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ACOUSTICAL REPORT

CONSTRUCTION NOISE AND VIBRATION MANAGEMENT PLAN

89 JOHN WHITEWAY DRIVE, GOSFORD NSW

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ACOUSTICAL REPORT

CONSTRUCTION NOISE AND VIBRATION MANAGEMENT PLAN

89 JOHN WHITEWAY DRIVE, GOSFORD NSW

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TABLE OF APPENDICES

1.0 INTRODUCTION

Koikas Acoustics Pty Ltd was commissioned by DEICORP to prepare a Construction Noise and Vibration Management Plan (CNVMP) concerning construction works to be conducted at 89 John Whiteway Drive, Gosford.

The CNVMP is required per the NSW Government Department of Planning and Environment Conditions of Consent No. C13(c) and C16 (Application No. SSD – 10321).

Documentation used to support and inform this CNVMP includes Bulk Earthworks Plans by Telford Civil (Project no. 2021288, dated 9th August 2022).

This report presents the results and findings of an acoustical assessment of the subject development site. Recommended acoustic treatments and noise control measures detailed within this report are deemed necessary for the development to satisfactorily mitigate/manage the impact on surrounding sensitive receivers.

2.0 THE PROPOSED DEVELOPMENT

The development is proposed to occupy the site at 89 John Whiteway Drive, Gosford.

This location is situated in a primarily suburban residential classified as R1 'General Residential' as per relevant land zoning maps included in the Central Coast Council Local Environment Plan 2022. Surrounding properties are also predominantly residential in classification, also located within R1 'General Residential' Zoning.

The subject site and surrounding properties are identified in the aerial photograph in Figure 1.

Figure 1. Aerial photo of the subject site and surrounding area – Image from SixMaps

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.

As per the development consent, the proposed development will consist of four residential flat buildings/towers to accommodate 188 dwellings, basement car parking, associated landscaping and public domain works.

Koikas Acoustics has also been advised of the typical duration of construction stages and any notable equipment to be used within each:

1. Phase 1 – Bulk Excavation (19th September – 15th December 2022)
    - 14T Excavator
    - 35T Excavator
    - 50T Excavator
    - D10 Bull Dozer
    - Surface Miner
    - Truck & Dog

2. Phase 2 – Detail Excavation & Structure (1st December – 1st August 2023)
    - 30T Excavator
    - Truck & Dog
    - Concrete trucks
    - Concrete Pumps
    - Hammers, saws, grinders, and other hand-held tools

3. Phase 3 – Façade & Fit-Out (1st August 2023 – 30th August 2024)
    - Hammers, saws, grinders, and other hand-held tools

3.0 UNATTENDED AMBIENT NOISE SURVEY

An unattended noise logging survey was conducted between 6 September 2022 and 12 September 2022. The microphone was placed at approximately 4.0 - 4.5 metres above the natural ground level in 'free-field' conditions, ie. ≥ 3.5 metres from any reflective façade.

Figure 2. Noise logging location – Image from SixMaps

A Type 1 Convergence Instruments NSRT – Mk3 noise logger was used for this noise survey. The instrument was set up to measure sound pressure levels as 'A' frequency weighting and 'Fast' time response. Noise levels were stored within the logger memory at 15 minutes intervals during the quarter-hour.

A NATA-calibrated and certified Larson Davis CAL200 precision acoustic calibrator was used to field calibrate the sound level meter before and after the noise survey. No system drift was observed for this sound level meter.

BOM weather records for the nearest available weather station indicate that inclement weather conditions may have impacted the noise survey. Noise data from affected periods throughout the survey were removed following standard requirements of the NSW Environmental Protection Authority (EPA).

A summary of the noise survey data is presented below.

Table 1. Summary of noise logger results [dB]

Day	Assessment background level			L_{Aeq} ambient noise level		
	Day	Evening	Night	Day	Evening	Night
Tuesday 6 Sep 2022	39	37	33	55	51	48
Wednesday 7 Aug 2022	38	36	34	54	52	50
Thursday 8 Aug 2022	40	36	33	55	51	49
Friday 9 Aug 2022	39	39	33	55	52	48
Saturday 10 Aug 2022	40	39	35	54	51	52
Sunday 11 Sept 2022	38	36	33	53	50	47
Monday 12 Sept 2022	38	-	33	54	-	48
Rating Background Level [RBL]	39	37	33			
Log average ambient noise level				54	51	49

Notes

1. The **NSW EPA Noise Policy for Industry (NPfI)** 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.

Daily logger graphs are attached in **Appendix B**.

4.0 ACOUSTIC GUIDELINES

4.1 NSW GOVERNMENT DEPARTMENT OF PLANNING AND ENVIRONMENT SSD-10321

The relevant conditions within the consent are as follows:

- **Condition 13(c)**, which is reproduced below –

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

C13. C13. Prior to the commencement of construction, the Applicant must submit a Construction Environmental Management Plan (CEMP) to the Certifier and provide a copy to the Planning Secretary. The CEMP must include, but not be limited to, the following:

(a) Details of:
  (i) hours of work;
  (ii) 24-hour contact details of site manager;
  (iii) management of dust and odour to protect the amenity of the neighbourhood;
  (iv) stormwater control and discharge;
  (v) measures to ensure that sediment and other materials are not tracked onto the roadway by vehicles leaving the site;
  (vi) groundwater management plan including measures to prevent groundwater contamination;
  (vii) external lighting in compliance with AS 4282-2019 Control of the obtrusive effects of outdoor lighting;
  (viii) community consultation and complaints handling as set out in the Community Communication Strategy required by condition C6
  (ix) detail the quantities of each waste type generated during construction and the proposed reuse, recycling and disposal locations;

(b) Construction Traffic and Pedestrian Management Sub-Plan (see condition C15);

(c) Construction Noise and Vibration Management Sub-Plan (see condition C16);

- **Condition C16,** which is reproduced below –

C16. The Construction Noise and Vibration Management Sub-Plan (CNVMSP) must address, but not be limited to, the following:

(a) be prepared by a suitably qualified and experienced noise expert;

(b) describe procedures for achieving the noise management levels in EPA's *Interim Construction Noise Guideline* (DECC, 2009);

(c) describe the measures to be implemented to manage high noise generating works such as piling, in close proximity to sensitive receivers;

(d) include strategies that have been developed with the community for managing high noise generating works;

(e) describe the community consultation undertaken to develop the strategies in condition C16(d);

(f) include a complaints management system that would be implemented for the duration of the construction; and

(g) include a program to monitor and report on the impacts and environmental performance of the development and the effectiveness of the management measures in accordance with condition C12.

4.2 CONSTRUCTION NOISE AND VIBRATION – INTERIM CONSTRUCTION NOISE GUIDELINES

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

4.2.1 Construction noise

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 set 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.

Demolition, excavation, and construction works will exceed three (3) weeks, meaning a quantitative assessment approach is warranted, i.e. calculating anticipated construction noise/vibration levels at the receivers and proposing site-specific mitigation measures where required. Koikas Acoustics Pty Ltd has been advised that the anticipated construction duration is **approximately 97 weeks**.

In a quantitative assessment, a receiver is categorised by the likely community reaction to the level of noise, where some community reaction is expected at 10 dB above the background level and strong community reaction is expected at levels exceeding $L_{Aeq,\ 15\ minutes}$ 75 dB.

Background noise levels were surveyed by Koikas Acoustics from 6 September 2022 – 12 September 2022. During the period of standard construction hours (daytime), the background noise level at the nearest residential receivers is expected to be **L_{A90} 39 dB.** The general area of the noise logging survey is shown in Figure 2.

The *Noise Affected Level (NAL)* as defined under the ICNG, otherwise known as the Noise Management Level, exists at 10 dB above the background level. This applies to residential receivers affected by or likely to be affected by construction noise.

In this case, the NAL for the nearest residents fronting John Whiteway Drive is:

- $L_{Aeq\ 15\ minutes}$ 49 dB (during the daytime period)

Above this noise level, it is required that all feasible and reasonable work practices are implemented to minimise impacts towards the NAL.

The upper floor levels of nearby residences may have a higher background level than those surveyed at ground level on account of increased exposure to traffic noise. It is reasonable to expect background levels 1 - 3 dB higher for upper floor levels, thus resulting in a noise management level closer to $L_{Aeq,\ 15\ minutes}$ 50-52 dB for the nearest residents fronting John Whiteway Drive.

$L_{Aeq,\ 15\ minutes}$ 75 dB is defined as the *Highly Noise Affected Level*. A level of $L_{Aeq,\ 15\ minutes}$ 75 dB represents the point where a strong community reaction is expected. At and above this level, additional feasible and reasonable mitigation strategies are implemented such as adopting time restrictions for work activities or providing respite periods throughout the workday that have been agreed upon via a community consultation process.

4.2.2 Construction vibration – human annoyance

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 as 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 2. 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

4.2.3 Construction vibration – structural damage

The geotechnical engineer will typically 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-Part 3.*

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

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

German standard DIN 4150-3 recommends a maximum peak particle velocity of:

Table 3. 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 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

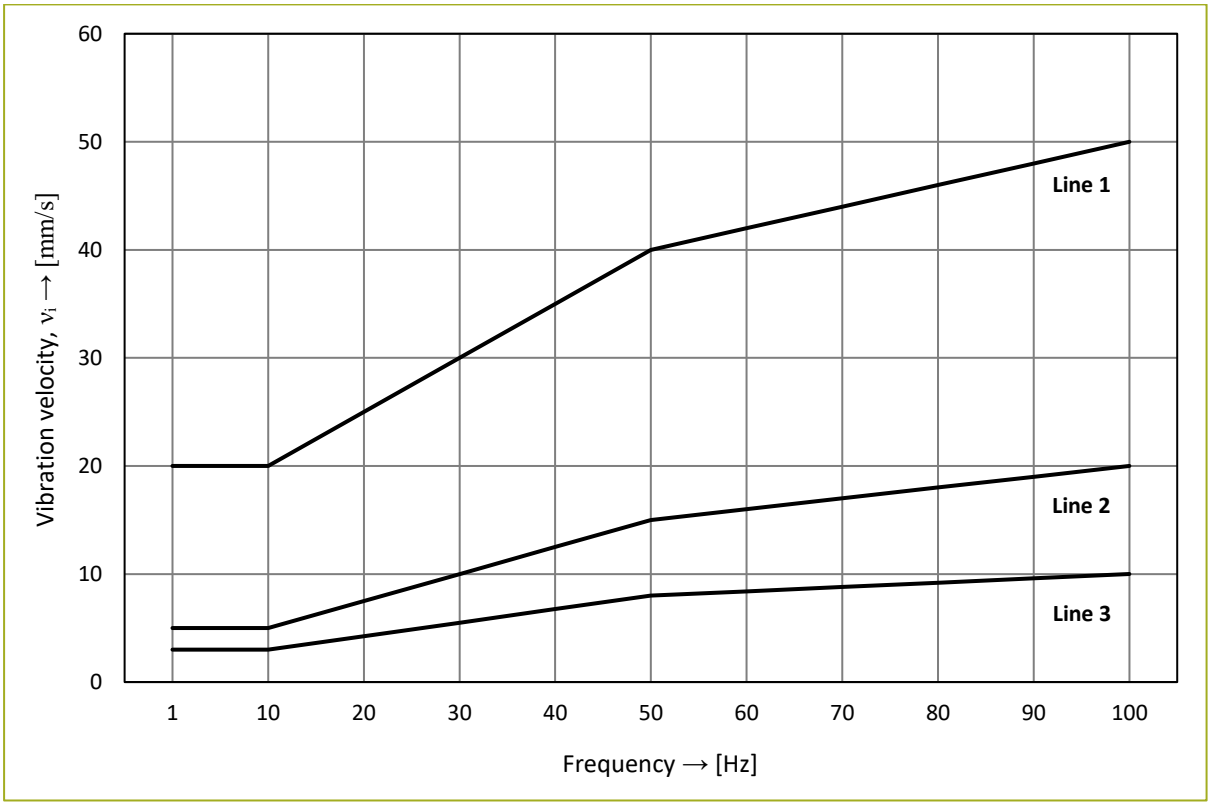


Figure 3. DIN4150-3 Curves representing guideline vibration velocity values at the building foundation

5.0 CONSTRUCTION NOISE AND VIBRATION MANAGEMENT PLAN

5.1 CONSTRUCTION NOISE

5.1.1 Construction noise sources and sound levels

The range of typical construction noise levels depends on the process or sources involved. 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.

Koikas Acoustics have been advised that the bulk excavation/detail excavation and structure/ façade +& fit-out will require the following equipment:

1. Phase 1 – Bulk Excavation
- 14T Excavator
- 35T Excavator
- 50T Excavator
- D10 Bull Dozer
- Surface Miner
- Truck & Dog

2. Phase 2 – Detail Excavation & Structure
- 30T Excavator
- Truck & Dog
- Concrete Trucks
- Concrete Pumps
- Hammers, saws, grinder, and other handheld tools

3. Phase 3 – Façade & Fit-Out
- Hammers, saws, grinder, and other handheld tools

Table 4.	Construction activity typical sound levels, [dB]		
Works stage	**Equipment**	**Typical sound power level – L_w**	**Reference noise level – L_{Aeq} at 10 m**
Bulk Excavation	14T Excavator	98	70
	35T Excavator	100	72
	50T Excavator	104	76
	D10 Bull Dozer	108	80
	Surface Miner	108	80
	Truck & Dog	107	79
Detail Excavation and Structure	30T Excavator	100	72
	Truck & Dog	107	79
	Concrete Trucks	108	80
	Concrete Pumps	108	80
	Hammers, saws, grinders, and other hand-held tools	108	80
Façade and Fit-Out	Hammers, saws, grinders, and other hand-held tools	108	80

5.1.2 Calculated construction noise levels

The level of noise predicted at a specific receiver location is governed by:

- The source noise level,
- The duration of the noise source,
- The distance between the source and receiver. As the location of plant and equipment on construction sites is not always at a fixed point, the distance between the noise source and receiver location can vary, and
- The screening between the source and receiver sound propagation path.

The following calculation parameters are assumed:

- Omni-directional point source radiating over hard ground.
- No screening attenuation.
- Source-receiver distances are calculated from the centre of the construction site, resulting in the following source-receiver distances:
    - 86 metres to the site boundary shared with 117 John Whiteway Drive, Gosford
    - 69 metres to the site boundary shared with 74-76 John Whiteway Drive, Gosford
    - 74 metres to the site boundary shared with 91-95 John Whiteway Drive, Gosford
    - 94 metres to the site boundary shared with 97-99 John Whiteway Drive, Gosford

Figure 3. Source-Receiver distances to the Nearest Boundaries. Image from SixMaps

Note that the EPA's Noise Policy for Industry states that the receiver point is 30m from a residential dwelling, or if the distance from the dwelling to the boundary is less than 30m, then at the boundary.

No duration corrections were made to machinery and tools to predict a worst-case scenario. This means that the plant & equipment is assumed to operate continuously.

Construction noise levels were calculated:

- At the nearest residential property boundary, where the distance from the dwelling to the boundary is less than 30m.
- At the reasonably most-affected point within 30 metres of the residence, where the distance from the dwelling to the boundary is more than 30m.

The calculated construction noise levels can vary on account of the duration of use, the method of use, and the location of the plant and equipment at any moment throughout the construction site.

Table 5. Estimated construction noise levels to surrounding receivers – $L_{Aeq, 15\ minutes}$ [dB]				
Equipment	**Noise assessment receiver locations**			
	117 John Whiteway Dr (18 m) Ground level	**74-76 John Whiteway Dr (111 m) Ground level**	**91-95 John Whiteway Dr (84 m) Ground level**	**97-99 John Whiteway Dr (79 m) Ground level**
14T Excavator	62 57	48 43	50 48	51 46
35T Excavator	64 59	50 45	52 47	53 48
50T Excavator	68 63	54 49	56 51	57 52
D10 Bull Dozer	75 70	59 54	62 57	62 57
Surface Miner	75 70	59 54	62 57	62 57
Truck & Dog	74 69	58 53	61 56	61 56
30T Excavator	64 59	56 51	59 54	59 54
Concrete Trucks	75 70	59 54	62 57	62 57
Concrete Pumps	75 70	59 54	62 57	62 57
Hammers, saws, grinders, and other hand-held tools	75 70	59 54	62 57	62 57
Notes 1.	Predicted construction noise levels are estimated only due to the large variance in noise levels generated by comparable construction-type plants 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.			

Numbers in RED in Table 5 above are the calculated construction noise levels without screening (hoarding) along the periphery of the subject construction site.

Numbers in BLUE in Table 5 above are the calculated construction noise levels with screening (hoarding) along the periphery of the subject construction site. A boundary fence of 1.8 metres in height would achieve at most receiver positions up to 5 dB lower construction noise levels on the ground floor.

It is noted, as the earthwork excavations progress, the cutting becomes the barrier. Cuttings on the work site will provide a greater reduction in noise compared to the hoarding located further away from the construction activities. The greatest noise reduction will be achieved for persons located at ground level and a lesser noise reduction for occupants in the Units on the higher floor levels, although, occupants located on the balcony of the units are located a greater distance compared to a point at the nearest residential boundary.

The maximum noise reduction that will be achived at the closest residential boundary at 117 John Whiteway Drive in excavation depth-increments of 3 metres is as follows:

Table 6. 50T Excavator noise levels at the closest receiver site – $L_{Aeq,\ 15\ minutes}$ [dB]		
Scenario	**Noise level**	**Noise reduction compared against the no-barrier scenario**
Ground level with **no barrier**	68	-
Ground level with **1.8 m hoarding** along the nearest residential boundary	62	+6 (+5)[Note 5]
Cutting 3 m below existing ground (1.5 m effective barrier)	54	+14 (+11)
Cutting 6 m below existing ground (4.5 m effective barrier)	49	+19 (+14)
Curring 9 m below existing ground (7.5 m effective barrier)	49	+19 (+15)
Cutting 12 m below existing ground (10.5 m effective barrier)	49	+19 (+15)

Notes

1. The table presents a worst-case scenario where excavation works are undertaken along the construction site boundary to the nearest noise-sensitive residential receivers
2. The noise calculations consider atmospheric attenuation, ground attenuation, effective barrier attenuation and distance attenuation.
3. As the earthworks progress, the performance of the effective barrier increases up until a certain depth. Beyond this point, reflections off the opposite cutting edge could result in noise levels up to 4 dB higher than those presented in the table.
4. The effective barriers would perform similarly on different points along the construction site.

At nearby receiver sites, construction noise levels are expected to exceed the NAL noise criterion of $L_{Aeq,\ 15\ minutes}$ 49 dBA. This is not surprising as most construction sites generate noise levels that far exceed the EPA's nominated construction noise criteria.

To reduce construction noise levels to nearby receiver points, the following noise control measures are recommended in Section 5.3.1. Implementing these measures will cumulatively reduce construction noise levels to surrounding residential premises.

5.2 VIBRATION ASSESSMENT

Ground vibration during excavation and earthworks for the basement may impact adjoining buildings and occupants depending on the local geology. Of particular sensitivity are the adjacent buildings to the North, West, and South-West as they share a site boundary with the works zone.

Excavating loose soil, sand and clays with an excavator and standard bucket and grab attachments is not expected to generate any significant vibration impacts on adjoining residents or structures. Excavation of sandstone bedrock will, however, typically require the use of excavators with hydraulic breaker attachments. Rock-breakers can generate significant levels of vibration.

The proximate location of adjoining buildings may require alternative work practices to impact-driven excavations along site boundaries if the minimum safe working distances as detailed cannot be achieved. Rock sawing and/or rock grinding are alternatives to impact-driven rock breaking that

generate far less vibration and should be used for the removal of hard rock in areas where the minimum safe working distances cannot be achieved.

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 7. 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)	5 m	15 m to 20 m
Vibratory roller	< 200kN (Typically 4-6 tonnes)	12 m	40 m
Vibratory roller	> 300kN (Typically 13-18 tonnes)	20 m	100 m
Small hydraulic hammer	300kg – 5 to 12t excavator	2 m	7 m
Medium Hydraulic Hammer	900kg – 12 to 18t excavator	7 m	23 m
Large Hydraulic Hammer	1600kg – 18 to 34t excavator	22 m	73 m
Vibratory Pile Driver	Sheet Piles	2 m to 20 m	20 m
Pile Boring	≤ 800 mm	2 m (nominal)	4 m
Jackhammer	Handheld	1 m (nominal)	2 m

5.3 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 in the development and success of each noise policy is to maintain open and free channels of communication 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 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 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-Guide to noise and vibration control on construction, demolition and maintenance sites* states the relevant effects of various types of noise control measures typically employed on construction sites.

Table 8. AS2436-2010 Table C3 – Relative effectiveness of various forms of noise control	
Control by	**Nominal noise reduction possible, in total A-weighted sound pressure level L_{pA} [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

5.3.1 General control measures

The following general noise and vibration control measures are recommended:

- Construction works are to occur during standard hours only as follows:
    - Monday to Friday from 7 am to 6 pm
    - Saturday 8 am to 1 pm
    - No work on Sundays and public holidays
- Use appropriately sized plant and equipment and ensure that the equipment is operated in a manner that reduces noise emissions such as turning off equipment when not in use.
- Trucks removing material from the site should not be left idle at any time whilst on-site and as being filled.
- Plant & equipment with broadband reversing alarms should be used instead of tonal reversing alarms.
- Motorised plant and equipment such as excavators shall be fitted with appropriate exhaust silencers to minimise noise emission during their use.
- Exhaust silencers should be fitted to high noise-generating plant and equipment when near sensitive receivers

- Ensure that all plant and equipment are appropriately maintained such that it remains in good working order.
- Avoid 'clustering' of plant & equipment in localised areas.
- The minimum work distances as tabled within this report should be observed at all times, especially regarding vibration damage guidelines.
- Extended periods of continuous vibration-generating work should be avoided to limit the potential for dynamic magnification due to resonance in neighbouring buildings/structures.

5.3.2 Community Control measures

The following noise and vibration control measures are recommended:

- Neighbouring residents are to be notified of the anticipated duration, equipment, and work processes involved during each stage of work (Bulk Excavation– Detail Excavation – Façade & Fit-Out). Notification in the form of a letterbox drop is generally found to best reach the majority of surrounding residents. The notification letter must include a contact phone number for appropriate site management personnel.

5.3.3 Additional Control Measures

If complaints arise during construction works that cannot be managed through work schedules, the following noise controls may be considered:

- Providing respite periods that are agreed upon through consultation with site management and the community.
- Exhaust silencers could be considered for motorised excavation-type plants & equipment.

5.3.4 Noise Monitoring

By undertaking noise monitoring at surrounding noise-sensitive residential premises, noise impacts can be further reduced by providing feedback to plant & equipment operators. The mode of operation of the construction activities can then be changed to reduce noise.

A noise data logger could be installed at a suitable noise-sensitive residential premise to monitor construction activities in real time.

In addition to this, attended noise monitoring could also be undertaken at various distances to

determine the sound power level of plant and equipment proposed for use and provide further advice regarding the method of use of the plant & equipment on the construction site.

5.3.5 Vibration Monitoring

Continuous vibration monitoring is advised along the boundaries during excavation to ensure vibration levels do not reach a point where the structural integrity of surrounding buildings is compromised.

The monitors are to provide real-time feedback in the form of visual and audible alarms to site management and equipment operators regarding the level of vibration being generated by certain work activities. Vibration monitors with a two-stage alarm system should be used and provisionally set as per the below guidelines, being the limiting structural damage guidelines within *DIN4150 Vibrations in buildings - Part 3: Effects on structures.* Site-specific threshold levels may be determined by conducting a series of attended vibration surveys to derive a suitable transfer function for vibration propagation.

Stage 1: Provisional vibration alarm – vibration threshold level set at 4 mm/s Peak Particle Velocity (PPV)

Stage 2: Stop-work alarm level - vibration threshold level set at 5 mm/s Peak Particle Velocity (PPV)

If construction activitiestrigger Stage 1 alarm, the equipment operators are to proceed with caution, ensuring that all care is taken to minimise unnecessary vibration during the construction works.

Should the Stage 2 alarm be triggered, the offending equipment and site activity must cease immediately and not recommence until further investigation is carried out by an acoustical or geotechnical engineer. Any recommendations made by the consulting engineer concerning vibration control must be implemented before work recommences.

5.4 COMPLAINTS HANDLING AND COMMUNITY CONSULTATION

A site-specific complaint-handling procedure must be established, implemented, and managed on the construction site by a suitable complaint-handling representative (representative to be determined by Project/Site Management). As a guide, the following procedure should be followed and actioned:

Contact information

1. Distribute via letterbox drops and publish on the site notice board the contact information (Name/24-hour contact phone number/Email) for the Complaint Handling Representative.

Receiving complaints

2. Establish a Complaint Register that is to be managed by the Complaint Handling Representative. The register should include as a minimum:
    a. Date and time of the complaint,
    b. The person receiving a complaint,
    c. Complainant's contact information,
    d. Site contact to whom the complaint was referred for action,
    e. Description of the complaint,
    f. Action to be taken,
    g. The proposed time frame for action to be implemented.

Responding to a complaint

3. Receipt of a complaint should be acknowledged by the Complaint Handling Representative with the complainant as soon as practicable upon receiving the complaint, preferably within the first hour of receiving the complaint and no later than 24 hours after receiving the complaint.
4. The response must include a follow-up to discuss in detail the nature of the complaint so that a suitable investigation of the complaint may be undertaken. During the follow-up consultation with the complainant, the verification process and scheduled completion of the verification process is to be advised.

Verifying a complaint

5. In the event of receiving a noise or vibration complaint, action must be taken to verify the complaint as to its merit concerning the associated development approval conditions. For a noise and/or vibration complaint, this will involve commissioning a noise and/or vibration audit of the offending work/s. The process to engage a suitable noise/vibration consultant to investigate site works must be initiated immediately after responding to the complainant.

Remediation

6. Where a complaint is verified by the consultant, the recommended rectification measures must be implemented and re-evaluated to ensure that the issue is effectively resolved such that the works are conducted under the development approval conditions.

Periodic review of the complaints handling procedure

7. The complaints handling procedure is to be periodically reviewed to maintain its effective delivery. Where the complaints handling procedure is amended/updated, the local community must be notified via letterbox drops and notifications posted on the site notice board.

6.0 CONCLUSION

Koikas Acoustics Pty Ltd was requested to provide a Construction Noise and Vibration Management Plan for the proposed construction activities at 89 John Whiteway Drive, Gosford NSW.

A quantitative construction noise/vibration assessment was undertaken that includes a summary of reasonable and feasible noise and vibration mitigation measures as stated in Section 5.0 of this report. It is noted that not all the mitigation measures apply to this subject site.

The following requirements of the PCA and the NSW Government Department of Planning and Environment have been addressed –

- Condition C16 (c), outlines the measures to be implemented to manage high noise-generating works near sensitive receivers. Refer to Sections **5.1.2** and **5.3.1** of the report, dot points **5 & 6**.
- Condition C16 (d) and (e), describes community consultation measures undertaken to develop public strategies for managing high noise-generating works. Refer to Section **5.3.2**, dot point 1, Sections **5.3.3** and **5.4** of the report.
- Condition C16 (g), includes a program to monitor and report on the impacts and environmental performance of the development and the effectiveness of management measures as per Condition C12. Refer to Sections **5.3.4** and **5.3.5** of the report.

The proposed noise and vibration mitigation measures are targeted at minimising the impacts of construction activities on nearby residences, with the intent of minising noise impacts to surrounding residential premises as per the EPA's Interim Construction Noise Guidelines.

APPENDIX A

APPENDIX A

APPENDIX A

Daily Rainfall (millimetres)

GOSFORD AWS

Station Number: 061425 · State: NSW · Opened: 2013 · Status: Open · Latitude: 33.44°S · Longitude: 151.36°E · Elevation: 7 m

2022	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1st	*0*	*0*	*21.2*	*11.8*	*2.0*	*0.2*	*0*	*0*	*21.4*			
2nd	*0*	*24.0*	*37.4*	*3.0*	*0*	*0*	*5.8*	*0*	*0*			
3rd	*0*	*11.8*	*72.6*	*0*	*0*	*0*	*80.2*	*0*	*24.4*			
4th	*0*	*56.2*	*49.2*	*0*	*0.2*	*0.6*	*80.4*	*0*	*22.0*			
5th	*3.0*	*15.2*	*11.0*	*0*	*0*	*0*	*89.2*	*9.2*	*0.2*			
6th	*26.6*	*4.0*	*12.2*	*0.6*	*1.4*	*1.0*	*22.0*	*0.2*	*1.6*			
7th	*0.2*	*3.2*	*56.2*	*1.0*	*0*	*0*	*65.6*	*0*	*0*			
8th	*18.4*	*2.0*	*74.8*	*82.4*	*0*	*0*	*0*	*0*	*0.2*			
9th	*5.8*	0.4	*42.4*	*6.8*	*0*	*0*	0	*0*	*3.4*			
10th	*0.6*	*0*	*0*	*2.8*	*15.6*	*0*	*24.2*	*1.0*	*2.0*			
11th	*0.2*	*1.2*	*0.6*	*0*	*24.6*	*0*	*16.6*	*0.6*	*0*			
12th	*0*	*32.2*	*0.2*	*0.2*	*14.0*	*0*	*0*	*0*	*0*			
13th	*0*	*1.4*	*0*	*36.0*	*6.8*	*0*	*0*	*3.6*	*0*			
14th	*0*	*0*	*0*	*9.0*	*4.0*	*0*	*6.6*	*0*				
15th	*0*	*0*	*0.2*	*0*	*0.2*	*0*	*1.0*	*0*				
16th	*16.8*	*0*	*29.0*	*0*	*0.2*	*0*	*0*	*0*				
17th	*0*	*0*	*0.8*	*0*	*0*	*0*	*0*	*0*				
18th	*0*	*16.0*	*0*	*0*	*0*	*0*	*0*	*0*				
19th	*21.2*	*0*	*48.0*	*0*	*0*	*4.2*	*2.0*	*0*				
20th	*12.8*	*0*	*2.4*	*5.8*	*0*	*2.2*	*20.6*	*0*				
21st	*1.2*	*0.2*	*0*	*0*	*0.2*	*0.2*	*3.8*	*0*				
22nd	*2.6*		*0*	*25.2*	*9.2*	*0.8*	*22.0*	*0*				
23rd	*4.4*		*0*	*12.4*	*24.2*	*0.2*	*6.8*	*0*				
24th	*2.0*	*22.8*	*13.8*	*3.6*	*22.2*	*0*	*0.8*	*11.8*				
25th	*0.2*	*137.6*	*16.0*	*1.4*	*1.0*	*0*	*0.2*	*0*				
26th	*0*	*38.6*	*34.0*	*6.6*	*0.2*	*0*	*0.8*	*1.0*				
27th	*0*	*13.0*	*11.4*	*0.4*	*0.2*	*0*	*0.2*	*2.6*				
28th	*0*	*10.6*	*11.2*	*3.6*	*0*	*0.2*	*0*	*0*				
29th	*0*		*8.4*	*12.4*	*0.4*	*4.4*	*0*	*0.2*				
30th	*0*		*19.2*	*0.2*	*0*	*0*	*0*	*0*				
31st	*0*		*6.8*		*3.2*		*0*	*0*				
Highest daily	*26.6*	*137.6*	*74.8*	*82.4*	*24.6*	*4.4*	*89.2*	*11.8*	*24.4*			
Monthly Total	*116.0*		*579.0*	*225.2*	*129.8*	*14.0*	448.8	*30.2*				

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

Product code: IDCJAC0009 reference: 89252037

Daily Rainfall (millimetres)

GOSFORD AWS

Station Number: 061425 · State: NSW · Opened: 2013 · Status: Open · Latitude: 33.44°S · Longitude: 151.36°E · Elevation: 7 m

Statistics for this station calculated over all years of data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Highest daily	*98.4*	*137.6*	*123.8*	*120.8*	*84.8*	*129.8*	*92.0*	*114.4*	*75.2*	*128.0*	*47.8*	*52.6*
Date of highest daily	19th 2015	25th 2022	17th 2019	21st 2015	3rd 2015	5th 2016	27th 2020	30th 2019	18th 2019	26th 2020	18th 2013	10th 2021

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

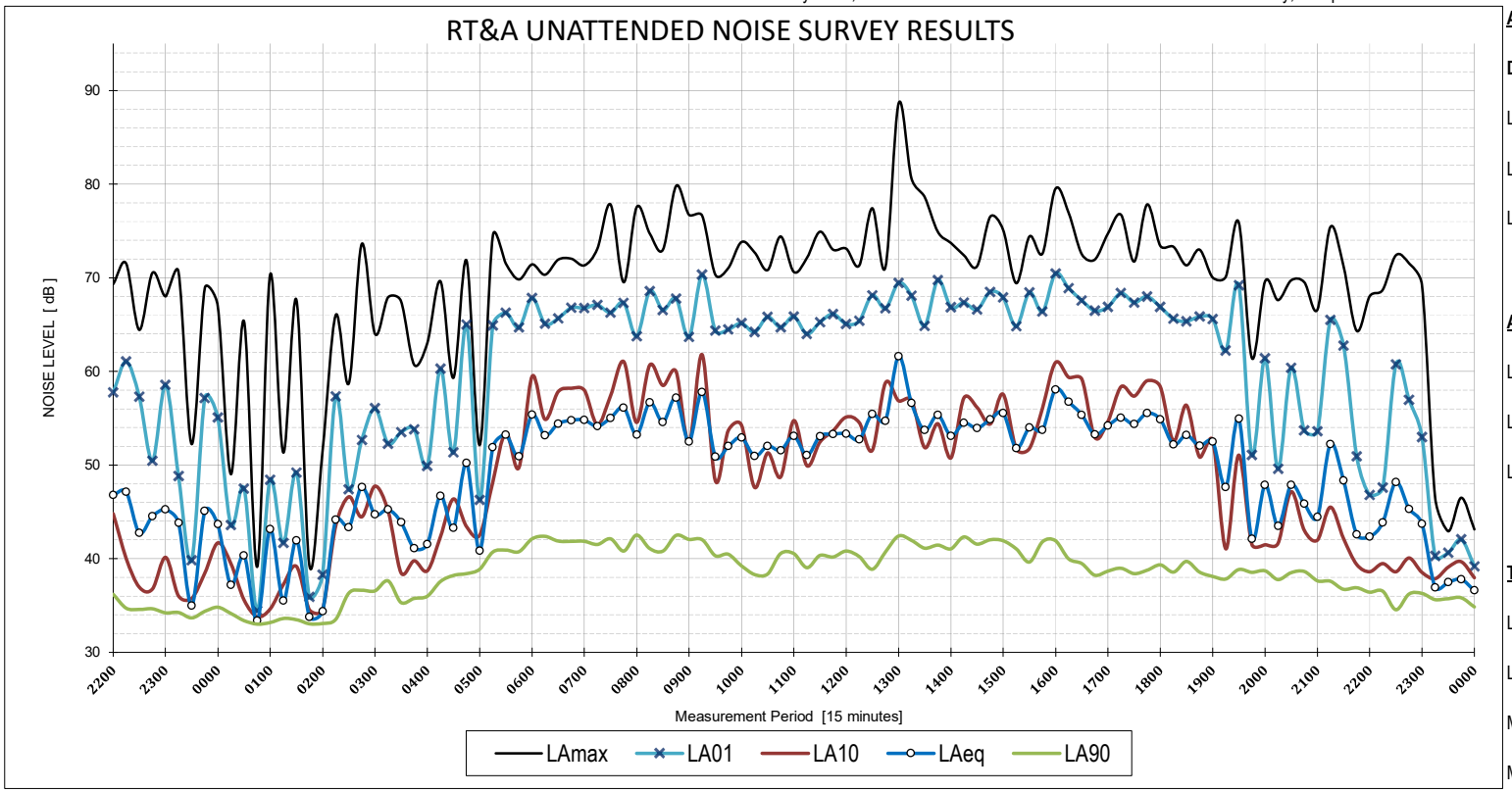
http://www.bom.gov.au/climate/cdo/about/about-rain-data.shtml.

APPENDIX B

APPENDIX B

APPENDIX B

DAY 1 **LOGGER LOCATION:** 89 John Whiteway Drive, Gostford **DATE:** Tuesday, 6 September 2022



AMBIENT BACKGROUND NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	39	dB
LA90 Evening	1800-2200	37	dB
LA90 Night-time	2200-0700	33	dB

AMBIENT NOISE METRICS

LAeq Daytime	0700-1800	55	dB
LAeq Evening	1800-2200	51	dB
LAeq Night-time	2200-0700	48	dB

TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	54	dB
LAeq 9 hours	2200-0700	48	dB
Max LAeq 1 hour	0700-2200	56	dB
Max LAeq 1 hour	2200-0700	53	dB

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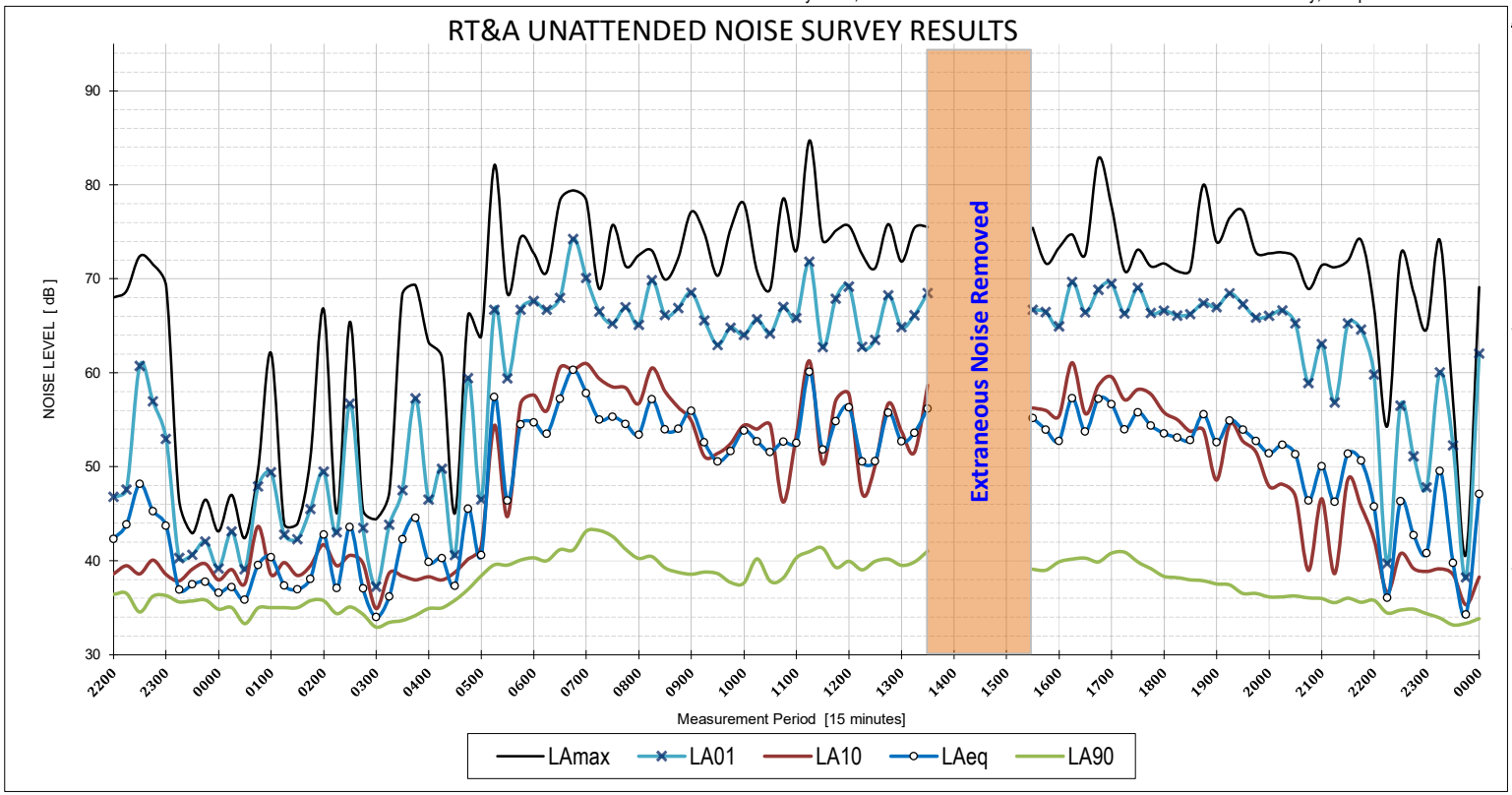
CONSULTANTS IN NOISE & VIBRATION

DAY 2 **LOGGER LOCATION:** 89 John Whiteway Drive, Gostford **DATE:** Wednesday, 7 September 2022



AMBIENT BACKGROUND NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	38	dB
LA90 Evening	1800-2200	36	dB
LA90 Night-time	2200-0700	34	dB

AMBIENT NOISE METRICS

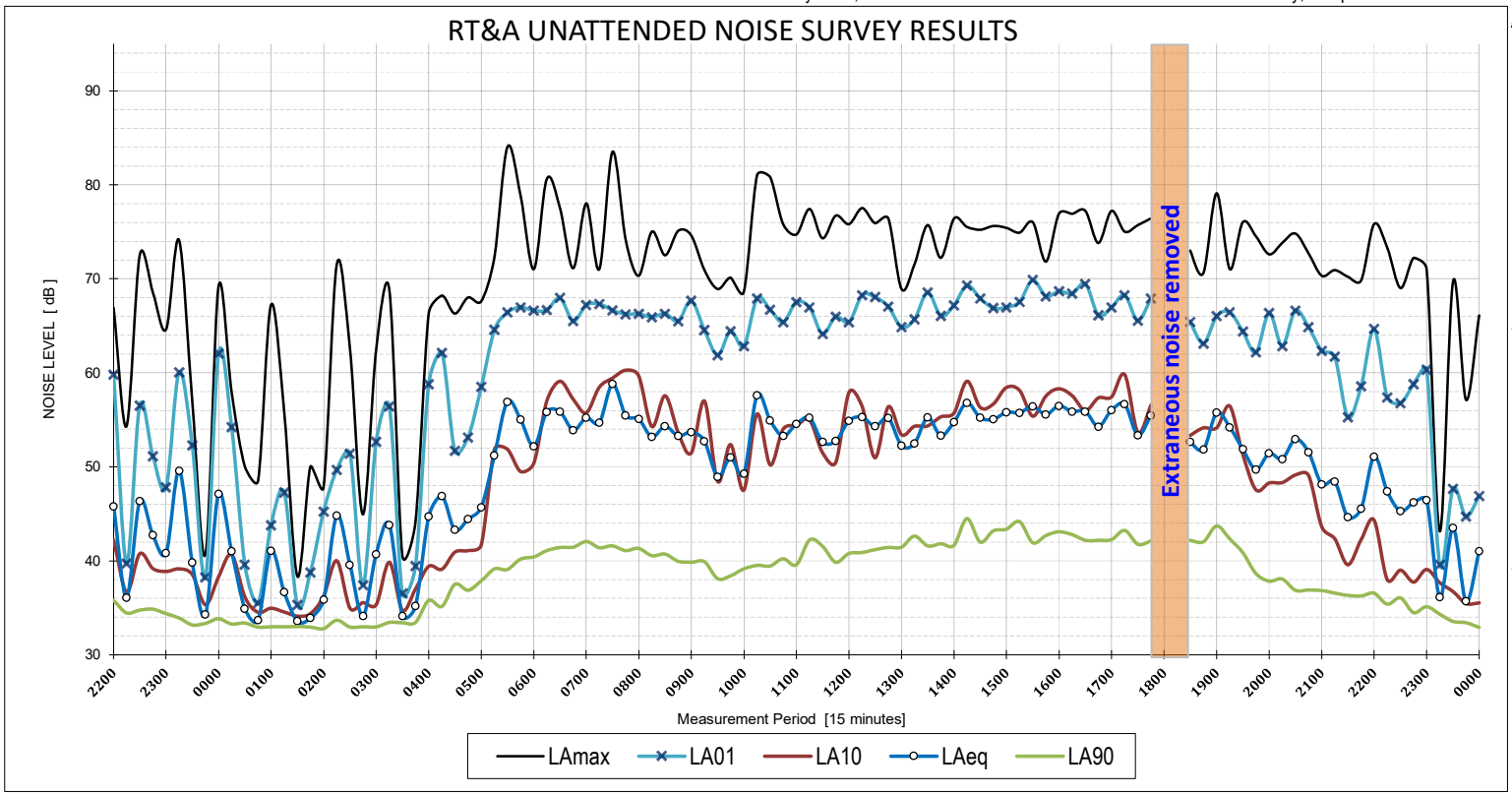
LAeq Daytime	0700-1800	54	dB
LAeq Evening	1800-2200	52	dB
LAeq Night-time	2200-0700	50	dB

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

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 3 **LOGGER LOCATION:** 89 John Whiteway Drive, Gostford **DATE:** Thursday, 8 September 2022



AMBIENT BACKGROUND NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	40	dB
LA90 Evening	1800-2200	36	dB
LA90 Night-time	2200-0700	33	dB

AMBIENT NOISE METRICS

LAeq Daytime	0700-1800	55	dB
LAeq Evening	1800-2200	51	dB
LAeq Night-time	2200-0700	49	dB

TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	54	dB
LAeq 9 hours	2200-0700	49	dB
Max LAeq 1 hour	0700-2200	56	dB
Max LAeq 1 hour	2200-0700	54	dB

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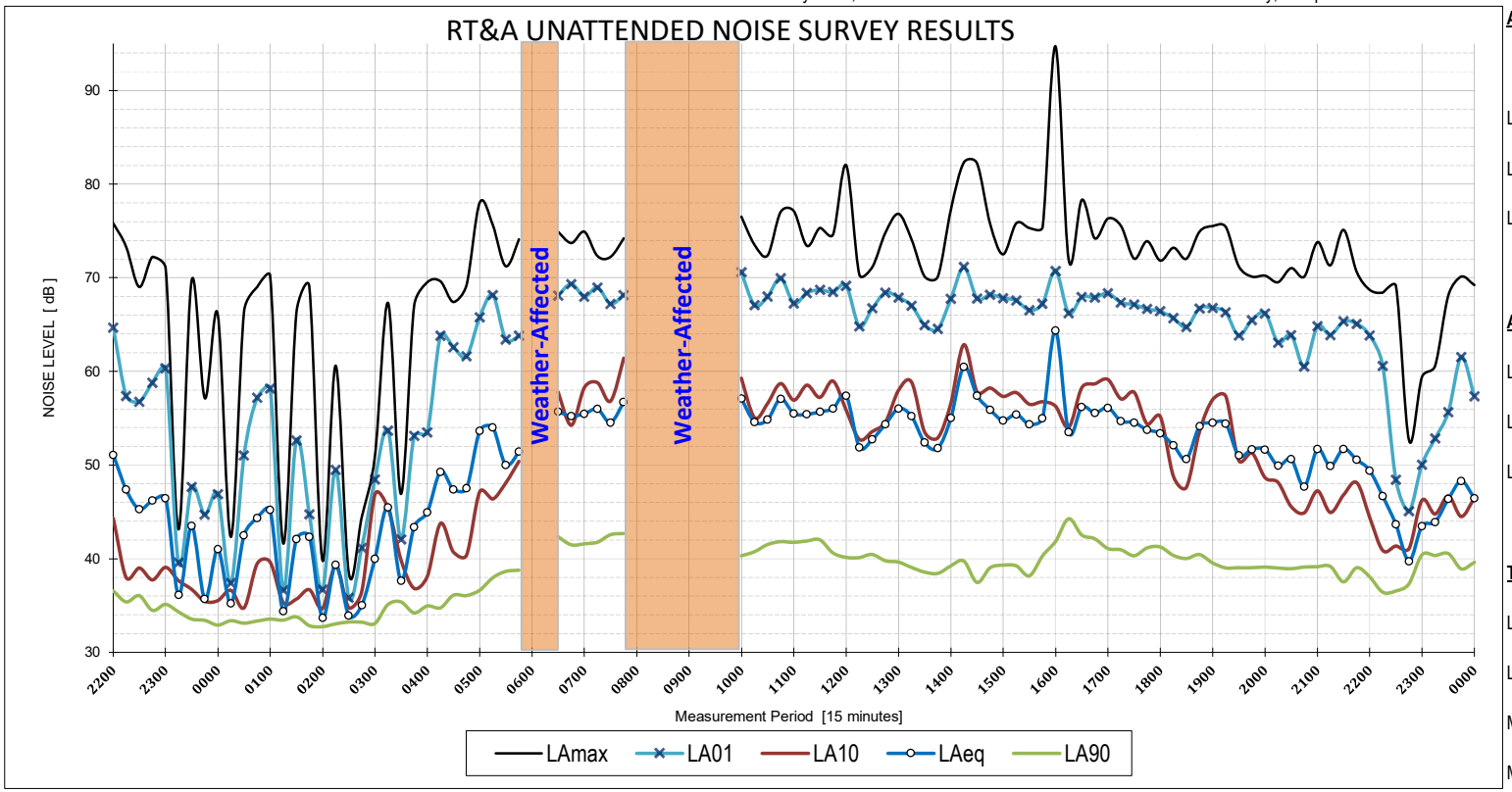
CONSULTANTS IN NOISE & VIBRATION

DAY 4 **LOGGER LOCATION:** 89 John Whiteway Drive, Gostford **DATE:** Friday, 9 September 2022



AMBIENT BACKGROUND NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	39	dB
LA90 Evening	1800-2200	39	dB
LA90 Night-time	2200-0700	33	dB

AMBIENT NOISE METRICS

LAeq Daytime	0700-1800	55	dB
LAeq Evening	1800-2200	52	dB
LAeq Night-time	2200-0700	48	dB

TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	55	dB
LAeq 9 hours	2200-0700	48	dB
Max LAeq 1 hour	0700-2200	57	dB
Max LAeq 1 hour	2200-0700	52	dB

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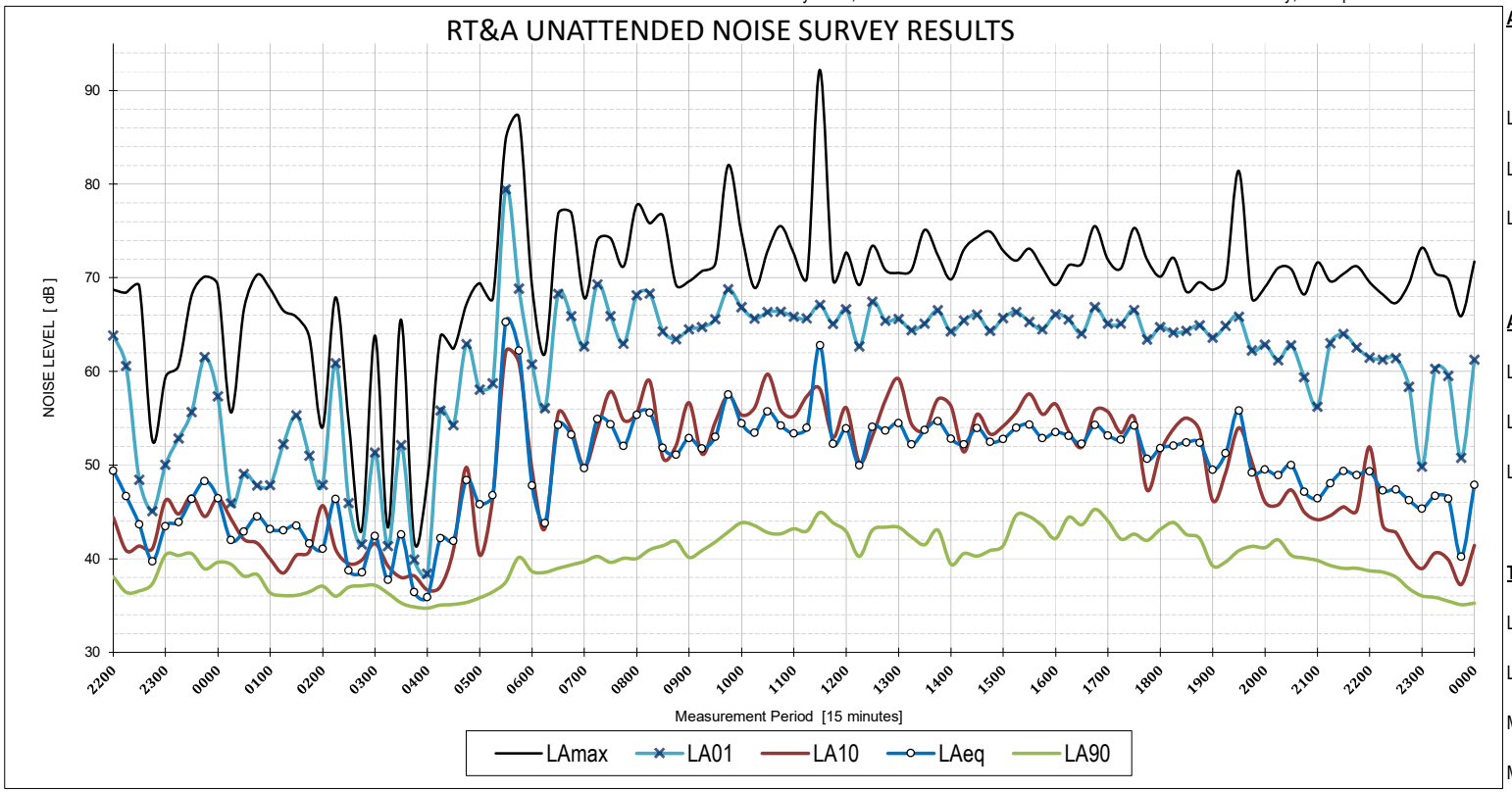
CONSULTANTS IN NOISE & VIBRATION

DAY 5 **LOGGER LOCATION:** 89 John Whiteway Drive, Gostford **DATE:** Saturday, 10 September 2022



AMBIENT BACKGROUND NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	40	dB
LA90 Evening	1800-2200	39	dB
LA90 Night-time	2200-0700	35	dB

AMBIENT NOISE METRICS

LAeq Daytime	0700-1800	54	dB
LAeq Evening	1800-2200	51	dB
LAeq Night-time	2200-0700	52	dB

TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	54	dB
LAeq 9 hours	2200-0700	52	dB
Max LAeq 1 hour	0700-2200	55	dB
Max LAeq 1 hour	2200-0700	59	dB

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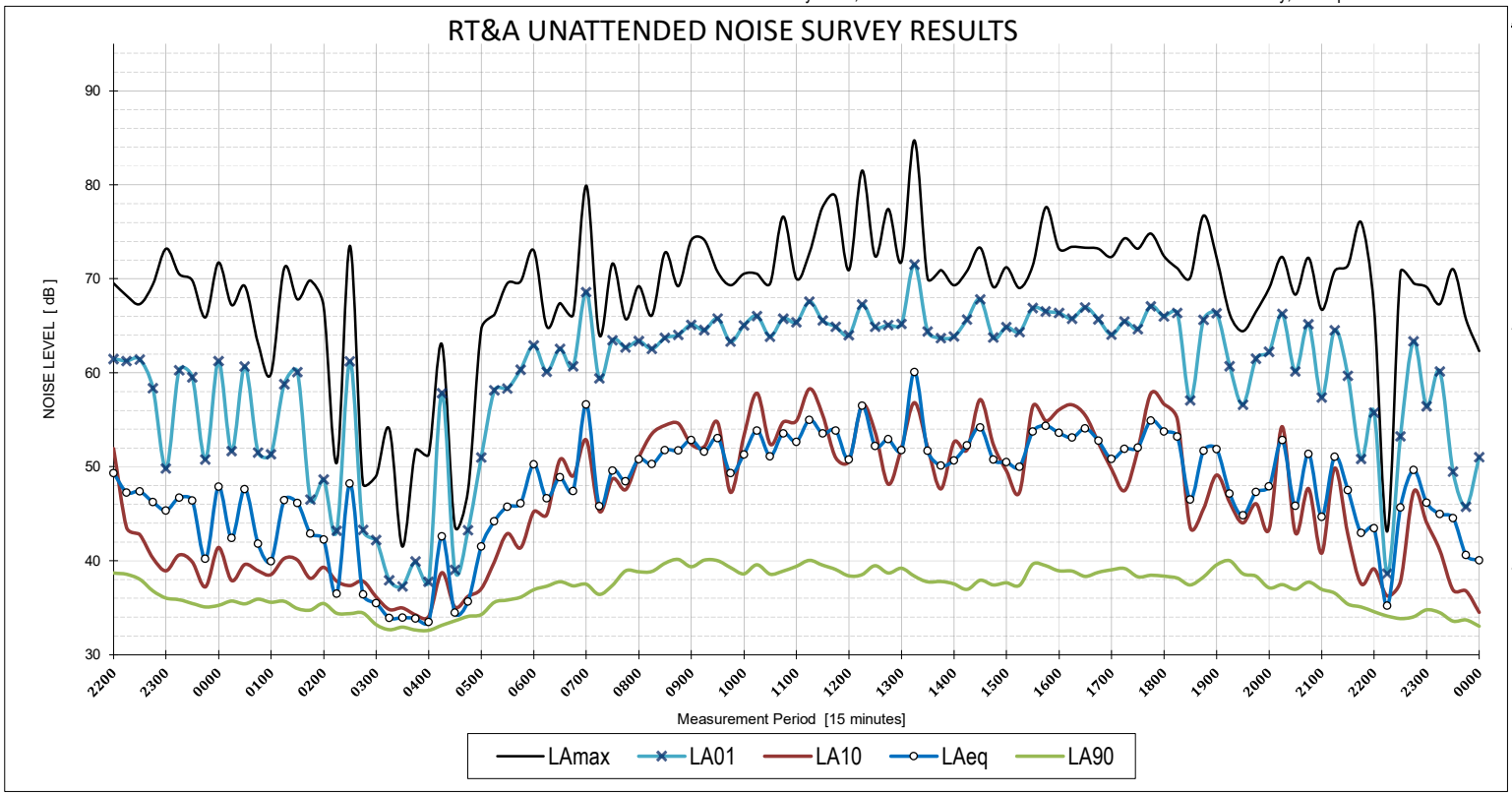
CONSULTANTS IN NOISE & VIBRATION

DAY 6 **LOGGER LOCATION:** 89 John Whiteway Drive, Gostford **DATE:** Sunday, 11 September 2022



AMBIENT BACKGROUND NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0800-1800	38	dB
LA90 Evening	1800-2200	36	dB
LA90 Night-time	2200-0800	33	dB

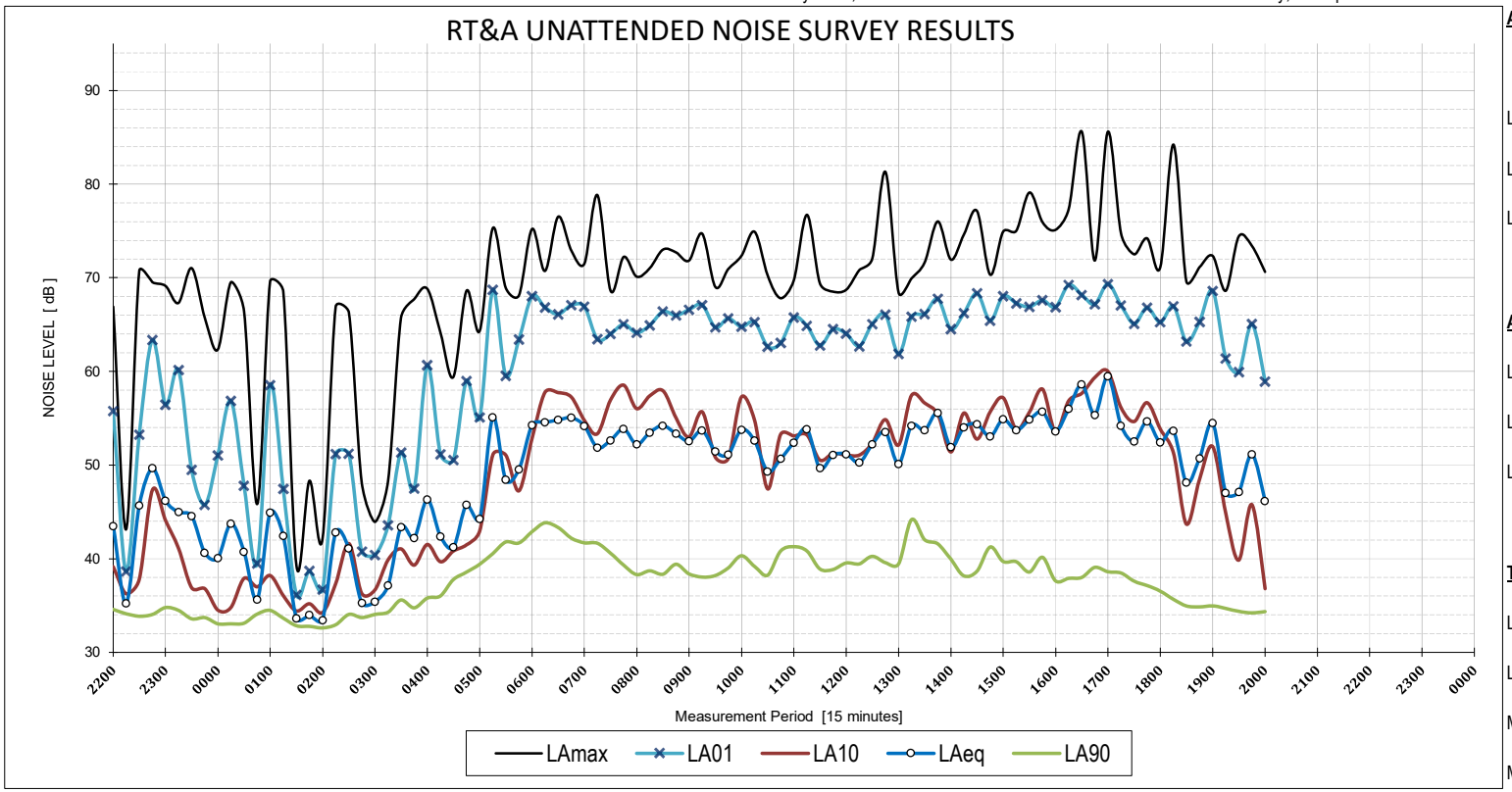
AMBIENT NOISE METRICS

LAeq Daytime	0800-1800	53	dB
LAeq Evening	1800-2200	50	dB
LAeq Night-time	2200-0800	47	dB

TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	52	dB
LAeq 9 hours	2200-0700	45	dB
Max LAeq 1 hour	0700-2200	54	dB
Max LAeq 1 hour	2200-0700	48	dB

DAY 7 **LOGGER LOCATION:** 89 John Whiteway Drive, Gostford **DATE:** Monday, 12 September 2022



AMBIENT BACKGROUND NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	38	dB
LA90 Evening	1800-2200	34	dB
LA90 Night-time	2200-0700	33	dB

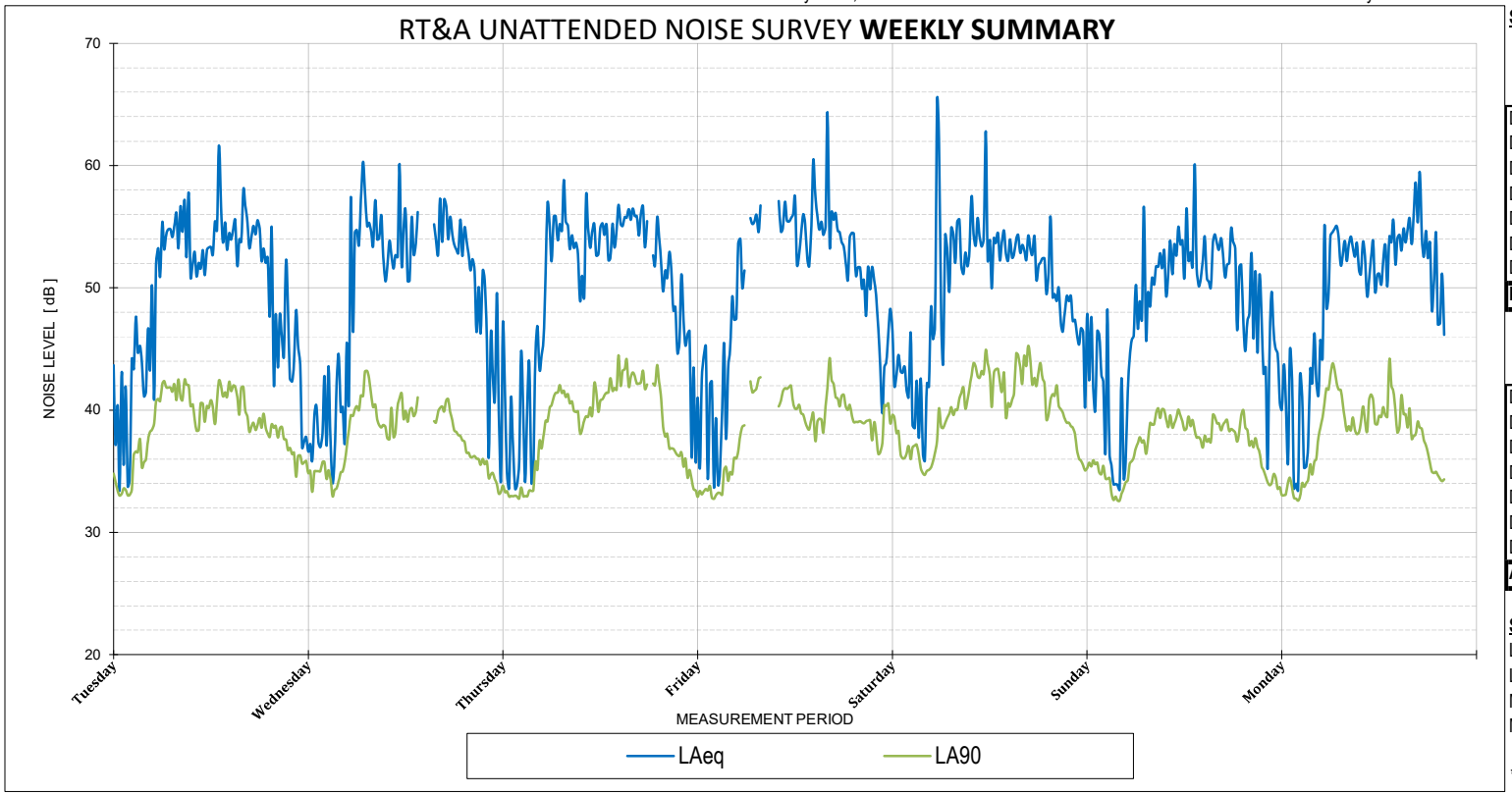
AMBIENT NOISE METRICS

LAeq Daytime	0700-1800	54	dB
LAeq Evening	1800-2200	49	dB
LAeq Night-time	2200-0700	48	dB

TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	53	dB
LAeq 9 hours	2200-0700	48	dB
Max LAeq 1 hour	0700-2200	56	dB
Max LAeq 1 hour	2200-0700	52	dB

WEEKLY SUMMARY **LOGGER LOCATION:** 89 John Whiteway Drive, Gostford **PERIOD:** 6th to 12th February 2022



SUMMARY OF AMBIENT NOISE LEVELS

	LA90 Daytime	*LA90* Evening	*LA90* Night-time
Day 1	39	37	33
Day 2	38	36	34
Day 3	40	36	33
Day 4	39	39	33
Day 5	40	39	35
Day 6	38	36	33
Day 7	38	N/A	33
RBL	**39**	**37**	**33**

	LAeq Daytime	*LAeq* Evening	*LAeq* Night-time
Day 1	55	51	48
Day 2	54	52	50
Day 3	55	51	49
Day 4	55	52	48
Day 5	54	51	52
Day 6	53	50	47
Day 7	54	N/A	48
Average	**54**	**51**	**49**

SUMMARY OF TRAFFIC & MISC. NOISE LEVELS

LAeq 15 hrs	0700-2200	54	dB
LAeq 9 hrs	2200-0700	49	dB
Max LAeq 1 hr	0700-2200	56	dB
Max LAeq 1 hr	2200-0700	54	dB

**Sundays and Public Holidays hours change to 0800*

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