Acoustic Noise and Vibration Report

New Primary School and High School in Huntlee

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Contents

1. Introduction

This Noise and Vibration Impact Report has been prepared to support a Review of Environmental Factors (REF) for the NSW Department of Education (The Department) for the construction and operation of the new primary school and high school for Huntlee (the activity).

The purpose of the REF is to assess the potential environmental impacts of the activity prescribed by *State Environmental Planning Policy (Transport and Infrastructure) 2021* (T&I SEPP) as "development permitted without consent" on land carried out by or on behalf of a public authority under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The activity is to be undertaken pursuant to Chapter 3, Part 3.4, Section 3.37A of the T&I SEPP.

This document has been prepared in accordance with the *Guidelines for Division 5.1 assessments* (the Guidelines) by the Department of Planning, Housing and Infrastructure (DPHI) as well as the *Addendum Division 5.1 guidelines for schools*. The purpose of this report is to determine the likely noise and vibration impacts from the school to surrounding sensitive receivers and provide recommended treatments and management controls to minimise impacts in accordance with relevant criteria.

Background noise monitoring has been conducted in the vicinity of the site to determine noise criteria in accordance with the NSW Environmental Protection Authority (EPA) and T&I SEPP 2021. Potential future noise impacts from related operational use of the proposed school development and relevant construction work are determined in this report. Based on the results of the assessment, recommendations for acoustic treatments and management controls are provided where necessary.

2. Project Information

2.1. Site Description

The current street address is 32 Persoonia Boulevard and part of 1823 Wine Country Drive, North Rothbury. The legal description of the site is 495/DP1246814 (Primary School), Lot 449/-/DP1289939 and Lot 696/-/DP1263808 (the High School). The Primary School site is regular in shape is has a total approximate area of 3 hectares. The High School site is irregular in shape and has a total approximate area of 5 hectares.

The site is approximately 18km northwest of Cessnock and 20km southeast of Singleton within the Hunter Valley. The catchment area for the proposed primary school is bound by the respective catchments of Kirkton Public School to the northwest, Branxton Public to the north and Greta Public School to the east. The high school intake catchment is bound by the catchments of Singleton High School to the north west, Rutherford Technology High School, Maitland Grossman High School and Maitland High School to the east.

The immediately surrounding land is described as follows:

- **North:** Land to the north currently includes areas of vegetation with Branxton Town Centre located on the northern side of the Hunter Expressway. Branxton Station is also located along the Hunter Trainline located 1km to the north.
- **East:** Low density residential subdivision has occurred to the east of the site and accommodates recently constructed detached dwelling houses serviced by new roads. Huntlee Shopping Centre and Huntlee Learning Centre are located to the northeast of the site providing services to the new residential areas.
- **West:** Low-density residential subdivision has occurred to the west of the site.
- **South:** Areas to the south of the site are currently undeveloped land and includes areas of existing vegetation.

Figure 1: Aerial Photograph of the Site (Source: Urbis, 2025)

2.2. Project Background

Huntlee is a new Urban Release Area gazetted by the Minister for Planning on the 31st of December 2010. Huntlee is located 20km north of Cessnock and 25km southeast of Singleton. The amendment to Schedule 3 of the former *State Environmental Planning Policy (Major Development) 2005* identified zoning and land use controls.

The school sites are located within Huntlee Town Centre Stage 1, approved under MP10_0137 by the Planning Assessment Commission (PAC) under the delegation of the Minister for Planning and Infrastructure on the 24 April 2013.

The development approved under MP_0137 (as modified) includes the following:

- Subdivision to create 2,272 residential allotments
- 123 large lot residential allotments
- 94 infrastructure, community, commercial and mixed-use allotments
- 2 allotments for a primary school and a high school
- Landscaped areas, drainage, public open space and recreation areas
- Associated bulk earthworks, and
- Infrastructure including roads, drainage works and utility services provision.

As part of the rezoning, Huntlee was required to enter into a voluntary planning agreement with the Minister for Planning and the Minister for the Environment (SEPP VPA). Notably, pursuant to the SEPP VPA, Huntlee was required to provide Education Contribution Land within the town centre for a future primary school. The developer

was required to also make various environmental conservation contributions to offset the impacts of the Development.

The VPA was amended in 2019 due to the approval of MP_0137_MOD 9. This modification was approved on 13 December 2019 and changed the location and configuration of the Education Contribution Land. The VPA includes the provision of a primary school. MOD 15 subsequently approved on the 7 December 2020 subdivided the education super lot located within the Town Centre stage 5 area into two lots. These two lots now make up the subject PS and HS sites.

2.3. Proposed Activity Description

The proposal is to construction a primary school (Huntlee PS) and a high school (Huntlee HS) on the site, with general details as follows:

Main Works Contractor Delivery

Construction of a new preschool, primary school and high school in Huntlee including earthworks, public domain works and landscaping.

Specifically, the proposal involves:

- 1 x Preschool for 60 children.
- 3 x Primary School buildings for 500 students including:
  - General Learning Spaces (GLS)
  - General Learning Spaces (Support) (SLU)
  - Multipurpose Rooms
  - School Hall
  - Canteen
  - Library
  - Administration area
- 2 x High School buildings for 1000 students including:
  - General Learning Spaces (GLS)
  - General Learning Spaces (Support) (SLU)
  - Science Learning Hubs
  - Visual Arts Learning Hubs
  - Wood and Metal Technology Learning Hubs
  - Food and Textiles Learning Hubs
  - Health and PE Learning Hubs
  - Performing Arts Learning Hubs
  - VET Hospitality Hubs
  - Multipurpose Rooms
  - Library
  - Gymnasium
  - Administration Areas
  - Staff Support Areas
- Landscaped open space including:
  - Playing Fields
  - Covered Outdoor Learning Areas (COLAs)
- Car parking
- Public domain upgrades

This assessment has been based on current architectural plans by NBRS & Partners, project ref. 24410, titled “New Primary School & High School in Huntlee”, dated 19 August 2025. Current site plans for the development are shown in Figure 2.

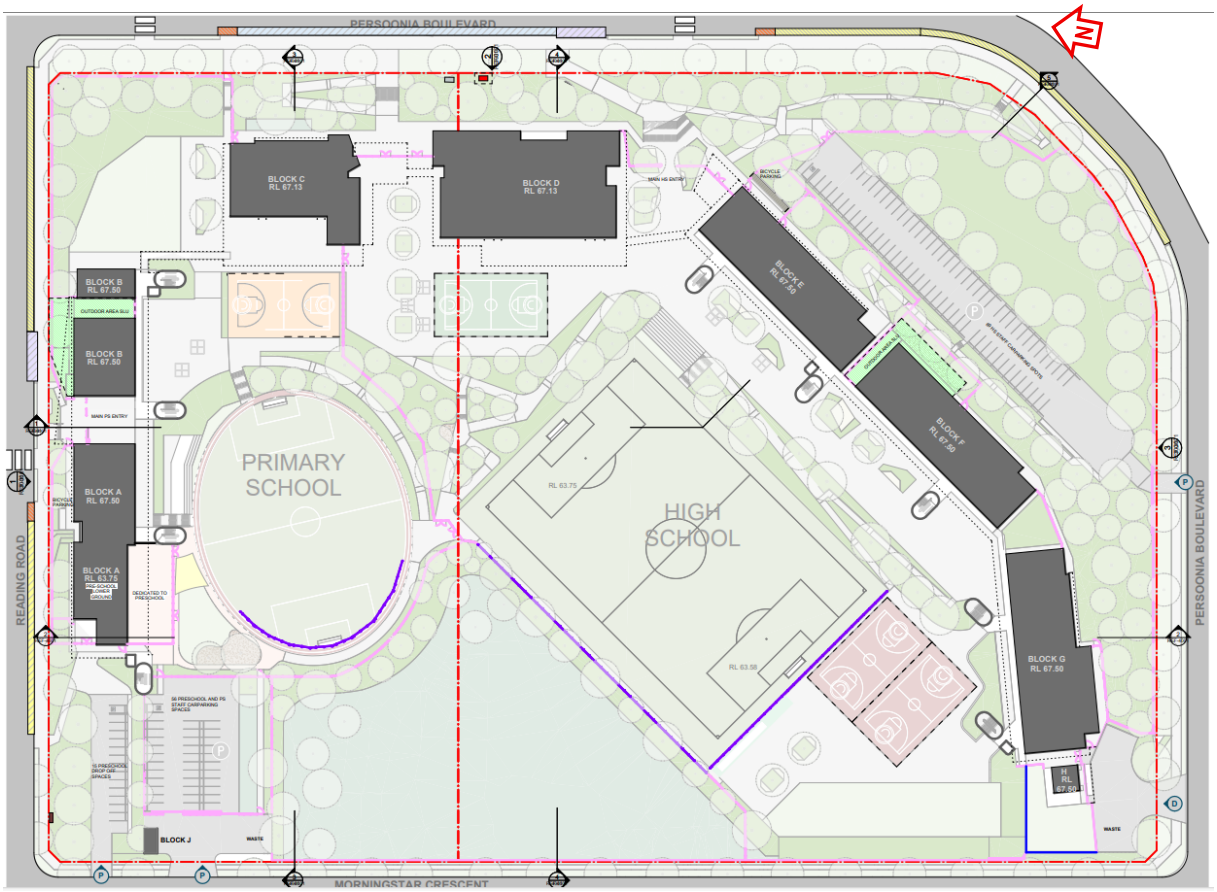

Figure 2: Proposed Site Plan – NBRS

3. Existing Acoustic Environment

3.1. Potentially Affected Receivers

The sensitive receivers potentially most affected from noise from the source under consideration are listed in Table 1 and shown in the aerial image of the surrounding area in Figure 3. All nearby property boundaries are nominated as receivers due to the SEPP 2021 noise criteria. Based on site inspections by BSE on 1 & 8 July 2025, it is known that residential dwellings will be located to the east and northwest of the site Receivers 1 and 3). Commercial uses are proposed to the north of the site (Receiver 2). Receivers 4 and 6 to the west and east respectively are proposed as residential dwellings, although construction in these areas has not yet begun. Receiver 5 to the south of the site is proposed as future recreation/open space.

The area between receivers 3 and 4 (west of the site and south of Caphilly Parkway) is currently surrounded by a fence and is understood to be a nature area and is assumed to remain like this in the future. Therefore, this area is deemed to not be assessable by the SEPP or any categories in the NSW Noise Policy for Industry (NPI).

Property addresses are taken from State of NSW Spatial Services and Cessnock City Council online mapping; some addresses have not yet been altered based on the new road network. They are clarified in brackets below where necessary.

Table 1: Table of potential affected receivers

Receiver ID	Receiver Type	Address	Description
R01	Future Residential	37-55 Persoonia Boulevard, North Rothbury	Future 1-2 storey residential dwellings
R02	Future Commercial	1823 Wine Country Drive North Rothbury (Reading Road, along north side)	Assumed future commercial buildings
R03	Future Residential	2 Caphilly Parkway & 21-29 Morningstar Crescent	Future 1-2 storey residential dwellings
R04	Future Residential	1823 Wine Country Drive North Rothbury (Morningside Crescent, along west side)	Assumed future 1-2 storey residential dwellings
R05	Future Recreation	1709 & 1769 Wine Country Drive North Rothbury (south of site)	Future recreation or open space – applied as passive rather than active in this report to provide a more conservative criteria
R06	Future Residential	1823 Wine Country Drive North Rothbury (Persoonia Boulevard, along southeast side)	Assumed future 1-2 storey residential dwellings

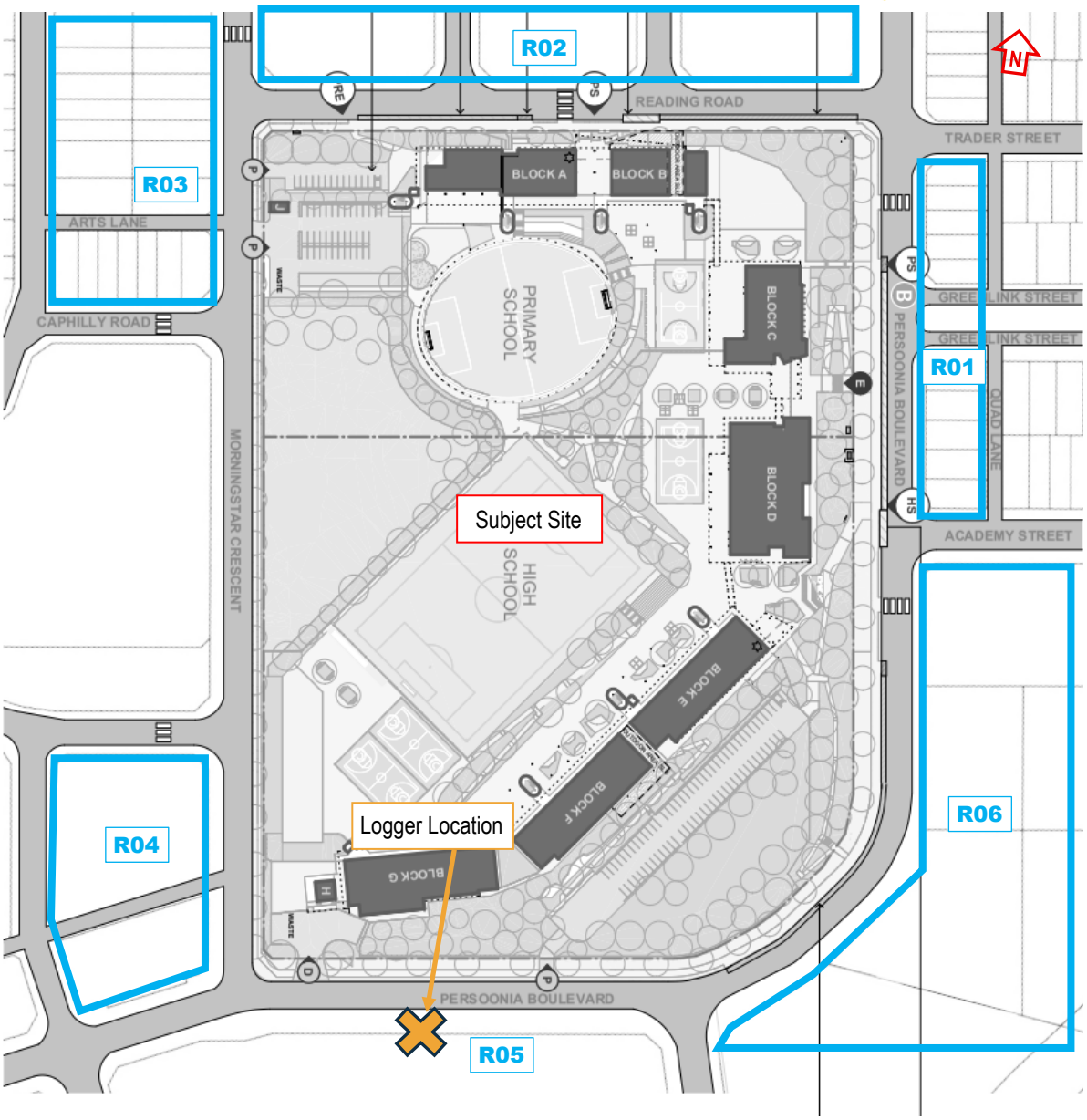

Figure 3: Site location, unattended noise monitoring and potentially affected receivers.

3.2. Unattended Sound Measurement Location

To determine the required appropriate site-specific sound levels of the project, an unattended sound logger (Type 1) was installed on the southern boundary of the site between 1 and 8 July 2025. BSE have undertaken unattended sound measurements in preparing this assessment using a Class 2 instrument, compliant with *IEC61672-1:2013 Electroacoustics – Sound level meters – Part 1: Specifications*, and within current NATA calibration at the time of the monitoring.

The sound logger was set to the "A-weighted" frequency weighting, the "Fast" time response, and was calibrated before and after use, using a NTi CAL200 S/N:17897 94 dB, 1 kHz tone, with no significant drift occurring. The sound logger serial number and calibration information are presented in Table 2.

Table 2: Noise Logger Calibration Information

Instrument model	Serial number	NATA Calibration certificate: issue date	Pre-Calibration [dB]	Post-Calibration [dB]
Rion NL-52EX	00710353	Nov 2023	94.0	94.0
NTi CAL200	17897	Feb 2025	-	-

Meteorological data for the project was sourced from the Bureau of Meteorology's weather stations at Singleton Defence AWS (Station 061430), Maitland Airport (Station 061428), and Cessnock Airport (Station 061260). As required by the NSW Environmental Protection Authority's (EPA), all weather affected measurements with significant rainfall or wind speeds > 5 m/s were deleted from the data set.

Note that during the first 2-3 days in July there was large amounts of rain and wind in much of Sydney-Newcastle region along the coast (50mm+ rain on 1 July), but there was significantly less measured around Singleton and Maitland areas inland (c. 10mm rain over the day with generally light drizzle observed).

The monitor was installed in a secure location in the vicinity of the site, which was representative of the existing background levels in the area, and minimally affected by residential dwelling construction to the east. Onsite earthworks were underway but were paused on the week starting from 30 June 2025, during the monitoring period.

During the installation of the noise monitor, it was observed that traffic noise from the Hunter Expressway (located over 800m to the north of the site) was slightly dominant at the site. Wind through trees and fauna such as birds were also clearly audible at times. Based on these observations, a single noise monitor was installed, and it is not expected that ambient noise levels would have been significantly different at locations of other assessed sensitive receivers (e.g. on the northern side of the site), as there is no nearby development that would create more localised noise impacts. Therefore, the installed noise logger is considered representative of existing ambient noise at the site and all nominated receivers. It is noted that future noise environment would change somewhat after suburban development and this is discussed further below; however, the current conditions are considered to be adequately captured based on the single logger location. Some limited construction to houses east of the site were ongoing, however at the logger location there was only very occasional hammering that was barely audible – this is not expected to have significantly affected the background LA90 measured. This is also a reason for the selected location which was far less affected by construction noise than other potential areas around the site.

Other locations around the site were generally inaccessible or insecure at the time of the assessment; houses to the east were under construction, the area to the north had some building materials and a construction site office and was therefore believed to be occupied, areas to the west have been cleared and separated into residential lots and were therefore essentially open ground and not suitable for long-term logger placement.

It is anticipated that once the surrounding area is fully developed, the nature of background noise will change dramatically and likely will be more dominated by suburban activity such as local traffic. Measured Hunter Expressway traffic noise will likely remain at a similar (or slightly increased) level, and fauna noise may remain similar or reduce in volume slightly. Measured noise levels are presented in Section 3.3.1 and the selection of noise criteria in relation to future development is discussed.

A photo of the noise monitor at this location is shown in Figure 4.

Figure 4: In-situ logger location, close-up view – southern boundary of site – facing south (1/7/25)

Figure 5: In-situ logger location, far view –standing onsite and facing south (1/7/25)

3.3. Measured Ambient Noise Levels

3.3.1. Unattended Background Levels

Following analysis, the overall Rating Background Levels (RBL) measured for Day, Evening, and Night periods are shown in Table 3.

Table 3: Overall L_{eq} ambient levels and Rating Background Levels (RBL)

Noise Data [$L_{90,\ period}$ dB(A)]	**Day (0700-1800)**	**Evening (1800-2200)**	**Night (2200-0700)**
Measured RBL	41	41	38
AS1055.3-1997 Guideline Background Levels (Areas with low density transportation)	45	40	35

As discussed, the surrounding area is currently sparsely populated but there are plans for construction of many new residential dwellings and sporting fields around the site, as well as new commercial development further to the north and east. After completion of these developments, the Huntlee area is expected to be typical of a suburban locality and background noise sources may change. During the noise monitoring period, background noise was observed to consists mostly of motorway traffic noise (from Hunter Expressway), flora and fauna noise. Noise levels from motorway traffic and birds are expected to remain relatively consistent after the development.

A graphical depiction of the measured ambient noise levels throughout the week is shown in Figure 6.

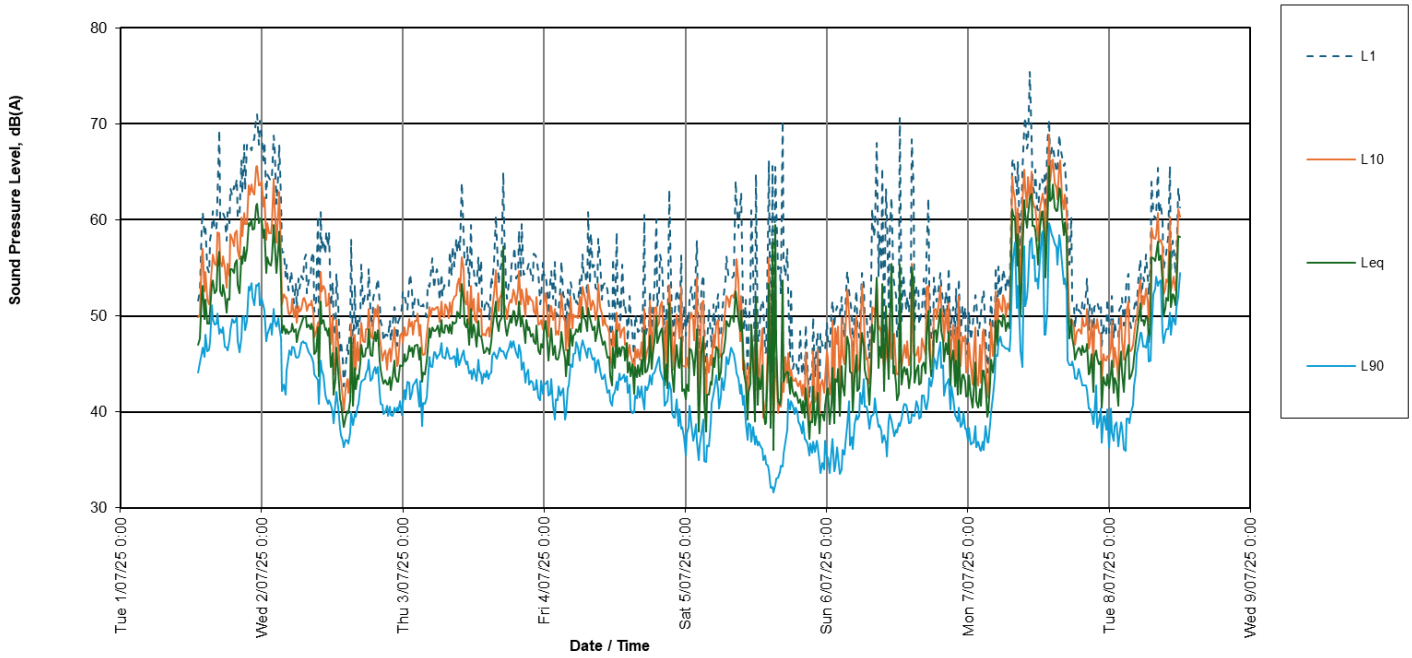

Figure 6: Ambient Noise Level Graph, dB(A)

Based on the measured noise levels, project specific criteria have been determined in the following section.

4. Statutory Noise Emission Requirements

4.1. Noise from School Uses

Noise criteria from school buildings are nominated in the State Environmental Planning Policy (SEPP) Transport and Infrastructure 2021, which is shown in this Section. Note that noise from outdoor play areas in schools are generally not explicitly stated in any NSW legislation.

However, the following may be used as guidance in assessing noise impacts from schools:

- NSW EPA Noise Guide for Local Government (2023)
- NSW EPA Noise Policy for Industry (2017)
- AAAC Guideline for Child Care Centre Acoustic Assessment (2013)

4.2. NSW Protection of the Environment Operations Act (1997)

Under the POEO (1997), the NSW Environment Protection Authority, has the responsibility to issue policy statements to set out criteria and methods of management for noise within the state. Cessnock Council may use its powers under the Protection of the Environment Operations Act (1997) to enforce noise controls in the community.

4.3. NSW Noise Guide for Local Government

The NSW Noise Guide for Local Government (2023) nominates private schools as responsibility of Council, and public schools as responsibility of the EPA. Table 6 of the Noise Guide for Local Governments states that “Councils should refer complaints/concerns to the EPA”. Although additional information regarding non-regulatory approaches and guidelines are provided for private schools, this is not included for public schools within the document.

4.4. Association of Australasian Acoustical Consultants

The Association of Australasian Acoustical Consultants (AAAC) discusses reasonable noise limits for outdoor play areas of childcare centres, in the *Guideline for Child Care Centre Acoustic Assessment Version 3.0*, dated September 2020. In lieu of legislation requirements, these criteria may be used as a guide for outdoor school noise as well. Noise criteria are nominated as follows:

> *"**Base Criteria** – With the development of childcare centres in residential areas, the background noise level within these areas can at certain times, be low. Thus, a base criterion of a contributed $L_{eq,15min}$ 45dB(A) for the assessment of outdoor play is recommended in locations where the background noise level is less than 40dB(A).*
>
> ***Up to 4 hours (total) per day)** – If outdoor play is limited to no more than 2 hours in the morning and 2 hours in the afternoon, the contributed $L_{eq,15min}$ noise level emitted from the outdoor play shall not exceed the background noise level by more than 10 dB at the assessment location.*
>
> ***More than 4 hours (total) per day)** – If outdoor play is not limited to no more than 2 hours in the morning and 2 hours in the afternoon, the contributed $L_{eq,15min}$ noise level emitted from the outdoor play shall not exceed the background noise level by more than 5 dB at the assessment location.*
>
> ***Commercial Receptors***
> *The cumulative $L_{eq,15min}$ noise level emitted from the use and operation of the childcare centre shall not exceed 65 dB(A), from all activities (including outdoor play), when assessed at the most affected point on or within any commercial property boundary.*

4.5. State Environmental Planning Policy (SEPP) Transport and Infrastructure 2021

4.5.1. Noise Emissions from School Buildings

The State Environmental Planning Policy (SEPP) Transport and Infrastructure code from 2021 details acoustic criteria for schools in relation to noise emissions to neighbouring sensitive receivers. Relevant criteria are specified in *Schedule 6 Complying development in schools – Chapter 3*, but may be applied to all development pathways, as shown:

> ***6 Noise***
>
> *A new building or (if the development is an alteration or addition to an existing building for the purpose of changing its use) an existing building that is to be used for the purpose of a school or school-based child care must be designed so as not to emit noise exceeding an L_{Aeq} of 5dB(A) above background noise when measured at any property boundary.*

Note that this noise limit is equivalent to the intrusive noise limit detailed in the NSW Noise Policy for Industry (NPfI) 2017. Therefore, compliance with the NSW NPfI 2017 would also indicate compliance with this SEPP regulation. Project specific criteria in the following section are determined from the Noise Policy for Industry but are equivalent to or lower than the SEPP limits.

4.6. NSW Noise Policy for Industry (NPfI) 2017

4.6.1. Intrusive/Amenity Criteria

The NSW NPfI provides assessment methodologies, criteria and detailed information on the assessment of environmental noise emissions in NSW. The NSW NPfI criteria for noise sources consider two (2) components, amenity and intrusive noise. Assessment of the components are summarised as follows:

- Maintaining noise amenity for various categories of land use (including residential receivers and other sensitive receivers). The amenity criterion is based on the sensitivity of a particular land use affected by industrial noise. The recommended amenity noise levels detailed in Table 2.2 of NSW NPfI represent the objective for total industrial noise at a receiver location, whereas the project amenity noise level represents the objective for noise from a single industrial development at a receiver location. This is to ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area. The project amenity criteria for each new source of industrial noise are equal to the recommended amenity noise level minus 5dBA.

- A +3dBA conversion is to be added to project amenity noise level for conversion from a period level to a 15-minutes level. Where the resultant project amenity noise level is 10dB or lower than the existing industrial noise level, the project amenity noise levels can be set at 10 dB below existing industrial noise levels if it can be demonstrated that existing industrial noise levels are unlikely to reduce over time.

- Controlling intrusive noise impacts for residential receivers. Assessing intrusiveness usually requires noise measurements to quantify background (LA90) noise levels at a location considered representative of the most potentially affected residential receiver(s). The intrusiveness criterion essentially means that for a given receiver the equivalent continuous noise level (Leq) of the source(s) under consideration should be controlled to 5 dB above the background noise level.

4.6.2. Sleep Disturbance Criteria

Sleep disturbance criteria are nominated in the policy for industry, as follows:

- $L_{Aeq,15min}$ 40 dB(A) or the prevailing RBL plus 5dB, whichever is the greater, and
- L_{AFMax} 52 dB(A) or the prevailing RBL plus 15dB, whichever is the greater

However, as the sleep disturbance criteria apply to the night-time period only (10pm-7am), and no activities are expected to occur onsite during this period, it has not been applied in this assessment.

4.7. Construction Noise

Construction noise is a major environmental noise issue in NSW, and it is well accepted that this activity can adversely affect, sleep, concentration and learning performance and mental and physical health. While construction noise is temporary in nature, its impacts need to be controlled.

The NSW Interim Guideline for Construction Noise (2009) (IGCN) is specifically aimed at managing noise from construction works. From a regulatory perspective, the local Council is the appropriate regulatory authority for non-scheduled construction activities. The following application of the policy is summarised below in Table 4.

Table 4: GCN noise criteria at residences, using quantitative assessment, L_{eq}.

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+10dB	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 meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration as well as contact details.
	Highly noise affected 75dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining, regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, considering: Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences) If the community is prepared to accept longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5dB	A strong justification would typically be required for work 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 (NSW Interim Construction Noise Guideline)

Table 5: GCN noise criteria at commercial receivers, using quantitative assessment, L_{eq}.

Land Use	Management Level, $L_{Aeq\ (15min)}$ (applies when properties are being used)	How to apply
Offices, retail outlets	External noise level 70dB(A)	The proponent should consult with noise sensitive land use occupants likely to be affected by noise from the works to schedule the project's work hours to achieve a reasonable noise outcome.
Classrooms at schools and other education institutions	Internal noise level 45dB(A)	
Places of worship	Internal noise level 45dB(A)	
Active recreation areas	External noise level 65dB(A)	
Passive recreation areas	External noise level 60dB(A)	

A 10dB(A) reduction is assumed between external and internal noise impacts at the relevant receivers, based on open windows. Therefore, a level of 55dB(A) externally is used as the relevant management level.

4.8. Construction Vibration Limits

Construction vibration levels depend on several factors. These include the activity, the machine, the geology of the ground and the distance between the building and the source. In Australia there is no current specific standard for construction vibration.

The NSW EPA Assessing Vibration: a technical guideline (2006) provides some guidance in relation to human comfort but does not directly relate to damage levels to buildings. This methodology is equivalent to the guidelines issued in current international standards and described in *'AS2670 Vibration and shock - Guide to the evaluation of human exposure to whole body vibration'*, as shown below in Table 6.

Table 6: Multiplying Factors to obtain limit vibration levels (mm/s) - human comfort criteria

Place	Multiplying Factors		
	Time	Continuous Vibration	Intermittent or Impulsive
Residential	Day 0700-2200	2	60
	Night 2200-0700	1.4	20
Office	Day 0700-2200	4	128
	Night 2200-0700	4	128
Workshops	Day 0700-2200	8	128
	Night 2200-0700	8	128

With regards to structural damage, the German DIN4150 and NSW OEH/British Standard BS6472 provide guidelines relevant to this assessment. These criteria are summarised below in Table 7.

Table 7: Typical Vibration Limit Criteria (mm/s) – structural damage criteria

Criterion	Typical Vibration Velocity (mm/s)	Standard
Disturbance to Persons (Day) 0700-2200	0.3 – 0.6 peak	BS6472
Disturbance to Persons (Night) 2200-0700	0.2 peak	BS6472
Damage to Dwellings	5 – 15 rms	DIN 4150
Damage to Heritage Buildings	3 – 8 rms	DIN 4150

Management of noise and vibration impacts during construction is best mitigated through the implementation of a site noise and vibration management plan by the prospective lead building contractor.

4.9. Traffic Noise Generation

The requirements of the NSW Road Noise Policy (RNP) regarding traffic generation from new developments are applicable to this assessment are summarised below in Table 8.

Table 8: NSW RNP – Noise Assessment Criteria for residential land uses, dB(A).

Road Category	Type of Project / Land Use	Assessment Criteria dB(A)	
		$L_{Aeq15hr}$, Day 7am to 10pm	$L_{Aeq\ 9hr}$ Night 10pm to 7am
Freeway/Arterial/Sub-Arterial	1. Existing residences affected by noise from new freeway/arterial/sub arterial road corridors	55 (external)	50 (external)
	2. Existing residences affected by noise from redevelopment on existing freeways	60 (external)	55 (external)
	3. Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments.		
Local Roads	4. Existing residences affected by noise from new local road corridors	55 (external)	50 (external)
	5. Existing residences affected by noise from redevelopment of existing roads.		
	6. Existing residences affected by additional traffic on existing local roads generated by land use developments.		

Table 9: NSW RNP – Noise Assessment Criteria for non-residential land uses affected by traffic generating developments, dB(A).

Existing sensitive land use	Assessment Criteria dB(A)	
	L_{Aeq1hr}, Day 7am to 10pm	L_{Aeq1hr} Night 10pm to 7am
1. School Classrooms	40 (Internal) when in use	-
2. Hospital Wards	35 (Internal)	55 (external)
3. Places of worship	40 (Internal)	40 (Internal)

The functional role for each type of road category definition relevant to this assessment is as follows:

a) Sub-arterial roads:
- Provide connection between arterial roads and local roads.
- May support arterial roads during peak periods.
- May have been designed as local streets but can serve major traffic generating developments or support non-local traffic.

b) Local roads:
- Provide vehicular access to abutting property and surrounding streets.
- Provide a network for the movement of pedestrians and cyclists and enable social interaction in a neighbourhood.
- Should connect, where practicable, only to sub-arterial roads.

The NSW Road Noise Policy notes the following:

> *"Where existing traffic noise levels are above the noise assessment criteria, the primary objective is to reduce these through feasible and reasonable measures to meet the assessment criteria. In assessing feasible and reasonable mitigation measures, an increase of up to 2dB represents a minor impact that is considered barely perceptible to the average person."*

For the purposes of this assessment and with reference to the Calculation of Road Traffic Noise (CORTN) the following assessment applicable to the NSW RNP was calculated on the following basis.

Change in Traffic Noise = 10 x log (Proposed vehicles per hour/Existing vehicles per hour) – where all other *environmental factors e.g. speed, gradient, % heavy vehicles are largely constant;*

Where a change of >2dB is considered to represent a perceptible change in traffic noise levels.

4.10. Project Specific Criteria

4.10.1. Intrusive/Amenity Noise Criteria

The selection of the project specific criterion is detailed in Table 10. Based on the future development of the surrounding area, the suburban residential category is selected for residential receivers.

Table 10: NSW Noise Policy for Industry Project Criteria, L_{eq} dB(A).

Receivers	Time Period	Measured Background L_{A90} RBL (dBA)	Intrusiveness Criteria (RBL + 5dBA)	Nominated Noise Amenity Area	Designated Amenity Noise Level	Project Amenity Criteria (Amenity Level -5dBA + 3dBA)	Overall Criterion (Lower of Intrusiveness/ Amenity)
1, 3-4, 6	Day	41	46	Suburban Residential	55	53	46
	Evening	41	46		45	43	43
	Night	38	43		40	38	38
2	Day	N/A	N/A	Commercial Premises (when in use)	65	63	63
	Evening	N/A	N/A		65	63	63
	Night	N/A	N/A		65	63	63
5	Day	N/A	N/A	Passive Recreation (when in use)	50	48	48
	Evening	N/A	N/A		50	48	48
	Night	N/A	N/A		50	48	48

4.10.2. Construction Noise

Following the determination of daytime RBL values, during Recommended Standard Hours, the following Noise Affected and Highly Noise Affected Construction Noise Management Levels are summarised below in Table 11. Predicted construction noise impacts have been determined in Section 5.2 of this report.

Table 11: Construction Noise Management Levels $L_{eq,15min}$ dBA – Recommended Standard Hours.

Time of Day	Receiver	Measured RBL (dBA)	Management Level, $L_{Aeq\ (15min)}$	Highly Affected Management Level, $L_{Aeq\ (15min)}$
Recommended Standard Hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or public holidays	1-6 (all) (residential)	41	Noise affected (41+10) = 51	75
Recommended standard hours and When receivers are in use	Offices, retail outlets	N/A	70	N/A
	Onsite classrooms (if operational during construction elsewhere on the site)	N/A	55*	N/A
	Places of worship	N/A	55*	N/A
	Active recreation areas	N/A	65	N/A
	Passive recreation areas	N/A	60	N/A

*Noise limits for school classrooms and places of worship are nominated as 45dB(A) internally in the Interim Construction Noise Guideline. A reduction of 10dB(A) from external levels to internal levels is applied, assuming open windows, according to the EPA. The levels listed in this table are the external levels (55dBA).

5. Noise Impacts

5.1. Environmental Noise Impacts

5.1.1. Noise Assessment Methodology

BSE have modelled as the following a worst-case 15-min period based on the information stated below. School activity is assessed during the daytime period (Mon-Sat 7am-6pm, Sun 8am-6pm) only. Use of the PS and HS halls has been also assessed throughout the evening period (6pm-10pm) as well, in relation to community events or after-hours school events that might take place. The total student numbers proposed for the schools are:

- Preschool – 60 children
- Primary School – 500 students
- High School – 1,000 students

The expected significant noise sources during typical operation of the schools, and general methodology for determining noise levels are as follows:

Noise from Buildings:

- 20 children in each classroom. Noise breakout from each classroom is determined based on the proposed facades, open windows, and an internal reverberation time of 0.5 seconds at mid-frequency. Half of the students are assumed to be talking simultaneously at normal speech levels.
- Noise breakout from the wood workshop is calculated based on typical use of circular saws, hammers, and student talking from 5 students simultaneously (normal voices).
- Noise breakout from the metal workshop is calculated based on typical use of hand-held welders (gas cutters), hammers, and student talking from 5 students simultaneously (normal voices).
- Up to 500 student/person crowd in the high school hall and 300 in the primary school hall. Noise sources assumed in these areas are:
    - Cheering, assumed 1 minute duration within a 15-minute period as a worst case
    - Talking at other times, with half of the audience speaking at any given time
    - Amplified music/speech for performances
- Predicted noise levels from voices in the halls and classrooms are modelled on normal voice levels of 57dB(A) Leq at 1m per person (average male and female voices).

Noise from Outdoor Sources:

- Vehicle carparking is assessed at the following rates:
    - 15 vehicle passes in the PS carpark in the worst-case daytime and evening 15-minute period
    - 20 vehicle passes in the HS carpark worst-case daytime and evening 15-minute period
- Outdoor play areas are assessed as follows:
    - 300 students are assessed externally on the high school oval and 200 in the primary school oval
    - 30 students are assessed externally in each of the basketball court areas.
    - Use of sports whistles on the ovals and court areas. A total of 10 separate 1-second whistle blasts assumed time over a 15-minute period. Whistles are assessed as both tonal and impulsive and have a +7dBA correction as a result.

- The outdoor VET and COWA areas include hand tools such as drills and hammers, as well as talking from 5 students simultaneously (raised voices) in each. Hammers are assessed as impulsive (+2dBA correction).
- 60 Preschool children are assessed outside as playing outside simultaneously. To form a worst-case scenario, they are split up as follows:
    - 10 students on in the entry courtyard (northwest of the preschool building)
    - 50 students on the main outdoor play area (south of the preschool building)
- Noise levels from children playing are based on those stated in the AAAC Guideline for Child Care Centre Acoustic Assessment, V3.0 dated September 2020, using levels for 3–5-year-olds.
- Predicted noise levels from voices in the outdoor ovals and courts are modelled on raised voice levels of 66dB(A) Leq at 1m per person (average male and female voices).
- Half of the children in each area are assumed to be talking at any given time.

Table 12: Noise Source Sound Power Levels, Leq

Area	Noise Source	Description	Octave Band Centre Frequency, Leq dB - Sound Power Level								
			63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	dB(A)
Classrooms (each classroom)	Speech & class activity	Breakout noise level - Voice (10 students talking)	52	56	64	65	56	54	50	45	**64**
Driveway/Carpark	Car Parking	15 second vehicle start and pass	86	84	81	78	80	80	75	67	**85**
HS Hall	500-person audience	Cheering/ applauding (1 min per 15-min period)	86	91	99	105	104	99	94	85	**107**
		Talking (250 normal voices)	82	87	97	98	90	88	84	79	**98**
	Amplified Speakers	Music, PA/speech	101	101	99	99	97	92	87	77	**101**
PS Hall	300-person audience	Cheering/ applauding (1 min per 15-min period)	84	89	97	103	102	97	92	83	**105**
		Talking (150 normal voices)	80	85	95	96	88	86	82	77	**96**
	Amplified Speakers	Music, PA/speech	101	101	99	99	97	92	87	77	**101**
HS Oval	300 students playing	Talking (150 raised voices)	80	85	95	96	88	86	82	77	**96**
	Whistles	Whistle noise per event	93	95	95	94	92	99	94	91	**102**
PS Oval	200 students playing	Talking (100 raised voices)	78	83	93	94	86	84	80	75	**94**
	Whistles	Whistle noise per event	93	95	95	94	92	99	94	91	**102**
HS Basketball Courts (Southwest)	30 students playing	Talking (15 raised voices)	70	75	85	86	78	76	72	67	**86**
HS Basketball Court (East)	30 students playing	Talking (15 raised voices)	70	75	85	86	78	76	72	67	**86**
PS Basketball Cout	30 students playing	Talking (15 raised voices)	70	75	85	86	78	76	72	67	**86**
VET Area	5 students talking	Talking (5 normal voices)	65	70	80	81	73	71	67	62	**81**
	Handheld Electric Drill	Drilling per event (30 seconds)	75	80	85	90	91	93	96	94	**101**

Area	Noise Source	Description	Octave Band Centre Frequency, Leq dB - Sound Power Level								
			63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	dB(A)
	Hammer	Hammer per event (10 seconds)	94	94	96	96	91	85	83	79	**97**
COWA Area	5 students talking	Talking (5 normal voices)	65	70	80	81	73	71	67	62	**81**
	Handheld Electric Drill	Drilling per event (30 seconds)	75	80	85	90	91	93	96	94	**101**
	Hammer	Hammer per event (10 seconds)	94	94	96	96	91	85	83	79	**97**
Preschool Outdoor Courtyard	10 children assumed 3+ years old	AAAC Levels for outdoor play	64	70	75	81	83	80	76	72	**87**
Preschool Outdoor Play	50 children assumed 3+ years old	AAAC Levels for outdoor play	71	77	82	88	90	87	83	79	**94**

Using these source levels, the calculated impacts are presented in Section 5.1.2.

5.1.2. Calculated Noise Impacts

Noise from Buildings

The calculated noise impacts from typical classroom voice activity are shown in Table 13. Only use of the hall is assessed during the evening periods; classroom activity occurs during the daytime only.

Table 13: Predicted Sound Power Level (Leq) from indoor activities at each receiver dB(A).

Receiver	Daytime Period (Mon-Sat 7am-6pm, Sun 8am-6pm)		Evening Period (6pm-10pm)		Complies with Criteria Yes/No
	Predicted Noise Level – $L_{eq,15min}$ Day	Criteria $L_{eq,15min}$ Day	Predicted Noise Level – $L_{eq,15min}$ Evening	Criteria $L_{eq,15min}$ Evening	
1 (Northeast)	37	46	36	43	Yes
2 (North)	42	63	38	63	Yes
3 (Northwest)	40	46	39	43	Yes
4 (Southwest)	44	46	38	43	Yes
5 (South)	38	48	31	48	Yes
6 (Southeast)	41	46	40	43	Yes

Results include recommended façade treatments to the hall buildings (C and D) for both the Primary School and High School, as discussed in Section 6.

Noise levels from assessed indoor activities are predicted to comply with relevant criteria at all assessed offsite receivers during the daytime period.

Noise from Outdoor Activity

The calculated noise impacts from outdoor activities are shown in Table 13, assessed in relation to AAAC guidelines (BG+10dBA) as discussed. Only vehicle passes are assessed during the evening periods in relation to use of the halls; children playing occurs during the daytime only.

Table 14: Predicted Sound Power Level (Leq) from outdoor activities at each receiver dB(A)

Receiver	Daytime Period (Mon-Sat 7am-6pm, Sun 8am-6pm)		Evening Period (6pm-10pm)		Complies with Criteria Yes/No
	Predicted Noise Level – $L_{eq,15min}$ Day	Criteria $L_{eq,15min}$ Day	Predicted Noise Level – $L_{eq,15min}$ Evening	Criteria $L_{eq,15min}$ Evening	
1 (Northeast)	46	51	29	51	Yes
2 (North)	51	51	34	51	Yes
3 (Northwest)	50	51	39	51	Yes
4 (Southwest)	51	51	25	51	Yes
5 (South)	44	51	35	51	Yes
6 (Southeast)	48	51	35	51	Yes

Noise levels from assessed outdoor activities are predicted to comply with relevant criteria at all assessed offsite receivers during the daytime period, on condition the recommendations in Section 6 are implemented.

5.2. Construction Noise Impacts

To predict the impact of noise associated with construction, estimated plant and sound power levels were split across the main construction stages. At this stage, the proposed construction methodology has not been finalised. For assessment purposes, we have assumed typical construction plant and equipment will be used at each stage of the project, as summarised below in Table 15.

Additional noise adjustment factors for tonal or impulsive noise have been included to relevant noise sources.

Table 15: Typical construction plant and sound power levels L_W dB(A) (DEFRA)

Typical Plant	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	dBA
Excavation Works									
Bobcat (5t)	99	99	94	87	87	86	82	76	**93**
Truck Delivery	114	110	105	102	98	94	90	83	**104**
Screw Piler	104	101	90	94	90	86	82	77	**95**
Structural Works									
Truck Delivery	114	110	105	102	98	94	90	83	**104**
Concrete Pump	112	104	98	99	101	101	94	86	**106**
Saw	110	110	100	99	97	96	90	92	**103**
Mobile Crane (50t)	106	97	95	92	90	85	77	68	**95**
Angle Grinder	85	79	80	88	98	105	101	101	**110**
Hammer	94	94	96	96	91	85	83	79	**97**
Fit out Works									
Truck Delivery	114	110	105	102	98	94	90	83	**104**
Angle Grinder	85	79	80	88	98	105	101	101	**110**
Hammer	94	94	96	96	91	85	83	79	**97**

Predicted construction noise impacts are presented below in Table 16. Fitout works are conservatively assumed to have a 10dB(A) reduction due to being undertaken internally within the relevant building. This assessment is conservative, as equipment may not all operate simultaneously, and therefore noise impacts may often be under the relevant criteria at all receivers.

Table 16: Predicted Construction Noise Levels $L_{eq15min}$. during regular hours dB(A)

Receiver	Phase	Predicted Noise Levels, $L_{Aeq15min}$	Noise Affected Management Level – Typical Standard Hours, $L_{Aeq15min}$	Highly Noise Affected Management Level, $L_{Aeq15min}$
1 (Northeast)	Excavation Works	65	51	75
	Structural Works	69	51	75
	Fit out Works	55	51	75
2 (North)	Excavation Works	65	51	75
	Structural Works	71	51	75
	Fit out Works	58	51	75
3 (Northwest)	Excavation Works	65	51	75
	Structural Works	68	51	75
	Fit out Works	50	51	75
4 (Southwest)	Excavation Works	62	51	75
	Structural Works	68	51	75
	Fit out Works	55	51	75
5 (South)	Excavation Works	58	51	75
	Structural Works	63	51	75
	Fit out Works	50	51	75
6 (Southeast)	Excavation Works	61	51	75
	Structural Works	66	51	75
	Fit out Works	51	51	75

Construction works are assumed to be undertaken at the closest typical location to each receiver. When construction works are being conducted at a location on the opposite side of the site to each receiver, noise impacts will be significantly lower than shown. Construction noise levels are predicted in the worst case to exceed the Noise Affected Management Levels at all nominated receivers during excavation and structural works, and during fit out works at Receivers 1, 2, and 4. Therefore, reasonable work controls may need to be implemented to minimise disruption to neighbouring residents.

Full planning and construction of the residential receivers have not yet been finished. Noise impacts may vary depending on the location of finished and occupied dwellings in relation to the construction location. Further assessment should be conducted through a noise and vibration management plan when this information, in addition to further construction equipment and programming information, are available.

The staging programme of the school construction is not currently known. If some onsite buildings/classes would be operational during construction of later stages, they would also be required to be included in a future assessment when this information becomes available. Truck and other heavy vehicle entry to the site should be conducted at a location as far as feasible away from occupied dwellings.

It is known that some excavation works are currently ongoing over both the Primary School and High School sites. Excavation work has been included in this assessment, but it is unknown to what extent this will be undertaken under this application and approval.

Further discussion and recommendations are provided in Section 6.

Table 17. AS2436 typical best practice construction noise mitigation measures.

Control by	**Nominal noise reduction, in total A-Weighted sound pressure level, dB(A)**	**Comments**
Distance Attenuation	6 dB(A) reduction per doubling of distance	Due to small distances to the nearest residential receiver, this measure has only limited effectiveness, particularly at the adjoining property boundary (see barriers/hoardings).
Barriers/Hoardings	Normally 5 to 10 dB(A), maximum 15 dB(A)	Site hoardings are both practical and effective means of reducing noise levels from the site to the nearest affected receivers. These are highly recommended, particularly for activities which may occur in close proximity to the nearest affected residential boundaries.
Enclosure	Normally 10 to 15 dB(A), maximum 50 dB(A)	This measure is best used on individually noisy plant items, such as saws, drills, pumps, where possible.
Silencing/Mufflers	Normally 5 to 10 dB(A), maximum 20 dB(A)	Consider the use of quiet plant and equipment, where possible.

5.3. Construction Vibration Impacts

Vibration impacts may become a potential issue to the onsite building where equipment such as piling rigs, vibratory rollers, or jackhammers are used. Although the construction methodology has not been finalised, this equipment is not expected to be used for the project, and therefore it is unlikely that significant vibration will occur. A construction vibration plan should be conducted where vibration limits could potentially cause cosmetic damage or exceed the limits stated in DIN4150-3 (2016) (Vibration in Buildings – Effects on Structures). Recommended safe working distances for typical equipment are provided in Table 18. Further assessment should be conducted when equipment selection and location have been finalised.

Table 18: Recommended safe working distances for construction plant, metres (m).

Plant Item	Rating Description	Cosmetic Damage	Human Response (OHSE Vibration Guideline - AVATG
Vibratory Roller	<50kN (Typically 1-2 tonnes)	5m	15-20m
	<100kN (Typically 1-2 tonnes)	6m	20m
	<200kN (Typically 1-2 tonnes)	12m	40m
	<300kN (Typically 1-2 tonnes)	15m	100m
Small hydraulic hammer	(300kg – 5 to 12t excavator)	2m	7m
Medium hydraulic hammer	(900kg – 12 to 18t excavator)	7m	23m
Large hydraulic hammer	(1600kg –18 to 34t excavator)	22m	73m
Jack hammer	Hand-held	1m	2m
Vibratory Pile Drive	Sheet Piles	2m to 20m	20m

6. Recommendations

6.1. SINSW Mitigation Measures

Mitigation measures are summarised in Table 19. Further specific recommendations for acoustic treatments and management controls are nominated in the following subsections.

Table 19: Mitigation Measures – from DoE Standards

Aspect	MM ID	MM Name	Mitigation Measure	Timing
Construction	**CMM2**	Construction Environmental Management Plan	A Construction Environmental Management Plan (CEMP) is to be prepared and implemented having regard to the *Environmental Management Guidelines for Construction Procurement (Edition 4)*, and is to include where relevant, but not limited to, the following: (a) Details of: (i) Hours of work; (ii) 24-hour contact details of site manager; (iii) Management of dust and odour; (iv) Stormwater control and discharge; (v) Measures to ensure that sediment and other materials are not tracked onto the roadway by vehicles leaving the site; (vi) Any other specific environmental construction Mitigation Measures detailed in the REF; (vii) Any requirements outlined in any relevant approvals, permits, licences or landowner consents; and (viii) Community consultation and complaints handling in line with DoE's Stakeholder and Community Participation Plan. (b) Aerial Site Plan showing the location of the works; (c) The following: (i) Construction Traffic and Pedestrian Management; (ii) Construction Worker Transport Strategy (iii) Construction Noise and Vibration Management; (iv) Construction Waste Management (including details on contaminated waste); (v) Construction Air Quality and Dust Management; (vi) Construction Soil and Water Management; and (vii) Construction Flood Management. (d) Construction Tree Protection Plan; (e) Erosion and Sediment Control Plan; (f) Unexpected finds protocol for Aboriginal and non-Aboriginal heritage; (g) Unexpected finds protocol for contamination; (h) Construction Emergency Management Plan; Training of responsibilities/heritage site inductions under the *National Parks and Wildlife Act 1975*, *Heritage Act 1977* and any other relevant legislation, as relevant to the works.	Construction
Operational Management	**OPMM4**	Operational Plant and Machinery	Prior to the commencement of operations, it must be demonstrated by a suitably qualified acoustic engineer that noise associated with the operation of mechanical plant or machinery installed does not exceed the relevant project noise trigger levels.	Prior to the commencement of operations
Operational Noise	**OPNMM1**	Acoustic Barrier	A 2-metre-high acoustic barrier is to be erected around the outdoor VET training area prior to operation of the high school.	Prior to the commencement of operations
Operational Noise	**OPNMM2**	Acoustic Façade Performance	Construction of Block C and Block D (the primary and high school halls) facades are to meet minimum acoustic design performance as nominated in the Acoustic Noise and Vibration report (dated	Prior to the commencement of operations

Aspect	MM ID	MM Name	Mitigation Measure	Timing
			30/09/2025, Version 7, prepared by Building Services Engineers). A suitably qualified acoustic consultant is to certify the acoustic rating of the proposed systems prior to operation.	
Operational Noise	**OPNMM3**	Car Park Treatments	A suitably qualified acoustic engineer must certify that carpark areas are constructed to avoid rattling from metal grates and tyre squeak from car movement.	Prior to the commencement of operations
Operational Management	**OPNMM4**	Operational Noise	Operational noise is to be managed as required to minimise noise impacts to surrounding receivers: a) Staff to notify students if they are causing excessive noise b) Staff to monitor or restrict use of portable speakers c) Close windows and doors and adjust amplified speaker levels if required to minimise noise emanating from the school hall d) Notify neighbours if a large event is scheduled to take place e) Educate staff and students on minimising noise impacts f) Waste collection and van/truck delivery is to be conducted at times in accordance with the nearby residential and commercial uses	During operations

6.2. Acoustic Barrier

An acoustic barrier is recommended to be installed around the outdoor VET training area to the extent shown in Figure 7, i.e. on the northern, western, and southern boundaries of the VET area (up to Building H) The barrier should be at least 2.0m high when measured from finished ground level; the finished ground level in the VET area is RL67.50m according to the current architectural drawings by NBRS dated 19 August 2025. If proposed elevations of the site and VET area change, the barrier height may need to be adjusted.

The barrier must be free of gaps and holes, with a minimum transmission loss of Rw25. Suitable materials include double-lapped timber (16mm thick palings with 60% overlap), 6.38mm thick glass, or 10mm thick Perspex. Other materials may be used provided they achieve the minimum Rw25 rating.

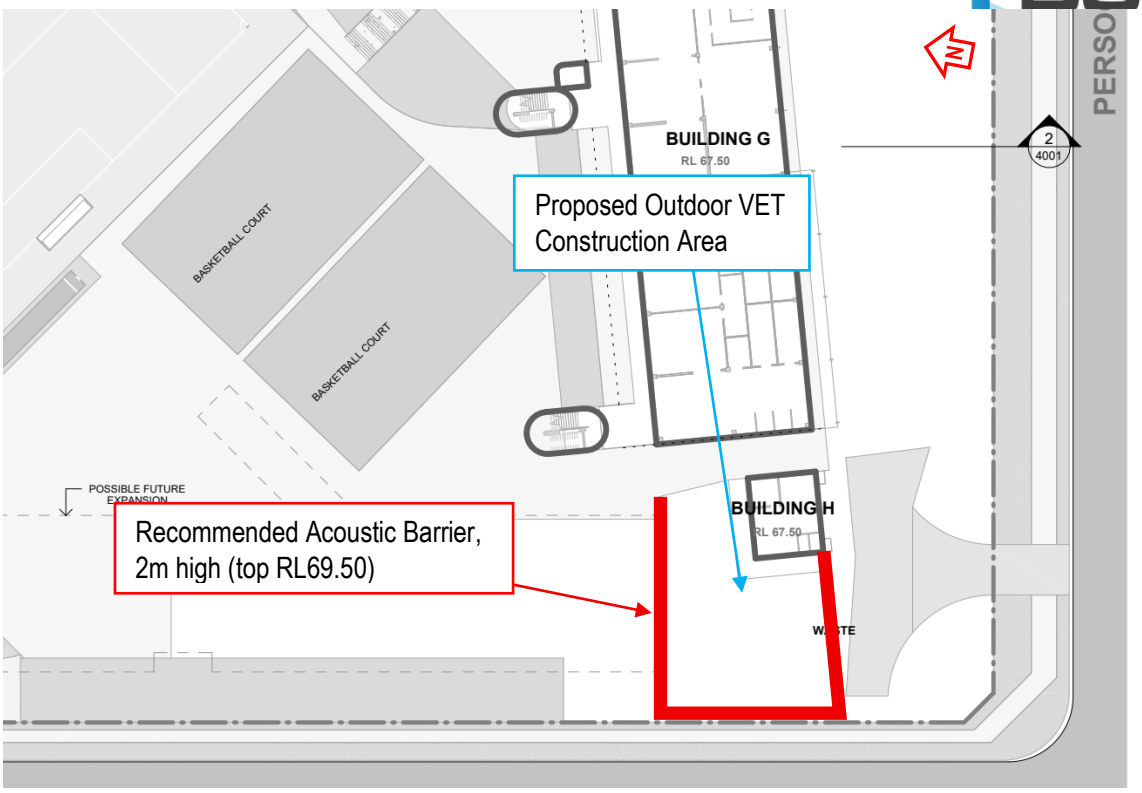

Figure 7: Recommended Acoustic Barrier (VET Training Area, Ground Level)

6.3. Façade Construction Recommendations

Based upon the predicted noise impacts which are detailed in Section 5.1.2, minimum acoustic ratings would be required for the hall buildings (Buildings C and D) in order to minimise noise breakout during full gatherings/events.

Minimum acoustic ratings are recommended as follows:

- All external walls should achieve minimum Rw40.
- On the eastern façade, external glazing and doors within the hall/gymnasium and stage spaces should achieve minimum Rw30.
- The roofs of the hall/gymnasium and stage areas should meet minimum Rw30.
- Doors and glazing on the southern, northern, and western facades can be of standard construction and remain open during events.

Façade treatments are shown in Figure 8.

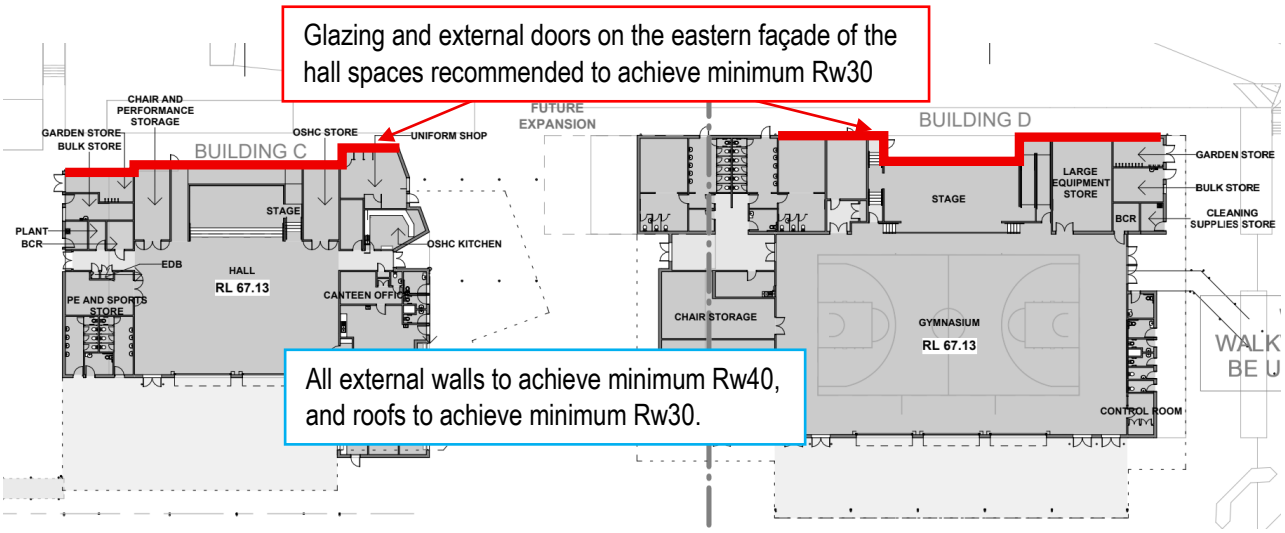

Figure 8: Primary and High School Hall Recommended Acoustic Treatments

Nominal façade wall constructions are listed below. Other systems may be implemented if they achieve the specified Rw rating.

- Wall Rw40:
  - Single 64mm steel studs, 75mm thick insulation (11kg/m^3) in cavity. 9mm thick fibre cement cladding externally and 13mm fire-rated plasterboard (min. 8.5kg/m^2) internally.
  - Standard masonry construction such as 190mm unfilled blockwork, or double brick, with internal plasterboard is generally compliant with Rw40.

Nominal glazing solutions are also stated below. Note that other systems may be implemented if they achieve the specified Rw rating. These systems are only typical recommendations; a laboratory (NATA or equivalent) test certificate should be reviewed to determine the rating of the applied system, once the exact product has been selected. The nominated Rw rating is required for the entire system which includes glass, frames, and seals.

- Glazing Rw30:
  - 6mm thick single glazing, fixed glazing or with full acoustic seals such as Q-Lon, or
  - 6mm/12mm air gap/4mm, fixed glazing or with full acoustic seals such as Q-Lon

Nominal ceiling constructions are listed below. Other systems may be implemented if they achieve the specified Rw rating.

- Ceiling Rw30:
  - 80mm thick Kingspan KS1000 RW (80) panels, with 50mm thick mineral fibre insulation (60kg/m^2) placed off a 70mm Galvanised Zed Purlin beneath. Perforated steel sheet (0.55mm thick, minimum 10% opening area) placed directly under insulation.
  - Sheet metal roof with joists and 10mm solid plasterboard internally.

The nominated wall, ceiling and glazing systems are only typical recommendations; a laboratory (NATA or equivalent) test should be reviewed to determine the rating of the applied system.

6.4. Other Construction and Management Controls

The following management controls should also be implemented to operation of the development.

- Amplified speakers inside each of the hall/gymnasium and stage areas of either school (Buildings C and D), should be limited to 93dB(A) when measured at 1m from any speaker.
- Use of the halls for events should be limited to the daytime and evening time periods only (Mon-Sat 7am-10pm, Sun & public holidays 8am-10pm).
- Use of all outdoor preschool, Primary School and High School play areas, including the ovals, basketball courts, and preschool play areas should be limited to the daytime period only (Mon-Sat 7am-6pm, Sun & public holidays 8am-6pm).
- Use of the outdoor VET and COWA construction areas should be limited to the daytime period only (Mon-Sat 7am-6pm, Sun & public holidays 8am-6pm).
- Waste collection should be undertaken in accordance with the surrounding residential and commercial uses.
- The following recommendations are proposed for the carparks in both schools:
    - Secure metal grating/drains to prevent any rattling.
    - Avoid any floor finishes that produce squealing tyres, e.g. polished concrete.

6.5. Construction Noise and Vibration

This report has included a preliminary assessment and recommendations for construction noise and vibration, as detailed in Section 5.2 and 5.3. Reasonable work controls may need to be implemented to minimise disruption to neighbouring residents, in line with AS2436-2010 and the NSW Interim Construction Noise Guideline.

All construction works are recommended to be conducted during standard work hours (Monday-Friday 7am-6pm, and Saturday 8am-1pm). No works are recommended to be undertaken during Sundays or public holidays.

Full planning and construction of the residential receivers have not yet been finished. Noise impacts may vary depending on the location of finished and occupied dwellings in relation to the construction location.

Further assessment should be conducted through a noise and vibration management plan when this information, in addition to further construction equipment and programming information, are available. Truck and other heavy vehicle entry to the site should be conducted at a location as far as feasible away from occupied dwellings.

It is not known at this stage whether any construction will occur during operation of onsite classrooms that are handed over in stages prior to remaining construction being completed. The noise impacts and recommendations would be dependent on the proposed staging program and the subsequent distances between operational classes and simultaneous construction, as well as more detailed equipment and schedule as part of the works. Therefore, this assessment to onsite receivers has not been included at this stage but should be conducted within a noise and vibration management plan in future design stages.

To achieve acceptable construction noise levels, it is recommended that best practice measures outlined in AS2436-2010 *'Guide to noise and vibration control on construction, demolition and maintenance sites'* and recommended best practice procedures in the NSW EPA Interim Guide are used. As stated, noise management measures such as scheduling, and community consultation are practical management measures to minimise the impacts to neighbouring residences and the existing school.

In addition, engineering measures such as site boundary hoardings may also be used to minimise these impacts. AS2436-2010 provides a summary of measures and their effectiveness in reducing noise impacts, as shown below

in Table 17. As specified by the EPA ICNG (2009) these mitigation measures must be feasible and reasonable options for use.

Given the relatively large working distances expected between heavy construction equipment and nearby residents (>50m), significant vibration impacts to these receivers are unlikely. Further assessment of vibration impacts to residents and onsite classes (if relevant) should be conducted during a future management plan, when more information regarding construction equipment and scheduling etc. is available.

It is a requirement of the Department of education that further assessment as part of a noise and vibration management plan is conducted after the exact equipment, and location/schedule of works is selected.

6.6. Mechanical Plant Noise

Limited information regarding mechanical plant location is available at this stage. Selection of equipment has not been undertaken at this stage and therefore a full acoustic assessment cannot be done. It is recommended that a full assessment be conducted at design stage, so that noise criteria stated in Section 4.5.1 is achieved at the nominated sensitive receivers. Further design work is also recommended in relation to mechanical plant noise impacts to onsite classrooms. However, it is anticipated that mechanical plant noise can be achieved through typical engineering measures such as:

- Selection of suitable setback distances / distance attenuation.
- Selection of quiet plant and equipment.
- The use of building shielding or rooftop shielding.
- The use of barriers and/or screens.
- The use of variable speed plant/equipment.
- The use of attenuators and or internally lined ductwork, where applicable.

This will be further developed during the detailed design phase of the project; however, it is anticipated that these measures will be sufficient to meet project specific noise levels for this development.

7. Conclusion

This Acoustic Noise and Vibration Impacts Assessment report has been undertaken for the proposed Primary and High Schools at Huntlee. This assessment has been completed in accordance with the SINSW Review of Environmental Factors (REF) requirements.

The areas surrounding the site are not finalised in respect to the proposed uses, building locations, etc. The assessment has been conducted based on proposed residential, commercial and recreation areas around the site based on current Huntlee suburb masterplan approvals. Noise and vibration criteria, particularly for construction works, may change depending on the final development plans for these offsite receivers.

Use of school buildings are predicted to comply with nominated SEPP noise criteria based on the assumptions stated in this report and the recommendations/mitigation measures outlined in Section 6 and below. For outdoor play and other activities, it is noted that there is no solid noise criteria nominated within the NSW EPA or SEPP legislation. A guideline of Background+10dBA for outdoor play areas is selected based on AAAC guidelines for childcare centres. This level is also predicted to be achieved for outdoor activities, if the recommendations stated in Section 6 are implemented.

Details regarding mechanical plant have not been finalised at this stage of the development. Potential noise impacts from any proposed mechanical plant should be assessed during design stages, when unit selection and location is finalised, to ensure that noise levels are compliant with the nominated criteria in this report, at sensitive onsite and offsite receivers.

A preliminary assessment of construction noise and relevant recommendations are also provided in this report; further assessment should be conducted once full scheduling and equipment selection has been finalised.

8. Appendix – Acoustic Terminology

'A' Weighted	Frequency filter applied to a noise spectrum that adjusts ('weights') each frequency differently. The 'A' weighting very roughly corresponds with subjective assessments of noise levels.
Ambient Sound	The overall noise level associated with an environment or space. It is usually a composite of sounds from many sources, both near and far. Usually taken to mean the L_{Aeq} value.
Background Noise Level	The average of the lowest measured noise levels in an affected area, in the absence of noise from occupants and/or unwanted external noise sources. Usually taken to mean the L_{A90} value.
dB(A)	The overall 'A' Weighted sound pressure level.
Decibel, dB	Unit of acoustic measurement. Measurements of power, pressure and intensity may be expressed in dB relative to standard reference levels.
D_w	*Weighted Level Difference* (D_w) a single integer number found by comparing the measured spectrum with the 'standard' curves for airborne and impact insulation. The weighted *level difference* is used to characterize the insulation between rooms in building as they are. Values cannot normally be compared with measurements made under other conditions.
L_{90}, L_{10}, etc	A statistical measurement giving the sound pressure level which is exceeded for the given percentile over a measurement period, i.e., L_{90} is the level which is exceeded for 90% of the measurement period. Likewise, the L_{10} level is the noise level exceeded for 10% of the measurement time. The L_{A90}, L_{A10} (etc) levels are the A-weighted noise levels exceeded for the respective percentile.
$L_{Aeq, T}$	Equivalent continuous A-weighted sound pressure level. The equivalent continuous A-weighted sound that, within a measurement time interval T, has the same A-weighted sound energy as a time-varying sound.
NR, Noise Rating	Single number evaluation of a background or ambient noise level. The noise spectrum is plotted against a series of NR curves and the NR is determined by the lowest NR curve not crossed by the noise spectrum. The NR is categorized by the level at 1 kHz i.e., the NR 50 curve has a value of 50 dB at 1 kHz. The NR level is normally around 5 to 6 dB below the 'A' weighted sound pressure level.
R_W	Weighted Sound Reduction Index. A single number value of the acoustic performance of a partition or building element. Calculation procedures for R_W are defined in ISO 140-2:1991 "*Measurement of Sound Insulation in Buildings and of Building Elements Part 2*". The R_W is function of the level difference between two spaces separated by the building partition or element, surface area of the building partition or element, room volume and area of absorption in the receiver room (generally measured by the reverberation time).
Sound Isolation	A reference to the degree of acoustical separation between any two areas. Sound isolation may refer to sound transmission loss of a partition or to noise reduction from any unwanted noise source. The term 'sound isolation' does not specify any grade or performance quality and requires the units and measurement conditions to be specified.

Sound Pressure Level **L_p, dB**	A measurement obtained directly using a microphone and sound level meter. Sound pressure level depends on the distance from a source and on the measuring environment. Sound pressure level equals 20 times the logarithm to the base 10 of the ratio of the rms. sound pressure to the reference sound pressure of 20 microPascals - $20\log_{10}$(measured rms pressure/2 x 10^{-6})
Sound Power Level **L_w, dB**	Sound power level is a measure of the sound energy emitted by a source. It does not change with distance and is not directly measured. Sound power level of a machine may vary depending on the actual operating load and is calculated from sound pressure level measurements with appropriate corrections for distance and/or environmental conditions. Sound power level is equal to 10 times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power of 1 picoWatt. - $10\log_{10}$(Sound Power/1 x 10^{-12}).