Cushman & Wakefield Project Services Aust Pty Ltd

November 2024

Noise Impact Assessment Report

SES ICC Expansion - Goulburn

Image: Lead Architects

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Noise Impact Assessment Report
SES ICC Expansion - Goulburn

Cushman & Wakefield Project Services Aust Pty Ltd

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WSP acknowledges that every project we work on takes place on First Peoples lands.
We recognise Aboriginal and Torres Strait Islander Peoples as the first scientists and engineers and pay our respects to Elders past and present.

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Glossary

Decibel, dB	The decibel (dB) is a logarithmic scale that allows a wide range of sound pressures to be represented in a more comprehensible range, typically 0 dB to 120 dB. The decibel is ten times the logarithm of the ratio of sound energy (i.e. power squared or pressure squared) relative to a reference level squared. The reference level for sound pressure is typically 20 µPa which is the approximate threshold of human hearing.
Decibel (A-weighted), dBA	A-weighting was devised to attempt to account for human response to sound not being equally sensitive at all frequencies; it consists of an electronic filter in a sound level meter, which attempts to build in this variability into the indicated noise level reading so that it will correlate, approximately, with human response.
Equivalent Continuous Sound Level, $L_{eq,T}$	Many sounds, such as road traffic noise or construction noise, vary repeatedly in level over a given time period. $L_{eq,T}$ is the equivalent continuous sound level over a given time period (T). It is often referred to as the 'average' level.
Maximum Sound Level, L_{max}	L_{max} is the absolute maximum sound level recorded over the measurement period.
Rating Background Level, RBL	RBL is the 10th percentile L_{A90} which accounts for temporal variation of background noise levels and is typically used as the assessment background level.
Sound insulation	A term to represent the level acoustical separation between any two areas. Sound insulation refers to the sound transmission loss of a partition or to noise reduction from any unwanted noise source. The term `sound insulation' does not specify any grade or performance quality and requires the units to be specified for any contractual condition.
Sound Power Level, L_w or SWL	The sound power level is the inherent noise of the source and is the total power radiated by the source, in dB. Sound power level does not vary with distance from the noise source or within a different acoustic environment.
Sound Pressure Level, L_p or SPL	The sound pressure level of a source, in dB, varies with distance from the noise source and with the environment in which it is located.
Spectrum Adaption Terms, C and C_{tr}	C and C_{tr} are spectrum adaptation terms that are added to sound insulation ratings (e.g. R_w+C_{tr}) to adjust for different sound characteristics. C is used to measure the performance of partitions for medium to high frequency sound sources. C_{tr} uses is used to measure the performance of a partition for low frequency sounds such as road traffic.
Statistical Noise Levels, L_n (L_{90}, L_{10}, L_{50}, etc.)	The noise level that is exceeded for the stated percentage of the noise measurement period. For example, L_{90} is the noise level that is exceeded for 90% of the noise measurement period. L_{90} is commonly referred to as the 'background' noise level. L_{10} is commonly referred to the 'intrusive' noise level. L_1 may refer to the 'average maximum" noise level.

Weighted Level Difference, D_w	Single number descriptor which characterises the airborne sound insulation properties of a building element over a defined range of frequencies from 100 Hz to 3.15 kHz. D_w is used to characterise the sound insulation of a partition that has been measured on site. It is derived from the difference in 1/3 octave band sound levels measured on one side of a partition to the other.
Weighted Sound Reduction Index, R_w	Single number descriptor which characterises the airborne sound insulation properties of a material or building element over a defined range of frequencies from 100 Hz to 3.15 kHz. R_w values are calculated from 1/3 octave band measurements undertaken in a test laboratory under ideal installation conditions.
Weighted Standardised Level Difference, $D_{nT,w}$	Single number descriptor which characterises the airborne sound insulation properties of a building element over a defined range of frequencies from 100 Hz to 3.15 kHz. The Weighted Level Difference (D_w) is then corrected based on a reference reverberation time and sound absorption area in the receiving space The single number $D_{nT,w}$ is then derived by comparison to reference values outlined in international standards.

Executive summary

WSP Australia Pty Ltd (WSP) has been engaged by Cushman & Wakefield Project Services Aust Pty Ltd (C&W) to prepare a Noise Impact Assessment as part of the Development Application (DA) submission for the proposed redevelopment of the NSW State Emergency Service (SES) premises located at 56-58 Knox Street, Goulburn, NSW. This report documents the methodology and outcomes of the assessment.

Operational noise egress criteria have been established and predictive assessment has been conducted to determine where noise mitigation measures will likely be necessary. Potential noise control mitigation measures are listed below. These measures will need to be reviewed and confirmed via future detailed design assessment by others:

- Diesel generator – plant enclosure, attenuators (subject to review of existing generator model)
- Following the consideration of safety, emergency sirens on vehicles will not to be used while in vicinity of the SES site.

External noise ingress criteria have also been recommended. Detailed design assessment will need to be conducted to finalise façade and roof constructions to meet the criteria.

Construction noise and vibration will need to be controlled per relevant NSW guidelines. The eventual construction contractor should prepare a Construction Noise and Vibration Management Plan (CNVMP) in consultation with an acoustic consultant.

1 Introduction

WSP Australia Pty Ltd (WSP) has been engaged by Cushman & Wakefield Project Services Aust Pty Ltd (C&W) to prepare a Noise Impact Assessment as part of the Development Application (DA) submission for the proposed redevelopment of the NSW State Emergency Service (SES) premises located at 56-58 Knox Street, Goulburn, NSW. This report documents the methodology and outcomes of the assessment.

1.1 Project overview

The project forms part of a larger set of works conducted in a total of four locations within NSW. The aim of the SES upgrades is to refurbish, expand and make existing facilities modular to make operation more efficient. The proposed scope of works for the redevelopment is summarised as follows:

- Construction of a new upper floor (Level 1) using a modular building system (currently the building is single level)
- Refurbishment / fit out of existing Ground Floor
- Building services infrastructure modifications for the new expansion. Additional new noise sources on the site will include externally located mechanical condenser units
- General site modifications such as landscaping, stormwater, radio systems and site storage
- Currently the site contains 14 existing car park spaces that will remain unchanged as a result of the redevelopment works.

The site location is shown in Figure 1.1.

Source: NSW SDT Explorer (accessed 06/11/2024)

Figure 1.1 Aerial photograph indicating site location

1.2 Relevant project documentation, policies and standards

The Noise Impact Assessment in this report is based on the following project documentation:

- Architectural drawings A00 to A15 (revision A2), issued by Lead Architects Pty Ltd, dated 04/11/2024.

Noise and vibration criteria in this report are based on the following key policies and standards:

- NSW Noise Policy for Industry (NPfI) [1]
- AS/NZS 2107 (AS 2107) [2]
- NSW DECC Interim Construction Noise Guideline (ICNG) [3]
- NSW DEC Assessing Vibration: a technical guideline (AVTG) [4]
- NSW Road Noise Policy (RNP) [5].

Refer to Section 7 for a comprehensive list of document references.

2 Operational noise egress criteria

This Section presents the criteria for operational noise egress from the site, which are based on requirements of the NSW NPfI [1]. No additional noise requirements appear to be required by the Goulburn Mulwaree Council [6]. Expected noise sources generated by the proposed development which are covered by the NPfI include mechanical plant and equipment and vehicle movements within the premises.

The NPfI assessment procedure for industrial noise sources has three components:

- Controlling noise intrusiveness in the short term for residences
- Maintaining noise level amenity for specific land uses for residences and other land uses
- Assessment of sleep disturbance for residences.

2.1 Nearby noise-sensitive receivers

The site is located within an Enterprise Corridor as designated by the Goulburn Mulwaree Local Environmental Plan 2009 [7]. The surrounding premises include light industrial land uses and residential properties. The operational use of the proposed development has potential noise impacts onto nearby noise sensitive premises, which are shown in Figure 2.1 and listed in Table 2.1.

Source: NSW SDT Explorer (accessed 06/11/2024)

Figure 2.1 Approximate site location and nearby noise-sensitive premises

Table 2.1 Identified nearest sensitive receivers

Ref.	Location	Type of receiver	Distance from project site
R1	54 Knox Street, Goulburn, NSW 2580	Light industrial	1 m (adjacent block)
R2	65 Knox Street, Goulburn, NSW 2580	Light industrial	20 m
R3	71 Knox Street, Goulburn, NSW 2580	Light industrial	20 m
R4	16 Oxley Steet, Goulburn, NSW 2580	Light industrial	25 m
R5	60 Knox Steet, Goulburn NSW 2580	Light industrial	1 m (adjacent block)
R6	89 Cathcart St, Goulburn NSW 2580	Industrial	115 m
R7	112 Mary Street, Goulburn NSW 2580	Residential (rural)	154 m
R8	110 Mary Street, Goulburn NSW 2580	Residential (rural)	154 m
R9	108 Mary Street, Goulburn NSW 2580	Residential (rural)	135 m
R10	106 Mary Street, Goulburn NSW 2580	Residential (rural)	117 m
R11	104 Mary Street, Goulburn NSW 2580	Residential (rural)	106 m
R12	102 Mary Street, Goulburn NSW 2580	Residential (rural)	100 m

2.2 Time periods

Time periods defined by the NSW NPfI are presented in Table 2.2.

It is anticipated that SES will be operating on a 24-hour-a-day, 7-days-a-week time period.

Table 2.2 NSW NPfI time periods

NPfI time period	Definition
Day	7am to 6pm Monday to Saturday; 8am to 6pm Sundays and Public Holidays
Evening	6pm to 10pm all days
Night	All other times

2.3 Project Noise Trigger Level

For strict compliance with the NSW NPfI, the following procedure for establishing Project Noise Trigger Levels (PNTL) needs to be followed:

1. For industrial receivers, the fixed NPfI 'Amenity' noise criteria are applicable as the PNTL.
2. For residential receivers, 'Intrusiveness' noise criteria need to be established based on results from noise monitoring conducted on-site, and the most onerous (lowest) noise level between the Intrusiveness and Amenity criteria are applicable as the PNTL. Note: For residential receivers, the NPfI notes that the PNTL is to be assessed at the residential boundary or the most affected point within the boundary.

Noise Intrusiveness risks are considered low as most of the noise generating sources on site are existing, and the changes proposed are unlikely to result in a substantial increase in overall noise egress from the site. In consideration of the extent of proposed changes and the low likelihood of noise impacts, noise monitoring has not been conducted for this assessment. Therefore, Intrusiveness criteria for residential receivers has not been established, and Amenity criteria has been adopted as the PNTL.

As required in Section 2.2 of the NSW NPfI, all PNTLs and limits are expressed as $L_{Aeq,15min}$, unless otherwise expressed. A summary of PNTL criteria is presented in Table 2.3. See Section 2.3.1 for detailed establishment of NPfI Project Amenity Noise Levels and PNTLs.

Table 2.3 Project Noise Trigger Levels

Receiver type	**Criteria basis**	**Project Noise Trigger Level, dBA $L_{eq,15min}$**
Residential	NPfI Amenity	**Day: 48** **Evening: 43** **Night: 38**
Industrial	NPfI Amenity	**68**

(1) NSW NPfI Day, Evening and Night time periods as per Table 2.2.

2.3.1 Project Amenity Noise Levels

To limit continuing increases in noise levels from application of the intrusiveness level alone, the ambient noise level within an area from all industrial noise sources combined should remain below the recommended amenity noise levels prescribed in the NSW NPfI where feasible and reasonable.

The recommended amenity noise levels 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.

> *Project amenity noise level for industrial development = recommended amenity noise level (Table 2.2 of NPfI) minus 5 dB(A)*

In order to standardise the time periods for the intrusiveness and amenity noise levels, the following conversion between $L_{eq,\ period}$ and $L_{eq,15min}$ has been applied (as per Section 2.2 of the NSW NPfI):

$$L_{eq,15min} = L_{eq,\ period} + 3\ dB$$

The amenity criteria shown in Table 2.4 has been established at the identified receivers based on the results of the unattended noise survey.

Table 2.4 Project Amenity Noise Level

Receiver type	**Recommended Amenity Noise Level, dBA $L_{eq,\ period}$**	**Project Amenity Noise Level, dBA $L_{eq,period}$**	**Project Adjusted Amenity Noise Level, dBA $L_{eq,15min}$ (and PNTL)**
Residential (rural)	Day: 50 Evening: 45 Night: 40	Day: 45 Evening: 40 Night: 35	Day: 48 Evening: 43 Night: 38
Industrial premises	70	65	68

(1) NSW NPfI Day, Evening and Night time periods as per Table 2.2.

2.4 Sleep disturbance

The potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered. Sleep disturbance is considered to be both awakenings and disturbance to sleep stages.

Where the subject development/premises night-time noise levels at a residential receiver exceed the following, a detailed maximum noise level event assessment should be undertaken.

- *40 dBA $L_{eq,15min}$ or the prevailing RBL plus 5 dB, whichever is the greater, and/or*
- *52 dBA L_{Fmax} or the prevailing RBL plus 15 dB, whichever is the greater.*

Table 2.5 summarises the maximum noise level event screening criteria for this project. These criteria are recommended levels which should not be exceeded at the nearest residences to prevent sleep disturbances.

As discussed in Section 2.3, noise monitoring has not been conducted for this assessment. Therefore, the NPfI fixed maximum noise level event screening criteria has been adopted.

Table 2.5 Maximum noise level event – Project screening criteria

Description	**Sound Pressure Level, dB (re 20 µPa)**
Sleep disturbance screening criteria	**40 dBA $L_{eq,15min}$**
	52 dBA L_{Fmax}

2.5 Road traffic noise

Existing road traffic volumes are not expected to increase as a result of the redevelopment. Section 3.4 of the NSW RNP states that *'…an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.'*. Therefore, for existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'. As no increase in road traffic is expected to occur under the proposal, further road traffic noise assessment has not been undertaken.

3 Operational noise egress assessment

This Section documents the predictive assessment of the operational noise egress from the site to the identified nearby noise sensitive receivers.

Notable new noise sources on the site will include:

- Externally located mechanical condenser units (4x).

Existing potentially notable noise-generating activities/sources at the SES site include:

- Heavy vehicle movement
- Outdoor training and workshop activities
- Deliveries
- Plant and external diesel generator
- Forklift movement.

3.1 Noise sources

Predictive assessment of noise from the following notable noise sources on site to nearby noise sensitive receivers has been conducted:

- Vehicles movement (trucks and emergency vehicles entering and existing the driveway)
- 4x new mechanical condenser units
- Existing diesel generator.

Assessment noise source locations are shown in Figure 3.1.

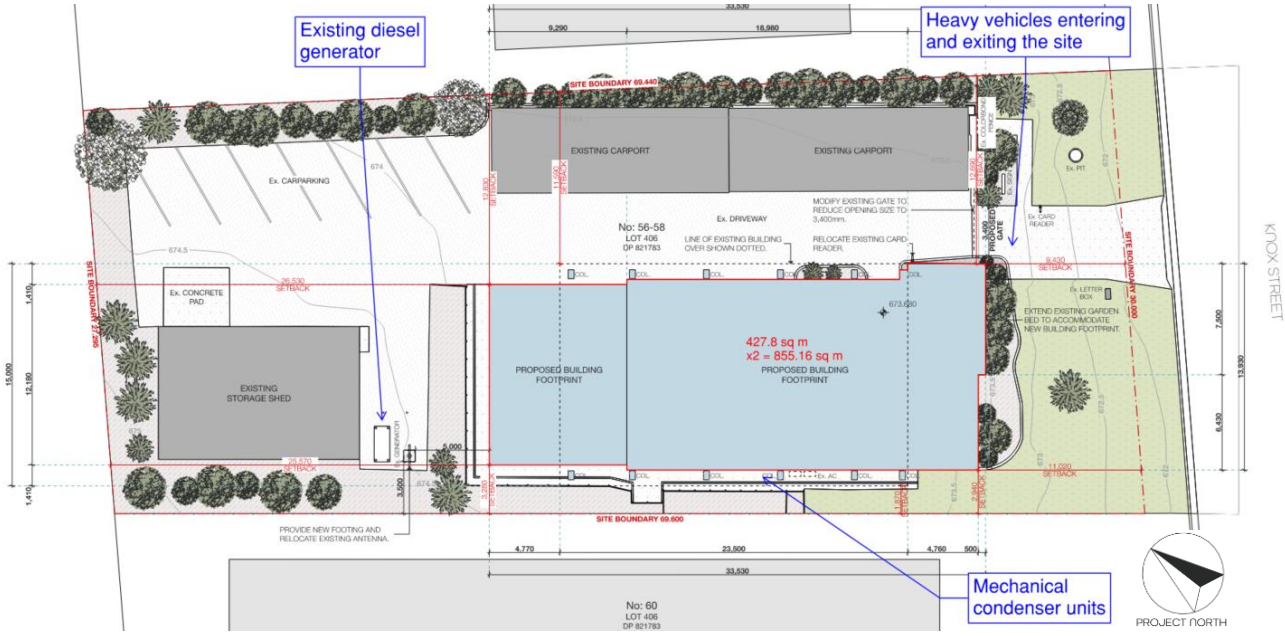

Figure 3.1 Site noise source locations

Source sound levels used for the predictive assessment are shown in Table 3.1. Note: Plant selections for project have not been finalised at the time of writing, and therefore condenser unit and diesel generator noise levels are based on noise emissions from typical plant for a site of this size..

Table 3.1 Source sound power levels used for predictive assessment

Industrial source type	Description	Sound Power Level, dB (re 1 pW)						
		Octave band centre frequency, Hz						
		63	125	250	500	1000	2000	4000
Heavy vehicle	Sound power levels back calculated from sound pressure levels at 6 m distance measured by WSP for a previous project.	88	87	82	80	81	79	72
Condenser units	Manufacturer noise data from example condenser unit – LG MULTI V S ARUN080LSS0.	68	68	68	65	63	64	58
Diesel generator	Manufacturer noise data from example diesel generator – Cummins C110 D5 (80 kWe prime rated)	96	97	95	97	96	95	95

3.2 Results

Predicted operational noise level results are shown in Table 3.2 and discussed in the subsequent Section.

Table 3.2 Predicted operational noise levels at nearest noise-sensitive receivers

Operating scenario	Included site noise sources (external)	Receiver assessment location	Project Noise Trigger Level, dBA $L_{eq,15min}$	Predicted noise level at receiver, dBA $L_{eq,15min}$
Normal operation	1x heavy vehicle 4x mechanical condenser units	Industrial receiver R5	68	**67**
		Residential receiver R12	Day: 48 Evening: 43 Night: 38	**35**
Emergency operation	1x heavy vehicle 4x mechanical condenser units 1x diesel generator	Industrial receiver R5	68	**83**
		Residential receiver R12	Day: 48 Evening: 43 Night: 38	**52**

3.3 Discussion

3.3.1 Normal operation

Noise egress from normal operation of the development (i.e. excluding emergency/smoke mode building services plant) is predicted to meet the PNTL limit at the nearest industrial and residential receivers.

3.3.2 Emergency operation (diesel generator)

Noise egress from emergency operation of the development is predicted to not comply with the PNTL at the nearest industrial and residential receivers. This is due to predicted noise levels from the existing diesel generator. It is noted that this will not be indicative of typical operations and this noise source will only operate under emergency conditions, where mains power supply is cut. Occasional short term daytime operation is also likely to be required on an infrequent, basis for maintenance activities. This may need to be addressed in detail in future design assessment to comply with PNTL criteria.

It is noted that the predicted noise levels are based on noise data from an indicative diesel generator selection, and noise levels from the actual existing generator are likely to be different. Future noise assessment should be based on the actual generator model and consider the infrequent nature of this noise impact.

If additional noise mitigation is deemed necessary based on future predictive assessment, this could include:

- Plant enclosure
- Attenuators (inlet, outlet and/or exhaust)
- Limiting testing of the generator to day time periods (see per Table 2.2) when PNTL is less onerous.

3.3.3 Vehicle sirens

It is assumed that noise from sirens on emergency vehicles entering and exiting the premises will not comply with project NPfI noise criteria. Therefore, following the consideration of safety issues, sirens should not be used while vehicles are in the vicinity of the site.

4 External noise ingress criteria

Table 4.1 provides recommended internal ambient noise level criteria for internal areas. These criteria, which are based on recommended design sound levels in AS 2107 [1] apply when the areas are unoccupied and relate to building services noise sources and external ambient noise ingress (e.g. road traffic noise).

Design assessment will need to be conducted by others in the future to determine façade and roof constructions to control external ambient noise ingress. While noise monitoring to benchmark the existing noise environment has not been conducted as part of this assessment, it is anticipated that external noise ingress will be adequately controlled using 'standard' façade and roof constructions (e.g. single glazing).

Table 4.1 Recommended internal ambient noise criteria

Project room reference	**Occupancy type**	**Internal ambient noise level, dBA $L_{eq,T}$**
Offices 01, 02, 03, 04 and 05	General office areas	≤ 45
Incident Control Centre	Video/audio Conference rooms	≤ 40
Lobby	Lobby	≤ 50
Meeting rooms 01, 02	Meeting rooms (small)	≤ 45
Multi-use rooms	General office areas	≤ 45
Open plan office	Open plan office	≤ 45
Parents/multipurpose room	Rest rooms	≤ 45
Reception	Reception	≤ 45
Situation room	Board and conference rooms	≤ 40
Staff breakout	Breakout spaces	≤ 45
Training room	Workshops (teaching)	< 45
Toilets	Toilets	≤ 55

5 Construction noise and vibration

Construction noise and vibration will need to be managed in accordance with the NSW Interim Construction Noise and Vibration Guideline (ICNG) [3] and the NSW Assessing Vibration Technical Guideline (AVTG) [4].

It is recommended that a detailed Construction Noise and Vibration Management Plan (CNVMP) is developed by the eventual Head Contractor in consultation with an acoustic consultant prior to construction commencement on site to ensure the final construction methodology and program comply with the applicable construction noise and vibration limits.

6 Conclusion

This report has documented the Noise Impact Assessment as part of the Development Application (DA) submission for the proposed redevelopment of the NSW State Emergency Service (SES) premises located at 56-58 Knox Street, Goulburn, NSW. The following aspects have been addressed:

- Operational noise egress criteria and predictive assessment
- External noise ingress criteria
- Construction noise and vibrations (general commentary / specification of applicable NSW guidelines).

The assessment has found that during emergency operation of the b ack-up diesel generator, noise impacts may be noted, particularly during night-time hours. Given the infrequent nature of this noise event, comprehensive mitigation may not be reasonable, however options for noise mitigation have been provided.

7 References

[1] NSW Environment Protection Authority (EPA), *Noise Policy for Industry*, 2017.

[2] Standards Australia Limited/Standards New Zealand, *Australian/New Zealand Standard AS/NZS 2107:2016 Acoustics—Recommended design sound levels and reverberation times for building interiors*, 2016.

[3] State of NSW and Department of Environment and Climate Change NSW (DECC), *Interim Construction Noise Guideline*, 2009.

[4] Department of Environment and Conservation NSW, *Assessing Vibration: a technical guideline*, 2006.

[5] Department of Environment, Climate Change and Water NSW, *NSW Road Noise Policy*, 2011.

[6] Goulburn Mulwaree Council, "Goulburn Mulwaree Council - Policies," [Online]. Available: https://www.goulburn.nsw.gov.au/Council/Policies. [Accessed 07 11 2024].

[7] NSW Government, "Goulburn Mulwaree Local Environmental Plan 2009," [Online]. Available: https://legislation.nsw.gov.au/view/html/inforce/current/epi-2009-0056. [Accessed 08 11 2024].