ACOUSTICS AND AIR

SCHOFIELDS PUBLIC SCHOOL

CONSTRUCTION NOISE & VIBRATION MANAGEMENT PLAN

REPORT NO. 17175-CN
VERSION A

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PREPARED FOR

ADCO CONSTRUCTIONS PTY LTD
LEVEL 2, 7-9 WEST STREET
NORTH SYDNEY NSW 2060

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GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

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_{A10} – The L_{A10} 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_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

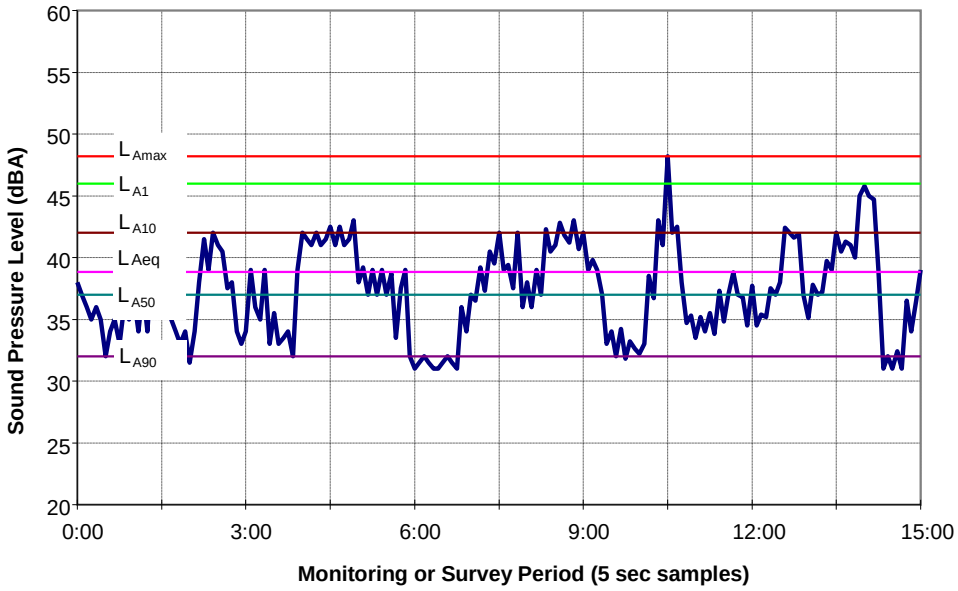
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) 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.

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_{A90}) 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.

Typical Graph of Sound Pressure Level vs Time



1 INTRODUCTION

Wilkinson Murray has been commissioned to prepare a Construction Noise and Vibration Management Plan (CNVMP) for the construction of the proposed redevelopment of Schofields Public School at St Albans Road, Schofields in order to address SSD condition B24.

A Noise and Vibration Assessment was prepared by Wilkinson Murray Pty Limited (WMPL) in September 2017 (Report 17175-S-SSD Schofields Public School - Noise and Vibration Assessment Version A) as part of a State Significant Development (SSD) application, which included both construction and operational aspects.

Item B24 of the SSD development consent states the following:

> *"B24. The Construction Noise and Vibration Management Sub-Plan must address, but not be limited to, the following:*
>
> *a) be prepared by a suitably qualified and experienced noise expert;*
> *b) describe procedures for achieving the noise management levels in EPA's Interim Construction Noise Guideline (DECC, 2009);*
> *c) describe the measures to be implemented to manage high noise generating works such as piling, in close proximity to sensitive receivers;*
> *d) include strategies that have been developed with the community for managing high noise generating works;*
> *e) describe the community consultation undertaken to develop the strategies in condition B24(d); and*
> *f) include a complaints management system that would be implemented for the duration of the construction."*

This document documents the noise and vibration management levels for the construction works, gives a summary of the predicted levels and advises the management and mitigation strategy for noise and vibration associated with the worst-case scenario associated with the construction works.

This CNVMP has been carried out with reference to the following documents:

- *Interim Construction Noise Guideline* (DECC, 2009) – *ICNG*
- *Assessing Vibration: A Technical Guideline* (DEC, 2006) – *AVTG*
- BS 7385 Part 2-1993 *"Evaluation and measurement for vibration in buildings Part 2"*

2 PROJECT OVERVIEW

2.1 Site Location

The redevelopment of the Schofields Public School will involve a combination of new construction and refurbishment, generally at the north of the site. The site location is shown in Figure 2-1.

Figure 2-1 Schofields Public School Location

Surrounding development is generally residential. Figure 2-2 shows three groups of residences that represent noise-sensitive receivers potentially impacted by the development:

Receiver	Type	Distance to Site Boundaries (m)
R1 – 58 St Albans Road	Single storey residence	5-100 (with boundary fence)
R2 – 61 to 71 St Albans Road	Single and double storey residences	40-140
R3 – 86 St Albans Road	Single storey residence	40-130 (with boundary fence)
R4 – Pop-up School Buildings	Temporary buildings	15 - 100

The figure also shows ambient noise monitoring locations A and B, described in later sections.

Figure 2-2 Noise Monitoring & Receiver Locations

2.2 Proposed Development

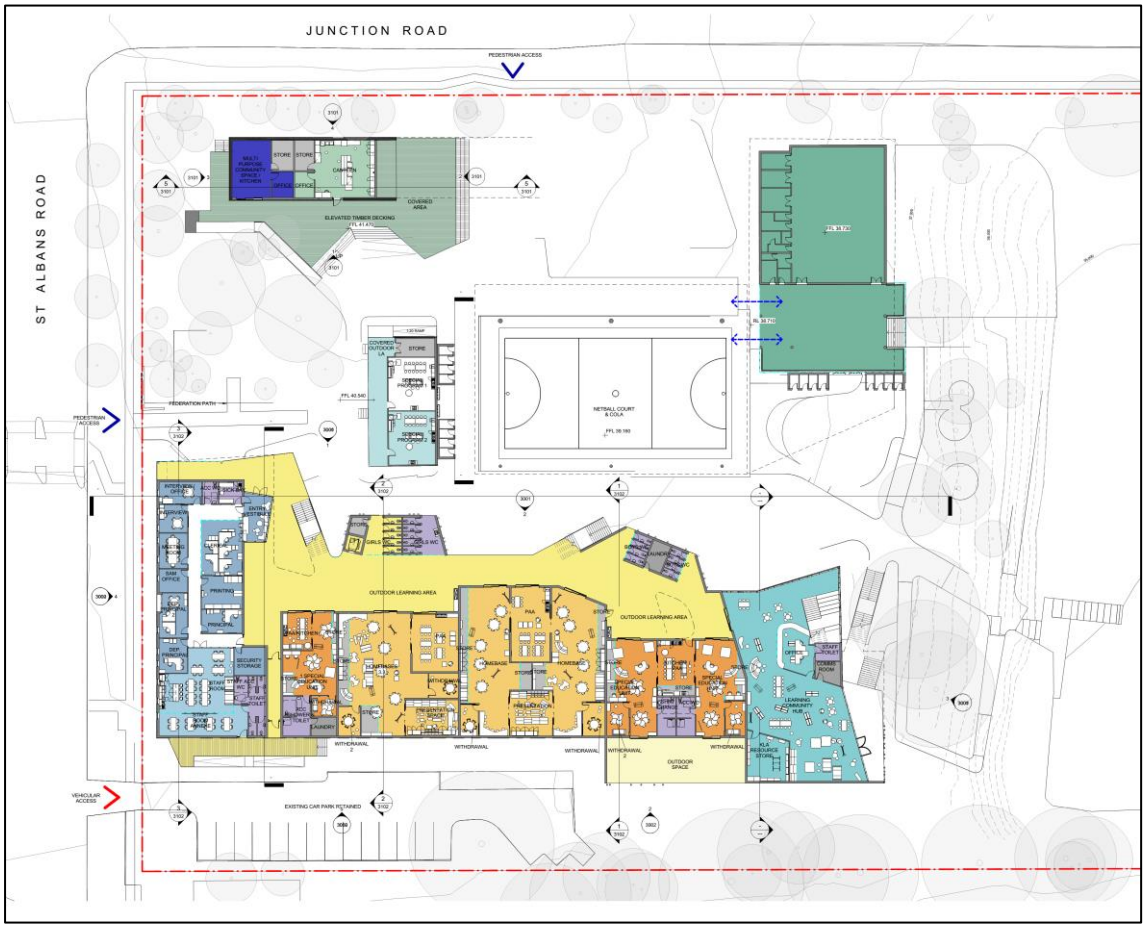
The existing school will be redeveloped to allow increased enrolment from 350 to 600 primary students.

The existing buildings will be demolished and replaced, with the exception of the existing hall, a heritage listed classroom, and parts of the administration block at the corner of Junction and St Alban Roads.

Students will be relocated in pop-up buildings to the south of the site during the proposed upgrade of the School.

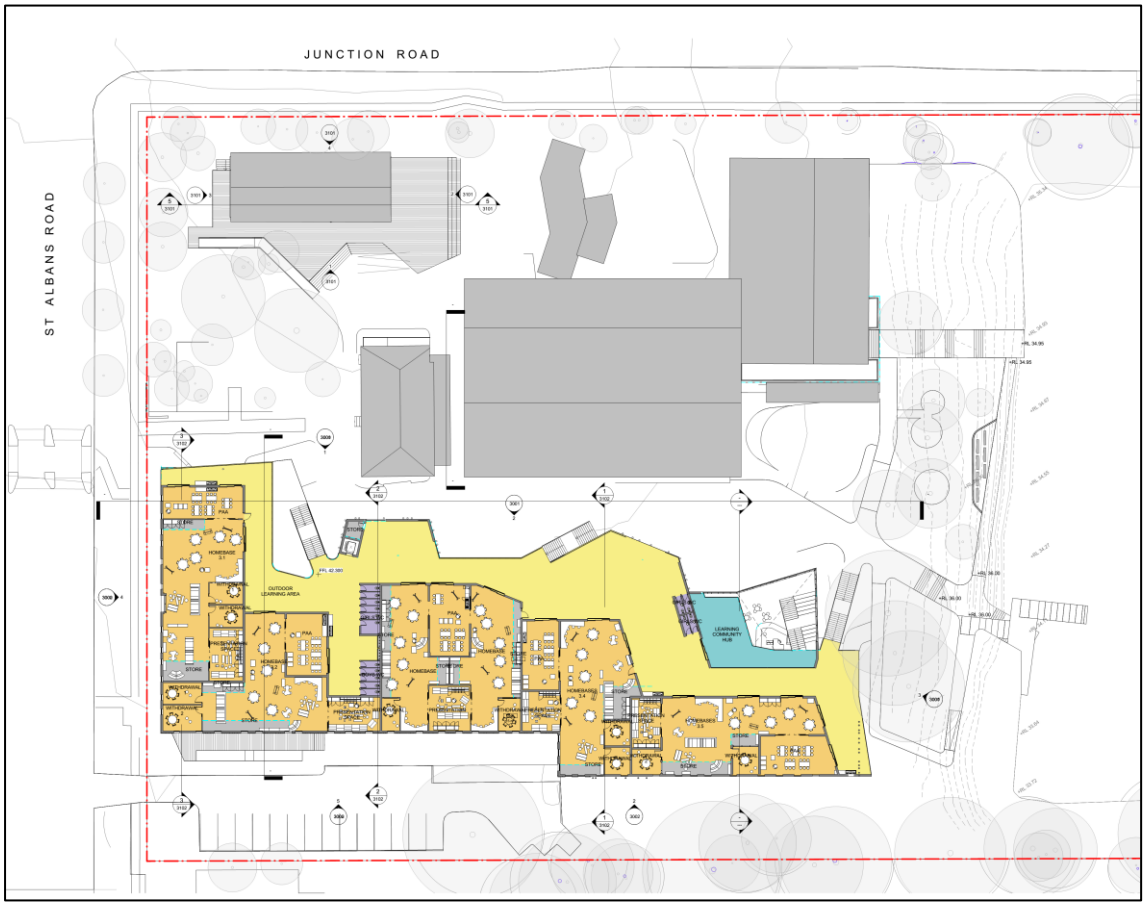
Figure 2-3 shows the proposed ground floor plan with new administration offices on the ground floor facing St Albans Road. Figure 2-4 shows the proposed first floor plan of classrooms along the south-western side of the school.

Figure 2-3 Proposed Ground Floor Plan



Drawing courtesy of TKD Architects

Figure 2-4 Proposed First Floor Plan



Drawing courtesy of TKD Architects

2.3 Proposed Construction Methodology and Schedule

As advised by the client, the works would include the following stages and (indicative) equipment:

Stage	Duration	Trades on Site	Plant & Equipment
Demolition	4 weeks	Demolisher and tree loppers	32-ton excavator with hammer attachment, truck and trailer
Excavation	8 weeks	Civil contractor	5t and 32t excavator, bobcat, truck and trailer
Construction – Structural	32 weeks	Screw piling, concreter, form workers, steel fixers, structural steel, roofer	10t excavator for screw piling, concrete trucks, small power tools, small generator, telehandler, delivery trucks
Fitout	20 weeks	Plasterboard contractor, electrician, plumber, air con, painter, carpet, etc	5t excavator, telehandler, scissor lifts, boom lifts, small power tools, small generator, delivery trucks

3 EXISTING NOISE ENVIRONMENT

3.1 Ambient Noise Survey

In order to characterise the existing acoustical environment in the area, ambient noise monitoring was carried out from 30 June to 10 July 2017 (Figure 2-2 Location A). The data appeared to be corrupted by a nearby air-conditioner that was not noticed during the daytime site visit, so minimum noise levels were not recorded. Logging was repeated from 10 July to 14 July 2017 at a different location (Figure 2-2 Location B).

Location B, adjacent to St Albans Road, was selected to quantify the potential exposure of future school buildings to any prevailing environmental noise sources, and to determine the minimum background sound levels likely to be experienced for the purpose of establishing environmental emissions criteria for the assessment of operational noise.

The noise monitoring equipment used for these measurements consisted of environmental noise loggers set to A-weighted, fast response, continuously monitoring over 15-minute sampling periods. This equipment is capable of remotely monitoring and storing noise level descriptors for later detailed analysis. The equipment calibration was checked before and after the survey and no significant drift was noted.

The logger determines L_{A1}, L_{A10}, L_{A90} and L_{Aeq} levels of the ambient noise. L_{A1}, L_{A10} and L_{A90} are the levels exceeded for 1%, 10% and 90% of the sample time respectively (see Glossary of Acoustic Terms for definitions). The L_{A1} is indicative of maximum noise levels due to individual noise events such as the occasional pass-by of a heavy vehicle. This is used for the assessment of sleep disturbance. The L_{A90} level is normally taken as the background noise level during the relevant period.

3.2 Noise Monitoring Results

The results of the unattended noise logging have been processed in accordance with the NSW SEPP *(Infrastructure)* 2007 and NSW *Road Noise Policy* time periods to determine the levels of road traffic noise experienced at the site during the daytime and night time. Table 3-1 details the $L_{Aeq(15hour)}$ daytime, the $L_{Aeq(9hour)}$ night time and the $L_{Aeq,1hr}$ road traffic noise levels recorded during the survey.

Table 3-1 Measured Road Traffic Noise Levels

Measurement Location	Noise Level – dBA re 20 µPa		
	$L_{Aeq(15hour)}$	$L_{Aeq(9hour)}$	$L_{Aeq(1hour)}$
Location A	50	44	50

To determine project-specific criteria on which to base assessment of operational noise emissions, the measured data was processed according to the NSW Environment Protection Authority's (EPA) *Noise Policy for Industry (NPfI)* assessment time periods. Table 3-2 details the RBL (background) noise levels and the L_{Aeq} noise levels recorded during the daytime, evening and night time periods.

Table 3-2 Measured Ambient Noise Levels Corresponding to NSW *NPfI* Assessment Time Periods

Measurement Location	Noise Level – dBA re 20 µPa					
	Daytime 7am–6pm		Evening 6pm–10pm		Night Time 10pm–7am	
	RBL	L_{Aeq}	RBL	L_{Aeq}	RBL	L_{Aeq}
Location B	38	50	36	44	31	41

The noise environment is dominated by traffic on Junction and St Albans Roads and some school activity.

4 CONSTRUCTION NOISE & VIBRATION CRITERIA

4.1 Construction Noise Criteria

The following sections detail the applicable site-specific noise and vibration criteria based on the EPA's *Interim Construction Noise Guideline*.

4.1.1 Construction Noise Management Levels

The EPA released the "*Interim Construction Noise Guideline*" *(ICNG)* in July 2009. The guideline provides noise goals that assist in assessing the impact of construction noise.

For residences, the basic daytime construction noise goal is that the $L_{Aeq,15min}$ noise management level (NML) should not exceed the background noise by more than 10dBA. This applies to construction works conducted during standard hours which are defined as Monday to Friday 7.00am-6.00pm, and Saturday 8.00am-1.00pm. Outside the standard hours, where construction is justified, the noise management level applicable is background + 5dBA. Table 4-1 details the *ICNG* noise management levels.

Table 4-1 Construction Noise Management Levels at Residences using Quantitative Assessment

Time of Day	Management Level $L_{Aeq,(15min)}$	How to Apply
Recommended Standard Hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or Public Holidays	Noise affected RBL + 10dBA	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq,(15min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise. 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 75dBA	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 proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level. If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided.

Time of Day	Management Level $L_{Aeq,(15min)}$	How to Apply
Outside recommended standard hours	Noise affected RBL + 5dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2 of the guideline.

Additionally, this CNVMP considers the *ICNG* recommendations for non-residential uses, in particular that construction noise levels do not exceed:

- $L_{Aeq,15min}$ 70dBA external to commercial buildings when they are in use; and
- $L_{Aeq,15min}$ 45dBA internally within school classrooms when in use.
- $L_{Aeq,15min}$ 65dBA internally within school outdoor play areas when in use.

For the purpose of this assessment the internal classroom noise level has been converted to an external level of $L_{Aeq,15min}$ 70dBA, allowing for attenuation (25dB) achieved through closed windows.

On the basis of the background noise logging results presented in Section 3.2 and the EPA's *ICNG* recommendations, a summary of the noise management levels adopted for construction activities at noise sensitive receivers are presented in Table 4-2.

Table 4-2 Site-Specific Construction Noise Management Levels

Receivers	Construction Noise Management Level, $L_{Aeq,15min}$ – dBA			Highly Noise-Affected Noise Level, L_{Aeq} dBA
	Day	Evening	Night	
Residential Receivers R1, R2, R3	48	41	36	75
School Classrooms – R4	70			
School Outdoor Play – R4	65	-	-	-

4.2 Vibration Criteria

Criteria for assessment of the effects of vibration on human comfort are set out in British Standard 6472-1992. Methods and criteria in that Standard are used to set "preferred" and "maximum" vibration levels in the document "*Assessing Vibration: A Technical Guideline*" (2006) produced by the NSW DECCW.

Acceptable values of human exposure to continuous vibration, such as that associated with drilling, are dependent on the time of day and the activity taking place in the occupied space (e.g. workshop, office, residence or a vibration-critical area). Guidance on preferred values for continuous vibration is set out in Table 4-3.

Table 4-3 Criteria for Exposure to Continuous Vibration

Place	Time	Peak Particle Velocity (mm/s)	
		Preferred	Maximum
Critical working areas (e.g. hospital operating theatres precision laboratories)	Day or night time	0.14	0.28
Residences	Daytime	0.28	0.56
	Night time	0.20	0.40
Offices	Day or night time	0.56	1.1
Workshops	Day or night time	1.1	2.2

In the case of intermittent vibration, which is caused by plant such as rock breakers, the criteria are expressed as a Vibration Dose Value (VDV) and are presented in Table 4-4.

Table 4-4 Acceptable Vibration Dose Values for Intermittent Vibration ($m/s^{1.75}$)

Location	Daytime		Night Time	
	Preferred Value	Maximum Value	Preferred Value	Maximum Value
Critical areas	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Calculation of VDV requires knowledge of the number of events and their duration in the relevant time period.

4.2.1 Building Damage

In terms of the most recent relevant vibration damage objectives, Australian Standard AS 2187: Part 2-2006 *"Explosives – Storage and Use – Part 2: Use of Explosives"* recommends the frequency dependent guideline values and assessment methods given in BS 7385 Part 2-1993 *"Evaluation and measurement for vibration in buildings Part 2"*, as they "are applicable to Australian conditions".

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

The recommended limits (guide values) from BS7385 for transient vibration to ensure minimal risk of cosmetic damage to residential and industrial buildings are presented numerically in Table 4-5.

Table 4-5 Transient Vibration Guide Values – Minimal Risk of Cosmetic Damage

Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
	4 Hz to 15 Hz	15 Hz and Above
Reinforced or framed structures Industrial and heavy commercial buildings	50mm/s at 4 Hz and above	N/A
Un-reinforced or light framed structures Residential or light commercial type buildings	15mm/s at 4 Hz increasing to 20mm/s at 15 Hz	20mm/s at 15 Hz increasing to 50mm/s at 40 Hz and above

The Standard states that the guide values in Table 4-5 relate predominantly to transient vibration which does not give rise to resonant responses in structures, and to low-rise buildings.

The British Standard goes on to state that *"Some data suggests that the probability of damage tends towards zero at 12.5 mm/s peak component particle velocity"*. In addition, a building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive.

4.3 Construction hours

Items C5 to C8 of the SSD conditions of consent state the following with regard to construction hours:

> *"C5. Construction, including the delivery of materials to and from the site, may only be carried out between the following hours:*
>
> *(a) between 7am and 6pm, Mondays to Fridays inclusive; and*
>
> *(b) between 8am and 1pm, Saturdays.*
>
> *No work may be carried out on Sundays or public holidays.*

C6. Activities may be undertaken outside of the hours in condition C5 if required:

(a) by the Police or a public authority for the delivery of vehicles, plant or materials; or

(b) in an emergency to avoid the loss of life, damage to property or to prevent environmental harm; or

(c) where the works are inaudible at the nearest sensitive receivers; or

(d) where a variation is approved in advance in writing by the Planning Secretary or her nominee if appropriate justification is provided for the works.

C7. Notification of such activities must be given to affected residents before undertaking the activities or as soon as is practical afterwards."

C8. Rock breaking, rock hammering, sheet piling, pile driving, and similar activities may only be carried out between the following hours:

(a) 9am to 12pm, Monday to Friday;

(b) 2pm to 5pm Monday to Friday; and

(c) 9am to 12pm, Saturday.

5 CONSTRUCTION NOISE & VIBRATION ASSESSMENT

This section of the assessment relates to typical construction activities expected to occur during works on the site, and their impact on residential receivers.

5.1 Construction Equipment & Noise Source Levels

Sound Power Levels (L_W) for typical construction plant are identified in Table 5-1. These L_w are based upon AS 2436-2010 *Guide to noise and vibration control on construction, demolition and maintenance sites* and archival data from measurements at other similar construction sites. Sound Power Level is independent of measurement position.

Table 5-1 Typical Construction Plant Sound Levels – dBA

Stage	Plant	Sound Power Level – dBA	
		L_w per Item	**L_w Total**
Demolition	32-ton excavator with hammer attachment	120	117
	Truck (with trailer)	107	
Excavation	5t excavator	102	112
	32t excavator	112	
	Bobcat	110	
	Truck (with trailer)	107	
Construction – Structural	10t excavator for screw piling	107	112
	Concrete trucks	112	
	Small power tools	100	
	Small generator	99	
	Telehandler	98	
	Delivery trucks	108	
Fitout	5t excavator	102	109
	Telehandler	99	
	Scissor lifts	103	
	Boom lifts	105	
	Small power tools	100	
	Small generator	99	
	Delivery trucks	108	

These sound power levels have been applied in the predictions of worst-case noise that may arise during the various construction/demolition activities. The total sound power levels for the activities have been determined based upon the typical operation time for each equipment item.

5.2 Construction Noise Predictions

Assessment of likely noise generation at surrounding receivers has been undertaken for the proposed construction works.

Site-related noise emissions were calculated addressing the following factors:

- Equipment sound level emissions and location;
- Receiver locations;
- Distance between source and receiver;
- Screening effect (existing barriers and buildings).

Calculations have been conducted for each stage with plant operating in "worst case" and "typical" locations across the construction site.

In all instances, it has been assumed plant operates continuously and simultaneously. As such, predictions represent the noise levels that would likely occur during intensive periods of construction. The resulting noise levels can be considered in the upper range expected at surrounding receivers throughout the course of construction works.

The results of construction noise predictions are shown in Table 5-2. Exceedances of the NML (48dBA) are listed, applicable to works during recommended standard hours. Exceedances of the "Highly Noise-Affected" 75dBA limit are identified in bold. This may occur at one house closest to demolition of the building in the north-west corner. This demolition work would typically be completed in less than one day.

Table 5-2 Predicted Construction Noise Levels at Residences – $L_{Aeq(15\ min)}$ – dBA

Residences West (58 St Albans Road)						
Stage	**Activities**	**Total L_w dBA**	**Maximum Noise Level**		**Exceedance NML**	
			Closest	**Typical**	**Closest**	**Typical**
1	Demolition	117	**76**	51	28	3
2	Excavation	112	71	46	23	-
3	Construction – Structural	112	71	46	23	-
4	Fitout	109	68	43	20	-
Residences North (across St Albans Road)						
Stage	**Activities**	**Total L_w dBA**	**Maximum Noise Level**		**Exceedance NML**	
			Closest	**Typical**	**Closest**	**Typical**
1	Demolition	117	75	54	27	6
2	Excavation	112	70	49	22	1
3	Construction – Structural	112	70	49	22	1
4	Fitout	109	67	46	19	-

Residences East (across Junction Road)						
Stage	Activities	Total L_w dBA	Maximum Noise Level		Exceedance NML	
			Closest	Typical	Closest	Typical
1	Demolition	117	70	49	22	1
2	Excavation	112	65	44	17	-
3	Construction – Structural	112	65	44	17	-
4	Fitout	109	62	41	14	-
Pop-up School Buildings (South of site)						
Stage	Activities	Total L_w dBA	Maximum Noise Level		Exceedance NML	
			Closest	Typical	Closest	Typical
1	Demolition	117	83	58	8	-
2	Excavation	112	78	53	3	-
3	Construction – Structural	112	78	53	3	-
4	Fitout	109	75	50	-	-
Temporary School Outdoor Play (South of site)						
Stage	Activities	Total L_w dBA	Maximum Noise Level		Exceedance NML	
			Closest	Typical	Closest	Typical
1	Demolition	117	69	48	4	-
2	Excavation	112	64	43	-	-
3	Construction – Structural	112	64	43	-	-
4	Fitout	109	61	40	-	-

5.3 Discussion of Results

The greatest potential impact from construction occurs when mobile construction plant operates in closest proximity to residential receivers adjacent to the western boundary. Throughout the demolition and excavation period, careful management will be required to minimise impact at residences.

A review of the predicted noise level range indicates exceedances of up to 27dBA at residential receivers may occur during bulk excavation works. This exceedance is not unusual for construction works in a relatively quiet residential area and can be mitigated by the construction noise management procedures detailed in the following sections.

Predicted noise levels at the school classrooms will range between 40 to 69dBA and are likely to exceed the recommended noise limits at times, due to the close proximity of works. At the closest point of the outdoor play areas levels construction noise will range between 48 to 69 dBA.

It is noted that the new pop-up buildings include upgraded glazing and air conditioning to allow windows to remain closed and maximise the noise reduction. Nevertheless, the noisiest activities should be programmed to occur prior to 9.00am and after 3.00pm as practicable. Opportunities to work the whole day on public holidays, on Saturdays and possibly on Sundays should also be considered to minimise impacts at the school, so long as the affected residences are notified.

Regular liaison with the school in regard to provision of specific respite periods during critical periods (i.e. exams) is recommended.

5.4 Vibration Impacts

Due to the relatively minor nature of these works, there are no vibration intensive activities proposed in close proximity to sensitive receivers, hence no adverse impacts are expected. Nevertheless, criteria have been established in this plan which can be used to assess potential impacts should vibration generation occur.

6 NOISE & VIBRATION CONTROL METHODS

6.1 Noise & Vibration Control

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.

6.1.1 Selection of Alternate Activity 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 out this activity by use of pneumatic hammers, bulldozers ripping and/or milling machines lower levels of noise will result.

6.1.2 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. Mobile equipment cannot be effectively attenuated by placing barriers at the source.

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 15dBA can be affected. Where only partial obstruction of line of sight occurs, noise reductions of 5 to 8dBA may be achieved. 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 10dBA greater than the maximum reduction provided by the barrier. In this case the use of a material such as 10mm or 15mm thick plywood would be acceptable for such barriers.

6.1.3 Silencing Devices

Where construction activities or plant 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.

6.1.4 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 20dBA.

6.1.5 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.

6.1.6 Noise and Vibration Monitoring

Where required, noise and vibration monitoring will be undertaken to determine the effectiveness of any control measures implemented. The results of monitoring can be used to devise further control measures.

7 CONSTRUCTION MANAGEMENT PROCESSES

7.1 Community Consultation

Consultation with and the provision of information to the surrounding community is regarded as a major factor in controlling the negative reaction to the inevitable impacts associated with a construction site.

In order for any construction noise management programme to work effectively, continuous communication is required between all parties, which may be potentially impacted upon including the builder, school and surrounding residential receivers. 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 process 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 the Complaints Register which will be used to address any construction noise related problems should they arise.

To ensure that this process is effective, regular information regarding the proposed works and period when they will be required to be conducted should be provide to neighbouring receivers.

7.2 Response to Complaints

Should ongoing complaints of excessive noise and vibration impacts occur measures shall be undertaken to investigate the complaint, the cause of the complaint identified and changes to work practices implemented. 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 and vibration complaint is received the complaint shall be recorded. The complaint form shall list:

- The name and location of the complainant (if provided);
- The time and date the complaint was received;
- The nature of the complaint and the time and date it occurred;
- 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 by a consultant or as detailed in this report; and
- Summary of feedback to the complainant.

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

The investigation of a complaint shall involve where applicable;

- measurements at the affected receiver;
- an investigation of the activities occurring at the time of the incident;
- inspection of the activity; and
- whether work practices were being carried out either within established guidelines or outside these guidelines.

7.3 Environmental Inductions

It is important that an induction is provided to all site personnel, contractors and sub-contractors with an emphasis on understanding and managing impacts. This shall include the location of sensitive receivers, specific mitigation measures, site hours and complaints procedure.

7.4 Monitoring

7.4.1 Construction Noise Monitoring

Where determined necessary, noise monitoring should generally be undertaken on an attended basis (minimum of 15 minutes at each location), in order to differentiate between construction noise sources and other sources, such as road traffic noise, and in order to observe and identify any abnormally noisy construction equipment or operations.

During the attended monitoring, typical maximum noise levels associated with particular plant items should be noted as well as the L_{Aeq} descriptor. Where possible, extraneous noise events such as road traffic noise should be excluded from the results or highlighted in accompanying notes.

Noise monitoring of construction noise during normal construction hours will be conducted by a qualified acoustic consultant at the beginning stages of demolition at locations representative of nearby receivers.

The results of measurements will be documented along with any recommendations for mitigation. Any mitigation will be determined in consultation with the site Project Manager.

Noise monitoring will be conducted in response to complaints from nearby identified receivers.

The results of all noise monitoring will be compared with established noise management level to determine appropriate actions.

Monitoring must be conducted with equipment (Class 1) that holds current NATA calibration. The time of day, duration and weather shall be noted as well as the contribution from construction activities.

7.4.2 Construction Vibration Monitoring

As per the noise monitoring, attended monitoring is preferred, typical maximum peak particle velocity levels associated with particular plant items should be measured in all three orthogonal directions.

Where possible, extraneous events should be excluded from the results, or highlighted in accompanying notes.

Vibration monitoring of construction activities will be conducted by a qualified acoustic consultant at the beginning stages of construction works at locations representative of affected receivers. Monitoring at each location for a minimum of 15 minutes is recommended.

The results of measurements will be documented along with any recommendations for mitigation. Any mitigation will be determined in consultation with the site Project Manager.

The results of all vibration monitoring will be compared with established vibration goals to determine appropriate actions.

Monitoring must be conducted with equipment that holds current calibration and that can measure PPV in all three orthogonal directions. The time of day, duration and weather shall be noted as well as the contribution from construction activities.

8 CONCLUSION

This CNVMP outlines the assessment of the potential for noise and vibration impacts that may result to surrounding residences and temporary school buildings from the upgrade of Schofields Public School.

The potential for impacts from the proposed works has been assessed against the relevant standards and guidelines detailed in Section 4.

Sections 6 and 7 of this report specifically outline measures to mitigate and manage noise (and vibration) impacts during construction.