

MEMORANDUM



220532_JEC_REF Additional Hours_BW_R1

TO: Rohan Dubois **DATE:** 10 June 2025
COMPANY: Hansen Yuncken
FROM: Ben White
SUBJECT: Jindabyne Education Campus – REF 1 and 2 extended working hours acoustic assessment

1. INTRODUCTION

Pulse White Noise Acoustics Pty Ltd (PWNA) has being requested to undertake a Construction Noise and Vibration Impact Statement for the Jindabyne Education Campus and the proposed extended working hours associated with the REF 1 and REF 2 works associated with the project.

The proposed works required to be undertaken as part of the project include the following:

- Works commencing from 6:30am:
 - Prestart activities.
 - Servicing equipment and machines.
 - Moving machines and equipment into designated work zone.
 - Review and re-instatement of traffic control devices.
- Work after 7am:
 - Regular operating procedures and construction including works during normal working hours.
- Works between 6pm and 7pm
 - Make good work area.
 - Moving machines and equipment into designated Material storage site.
 - Make Good out of hours traffic control devices.

No rock breaking or designated invasive construction activities are anticipated to be completed outside of the regular approved REF conditioned working hours, which include the following:

37. Work Hours

The undertaking of any construction work, including the entry and exiting of construction and delivery vehicles at the site, is restricted to the following standard work hours:

- a. Monday to Friday inclusive: Between 7.00am to 6.00pm;
- b. Saturday: Between 8.00am to 1.00pm; and
- c. Sunday and Public Holidays: No work permitted.

Provided noise levels do not exceed the existing background noise level plus 5dB, works may also be undertaken during the following additional work hours:

- a. Mondays to Friday inclusive: Between 6:00pm to 7:00pm; and
- b. Saturday: Between 1:00pm to 4:00pm.

Construction work may be undertaken outside of the standard and additional work hours outlined above, but only if notification has been given to the occupiers of any land within a minimum of 80 metres of the site boundaries before undertaking the work or as soon as is practical afterwards, and only if it is strictly 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 completely inaudible at the nearest sensitive receiver.

38. Construction Methods

To minimise loss of amenity, blasting is not permitted and the use of any rock excavation machinery, mechanical pile drivers or the like is restricted to the following hours:

- a. Monday to Friday inclusive: 9:00am to 12:00pm;
- b. Monday to Friday inclusive: 2:00pm to 5:00pm; and
- c. Saturday: 9:00am to 12:00pm.

2. Surrounding Receivers

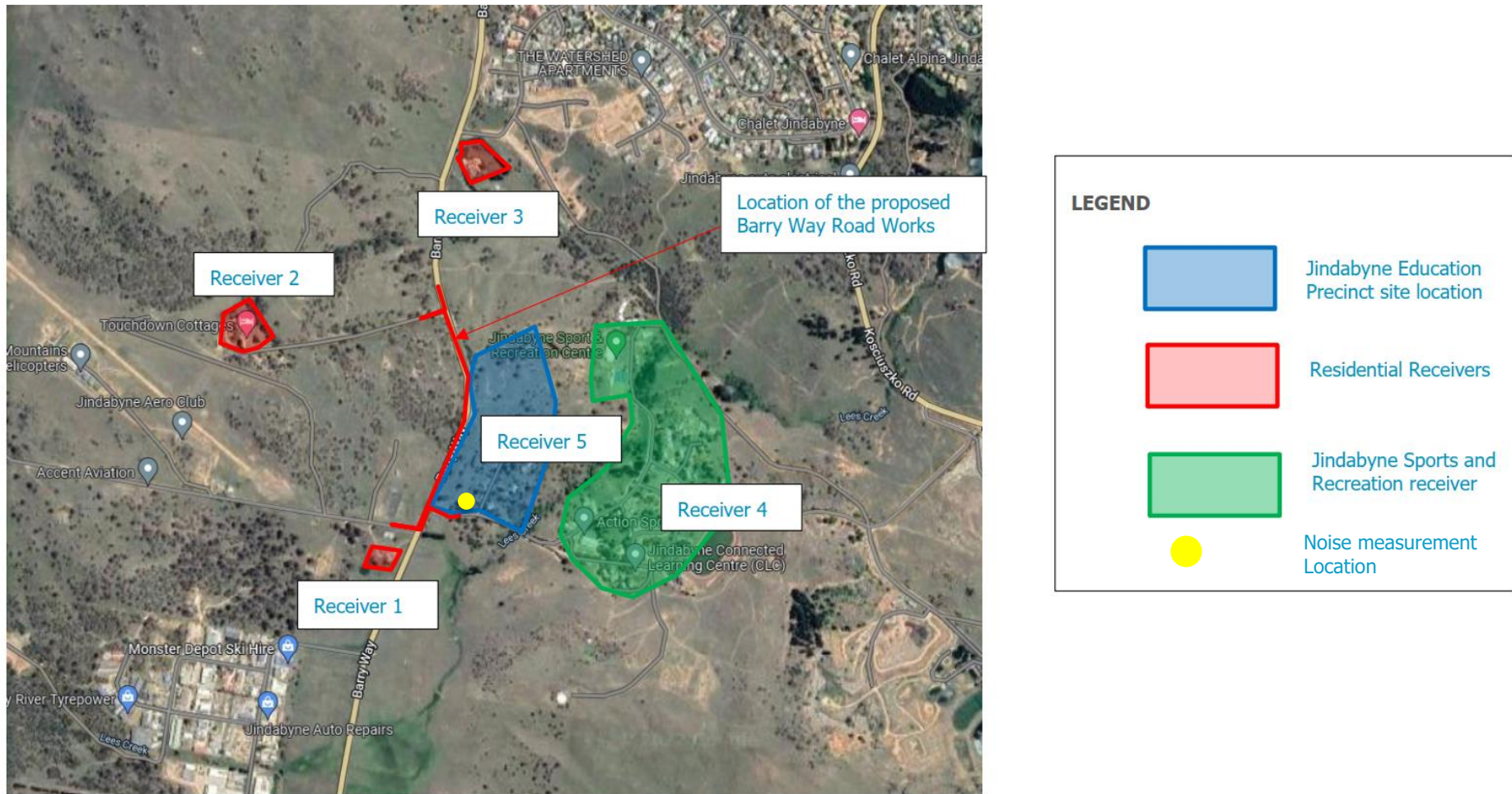
The required works include those to be undertaken as part of the external works associated with the Jindabyne Educational Campus, including the activities including the following:

- Works commencing from 6:30am:
 - Prestart activities.
 - Servicing equipment and machines.
 - Moving machines and equipment into designated work zone.
 - Review and re-instatement of traffic control devices.
- Work after 7am:
 - Regular operating procedures and construction including works during normal working hours.
- Works between 6pm and 7pm
 - Make good work area.
 - Moving machines and equipment into designated Material storage site.
 - Make Good out of hours traffic control devices.

The roadworks are located to the west of the Jindabyne Educational Campus.

A map showing the site location as well as nearest receivers is provided below. Additionally, shown below are the onsite measurements which were conducted as part of this assessment.

Figure 1 Site Map and Surrounding Receivers



3. Noise and Vibration Criteria

3.1 Noise Criteria

3.1.2 NSW EPA Interim Construction Noise Guideline (ICNG) – DECC 2009

Noise criteria for construction and demolition activities are discussed in the *Interim Construction Noise Guideline* (ICNG). The ICNG also recommends procedures to address potential impacts of construction noise on residences and other sensitive land uses. The main objectives of the ICNG are summarised as follows:

- Promote a clear understanding of ways to identify and minimise noise from construction works.
- Focus on applying all “feasible” and “reasonable” work practices to minimise construction noise impacts.
- Construction to be undertaken only during the recommended standard hours unless approval is given for works that cannot be undertaken during these hours.
- Streamline the assessment and approval stages and reduce time spent dealing with complaints at the project implementation stage; and
- Site-specific feasible and reasonable work practices to minimise noise impacts.

The ICNG contains a quantitative assessment method which is applicable to this project. Guidance levels are given for airborne noise at residences and other sensitive land uses.

The quantitative assessment method involves predicting noise levels at sensitive receivers and comparing them with the Noise Management Levels (NMLs). The NML affectation categories for residential receivers have been reproduced from the guideline and are listed in the table below.

Table 1 NMLs for quantitative assessment at residences

Time of Day	Noise Management Level $L_{Aeq}(15\text{minute})^{1,2}$	How to Apply
Outside recommended standard hours (Non-approved original construction hours)	Noise affected RBL + 5 dB	<ul style="list-style-type: none">• 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 5 dB above the noise affected level, the proponent should negotiate with the community.
<i>Note 1 The RBL is the overall single-figure background noise level measured in each relevant assessment period (during or outside the recommended standard hours). The term RBL is described in detail in the NSW Noise Policy for Industry (EPA 2017).</i>		

Construction noise levels at other noise receivers are outlined below:

Based on the measured background noise levels undertaken at the site and detailed in Figure 1 above, and the NMLs outlined above the construction noise criteria to be used in this assessment are listed in Table 2.

Table 2 NMLs as basis for the acoustic assessment

Receiver Types	Measured Background Noise levels	NML, dB LAeq(15minute)
	<u>Outside Standard Hours</u> Monday to Friday: 8:00pm to 5:00am	<u>Outside Standard Hours</u> Monday to Friday: 8:00pm to 5:00am
Residences (Measured externally)	38 dB(A) L _{eq} (15 min)	43 dB(A) L _{eq} (15 min)
Active Recreation Area	-	65 dB(A) L _{eq} (15 min)
School areas	-	40 dB(A) L _{eq} (15 min) (internally)

3.1.2 Construction Traffic Noise Criteria

For existing residences and other sensitive land uses affected by additional traffic on existing roads, the NSW *Road Noise Policy (RNP)* states that for noise associated with increased road traffic generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB during both day and night-time periods. An increase of 2 dB represents a minor impact that is considered barely perceptible to the average person.

3.2 Vibration Criteria

3.2.1 Human Comfort

Vibration effects relating specifically to the human comfort aspects of the project are taken from the guideline titled "*Assessing Vibration – A Technical Guideline*". (AVTG) This type of impact can be further categorised and assessed using the appropriate criterion as follows:

- Continuous vibration – from uninterrupted sources (refer to Table 3).
- Impulsive vibration – up to three instances of sudden impact e.g., dropping heavy items, per monitoring period (refer to

- Table 4).
- Intermittent vibration – such as from drilling, compacting or activities that would result in continuous vibration if operated continuously (refer to Table 5).

Table 3 Continuous vibration acceleration criteria (m/s²) 1 Hz-80 Hz

Location	Assessment period	Preferred Values		Maximum Values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day or night-time	0.020	0.014	0.040	0.028
		0.04	0.029	0.080	0.058
Workshops	Day or night-time	0.04	0.029	0.080	0.058

Table 4 Impulsive vibration acceleration criteria (m/s²) 1 Hz-80 Hz

Location	Assessment period	Preferred Values		Maximum Values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day or night-time	0.64	0.46	1.28	0.92
Workshops	Day or night-time	0.64	0.46	1.28	0.92

Table 5 Intermittent vibration impacts criteria (m/s^{1.75}) 1 Hz-80 Hz

Location	Daytime		Night-time	
	Preferred Values	Maximum Values	Preferred Values	Maximum Values
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

3.2.2 Building Contents and Structure

The vibration effects on the building itself are assessed against international standards as follows:

- For transient vibration: British Standard BS 7385: Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration" (BSI 1993); and
- For continuous or repetitive vibration: German DIN 4150: Part 3 – 1999 "*Effects of Vibration on Structure*" (DIN 1999).

Note: British Standard BS 7385 and German Standard DIN 4150 are being referenced in lieu of any relevant Australian Standards for vibration impacts to either building contents or structures.

3.2.3 British Standard BS 7385 Part 2 - 1993

For transient vibration, as discussed in standard BS 7385 Part 2-1993, the criteria are based on peak particle velocity (mm/s) which is to be measured at the base of the building. These are summarised in Table 6 and illustrated in Figure 2. **Error! Reference source not found.**

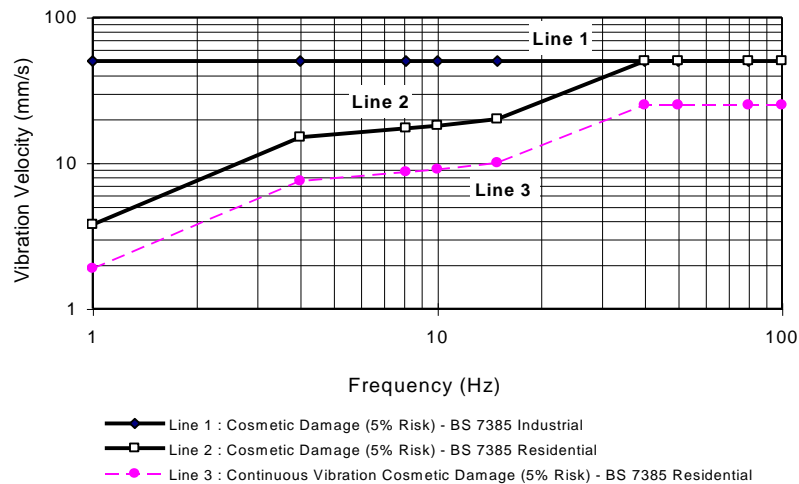
Table 6 Transient vibration criteria as per standard BS 7385 Part 2 - 1993

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

Standard BS 7385 Part 2 – 1993 states that the values in Table 6 relate to transient vibration which does not cause resonant responses in buildings.

Where the dynamic loading caused by continuous vibration events is such as that results in dynamic magnification due to resonance (especially at the lower frequencies where lower guide values apply), then the values in Table 6 may need to be reduced by up to 50% (refer to Line 3 in Figure 2 **Error! Reference source not found.**).

Figure 2 BS 7385 Part 2 – 1993, graph of transient vibration values for cosmetic damage



In the lower frequency region where strains associated with a given vibration velocity magnitude are higher, the recommended values corresponding to Line 2 are reduced. Below a frequency of 4 Hz where a high displacement is associated with the relatively low peak component particle velocity value, a maximum displacement of 0.6 mm (zero to peak) is recommended. This displacement is equivalent to a vibration velocity of 3.7 mm/s at 1 Hz.

The standard also states that minor damage is possible at vibration magnitudes which are greater than twice those given in Table 6, and major damage to a building structure may occur at values greater than four times the tabulated values. Fatigue considerations are also addressed in the standard, and it is concluded that unless calculation indicates that the magnitude and number of load reversals is significant (in respect of the fatigue life of building materials) then the values above should not be reduced for fatigue considerations.

3.2.4 German Standard DIN 4150 Part 3 - 1999

For continuous or repetitive vibration, standard DIN 4150 Part 3-1999 provides criteria based on values for peak particle velocity (mm/s) measured at the foundation of the building; these are summarised in Table 7. The criteria are frequency dependent and specific to particular categories of structures.

Table 7 Structural damage criteria as per standard DIN 4150 Part 3 - 1999

Type of Structure	Peak Component Particle Velocity, mm/s			
	Vibration at the foundation at a frequency of			Vibration of horizontal plane of highest floor at all frequencies
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz ¹	
Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
Structures that, because of their sensitivity to vibration, do not correspond to those listed in lines 1 and 2 and are of great intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

Note 1: For frequencies above 100Hz, at least the values specified in this column shall be applied.

4. Noise and vibration assessment

4.1 Construction Vibration Assessment

Based on the proposed activities to be undertaken as part of the project do not include high generating activities and compliance with the relevant construction vibration requirements will be achieved without mitigations required.

Ongoing communication with surrounding receivers is required to be undertaken to inform the occupants of expected work areas and period works, prior to construction activities commencing on the site.

4.2 Construction Noise Assessment

Sound power levels have been predicted for the construction tasks identified in the project program. The equipment anticipated for use in each task is based on previous project experience. The sound power levels for the equipment likely to be used for each of the listed tasks are provided in Table 8 below.

Table 8 Summary of predicted sound power levels

Tasks	Equipment	Sound Power Levels (dBA re 1pW)	Aggregate Sound Power Level per Task (dBA re 1pW)
Construction Activities	Equipment Movements	105	106
	Servicing Equipment	90	
Note 1: An assumed time correction has been applied, this being 5 minutes of operation in any 15-minute interval.			

Based on the sound power levels outlined above, predicted noise levels to each surrounding receiver are identified below.

Table 9 Predicted Construction Noise Levels – Residential

Receiver Location	Activity	Aggregate Sound Power Level (dBA re 1pW)	Predicted Individual Noise Level at Receiver dBA LAeq 15 minutes	Predicted Combined Noise Level at Receiver dBA LAeq 15 minutes	Criteria dBA LAeq 15 minutes	Summary of Result
Residential Receivers	Equipment Movements	106	105	Up to 41	43 (BG+5dBA) (External)	Noise levels expected to comply at all residential receivers
	Servicing Equipment		90			

Table 10 Predicted Construction Noise Levels – Sports and Recreation Areas

Receiver Location	Activity	Aggregate Sound Power Level (dBA re 1pW)	Predicted Individual Noise Level at Receiver dBA LAeq 15 minutes	Predicted Combined Noise Level at Receiver dBA LAeq 15 minutes	Criteria dBA LAeq 15 minutes	Summary of Result
Sports and Recreation area	Equipment Movements	106	105	Up to 40	43 (BG+5dBA) (External)	Noise levels expected to comply at sports and recreation area
	Servicing Equipment		90			

Table 11 Predicted Construction Noise Levels - School

Receiver Location	Activity	Aggregate Sound Power Level (dBA re 1pW)	Predicted Individual Noise Level at Receiver dBA LAeq 15 minutes	Predicted Combined Noise Level at Receiver dBA LAeq 15 minutes	Criteria dBA LAeq 15 minutes	Summary of Result
School Receiver	Equipment Movements	106	105	Up to 45	40 (Internally) – When in operation	Operation of the school is not expected to be undertaken during the proposed additional construction hours.
	Servicing Equipment		90			

Based on the details included in the assessment conducted above, the resulting works proposed as part of the additional working hours will not generate adverse impacts on surrounding sensitive receivers.

4.3 Review of Construction Impacts

Based on the location of the works to be undertaken during the proposed extended working hours and included within the REF 1 and REF 2 compliance with the recommended extended working hours criteria of background noise levels + 5 dB(A) at all surrounding residential receivers will be achieved.

4.4 Contingency Plans

Contingency plans are required to address noise or vibration problems if excessive levels are measured at surrounding sensitive receivers and/or if justified complaints occur. Such plans include:

- Stop the onsite works.
- Identify the source of the main equipment within specific areas of the site which is producing the most construction noise and vibration at the sensitive receivers; and
- Review the identified equipment and determine if an alternate piece of equipment can be used or the process can be altered.
- In the event an alternate piece of equipment or process can be used, works can re-commence.
- In the event an alternate piece of equipment or process cannot be determined implement a construction assessment to be performed by a suitably qualified acoustic consultant.

The Superintendent shall have access to view the Contractor's noise measurement records on request. The Superintendent may undertake noise monitoring when required.

4.5 General Mitigation Measures (Australia Standard 2436-2010)

As well as the above project specific noise mitigation controls, AS 2436-2010 "*Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites*" sets out numerous practical recommendations to assist in mitigating construction noise emissions. Examples of strategies that could be implemented on the subject project are listed below, including the typical noise reduction achieved, where applicable:

- The use of alternative activities.
- Use of acoustic screens if possible.

4.6 Construction Traffic Noise Criteria

For existing residences and other sensitive land uses affected by additional traffic on existing roads, the NSW Road Noise Policy (RNP) states that for noise associated with increased road traffic generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB during both day and night-time periods. An increase of 2 dB represents a minor impact that is considered barely perceptible to the average person.

Based on the proposed works to be undertaken during the additional hours being sort as part o the REF 1 and REF 2 compliance with the noise levels included within the RNP will be complied with, providing deliveries to the site are undertaken during standard working hours.

5. Conclusion

Pulse White Noise Acoustics Pty Ltd (PWNA) has being requested to undertake a Construction Noise and Vibration Impact Statement for proposed extended working hours associated with the REF 1 and REF 2 works associated with the project.

As outlined above, the proposed constriction noise impacts will comply with the noise level criteria within the EPA *interim Construction Noise Guidelines* and will therefore be acoustically acceptable.

Based on the details included in this assessment, the proposed construction activities to be undertaken within the additional working hours being sort will not generate adverse impacts on surrounding sensitive receivers.

For any additional information please do not hesitate to contact the person below.

Regards

A handwritten signature in blue ink that reads "BG White". The signature is written in a cursive, flowing style.

Ben White
Director

Pulse White Noise Acoustics