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REFERRED TO:

**Noise & Vibration Management Plan  
during the Demolition, Excavation and  
Construction of**

**For the proposed development at**

**No. 9-15 Raphael Street, Lidcombe**

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## **1.0 INTRODUCTION**

Acoustic Noise & Vibration Solutions was commissioned to assess, and where required make recommendations to reduce and manage the noise impact at the nearest potentially affected receiver/s resulting from the demolition, excavation and construction of the proposed development No. 9-15 Raphael Street, Lidcombe as per Cumberland Council requirements.

The proposed development is located on the corner of Raphael St and Davey St in the suburb of Lidcombe (Figure 1 – Site Location). The architectural plans by Urban Link Architecture dated the 24<sup>th</sup> May, 2017, are for the proposed construction of a ten (10) storey residential development, including four (4) levels of basement parking.

This report presents the relevant noise emission criteria, noise 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 demolition, excavation and construction works.

This report will comply with Cumberland Council requirements and the following the relevant industry and professional standards and guidelines:

- Section 80A of the Environmental Planning & Assessment Act, 1979
- Protection of the Environment Operations Act 1997 (NSW)
- Protection of the Environment Operations (Noise Control) Regulation 2008 (NSW).
- Interim Construction Noise Guideline, Department of Environment & Climate Change July 2009;
- Australian Standard 2436 – 1981 Guide to Noise control on Construction, maintenance and demolition sites;
- NSW Industrial Noise Policy, January 2000;
- Assessing Vibration: A Technical Guideline, Department of Environment & Climate Change 2006;
- Assessing Vibration: A Technical Guideline (DEC 2006)
- Australian Standard AS2436-1981 *Guide to Noise Control on Construction, Maintenance and Demolition Sites.*

Acoustic readings will be measured in accordance with AS 1055:1.2.1997.

## **2.0 ACOUSTIC DESCRIPTORS**

**Maximum Noise Level ( $L_{Amax}$ )** – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

**$L_{A1}$**  – The  $L_{A1}$  level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the  $L_{A1}$  level for 99% of the time.

**L<sub>A10</sub>** – The L<sub>A10</sub> level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L<sub>A10</sub> level for 90% of the time. The L<sub>A10</sub> is a common noise descriptor for environmental noise and road traffic noise.

**L<sub>Aeq</sub>** – The equivalent continuous sound level (L<sub>Aeq</sub>) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

**L<sub>A50</sub>** – The L<sub>A50</sub> level is the noise level which is exceeded for 50% of the sample period. During the sample period, the noise level is below the L<sub>A50</sub> level for 50% of the time.

**L<sub>A90</sub>** – The L<sub>A90</sub> level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L<sub>A90</sub> level for 10% of the time. This measure is commonly referred to as the background noise level.

**ABL** – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L<sub>A90</sub>) for each period.

**RBL** – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

### **3.0 DESCRIPTION OF OPERATIONS AND ENVIRONS**

The demolition, excavation and construction works will be undertaken on site at No. 9-15 Raphael Street, Lidcombe. The background noise in the local area is dominated by traffic noise from the surrounding streets as well as residential and commercial activities in the close vicinity of the site (Figure 2 – Surrounding Environment).

The development site boundaries are shared with a residential property located west of the site at No.7-19 Davey Street, Lidcombe (large block of units) and a commercial property located south of the site at No. 23 James St, Lidcombe (Figure 3 – Nearest Receivers). For the purpose of this report, the nearest residential property potentially affected by the proposed development is the residential property at No. 7-19 Davey St, Lidcombe.

Acoustic Noise & Vibration Solutions understands that the demolition, excavation and construction works are proposed over several months, during the daytime hours only. Works are generally undertaken between the following hours only, as per Cumberland Council requirements:

### All Building Works:

- Monday to Friday 7:00am to 6:00pm.
- Saturday 8:00am to 4:00pm (no demolition to be carried out on Saturday)
- Sunday & Public Holidays: No Work Permitted

**Note\*** the above hours will be confirmed once the development has been approved and DA conditions have been provided by Cumberland Council.

## 4.0 IMPACTS OF EXCESSIVE NOISE AND VIBRATION DOSES

Vibration caused by the project works can be classified as intermittent vibration under the DECCW's "*Assessing Vibration: a technical guideline*". The human comfort goals for intermittent vibration from this guideline applicable for the project are shown in the table below.

Table 1 - Preferred and maximum vibration dose values for human comfort

Building Type	Intermittent Vibration (m/s <sup>1.75</sup> )	
	Preferred	Maximum
Critical working areas (e.g. hospital operating theatres, laboratories)	0.10	0.20
Residential daytime (7:00am to 10:00pm)	0.20	0.40
Residential night time (10:00pm to 7:00am)	0.13	0.26
Offices, educational institutions. Places of worship	0.40	0.80
Workshops	0.80	1.60

The 'human annoyance' criteria for intermittent vibration are cumulative dose values, rather than instantaneous particle velocities or acceleration. Determining dose values depends not only on vibration levels but the length of time over which they affect a receiver. Vibration generating equipment is not often used constantly, making accurate predictions of dose values for intermittent vibration difficult in practice. Determining vibration dose values and compliance with the criteria relies on field measurements during the activity.

To give an indication of potential situations where the criteria for intermittent vibration might be exceeded, the information presented in Table 2 has been used to determine the time it would take before the vibration dose values are exceeded for various items of plant. These are presented in Table 3. In these calculations it is assumed that the equipment would be in continuous use for the full duration of the specified time. The times outlined are therefore considered to be conservative.

Table 2 - Intermittent Vibration

Equipment	Approximate Time to Reach a VDV of 0.4 (hours) at given distance					
	5m	10m	20m	30m	40m	50m
<b>Vibratory Roller</b>	<1	<1	<1	1.3	8	15
<b>Heavy rock hammer</b>	<1	0.6	46	>1000	>1000	>1000
<b>Rock saw Rock drill (estimate)</b>	<1	<1	0.7	3	8	14
<b>Bored piling</b>	<1 1.3	3 30	46 >1000	193 >1000	741 >1000	>1000 >1000
<b>Light rock hammer</b>	113	>1000	>1000	>1000	>1000	>1000

The vibration criteria in relation to surface structures are adopted from the German Standard *DIN 4150 Part 3-1999 Structural Vibration in Buildings – Effects on Structures*. These are shown below.

Table 3 - Vibration velocity guide values – short term vibration on structures (mm/s)

Building Type	Vibration at the foundation at a frequency of			Vibration at horizontal plane of highest floor at all 1Hz to frequencies
	1Hz to 10Hz	10Hz to 50Hz	50Hz to 100Hz	
Buildings used for commercial purposes, industrial buildings and buildings of a similar design	20	20 to 40	40 to 50	40
Dwellings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20	15
Structures that, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 and are of great intrinsic value	3	3 to 8	8 to 10	8

Prior to the commencement of construction of each part of the project that may impact on surrounding properties the following shall occur:

- identify properties at risk from impact / damage based on the criteria in Table 3 above;
- for the properties identified at risk from damage, a risk assessment will be undertaken by appropriately qualified and experienced geotechnical and construction engineering experts. Inspections of those properties will be undertaken prior to construction in accordance with *AS 4349.1 'Inspection of Buildings'*;
- the owners of all properties on which inspections are to be conducted will be contacted at least two weeks before the inspection, or as otherwise agreed by the affected property owners. The scope and methodology for the inspection along with the process for making a property damage claim will be advised;

- a copy of the property inspection report will be provided to the owner of each property inspected at least one week prior to construction commencing that could affect the property; and
- a register will be maintained of all properties inspected, indicating whether the owner accepted or refused the property inspection offer.

Any property damage caused directly or indirectly as a result of construction works will be rectified at no cost to the property owner. Alternatively, property owners will be offered compensation for any damage. The major sources of vibration caused by the project will include the use of excavators with rock breakers (or grinding heads attached), bulldozers, vibratory rollers and rock anchoring.

Typical ground vibration from bulldozers range from 1 mm/s to 2 mm/s at a distance of approximately 5m. At distances of 20m or greater, vibration levels are generally below 0.2 mm/s. Table 4 details the typical ground vibration from a range of plant and equipment.

Table 4 - Typical Vibration Levels

Operation	Frequency of vibration (Hz)	Peak Vibration Level (mm/s) at Given Distance					
		5m	10m	20m	30m	40m	50m
Light rock hammer	30-60	0.2	0.06	0.02	0.01	0.01	0.01
Heavy rock hammer	30-60	5	1.5	0.5	0.2	0.15	0.1
Vibratory Roller	~30 Hz	7	3	1.05	0.55	0.35	0.3
Rock saw	45-90	0.75	0.5	0.3	0.2	0.16	0.14
Bored piling	30-60	0.4	0.2	0.1	0.07	0.05	0.04
Rock drill (estimate)	18-60	1.1	0.5	0.2	0.1	0.05	0.04

Ground vibration caused by vibratory rollers can be up to 1.05mm/s at 20m. Table 5 shows the safe working distances for the use of vibratory rollers close to buildings.

Table 5 - Safe Working Distances from Vibratory Rollers

Roller Class	Weight Range (tonnes)	Centrifugal Force (kN)	Distance from Building (m)	
			A	B
I – Very Light	Less than 1.25	10-20	3	No effect
II – Light	1 to 2	20-50	5	No effect
III – Medium	2 to 4	50-100	6	12
IV – Medium Heavy	4 to 6	100-200	12	24
V – Heavy	7 to 11	200-300	25	50
VI – Very Heavy	12 and over	Over 300	25	50

Note: Source of data: ARRB Special Report No.11, “Ground Vibrations: Damaging Effects to Buildings”.

A: Values suggested to prevent damage to buildings and structures

B: Values suggested to minimise strongly adverse comment from residents

Based on this table, roller class “I – Very Light” (if required) or lighter should be utilised when working within 5m from the neighbouring buildings or structures. Generally, vibration caused by the project is predicted to be less than structural damage criteria.

Where vibration causing works are being undertaken in close proximity to the neighbouring buildings or structures, careful selection of plant will be necessary as outlined above from rock hammers and vibratory rollers.

Plant and machinery selection will be undertaken by the relevant builders/engineers in consultation with Acoustic Noise & Vibration Solutions during construction planning and during the development of Construction Method Statements. Further review of equipment selection will occur if Acoustic Noise & Vibration Solutions predict significant exceedances of intermittent vibration dose value criteria and/or structural damage limits.

Dilapidation surveys will be considered, in consultation with the landowner, for properties where vibration causing activities is within the limits for 'strongly adverse comment'. Generally, this will be for all properties within 50m of vibration causing works. Dilapidation surveys will be undertaken prior to the commencement of the specific works in the area. Impacts of vibration levels can result in a serious nuisance and loss of amenity for site and surrounding occupants including surrounding residents, site workers, the sensitive fauna population etc.

Occupational health risks to site workforce including:

- 1) Noise induced hearing loss, tinnitus, etc;
- 2) Communication problems including safety instructions;
- 3) Stress.

Vibration may also cause damage to the site and surrounding buildings and infrastructure.

## **5.0 PROJECT SPECIFIC NOISE CRITERIA**

The following sections outline the relevant construction noise, vibration & dust emission criteria and conditions applicable to the works.

### **5.1 DECCW Construction Noise Criteria**

In this section, the relevant construction noise emission criteria and conditions applicable to the works are outlined, based on the NSW Department of Environment, Climate Change's and Water's (DECCW) Interim Construction Noise Guideline (ICNG). The ICNG is the appropriate guideline for use in construction noise assessments and is to be used when establishing specific construction noise management levels for a particular project.

The NSW DECCW's ICNG is developed to manage noise from construction works. The ICNG advises that a qualitative methodology for assessment of construction noise emission may be undertaken for short-term works (less than 3 weeks). However, for larger construction projects, a quantitative assessment of construction noise should be undertaken.

Section 4 of the ICNG classifies noise criteria into the following categories:

- Airborne noise;
- Ground-borne noise;
- Sleep disturbance at residences;
- Blasting and vibration; and
- Predicting noise levels – quantitative assessment.

The ICNG also goes on to state 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*”.

The CNG provides management levels (criteria) 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.

Acoustic Noise & Vibration Solutions P/L has determined the daytime ambient background noise environment at the boundary of the nearest residential receivers at No.7-19 Davey Street, Lidcombe (Figure 3 – Nearest Receiver)

### 5.1.1 Airborne Noise

Criteria for residential receivers are set using the information in the table below.

Table 6 - Measured Ambient Noise Environment

Time of day	Management Level $L_{Aeq, (15min)}$	How to apply
<b>Recommended standard hours:</b>  <u>For all Building Works:</u> Monday to Friday 7:00am to 6:00pm Saturday 8:00am to 4:00pm (No demolition)  No work on Sundays or public holidays.	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. -Where the predicted or measured $L_{Aeq, (15 min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.  The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. -Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that

		<p>the very noisy activities can occur, taking into account:</p> <ul style="list-style-type: none"> <li>- Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences)</li> <li>- If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.</li> </ul>
<b>Outside recommended standard hours</b>	Noise affected RBL + 5 dB	<ul style="list-style-type: none"> <li>- A strong justification would typically be required for works outside the recommended standard hours.</li> <li>- The proponent should apply all feasible and reasonable work practices to meet the noise affected level.</li> <li>- Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.</li> </ul> <p>For guidance on negotiating agreements see section 7.2.2 (ICNG)</p>

## **6.0 PROCEDURES AND INSTRUMENTATION**

Acoustic Noise & Vibration Solutions P/L sound pressure measurements and monitoring were conducted in general accordance with the Australian Standard, *"Acoustics - Description and Measurement of Environmental Noise. Part 1: General Procedures"* and were carried out using precision sound level meters conforming to the requirements of AS1259 *"Sound Level Meters"*.

### **6.1 Noise Survey Instrumentation**

The existing noise readings presented here are carried with Svantek 957 Noise and vibration level meter which has the following features:

- Type 1 sound level measurements meeting IEC 61672:2002
- General vibration measurements (acceleration, velocity and displacement) and HVM meeting ISO 8041:2005 standard
- Three parallel independent profiles
- 1/1 and 1/3 octave real time analysis
- Acoustic dose meter function
- FFT real time analysis (1920 lines in up to 22.4 kHz band)
- Reverberation Time measurements (RT 60)
- Advanced Data Logger including spectra logging
- USB Memory Stick providing almost unlimited logging capacity

- Time domain signal recording
- Advanced trigger and alarm functions
- USB 1.1 Host & Client interfaces (real time PC “front end” application supported)
- RS 232 and IrDA interfaces
- Modbus protocol

The readings referred to in this report were carried out on the 19<sup>th</sup> September, 2017 by our office at a time where we expect the background noise level to be at their lowest. Readings were carried out at the western boundary of the site adjacent to the nearest receiver at No.7-19 Davey Street, Lidcombe (Figure 3), to represent a conservative sample of the acoustic environment at the boundaries of the potential residential receivers.

Table 7 provides a summary of the noise levels for the daytime, evening and night time periods as defined in the NSW Department of Environment Climate Change & Water (DECCW) Construction Noise Guideline (CNG).

Table 7- Measured Ambient Noise Environment

Location	Period	Measured Noise Levels [dB(A)]	
		LA <sub>eq</sub>	LA <sub>90</sub>
Nearest Residential Receivers – No.7-19 Davey Street, Lidcombe	Day Time	58	53
	Evening and Night Time	N/A	N/A

**Note:** 1) Measured noise levels are ambient, and do not include any subject works or associated activities.

2) Works at the site are not expected to take place outside the hours of:

**All Building Works:**

- Monday to Friday 7:00am to 6:00pm.
- Saturday 8:00am to 4:00pm (no demolition to be carried out on Saturday)
- Sunday & Public Holidays: No Work Permitted

Based on the measured background noise environment, Table 8 presents the construction noise emission management levels/criteria, as detailed in the DECCW's ICNG, for the nearest residential receivers.

**Table 8 - Site Specific Construction Noise Criteria at Residential Receiver**

<b>Receiver</b>	<b>Time of Day</b>	<b>DECCW Management Level <sup>(1)</sup></b> <b>(L<sub>Aeq</sub> (15 min))</b>	<b>Site Specific Construction Noise Emission Criteria</b> <b>(L<sub>Aeq</sub>(15 min))</b>
Boundary of Nearest Residential Receiver – No.7-19 Davey Street, Lidcombe	<b>Recommended Standard Hours <sup>(2)</sup>:</b> <u>For all Building Works:</u> Monday to Friday 7:00am to 6:00pm Saturday 8:00am to 4:00pm (No demolition)  No work on Sundays or public holidays.	RBL + 10 dB	63 dB(A)
	<b>Outside Recommended Standard Hours</b>	RBL + 5dB	58 dB(A)

Note:

<sup>(1)</sup> Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence

<sup>(2)</sup> Recommended standard hours are as stated in DECCW's Interim CNG

## **7.0 METHODOLOGY FOR EMISSION PREDICTION AND ASSESSMENT**

Acoustic Noise & Vibration Solutions understands that the following items of noise emitting equipment and machinery are likely to be used during the demolition, excavation and construction works on site:

### ***Demolition (Around 2 weeks duration)***

- Hammers;
- Saws;
- Grinders;
- Other hand-held tools;
- Excavator; and
- Trucks (for removal of materials).

### ***Piers & Basement Excavation (Around 2 weeks duration)***

- Excavator; and
- Trucks (for removal of materials).

### ***Construction (Around 52 weeks duration)***

- Concrete Trucks;
- Trades (Brick Layers, Concreters, Renderers, Roofers, Carpenters, Plumbers etc.);
- Concrete Pumps; and
- Trucks (for removal of materials).

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

Acoustic Noise & Vibration Solutions has conducted operator-attended noise monitoring of similar equipment/activities at many 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 our noise prediction calculations and modelling, the noise emission contribution from the above items of equipment has been incorporated into the prediction calculations and modelling along with various loss factors, including:

- Losses due to distance and ground topography;
- Airborne noise losses;
- Losses due to direction;
- Weather conditions; and
- Acoustic shielding.

## **8.0 NOISE EMISSION PREDICTION AND ASSESSMENT**

Acoustic Noise & Vibration Solutions P/L advises that the project is likely to be undertaken in three main stages:

- Demolition;
- Excavation; and
- Construction.

Acoustic Noise & Vibration Solutions Australia P/L understands demolition works will be undertaken over a 2 weeks period. It is likely that earthworks and excavation works would be undertaken over a period of 2 weeks. Construction works would then be undertaken and may last for a period between 40 to 52 weeks.

The demolition, excavation and construction stages typically produce the highest levels of noise emission during a project such as this.

### **8.1 Noise Emission Prediction Calculations**

Acoustic Noise & Vibration Solutions P/L has performed prediction calculations and determined maximum LAeq noise emission levels at adjacent receiver locations, resulting from proposed demolition, excavation and construction activities, including use of the tools and equipment listed in Section 4.

For the purpose of noise assessment, the likely maximum “*at source*” noise levels (sound pressure levels at 1 metre) have been used as detailed below.

#### ***Demolition (Around 2 weeks duration)***

- Hammers (similar to criteria for impact wrenches) — 85 dB (A);
- Saws—80 dB (A);
- Grinders — 80 dB (A);
- Other hand-held and electric tools — 80 dB (A);
- Excavator (5 tonne) — 83 dB (A); and
- Trucks (for removal of materials) — 85 dB (A).

#### ***Piers & Basement Excavation (Around 2 weeks duration)***

- Excavator (5 tonne) — 83 dB (A); and
- Trucks (for removal of materials) — 85 dB (A).

#### ***Construction (Around 52 weeks duration)***

- Concrete Mixers — 90 dB (A);
- Concrete Pumps — 100 dB (A);
- Bricklayers, Roofers, Carpenters 55 -65 dB (A); and
- Trucks (for removal of materials) — 85 dB (A).

All plant and machinery noise emissions are to comply with the criteria set out in the table below:

Table 9 - Maximum Demolition, Excavation, and Construction Noise Emission at Boundaries

Location of Residential Receiver Boundary	Time of the Day	Maximum Predicted LAeq Level dB(A) from Building Works	Site specific construction noise emission criteria (LAeq(15 min))- Table 8	Criteria Exceeded by
No.7-19 Davey Street, Lidcombe	<p><u>For all Building Works:</u> Monday to Friday 7:00am to 6:00pm Saturday 8:00am to 4:00pm (No demolition)  No work on Sundays or public holidays.</p>	63	63	0

**Note** should be made that the predicted noise levels above, are the maximum predicted LAeq noise levels from an activity at the nearest boundaries of the listed properties, resulting from proposed demolition, excavation and building works at the centre of the subject site. Typically, received LAeq noise emission levels would be expected to be lower than these during the majority of the demolition, excavation and construction works. Significantly lower noise levels than those presented would also be expected within (inside) the nearest potential residential receivers residences.

Due to the fact that highest noise emitting items are unlikely to be used for a long duration then it is unlikely to lead to complaints.

## 8.2 Noise Assessment

Noise emission resulting from demolition, excavation and construction has been considered and is likely to cause higher noise emission levels than during the majority of the construction phase of the project, when much of the noise emission can be significantly contained within the new building envelope.

The predicted noise emission levels presented in Table 9 above indicate LAeq noise emission associated with the proposed demolition, excavation and building works will exceed the relevant construction noise criterion at certain times.

Acoustic Noise & Vibration Solutions P/L advises that lower noise levels, which are likely to be acceptable, would be received inside these nearby/adjacent dwellings, when the external windows are closed.

To ensure that construction noise emission levels from the proposed works are kept to a minimum, Acoustic Noise & Vibration Solutions P/L provides recommendations for feasible and reasonable noise mitigation and management, which should be incorporated into the noise management plan for the proposed demolition, excavation and construction.

## **9.0 DISCUSSION AND RECOMMENDATIONS**

Further to the predicted noise emission levels presented in Section 9, Acoustic Noise & Vibration Solutions P/L advises that measures are required to minimise and manage noise emission and impact from the proposed demolition, excavation and construction works at the site.

We understand that proposed works at No.9-15 Raphael Street, Lidcombe will only be carried out during daytime hours only:

### **All Building Works:**

- **Monday to Friday 7:00am to 6:00pm.**
- **Saturday 8:00am to 4:00pm (no demolition to be carried out on Saturday)**
- **Sunday & Public Holidays: No Work Permitted**

**Note\*** the above hours will be confirmed once the development has been approved and DA conditions have been provided by Cumberland Council.

We recommend the following measures be implemented to minimise and manage noise emission from the subject demolition, excavation and construction:

### **9.1 Noise induction of all site staff**

We recommend that all site staff be inducted, ensuring each person is aware of the noise management and mitigation procedures applicable to the site and site works.

All site managers should be made aware of noise and vibration limits, applicable control measures and methods. They should ensure that all agreed noise and vibration measures are carried out by employees and sub-contractors.

When a builder/contractor has made noise reduction commitments all staff needs to be made aware of them. Workers and sub-contractors need to be trained to follow noise management practices (a toolbox meeting may be an effective way to do this).

Embedding requirements to manage noise in tenders, employment contracts or sub-contractor agreements can be an effective tool for pro-active noise management. This ensures that responsibility for noise rests with all people involved.

## **9.2 Implementation of an appropriate community liaison procedure**

Acoustic Noise & Vibration Solutions P/L recommends implementation of an appropriate community liaison procedure, including a noise management and compliant procedure, and continual liaison with the nearby potentially affected receivers.

### **Community Liaison**

Community consultation is an essential part of managing noise from a construction project. Builders/contractors should aim to:

- establish good working relationships with community stakeholders;
- give and receive feedback on construction activity and performance during a project; and
- discuss the community's concerns and be proactive in complaint resolution.

As part of a community consultation strategy, neighbouring premises should be given written notification of the project. The information should outline the type and duration of works, likely noise impacts, and provide contact details for feedback and/or complaints. The minimum notification period is 48 hours before noisy work is scheduled.

Methods of notification for noisy works and ongoing communication about a project's progress can include:

- letterbox drops;
- meetings;
- individual contact;
- a website (for larger projects); or
- a regular newsletter with site news, project planning etc.

In some areas, provision of multi-lingual notification may be required.

### **Complaint Resolution**

A person may have experienced noise disturbance for some time before they approach the builder/contractor or the Council, and may have become tense and angry. This is particularly important to acknowledge when the complaint refers to disturbed sleep and/or noise that is tonal (beeping, metal-on-metal), impulsive (hammering, pile driving) or low frequency (truck engine, heavy machinery).

The builder/contractor should respond respectfully to a complaint and implement all feasible and reasonable measures to address the issue. High impact projects should have a readily accessible contact point such as a 24-hour toll-free information and complaints line. The builder/contractor should call back as soon as possible, and then maintain communication about how the issue is to be resolved.

The complaint management process should be well documented, with details about the following:

- the noise/s, vibration or dust issue in question;
- the time of the complaint and the person making it;
- the person dealing with the complaint and how they plan to do so;
- how resolution of the complaint is to be communicated to the person who made the complaint, the community and the Council;
- who should be contacted if the complaint cannot be resolved; and
- the time taken for responses.

## **9.3 Implementation of monitoring and reporting programmes**

Noise & vibration monitoring and reporting that is to be undertaken during the main stages of work and is to be the course of action to be taken following receipt of a complaint concerning noise and vibration from the proposed works should they arise.

In response to requests by the builder or owner, Acoustic Noise & Vibration Solutions Australia P/L will attend site and carry out operator-attended noise and vibration measurements and monitoring of site equipment and operations.

### **9.3.1 Noise monitoring and reporting methodology**

Upon request of the builder or owner, Acoustic Noise & Vibration Solutions P/L would carry out additional noise monitoring at the boundary of the nearest potential receiver or at any other location where there is a complaint, in a similar method as discussed in Section 7.0 of this report.

### **9.3.2 Vibration monitoring and reporting methodology**

All excavation proposed on site for footings/piers and basement, are expected to be carried out in clay/shale. Therefore vibration monitoring may be carried out where predicted vibration levels approach or exceed structural damage criteria, in response to complaints or for the purpose of refining construction methods or techniques to minimise vibrations. Monitoring will be carried out in accordance with:

- for structural damage vibration – *German Standard DIN 4150 and BS 7385: Part 2 – 1993*;
- for human exposure to vibration – the evaluation criteria presented in the *Environmental Noise Management Assessing Vibration: A Technical Guideline* (DECC 2006).

### **9.4 Use of quietest available equipment and lowest vibration generating equipment for works (where feasible and reasonable)**

As indicated within Section 7, Acoustic Noise & Vibration Solutions P/L will 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.

All builders/contractors should endeavour to use low-noise, well-maintained equipment where feasible and reasonable. Deciding to use low-noise equipment in the early stages of a project can be of considerable benefit in reducing noise, especially for medium and high impact projects.

#### **Selecting Equipment**

Consideration of equipment noise levels should be part of each stage of project planning and contract specification. The builder/contractor should look at different types of equipment that do the same job and compare the noise level data. Noise emission labels are often provided on equipment and can be used to assist in this process. Investigate high-quality mufflers, enclosures, low- noise tool bits/blades and inquire from suppliers about lower-noise equipment.

#### **Alternative Equipment**

Compressors for pneumatic equipment can often cause problem noise levels and should be silenced, enclosed and located appropriately. Hydraulic or electrical equipment may be a viable alternative. Electrical equipment may also be used in place of diesel or petrol engines, but care must be taken with the location of the generator and supply line.

Impacts from noisy excavation and demolition works can be reduced by alternative work methods. Alternatives to rock-breaking include hydraulic splitters for rock and concrete, hydraulic jaw crushers, rock and concrete sawing. Smaller rock breakers/excavators are generally preferable to larger machines, but increased time on the job should be considered.

### **9.5 Use Acoustic Barriers**

Barriers or screens can be an effective means of reducing noise. Barriers can be located either at the source or receiver. The placement of barriers at the source is generally only effective for static plant (tower cranes). Placing barriers at the source cannot effectively attenuate equipment which is on the move or working in rough or undulating terrain.

Barriers can also be placed between the source and the receiver. The degree of noise reduction provided by barriers is dependent on the amount by which line of sight can be blocked by the barrier. If the receiver is totally shielded from the noise source reductions of up to 15 dB (A) can be effected. Where only partial obstruction of line of sight occurs, noise reductions of 5 to 8 dB (A) may be achieved. Where the barrier does not obstruct line of sight, generally no noise reduction will occur.

As barriers are used to provide shielding and do not act as an enclosure, the material they are constructed from should have a noise reduction performance which is approximately 10 dB(A) greater than the maximum reduction provided by the barrier. In this case the use of a material such as 10 or 15mm plywood would be acceptable for the barriers.

### **9.6 Silencing Devices**

Where construction process or appliances are noisy, the use of silencing devices may be possible. These may take the form of engine shrouding, or special industrial silencers fitted to exhausts.

### **9.7 Material Handling**

The installation of rubber matting over material handling areas can reduce the sound of impacts due to material being dropped by up to 20dB(A).

### **9.8 Treatment of Specific Equipment**

In certain cases it may be possible to specially treat a piece of equipment to reduce the sound levels emitted. These may take the form of engine shrouding, or special industrial silencers fitted to exhausts.

### **9.9 Establishment of Site Practices**

This involves the formulation of work practices to reduce noise generation. This includes locating fixed plant items as far as possible from residents as well as rotating plant and equipment to provide respite to receivers.

Construction vehicles accessing the site should not queue in residential streets and should only use the designated construction vehicle routes. Loading of these vehicles should occur as far as possible from any sensitive receiver.

#### **9.10 Strategic Positioning of Processes On-Site**

Where practicable, particular processes of activities can be located in particular positions on site to minimise noise to surrounding sensitive receivers.

For example, stationary plant may be positioned where direct line of sight shielding can be achieved using natural barriers, or may maximise the distance to the nearest sensitive receiver. This may also be applicable to the demolition and recycling of building structures where the façade closest to residential receivers is left until last to provide barrier screening for the demolition of the other parts of the building.

#### **9.11 Establishment of Direct Communication with Affected Parties**

In order for any construction noise management programme to work effectively, continual communication is required between all parties that may be potentially impacted upon, the builder and the regulatory authority. This establishes a dynamic response process that allows for the adjustment of control methods and criteria for the benefit of all parties.

The objectives of the consultation process are to:

- Inform and educate the groups about the project and the noise controls being implemented.
- Increase understanding of all acoustic issues related to the project and the options available.
- Identify group concerns generated by the project, so that they can be addressed.

The owners of the site are to contact the owners/residents of the neighbouring potentially affected sites, including but not limited to No.7-19 Davey Street, Lidcombe.

A letter shall be dropped off in the mailbox of the affected parties prior to the demolition and construction of the proposed development and it should include the following information:

- Briefly inform them of the works and the estimated duration of the works.
- Explain to the affected parties the projects acoustic issues and how it may affect them and inform them of the measures implemented to decrease the affects.
- Ask the potentially affected receivers to contact the builder, attach his/her details, or to mail a letter to a designated mail box should they have any queries or issues.

## 10.0 CONCLUSION

Acoustic Noise & Vibration Solutions P/L has undertaken a quantitative assessment of the noise impact at the nearest potentially affected receivers resulting from associated activities, for the proposed development at 9-15 Raphael Street, Lidcombe in accordance with the requirements of Cumberland Council and the NSW DECCW's Interim Construction Noise Guideline.

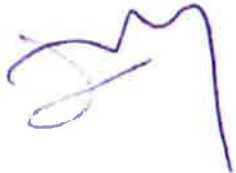
The calculated noise emission associated with the proposed demolition of existing residence, excavation and construction of proposed development is unlikely to generate "offensive noise", as described in the POEC Act 1997, at the surrounding residential receiver locations.

Acoustic Noise & Vibration Solutions P/L advises that implementation of the recommendations contained in Section 9 of this report will assist with the mitigation and management of noise emission from demolition, excavation and construction of the subject development site.

This report addresses the requirements of Cumberland Council and Section 80A of the Environmental Planning & Assessment Act 1979.

We hope this report meets your requirements. Should you require further explanations, please do not hesitate to contact us.

Yours sincerely,



M. Zaioor  
M.S. Eng'g Sci. (UNSW).  
M.I.E.(Aust), CPEng.  
Australian Acoustical Society (Member).

## **11.0 APPENDIX**

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Figure 1 - Site Location

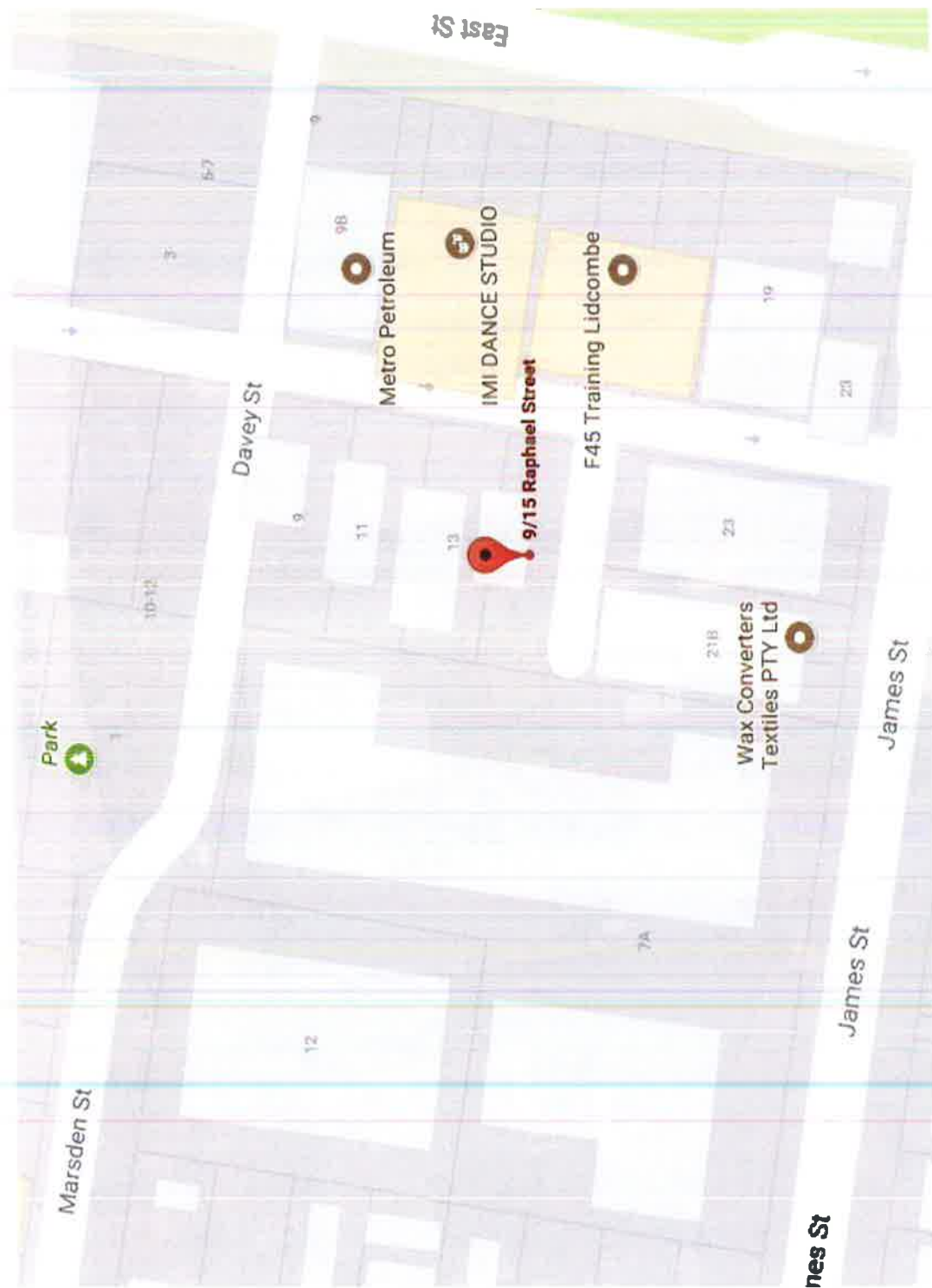


Figure 2 -Surrounding Environment



Figure 3 - Nearest Residential Receivers

TABLE 1

**CATEGORIES OF WORKING HOURS, AND NOISE CRITERIA**

DAY	TIME ZONE	CATEGORY	NOISE CRITERIA (which must not be exceeded)
Monday to Friday	00.00 - 07.00	4	Background + 0 dBA
	07.00 - 08.00	1	Background + 5 dBA
	08.00 - 19.00	1	Background + 5 dBA + 5 dBA to be determined on a site basis
	19.00 - 23.00	2	Background + 3 dBA
Saturday	23.00 - 24.00	4	Background + 0 dBA
	00.00 - 07.00	4	Background + 0 dBA
	07.00 - 08.00	1	Background + 5 dBA
	08.00 - 17.00	1	Background + 5 dBA + 5 dBA to be determined on a site basis
Sundays and Public Holidays	17.00 - 23.00	2	Background + 3 dBA
	23.00 - 24.00	4	Background + 0 dBA
	00.00 - 07.00	4	Background + 0 dBA
	07.00 - 17.00	3	Background + 3 dBA
	17.00 - 24.00	4	Background + 0 dBA

NOTE: 00.00 or 24.00 means 12.00 midnight.

1. All noise levels to be  $L_{A,eq,15min}$  (15 minute) measured at the nearest Nominated Occupancy.
2. The permissible noise level is to be complied with during each fifteen (15) minute period during the relevant Category of Hours.
3. The guidelines for control of construction noise as outlined in AS2436 shall be applied, where appropriate.
4. Background is "Background Noise Level" as defined in para 18.j (page 5).

Figure 4 - Categories of Working Hours and Noise Criteria

SCHEDULE 1

LISTED APPLIANCES AND ALLOWABLE NOISE LEVELS

GROUP A (see Note 2)	GROUP B 90dBA	GROUP C 85dBA	GROUP D 80dBA	GROUP E 75dBA	GROUP F 70dBA
Pile drivers Hydraulic hammers Machine mounted rock breakers Sand blasters Steam cleaners Mole borers	Earthmoving equipment of engine capacity above 200kW NEP Warning sirens* Reversing alarms+ Trucks	Impulsive tools - air, electric or hydraulic Earthmoving equipment of engine capacity between 100kW and 200kW NEP Explosive power tools Impact wrenches Refuse chutes* Scabblers Chain saws Rock drills	Concrete agitators Concrete pumps Concrete saws Cranes (fixed) Cranes (mobile) Earthmoving equipment up to and including engine capacities of 100kW NEP Concrete vibrators Portable hand tools Vibratory compactors	Air compressors above 170 L/s capacity Construction dumpers over 1m <sup>3</sup> capacity Public address system* Internal combustion or electrically driven equipment (unless grouped elsewhere) up to 14kW NEP	Air compressors up to 170 L/s capacity Fluid pumps Internal combustion or electrically driven equipment (unless grouped elsewhere) up to 14kW NEP

- \* To be measured at the site boundary closest to the affected area.  
+ Reversing alarms must be controlled so that noise levels produced do not exceed the background sound level by more than 10dBA.

Notes

- Where any appliance is unable to comply with the allowable noise level, para 43 applies.
- A Certificate of Acoustic Performance (see Form D) shall be provided for each appliance listed in Group A.
- All noise levels are to be  $L_A$  or  $L_{Amax}$  (1 minute) measured at 7 m from the point nearest to an Appliance.
- "NEP" means the Net Engine Power and shall be determined in accordance with Australian Design Rule No.28/00 External Noise of Motor Vehicles, Other Than L-Group Vehicles dated March 1989;

Figure 5 - Listed Appliances and Allowable Noise Levels

