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UNE Wright Block Development

Construction Noise and Vibration Management Plan

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TABLE OF CONTENTS

1 EXECUTIVE SUMMARY

A construction noise and vibration management plan has been carried out for the proposed demolition and construction activities to assess whether these activities would impact sensitive receivers around the University of New England (UNE Wright Block building site based on the requirements of the NSW EPA Document *'Interim Construction Noise Guideline ("ICNG")* and Australian Standard AS2436). The results of the assessment have been used to develop a construction noise and vibration management plan that will be used to manage impacts from these activities.

The Management Plan outlines the development of controls and safeguards that would be applied to all activities on the site by the construction contractor. The objective of these controls is to ensure that all work is carried out in a controlled and predictable manner that will minimise noise emissions and protect the amenity of the sensitive receivers surrounding the site.

Further reviews would be undertaken through the construction period, as required, in response to revised methods and equipment, as well as in response to the monitoring and evaluation of actual impacts. This management plan outlines the procedures that would be adopted by the contractor during the detailed construction planning and execution phases.

3 INTRODUCTION

The principal objective is to undertake detailed evaluation of all work to be performed during the demolition and construction period of the University of New England (UNE Wright Block building site) and to forecast the potential impact. The noise forecasts will be used to formulate and streamline effective regulation and mitigation measures as required by the ACT EPA and Australian Standard AS2436.

The project includes the construction of the UNE Wright Block building site.

The principal issues that will be addressed in this document are:

1. Specific activities that will be conducted and the associated noise sources,
2. Identification of all potentially affected noise sensitive receivers,
3. The development, hours of work and excavation period,
4. The construction noise objective specified in the conditions of consent,
5. Appropriate noise objectives for each identified potentially affected noise sensitive receiver,
6. Noise monitoring, reporting and response procedures,
7. Assessment of potential noise from the proposed excavation activities,
8. Contingency plans to be implemented in the event of non-compliances and/or noise complaints.
9. Compliance with Councils' Code for the Control and Regulation of Noise on Building Sites,
10. Compliance with the NSW EPA Document *'Interim Construction Noise Guideline ("ICNG")*
11. Compliance with Australian Standard 2436-2010 "Guide to Noise Control on Construction, Maintenance and Demolition Sites"
12. The noise mitigation measures available

4 PROJECT DESCRIPTION

Proposed works include the demolition of the existing building and construction of the UNE Wright Block buildings the site located within the existing University of New England site.

Primary schedules for the work on site are:

- Site establishment and demolition of existing buildings.
- Construction of the new multistorey the UNE Wright Block buildings and surrounding roadways.

See figures below for the site location and proposed works.

Site investigation indicates that the nearest potentially affected receivers are existing student accommodation rooms and related offices adjacent to the site (see aerial photo below):

- Receiver 1 (R1)- Existing Block A Building with accommodation rooms and office with openable double glazing (approx. 6mm/12mm airgap/6mm) facing project site.

- Receiver 2 (R2) - Existing Block B Building with accommodation rooms with openable double glazing (approx. 6mm/12mm airgap/6mm) facing project site.

- Receiver 3 (R3) - Existing Block C Building with accommodation rooms with openable double glazing (approx. 6mm/12mm airgap/6mm) facing project site

Figure 1 below details the location of the proposed development including potentially affected receivers. Figure 2 below details the construction site plan.

Figure 1 – Site location and Closest Affected Receivers

Figure 2 – Site Plan - Construction

5 HOURS OF WORK

The NSW EPA Interim Guideline Constructions recommended standard hours of work for normal construction works are Monday to Friday 7am to 6pm, Saturday 8am to 1pm with no work on Sundays or Public Holidays

6 EXISTING BACKGROUND NOISE LEVELS AROUND PROJECT SITE

Attended background noise measurements have been conducted on site to measure existing noise levels in the most affected noise sensitive internal spaces adjacent to the proposed construction site. The background noise level in internal spaces for the daytime period has been determined based on noise levels without construction activities.

Measurements were conducted using an Norsonic Type 140 Sound Level meter. The equipment was calibrated at the beginning and end of the measurements using a Norsonic 1252 calibrator; no significant drift was detected. Measurements were taken on A-weighted fast response mode. Measurements were taken on site between 11am and 4pm on Wednesday 23rd January 2019.

Noise measurements were carried out at locations below which are regarded as the nearest sensitive receivers. These locations were chosen as they are deemed to be the internal spaces to be most affected by construction noise and vibration activities. We note that the existing background noise measurements have been performed with all external windows closed.

Table 1 - Internal Background Noise Measurements – R1 Building A

Room Number	Location	Noise Level - L_{90}
129	Accommodation	30 dB(A) L_{90}
126	Accommodation	29 dB(A) L_{90}
110	Accommodation	33 dB(A) L_{90}
105	Accommodation	29 dB(A) L_{90}
Office	Private office	41 dB(A) L_{90}
103	Accommodation	41 dB(A) L_{90}
111	Accommodation	36 dB(A) L_{90}

Table 2 - Internal Background Noise Measurements – R2 Building B

Room Number	Location	Noise Level - L_{90}
119	Accommodation	26 dB(A) L_{90}
118	Accommodation	27 dB(A) L_{90}
127	Accommodation	28 dB(A) L_{90}

Table 3– Internal Background Noise Measurements – R3 Building C

Room Number	Location	Noise Level - L_{90}
111	Accommodation	42 dB(A) L_{90}
127	Accommodation	26 dB(A) L_{90}
110	Accommodation	33 dB(A) L_{90}
124	Accommodation	25 dB(A) L_{90}

7 HIERARCHY OF SENSITIVITY

Based on the functions carried out in the buildings adjacent to the site, a table of occupancies and their sensitivity to noise and vibration has been developed.

Table 4 – Hierarchy of Sensitivity to Noise and Vibration

Occupancy	Sensitivity To Noise	Hours of Use	Comment
General Office and Lab areas	Sensitive	7am to 6:00 pm Monday to Friday	Rooms are considered normally sensitive as for typical office functions.
Accommodation	Sensitive when in use	7am to 6:00 pm Monday to Friday and 8.00am to 1pm Saturday– used intermittently.	Room not noise sensitive when not in use. Typically these rooms are sleeping quarters and will generally only be used during night time hours.

8 CONSTRUCTION NOISE AND VIBRATION OBJECTIVES

The NSW EPA *Interim Construction Noise Guideline (ICNG) 2009 will be used to assess noise and vibration to the receivers*. Please see the criteria below.

8.1 NSW EPA *INTERIM CONSTRUCTION NOISE GUIDELINE (ICNG) 2009*

EPA guidelines adopt differing strategies for noise control depending on the predicted noise level at the nearest residences:

- *"Noise affected" level*. Where construction noise is predicted to exceed the "noise affected" level at a nearby residence, the proponent should take reasonable/feasible work practices to ensure compliance with the "noise affected level". For residential properties, the "noise affected" level occurs when construction noise exceeds ambient levels by more than:
    - 10dB(A)$L_{eq(15min)}$ for work during standard construction hours (7am-6pm Monday to Friday and 8am to 1pm on Saturdays) and
    - 5dB(A)$L_{eq(15min)}$ for work outside of standard construction hours.
- "*Highly noise affected level".* Where noise emissions are such that nearby properties are "highly noise affected", noise controls such as respite periods should be considered. For residential properties, the "highly noise affected" level occurs when construction noise exceeds 75dB(A)$L_{eq(15min)}$ at nearby residences.

A summary of noise emission goals for standard hours of construction are presented below:

Table 5 – Construction Noise Emission Management Level (Residents)

Receiver Type	**"Noise Affected" Level - dB(A)$L_{eq(15min)}$**	**"Highly Noise Affected" Level - dB(A)$L_{eq(15min)}$**
Closest Receiver (Receiver 1, 2 & 3)	Background + 10dB(A)	75

8.2 AUSTRALIAN STANDARD AS 2436:2010 *"GUIDE TO NOISE CONTROL ON CONSTRUCTION, MAINTENANCE AND DEMOLITION SITES"*

Australian Standard AS 2436 provides guidance on noise and vibration control in respect to construction and demolition sites, the preparation of noise and vibration management plans, work method statements and impact studies.

The Standard states that:

- "Some construction and demolition activities are by their very nature noisy. The authorities responsible for setting noise level criteria for essential works will take note of the constraints imposed by such activities, especially when they are of short duration."

- Construction, demolition and maintenance works pose different problems of noise and vibration control when compared with most other types of industrial activity, since (a) they are mainly carried on in the open; (b) they are often temporary in nature although they may cause considerable disturbance whilst they last; (c) the noise and vibration arise from many different activities and kinds of plant, and their intensity and character may vary greatly during different phases of the work; and (d) the sites cannot be separated by planning controls, from areas that are sensitive to noise and vibration.

The standard provides advice and guidelines for the prediction of impacts and the methods available to manage impacts. It guideline promulgates feasible and reasonable mitigation strategies and controls, and stakeholder liaison, in the effort to reach a realistic compromise between site activities and impacts on neighbouring properties.

8.3 INTERNAL NOISE MANAGEMENT LEVELS

Based on previous experience with similar project sites, the ALC recommended noise management levels to noise sensitive internal spaces adjacent to the proposed construction site shall be below:

- R1 to R3: background noise measurements +10dB(A) dB(A)$L_{eq,\ 15\ min}$. Internal noise goals levels will be based on the windows being closed within the internal spaces.
- We note that the average internal noise level from the internal noise measurements of accommodation rooms will be used as a basis for the accommodation rooms.

Noise management levels are summarised in the tables below:

Table 6– Internal Noise Management Level – R1 Building A

Building/Location	Measured Existing Internal Noise Level - dB(A) L_{90}	Internal Noise Management Level - Background Noise Level +10dBA(A)
Office –	41 dB(A) L_{90}	51
Accommodation (All)	Average measurement -35 dB(A) L_{90}	45

Table 7– Internal Noise Management Level – R2 Building B

Building/Location	Measured Existing Internal Noise Level - dB(A) L_{90}	Internal Noise Management Level - Background Noise Level +10dBA(A)
Accommodation (All)	Average measurement - 32 dB(A) L_{90}	42

Table 8– Internal Noise Management Level – R3 Building C

Building/Location	Measured Existing Internal Noise Level - dB(A) L_{90}	Internal Noise Management Level - Background Noise Level +10dBA(A)
Accommodation (All)	Average measurement - 34 dB(A) L_{90}	44

8.4 VIBRATION CRITERIA

Vibration caused by construction at any residence or structure outside the subject site must be limited to the EPA Assessing Vibration: A Technical Guideline which references the following criteria:

- For structural damage vibration, German Standard DIN 4150-3 *Structural Vibration: Effects of Vibration on Structures; and*

- For human exposure to vibration, British Standard BS 6472 – 'Guide to Evaluate Human Exposure to Vibration Buildings (1Hz to 80Hz.

The criteria and the application of this standard are discussed in separate sections below.

8.4.1 Structure Borne Vibration

German Standard DIN 4150-3 (1999-02) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 (1999-02) are presented in Table 2.

It is noted that the peak velocity is the absolute value of the maximum of any of the three orthogonal component particle velocities as measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

Table 9 – DIN 4150-3 (1999-02) Safe Limits for Building Vibration

Type of Structure		Peak Particle Velocity (mms^{-1})			
		At Foundation at a Frequency of			Plane of Floor of Uppermost Storey
		< 10Hz	10Hz to 50Hz	50Hz to 100Hz	All Frequencies
1	Buildings used in commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

8.4.2 Human Comfort

The British Standard BS 6472 – 'Guide to Evaluate Human Exposure to Vibration Buildings (1Hz to 80Hz' will be used to assess construction vibration for human comfort.

This guideline provides procedures for assessing tactile vibration and regenerated noise within potentially affected buildings. The recommendations of this guideline should be adopted to assess and manage vibration from the site. Where vibration exceeds, or is likely to exceed, the recommended levels then an assessment of reasonable and feasible methods for the management of vibration should be undertaken.

Table 10 – BS 6472 Vibration Criteria

		RMS acceleration (m/s^2)		RMS velocity (mm/s)		Peak velocity (mm/s)	
Place	**Time**	**Preferred**	**Maximum**	**Preferred**	**Maximum**	**Preferred**	**Maximum**
Continuous Vibration							
Residences	Daytime	0.01	0.02	0.2	0.4	0.28	0.56
Offices		0.02	0.04	0.4	0.8	0.56	1.1
Workshops		0.04	0.08	0.8	1.6	1.1	2.2
Impulsive Vibration							
Residences	Daytime	0.3	0.6	6.0	12.0	8.6	17.0
Offices		0.64	1.28	13.0	26.0	18.0	36.0
Workshops		0.64	1.28	13.0	26.0	18.0	36.0

Note 1: Continuous vibration relates to vibration that continues uninterrupted for a defined period (usually throughout the daytime or night-time), e.g. continuous construction or maintenance activity. (DECC, 2006)

Note 2: Impulsive vibration relate to vibration that builds up rapidly to a peak followed by a damped decay and that may or may not involve several cycles of vibration (depending on frequency and damping), with up to three occurrences in an assessment period, e.g. occasional loading and unloading, or dropping of heavy equipment. (DECC, 2006)

9 ASSESSMENT OF POTENTIAL NOISE EMISSIONS

9.1 INTRODUCTION AND INTENT

The purpose of the assessment of noise emissions is to highlight those activities that have the potential to exceed the project noise goals, so that management of those activities can be assessed in accordance with project requirements. **The noise levels presented in the assessment are worst case noise levels without any management that may be possible (eg physical controls, time scheduling, selection of alternative process, etc that are proposed as part of this management plan).**

9.2 NOISE SOURCE LEVELS

The A-weighted sound power levels for typical equipment/processes anticipated to be used during these works are outlined in Table below.

Table 11- Sound Power Levels

CONSTRUCTION ACTIVITY	EQUIPMENT /PROCESS	SOUND POWER LEVEL - dB(A)
Demolition	Truck	108
	Bobcat	105
	30 Ton Excavator	114
	Impact drill	105
	Angle grinders	105
	Electric Saw	102
Excavation	5 Ton Excavator (with hydraulic hammer)	123*
	Bobcat	105
Construction	Angle Grinders	105
	Electric Saw	102
	Drilling	95
	Hammering	110
	Concrete Vibrator	100
	Cement Mixing Truck	105
	Concrete Pumps	105

* - includes 5 dB(A) addition for characteristics of noise source.

** - The noise levels presented in the above table are derived from on-site measurements, Table A1 of Australian Standard 2436-2010 and data held by this office from other similar studies.

9.3 POTENTIALLY AFFECTED RECEIVERS

A survey of potentially affected sensitive receivers has been conducted and the following locations have been identified:

- Receiver 1 - Building A accommodation building and internal receivers to the north, east and partially to the south (approximately 10m);
- Receiver 2- Building B accommodation building and internal receivers to the north (approximately 45m);
- Receiver 3 - Building C accommodation building and internal receivers to the north (approximately 10m);

9.4 PREDICTED NOISE LEVELS

Noise levels have been predicted at various locations representing the range of potentially affected receivers around the site.

The predicted noise levels assume that the activity will be occurring continuously. As plant items will generally be spread around the site, and the plant will not operate continuously for the entire day, the upper limit noise levels indicated in the tables would generally only be reached for limited periods and represent the absolute worst case.

The predictions take into account the nominated sound power levels, corrected for distance losses, air absorption, screening (where applicable) façade loss (where internal levels are calculated.

Noise impacts on nearby development will be dependent on the activity and where on the site the activity is undertaken. Excavation works tend to be the loudest typical activity. Work close to the southern boundaries boundaries will have greatest impacts on surrounding university receivers.

9.5 TO RECEIVER 1 – BUILDING A – ACCOMMODATION AND OFFICE

9.5.1 Predicted Internal Noise Levels to the Accommodation Building

The predicted internal noise level to the building A Receivers has been presented below. Noise within the closest affected internal receivers will be a combination of airborne noise through the façade structure, and structure borne noise, (primarily) due to vibration transmission from ground vibration operations that indirectly vibrates the building.

Table12– Predicted Internal Noise Levels – Building A - Accommodation

Building/Location	Predicted Internal Construction Noise Level dB(A)L_{eq}	Internal Noise Management Level - Background Noise Level +10dBA	Complies
Accommodation	37-57	45	Exceedances when used close to receiver side. See recommendations in section 10 below.
Office	27-47	51	Yes

The predictions indicate that in worst case situations, a number of processes / activities along the southern boundary of the site will exceed the internal noise management level. The main exceedences will occur during the demolition and excavation stages when works are outside and affecting the receivers along the northern façade where windows have full view and equipment is working close to the receiver side.

All other processes generally comply with the internal noise management level at these receivers with some minor exceedences. However, these equipment / processes are intermittent in nature and would occur for limited periods. Builders are to co-ordinate works with the UNE to minimise disruption to the university. Refer to ameliorative measures recommended in section 10.

9.6 TO RECEIVER 2 – BUILDING B – ACCOMMODATION

9.6.1 Predicted Internal Noise Levels to the Accommodation Building

The predicted internal noise level to the building B Receivers has been presented below. Noise within the closest affected internal receivers will be a combination of airborne noise through the façade structure, and structure borne noise, (primarily) due to vibration transmission from ground vibration operations that indirectly vibrates the building.

Table 13– Predicted Internal Noise Levels – Building A - Accommodation

Building/Location	Predicted Internal Construction Noise Level dB(A)L_{eq}	Internal Noise Management Level - Background Noise Level +10dBA	Complies
Accommodation	25-45	42	Marginal Exceedances when used close to southern side of project. See recommendations in section 10 below.

The predictions indicate that in worst case situations, a number of processes / activities along the southern boundary of the site will marginally exceed the internal noise management level. The main exceedences will occur during the demolition and excavation stages when works are outside and affecting the receivers along the northern and eastern façade where windows have partial view and equipment is working close to the receiver side.

All other processes generally comply with the internal noise management level at these receivers with some minor exceedences. However, these equipment / processes are intermittent in nature and would occur for limited periods. Builders are to co-ordinate works with the UNE to minimise disruption to the university. Refer to ameliorative measures recommended in section 10.

9.7 TO RECEIVER 3 – BUILDING C – ACCOMMODATION

9.7.1 Predicted Internal Noise Levels to the Building

The predicted internal noise level to the building C Receivers has been presented below. Noise within the closest affected internal receivers will be a combination of airborne noise through the façade structure, and structure borne noise, (primarily) due to vibration transmission from ground vibration operations that indirectly vibrates the building.

Table14– Predicted Internal Noise Levels – Building A - Accommodation

Building/Location	Predicted Internal Construction Noise Level dB(A)L_{eq}	Internal Noise Management Level - Background Noise Level +10dBA	Complies
Accommodation	37-57	44	Exceedances when used close to receiver side. See recommendations in section 10 below.

The predictions indicate that in worst case situations, a number of processes / activities along the southern boundary of the site will exceed the internal noise management level of the accommodation rooms. The main exceedences will occur during the demolition and excavation stages when works are outside and affecting the receivers along the northern façade where windows have full view and equipment is working close to the receiver side.

All other processes generally comply with the internal noise management level at these receivers with some minor exceedences. However, these equipment / processes are intermittent in nature and would occur for limited periods. Builders are to co-ordinate works with the UNE to minimise disruption to the university. Refer to ameliorative measures recommended in section

10 SPECIFIC NOISE CONTROLS AND METHODOLOGY

10.1.1 Potential Vibration and Structure Borne Noise Impacts

Structural connections should be determined on site and demolition measures employed (such as saw cut if necessary) to limit the degree of structure borne noise being transmitted into the adjoining tenancy.

10.1.2 Acoustic Screens

In relation to the potential for acoustic screens to be employed around the site to reduce the emission of construction noise to surrounding receivers, ALC make the following commentary:

- Given that the majority of accommodation receivers along the southern boundary of the site are double level dwellings, a screen could be employed to reduce construction noise by up to 10-15dB(A) during the excavation and demolition works to the ground level. It should be noted that any levels apart from the ground level of multi-storey accommodation buildings such as along the southern boundary would still have a view over any reasonable acoustic screen.

10.1.3 Excavator Mounted Hammer and Sawing

Hammering with an excavator will typically produce the loudest noise levels emanating from the site and have the highest potential for noise impacts on surrounding receivers. On this basis, it is recommended that the university are consulted on the processes of the demolition phase (particularly any rock breaking). Management processes will include:

- Substituting rock breaking during excavation for alternative measures such as sawing and lifting the slab pieces entailing:
    - Making saw cuts to break up the slab;
    - Using a muncher or pulveriser to break up the slab pieces, where practically feasible.
- All noisy pneumatic hammer work should commence on site only after 8:00am, providing a 1-hour respite period during the morning period, from the 7am approved hours of construction.
- In addition to this, an afternoon respite period should also be enforced on site between the hours of 12pm to 2:00pm
- The university should be notified of the duration and extent of the works proposed during the excavation stage via letterbox drops, with a detailed engagement plan and contact information for all relevant personnel on site.

10.1.4 Excavator Noise - Generally

Excavators are expected to be used for the majority of the time during the demolition and excavation periods. Given the acoustic screen proposed along the southern boundary of the site, an approximate 10-15dB(A) reduction would be expected to the receivers.

Where prolonged excavator use is necessary, excavators could be moved to another part of the site to offer the receiver closest to the excavator some respite. Where practical and feasible, by moving the excavator from working on one part of the site to the opposite side of the site can provide up to a 13dB(A) reduction in noise levels impacting residential receiver locations. Management processes include;

- All noisy pneumatic hammer work should commence on site only after 8:00am, providing a 1-hour respite period during the morning period, from the 7am approved hours of construction.

- In addition to this, an afternoon respite period should also be enforced on site between the hours of 12pm to 2:00pm

10.1.5 Angle Grinders

Angle grinders would only be typically used sporadically. Notwithstanding, where practical, the use of angle grinders should be limited to areas which are screened from surrounding receiver locations.

10.1.6 Vehicle Noise and Concrete Pumps

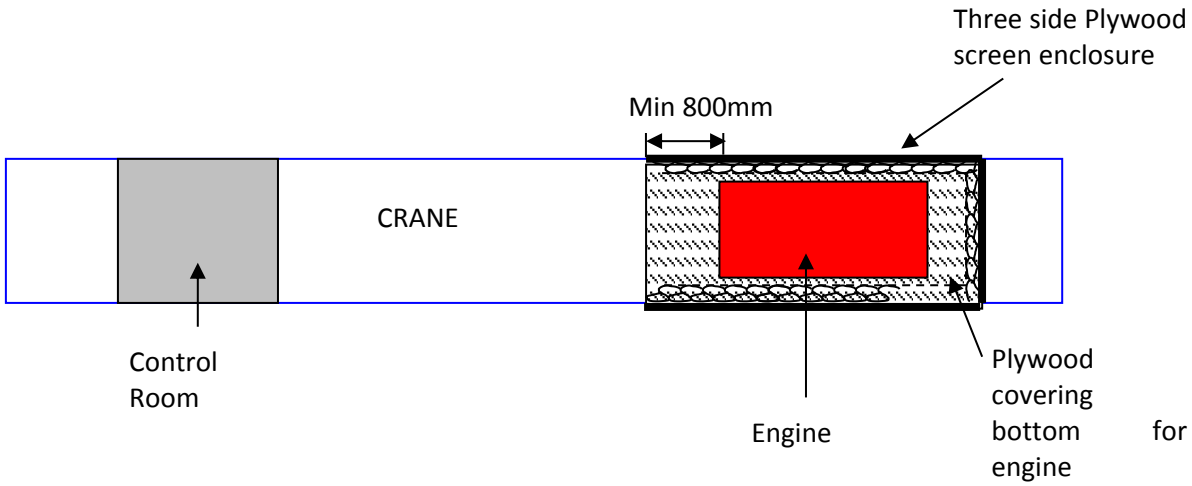
- Trucks must turn off their engines when on site to reduce impacts on adjacent land use (unless truck ignition needs to remain on during concrete pumping).

10.1.7 Cranes

- Use electrical tower cranes, alternatively use Diesel Tower Crane with the following noise controls:

  A three-sided screen and bottom covering enclosure for the engine. The screen/bottom can be constructed from 15mm plywood lined with Martini HD-50 or equal.

  The engine exhaust can be treated with an additional muffler if required, however it appears that piping the exhaust up to the upper section of the crane is adequate. This can only be confirmed once the plywood is installed.



10.1.8 Other Activities

- In the event of non-compliances, noise management techniques identified in this report should be employed to minimise the level of noise impact. This may include community consultation and scheduling of loud construction processes.
- Notwithstanding above, general management techniques and acoustic treatments are included below which may be implemented on a case-by-case basis to reduce noise emissions to surrounding receivers.

11 CONTROL OF CONSTRUCTION NOISE AND VIBRATION

The execution of this work will facilitate the formulation of noise control strategies for this project.

The flow chart presented in Figure 3 illustrates the process that will be followed in assessing construction activities.

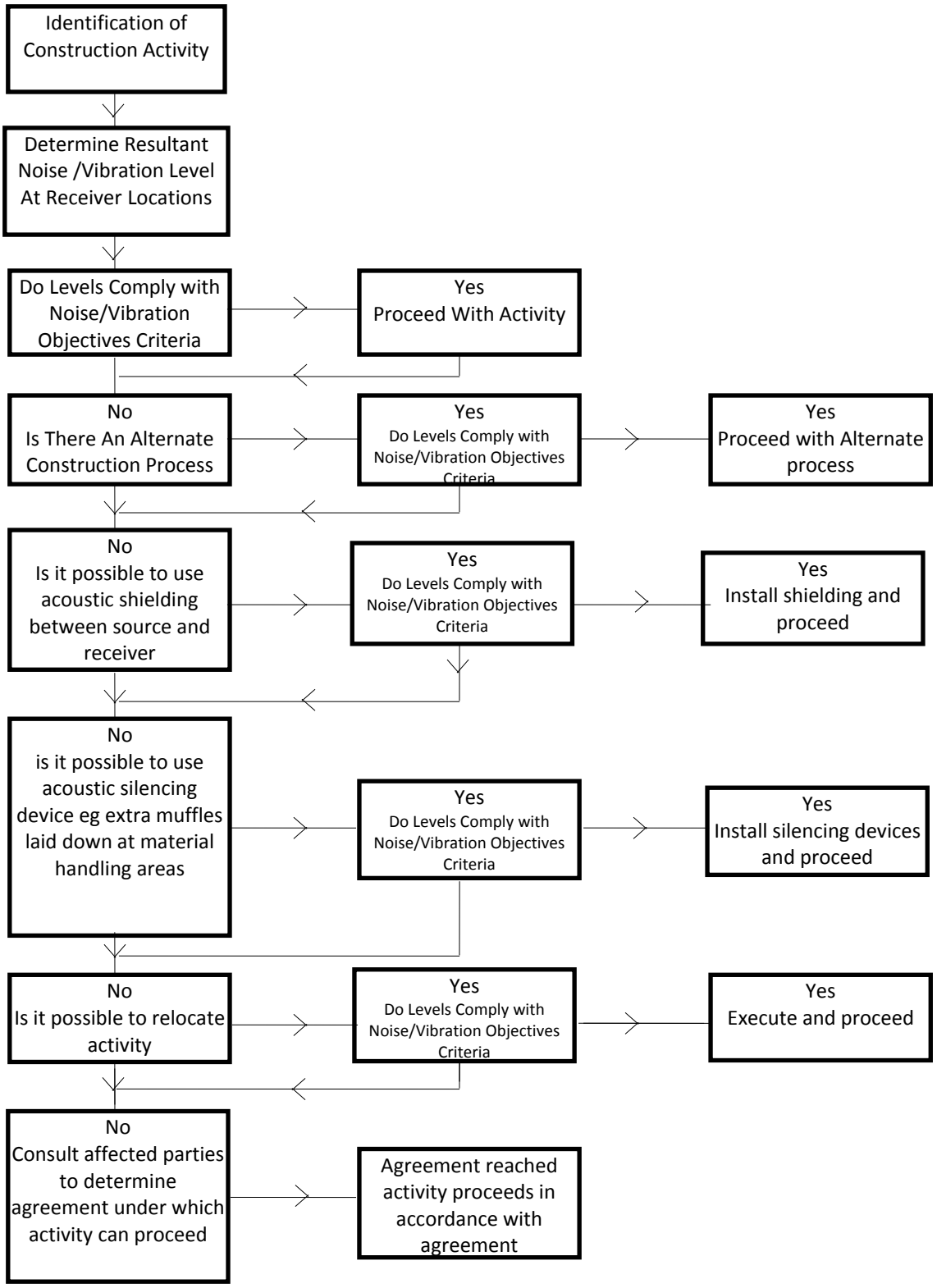


Figure 3– Process Flowchart

12 NOISE AND VIBRATION CONTROL METHODS

The determination of appropriate noise control measures will be dependent on the particular activities and construction appliances. This section provides an outline of available methods.

12.1 SELECTION OF ALTERNATE APPLIANCE OR PROCESS

Where a particular activity or construction appliance is found to generate excessive noise levels, it may be possible to select an alternative approach or appliance. For example; the use of a hydraulic hammer on certain areas of the site may potentially generate high levels of noise. By carrying this activity by use of pneumatic hammers, bulldozers ripping and/or milling machines lower levels of noise will result.

Selection of alternative appliances have been explored for the demolition of the existing structure. Due to safety concerns, particularly in relation to slab and structural loading, large excavator mounted milling will not be feasible.

Pre-drilling, saw cutting and ripping may be incorporated in the excavation of the existing base slab. Whilst hammering may still be required, the substitution of drilling, sawing and ripping will reduce degree of hammering required.

12.2 ACOUSTIC BARRIER

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). Equipment which is on the move or working in rough or undulating terrain cannot be effectively attenuated by placing barriers at the source.
- Barriers can also be placed between the source and the receiver however this will not beneficial in this instance due to receivers overlooking the site.

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 15dB(A) can be gained. Where only partial obstruction of line of sight occurs, noise reductions of 5 to 8dB(A) may be achieved. Where no line of sight is obstructed by the barrier, 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 that is approximately 10dB(A) greater than the maximum reduction provided by the barrier. In this case the use of a material such as 10mm or 15mm thick plywood (radiata plywood) would be acceptable for the barriers.

12.3 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.

12.4 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).

12.5 TREATMENT OF SPECIFIC EQUIPMENT

In certain cases, it may be possible to specially treat a piece of equipment to dramatically reduce the sound levels emitted.

12.6 ESTABLISHMENT OF SITE PRACTICES

This involves the formulation of work practices to reduce noise generation. It is recommended that all available and reasonable treatments and mitigation strategies presented in this report be adopted to minimise noise emissions from the excavation and construction activities on site.

12.7 NOISE MONITORING

Predicted noise levels indicate that noise emissions from the proposed works on site will not strictly comply with the EPA noise management levels, given the close proximity of adjoining properties. On this basis, noise monitoring can be undertaken to determine the effectiveness of measures which have been implemented.

No long term noise monitoring is recommended for the proposed demolition activities because the recorded internal noise levels will be mixed or interfered by occupant's activities.

As a minimum, attended noise measurements shall be carried out once of noise and vibration impacts on the buildings adjacent of any significant new noise or vibration source shall occur at the commencement of that activity. The plant/activity shall be located such that the maximum impact on the receivers is generated so that the measures the worst-case impact. In some cases, additional measurements with that activity at other locations on the building site may be desirable in order to facilitate management of that activity.

Ongoing monitoring and reporting can be conducted if required, after this initial benchmark period. Continuous monitoring will typically include report generated fortnightly, with additional reports created if benchmark levels are exceeded. In events of exceedance in benchmark levels, site foreman will immediately stop work on site and contact acoustic consultant to determine if;

- Noisy plant/activity was recognised by site foreman – determine reason for exceedance and recommend ameliorative measures or alternate processes for the activity.

- Site attendance is required by acoustic consultant to determine noisy plant/activity and conduct attended measurements. Device further controls based on measured levels.

12.8 COMBINATION OF METHODS

In some cases, it may be necessary that two or more control measures be implemented to minimise noise.

12.9 MAINTENANCE OF PLANT, EQUIPMENT AND MACHINERY

The builder should ensure all plant, equipment and machinery are regularly serviced and maintained at optimum operating conditions, to ensure excessive noise emissions are not generated from faulty, overused or unmaintained machinery.

12.10 STAFF TRAINING AND REPORTING MECHANISM

All construction staff on site, as part of the site induction process, will be informed of the surrounding sensitive receivers on site and the site-specific recommendations to reduce noise impacts to these receivers (late starts, respite period, vehicle noise control etc. – refer section 10-11).

Any complaints received by construction staff must be immediately reported to the site foreman, followed by completion of incident report form and steps detailed in section 13 below.

A copy of the recommendations detailed in this report and dealing with complaints procedure will be posted at key areas around the site for easy reference by all staff.

13 COMMUNITY INTERACTION AND COMPLAINTS HANDLING

13.1 ESTABLISHMENT OF DIRECT COMMUNICATION WITH AFFECTED PARTIES

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

The objective in undertaking a consultation processes is 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 options available;
- Identify group concerns generated by the project, so that they can be addressed; and
- Ensure that concerned individuals or groups are aware of and have access to a Constructions Complaints Register which will be used to address any construction noise related problems should they arise.

Community consultation should be conducted prior to any works commencing on site, with letterbox notifications to all identified however not limited to surrounding sensitive receivers (refer section 4).

13.2 COMMUNITY CONSULTATION SESSIONS AND INFORMATION LEAFLETS

The following is a list of community consultation documents and procedures are recommended:

- A community engagement plan should be prepared by Citi Building and issued to all surrounding affected receivers.
- An incident report form will also be issued to all stakeholders in the area, should the need for any complaints arise.
- Citi Building should maintain a direct line of communication with all affected stakeholders in the area.

13.3 DEALING WITH COMPLAINTS

Should ongoing complaints of excessive noise or vibration criteria occur immediate measures shall be undertaken to investigate the complaint, the cause of the exceedances and identify the required changes to work practices. In the case of exceedances of the vibration limits all work potentially producing vibration shall cease until the exceedance is investigated.

The effectiveness of any changes shall be verified before continuing. Documentation and training of site staff shall occur to ensure the practices that produced the exceedances are not repeated.

If a noise complaint is received the complaint should be recorded on a Noise Complaint Form. The complaint form should list:

- The name and address of the complainant (if provided);
- The time and date the complaint was received;

- The nature of the complaint and the time and date the noise was heard;
- The name of the employee who received the complaint;
- Actions taken to investigate the complaint, and a summary of the results of the investigation;
- Required remedial action, if required;
- Validation of the remedial action; and
- Summary of feedback to the complainant.

A permanent register of complaints should be held. All complaints received should be fully investigated and reported to management. The complainant should also be notified of the results and actions arising from the investigation.

The investigation of a complaint shall involve where applicable;

- Noise measurements at the affected receiver;
- An investigation of the activities occurring at the time of the incident;
- Inspection of the activity to determine whether any undue noise is being emitted by equipment; and
- Whether work practices were being carried out either within established guidelines or outside these guidelines.

Where an item of plant is found to be emitting excessive noise, the cause is to be rectified as soon as possible. Where work practices within established guidelines are found to result in excessive noise being generated then the guidelines should be modified so as to reduce noise emissions to acceptable levels. Where guidelines are not being followed, the additional training and counselling of employees should be carried out.

Measurement or other methods shall validate the results of any corrective actions arising from a complaint where applicable.

13.4 REPORTING REQUIREMENTS

The following shall be kept on site:

1. A register of complaints received/communication with the local community shall be maintained and kept on site with information as detailed in section 12.
2. Where noise/vibration complaints require noise/vibration monitoring, results from monitoring shall be retained on site at all times.
3. Any noise exceedances occurring including, the actions taken and results of follow up monitoring.
4. A report detailing complaints received and actions taken shall be presented to the construction liaison committee.

13.5 CONTINGENCY PLANS

Where non-compliances or noise complaints are raised the following methodology will be implemented.

1. Determine the offending plant/equipment/process
2. Locate the plant/equipment/process further away from the affected receiver(s) if possible.
3. Implement additional acoustic treatment in the form of localised barriers, silencers etc where practical.
4. Selecting alternative equipment/processes where practical

14 CONCLUSION

This report presents an assessment of noise impacts associated with the demolition, excavation and construction of the Wright Block Development to be located At the University of New England.

A prediction of noise and vibration levels associated with the works have been discussed in this report. The outcomes are as follows:

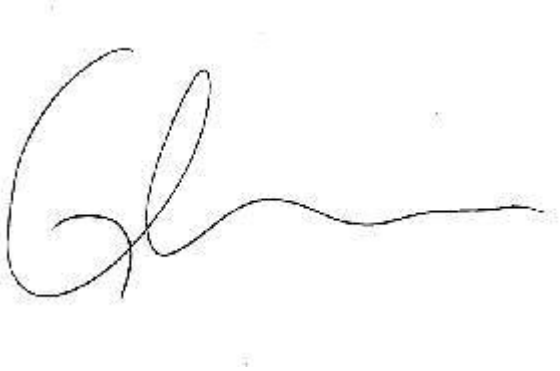
- There is likely to be exceedances of the construction noise goals particularly with heavier equipment such as excavators, rock breakers, concrete saws and the like during the excavation phases.

- General construction works will have significantly lower impact on surrounding receivers due to the quieter items of plant (Power Tools, etc).

- Notwithstanding, in all circumstances noise emissions from the site should be minimised as practically possible during the construction period.

We trust this information is satisfactory. Please contact us should you have any further queries.

Yours faithfully,



Glen Campbell