report.

2.0 SITE DESCRIPTION

The development is proposed to occupy the site at 20-22 Mindarie Street & 30 Pinaroo Place, Lane Cove North NSW.

The application is for a multi-storey residential building consisting of:

- 2 basement parking levels and
- 30 residential units within 6 above-ground floor levels.

The current development design can be seen in architectural drawings as prepared by Stanton Dahl Architects, detailed in Table 1. All calculations and noise modelled scenarios conducted for this assessment are referenced to these architectural drawings.

Table 1. Design drawings used in the assessment

Drawing Title	Drawing No.	Revision	Date	Project No.
Site & External Works Plan	DA03	01	01/12/20	2088.16
Floor Plan – Basement L2	DA05	01	01/12/20	2088.16
Floor Plans – Basement L1	DA06	01	01/12/20	2088.16
Floor Plans – Ground Level	DA07	01	12/11/2020	2088.16
Floor Plans – Level 01	DA08	01	01/12/20	2088.16
Floor Plans – Level 02	DA09	01	01/12/20	2088.16
Floor Plans – Level 03	DA10	01	01/12/20	2088.16
Floor Plans – Level 04	DA11	01	01/12/20	2088.16
Floor Plans – Level 05	DA12	01	01/12/20	2088.16
Roof Floor Plan	DA13	01	01/12/20	2088.16
East Elevation – Pinaroo St.	DA14	01	01/12/20	2088.16
North Elevation – Mindarie St.	DA15	01	01/12/20	2088.16
West Elevation – Mindarie St.	DA16	01	01/12/20	2088.16
South Elevation	DA17	01	01/12/20	2088.16
Section S01	DA18	01	01/12/20	2088.16
Section S02	DA19	01	01/12/20	2088.16

Notes

1. Detailed above are the plans and drawings available at the time of assessment. Where design changes are made without the prior knowledge of Koikas Acoustics, our assessment results and conclusions published within this report may be incorrect.

The development location is situated in a primarily urban residential area. The subject site and surrounding properties are identified on the aerial photograph included as Figure 1.

Prevailing ambient noise conditions on-site and in the local area are generally the result of typical environmental noise such as distant traffic (from Epping Road to the south at approximately 160 m away from the southern boundary) and localised domestic noise sources.

Figure 1. Aerial photo of the subject site and surrounding area (Image source – SixMaps)

3.0 AMBIENT NOISE SURVEY

Existing external ambient noise levels were measured by installing a sound level meter data logger in the rear yard of 30 Pinaroo Place.

A Type 1 precision Svantek 949 noise logger was used for the survey. The installed location in the yard meant that the microphone was approximately 1.5 metres above the ground level and in free field conditions. This meter was placed to measure existing background noise levels that would be common for the residential area. Noise logger location is shown in figure 1.

The instrument was set-up to measure A-frequency and 'Fast' time-weighted noise levels. Noise level data was stored within the logger memory at 15-minutes intervals for one week between Tuesday 18th and Monday 24th February 2020.

Calibration readings were taken before and after each survey with a NATA calibrated and certified Larson Davis CAL200 precision acoustic calibrator. No system drifts were observed for this meter.

BOM (Bureau of Meteorology) weather records for the nearest available weather station indicate that inclement weather conditions adversely impacted the noise survey. All extraneous noise and inclement weather events were removed from the survey. Bureau of Meteorology weather reports is attached as **Appendix A**.

Table 2. Summary of noise logger results [dB]

Location	Period, T	Ambient noise level LAeq	Rating Background Level LA90
30 Pinaroo Place	Day	53	38
	Evening	52	37
	Night[1]	47	33

Notes

1: The NSW EPA NPI refers to,

Daytime: 7 am – 6 pm Monday to Saturday and 8 am to 6 pm Sunday and public holidays.

Evening: 6 pm – 10 pm Monday to Sunday

Night: 10 pm - 7 am Monday to Saturday and 10 pm to 8 am Sunday and public holidays..

Noise logger graphs are attached as **Appendix B**.

4.0 ROAD TRAFFIC NOISE IMPACT ASSESSMENT

4.1 ROAD TRAFFIC NOISE CRITERIA

As per Clause 102 of the State Environmental Planning Policy (ISEPP) (Infrastructure) 2007, hereafter referred to as ISEPP, development for the residential, place of public worship, hospital, educational facility or child care centre use must be designed to consider the indoor noise amenity of future occupants.

Where the development is for residential use, and the site is adjacent to a classified road that carries an annual daily traffic volume of more than 20,000 vehicles, and that the consent authority considered that it is likely to be impacted by road noise or vibration, maximum allowable indoor traffic noise levels are defined as:

- L_{Aeq} 35 dB in any bedroom in the building between the hours of 10 pm and 7 am.
- L_{Aeq} 40 dB elsewhere in the building (excluding a garage, kitchen bathroom or hallway) at any other time.

ISEPP requires that before any application is determined under which this clause applies, consideration must be given to guidelines that are issued by the Director-General. It is the understanding of Koikas Acoustics that the Director-General has issued guidelines relating to the determination of suitable indoor noise levels for development with open windows allowing natural ventilation of indoor areas. The Director-General has recommended under this condition (open windows) that indoor noise levels should not exceed:

- L_{Aeq} 45 dB in any bedroom in the building between the hours of 10 pm and 7 am.
- L_{Aeq} 50 dB elsewhere in the building (excluding a garage, kitchen bathroom or hallway) at any other time.

The NSW Department of Planning (DoP) supports the design targets of ISEPP and the Director-General guidelines within their road/rail noise guidelines (*Development near rail corridors and busy roads, Interim Guideline 2008*). The DoP guideline further defines the duration under which noise levels are assessed, being $L_{Aeq\ 9\ hours\ (10\ pm\ to\ 7\ am)}$ for bedrooms and $L_{Aeq\ 15\ hours\ (7\ am\ to\ 10\ pm)}$ elsewhere.

Neither the ISEPP nor DoP guidelines specifically define a target level for sleeping areas during daytime hours. To maintain a level of consistency between indoor traffic noise amenity in living and sleeping areas during daytime hours, an L_{Aeq} (15 hours) limit of 40 dB (windows and doors closed) and 50 dB (windows and doors open) is adopted by Koikas Acoustics. A summary of the applied rail noise planning levels is included in Table 3.

Table 3. Indoor design noise level [dB]

Design condition	Area	Noise metric	Day (7 am to 10 pm)	Night (10 pm to 7 am)
Windows/doors closed	Bedroom	LAeq (Day/Night)	40	35
Windows/doors closed	Living area	LAeq (Day/Night)	40	40
Windows/doors open	Bedroom	LAeq (Day/Night)	50	45
Windows/doors open	Living area	LAeq (Day/Night)	50	50

4.2 FAÇADE TRAFFIC NOISE LEVELS & RECOMMENDATIONS

The closest distance between the subject site boundary (southern boundary) and the nearest traffic lane of the main road, Epping Road is approximately 165 metres. Refer to Figure 2.

Following the initial investigation of the site location, the internal habitable rooms of the subject assessment site are not adversely affected by road traffic noise on account of the following reasons:

- The closest distance between the property boundary to the road kerb of Epping Road is approximately 165 metres, and
- Presence of screening objects (existing buildings and rocky barriers along Epping Road) situated between the assessment site and the main road (Epping Road).

Based on the above, it is Koikas Acoustics professional opinion that road traffic noise impact from Epping Road to the subject site is negligible and a detailed road traffic noise assessment is **not warranted**.

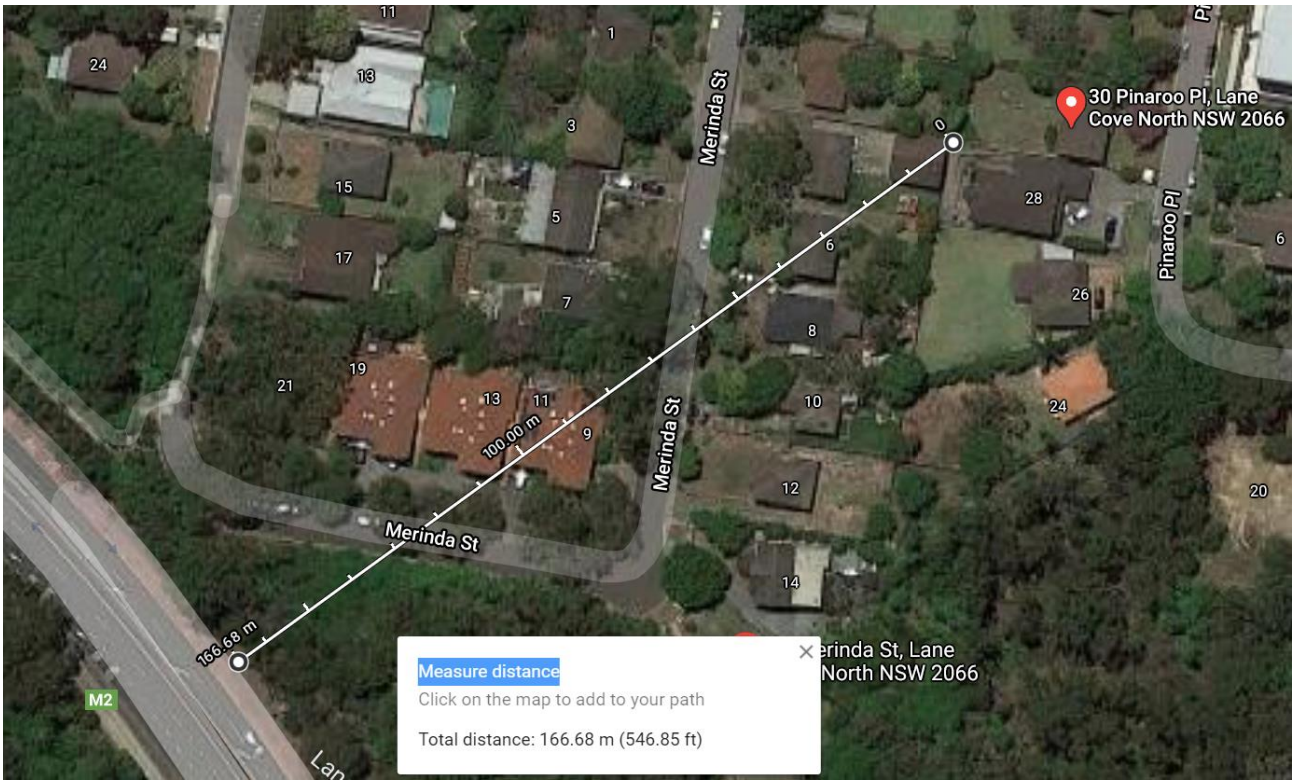


Figure 2. Site location and distance to the main road (Epping Road) – Image courtesy of Google Maps

Furthermore, the assessment site falls under Category 2 as defined by the document entitled "Development Near Rail Corridors and Busy roads – Interim Guideline" by NSW Government Department of Planning (NSW DoPI). Refer to Figure 3 below. As such, by achieving the minimum acoustic performance of building elements (Figure 4 of this report) and utilising the standard building materials (Figure 5 of this report), the proposed residential will be acoustically satisfactory for the Category 2 assessment site.

The below figures 3, 4 and 5 have been extracted from the "Development Near Rail Corridors and Busy roads – Interim Guideline".

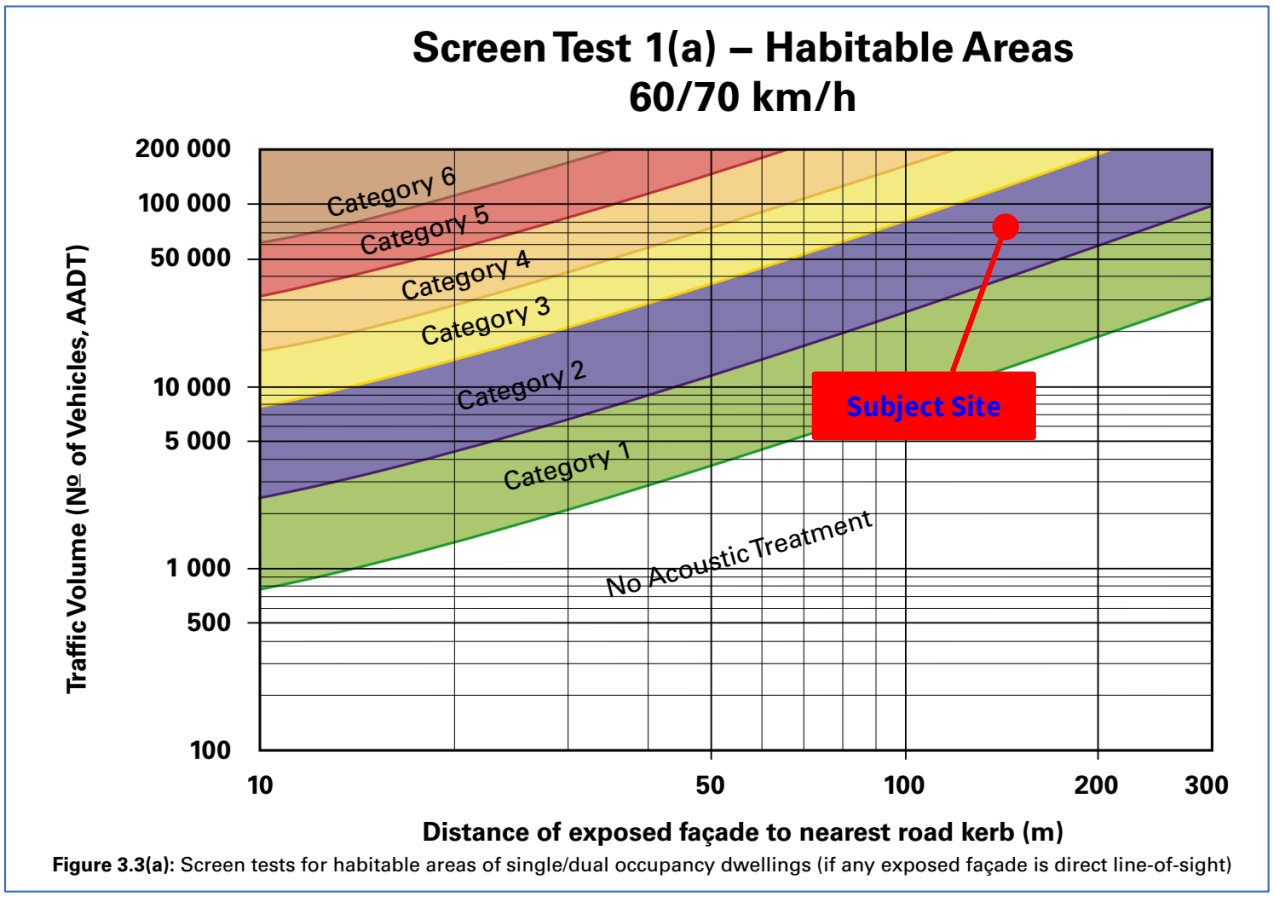


Figure 3. Subject site vs Category defined by NSW DoPI (extracted)

It's noted that based on the most recent traffic counting stations available from RMS, the estimated Annual Averaged Daily Traffic (AADT) is 70,000~80,000.

Category of Noise Control Treatment	R_w of Building Elements (minimum assumed)				
	Windows/Sliding Doors	Frontage Facade	Roof	Entry Door	Floor
Category 1	24	38	40	28	29
Category 2	27	45	43	30	29
Category 3	32	52	48	33	50
Category 4	35	55	52	33	50
Category 5	43	55	55	40	50

Figure 4. Acoustic performance of building elements – Category 2 is applicable (extracted)

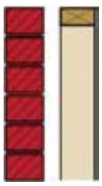
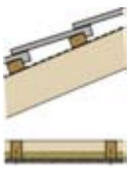
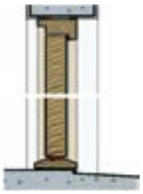
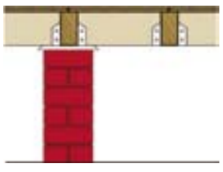
Category No.	Building Element	Standard Constructions	sample
2	**Windows/Sliding Doors**	Openable with minimum 6mm monolithic glass and full perimeter acoustic seals	
	Frontage Facade	**Timber Frame or Cladding Construction:** 6mm fibre cement sheeting or weatherboards or plank cladding externally, 90mm deep timber stud or 92mm metal stud, 13mm standard plasterboard internally with R2 insulation in wall cavity.	
		Brick Veneer Construction: 110mm brick, 90mm timber stud frame or 92mm metal stud, minimum 50mm clearance between masonry and stud frame, 10mm standard plasterboard internally.	
		Double Brick Cavity Construction: 2 leaves of 110mm brickwork separated by 50mm gap	
	Roof	Pitched concrete or terracotta tile or metal sheet roof with sarking, 10mm plasterboard ceiling fixed to ceiling joists, R2 insulation batts in roof cavity.	
	Entry Door	40mm solid core timber door fitted with full perimeter acoustic seals	
	Floor	1 layer of 19mm structural floor boards, timber joist on piers	
		Concrete slab floor on ground	

Figure 5. Standard constructions and building materials for Category 2 assessment sites (extracted)

5.0 ROOFTOP COMMUNAL OPEN SPACE (COS)

Koikas Acoustics was advised that there will be a maximum of 30 occupants/guests occupying the Rooftop Communal Open Space (COS). The associated noise sources considered in this noise assessment are speech level of 30 people and of which 50% (i.e. 15) of people are talking with normal vocal effort.

5.1 NOISE CRITERIA

5.1.1 Noise Policy for Industry 2017

The assessment procedures outlined in the Environment Protection Authority (EPA) Noise Policy for Industry (NPfI) 2017 have been adopted. The policy is designed to assess environmental noise impacts associated with scheduled activities prescribed within Schedule 1 of the POEO Act 1997. It is also commonly used as a reference tool for establishing suitable planning levels for noise generated by mechanical plant and equipment and noise emission from commercial operations.

The guideline applies limits on the short-term intrusive nature of a noise or noise-generating development (project intrusive noise level), as well as applying an upper limit on cumulative industrial noise emissions from all surrounding development/industry (project amenity noise level).

The most stringent of the project intrusive noise level and project amenity noise level is applied as the **project noise trigger level**. The project noise trigger level is the point, above which noise emission from a source or development site would trigger a management response.

To be able to define the more stringent of the intrusive and amenity noise levels, the underlying noise metrics must be the same. As the intrusive noise level is defined in terms of an $L_{Aeq\ 15\ minutes}$ and the amenity noise level is defined in terms of an $L_{Aeq\ Period}$, a correction +3dB correction is applied to the project amenity noise level to equate the $L_{Aeq\ Period}$ to $L_{Aeq\ 15\ minutes}$.

5.1.2 Project Noise Trigger Levels

Based on the above discussion, ambient noise survey results (Section 3.0) and the DA report, the adopted of noise criteria for COS are summarised below.

- $\mathbf{L_{Aeq,\ 15\ min}}$ **≤ 43 dB** during the daytime period;
- $\mathbf{L_{Aeq,\ 15\ min}}$ **≤ 42 dB** during the evening period, and

- **$L_{Aeq,\ 15\ min}$ ≤ 38 dB** during the night-time period.

The above noise criteria area applicable to external façades of the affected residential premises. The closest noise-affected residential premises are within the same development (on the top floor level) or at the residential building to the north.

5.2 SOUND SOURCE LEVELS

As shown on the architectural drawing (drawing no. DA 13 and Rev 1), there is a rooftop open communal space (COS) proposed for the subject development. Koikas Acoustics was advised that a maximum of 30 people are likely to occupy this area. This is a preliminary acoustic assessment based on the following assumptions:

- A maximum of 30 people is to occupy the COS.
- No speakers are to be placed outdoors.
- COS is closed during the night-time period between 2200 and 0700 hours.
- The associated noise sources considered for the COS are 30 people outdoors and 50% (i.e. 15 people) of people are talking with 'normal' vocal effort.

Table 4. Sound power levels – L_{wAeq} [dB]

Frequency [Hertz]	31.5	63	125	250	500	1000	2000	4000	8000	Total
Speech levels - **raised vocal effort (male)**	-	-	46	58	66	64	60	56	48	**69**
Speech levels - **normal vocal effort (male)**	-	-	42	53	61	58	54	51	43	**64**
Speech levels - **casual vocal effort (male)**	-	-	39	48	56	49	50	47	43	**58**

5.3 NOISE MODEL SCENARIO AND CALCULATED NOISE LEVEL RESULTS

A calibrated Cadna/A (computer software program) noise model was used to predict external façade noise levels resulting from the COS. It is noted, the noise levels may vary depending on the locations of people occupying this area. The predicted maximum external noise levels are:

- **L_{Aeq} 32 dB** to the residential premises along the northern side.
- **L_{Aeq} 32 dB** to the residential premises along the eastern side (top floor level of the subject building).
- L_{Aeq} 19 dB to the residential premises along the southern side (top floor level of the subject building).
- L_{Aeq} 23 dB to the residential premises along the western side (top floor level of the subject building).

All noise sensitive receiver locations have complied to the nominated daytime/evening external noise criteria of $L_{Aeq,15minutes}$ 42~43 dB.

Refer to **Appendix C** for CadnaA noise level map relating to predicted/calculated noise levels from COS.

5.4 RECOMMENDATIONS FOR ROOFTOP COMMUNAL OPEN SPACE (COS)

Based on the calculated maximum external noise levels of L_{Aeq} 32 dB from 30 people occupying the rooftop COS, no further noise mitigation measures are required. However, the above compliant noise levels were based on the following restrictions:

- The total capacity for the rooftop COS is not to exceed 30 people.
- No speakers are to be placed outdoors.
- The rooftop COS is open use during the daytime and evening period between 0700 and 2200 hours.

6.0 CONSTRUCTION NOISE AND VIBRATION PLAN OF MANAGEMENT

6.1 CONSTRUCTION NOISE

6.1.1 Construction Noise Criteria

Noise generated during excavation and construction works is assessed at surrounding residential receivers as per the Interim Construction Noise Guidelines (ICNG) (NSW DECCW, 2009).

The guideline recognises that construction and excavation works will at times generate noise that is audible at neighbouring sites. The primary focus is to provide a means of determining the severity of noise impacts at surrounding affected receiver locations and a framework for managing construction noise, generally through implementing best practice noise minimisation principles and facilitating communication between construction workers and the local community.

Small-scale construction projects/works generally do not require detailed calculations of noise emission.

For ongoing projects where surrounding receivers may be exposed to construction noise for periods exceeding three weeks, a more detailed assessment approach is adopted. In this case, a receiver is categorised by the likely community reaction to the level of noise, where some community reaction is expected at 10dB above the background level and strong community reaction is expected at levels exceeding 75dB(A).

Considering the construction noise criteria recommended in Interim Construction Noise Guidelines ($L_{A90,Period}$ + 10 dB for residential premises), the construction noise criterion applicable during the recommended standard construction hours* is **$L_{Aeq,\ 15\ min} \leq$ 48 dB**.

Recommended Standard Hours are:

- Monday to Friday 7 am to 6 pm
- Saturday 8 am to 1 pm
- No work on Sundays or public holidays

6.1.2 Construction noise sources and sound levels

In terms of noise emanating from typical construction activity, levels range depending on the process or

sources involved. Typical construction noise levels are included in *Australian Standard 2436-2010 Guide to noise and vibration control on construction, demolition and maintenance sites* and the *Department for Environment, Food and Rural Affairs (DEFRA – UK) Update of Noise Database for Prediction of Noise on Construction and Open Sites, December 2004.*

Table 5. Construction activity typical sound levels - [dB]		
Equipment	**Typical sound power level – Lw**	**Reference noise level – LAeq at 10m**
Circular saw	112	84
Angle grinder	108	80
Hand tools (pneumatic)	116	88
Trucks (dump)	117	89
22-tonne excavator	99	71
Excavator loading truck	107	79
Concrete pump	103	75
Concrete truck and pump	95	67

6.1.3 Calculated construction noise levels

The level of noise predicted at a specific receiver location is governed by the source noise level, the distance between the source and receiver, and the presence of any screening objects along the propagation path. The location of plant and equipment on construction sites are not always at a fixed point and, therefore, the distance between a noise source and receiver location can vary.

Koikas Acoustics has assessed each of the identified construction noise sources at the closest location (on the development site) to the noise-sensitive receivers. This results in the following shortest distances to nearby receiver locations:

- Approximately 18 metres to the residential property boundaries across Mindarie St to the north.
- Approximately 5~10 metres to the residential property boundary to the west and south.
- Approximately 15 metres to the residential property boundaries across Pinaroo Pl to the east.

Construction noise levels were calculated at the most noise-sensitive receiver locations. Construction noise levels will vary at times from those predicted in this report on account of plant and equipment being located at varying locations within the development site.

Table 6. Estimated construction noise levels to surrounding receivers – $L_{Aeq\ 15\ min}$ [dB]				
Equipment	**Noise assessment receiver location**			
	Residential to the north	**Residential to the west**	**Residential to the south**	**Residential to the east**
Circular saw	79	90	90	81
Angle grinder	75	86	86	77
Hand tools (pneumatic)	83	94	94	85
Trucks (dump)	84	95	95	86
22 tonne excavator	66	77	77	68
Excavator loading truck	74	85	85	76
Concrete pump	70	81	81	72
Concrete truck and pump	62	73	73	64
Criterion	**48**	**48**	**48**	**48**
Notes 1.	Predicted construction noise levels are estimates only due to the large variance in noise level generated by comparable plant performing similar tasks on different construction sites. Should complaints arise it may be necessary to survey noise being generated on-site to determine the actual working noise levels.			

Estimated construction noise levels in Table 6 do not consider acoustic screening from any existing boundary fences. Receivers that are screened from construction equipment by a boundary fence of approximately 1.8 metres in height, noise levels may be up to 5dB below those predicted.

Noise from construction is predicted to, at times, exceed the Noise Affected level (nominated construction noise criteria) of the ICNG at nearby premises. This is due to the proximity of the adjoining residences with the assessment site and the typical nature of noise associated with construction equipment.

It should be noted that the predicted levels consider construction noise levels being constant over a 15 minute assessment period with the equipment operating at maximum capacity. Therefore, calculated noise levels above should be considered as conservative. Given typical respite periods, we could reasonably expect construction noise levels to be up to 3 to 5dB lower than predicted.

6.2 VIBRATION ASSESSMENT

6.2.1 Construction Vibration

Section 4.4 of the ICNG states that "Human comfort vibration from construction works, including continuous, intermittent or impulsive vibration from construction, but excluding blasting, is to be assessed per Section 2.5 'Short-term works' in *Assessing Vibration – a technical guideline (DEC 2006)*".

The DEC vibration standard has been sourced from *British Standard 6472-1992 Evaluation of human exposure to vibration in buildings (1Hz to 80Hz).* The referenced table nominates preferred and maximum vibration dose values (VDV) that correlate with human annoyance at receiver sites of different classifications such as residential, education facilities etc.

Table 7. Acceptable vibration dose value for intermittent vibration (m/s$^{1.75}$), BS6472:1992

Location	Daytime		Night-time	
	Preferred values	Maximum values	Preferred values	Maximum values
Critical areas	0.1	0.2	0.1	0.2
Residences	0.2	0.4	0.13	0.26
Offices, schools, educational institutions, and places of worship	0.4	0.8	0.4	0.8
Workshops	0.8	1.6	0.8	1.6

A more critical assessment of vibration impacts may be related to structural damage to surrounding buildings. It is expected that the geotechnical engineer will specify a peak particle velocity limit not to be exceeded at the site boundary. Where this is not available, a guide to applicable structural damage criteria can be taken from *British Standard 7385-2:1993* and/or *German Standard DIN4150-3.*

BS7385-2:1993 recommends a maximum peak component particle velocity when measured at the base of the building of:

- 50mm/s for reinforced or framed structures – Industrial and heavy commercial buildings.
- 15mm/s for unreinforced or light framed structures – Residential or light commercial type buildings.

German standard DIN4150-3 recommends a maximum peak particle velocity of:

Table 8. DIN4150-3 guideline values for assessing short-term vibration effects					
Line	**Type of structure**	**Vibration velocity, v_i, in mm/s**			
		Foundation			**Plane of the floor of the uppermost full storey**
		At a frequency of			**Frequency mixture**
		Less than 10Hz	**10 to 50Hz**	**50 to 100Hz**	
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of a similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that, because of their particular sensitivity to vibration, do not correspond to those listed in lines 1 and 2 and are of great intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

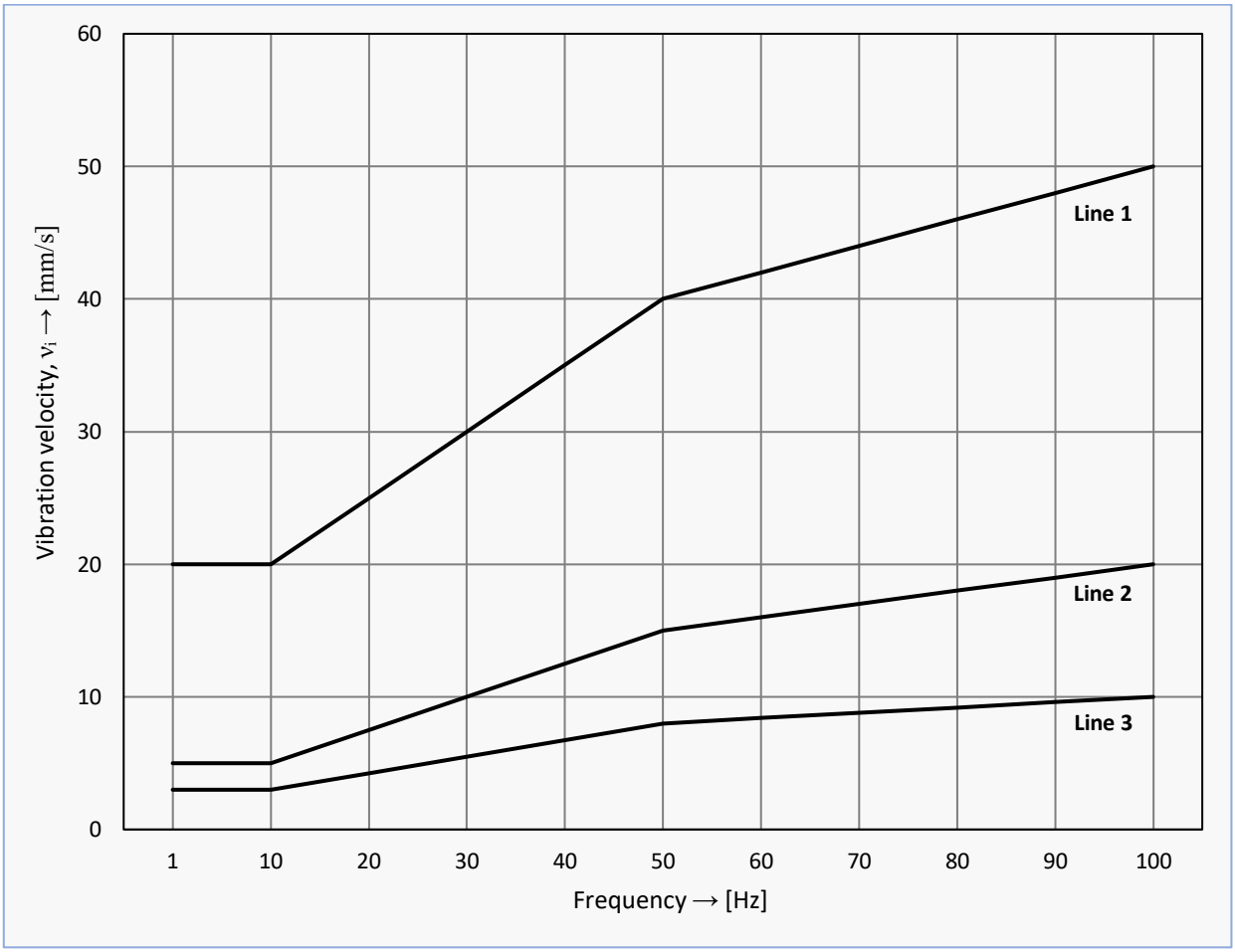


Figure 6. DIN4150-3 Curves representing guideline vibration velocity values at the building foundation

6.3 VIBRATION ASSESSMENT

Ground vibration during excavation and earthworks for the below-ground floor levels may impact adjoining building and the occupants within. The highest anticipated vibration levels will result from rock breaking or other impulsive-type excavation works (depending on the local geology).

Alternative work practices may be required to rock breaking (if any) along the southern and northern boundaries of the development site. Concrete sawing is an alternative to rock breaking that generates far less vibration and should be used for the removal of any existing concrete/rocky structure (if applicable) along the affected boundaries.

A guide to safe work distances for typical vibration generating construction works is given in Table 2 of the *Construction Noise and Vibration Guideline (RMS, 2016)*.

Table 9. Reproduced in part from Table 2 of the RMS construction noise and vibration guide

Plant item	Rating / Description	Minimum working distance	
		Cosmetic damage (BS7385)	Human response (Assessing vibration: A technical guideline)
Vibratory roller	< 50kN (Typically 1-2 tonnes)	5m	15m to 20m
	< 100kN (Typically 2-4 tonnes)	6m	20m
Small hydraulic hammer	300kg – 5 to 12t excavator	2m	7m
Medium Hydraulic Hammer	900kg – 12 to 18t excavator	7m	23m
Jackhammer	Handheld	1m (nominal)	2m

The vibration generated from an excavator removing site soil during earthworks for the basement is not expected to result in structural damage or human annoyance at nearby receivers.

6.4 NOISE & VIBRATION CONTROLS

The NSW Department of Environment, Climate Change and Water (DECCW) recognise that there is a need to balance the existing noise amenity of residents along with the necessity to continue growth within the region. The fundamental principle involved with the development and success of each noise policy is maintaining open and free channels of communications between developers and residents alike.

Construction noise policies are implemented to limit noise exposure for premises surrounding construction sites. Noise controls and mitigation strategies must be reasonable and feasible and applied

on a case-by-case basis to ensure the best possible outcome for all parties involved.

In urban and suburban residential areas, it is often the case that a construction site will share a boundary with another residential property. Due to proximity, construction noise levels will generally exceed any adopted criterion. For this particular development, construction noise levels could potentially significantly exceed the Noise Affected Level of the ICNG at times.

Minimising the impact of noise from construction sites to surrounding land uses can be achieved through treatment of the noise sources themselves, treating noise along its propagation path and/or by consulting with the community and scheduling noise intensive works during less noise-sensitive times of the day. Consideration needs to be given to each source in identifying the most practical and efficient noise controls where treatment is necessary.

Table C3 in AS2436-2010 states the relevant effects of various types of noise control measures typically employed on construction sites.

Table 10. AS2436-2010 Table C3 – Relative effectiveness of various forms of noise control

Controlled by	Nominal noise reduction possible, in total A-weighted sound pressure level LpA [dB]
Distance	Approximately 6 for each doubling of distance
Screening	Normally 5 to 10, maximum 15
Enclosure	Normally 15 to 25, maximum 50
Silencing	Normally 5 to 10, maximum 20

For this project, the following noise and vibration controls could be implemented to help maintain suitable noise and vibration amenity for surrounding land uses:

- The use of moveable screens for specific work practices could achieve noise reductions of Table 10. The screens would have to be moveable where noise sources are not stationary within the construction site. This may not be required or practical depending on the location and the model type of the plant/equipment.
- Providing an acoustic type hoarding along the site boundary will also lower noise levels, however, the benefit would only be realised by residents on the ground floor level of adjoining buildings.
- Exhaust silencers could be considered to motorised plant and equipment such as the excavators. Silenced plant and equipment could lower noise emission from the exhaust system by 5 to 10dB. This may not be required or practical depending on the location and the model type of the

plant/equipment.

- Undertake construction works during standard hours as defined in the ICNG.
- Use appropriately sized plant and equipment.
- Identify when high noise-generating activities are likely to take place and conducting this work during times of least noise sensitivity as agreed through community consultation. Having open lines of communication with residents and appropriate scheduling of works on construction sites are processes recommended in the NSW ICNG.
- To minimise vibration from rock breaking, it is recommended that a hydraulic hammer attachment with a pointed 'cone' type hammer is used in place of a flat 'block' type hammer.
- The minimum work distances as tabled within this report should always be observed, especially regarding structural damage guidelines.
- Continuous vibration monitoring surveys may be considered during excavation to ensure vibration levels do not reach a point where the structural integrity of surrounding buildings is compromised. Vibration monitors can be set to measure either the peak particle velocity or r.m.s. acceleration at the site boundary where a design vibration limit is specified by the Geotech engineer or as a Vibration Dose Value within adjoining residential buildings. Measuring vibration within the adjoining residential building will require significant cooperation from the tenants/occupants.
- Progress noise monitoring could also be conducted during construction works to provide feedback to site managers as to the level of noise being emitted from the site.

Whether the above noise control measures can be practically included during construction will depend on the location of the plant, type of plant, construction program schedule and neighbours' responses to noise.

The proactive and close communication with neighbours can also effectively reduce the noise disturbances to surrounding residents/occupants.

The noise sources on construction sites are rarely stationary and plant/equipment utilised would vary on daily basis, therefore, it is not feasible to have any noise and vibration control measures set and form as part of the requirement at this stage. It is recommended to include noise and vibration monitoring during construction as part of the management for noise and vibration control and minimisation. Feasible and reasonable noise & vibration measures can then be provided based on the real-time monitoring results and construction activities schedule (this can only be known at a later stage).

6.5 COMPLAINTS HANDLING

A site contact and phone number should be distributed to all surrounding premises and displayed on the site notice-board for any complaints arising due to noise and/or vibration generated during construction works. The site should have clear complaints handling procedures and staff who are well-versed in the complaints handling procedures.

A register of all complaints must be kept on-site and be readily available. Details within the complaints register should include, but not be limited to:

- Date and time of the complaint,
- The person receiving a complaint,
- Complainant phone number,
- Site contact who the complaint was referred to for action,
- Description of the complaint,
- Action to be taken,
- The time frame for action to be implemented.

All complaints should be given a fair hearing and adequately investigated. This may involve scheduling a relevant consultant to substantiate or refute any received complaint, and/or verifying any remedial action taken by the site manager by way of on-site testing.

7.0 SUMMARY AND CONCLUSION

Koikas Acoustics Pty Ltd was requested by BLC2 Limited to provide this supplementary document for DA submission to address the potential noise impact as the results of the proposed residential development at 20-22 Mindarie Street & 30 Pinaroo Place, Lane Cove North NSW.

The development is subject to approval by the Lane Cove Council to ensure the development complies with all relevant statutory requirements and is consistent with the development standards required in the respective Local Government Area. A further detailed acoustical report may be required for the CC submission should the building design be amended, or as required by Council.

As per the pre-DA lodgement Meeting Minutes – 6 July 2020, our assessment concludes the following concerning the assessed components of noise:

1. **Road noise assessment**

   The potential road traffic noise-related impact to internal habitable spaces of the subject site has been adequately addressed and the standard building materials have been nominated in this report (**Section 4.2**). No further consideration is required for road traffic noise intrusion to the proposed residential development.

2. **Rooftop Communal Open Space (COS)**

   The calculated maximum noise level of 30 people occupying outdoor dining areas was found to be L_{Aeq} 32 dB and comply with the nominated noise criteria. Recommended operating restrictions have been nominated in this report (**Section 5.4**) and will achieve the desired noise reductions to comply with the nominated noise criteria for this space.

3. **Noise & vibration management plan**

   The predicted construction noise levels from the subject premise for the proposed construction activities will not achieve the nominated construction noise criterion to many receiver locations. This is consistent with the DECCW's expectations and therefore reasonable and feasible noise and vibration mitigation measures as stated in **Section 6.4 & 6.5** of this report will be required to be implemented to minimise impacts to surrounding occupants.

In our professional opinion, there is sufficient scope within the proposed building design to accommodate acoustic design requirements discussed in this report.

Including the recommended acoustic treatments and management policies/restrictions that are identified in this report will ensure that noise generated from the use and occupation of the proposed residential development at 20-22 Mindarie Street & 30 Pinaroo Place, Lane Cove North will result in minimal acoustic amenity impacts to residents in the local area and comply with relevant noise criteria.

The noise-related issues raised in the pre-DA lodgement Meeting Minutes – 6 July 2020 have been adequately addressed.

APPENDIX A

APPENDIX A

APPENDIX A

Daily Rainfall (millimetres)

CHATSWOOD BOWLING CLUB

Station Number: 066011 · State: NSW · Opened: 1951 · Status: Open · Latitude: 33.80°S · Longitude: 151.18°E · Elevation: Unknown m

2020	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1st	*0*	*0*										
2nd	*0*	*0*										
3rd	*1.0*	*12.0*										
4th	*0*	*2.0*										
5th	*0*	*0*										
6th	*0*	*1.0*										
7th	*7.0*	*56.0*										
8th	*0*	*70.0*										
9th	*0*	*83.0*										
10th	*0*	*206.0*										
11th	*0*	*0*										
12th	*0*	*0*										
13th	*2.0*	*4.0*										
14th	*0*	*10.0*										
15th	*0*	*1.0*										
16th	*1.0*	*1.0*										
17th	*24.0*	*0*										
18th	*28.0*	*1.0*										
19th	*7.0*	*9.0*										
20th	*0*	*0*										
21st	*0*	*0*										
22nd	*0*	*0*										
23rd	*0*	*0*										
24th	*0*	*2.0*										
25th	*2.0*	*0*										
26th	*0*	*0*										
27th	*0*											
28th	*0*											
29th	*0*											
30th	*0*											
31st	*0*											
Highest daily	*28.0*	*206.0*										
Monthly Total	*72.0*											

↓ This day is part of an accumulated total
Quality control: 12.3 Done & acceptable, *12.3* Not completed or unknown

Product code: IDCJAC0009 reference: 57968876

Australian Government
Bureau of Meteorology

Daily Rainfall (millimetres)

CHATSWOOD BOWLING CLUB

Station Number: 066011 · State: NSW · Opened: 1951 · Status: Open · Latitude: 33.80°S · Longitude: 151.18°E · Elevation: Unknown m

Statistics for this station calculated over all years of data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	98.2	156.8	131.5	97.6	93.4	130.6	76.1	77.8	51.8	88.6	102.4	76.8
Median	72.4	131.0	106.0	64.5	48.6	102.0	54.5	51.6	44.0	59.0	62.7	69.0
Highest daily	*132.0*	*206.0*	153.7	*131.0*	166.4	131.6	122.4	*104.0*	*69.0*	123.2	178.3	71.6
Date of highest daily	29th 2013	10th 2020	10th 1958	21st 2015	2nd 1953	15th 1952	21st 1959	20th 2007	15th 2010	22nd 1960	19th 1961	19th 1955

1) Calculation of statistics

Summary statistics, other than the Highest and Lowest values, are only calculated if there are at least 20 years of data available.

2) Gaps and missing data

Gaps may be caused by a damaged instrument, a temporary change to the site operation, or due to the absence or illness of an observer.

3) Further information

http://www.bom.gov.au/climate/cdo/about/about-rain-data.shtml.

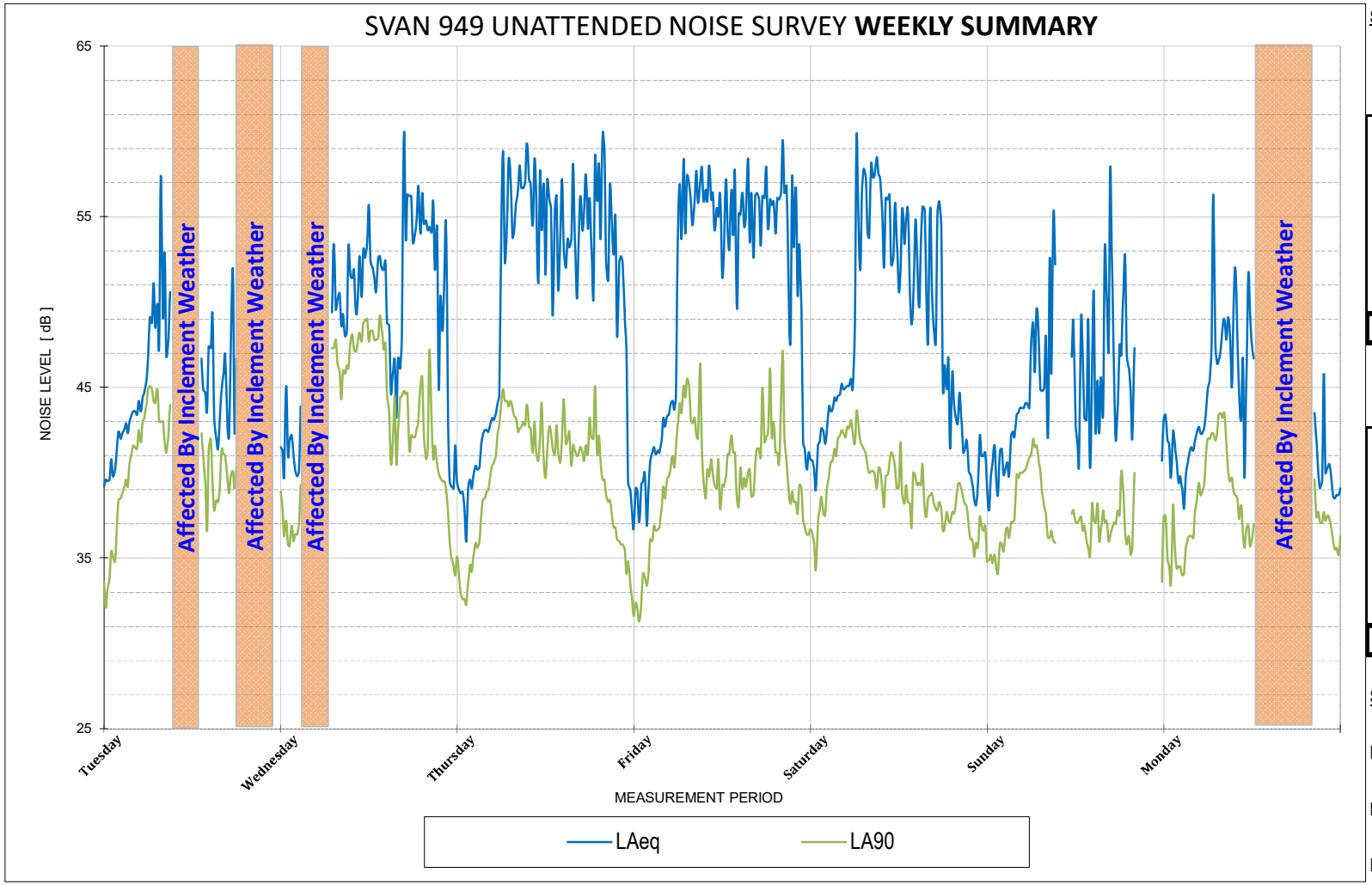
Product code: IDCJAC0009 reference: 57968876 Created on Wed 26 Feb 2020 16:30:17 PM EST

APPENDIX B

APPENDIX B

APPENDIX B

WEEKLY SUMMARY **LOGGER LOCATION:** 30 Pinaroo Place, Lane Cove North (Rear) **PERIOD:** 18th to the 24th February 2020



Sundays and Public Holidays the hours change to 0800

SUMMARY OF AMBIENT LEVELS

	LA90 Daytime	*LA90* Evening	*LA90* Night-time
Day 1	38	40	32
Day 2	42	40	35
Day 3	41	37	33
Day 4	38	38	31
Day 5	38	36	36
Day 6	36	35	34
Day 7	36	36	33
RBL	**38**	**37**	**33**

	LAeq Daytime	*LAeq* Evening	*LAeq* Night-time
Day 1	49	47	44
Day 2	52	54	42
Day 3	56	56	48
Day 4	56	56	49
Day 5	55	44	50
Day 6	49	48	43
Day 7	48	42	45
Average	**53**	**52**	**47**

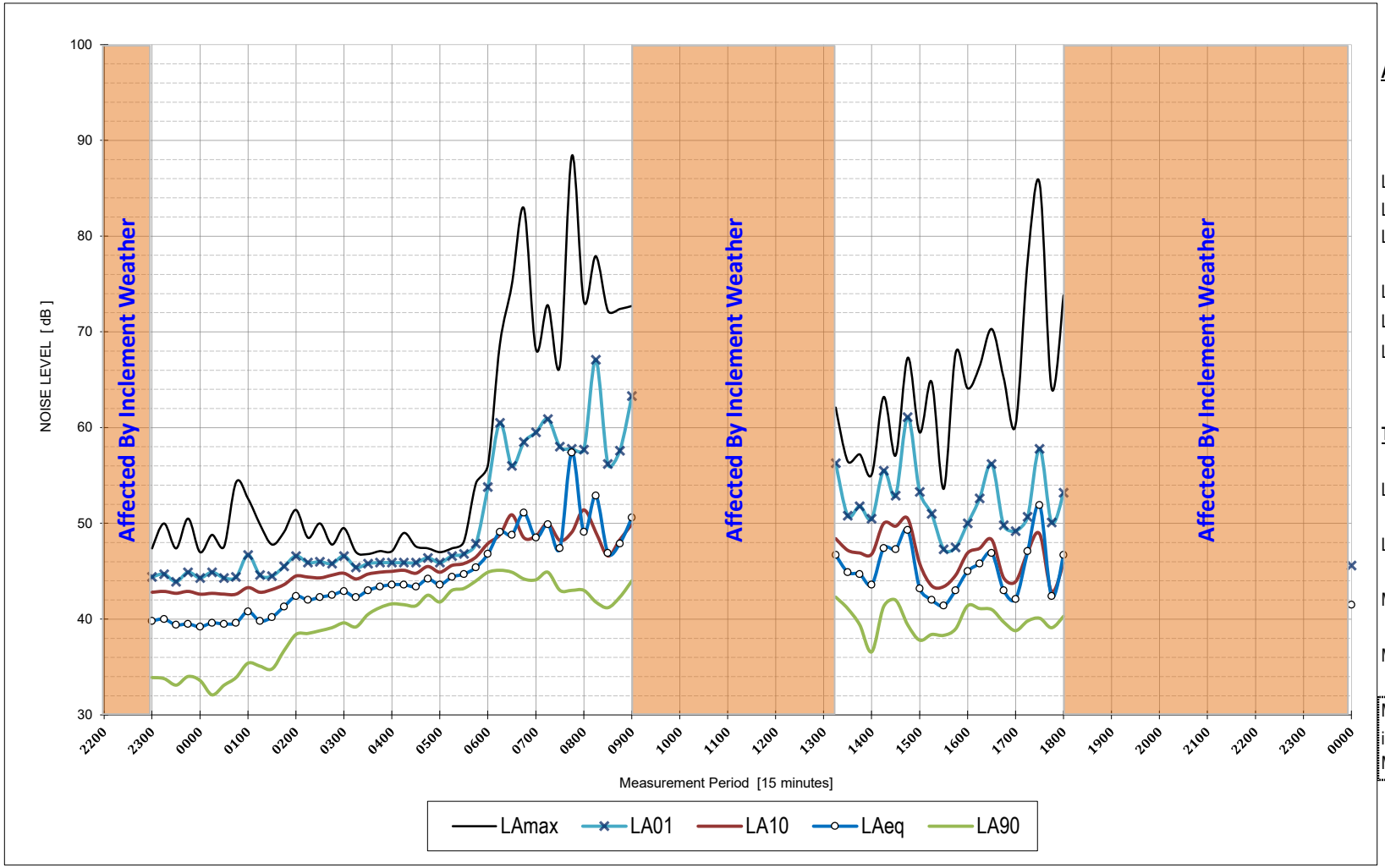
SUMMARY OF TRAFFIC LEVELS

LAeq 15 hrs	0700-2200	53	dB
LAeq 9 hrs	2200-0700	47	dB
Max LAeq 1 hr	0700-2200	55	dB
Max LAeq 1 hr	2200-0700	45	dB

Maximum noise events as defined in the Environmental Noise Management Manual 7 day average - [LAmax - LAeq ≥ 15]	6

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 1 **LOGGER LOCATION:** 30 Pinaroo Place, Lane Cove North (Rear) **DATE:** Tuesday, 18 February 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	38	dB
LA90 Evening	1800-2200	40	dB
LA90 Night-time	2200-0700	32	dB
LAeq Daytime	0700-1800	49	dB
LAeq Evening	1800-2200	47	dB
LAeq Night-time	2200-0700	44	dB

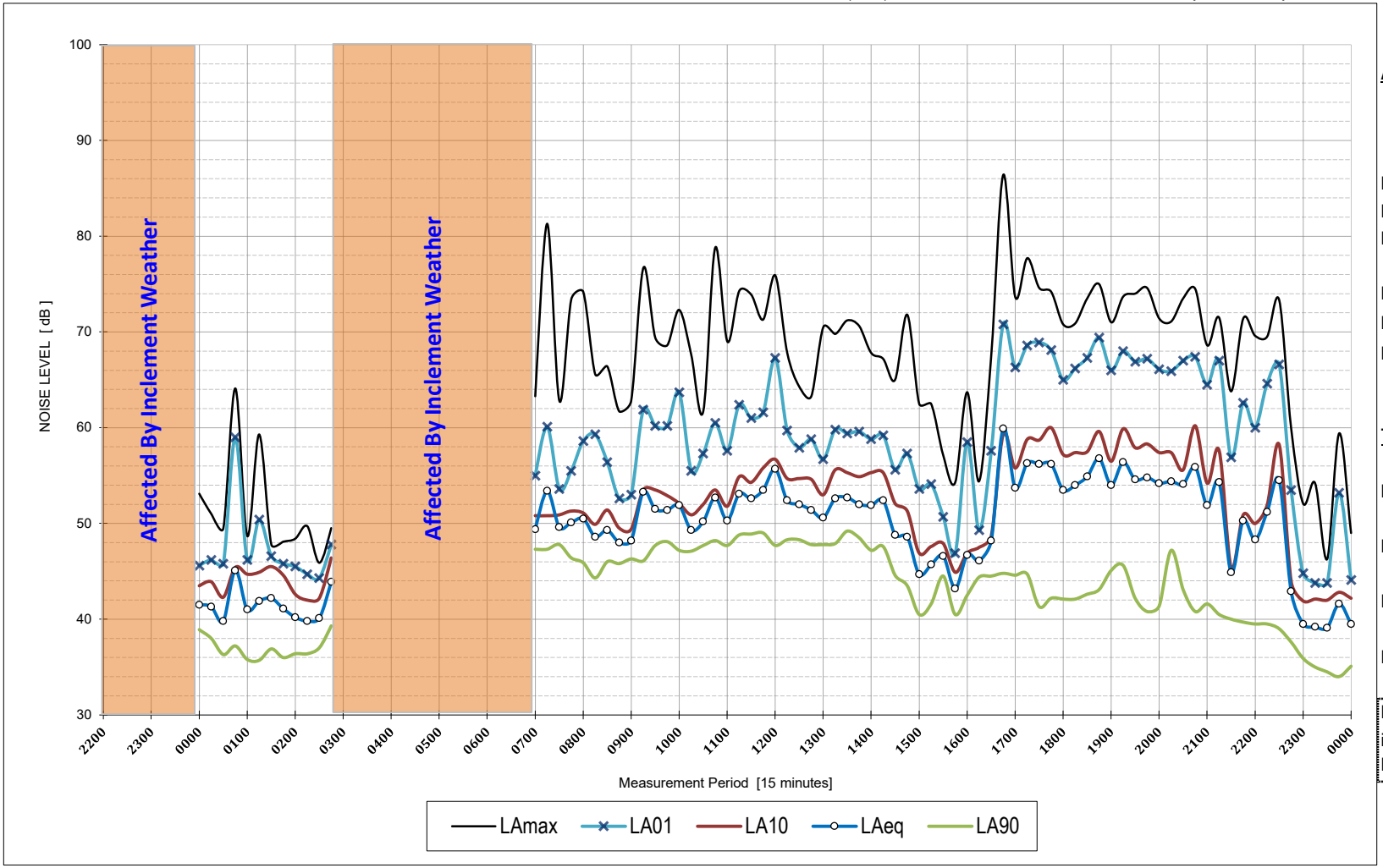
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	49	dB
LAeq 9 hours	2200-0700	44	dB
Max LAeq 1 hour	0700-2200	53	dB
Max LAeq 1 hour	2200-0700	45	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	3

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 2 **LOGGER LOCATION:** 30 Pinaroo Place, Lane Cove North (Rear) **DATE:** Wednesday, 19 February 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	42	dB
LA90 Evening	1800-2200	40	dB
LA90 Night-time	2200-0700	35	dB
LAeq Daytime	0700-1800	52	dB
LAeq Evening	1800-2200	54	dB
LAeq Night-time	2200-0700	42	dB

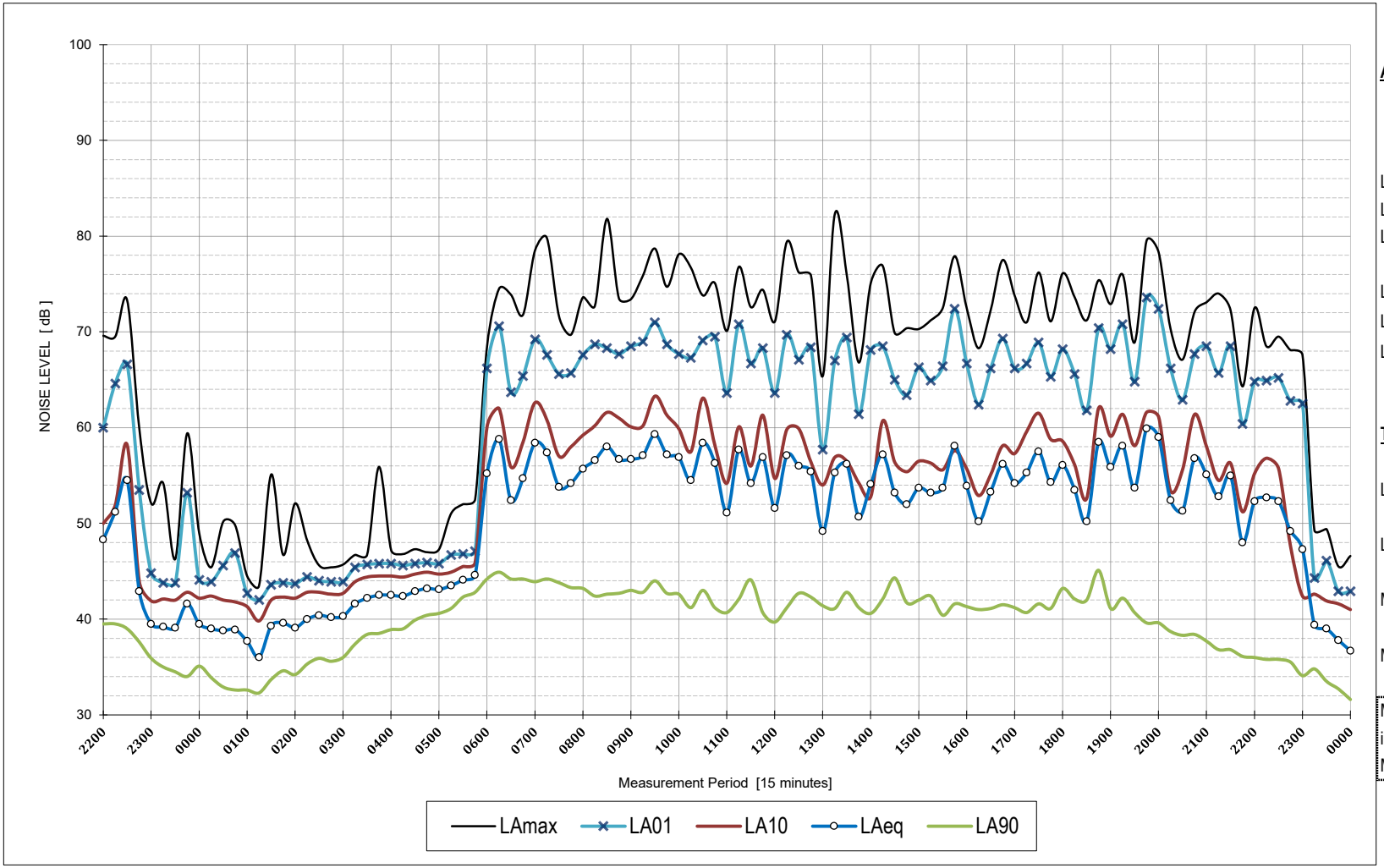
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	53	dB
LAeq 9 hours	2200-0700	42	dB
Max LAeq 1 hour	0700-2200	55	dB
Max LAeq 1 hour	2200-0700	42	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	2

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 3 **LOGGER LOCATION:** 30 Pinaroo Place, Lane Cove North (Rear) **DATE:** Thursday, 20 February 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	41	dB
LA90 Evening	1800-2200	37	dB
LA90 Night-time	2200-0700	33	dB
LAeq Daytime	0700-1800	56	dB
LAeq Evening	1800-2200	56	dB
LAeq Night-time	2200-0700	48	dB

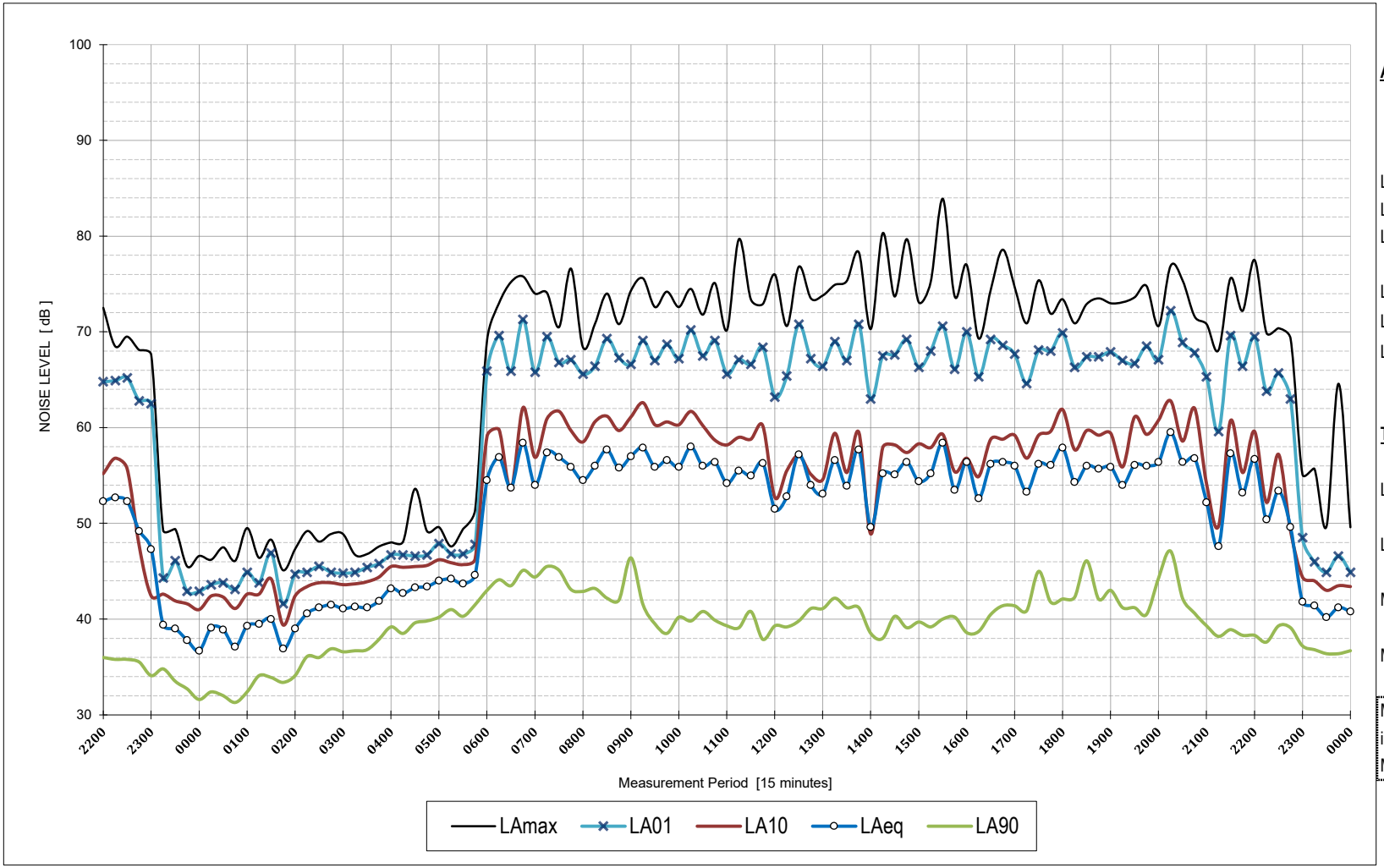
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	56	dB
LAeq 9 hours	2200-0700	48	dB
Max LAeq 1 hour	0700-2200	57	dB
Max LAeq 1 hour	2200-0700	51	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	10

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 4 **LOGGER LOCATION:** 30 Pinaroo Place, Lane Cove North (Rear) **DATE:** Friday, 21 February 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0800-1800	38	dB
LA90 Evening	1800-2200	38	dB
LA90 Night-time	2200-0800	31	dB
LAeq Daytime	0700-1800	56	dB
LAeq Evening	1800-2200	56	dB
LAeq Night-time	2200-0700	49	dB

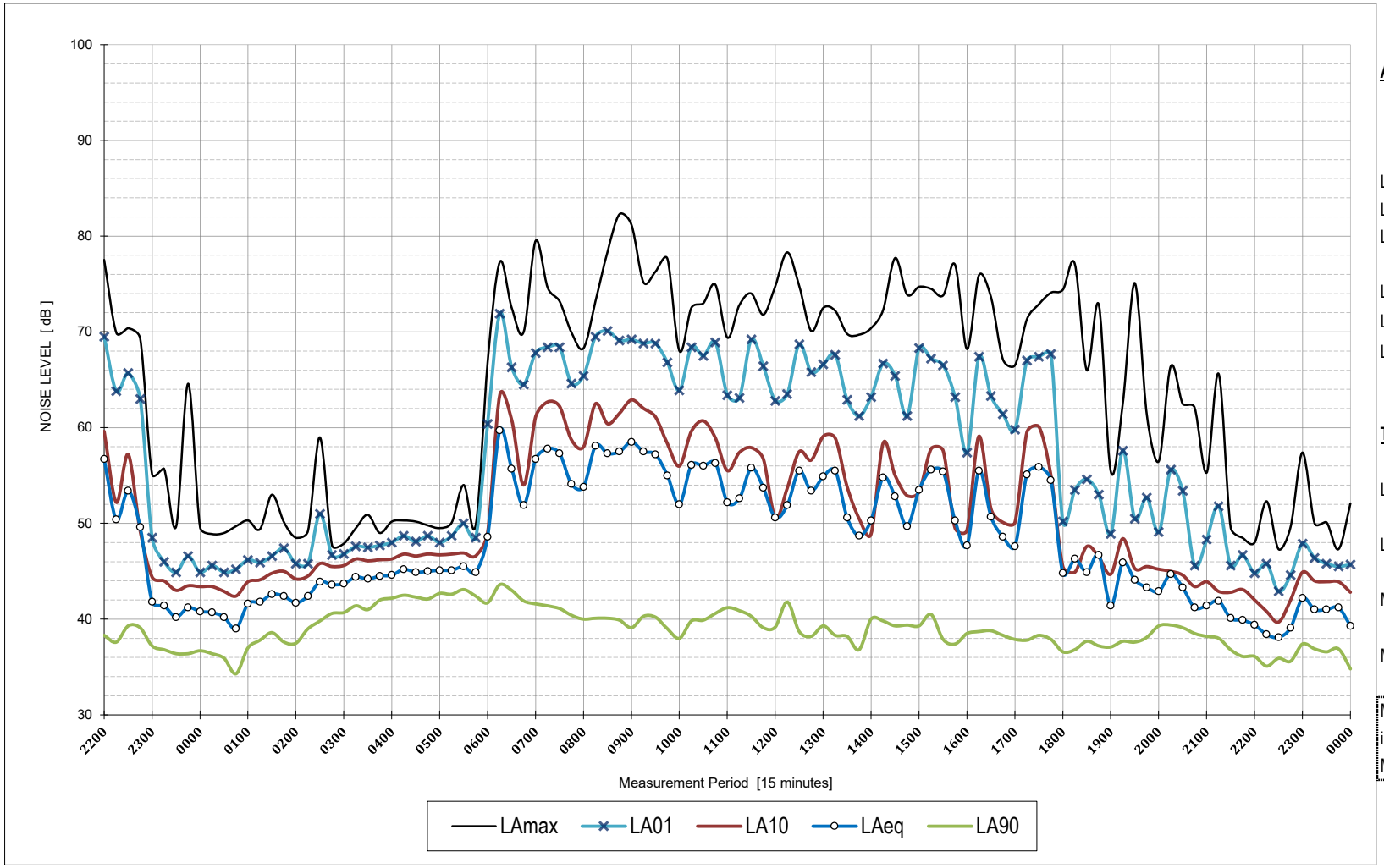
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	56	dB
LAeq 9 hours	2200-0700	49	dB
Max LAeq 1 hour	0700-2200	57	dB
Max LAeq 1 hour	2200-0700	52	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	8

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 5 **LOGGER LOCATION:** 30 Pinaroo Place, Lane Cove North (Rear) **DATE:** Saturday, 22 February 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	38	dB
LA90 Evening	1800-2200	36	dB
LA90 Night-time	2200-0700	36	dB
LAeq Daytime	0700-1800	55	dB
LAeq Evening	1800-2200	44	dB
LAeq Night-time	2200-0700	50	dB

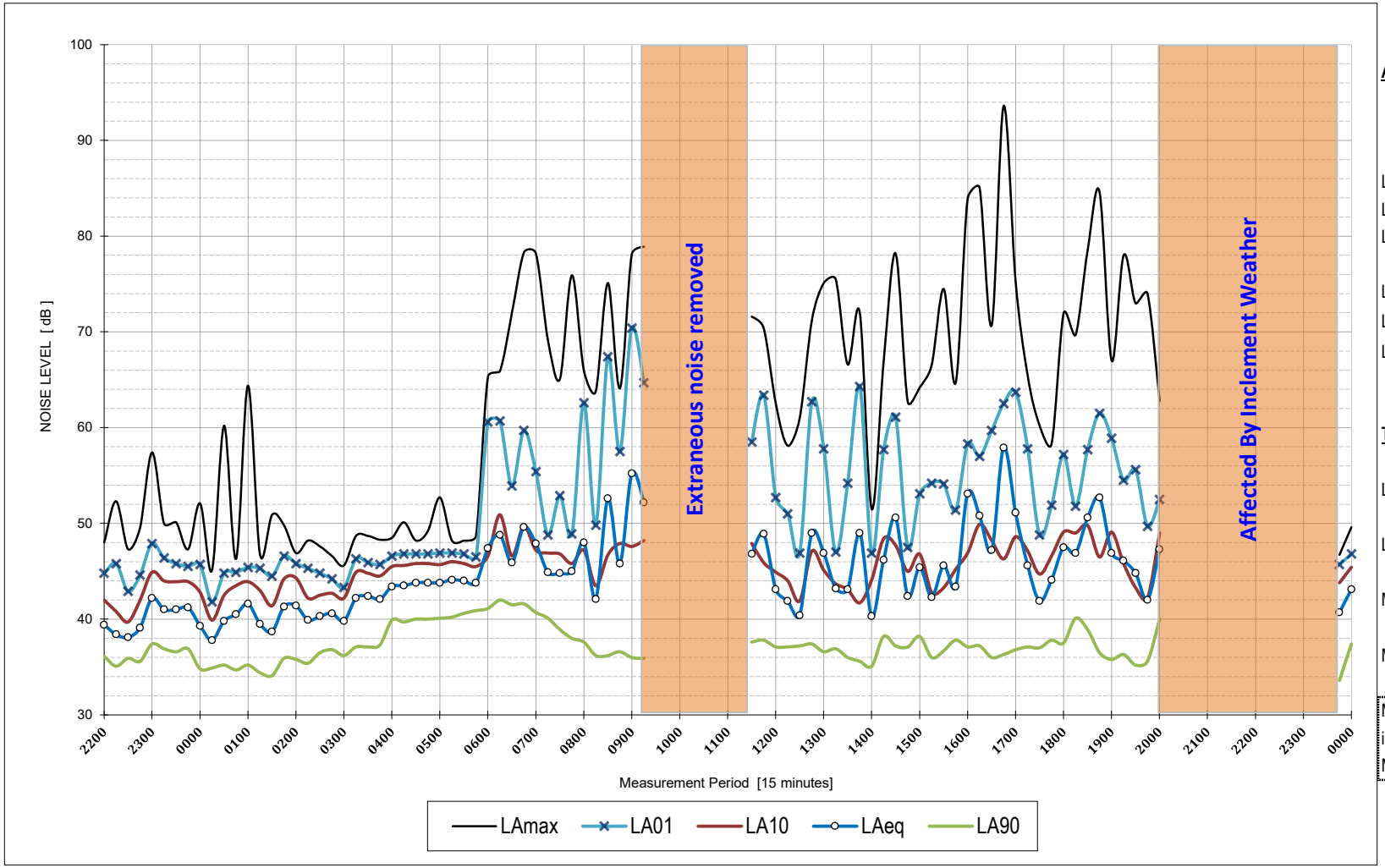
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	54	dB
LAeq 9 hours	2200-0700	50	dB
Max LAeq 1 hour	0700-2200	56	dB
Max LAeq 1 hour	2200-0700	53	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	10

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 6 **LOGGER LOCATION:** 30 Pinaroo Place, Lane Cove North (Rear) **DATE:** Sunday, 23 February 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	36	dB
LA90 Evening	1800-2200	35	dB
LA90 Night-time	2200-0700	34	dB
LAeq Daytime	0800-1800	49	dB
LAeq Evening	1800-2200	48	dB
LAeq Night-time	2200-0800	43	dB

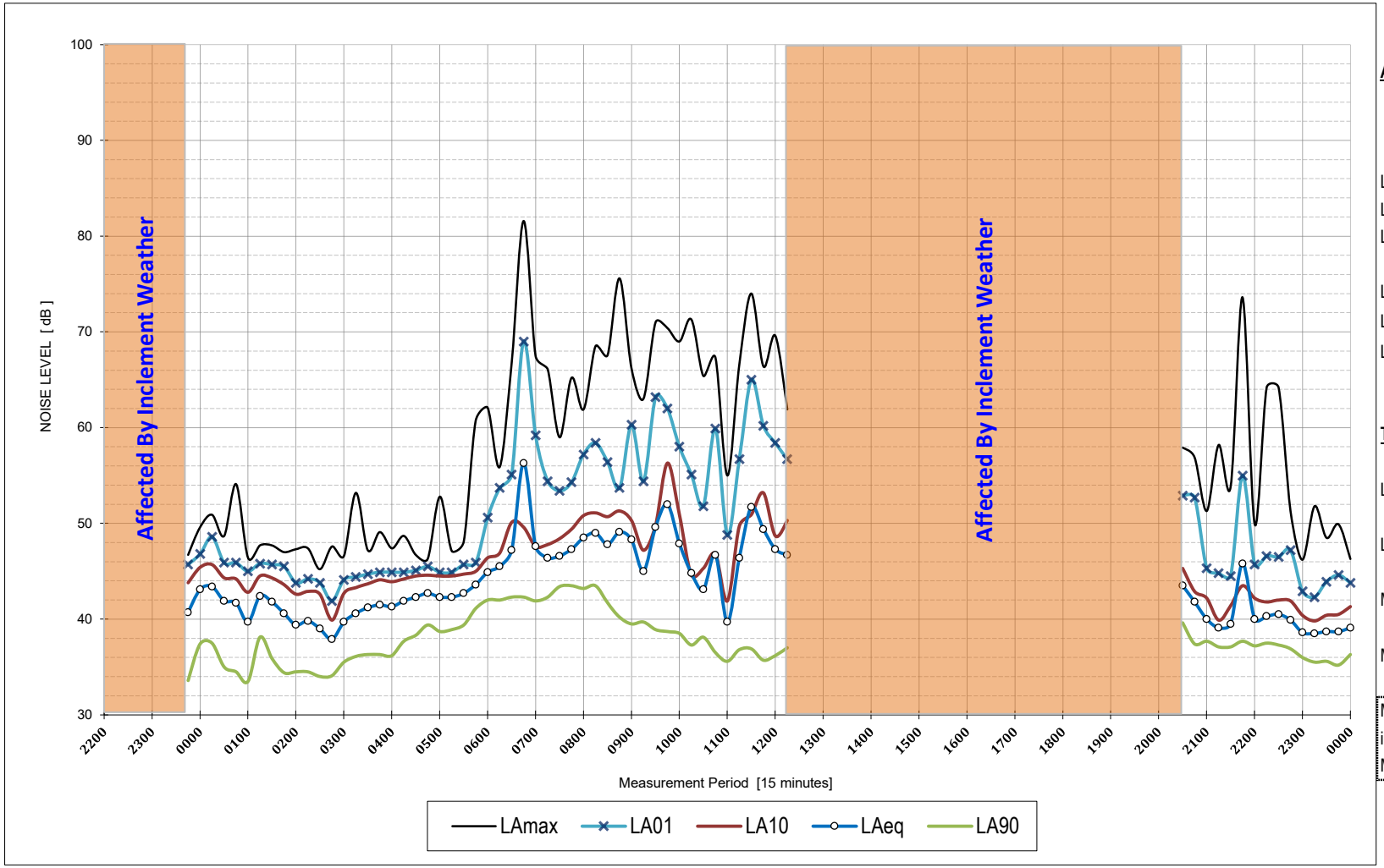
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	49	dB
LAeq 9 hours	2200-0700	43	dB
Max LAeq 1 hour	0700-2200	52	dB
Max LAeq 1 hour	2200-0700	45	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	7

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 7 **LOGGER LOCATION:** 30 Pinaroo Place, Lane Cove North (Rear) **DATE:** Monday, 24 February 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	36	dB
LA90 Evening	1800-2200	36	dB
LA90 Night-time	2200-0700	33	dB
LAeq Daytime	0700-1800	48	dB
LAeq Evening	1800-2200	42	dB
LAeq Night-time	2200-0700	45	dB

TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	47	dB
LAeq 9 hours	2200-0700	45	dB
Max LAeq 1 hour	0700-2200	49	dB
Max LAeq 1 hour	2200-0700	44	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	4

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

APPENDIX A

APPENDIX A

APPENDIX A

ROOFTOP COMMUNAL OPEN SPACE (COS)
JOB NUMBER: 4060
ASSESSED TO: NSW DoP
LIMITING CRITERIA: LAeq,15minutes 42-43 dBA-External

****COS NOISE MODEL****

NOISE SOURCES

~ 30 people occupying the rooftop communal open space (COS).

Note:

- LAeq,15mins noise levels are at 1.5 m above top floor level of the surounding residential buildings.

- The maximum reading at the surounding residential premises is LAeq,15mins 32 dB.

PRINT DATE: 11/12/20

N
W E
S

+ Point Source
Building
Contour Line
Receiver

> -99.0 dB
> 50.0 dB
> 55.0 dB
> 60.0 dB
> 65.0 dB
> 70.0 dB
> 75.0 dB
> 80.0 dB
> 85.0 dB
> 90.0 dB
> 95.0 dB
> 100.0 dB