Construction Noise & Vibration Management Plan
Proposed Construction Works
1-5 Nelson Road, Lindfield, NSW

Client:
Castle Hill No. 3 Pty Ltd

4 June 2025

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Document	Rev	Date	Prepared	Reviewed	Authorised	Approved
6792R002.LM.250520	0	22 May 2025	LM	RH	RH	RH
6792R002.LM.250604	1	4 June 2025	LM	RH	RH	RH

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GLOSSARY

NOISE

Noise is produced through rapid variations in air pressure at audible frequencies (20 Hz – 20 kHz). Most noise sources vary with time. The measurement of a variable noise source requires the ability to describe the sound over a particular duration of time. A series of industry standard statistical descriptors have been developed to describe variable noise, as outlined below.

NOISE DESCRIPTORS

L_{eq} – The sound pressure level averaged over the measurement period. It can be considered as the equivalent continuous steady-state sound pressure level, which would have the same total acoustic energy as the real fluctuating noise over the same time period.

$L_{Aeq(15min)}$ – The A-weighted average equivalent sound level over a 15-minute period.

L_{A10} – The A-weighted noise level that has been exceeded for 10% of the measurement duration.

L_{A90} – The A-weighted noise level that has been exceeded for 90% of the measurement duration. This descriptor is used to describe the background noise level.

RBL – Rating Background Level. The overall, single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period (as opposed to over each 24-hour period used for assessment background level). This is the level used for assessment purposes.

dB – Decibels. The fundamental unit of sound, a Bell is defined as the logarithm of the ratio of the sound pressure squared over the reference pressure squared. A Decibel is one-tenth of a Bell. Probably the most common usage of the Decibel in reference to sound loudness is dB sound pressure level (SPL), referenced to the nominal threshold of human hearing. For sound in air and other gases, dB (SPL) is relative to 20 micropascals (μPa) = 2×10^{-5} Pa, the quietest sound a human can hear.

A-WEIGHTING

"A-weighting" refers to a prescribed amplitude versus frequency curve used to "weight" noise measurements to represent the frequency response of the human ear. Simply, the human ear is less sensitive to noise at some frequencies and more sensitive to noise at other frequencies. A-weighting is a method to present a measurement or calculation result with a number representing how humans subjectively hear different frequencies at different levels.

NOISE CHARACTER, NOISE LEVEL AND ANNOYANCE

The perception of a given sound to be deemed annoying or acceptable is greatly influenced by the character of the sound and how it contrasts with the character of the background noise. A noise source may be measured to have only a marginal difference to the background noise level but may be perceived as annoying due to the character of the noise.

Acoustic Dynamics' analysis of noise considers both the noise level and sound character in the assessment of annoyance and impact on amenity.

1 INTRODUCTION

1.1 EXECUTIVE SUMMARY

Acoustic Dynamics is engaged by **Castle Hill No. 3 Pty Ltd** to assess and make recommendations to reduce and manage noise and vibration emission resulting from the demolition, excavation and construction works for the proposed development located at 1-5 Nelson Road, Lindfield, NSW.

This report presents the relevant construction noise and vibration emission objectives, construction noise and vibration prediction calculations, an impact assessment and recommendations for mitigation and management measures to be implemented, to minimise the potential for adverse impact at the nearest potentially affected receivers, resulting from excavation and construction works.

This report is prepared in accordance with the various acoustic requirements of:

(a) Ku-ring-gai Council;
(b) NSW Department of Planning, Housing and Infrastructure;
(c) NSW Environment Protection Authority; and
(d) Australian Standards.

1.2 PROJECT DESCRIPTION

The project site is located at 1-5 Nelson Road, Lindfield, situated within a Low Density Residential (R2) land zone within the Ku-ring-gai Council area of NSW. The site is bounded by Nelson Road to the west, and residential developments to the north, east and south. Access to the development shall be via Nelson Road.

The project proposal is to include the following:

- Demolition of existing improvements, tree removal and site clearing;
- Construction of a new residential flat building comprising of 167 residential apartments (inclusive of affordable housing apartment) and basement car parking; and
- External landscaping works.

Acoustic Dynamics is advised that use of noise generating equipment during the proposed works will be undertaken between the following operating hours, as shown below.

Table 1.1 Operating Hours of Noise Generating Equipment

Activity	Permitted Work Hours
All building, construction and site work, including site deliveries (except as detailed below)	• Monday to Friday – 7:00am to 5:00pm • Saturdays – 8:00am to 12:00pm • Sundays & public holidays – No work or deliveries permitted
Excavating of rock, use of jackhammers, pile-drivers or the like	• Monday to Friday – 7:00am to 5:00pm • Weekends & public holidays – No work permitted

The project site, adjacent receivers and surrounding area are shown in the Location Map and Aerial Image presented within **Appendix A**.

2 ASSESSMENT CRITERIA AND STANDARDS

Acoustic Dynamics has reviewed local planning and development control instruments, government policies and legislation, standards and guidelines that are applicable to the associated works. The relevant sections of this review and the most stringent criteria applicable to this assessment are presented below.

2.1 NSW ENVIRONMENT PROTECTION AUTHORITY

2.1.1 INTERIM CONSTRUCTION NOISE GUIDELINE 2009

The NSW EPA's *Interim Construction Noise Guideline 2009* (ICNG) is developed to manage noise from construction works. The ICNG advises that a quantitative methodology of assessment of construction noise emission may be undertaken for long-term (greater than three weeks) works.

Acoustic Dynamics advises that the most appropriate methodology for the assessment of noise emission from the proposed works is a quantitative assessment, to minimise noise emission from the works. Note should be made that the ICNG states that when developing noise mitigation strategies for reducing construction noise emission focus should be given to *"applying all 'feasible' and 'reasonable' work practices to minimise construction noise impacts"*.

Accordingly, relevant noise emission goals have been determined for the proposed works, in accordance with the information contained within the ICNG, which should be achieved where possible.

The ICNG provides information on management levels (noise emission goals) for construction noise emission at residential receivers, and other various sensitive receivers. The management noise levels at residential receivers are dependent upon the relevant rated background level (RBL) at the residential receiver, and the time of day that the construction noise is to be generated.

To establish the acoustic environment at the subject site in accordance with the guidelines of the NPfI, unattended noise monitoring was conducted in the front and rear yard of 3 Nelson Road between Friday 23 May 2025 and Friday 30 May 2025.

Acoustic Dynamics advises the measurement locations, shown in **Appendix A**, are representative of the existing noise environment of the nearest sensitive receivers. Results from the long-term noise monitoring are presented in **Appendix B**.

The results of unattended noise monitoring from Friday 23 May 2025 until Friday 30 May 2025, within the rear yard of 3 Nelson Road, Lindfield, are presented below.

Table 2.1 Measured Ambient Noise Environment

Location	Period	Measured Noise Levels [dB][1,2]	
		RBL (L_{A90})	L_{Aeq}
3 Nelson Road (Rear Yard)	Daytime (7am to 6pm)	39	51

Note: 1) Measured noise levels are ambient, and do not include any subject works or associated activities.
2) Works at the site will not take place outside daytime hours of 7am to 5pm Monday to Saturday.

Based on the measured background noise measurements and surrounding environment, **Table 2.2** presents the construction external noise emission management objectives, as detailed in the ICNG, for the nearest sensitive receivers:

Table 2.2 Site Specific Construction External Noise Objectives at Receivers

Time of Day	EPA Management Level ($L_{Aeq\ (15\ min)}$)	Site specific construction noise emission goals $L_{Aeq\ (15\ min)}$ [dB]
Recommended Standard Hours: Monday to Friday 7am to 5pm Saturday 8am to 12pm No work on Sundays or Public Holidays	Residences	**49 (RBL + 10 dB)**
	Highly noise affected	**75**

Note: 1) Works at the site are not expected to take place outside recommended standard hours.

Based on the information contained within the ICNG, Acoustic Dynamics recommends that noise emission from the proposed works achieves the following noise emission goals, when possible.

Note should be made that as night-time works are not expected to occur, the assessment of sleep disturbance is not warranted.

2.2 AUSTRALIAN AND INTERNATIONAL STANDARDS

Acoustic Dynamics has reviewed relevant Australian and International Standards in relation to noise and vibration emission from construction works, including the following standards:

- *AS 2436-2010 "Guide to noise and vibration control on construction, demolition and maintenance sites"*;
- *BS 7385-2:1993 "Evaluation and measurement for vibration in buildings – Guide to damage levels from groundborne vibration"*; and
- *DIN 4150-3:2016-12 "Vibration in buildings – Part 3: Effects on structures"*.

2.2.1 AS 2436-2010 "GUIDE TO NOISE AND VIBRATION CONTROL ON CONSTRUCTION, DEMOLITION AND MAINTENANCE SITES"

AS 2436 provides guidance on noise control regarding engineering construction, maintenance and demolition works, including guidance toward the investigation and identification of noise sources, sound measurement and assessment, and noise management.

The following information relating to appropriate noise emission goals for construction sites is provided:

> *"**3.2 NOISE AND VIBRATION IMPACTS ON THE COMMUNITY***
>
> *Whether or not noise from a construction, maintenance or demolition site is likely to constitute a problem depends upon a number of considerations, such as –*
>
> *(a) existing background noise level;*
> *(b) distance between the site and the areas likely to be affected by the construction noise;*
> *(c) nature of buildings and the activity therein, where the noise is likely to be heard;*
> *(d) the likely duration of construction, maintenance and demolition operations and the hours during which the above operations will be carried out (whether during the day, night or weekends);*
> *(e) the nature of the noise, e.g. audible pure tone components and impulsive character; and*
> *(f) the number of items of major plant and equipment being utilized simultaneously on the site for their cumulative impact.*
>
> *Some construction or demolition activities are by their very nature noisy. The authorities responsible for setting noise level criteria for essential works will take note of the constraints imposed by such activities, especially when they are of short duration."*

Acoustic Dynamics advises that determination of appropriate noise emission goals for the proposed works in accordance with the ICNG guidelines will satisfy the recommendations and guidelines detailed within AS 2436.

We advise that assessment of the proposed works, detailed within this document, has been carried out in accordance with the information and guidelines detailed within AS 2436.

2.2.2 BS 7385-2:1993 "EVALUATION AND MEASUREMENT FOR VIBRATION IN BUILDINGS — GUIDE TO DAMAGE LEVELS FROM GROUNDBORNE VIBRATION"

In terms of the most recent relevant vibration damage criteria, BS 7385 represents a definitive standard against which the likelihood of building damage from ground vibration can been assessed.

Although there is a lack of reliable data on the threshold of vibration-induced damage in buildings both in countries where national standards already exist and, in the UK, BS 7385: Part 2 has been developed from an extensive review of UK data, relevant national and international documents and other published data.

The standard sets guide values for building vibration based on the lowest vibration levels above which damage has been credibly demonstrated. These levels are judged to give a minimum risk of vibration-induced damage, where minimal risk for a named effect is usually taken as a 95% probability of no effect.

Sources of vibration, which are considered in the standard, include blasting (carried out during mineral extraction or construction excavation), excavation, piling (sheet, bored, contiguous), ground treatments (e.g. compaction), construction equipment, tunnelling, road and rail traffic and industrial machinery.

The guide values from this standard for transient vibration judged to result in a minimal risk of cosmetic damage to residential buildings and industrial buildings are presented numerically in **Table 2.3** and graphically in **Figure 2.4**.

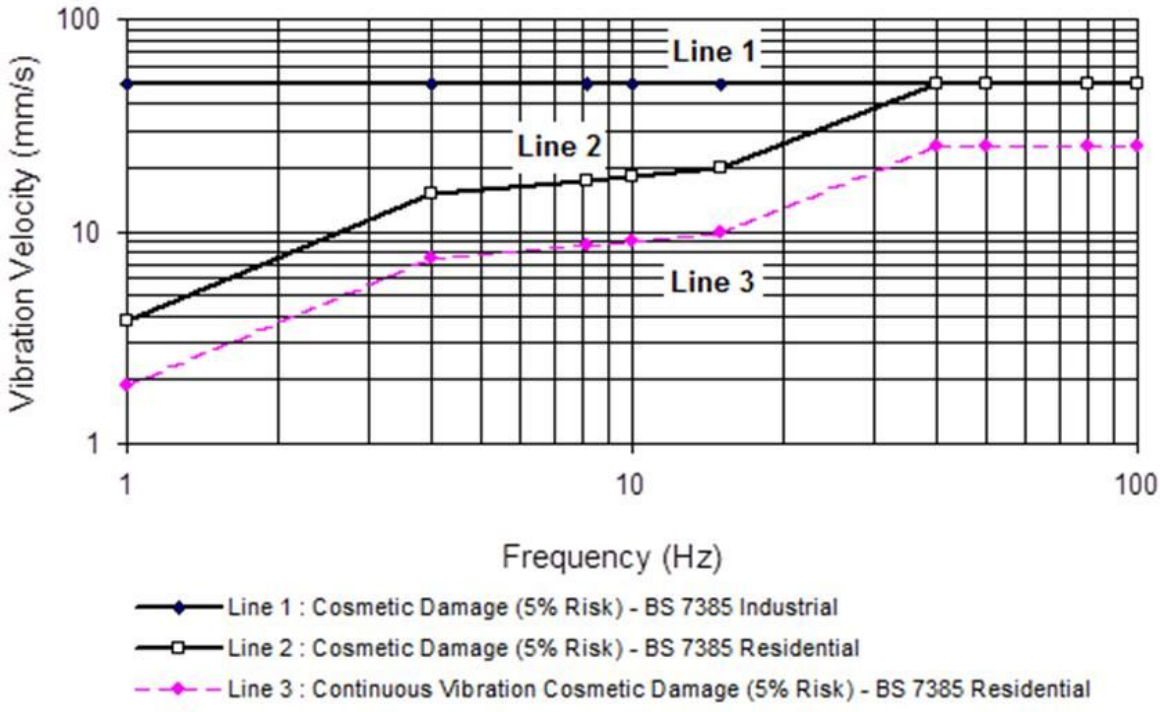
Table 2.3 Transient Vibration Guide Values - Minimal Risk of Cosmetic Damage

Line	Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
		4 Hz to 15 Hz	15 Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structures residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

In relation to guide values for continuous vibration relating to cosmetic damage, the standard states that the guide values above relate predominantly to transient vibration, which does not give rise to the resonant responses in structures, and to low-rise buildings.

Where the dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification due to resonance, especially at lower frequencies where lower guide values apply, then the guide values above may need to be reduced by up to 50%, as is the case with continuous vibration from rock breaking.

Figure 2.1 Graph of Transient Vibration Guide Values for Cosmetic Damage



The standard goes on to state that minor damage is possible at vibration magnitudes, which are greater than twice those presented above, and major damage to a building structure may occur at values greater than four times the tabulated values.

It is noteworthy that in addition to the guideline values presented above, the standard also states the following:

> *"Some data suggests that the probability of damage tends towards zero at 12.5 mm/s peak component particle velocity. This is not inconsistent with an extensive review of the case history information available in the UK."*

Note is made that **cosmetic damage** to buildings occurs at vibration levels significantly lower than those causing **structural damage**.

- BS 7385 indicates a 5% risk of **cosmetic damage** to commercial/industrial buildings at 50 mm/s from transient vibration and at 25 mm/s from continuous vibration; and

- BS 7385 indicates a 5% risk of **cosmetic damage** to residential and light framed structures at 15 mm/s at 4 Hz from transient vibration and at 7.5 mm/s at 4 Hz from continuous vibration.

2.2.3 DIN 4150-3:2016-12 "VIBRATION IN BUILDINGS – PART 3: EFFECTS ON STRUCTURES"

In addition to the above standard, DIN 4150 provides guideline values of vibration velocity for evaluating the effects of short-term vibration. Table 1 of DIN 4150 is reproduced below.

Table 2.4 Guideline values of vibration velocity, vi, for evaluating the effects of short-term vibration

Line	Type of structure	Vibration Velocity, v_i, in mm/s			
		Foundation			Plane of floor of uppermost full storey
		At a frequency of			Frequency mixture
		Less than 10 Hz	10 to 50 Hz	50 to 100)* Hz	
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
*) For frequencies above 100 Hz, at least the values specified in this column should be applied.					

In view of the foregoing, the following **conservative** site assessment control limits could be adopted for the purposes of monitoring and evaluating the measured vibration levels from the excavation works, should this be required:

Residential Structures Adjacent to Proposed Works:

- All buildings and structures adjacent to works – 7.5 mm/s peak component particle velocity (site control level).

3 NOISE MEASUREMENT EQUIPMENT AND STANDARDS

All measurements were conducted in general accordance with AS 1055.1:2018 *Acoustics – Description and Measurement of Environmental Noise Part 1: General Procedures*. Sound measurements were carried out using precision sound level meters conforming to the requirements of IEC 61672.1:2002 *Electroacoustics: Sound Level Meters – Part 1: Specifications*. The instrumentation used during the survey is set out in **Table 3.1**.

Table 3.1 Noise Survey Instrumentation

Type	Serial Number	Instrument Description
XL2	A2A-05090-E0	NTI Audio XL2 Noise Logger
4230	1234148	Brüel & Kjaer Acoustic Calibrator

The reference sound pressure level was checked prior to and after the measurements using the acoustic calibrator and remained within acceptable limits.

The prevailing weather conditions during the measurements were generally calm and did not influence the noise measurements taken.

4 ASSESSMENT METHODOLOGY

Acoustic Dynamics has performed calculations to predict maximum L_{Aeq} noise emission levels at adjacent receiver locations resulting from the proposed works and operations.

Acoustic Dynamics has conducted operator-attended noise measurements of similar/equivalent equipment at various other sites on numerous occasions. Based on previous operator-attended surveys of similar activities and equipment, prediction calculations have been undertaken to predict the noise impact at adjacent receiver locations, resulting from the proposed works, in accordance with the assessment criteria and standards detailed in **Section 2**.

Within our calculations and acoustic modelling, noise emission contributions from the development have been considered taking the following factors into account:

- Airborne noise losses due to distance and ground topography;
- Losses due to direction and diffraction;
- Increases due to reflections; and
- Acoustic shielding.

4.1 NOISE SOURCES AND OPERATIONS

Acoustic Dynamics advises that the project is likely to be undertaken in three main stages:

1. Demolition (approximately 1 month duration);
2. Excavation (approximately 6 months duration); and
3. Construction (approximately 24 months duration).

Acoustic Dynamics understands that the following items of noise emitting equipment and machinery are likely to be used during the proposed works.

Table 4.1 Predicted Noise Sources and Operations

Source	Sound Pressure Level @ 1m L_p [dB(A)][1]
Demolition Works	
Hammers	85
Saws	101
Other hand-held tools	94
5-Tonne Excavator (including attachments)	97
18-Tonne Excavator (including attachment)	101
Trucks (for removal of materials)	92
Excavation Works	
5-Tonne Excavator (including attachments)	97
18-Tonne Excavator (including attachment)	101
30-Tonne Excavator (including attachments)	103
45-Tonne Excavator (including attachment)	107
Anchor Rig	93
Bobcat	80
Trucks (for removal of materials)	92
Construction Works and Site Restoration	
Hammers	85
Kanga Hammers	103
Saws	101
Grinders	80
Drills	80
Mud/cement mixers	85
Compressors	92
Nail guns	85
Concrete trucks/pumps	95

Source	Sound Pressure Level @ 1m L_p [dB(A)][1]
Concrete vibrators	105
Cranes	90
Trucks (for delivery of materials)	92
Trades	N/A
Other typical building tools and equipment	90

Note: 1) For the purpose of noise assessment, the likely maximum "at source" noise levels (A-weighted sound pressure levels at 1 metre) have been used.

Accordingly, assessment of the operation of the above items requires calculation of their noise emission levels to nearby potentially affected receiver locations.

4.2 NEAREST RECEIVERS

The cumulative noise impact has been assessed to the potentially most affected point at the adjacent sensitive receiver properties and presented below.

Table 4.2 Nearest Sensitive Receiver Locations

Source	Location	Direction
R_1	7 Nelson Road	North
R_2	9A Nelson Road	North
R_3	6-8 Lightcliff Ave	East
R_4	2-4 Lightcliff Ave	East
R_5	36-40 Tryon Road	South
R_6	30-34 Tryon Road	South
R_7	12-16 Nelson Road	West

5 CONSTRUCTION NOISE AND VIBRATION EMISSION ASSESSMENT

The calculated maximum noise emission and vibration levels at the nearest receiver locations are presented below.

The assessment location for **external noise emission** is defined as the most affected point on or within any sensitive receiver property boundary. Examples of this location may be:

- 1.5m above ground level;
- On a balcony at 1.5m above floor level; and
- Outside a window on the ground or higher floors, at a height of 300mm below the head of the window.

Vibration emission is assessed at the nearest building or structure likely to be affected by the excavation works on or within any sensitive receiver property boundary.

5.1 PREDICTED EXTERNAL NOISE EMISSION LEVELS

Acoustic Dynamics has calculated external noise emission levels resulting from various stages of the proposed works. The predicted noise levels at the various receivers represent the **maximum cumulative** received L_{Aeq} noise levels resulting from the use and operation of the highest noise emitting items listed above.

Note should be made that the highest noise emitting items of plant and equipment are unlikely to be used for long durations. Typically, received L_{Aeq} noise emission levels are expected to be lower than these during the majority of the works. Significantly lower noise levels than those presented in the table would also be expected within internal areas.

Table 5.1 Maximum Predicted Noise Emission Levels and Criteria

Receiver Location	Stage of Works	Predicted Range of L_{Aeq} Noise Levels[1] [dB]	EPA L_{Aeq} Noise Management Levels [dB]		Achieves EPA Guidelines?	
			Noise Affected	Highly Noise Affected	Noise Affected	Highly Noise Affected
R_1	Demolition	58 – 82	49	75	**No**	**No**
	Excavation	58 – 75			**No**	**Yes**
	Construction	58 – 75			**No**	**Yes**
R_2	Demolition	56 – 64	49	75	**No**	**Yes**
	Excavation	58 – 75			**No**	**Yes**
	Construction	56 – 75			**No**	**Yes**
R_3	Demolition	56 – 59	49	75	**No**	**Yes**
	Excavation	54 – 75			**No**	**Yes**
	Construction	53 – 75			**No**	**Yes**
R_4	Demolition	57 – 59	49	75	**No**	**Yes**
	Excavation	54 – 75			**No**	**Yes**
	Construction	53 – 75			**No**	**Yes**
R_5	Demolition	58 – 68	49	75	**No**	**Yes**
	Excavation	58 – 77			**No**	**No**
	Construction	56 – 75			**No**	**Yes**

Receiver Location	Stage of Works	Predicted Range of L_{Aeq} Noise Levels[1] [dB]	EPA L_{Aeq} Noise Management Levels [dB]		Achieves EPA Guidelines?	
			Noise Affected	Highly Noise Affected	Noise Affected	Highly Noise Affected
R_6	Demolition	58 - 81	49	75	**No**	**No**
	Excavation	58 – 77			**No**	**No**
	Construction	56 – 75			**No**	**Yes**
R_7	Demolition	57 – 61	49	75	**No**	**Yes**
	Excavation	58 – 68			**No**	**Yes**
	Construction	56 – 70			**No**	**Yes**

Note: 1) Calculated noise level at nearest residential boundary or nearest exposed facade.
2) Instances considered "Highly Noise Affected" will be infrequent and are unlikely to unreasonably disturb the adjoining properties.

5.2 PREDICTED VIBRATION EMISSION LEVELS

Acoustic Dynamics has been advised that mechanical excavation methods will be utilised. Based on the information provided by the proponent, the proposed excavation methodology is likely to result in **minimal perceivable** vibration levels (human comfort) at the nearest receivers, provided the management strategies in **Section 7** are implemented and strictly adhered to.

Acoustic Dynamics advises that where rock is to be removed from the site, excavation should incorporate the use of saw cuts in rock to enable smaller, rather than large, rock-breakers to be used to break the rock away from the saw cut.

Such sawing has been shown to produce significantly lower vibration levels and substantially reduce the potential for structural or cosmetic damage to adjacent buildings and structures.

Table 5.2 Maximum Predicted Excavation Works Vibration Emission Levels and Criteria

Construction Stage	Receiver Location	Predicted Vibration Levels (PPV)[1,2]	5% Risk of Cosmetic Damage Criterion	Likely to Comply?
Excavation works	**R_1**	<5.0 mm/s	**7.5 mm/s**	**Yes**
	R_2	<5.0 mm/s		**Yes**
	R_3	<1.0 mm/s		**Yes**
	R_4	<1.0 mm/s		**Yes**
	R_5	<3.0 mm/s		**Yes**
	R_6	<3.0 mm/s		**Yes**
	R_7	<1.0mm/s		**Yes**
All other works	**R_1**	<1.0 mm/s	**7.5 mm/s**	**Yes**
	R_2	<1.0 mm/s		**Yes**
	R_3	<1.0mm/s		**Yes**
	R_4	<1.0mm/s		**Yes**
	R_5	<1.0mm/s		**Yes**
	R_6	<1.0mm/s		**Yes**
	R_7	<1.0mm/s		**Yes**

Note: 1) Predicted received peak component particle velocity (PPV) at structure.

2) Subject to the strict adherence to a vibration monitoring program at the nearest sensitive structures.

6 DISCUSSION

Acoustic Dynamics' predicted maximum construction noise and vibration emission levels indicate the following:

1. Noise emission associated with the proposed works is predicted to **exceed** the EPA's "*Noise Affected*" construction noise management level at all receivers, given the particularly low level of background noise measured on-site;

2. Noise emission associated with the proposed works is expected to **generally comply** with the EPA's "*Highly Noise Affected*" construction noise management level at the nearest receivers;

3. Noise emission associated is predicted to **exceed** the relevant "*Highly Noise Affected*" construction noise management level at the following receivers:

    - **R_1** 7 Nelson Road (Demolition);
    - **R_5** 36-40 Tryon Road (Excavation); and
    - **R_6** 30-32 Tryon Road (Demolition & Excavation);

4. Although the majority of construction activities are **expected to comply** with the EPA's "*Highly Noise Affected*" construction noise management level, the magnitude of the predicted exceedance may lead to complaint and appropriate strategies should be developed to manage noise emission and community liaison;

5. To minimise construction noise emission levels from the proposed works, Acoustic Dynamics provides recommendations for feasible and reasonable noise mitigation and management in **Section 7**, which should be incorporated into the noise management plan for the proposed construction works;

6. Whilst predicted levels of vibration emission during excavation works poses a **low risk** for structural damage at the nearest receivers, Acoustic Dynamics recommends vibration monitoring be undertaken at the nearest adjacent structures at each boundary for the duration of the excavation works;

7. The predicted vibration levels resulting all other stages of the proposed works are below the relevant structural damage criteria;

8. To ensure the assessment is conducted in a conservative manner, noise and vibration emission has been assessed as a **worst-case** scenario. Generally, noise emission associated with the works is **predicted to be lower** than the calculations presented; and

9. The noise and vibration calculations should not be considered prescriptive. They are modelling assumptions that have been used to demonstrate typical noise sources and operations associated with the proposed works **can be managed to achieve compliance** with the relevant criteria.

7 RECOMMENDATIONS AND ADVICE

Further to the predicted noise emission levels presented in **Section 5**, Acoustic Dynamics advises that measures are required to minimise and manage noise emission and impact from the proposed demolition, excavation and construction works at the subject site.

7.1 NOISE AND VIBRATION MANAGEMENT PLAN

Acoustic Dynamics recommends the following measures be implemented to minimise and manage noise and vibration emission from the proposed construction works:

1. Acoustic Dynamics recommends that the use of noise-generating equipment at the subject site only be carried out during the following construction hours:

    - **Monday to Friday:** 7:00am to 5:00pm; and
    - **Saturday:** 8:00am to 12:00pm.

    NB: No work is to be carried out on Sundays and Public Holidays.

2. **Noise and vibration induction** of all site staff, including the explanation of noise and vibration control, and a discussion of project specific reduction strategies;

3. Implementation of an appropriate **community liaison procedure**, including a noise and vibration management and noise and vibration complaint procedure and continual liaison with nearby potentially affected receivers;

4. Implementation of a **noise and vibration monitoring** and reporting programme, where necessary, to protect the interest of all parties or should complaints arise;

5. The use of **temporary noise barriers** around particularly noisy activities (where feasible and reasonable);

6. Use of **quietest available** equipment and **lowest vibration-generating** equipment for works (where feasible and reasonable);

7. Where excavation of rock is required, an appropriate **excavation methodology** should be adopted;

8. Where there is any risk of damage, a **dilapidation survey** of adjacent buildings and structures should be completed prior to the commencement of any excavation works;

9. Implementation of **periods of respite**, where highly intensive activities produce loud noise (i.e. greater than 75 dB(A) at nearby residences) to minimise disturbance to nearby receivers; and

10. Should trucks or other vehicles be required to be on site for longer than five minutes, Acoustic Dynamics advises that engines should be **switched off** for the duration.

The following sections provide further detail regarding the various measures listed above and how they are to be incorporated into the noise management procedures for the proposed works.

7.2 COMMUNITY LIAISON PROCEDURE

Acoustic Dynamics recommends implementation of an appropriate community liaison procedure, including a noise management and complaint procedure, and continual liaison with the nearby potentially affected receivers. The following should be carried out by the proponent:

1. A sign is to be located near the entry to the site with 24-hour contact details (mobile phone numbers and email addresses for receipt of complaints); and

2. A detailed (physical) log of all complaints relating to noise is to be kept on site. Such a log should include details of:

    (a) the address of the complainant;
    (b) the date and time of the complaint;
    (c) the date and time the subject noise was heard;
    (d) a description of the activities being undertaken at the time of the subject complain;
    (e) a contact telephone number for the complainant; and
    (f) detail of the person who fielded and logged the complaint;
    (g) the signature of the project manager or site foreman confirming the complaint has reached an appropriate level of responsibility;
    (h) detail of the action taken to respond to the complaint and the timing of this response; and
    (i) the signature of the project manager or site foreman signing off confirmation that the complaint has been appropriately addressed.

3. Neighbouring residents should be notified in writing prior to the commencement of excessively noisy activities. Notices should include an approximate timeframe of the works and a site contact phone number. The following would be suitable phrasing to include within a notification letter:

    "Dear Resident

    We are writing to inform you of the upcoming works and activities that will be occurring at 1- 5 Nelson Road, Lindfield.

    Between date DD/MM/YY and date DD/MM/YY, we will be conducting demolition activities, removal of site waste and construction activities.
    The works will be occurring weekdays (7:00am to 5:00pm) and Saturdays (8:00am to 12:00pm).

    To ensure amenity impacts are controlled, we are implementing management measures such as restricting the duration of noisy activities, allowance for respite periods and selecting low noise equipment.

    The contact details for the site manager are listed below should you wish to discuss any aspect of the noise impacts associated with the works.

    We appreciate your understanding during this inconvenience."

7.3 TEMPORARY NOISE BARRIERS

Should acoustic disturbance arise to the residential receivers to the north of the site, temporary noise barriers may be constructed along the northern site boundary to reduce noise emission during high noise generating activities.

If required, a suitable temporary noise barrier is likely to:

1. Contain no gaps along the surface area of the screen, and be close fitting (i.e. within 30mm) to the ground (to prevent the transmission of noise below the barrier); and
2. The temporary noise barrier(s) should provide a minimum surface density of **14 kg/m^2**, and contain **no gaps** along the surface of the barrier(s), such as:

    - 25 mm thick marine plywood; or
    - A minimum 9 mm thick compressed fibre-cement sheeting; or
    - Other suitable material (minimum surface density of **14 kg/m^2**).

Design of supports of any temporary noise barrier(s) must be verified by a suitably qualified professional to ensure sufficient structural and wind loading support is provided.

7.4 NOISE AND VIBRATION MONITORING AND REPORTING

If deemed necessary by an appropriately qualified geotechnical engineer, implementation of a vibration monitoring and reporting programme (where necessary — to protect the interest of all parties or should complaints arise). The vibration monitoring analysis shall refer to the recommendations in the geotechnical report.

If required, the following monitoring process may be implemented to ensure site limits are complied with:

1. Attended vibration monitoring is to be conducted at a time representative of high-risk activities, so as to provide an accurate picture of the potential impacts;

2. Where necessary, impact minimisation options are to be provided to project manager and are to be implemented into the operation of plant and high-risk activities;

3. Where additional impact minimisation measures require the spot check verification of noise and vibration levels, attended measurements are to be undertaken within a period of 14 days from the commencement of the excavation activities. The purpose of these measurements is to confirm that vibration levels from the works in the adjacent community are consistent with the predictions in the construction noise and vibration assessment;

4. Long-term vibration monitoring should be conducted for the duration of excavation (and construction, if deemed necessary). The vibration monitoring equipment can be installed such that a visual warning system (i.e. flashing light) will alert plant operators that the site vibration limit (e.g. **5 mm/s** (lower limit) and **7.5 mm/s** (upper limit), or other limits deemed appropriate in the geotechnical report) is being approached. Where feasible, plant operators are to adopt a different excavation methodology;

5. Vibration monitoring equipment can be programmed to issue SMS alerts based on the exceedance of a set threshold, to all required parties to notify site limits are being approached; and

6. Where site vibration limits are reported to have been exceeded, the works methodology is to be re-assessed and appropriate control measures are to be provided and implemented to assist in the reduction of impacts.

7.5 USE OF QUIETEST AVAILABLE EQUIPMENT FOR WORKS

Noise emission can be effectively minimised by ensuring noise-generating mechanical plant, equipment and machinery incorporate the most advanced, best available, and economically affordable technology. Such noise control measures include:

1. Consider alternatives to tonal reversing alarms (where work health and safety is appropriately considered;

2. Ensure all noisy engines, fans and pumps are fitted with efficient muffler or silencer design;

3. Where feasible, consider using quieter engines, such as electric instead of internal combustion;

4. Regularly maintain and service mechanical equipment to maintain low mechanical noise emission levels; and

5. Where necessary, consider using efficient enclosures for mechanical noise sources.

NB: Acoustic Dynamics can carry out operator-attended noise measurements of site equipment and operations (as required/requested), to ensure quietest techniques and equipment are being used for the subject works.

7.6 APPROPRIATE EXCAVATION METHODOLOGY

Where excavation of rock is required, the excavation methodology should incorporate the use of saw cuts in the rock wherever feasible to enable smaller rock-breakers to be used to remove the rock. Such sawing has been shown to produce significantly lower vibration levels and substantially reduce the potential for structural (or even cosmetic) damage to adjacent buildings and structures.

In addition, Acoustic Dynamics recommends the following:

1. Use of hand-held jackhammers for rock-breaking activities **within 5 m** of adjacent structures;

2. No use of small rock-breakers **within 5 m** of adjacent structures; and

3. No use of large rock-breakers **within 10 m** of adjacent structures.

7.7 DILAPIDATION SURVEY OF ADJACENT BUILDINGS AND STRUCTURES

Where there is any risk of damage, a detailed dilapidation survey of adjacent buildings and structures completed prior to the commencement of any excavation works would provide an appropriate reference condition, against which post works inspections can be compared.

7.8 PROVISION OF RESPITE PERIODS DURING INTENSIVE ACTIVITIES

Where there is potential for receivers to be affected by **sustained high noise levels** (i.e. greater than $\mathbf{L_{Aeq(15minute)}}$ **75 dB** at nearby residences), periods of respite may be provided.

Such respite may include provisions:

1. Not to commence such noisy activities prior to 8:00am;

2. Not to undertake such noisy activities after 4:30pm; and

3. Not to undertake such noisy activities for any sustained period greater than 3 hours without a minimum 30-minute period of respite.

8 CONCLUSION

Acoustic Dynamics has undertaken a quantitative assessment of the noise and vibration impact at the nearest potentially affected receivers resulting from the demolition, excavation and construction works to be undertaken at 1-5 Nelson Road, Lindfield, NSW.

This report is prepared in accordance with the various acoustic requirements of:

(a) Ku-ring-gai Shire Council;
(b) NSW Department of Planning, Housing and Infrastructure;
(c) NSW Environment Protection Authority; and
(d) Australian and International Standards.

Acoustic Opinion

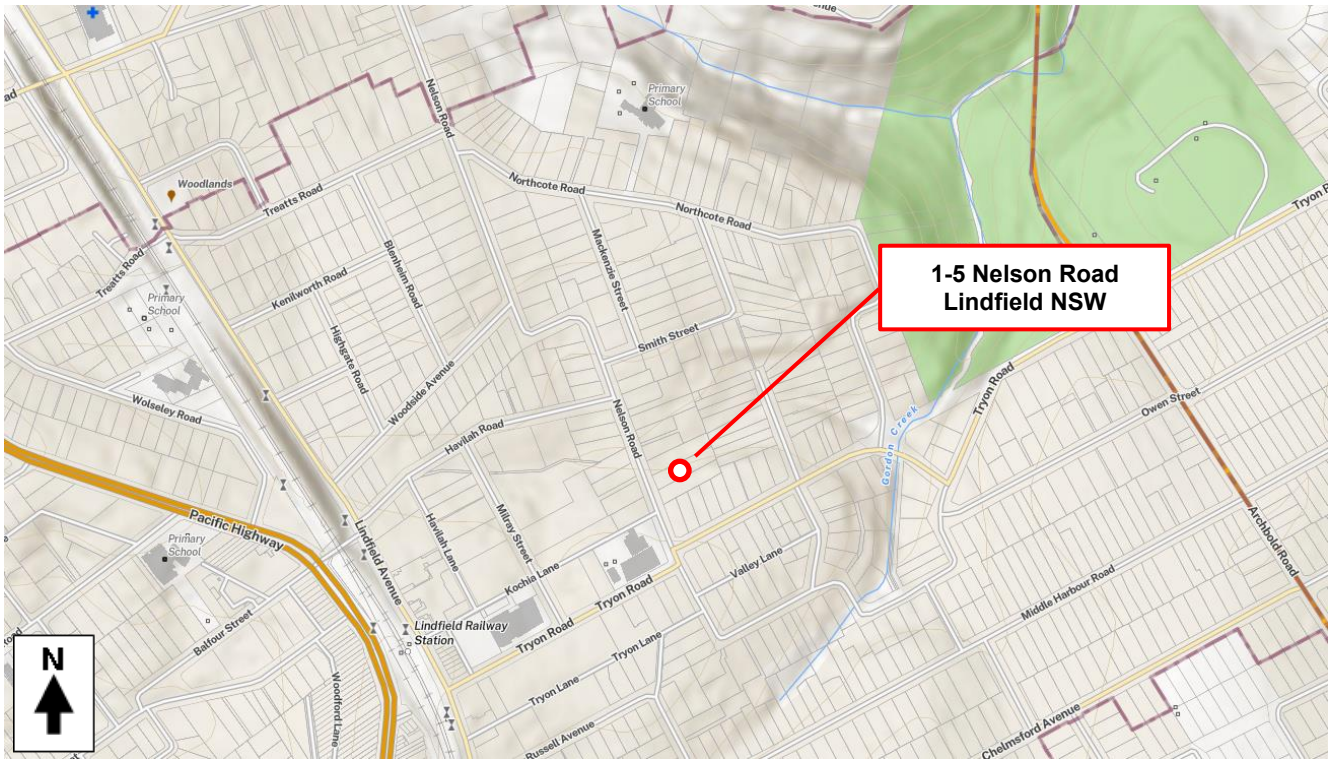
The magnitude of the predicted noise exceedances above the construction noise goals may lead to complaint (adverse comment) and appropriate strategies should be developed for management of noise emission and community liaison.

Acoustic Dynamics advises that implementation of the noise and vibration management strategies contained within this report will assist with the mitigation and management of noise and vibration emission from the proposed construction works.

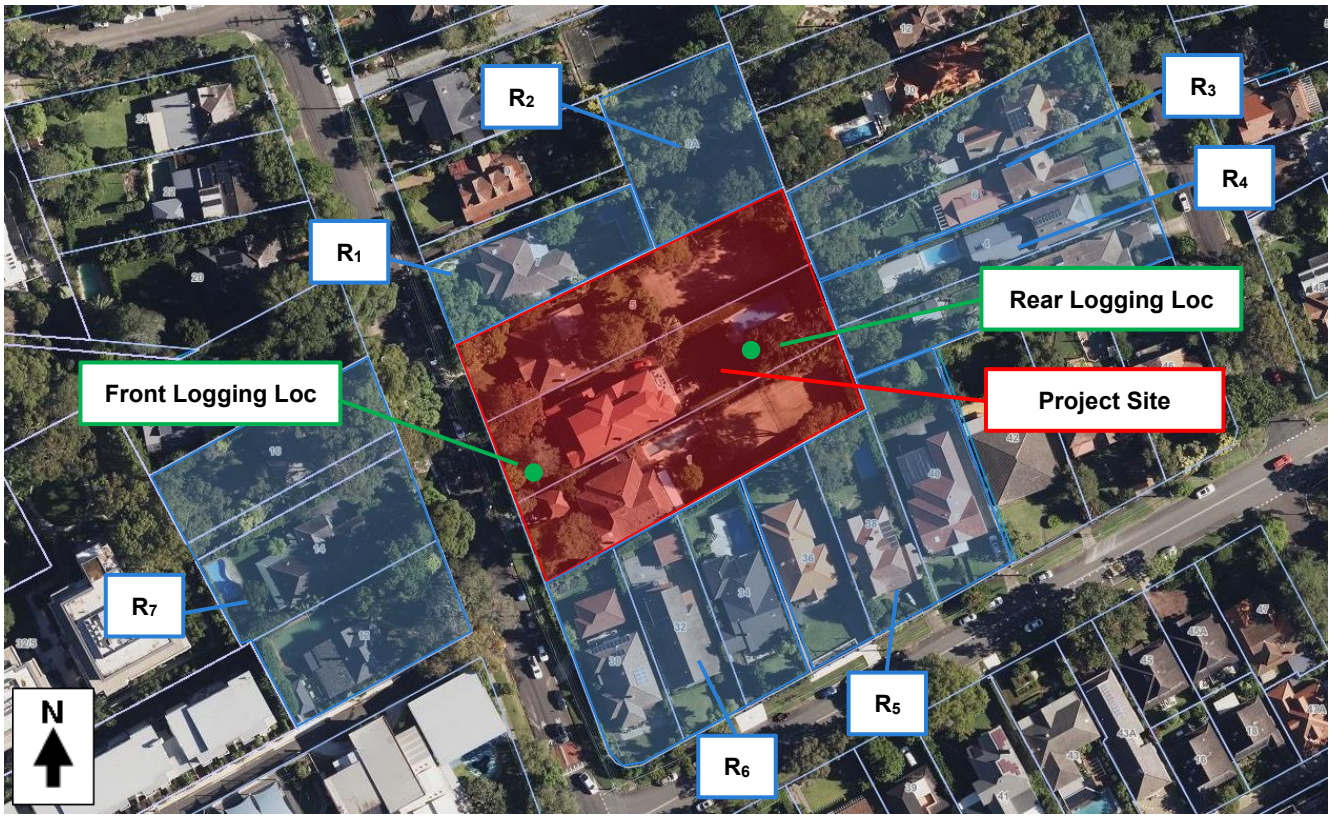
We trust that the above information meets with your present requirements and expectations. Please do not hesitate to contact us on 02 9908 1270 should you require more information.

APPENDIX A — LOCATION MAP, AERIAL IMAGE AND DRAWINGS

A.1 LOCATION MAP (COURTESY OF SIX MAPS)

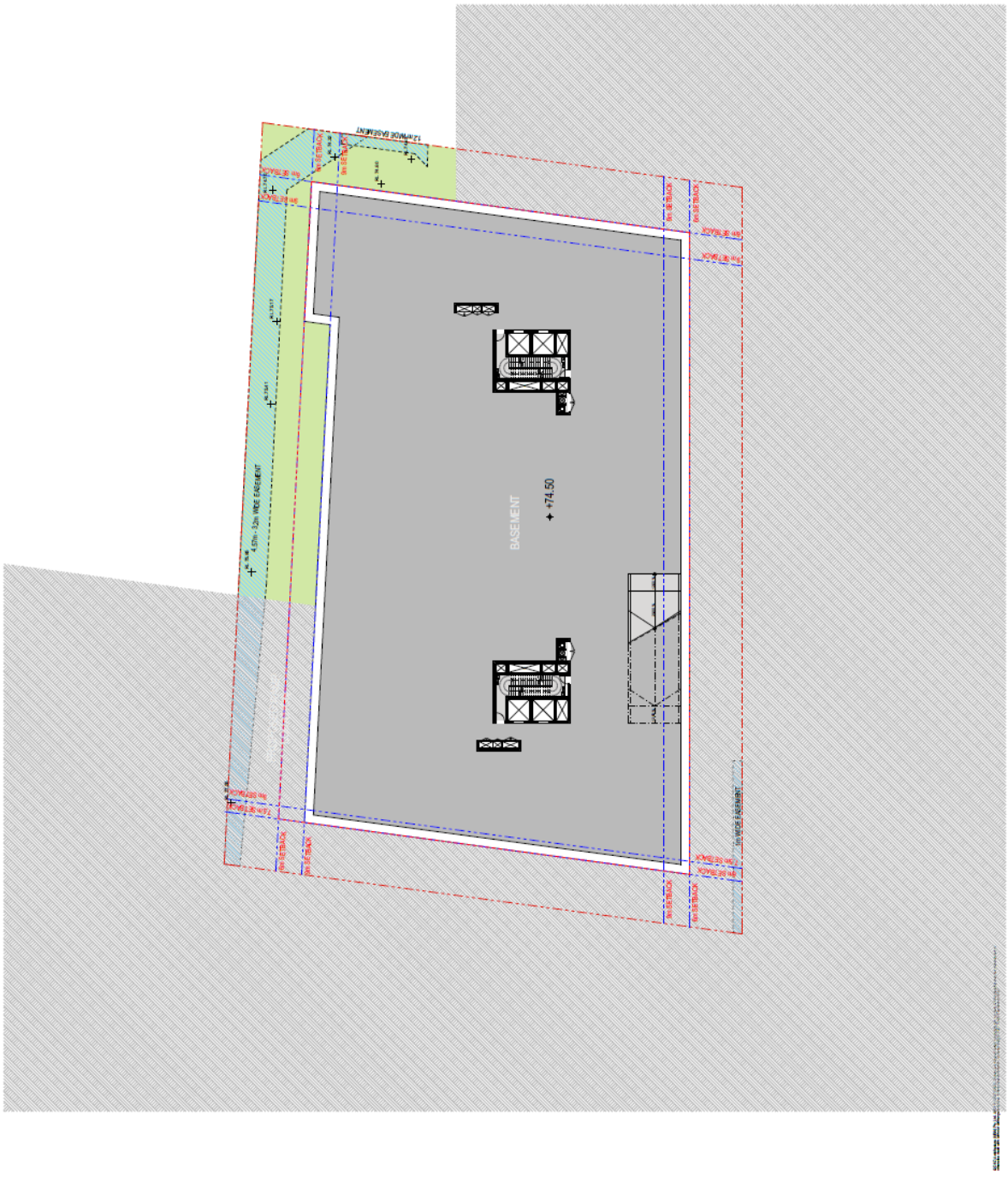


A.2 AERIAL IMAGE (COURTESY OF SIX MAPS)

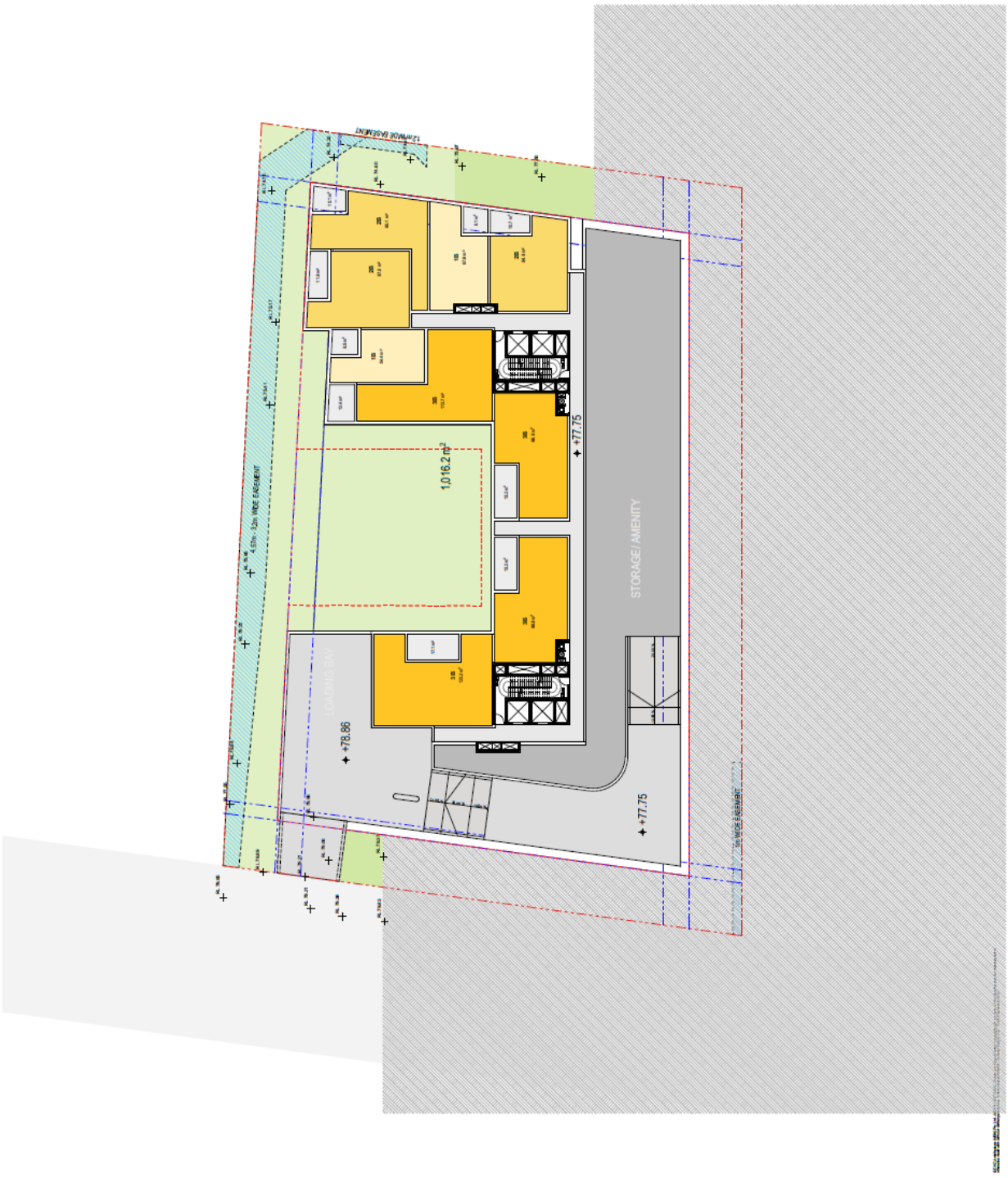


A.3 ARCHITECTURAL PLANS (COURTESEY OF DKO ARCHITECTURE)

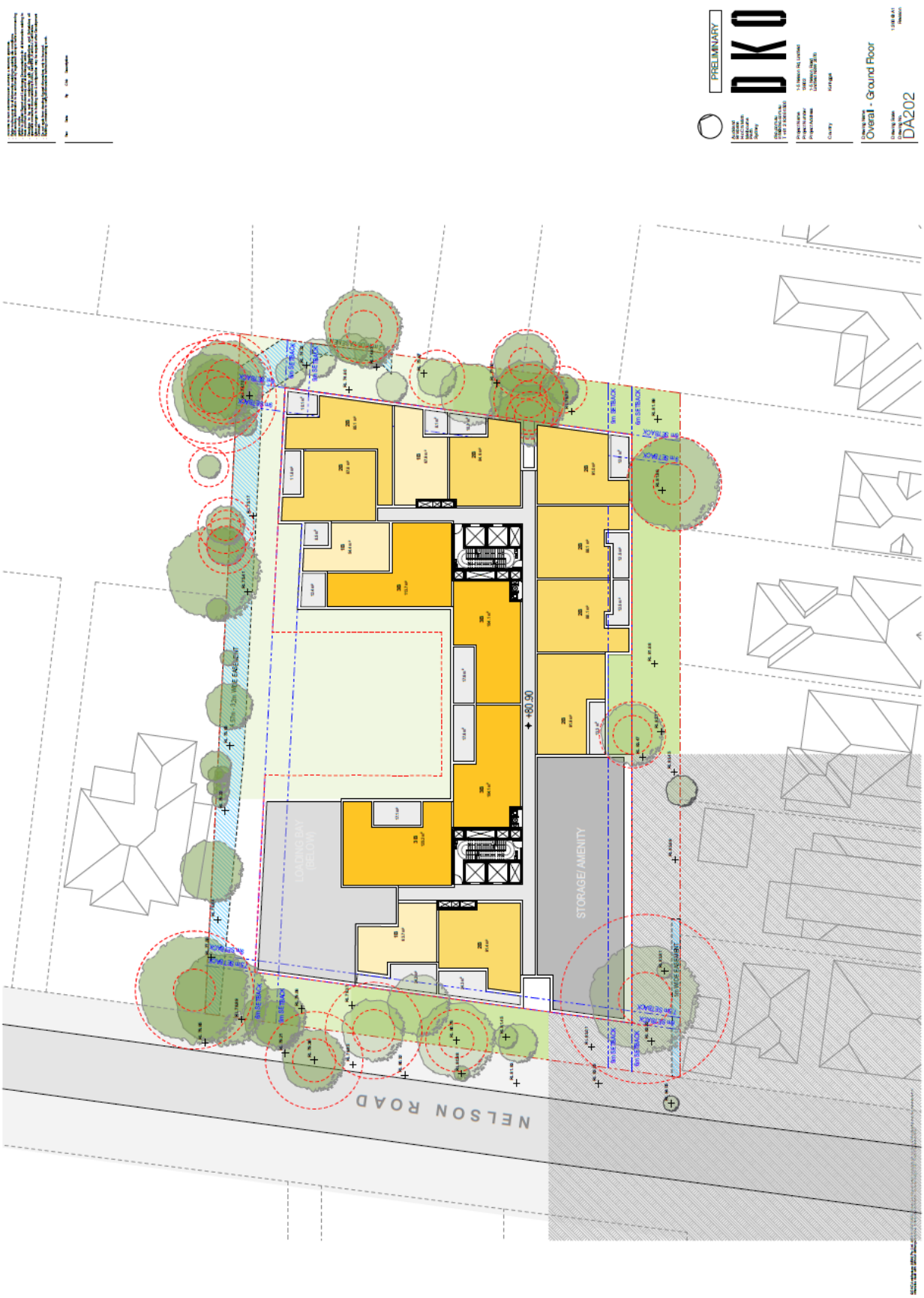
A.3.1 BASEMENT 2 PLAN



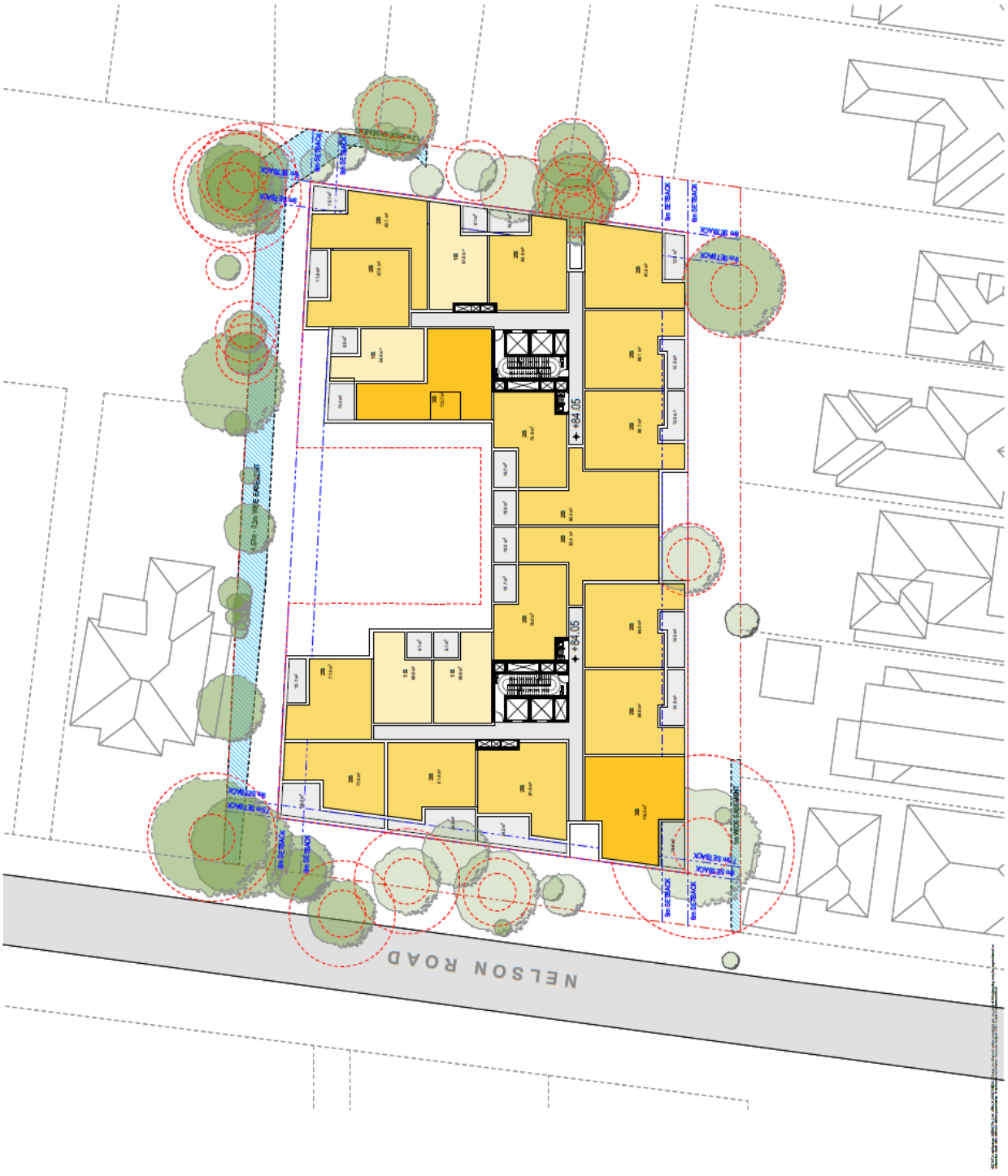
A.3.2 BASEMENT 1 PLAN



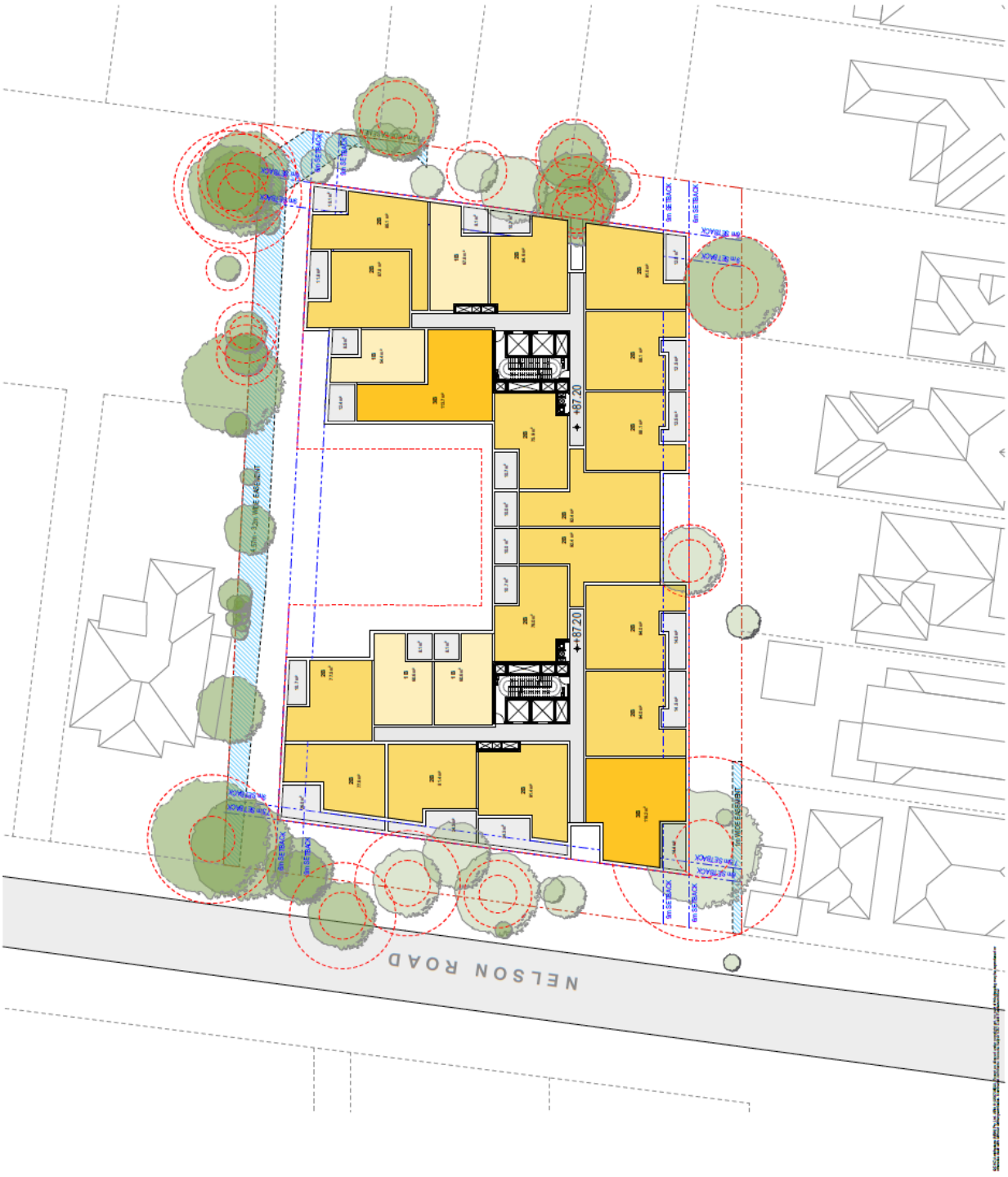
A.3.3 GROUND FLOOR PLAN



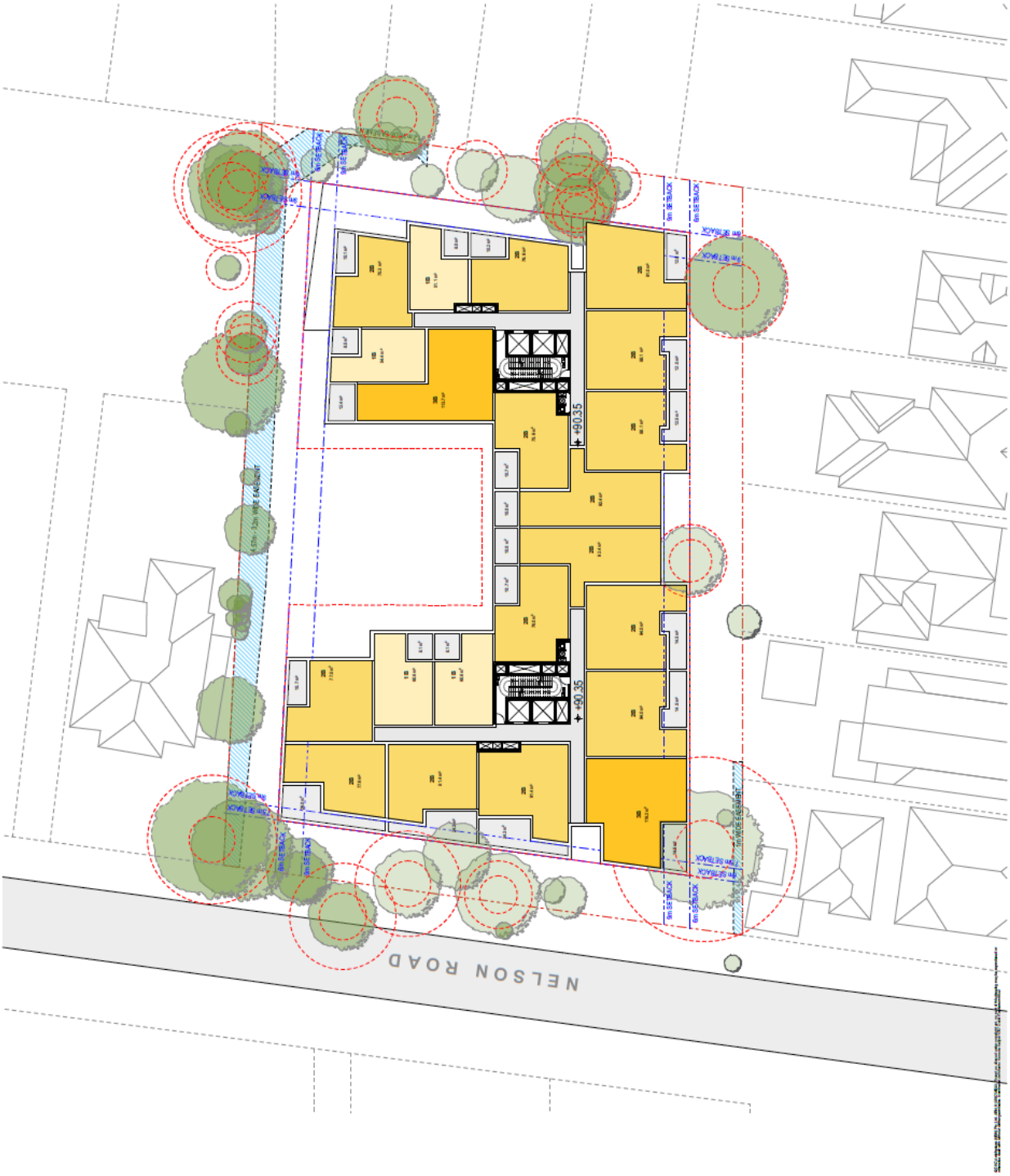
A.3.4 LEVEL 1 PLAN



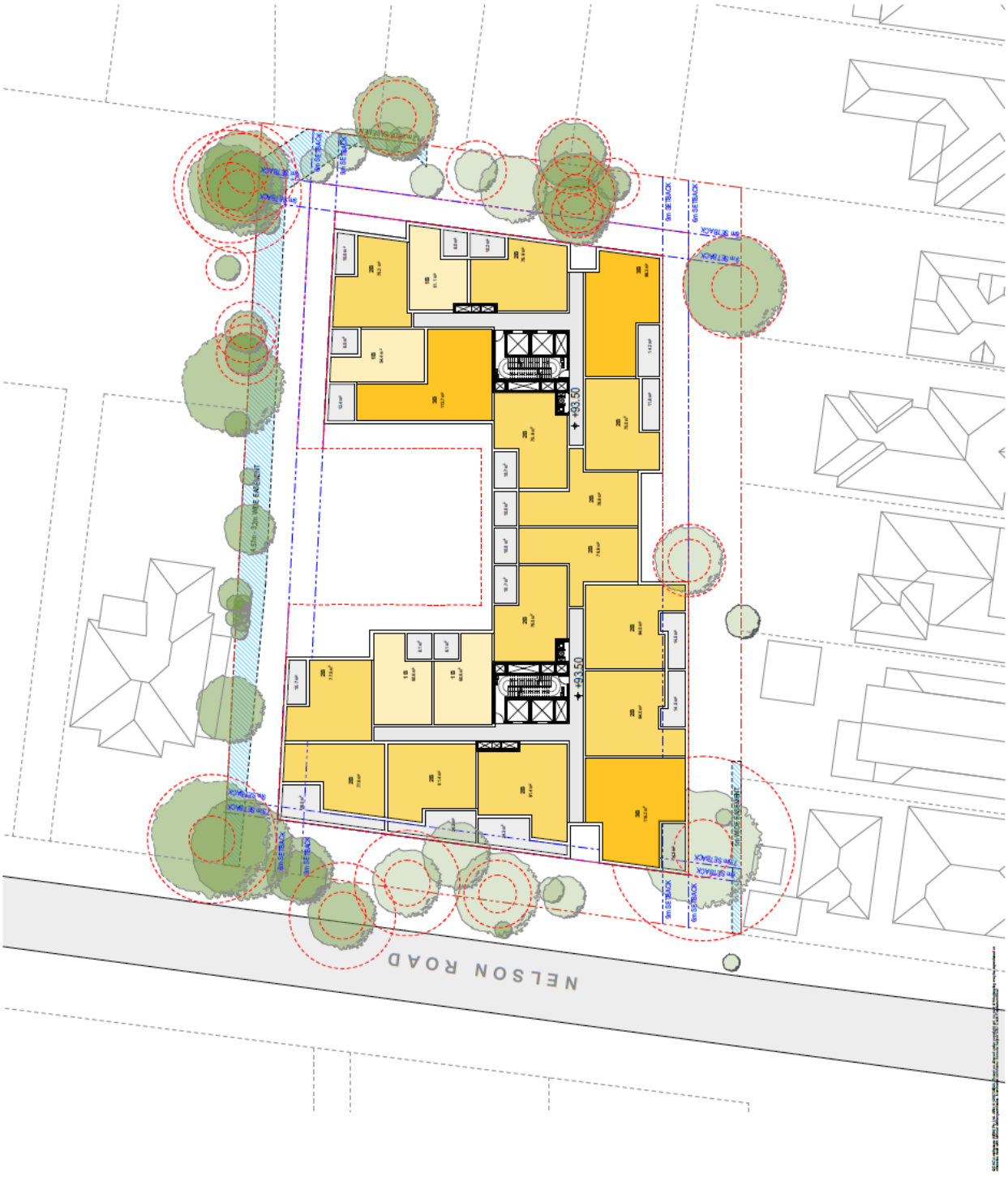
A.3.5 LEVEL 2 PLAN



A.3.6 LEVEL 3 PLAN



A.3.7 LEVEL 4 PLAN

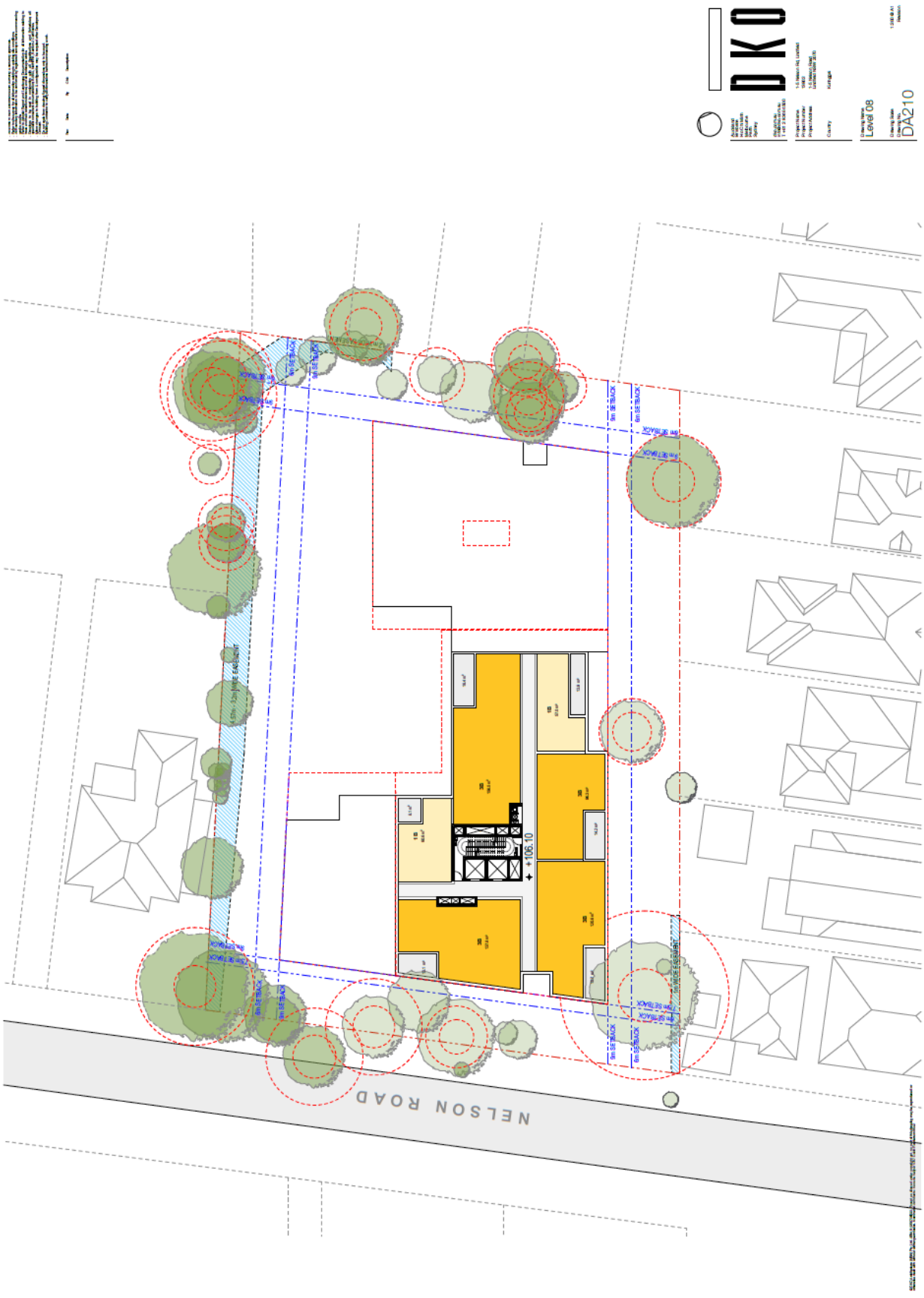


A.3.8 LEVEL 5 PLAN

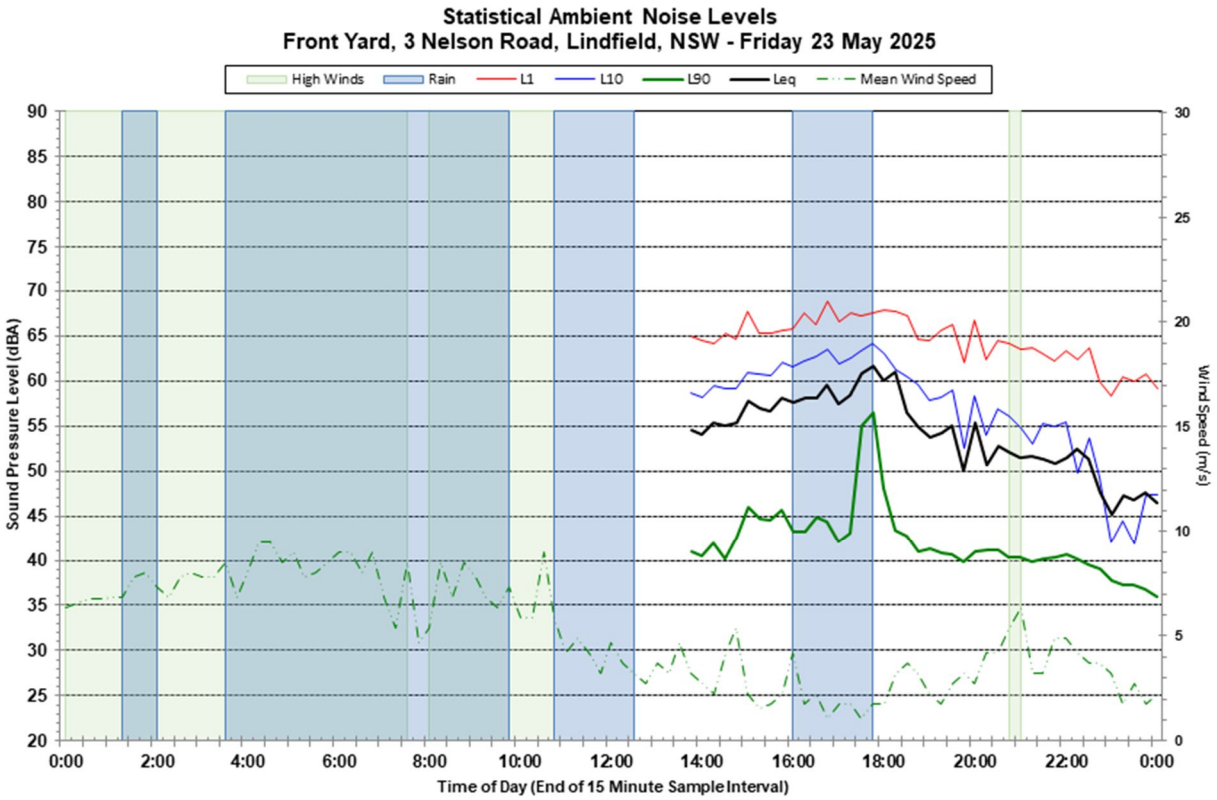
A.3.9 LEVEL 6 PLAN

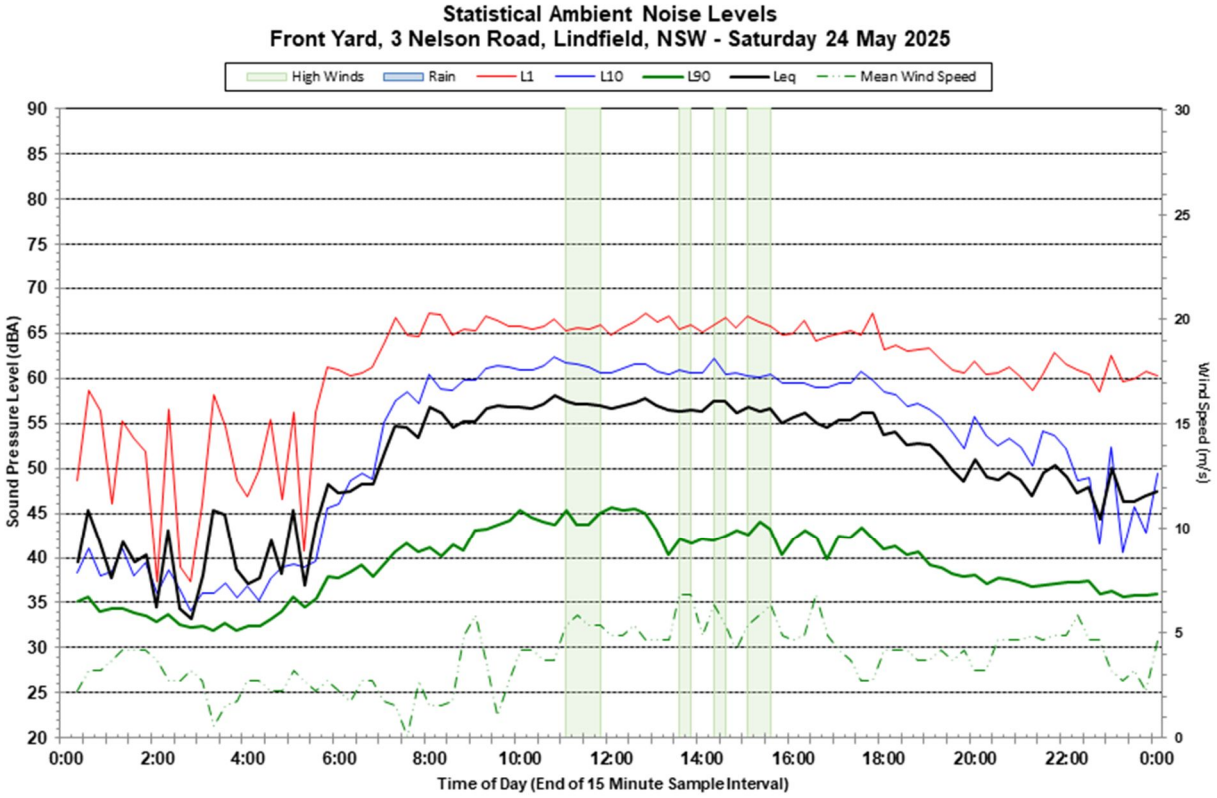
A.3.10 LEVEL 7 PLAN

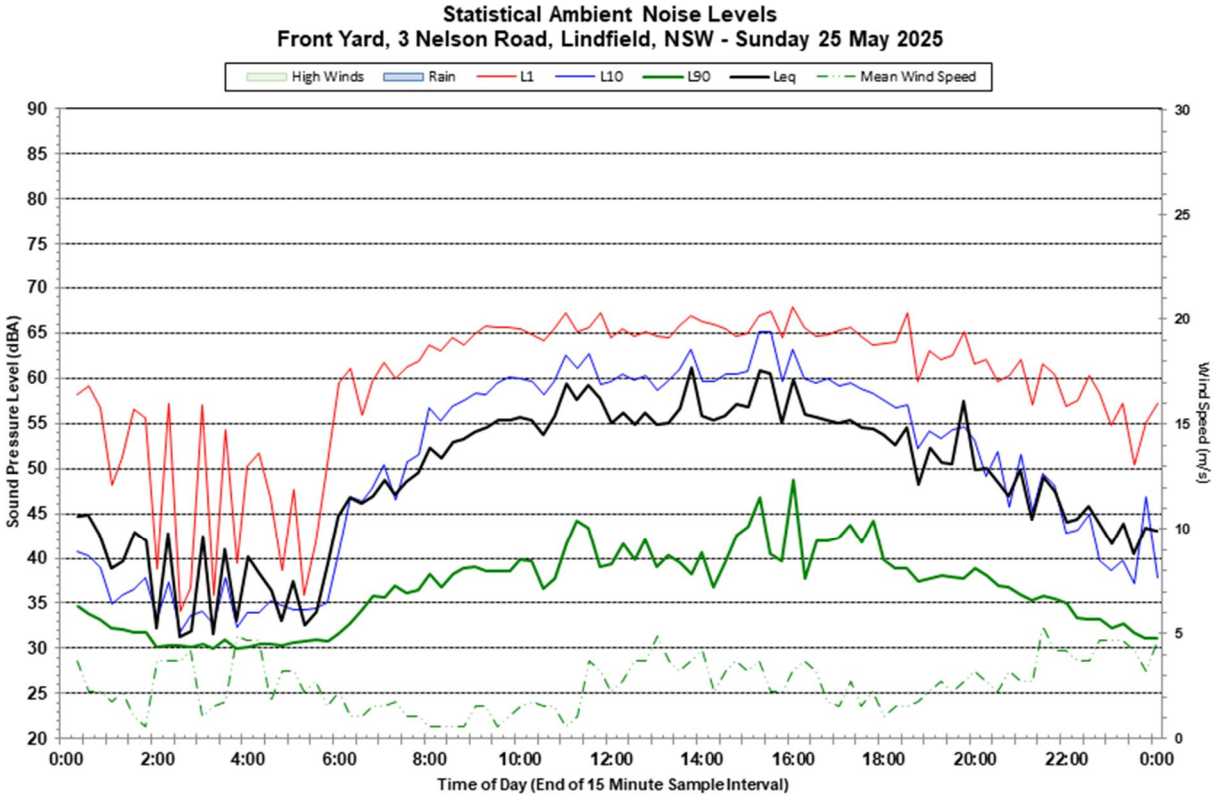
A.3.11 LEVEL 8 PLAN

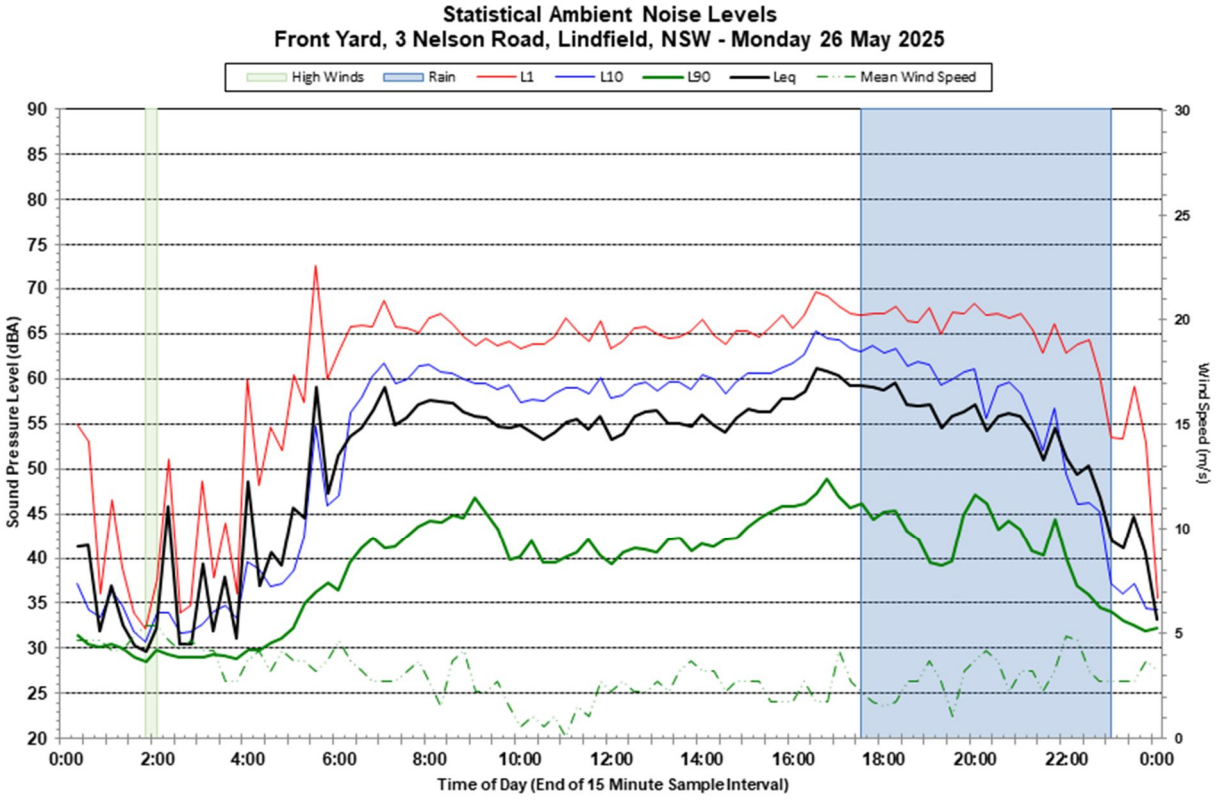


APPENDIX B — UNATTENDED NOISE MONITORING STATISTICAL GRAPHS






Statistical Ambient Noise Levels
Front Yard, 3 Nelson Road, Lindfield, NSW - Sunday 25 May 2025
High Winds
Rain
L1
L10
L90
Leq
Mean Wind Speed
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Front Yard, 3 Nelson Road, Lindfield, NSW - Monday 26 May 2025
High Winds
Rain
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L10
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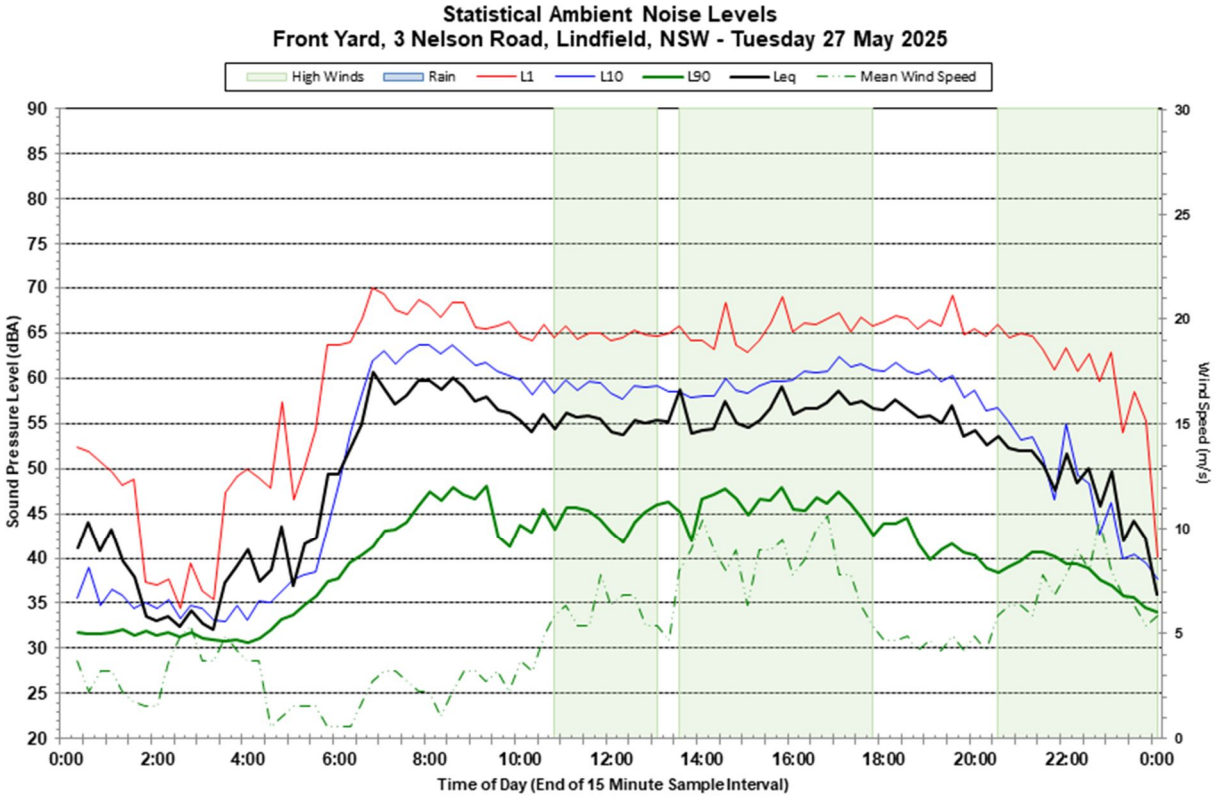
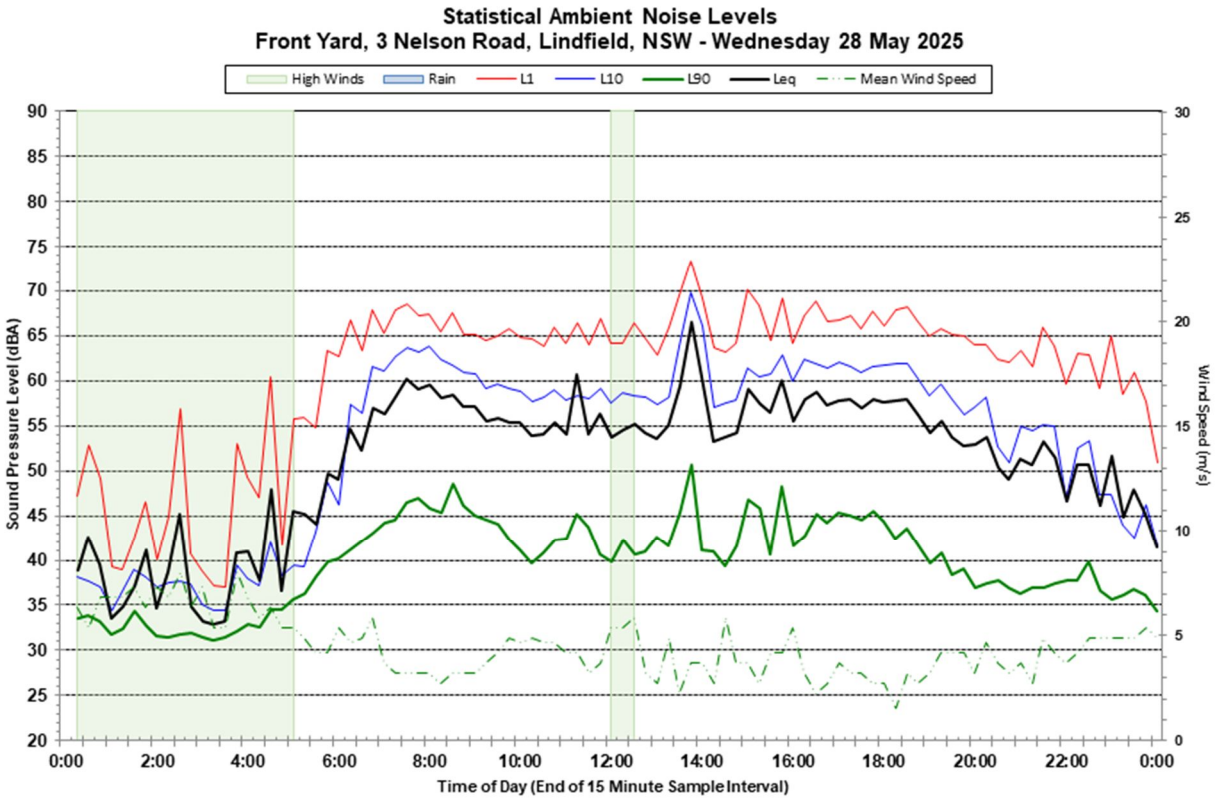
Leq
Mean Wind Speed
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Front Yard, 3 Nelson Road, Lindfield, NSW - Tuesday 27 May 2025
High Winds
Rain
L1
L10
L90
Leq
Mean Wind Speed
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Front Yard, 3 Nelson Road, Lindfield, NSW - Wednesday 28 May 2025
High Winds
Rain
L1
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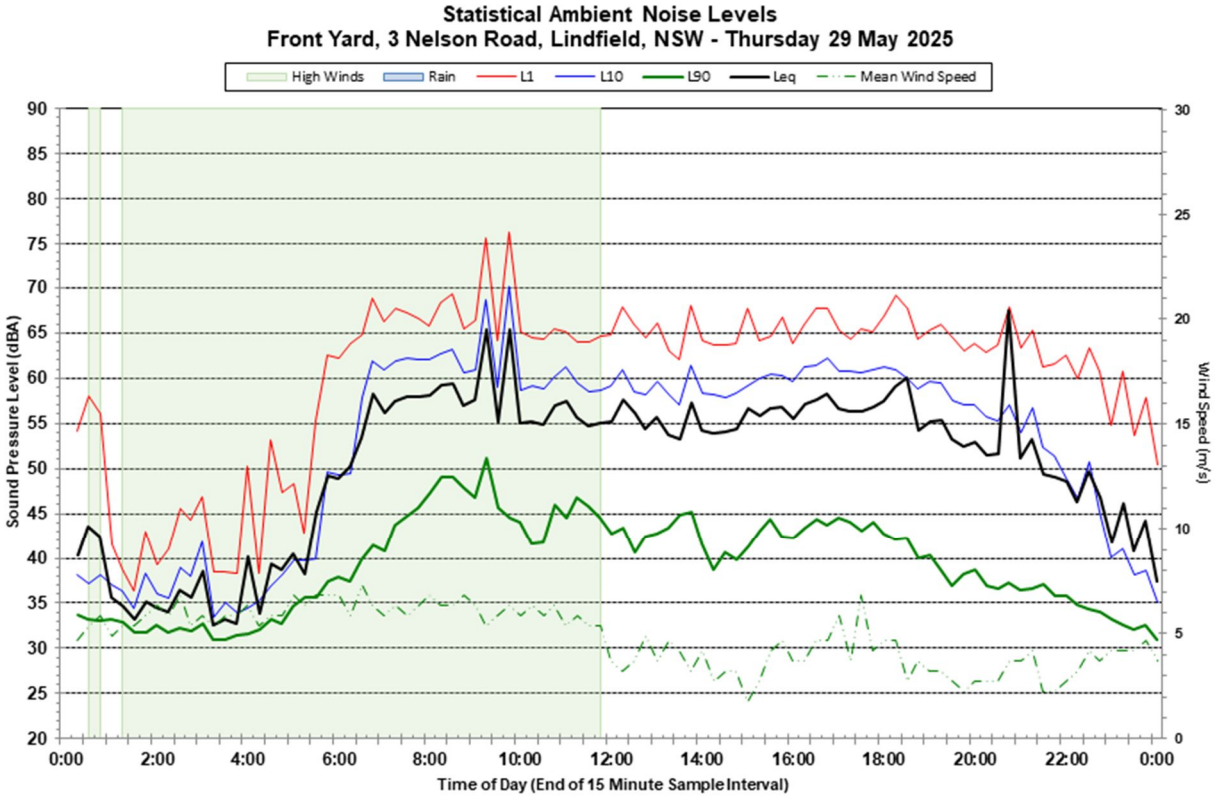
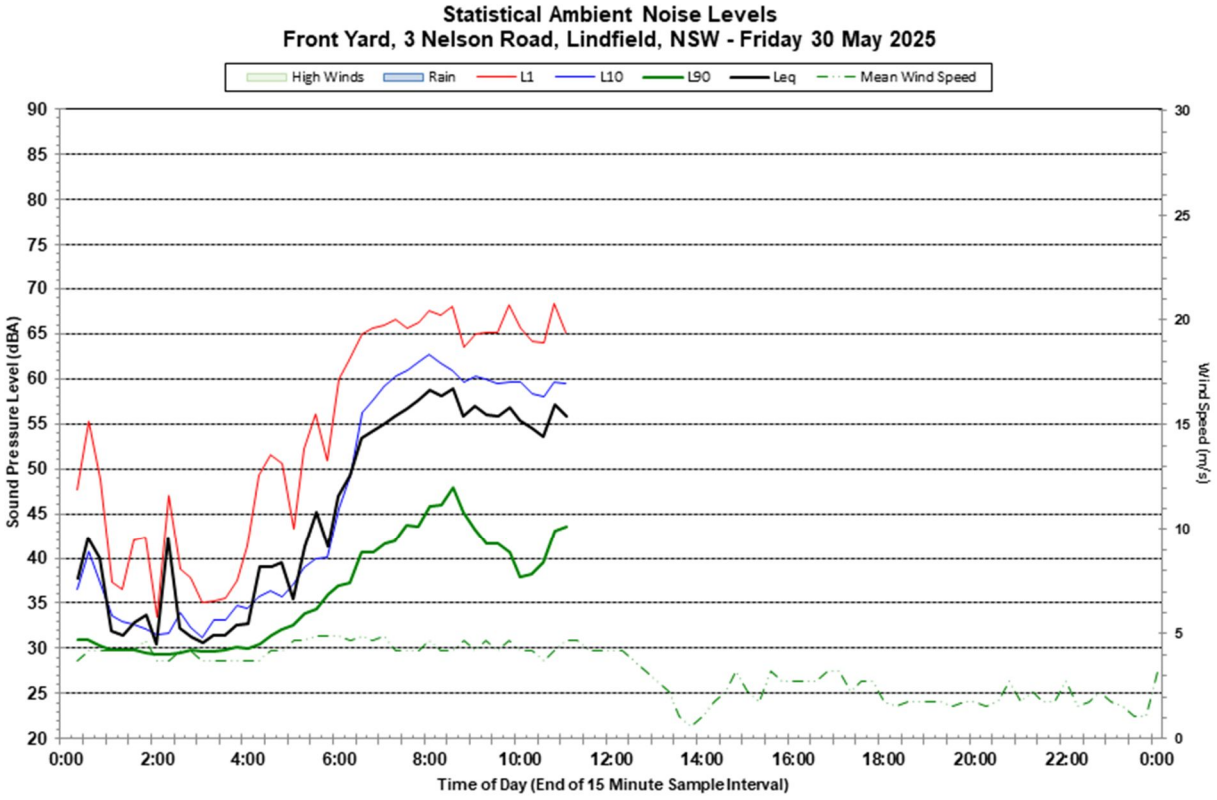
Leq
Mean Wind Speed
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Front Yard, 3 Nelson Road, Lindfield, NSW - Thursday 29 May 2025
High Winds
Rain
L1
L10
L90
Leq
Mean Wind Speed
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Front Yard, 3 Nelson Road, Lindfield, NSW - Friday 30 May 2025
High Winds
Rain
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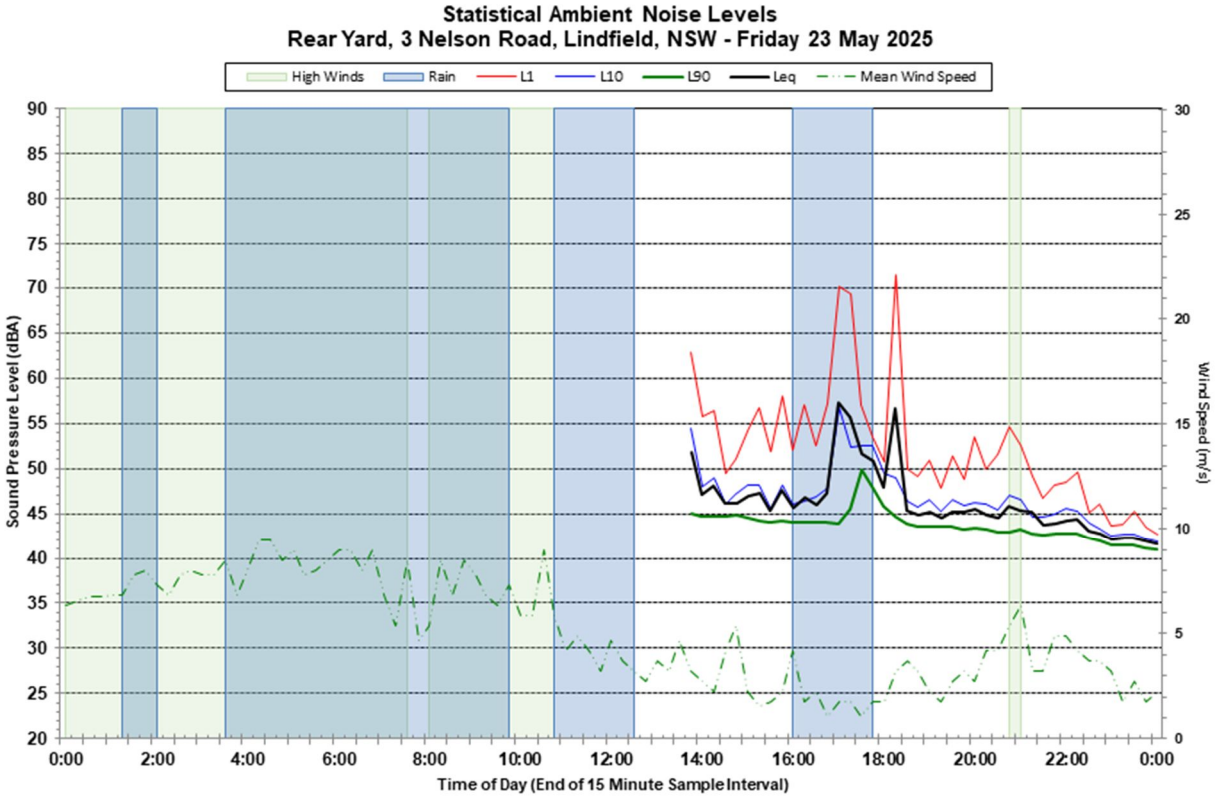
Leq
Mean Wind Speed
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Rear Yard, 3 Nelson Road, Lindfield, NSW - Friday 23 May 2025
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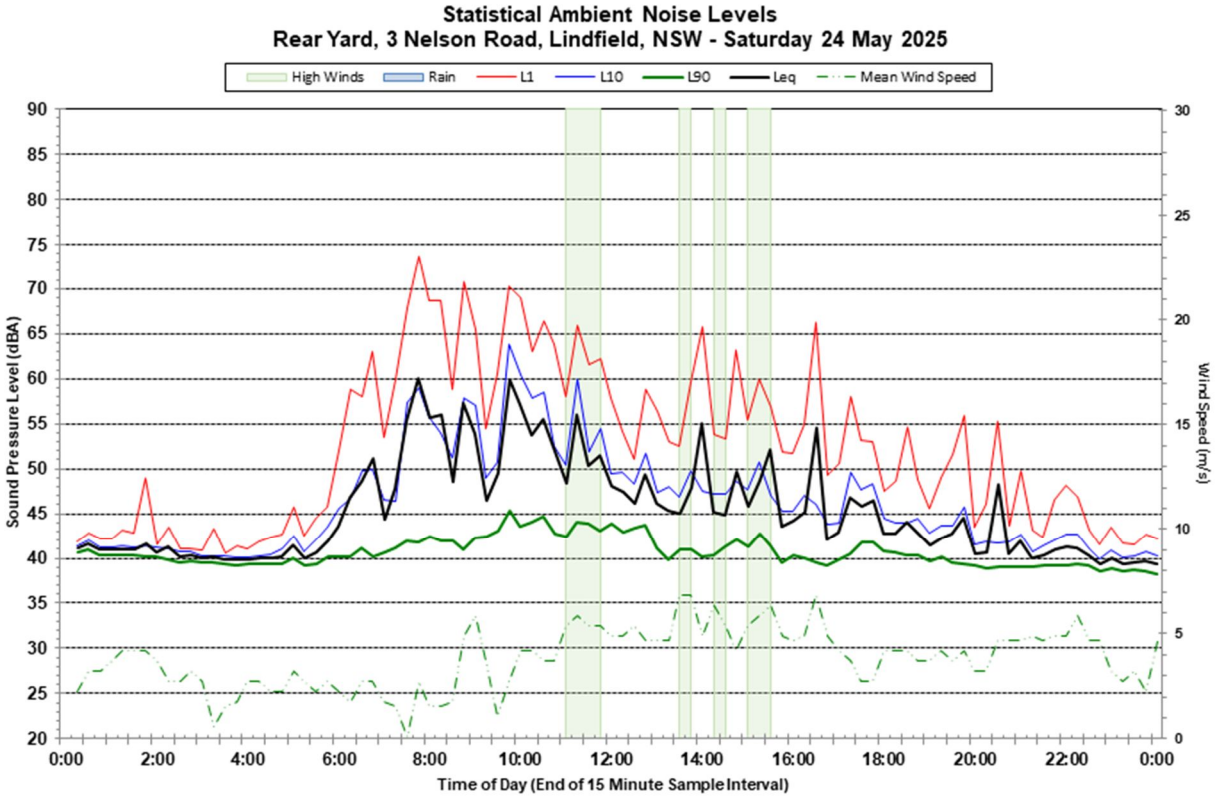
Mean Wind Speed
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
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High Winds
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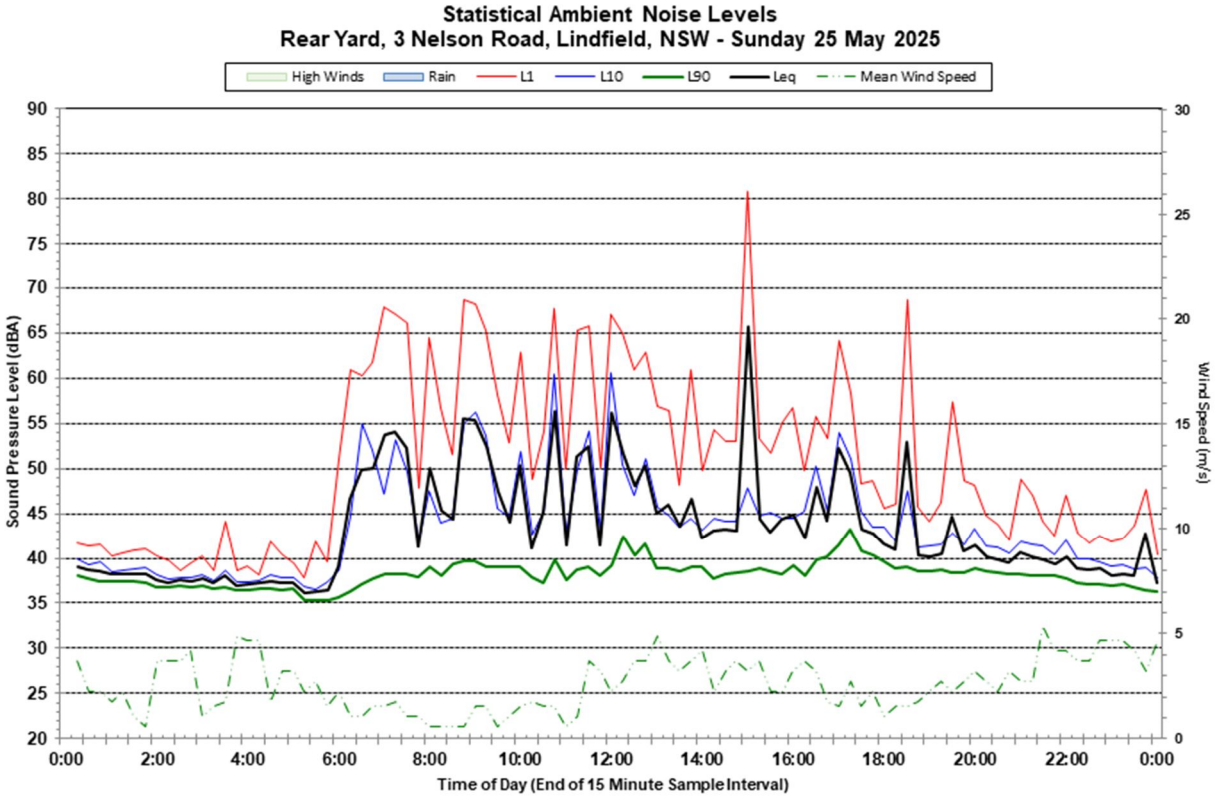
Mean Wind Speed
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Rear Yard, 3 Nelson Road, Lindfield, NSW - Sunday 25 May 2025
High Winds
Rain
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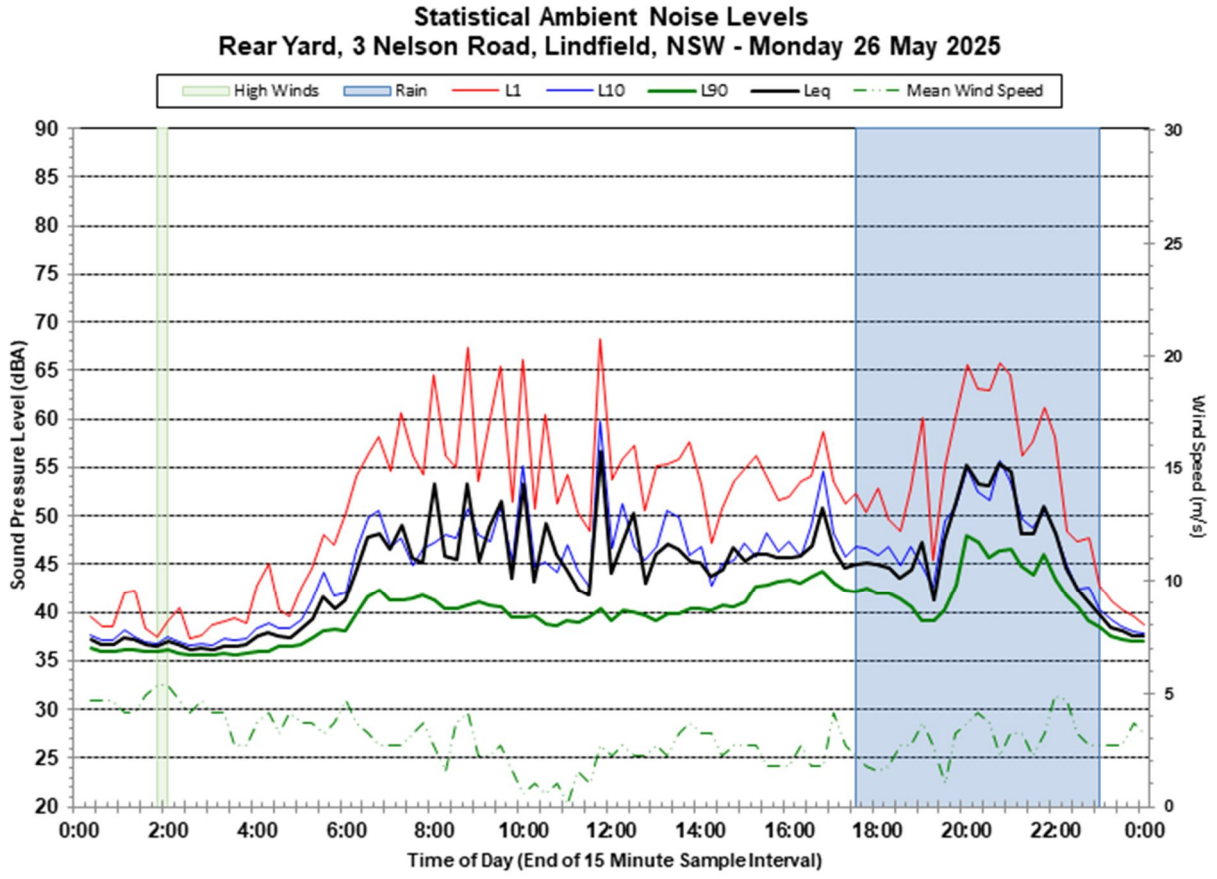
Mean Wind Speed
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Rear Yard, 3 Nelson Road, Lindfield, NSW - Monday 26 May 2025
High Winds
Rain
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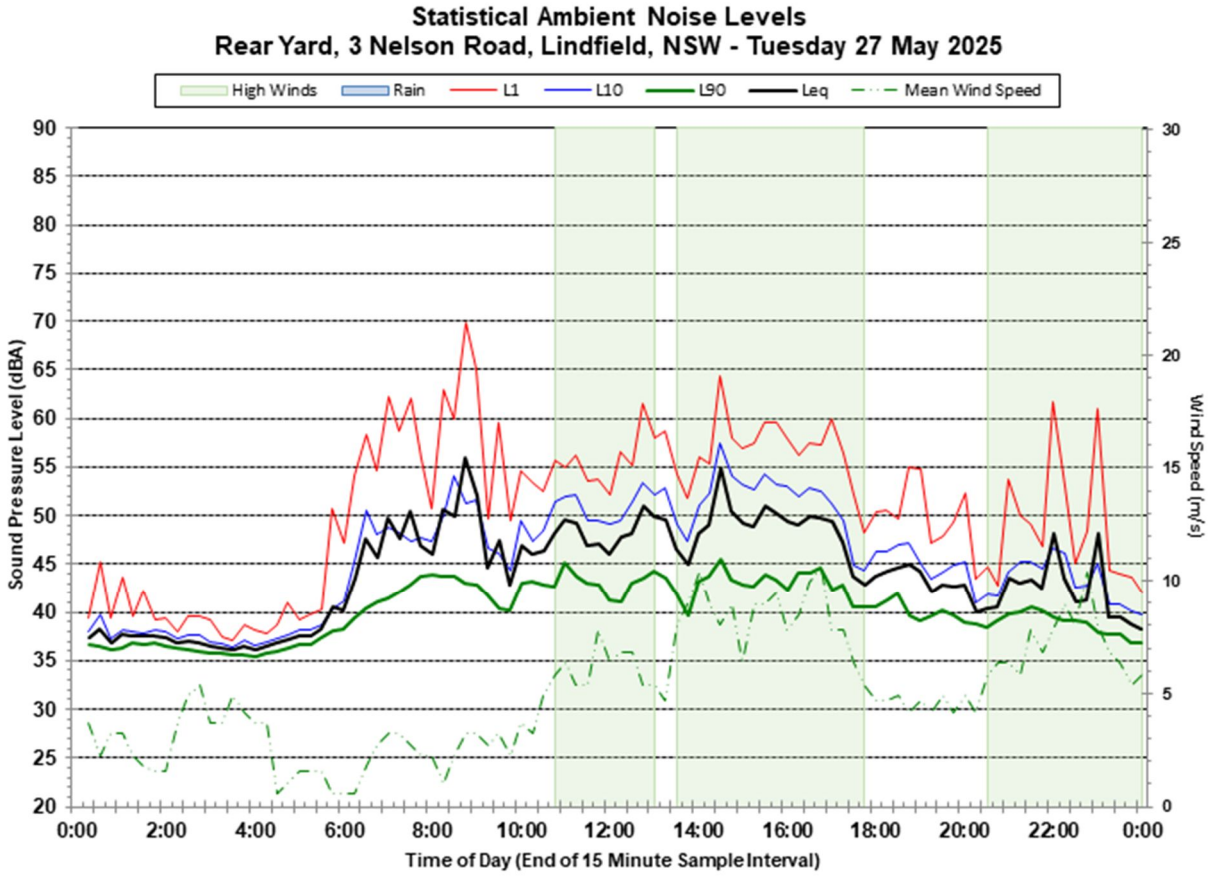
Mean Wind Speed
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Rear Yard, 3 Nelson Road, Lindfield, NSW - Tuesday 27 May 2025
High Winds
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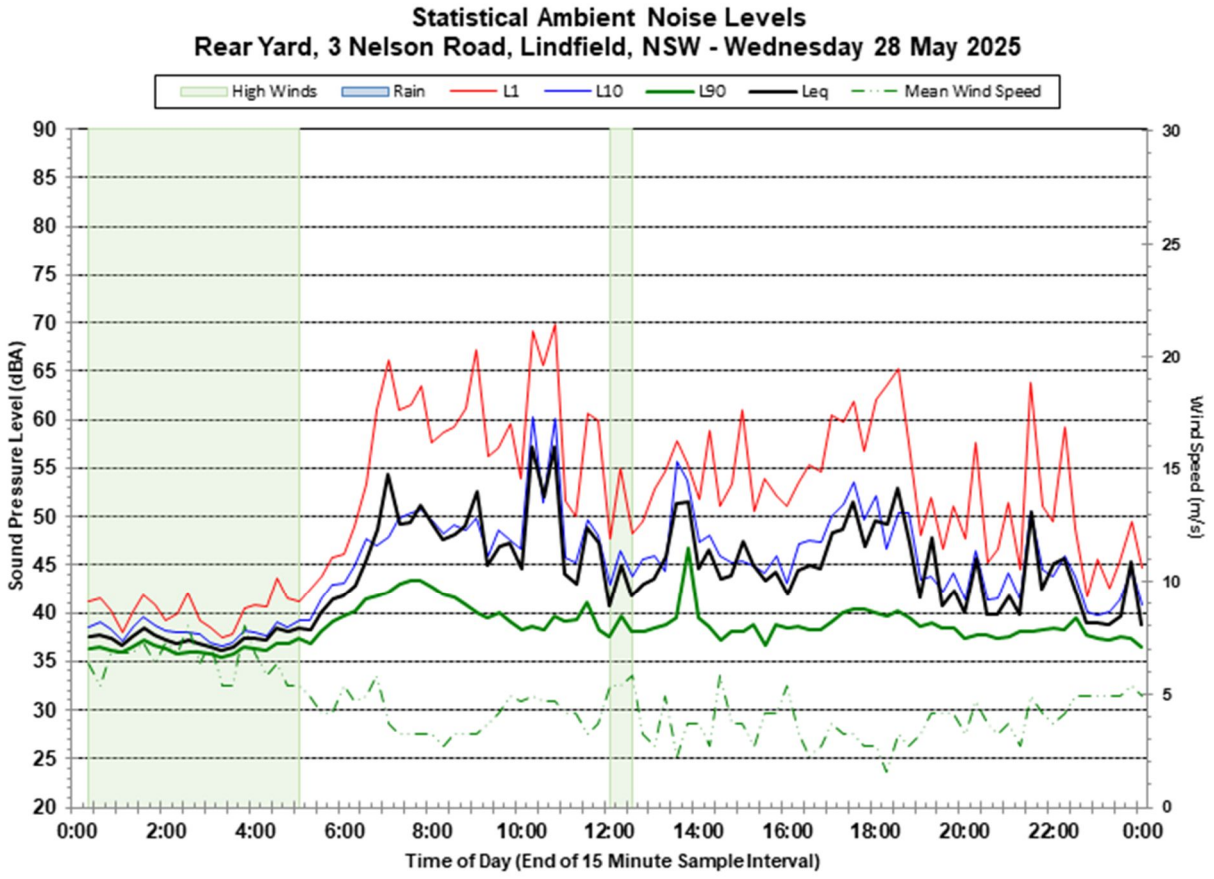
Mean Wind Speed
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Rear Yard, 3 Nelson Road, Lindfield, NSW - Wednesday 28 May 2025
High Winds
Rain
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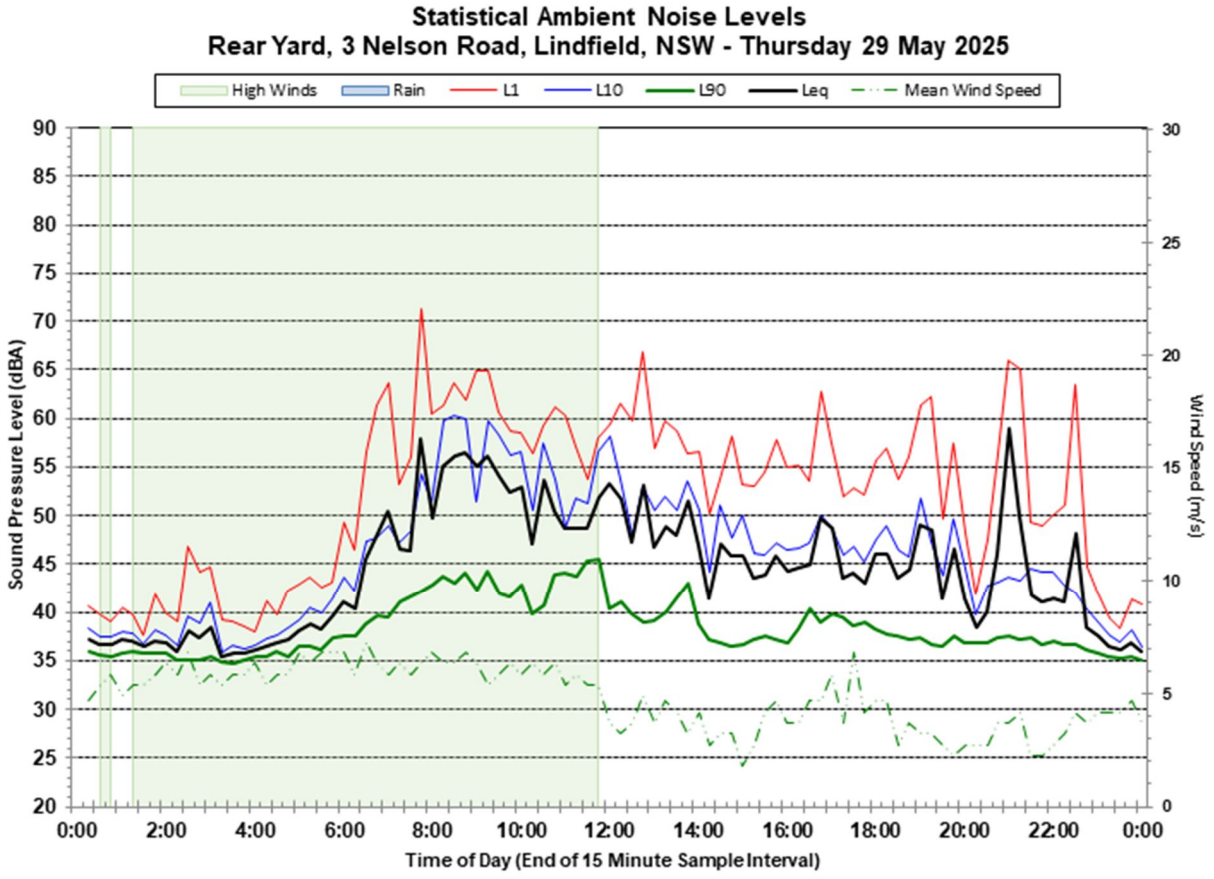
Mean Wind Speed
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Rear Yard, 3 Nelson Road, Lindfield, NSW - Thursday 29 May 2025
High Winds
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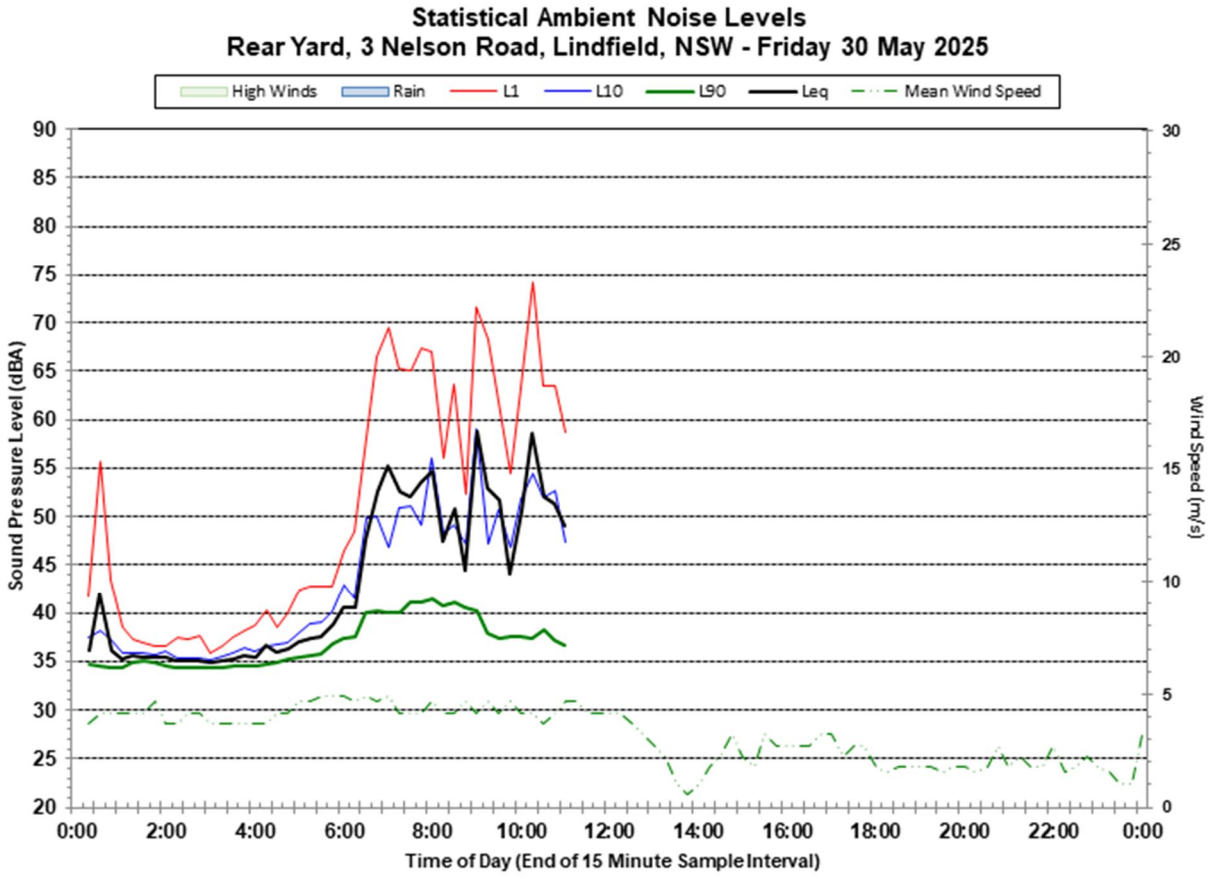
Mean Wind Speed
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Rear Yard, 3 Nelson Road, Lindfield, NSW - Friday 30 May 2025
High Winds
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Mean Wind Speed
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of 15 Minute Sample Interval)