RODNEY STEVENS ACOUSTICS
Acoustic Consultants
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REPORT 180260R1

Revision 0

Noise Impact Assessment
Proposed Boarding House
1 Edna Street, Kingswood

PREPARED FOR:
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15 November 2018

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Noise Impact Assessment

Proposed Boarding House

1 Edna Street, Kingswood NSW

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DOCUMENT CONTROL

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180260R1	Revision 0	2 July 2018	Dani Awad	Desmond Raymond	Rodney Stevens
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1 INTRODUCTION

Rodney Stevens Acoustics Pty Ltd (here forth referred to as RSA), has been engaged by Designcorp Architects to conduct a noise impact assessment for Development Application (DA) lodgment of the proposed boarding house at 1 Edna Street, Kingswood.

This report will address noise impact from Edna Street, Second Avenue and the commercial area to the east on the amenity of the proposed boarding house. A construction and vibration management plan has been included in addition to statements concerning the potential effects of any mechanical plant, carpark and outdoor communal area noise caused by the site on nearby sensitive receivers.

This assessment is to form part of the supporting documentation for the DA submission to Penrith City Council.

Specific acoustic terminology is present throughout this report. An explanation of these acoustic terms is provided in Appendix A

2 PROPOSED DEVELOPMENT

2.1 Site Location

The proposed residential development site is located at 1 Edna Street, Kingswood. It is bounded by residential premises to the north, west and south with a small commercial area to the east. The location of the proposed site and surrounding area is presented in Figure 2-1.

Figure 2-1 Site Location

Aerial image courtesy of Near Map © 2018

2.2 Proposed Development

The proposal consists of the construction of a two-story boarding house comprising of 16 boarding rooms split between the ground and first floor. The site will have a small outdoor communal area, 2 outdoor and 6 basement car parking spaces. The architectural plans of the proposed residential development are presented in Appendix C.

3 EXISTING ACOUSTIC ENVIRONMENT

3.1 Unattended Noise Monitoring

In order to characterize the existing acoustical environment of the area, RSA carried out unattended noise monitoring between Wednesday 30 May and Wednesday 6 June 2018 at the logging location shown in Figure 2-1. The noise monitoring at this location is representative of the acoustic environment at the project site.

RSA selects logger location with consideration to; other noise sources, which may influence readings, equipment security issues and gaining permission for access from other landowners.

Instrumentation for the survey comprised of a RION NL-42 environmental noise logger (serial number: 546393) fitted with a microphone windshield. Calibration of the logger was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dB (A). All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

3.2 Ambient Noise Level Results

In order to assess the acoustical implications of the proposed development on the levels of noise received at the neighboring residential and commercial premises, the measured data was processed according to the NSW Environment Protection Authority (EPA) and Noise Policy for Industry (NPfI) assessment time periods. Table 3-1 details the RBL (background) and L_{Aeq} noise levels recorded during the daytime, evening and nighttime periods.

Table 3-1 Measured Ambient Noise Levels

Noise Level – dB(A) re 20 µPa					
Day		Evening		Night	
RBL [1]	L_{Aeq} [2]	RBL [1]	L_{Aeq} [2]	RBL [1]	L_{Aeq} [2]
44	54	42	50	35	48

Note 1: The RBL noise level is representative of the average minimum background sound level (in the absence of the source under consideration), or simply the background level

Note 2: The L_{Aeq} is essentially the average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.

4 NOISE CRITERIA

4.1 Road Noise and Vibration Criteria

The determination of an acceptable level of road noise that will impact internal residential spaces requires consideration of the activities carried out within the space and the degree to which noise will interfere with those activities.

As sleep is the activity most affected by traffic noise, bedrooms are considered to be the most sensitive internal living areas. Higher levels of noise are acceptable in living areas without interfering with activities such as reading, listening to the television etc. Noise levels in utility spaces such as kitchens, bathrooms, laundries etc. can be higher.

4.1.1 Penrith City Council Requirements

Penrith City Council has specific requirements for traffic noise intrusion into residential spaces. These requirements are detailed in the Penrith City Council's DCP and pertain to the SEPP (Infrastructure) 2007 they are as follows:

> ***State Environmental Planning Policy (Infrastructure) 2007***
>
> *Appropriate measures must be taken to ensure that the following LAeq levels are not exceeded:*
>
> *In any bedroom in the building – 35 dB(A) at any time between 10 pm and 7 am*
>
> *Anywhere else in the building (other than a garage, kitchen, bathroom or hallway) – 40 dB(A) at any time*
>
> ***Environmental Health***
>
> *An acoustic report is to be prepared by an appropriately qualified acoustic consultant having the technical eligibility criteria required for membership of the Association of Australian Acoustical Consultants (AAAC) and/or grade membership of the Australian Acoustical Society (MAAS). The report shall consider noise intrusion from the road and measures to ensure compliance with SEPP (Infrastructure) 2007. The report should also consider noise emissions from the development including but not limited to proposed mechanical plant (air conditioners, lift shift, automatic roller doors, and ventilation plant for the underground car park) and construction/vibration impacts. The report should be prepared in accordance with the NSW Environment Protection Authority Industrial Noise Policy, EPA's Interim Construction Noise Guidelines & NSW DP&I's Development near Rail Corridors and Busy Roads – Interim Guideline*

4.1.2 State Environmental Planning Policy (Infrastructure) 2007

Road and Rail Noise Criteria

The NSW Government's State Environmental Planning Policy (Infrastructure) 2007 (SEPP (Infrastructure) 2007) was introduced to facilitate the delivery of infrastructure across the State by improving regulatory certainty and efficiency. In accordance with the SEPP, Table 3.1 of the NSW Department of Planning and Infrastructure's "*Development near Rail Corridors and Busy Roads - Interim Guideline"* (the DP&I Guideline) of December 2008 provides noise criteria for residential and non-residential buildings. These criteria are summarized in Table 4-1.

Table 4-1 DP&I Interim Guideline Noise Criteria

Type of occupancy	Noise Level dB(A)	Applicable time period
Sleeping areas (bedroom)	35	Night 10 pm to 7 am
Other habitable rooms (excl. garages, kitchens, bathrooms & hallways)	40	At any time

Note 1: Airborne noise is calculated as $L_{Aeq\ (15hour)}$ daytime and $L_{Aeq\ (9hour)}$ night-time

The following guidance is provided in the DP&I Guideline:

> *"These criteria apply to all forms of residential buildings as well as aged care and nursing home facilities. For some residential buildings, the applicants may wish to apply more stringent design goals in response to market demand for a higher quality living environment.*
>
> *The night-time "sleeping areas" criterion is 5 dB (A) more stringent than the "living areas" criteria to promote passive acoustic design principles. For example, designing the building such that sleeping areas are less exposed to road or rail noise than living areas may result in less onerous requirements for glazing, wall construction and acoustic seals. If internal noise levels with windows or doors open exceed the criteria by more than 10 dB(A), the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia."*

The noise criteria presented in Section 4.1.2 and in Table 4-1 apply to a 'windows closed condition'. Standard window glazing of a building will typically attenuate noise ingress by 20 dB(A) with windows closed and 10 dB(A) with windows open (allowing for natural ventilation). Accordingly, the external noise threshold above which a dwelling will require mechanical ventilation is an $L_{Aeq(9hour)}$ of 55 dB(A) for bedrooms and $L_{Aeq(15hour)}$ of 60 dB(A) for other areas.

Where windows must be kept closed, the adopted ventilation systems must meet the requirements of the Building Code of Australia and Australian Standard 1668 – The use of ventilation and air conditioning in buildings.

4.2 Operational Noise Project Trigger Noise Levels

Responsibility for the control of noise emissions in New South Wales is vested in Local Government and the EPA. The EPA oversees the Noise Policy for Industry (NPfI) October 2017 which provides a framework and process for deriving project trigger noise level. The NPfI project noise levels for industrial noise sources have two (2) components:

- Controlling the intrusive noise impacts for residents and other sensitive receivers in the short term; and
- Maintaining noise level amenity for particular land uses for residents and sensitive receivers in other land uses.

4.2.1 Intrusiveness Noise Levels

For assessing intrusiveness, the background noise generally needs to be measured. The intrusiveness noise level essentially means that the equivalent continuous noise level (LAeq) of the source should not be more than 5 dB(A) above the measured Rated Background Level (RBL), over any 15-minute period.

4.2.2 Amenity Noise Levels

The amenity noise level is based on land use and associated activities (and their sensitivity to noise emission). The cumulative effect of noise from industrial sources needs to be considered in assessing the impact. The

noise levels relate only to other industrial-type noise sources and do not include road, rail or community noise. The existing noise level from industry is measured.

If it approaches the project trigger noise level value, then noise levels from new industrial-type noise sources, (including air-conditioning mechanical plant) need to be designed so that the cumulative effect does not produce total noise levels that would significantly exceed the project trigger noise level.

4.2.3 Area Classification

The NPfI characterises the "Suburban" noise environment as an area with an acoustical environment that:

- has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry.
- This area often has the following characteristic: - evening ambient noise levels defined by the natural environment and human activity

The area surrounding the proposed development falls under the "Suburban" area classification.

4.2.4 Project Specific Trigger Noise Levels

Having defined the area type, the processed results of the attended noise monitoring have been used to determine project specific project trigger noise level. The intrusive and amenity project trigger noise level for nearby residential premises are presented in Table 4-2. These project trigger noise levels are nominated for the purpose of assessing potential noise impacts from the proposed development.

For each assessment period, the lower (i.e. the more stringent) of the amenity or intrusive criteria are adopted. These are shown in bold text in Table 4-2.

Table 4-2 Project Specific Trigger Noise Levels

Receiver	Time of Day	ANL [1] $L_{Aeq(15min)}$	Measured		Project specific Noise Levels	
			RBL [2] $L_{A90(15min)}$	L_{Aeq} Noise Level)	Intrusive $L_{Aeq(15min)}$	Amenity [3] $L_{Aeq(15min)}$
Residential	Day	55	44	54	**49**	55
	Evening	45	42	50	47	**45**
	Night	40	35	48	**40**	40
Commercial	When in Use	65	-	-	**-**	65

Note 1: ANL = "Acceptable Noise Level" for residences in Suburban Areas.

Note 2: RBL = "Rating Background Level".

Note 3: Assuming existing noise levels are unlikely to decrease in the future

5 NOISE IMPACT ASSESSMENT

5.1 Road Traffic Noise

5.1.1 Road Traffic Noise Intrusion Assessment

In order to ascertain the existing noise levels from the surrounding area, the measured noise logger data was processed in accordance to the NSW Road Noise Policy assessment time periods. Table 5-1 details the traffic noise levels.

Table 5-1 Measured Traffic Noise Levels

Logger Location	Noise Level – dB(A) re 20 µPa	
	$L_{Aeq\ (15hour)}$ 07:00 – 22:00	$L_{Aeq\ (9hour)}$ 22:00 to 07:00
1 Edna Street	53	47

Traffic noise levels recorded by the noise logger have been corrected to account for the distance from the road to the proposed façade. These are representative of the noise levels the proposed façade will encounter.

6 RECOMMENDED NOISE CONTROL TREATMENT

The calculation procedure establishes the required noise insulation performance of each surface component such that the internal noise level is achieved whilst an equal contribution of traffic noise energy is distributed across each component. Building envelope components with a greater surface area must therefore offer increased noise insulation performance.

The recommended acoustic treatments are based on the following floor finishes:

- Bedrooms: Carpet and underlay
- Living Room Hard Flooring
- Kitchen/Wet Areas: Tiles

The acoustic requirements shown in this report will further increase where bedroom floor finishes are tiled or timbered.

All recommendations must be checked against others to ensure compliance with other non-acoustic requirements that Council or other authorities may impose (e.g. Thermal requirements for BASIX compliance).

6.1 Glazing

The R_w rating required for each window will vary from room to room. Recommendations for windows also apply to any other item of glazing located on the external facade of the building in a habitable room unless otherwise stated.

Note that the R_w rating is required for the complete glazing and frame assembly. The minimum glazing thicknesses will not necessarily meet the required R_w rating without an appropriate frame system. It will be therefore necessary to provide a window glass and frame system having a laboratory tested acoustic performance meeting the requirements acoustic requirements.

The window systems must be tested in accordance with both of the following:

- Australian Window Association Industry Code of Practice Window and Door – Method of Acoustic Testing; and
- AS 1191 Acoustics – Method for laboratory measurement of airborne sound insulation of building elements.

It is necessary to submit such Laboratory certification for the proposed glazing systems (i.e. windows and framing systems) (e.g. NAL or CSIRO) for approval by RSA Acoustics prior to ordering or commitment.

The entire frame associated with the glazing must be sealed into the structural opening using acoustic mastics and backer rods. Normal weather proofing details do not necessarily provide the full acoustic insulation potential of the window system. The manufacturers' installation instructions for the correct acoustic sealing of the frame must be followed.

It is possible that structural demands for wind loading or fire rating or the like may require more substantial glass and framing assemblies than nominated above. Where this is the case the acoustic requirements must clearly be superseded by the structural or fire rating demands.

6.2 Rw Requirements for Glazing

Based on the predicted internal noise levels, glazed windows and doors certain facades of residential development should have the following minimum Rw rating as indicated in Table 6-1 below.

Table 6-1 In-principle Glazing Recommendations

Location	Glazing Type	Minimum Glazing Rw Rating	Indicative Glazing System
All Façades			
Living/Communal Room	Sliding Doors	Rw 22	5mm clear glass in acoustically sealed frame*
	Windows	Rw 22	5mm clear glass in acoustically sealed frame*
Bedrooms/private rooms	Windows	Rw 22	5mm clear glass in acoustically sealed frame*

Note *: glazing system are for reference only. Any glazing system to be installed for the development is to achieve the minimum Rw rating indicated above.

Please note Rw ratings provided in Table 6-1 rely on the acoustic performance of the window glazing and frame. Rw ratings should be checked with glazing manufacturers and frames should be selected and installed as to not degrade the performance of the glazing. It is also recommended that glazing specifications are reviewed at the detailed design stage, most notably if changes to the glazing area are made throughout the design.

7 OPERATIONAL NOISE ASSESSMENT

7.1 Mechanical Plant Noise Assessment

Finalised architectural layouts and specific mechanical plant selections have not been supplied at this stage. It is anticipated that the building will be serviced by typical mechanical ventilation/air conditioning and heating equipment.

It is likely that the criteria set out by Penrith City Council and other regulatory standards will be met through the use of conventional noise control methods (e.g. selection of equipment on the basis of quiet operation and, where necessary, providing enclosures, localised barriers, silencers and lined ductwork).

An appropriately qualified acoustic consultant should review the mechanical plant associated with the development at the detailed design stage when final plant selections have been made and full mechanical plant assessment must then be carried out.

7.2 Typical Vocal Levels

Calculations of the amount of noise transmitted to these receivers from the proposed boarding house have been based on voice levels as referenced in the Handbook of Acoustical Measurements and Noise Control by Cyril M. Harris. This handbook provides voice spectrums for males and females as well as different vocal efforts. The spectrum is given in Table 7-1.

The spectra have been scaled based upon the overall number of patrons expected to be in the outdoor areas at any given time

Table 7-1 Speech Spectrums - Handbook of Acoustical Measurements and Noise Control.

Type	Noise Level (dB) at Octave Band Centre Frequency (Hz)							Overall dB(A)
	125	250	500	1 k	2 k	4 k	8 k	
Male (Raised)	49	55	58	51	47	43	37	58
Female (Raised)	37	51	54	49	44	43	38	55

7.3 Tenant Sound Power Levels

Based on a maximum number of 20 tenants in the outdoor area (assuming that 20 people will live in the development, that being 1 or 2 tenants per room), the following worst-case operational scenarios have also been assumed for our assessment:

- A total of 20 people in the outdoor area. Therefore, with 100 percent of the patrons talking, the worst-case scenario will be 20 tenants talking at any one time in the outdoor area.

Table 7-2 Sound Power Levels of People talking with Raised Voice - L_W – dB(A)

Scenario	Resultant Sound Power Level per Octave Band (dB)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
20 Tenants with Raised Vocal in the Outdoor Area	-	72	78	82	77	72	67	61

7.4 Noise Emissions Calculation

Calculations of the noise levels from the operation of the proposed mechanical plant have been carried out using the data in tables 7-1 and 7-2. We have used the worst-case scenario where all noise is active at the same time. Calculations take into account factors such as distance, shielding from buildings and barriers.

The following figure presents the proposed development and all sensitive receivers

Figure 7-1 Sensitive Receiver Location

7.5 Predicted Noise Levels

Predictive resultant noise levels have been calculated for residents using the rear yard and car movements within the site. Noise emissions at the nearest residential receivers are presented in the table below. The predicted noise calculations take into account the following:

- Heights of receivers are assumed to be 1.5 meters above ground level.
- The boundary fence on the west and north boundaries is a solid 1.8 meters fence
- Up to 20 people will be in the outdoor communal area at a time (day and evening time only) night time will be restricted to 7 people.
- The maximum capacity of the both carpark areas is 8 cars and 5 motorbikes/bicycles, we have assumed that 4 cars leave the parking area at the same time.

Table 7-3 Predicted Noise Levels at sensitive receivers.

Receiver	Period	Calculated Noise Level L_{Aeq} – dB(A)	Criteria	Compliance
R1	Day	49	49	Yes
	Evening	49	47	No
	Night	47	40	No
R2	Day	45	49	Yes
	Evening	45	47	Yes
	Night	43	40	No
R3	Day	45	65	Yes
	Evening	45	65	Yes
	Night	43	-	Yes
R4	Day	43	49	Yes
	Evening	43	47	Yes
	Night	40	40	Yes

It is likely that most tenants will use the common room, however, all tenants must be instructed to minimise noise while using the outdoor areas to minimise unnecessary noise. We note that our calculations assumed that the outdoor common areas will only be used by the tenants.

7.6 Outdoor Communal Area Mitigation Recommendations

To ensure the future amenity of nearby sensitive receivers most notably the residential development to the west, the following recommendations should be put in place:

- Ensuring the proposed 1.8m boundary fencing is built on the north and west facades.
- No music is to be played in the outdoor communal area.
- Minimise the number of tenants using the outdoor area to 10 people in the evening.
- No tenants allowed in the outdoor area after 10pm

8 CONSTRUCTION NOISE AND VIBRATION MANAGEMENT PLAN

8.1 Project Area and Sensitive Receivers

Construction will wholly take place within the boundaries of at 1 Edna Street, Kingswood. Potentially affected sensitive receivers are displayed below in red in correlation to the site in yellow in Figure 8-1.

Figure 8-1 Sensitive Receivers

8.2 Proposed Construction Works

All construction works required to complete the proposed development will be undertaken during standard daytime construction hours of 7 am – 6 pm Monday to Friday and 8 am – 1 pm Saturday only. Works outside of the standard daytime construction hours will only be undertaken with prior assessment and required approvals.

The construction program is to include the following key work stages and potential noise and ground vibration generating activity:

- Demolition of the parts of the existing building located at the project site;
- Excavation of some of the bedrock adjacent to the residence;
- Construction of the new parts of the residential building including foundation works, concreting and infrastructure installation of framework, walls, roof and electrical fit out;

The construction phases will include some limited site clearance, foundation preparation and infrastructure installation. It is our understanding that the construction program is proposed to be more than 3 weeks in duration.

8.3 Construction Noise and Vibration Criteria

8.3.1 Construction Noise

Noise criteria for construction works are established in accordance with the EPA *Interim Construction Noise Guidelines* (ICNG).

All construction works are to be undertaken during daytime core hours of 7 am–6 pm Monday to Friday and 8 am-1 pm Saturdays. No construction works are anticipated to be required outside of the standard daytime standard construction hours unless otherwise approved.

The ICNG provides recommended construction (airborne) noise management levels for residential receivers as detailed in Table 8-1.

Site specific noise management levels (NML) have been established adopting the background noise levels (L_{A90}) measured within the project site.

The noise management levels are design as a trigger for the project to investigate feasible and reasonable noise management and mitigation measures to reduce noise impacts at nearest noise affected receivers.

Table 8-1 Recommended Residential Construction Noise Criteria

Time of construction	Noise Management level $L_{Aeq, 15min}$	Adopted noise NML $L_{Aeq, 15min}$ at neighbouring residences
Standard construction hours Monday to Friday 7 am – 6 pm Saturday 8 am-1 pm No work on Sundays or public holidays	Noise affected receivers RBL + 10 dB(A)	54 dB(A)

Note: RBL rating background level, the measured L_{A90} noise level.

As construction works for the proposed development will only be carried out during the daytime period a standard daytime construction noise management level for the neighbouring residential receivers of $L_{Aeq, 15min}$ 54 dB(A) has been adopted in accordance with the ICNG. NMLs for the evening and night periods are not applicable to this assessment.

There are no noise sensitive receivers such as schools, hospitals or places of worship that have been identified within the study area.

A $L_{Aeq,15min}$ 75 dB(A) highly noise affected construction noise management level will be applied as a trigger for the application of additional construction noise controls such as respite periods or restriction of construction hours of operation. This trigger would apply to noise impacts on residential receivers only.

The recommended noise management levels are planning goals only. Factors such as the social benefits of the activity, economic constraints, and the nature and duration of the proposed construction program need to be considered when assessing potential noise impacts from construction works.

8.3.2 Construction Vibration

Vibration during construction works is considered an intermittent source associated with two main types of impact; disturbance at receivers and potential architectural/structural damage to buildings. Generally, if disturbance issues are controlled, there is limited potential for structural damage to buildings.

Detailed in Table 8-2, the ICNG guidance adopts the *Environmental Noise Management Assessing Vibration: a technical guideline* (2006) for the assessment of human annoyance due to construction vibration. German Standard DIN 4150: Part 3-1999, provides guidelines for evaluating the effects of vibration on structures.

Dependent upon the dominant frequency of vibration, assessed in Hertz (Hz), structural vibration limits are established at the foundation of nearest buildings.

Table 8-2 Adopted Vibration Constriction Criteria

Receiver	Annoyance VDV criteria, $m/s^{1.75}$		Structural PPV criteria, mm/s
	Preferred	Maximum	
Residential	0.2	0.4	5 - 20

Notes: structural vibration goals established for < 10 – 100 Hz dominant frequency of vibration.

VDV = vibration dose value; PPV = peak particle velocity

9 CONSTRUCTION NOISE & VIBRATION MANAGEMENT PLAN

9.1 Noise & Vibration Intensive Works

9.1.1 Construction Noise

The basis for the project-specific construction airborne noise goals for approved daytime hours is shown in Table 8-1**.**

Where the noise goals shown in cannot be achieved, the construction contractor will use all reasonable and feasible noise mitigation and management measures to reduce noise generation and impacts.

9.1.2 Construction Vibration

The construction contractor will, if required, ensure compliance with the criteria of Table 8-1.

It is anticipated that there will be minimal Construction Vibration within this development.

9.1.3 Typical Plant & Equipment Sound Pressure Levels

Sound pressure levels for typical items of plant are listed in Table 9-1. These noise levels are representative of modern plant operating with noise control measures in good condition.

Table 9-1 Noise Levels of Typical Construction Plant & Equipment

Item	Typical Plant Type	Typical L_{Aeq} Noise Level at 15 metres – dB(A)
Excavator	5 to 8 tonnes	75
Bob Cat		71

Tip trucker	72
Hand Tools: - saws, nail gun, drills, hammers	70
Concrete pump	75
Cement mixer	75
Crane	70
Kango	75

9.2 Noise & Vibration Mitigation Measures

9.2.1 Noise Control

The following noise mitigation measures will, if required, be implemented. The construction contractor will, where reasonable and feasible, apply best practice noise mitigation measures including:

- Maximising the offset distance between noisy plant items and nearby noise sensitive receivers.
- Avoiding the coincidence of noisy plant working simultaneously close together and adjacent to sensitive receivers.
- Minimising consecutive works in the same locality.
- Orienting equipment away from noise sensitive areas.
- Carrying out loading and unloading away from noise sensitive areas.

In order to minimize noise impacts during the works, the construction contractor will take all reasonable and feasible measures to mitigate noise effects.

The contractor will also take reasonable steps to control noise from all plant and equipment. Examples of appropriate noise control include efficient silencers and low noise mufflers.

Silenced air compressors, fitted with noise labels indicating a maximum (L_{Amax}) sound pressure level of not more than 75 dB(A) at 7 m will be used on site. The sound pressure level of noise emitted from a compressor used will comply with noise label requirements.

9.2.2 Vibration Control

The following vibration mitigation measures will be implemented by the construction contractor:

- Relocate any vibration generating plant and equipment to areas within the site in order to lower the vibration impacts.
- Investigate the feasibility of rescheduling the hours of operation of major vibration generating plant and equipment.
- Use lower vibration generating items of excavation plant and equipment e.g. smaller capacity rock breaker hammers.
- Minimise consecutive works in the same locality (if applicable).

- Schedule a minimum respite period of at least 0.5 hour before activities commence which are to be undertaken for a continuous four-hour period.

9.2.3 Summary of Mitigation Measures

The noise and vibration mitigation measures to be implemented by the construction contractor are listed in Table 9-2.

Table 9-2 Summary of Noise & Vibration Mitigation Measures

Item	Description
Construction Hours	Works will be carried out within the standard construction hours.
Deliveries	Deliveries will be carried out within the standard construction hours.
Site Layout	Where possible, plant and equipment will be located and orientated to direct noise away from sensitive receivers.
Quietest Suitable Equipment	Plant and equipment will be selected to minimise noise emission, where possible, whilst maintaining efficiency of function. Residential grade silencers will be fitted and all noise control equipment will be maintained in good order.
Hammer Equipment	Maximise hammer penetration (and reduce blows) by using sharp hammer tips. Keep stocks of sharp profiles at site and monitor the profiles in use.
Reversing Alarms	Mobile plant and trucks operating on site for a significant portion of the project will have reversing alarm noise emissions minimised, where possible, recognising the need to maintain occupational safety standards.
PA System	No public-address system will be used at this site.
Truck Noise (off site)	All trucks regularly used for the project are to have mufflers, and any other noise control equipment, maintained in good working order. Trucking routes will use main roads, where feasible.
Construction Hours	Works will be carried out within the standard construction hours.

9.3 Identifying and Managing Future Noise & Vibration Issues

If additional activities or plant are found to be necessary that will emit noise and/or vibration emissions significantly exceeding those assumed for this assessment, these will, if required, be assessed by the Acoustical Consultant on a case-by-case basis and appropriate mitigation measures will be implemented.

9.4 Complaint Handling

The construction contractor will adopt the following protocol for handling complaints. This protocol is intended to ensure that the issues are addressed and that appropriate corrective action is identified and implemented as necessary:

- The project manager will record all verbal and telephone complaints in writing and will forward all complaints to the contractor, together with details of the circumstance leading to the complaint and all subsequent actions.

- Complaints received by the contractor will, as an initial step, be referred to the project manager who will respond as described above.

- The contractor will investigate the complaint in order to determine whether a criterion exceedance has occurred or whether noise and/or vibration have occurred unnecessarily.
- If excessive or unnecessary noise and/or vibration have been caused, corrective action will be planned and implemented by the project manager.
- Complainants will be informed by contractor that their complaints are being addressed, and (if appropriate) that corrective action is being taken.

Complainants will be informed of the implementation of the corrective action that has been taken to mitigate the adverse effects.

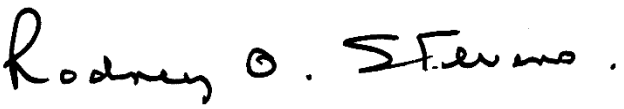
10 CONCLUSION

Rodney Stevens Acoustics has conducted a noise impact assessment of the proposed boarding house development located at 1 Edna Street, Kingswood NSW. The review has assessed the noise intrusion of the site and compared it with the noise criteria required by in Penrith City Council and other relevant standards including the EPA's Noise Policy for Industry.

Rodney Stevens Acoustics has developed a construction noise and vibration management plan for the proposed boarding house development located at 1 Edna Street, Kingswood NSW.

A noise survey has been carried out and the processed data has been used to determine traffic noise from the surrounding area to the project site. Based on the noise impact study conducted, the proposed development is deemed to comply with the SEPP (Infrastructure) 2007-noise criteria with recommendations from this report. It is therefore recommended that planning approval be granted for the proposed development based on acoustics.

Approved: -



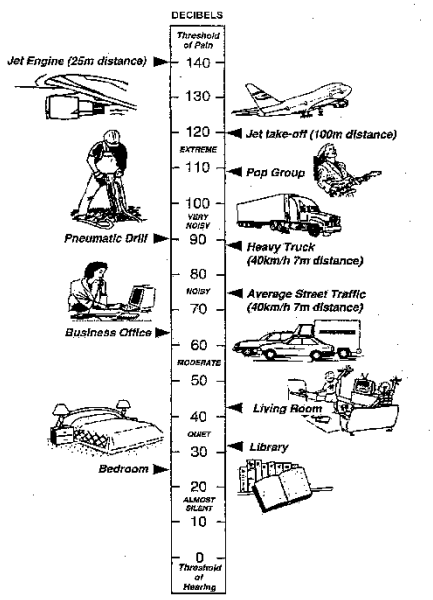
Rodney Stevens

Manager/Principal

Appendix A. Acoustic Terminology

A-weighted sound pressure	The human ear is not equally sensitive to sound at different frequencies. People are more sensitive to sound in the range of 1 to 4 kHz (1000 – 4000 vibrations per second) and less sensitive to lower and higher frequency sound. During noise measurement, an electronic '*A-weighting*' frequency filter is applied to the measured sound level *dB(A)* to account for these sensitivities. Other frequency weightings (B, C and D) are less commonly used. Sound measured without a filter is denoted as linear weighted dB(linear).
Ambient noise	The total noise in a given situation, inclusive of all noise source contributions in the near and far field.
Community annoyance	Includes noise annoyance due to: ▪ character of the noise (e.g. sound pressure level, tonality, impulsiveness, low-frequency content) ▪ character of the environment (e.g. very quiet suburban, suburban, urban, near industry) ▪ miscellaneous circumstances (e.g. noise avoidance possibilities, cognitive noise, unpleasant associations) ▪ human activity being interrupted (e.g. sleep, communicating, reading, working, listening to radio/TV, recreation).
Compliance	The process of checking that source noise levels meet with the noise limits in a statutory context.
Cumulative noise level	The total level of noise from all sources.
Extraneous noise	Noise resulting from activities that are not typical to the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
Feasible and reasonable measures	Feasibility relates to engineering considerations and what is practical to build; reasonableness relates to the application of judgement in arriving at a decision, taking into account the following factors: ▪ Noise mitigation benefits (amount of noise reduction provided, number of people protected). ▪ Cost of mitigation (cost of mitigation versus benefit provided). ▪ Community views (aesthetic impacts and community wishes). ▪ Noise levels for affected land uses (existing and future levels, and changes in noise levels).
Impulsiveness	Impulsive noise is noise with a high peak of short duration or a sequence of these peaks. Impulsive noise is also considered annoying.

Low frequency	Noise containing major components in the low-frequency range (20 to 250 Hz) of the frequency spectrum.
Noise criteria	The general set of non-mandatory noise levels for protecting against intrusive noise (for example, background noise plus 5 dB) and loss of amenity (e.g. noise levels for various land use).
Noise level (goal)	A noise level that should be adopted for planning purposes as the highest acceptable noise level for the specific area, land use and time of day.
Noise limits	Enforceable noise levels that appear in conditions on consents and licences. The noise limits are based on achievable noise levels, which the proponent has predicted can be met during the environmental assessment. Exceedance of the noise limits can result in the requirement for either the development of noise management plans or legal action.
Performance-based goals	Goals specified in terms of the outcomes/performance to be achieved, but not in terms of the means of achieving them.
Rating Background Level (RBL)	The rating background level is the overall single figure background level representing each day, evening and night time period. The rating background level is the 10th percentile min L_{A90} noise level measured over all day, evening and night time monitoring periods.
Receptor	The noise-sensitive land use at which noise from a development can be heard.
Sleep disturbance	Awakenings and disturbance of sleep stages.
Sound and decibels (dB)	Sound (or noise) is caused by minute changes in atmospheric pressure that are detected by the human ear. The ratio between the quietest noise audible and that which should cause permanent hearing damage is a million times the change in sound pressure. To simplify this range the sound pressures are logarithmically converted to decibels from a reference level of 2 x 10-5 Pa. The picture below indicates typical noise levels from common noise sources.



dB is the abbreviation for decibel – a unit of sound measurement. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure.

Sound power Level (SWL)

The sound power level of a noise source is the sound energy emitted by the source. Notated as SWL, sound power levels are typically presented in *dB(A)*.

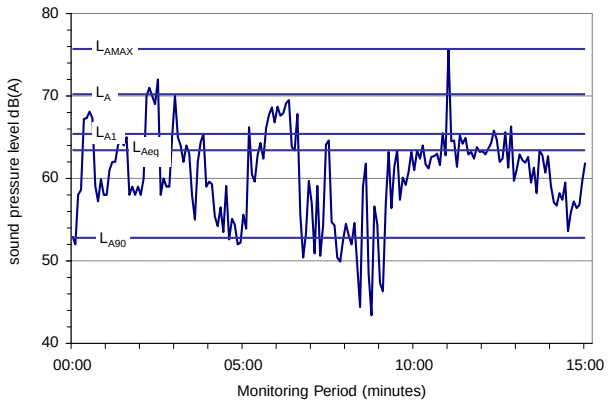
Sound Pressure Level (SPL)

The level of noise, usually expressed as SPL in *dB(A)*, as measured by a standard sound level meter with a pressure microphone. The sound pressure level in *dB(A)* gives a close indication of the subjective loudness of the noise.

Statistic noise levels

Noise levels varying over time (e.g. community noise, traffic noise, construction noise) are described in terms of the statistical exceedance level.

A hypothetical example of A weighted noise levels over a 15 minute measurement period is indicated in the following figure:



Key descriptors:

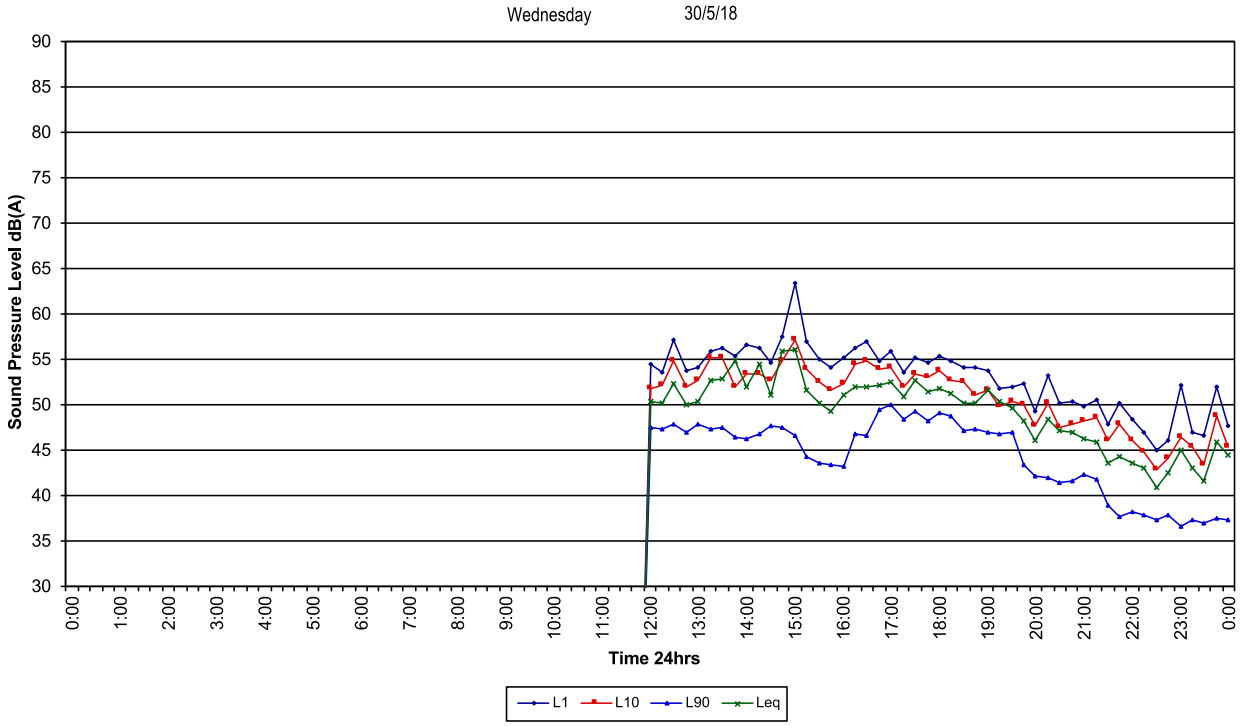
L_{Amax} Maximum recorded noise level.

L_{A1} The noise level exceeded for 1% of the 15 minute interval.

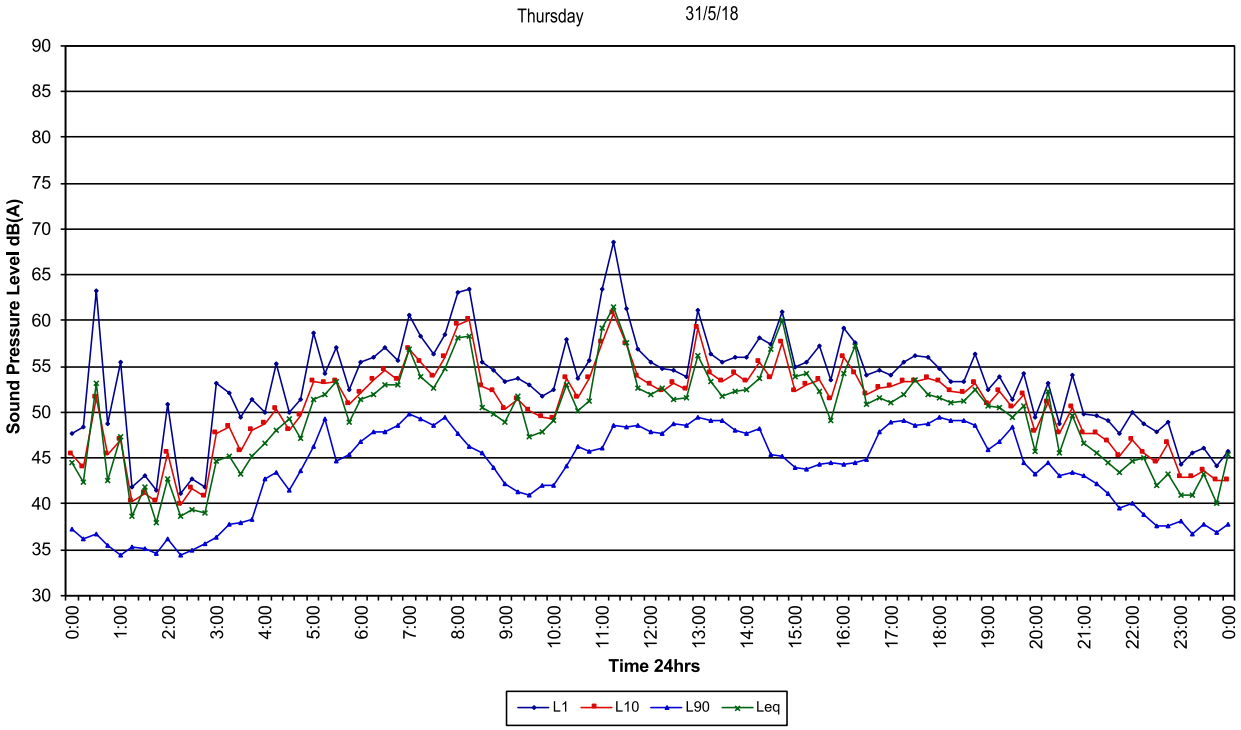
	L_{A10} Noise level present for 10% of the 15-minute interval. Commonly referred to the average maximum noise level. L_{Aeq} Equivalent continuous (energy average) A-weighted sound pressure level. It is defined as the steady sound level that contains the same amount of acoustic energy as the corresponding time-varying sound. L_{A90} Noise level exceeded for 90% of time (background level). The average minimum background sound level (in the absence of the source under consideration).
Threshold	The lowest sound pressure level that produces a detectable response (in an instrument/person).
Tonality	Tonal noise contains one or more prominent tones (and characterised by a distinct frequency components) and is considered more annoying. A 2 to 5 dB(A) penalty is typically applied to noise sources with tonal characteristics

Appendix B Logger Graphs

1 Edna St, Kingswood



1 Edna St, Kingswood



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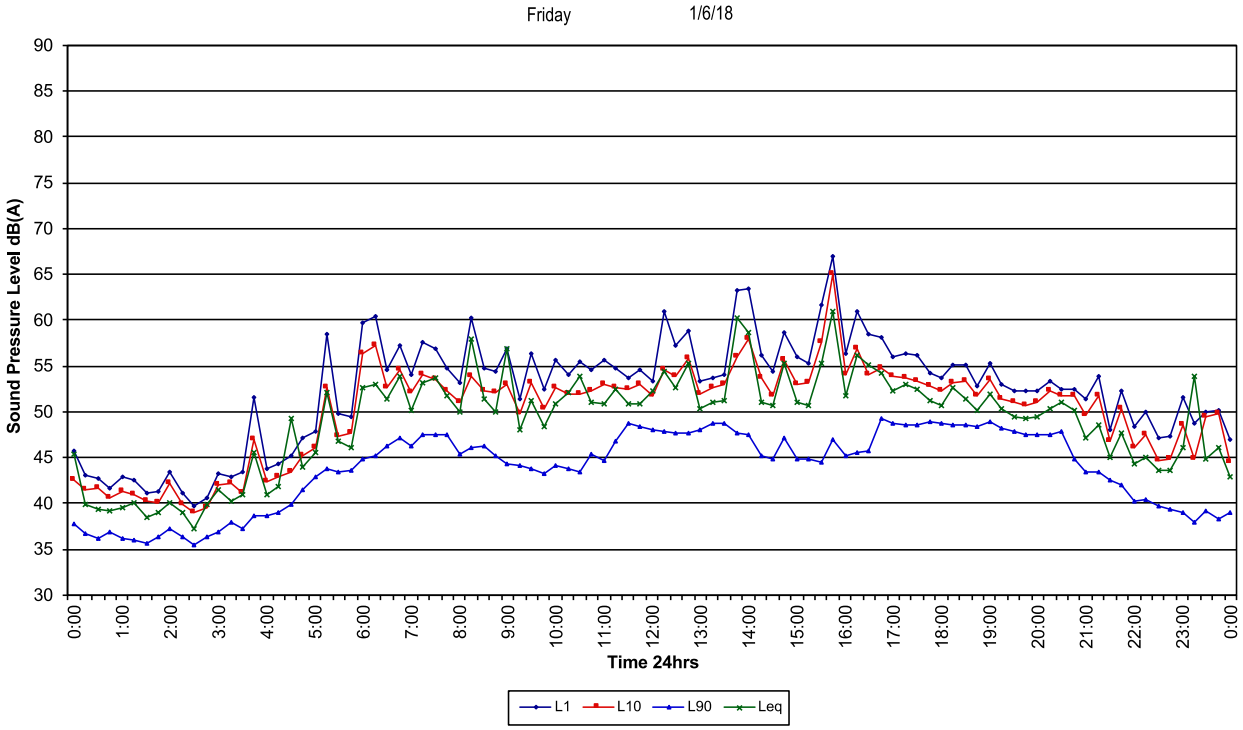

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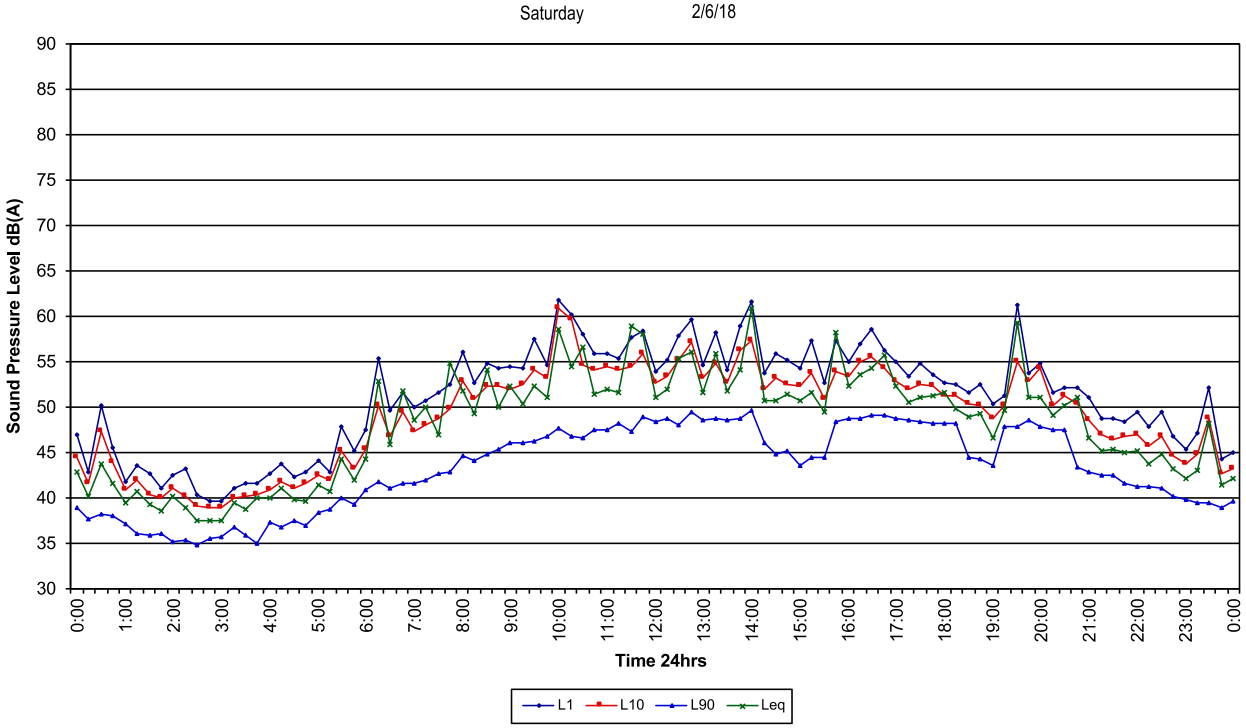

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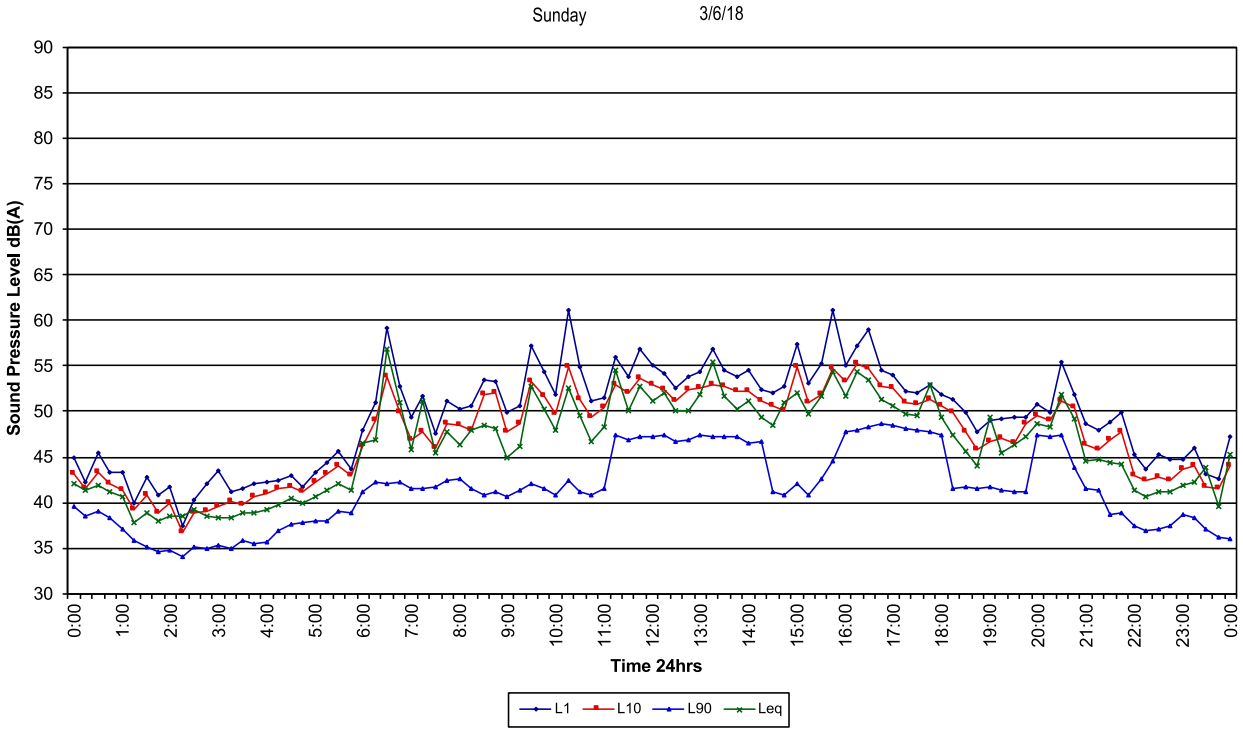

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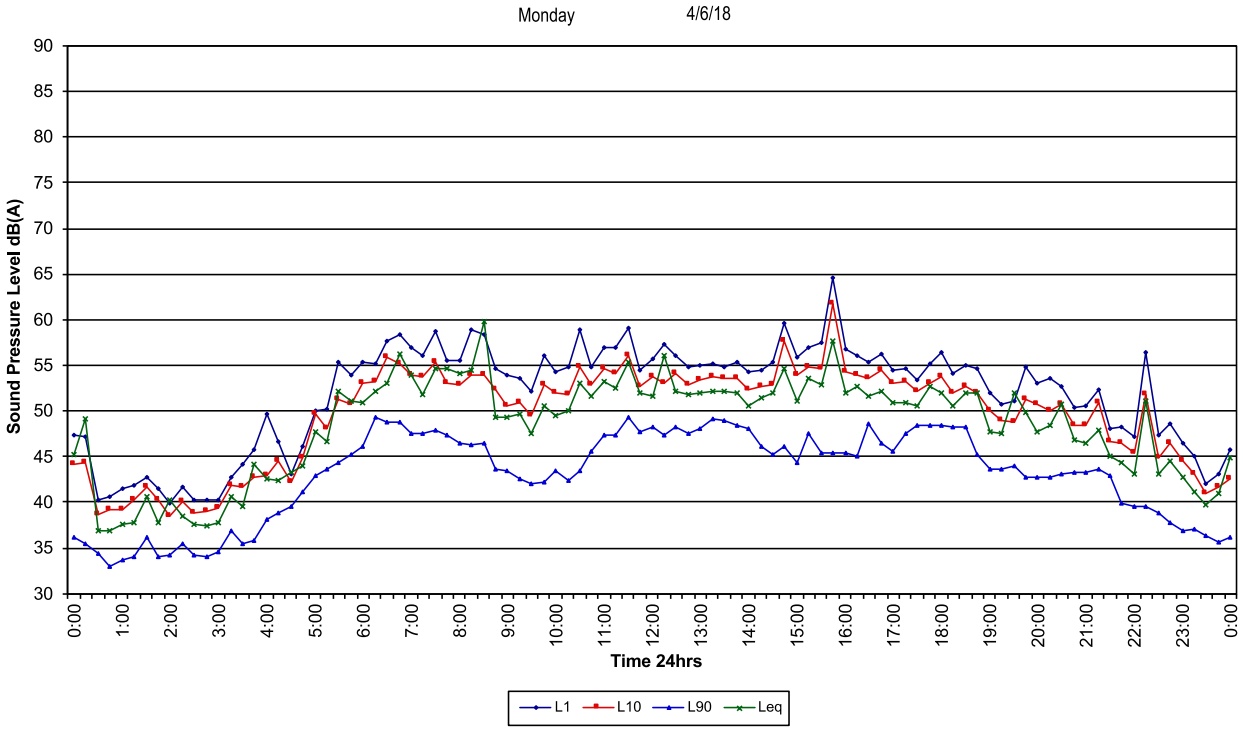
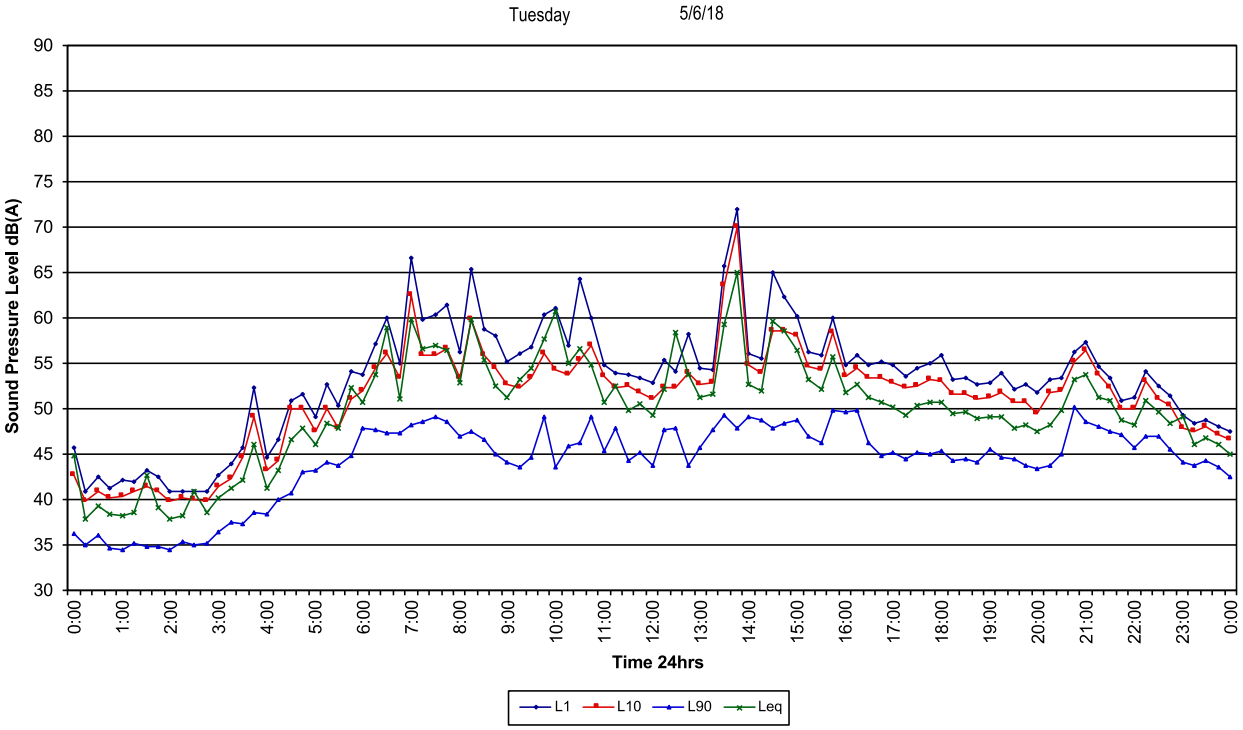
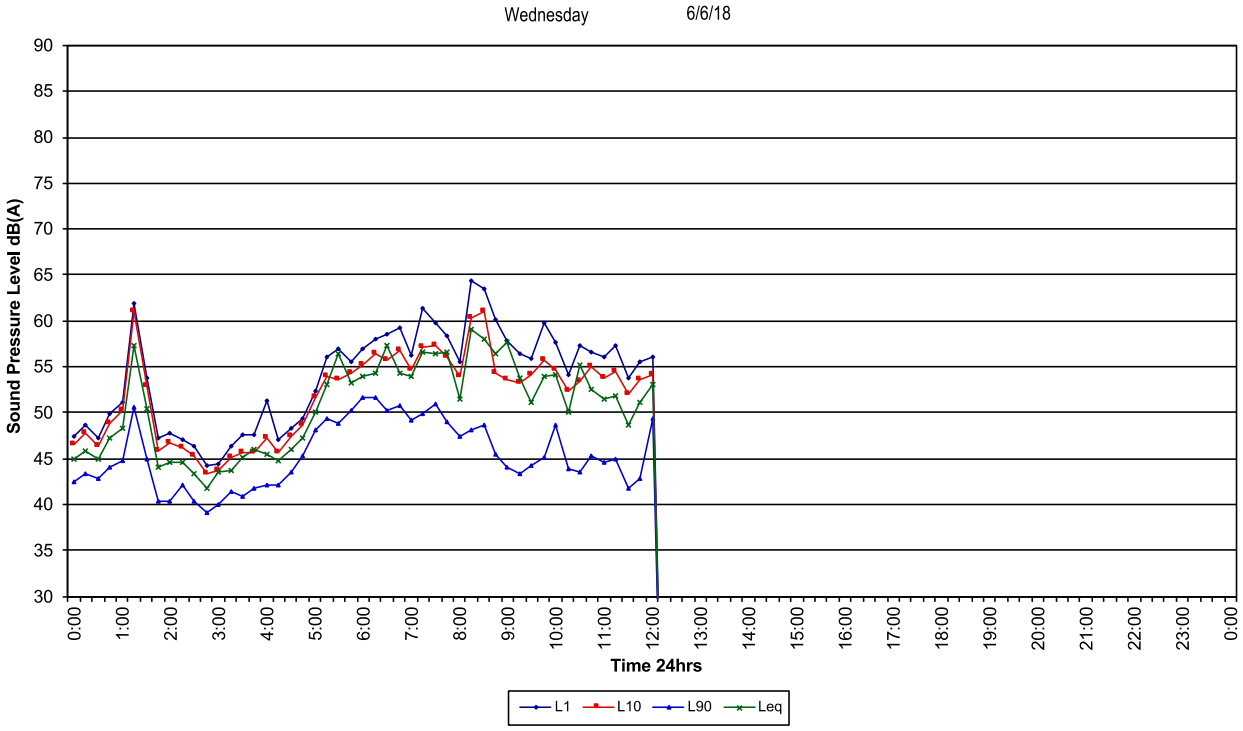


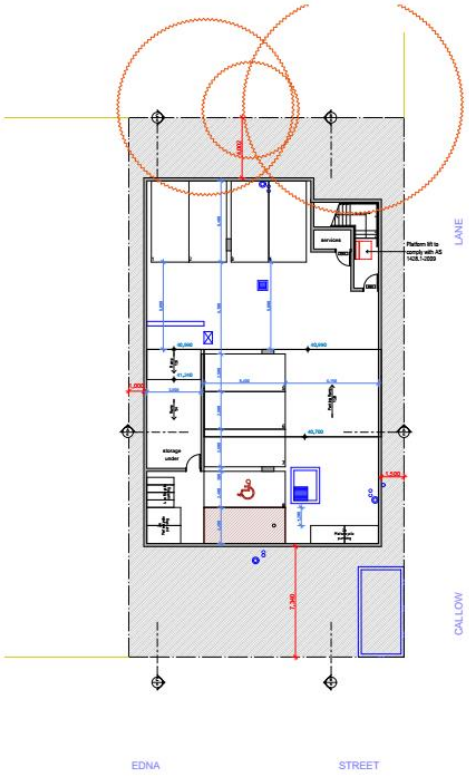
1 Edna St, Kingswood



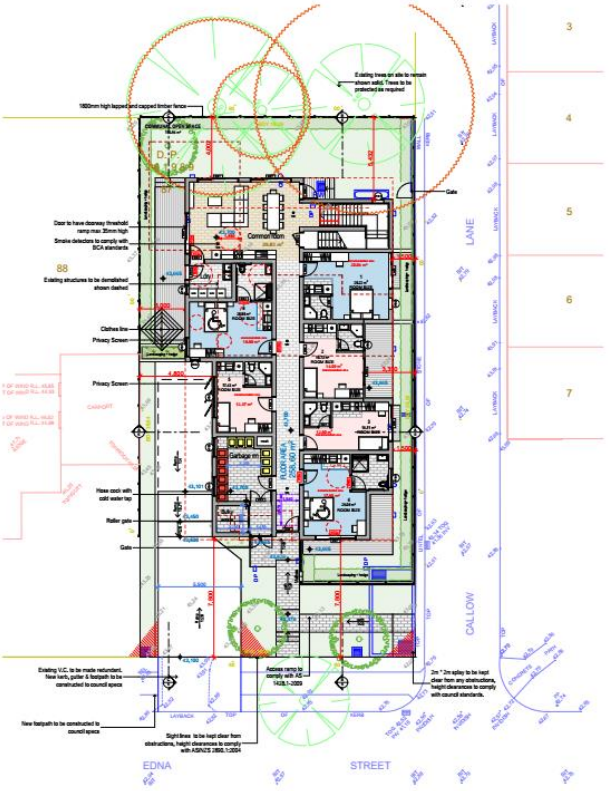
1 Edna St, Kingswood



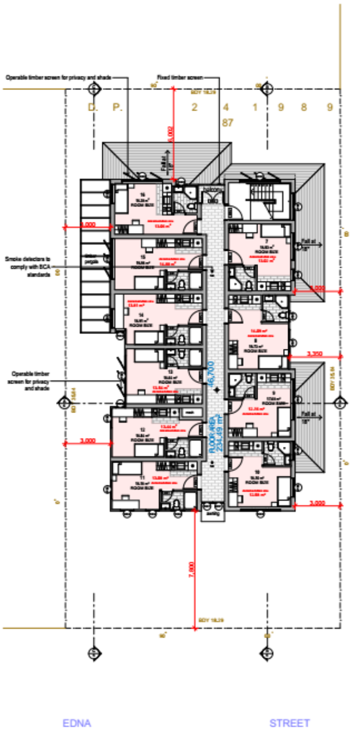
Appendix C Architectural plans



BASEMENT FLOOR PLAN
1:200



GROUND FLOOR PLAN
1:200



FIRST FLOOR PLAN
1:200

No. Occupants			
LEVEL	UNIT TYPE	ROOMS	OCCUPANTS
GROUND	1bed	4	4
	2bed	3	6
FIRST	1bed	9	9
	2bed	0	0
TOTAL		16	19

NOTE

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3. FIGURED DIMENSIONS ARE TO BE TAKEN IN PREFERENCE TO SCALING.
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6. STORMWATER TO BE CONNECTED AND DISCHARGED TO COUNCIL'S REQUIREMENTS AND TO AS 3500.3-1990.
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8. ALL DIMENSIONS TO BE VERIFIED BY BUILDER/ REGISTERED SURVEYOR ON SITE PRIOR TO CONSTRUCTION COMMENCING
9. ALL DEMOLITION AND REMOVAL WORK TO BE CARRIED OUT WITH APPROVED WASTE MANAGEMENT PLAN AND IN ACCORDANCE WITH COUNCIL'S REQUIREMENTS & D.A. CONDITIONS

LEVEL	ROOM	ROOM GROSS FLOOR AREA (including bathroom & kitchen)	SINGLE BED = 12m² min (max 25m2)	DOUBLE BED = 16m2 min (max 25m2)
GRND	1	25.22		20.04
	2	19.73	14.09	
	3	18.11	12.9	
	4	26.06		17.9
	5	17.43	12.37	
	6	26.55		18.5
FIRST	7	18.53	13.02	
	8	17.73	14.09	
	9	17.68	12.16	
	10	18.1	12.58	
	11	18.18	13.08	
	12	18.54	13.44	
	13	18.64	13.54	
	14	18.91	13.81	
	15	19.98	14.88	
	16	18.38	13.06	
TOTAL		16	13	3

LEP/DCP- COMPLIANCE TABLE			
CONTROL	REQUIRED	PROPOSED	Compliance
Site Area (m^2) R3	400	655.55	YES
Lot Width	15m	18.3m	YES
Street Frontage Setback	Average of immediate neighbours or 5.5m	7.8m	YES
Secondary Setback	3m	3m	YES
Side Setback	2m	3m	YES
Rear Setback	4m for single storey (6m for two storey building component)	4 & 6m	YES
Building Height	max 8.5m	8.2m	YES
Solar Access	3 hours , Between 9am & 3pm 21 Jun	3 hours	YES

DOOR SCHEDULE						
ID	TYPE	HEIGHT	WIDTH	PLAN	ELEVATION	Q
D01	SINGLE SWING	2,070	720			14
D02	SINGLE SWING	2,070	920			24
D03	DOUBLE SWING	2,070	1,400			1
D04	DOUBLE SWING	2,400	1,550			1
D05	SLIDING	2,400	2,400			2
D06	SLIDING	2,400	1,800			1
D07	SLIDING	2,400	2,700			4
D08	SINGLE SWING & SIDELIGHT	2,700	1,550			1
D09	SINGLE SWING	2,400	920			2

AHSEPP - COMPLIANCE TABLE			
CONTROL	REQUIRED	PROPOSED	Compliance
Min. Landscape	Landscaping of front setback area compatible with streetscape	Proposed front yard fencing and landscaping compatible with streetscape	YES
Solar Access	Communal living rooms minimum 3 hours direct sunlight 9:00am to 3:00pm mid winter	Common room linked to open courtyard receiving min 3 hrs of direct sunlight	YES
Private Open Space	Min 20m²; min dimension 3m	All rooms have access to shared open courtyard and garden 116.9 m² (min dim 3m)	YES
Communal Living room	If boarding Has 5 or more Boarding rooms	16 rooms proposed - 1 Communal Room provided	YES
Parking	0.5 per room / (16*0.5=8)	8	YES
Parking (Motor cycle) / (Bicycle)	Minimum 1 bicycle space and 1 motorcycle space for every 5 boarding rooms (16/5=3.2)	4 - Motorcycles 4 - Bicycles	YES

WINDOW SCHEDULE							
ID	TYPE	SILL	WIDTH	HEIGHT	PLAN	ELEVATION	Q
W01	Louvers in Frame	800	775	1,800			2
W02	Double Hung	1,150	600	1,250			4
W03	Double Hung	900	750	1,500			6
W04	Double Hung	600	900	1,800			3
W05	Double Hung	1,150	2,700	1,250			1
W06	Double Hung	1,150	1,250	1,250			10
W07	Sliding	900	1,800	1,500			3
W08	Double Hung	600	2,700	1,800			6

Member Australian Institute of Architects

issue k:
issue j:
issue i:
issue h:
issue g: DA deferral redesign 05/11/2018
issue f: DA 09/07/2018
issue e: DA - Amendments 08/06/2018
issue d: DA - Schematic 31/05/2018
issue c: Coordination 29/05/2018
issue b: Pre-DA 01/05/2018
issue a: Schematics 30/04/2018

project PROPOSED NEW GENERATION BOARDING HOUSE @ 1 EDNA ST KINGSWOOD
client MR ELIE ELIAS
drawn: E.K. | scale: as shown | scale: as shown | Council
checked: J.E. | date: NOV18 | ref: 2018-140 | PCC

G4

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N

NORTH ELEVATION
1:200

EAST ELEVATION
1:200

SOUTH ELEVATION
1:200

WEST ELEVATION
1:200

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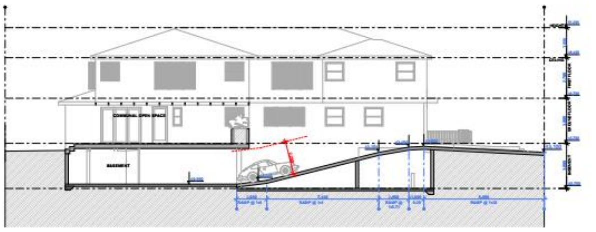

SECTION C
1:200

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