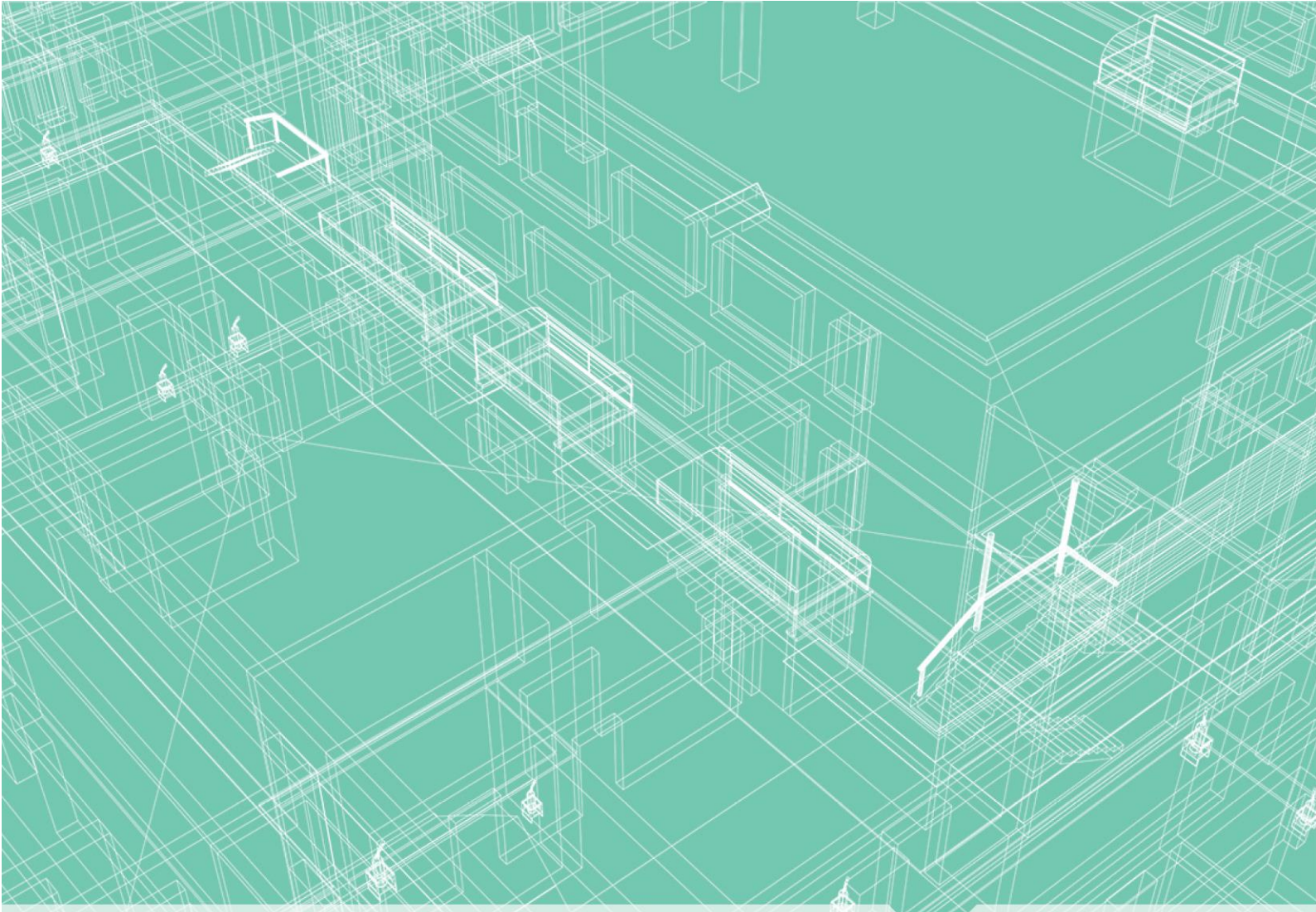

NOISE & VIBRATION IMPACT ASSESSMENT FOR SSDA (SSD-10224)

NEW PRIMARY SCHOOL IN EDMONDSON PARK

ACOUSTIC SERVICES

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CONTENTS

1 INTRODUCTION

1.1 OVERVIEW

This noise & vibration impact assessment has been prepared by JHA Consulting Engineers on behalf of School Infrastructure, NSW (the Applicant) and it accompanies the State Significant Development Application (SSD-10224) for the proposed New Primary School in Edmondson Park (the Proposal) located at Buchan Avenue, Edmondson Park.

Consent is sought for a new core 35 primary school accommodating 1,012 students and a cold shell 40 place pre-school at the site.

This report shall be read in conjunction with the Architectural design drawings and other consultant design reports submitted as part of the application.

The objectives of this acoustic and vibration assessment are:

- Address the relevant SEARs dated 10 December 2020.
- Identify noise sensitive receivers that will potentially be affected by the operation and construction of the proposed development.
- Establish appropriate noise criteria based on the noise surveys, in accordance with the relevant standards, guidelines and legislation for the following noise emissions:
  - Mechanical plant from the development to the surrounding receivers.
  - Public address and school bell systems.
  - Activities and events within the Communal Hall and Out of Hours community use.
  - Noise from Early Learning Centre.
  - Noise from classroom activities.
  - Traffic generation noise.
- Determine whether the relevant criteria can be achieved based on the proposed operations and construction methods. Where applicable, provide recommendations for any necessary acoustic control measures that will need to be incorporated into the development or use in order to ensure with the assessment criteria.
- Establish noise and vibration criteria for construction work based on the noise surveys, in accordance with standards and guidelines.
- Provide recommendations for Construction Noise and Vibration Planning.

The following documentation has been used for the preparation of this report:

- Architectural drawings of the proposed development.
- Noise data collected on site through the use of noise loggers and a hand held spectrum analyser.
- SEARS for SSD-10224 dated 10 December 2020.

This document and related work has been prepared following JHA Consulting Engineers Quality and Environmental Management Systems, which are based on AS/NZS ISO 9001:2015 and ISO 14001:2015 respectively.

1.2 RESPONSE TO SEARS

The acoustic report is required by the Secretary's Environmental Assessment Requirements (SEARs) for SSD-10224. Table 1 identifies the relevant SEARs requirements and corresponding references within this report.

SEARs Item	*Report Reference*
11. Noise and Vibration *Provide a noise and vibration impact assessment that:* • *Includes a quantitative assessment of the main noise and vibration sources during demolition, site preparation, bulk excavation and construction.* • *Details the proposed construction hours and provide details of, and justification for, instances where it is expected that works would be carried out outside standard construction hours.* • *Includes a quantitative assessment of the main sources of operational noise, including consideration of any public-address system, school bell, mechanical services (e.g. air conditioning plant), use of any school hall for concerts etc. (both during and outside school hours) and any out of hours community use of school facilities.* • *Outlines measures to minimise and mitigate the potential noise impacts on nearby sensitive receivers.* • *Considers sources of external noise intrusion in proximity to the site (including, road rail and aviation operations) and identifies building performance requirements for the proposed development to achieve appropriate internal amenity standards.* • *Demonstrates that the assessment has been prepared in accordance with policies and guidelines relevant to the context of the site and the nature of the proposed development.*	Section 5 and 6
Relevant Policies and Guidelines: • *NSW EPA Noise Policy for Industry (2017)* • *Interim Construction Noise Guideline (DECC) 2009* • *Assessing Vibration: A Technical Guideline 2006 (Department of Environment and Conservation, 2006)* • *Development Near Rail Corridors and Busy Roads – Interim Guideline (Department of Planning, 2008)*	Section 4

Table 1: SEARs and Relevant References.

2 DESCRIPTION OF THE PROPOSAL

2.1 LOCATION / SITE DESCRIPTION

Edmondson Park is a suburb of Sydney, in the Local Government Area of Liverpool and City of Campbelltown, approximately at 32km south west of Sydney CBD.

The proposed primary school site is located on the corner of Buchan Avenue and Faulkner Way, being approximately 0.5km west of the Edmondson Park Railway Station. The site contains two lots which are anticipated to be consolidated. The site is legally known as Lot 1 in DP1257105 and Lot 2 in DP1257105.

The surrounding development is mainly single and two storey detached houses. The surrounding land uses are as follows:

- *North*: Future residential development and existing Clermont Park.
- *East:* Land to the East will be the site of the future / potential Edmondson Park High School.
- *South*: Land immediately to the South is bounded by the South West Rail Link corridor.
- *West*: Land to the West is occupied by residential developments mainly detached houses.

Figure 1 shows the site boundary and surrounding area for the New Primary School in Edmondson Park.

Figure 1: New Primary School in Edmondson Park site boundary.

The adjacent train line is below the highest levels of the site by approximately 6-7m, within an engineered cutting, being constant the depth of the railway cutting for almost all of the length of the track adjoining the school site.

2.2 PROPOSED WORKS

This SSDA seeks approval for a new core 35 primary school accommodating 1,012 students and a coldshell 40 place pre-school at the site. The works comprise:

- Site preparation and excavation;
- Land use for the purpose of a new primary school and pre-school;
- Construction of new buildings including:
  - A three storey building on the western portion of the site primarily addressing Faulkner Way comprising 36 homebases, 4 special support unit teaching spaces, staff room, administration office at the ground floor and library at the first floor addressing the corner of Buchan Avenue and Faulkner Way, and student amenities;
  - A single storey coldshell preschool building for educational programs for children the year before they commence kindergarten, accommodating 40 places. The pre-school building will be connected at the southern end of the three storey building; and
  - A single storey building on the eastern portion of the site comprising a communal hall, out of school hours care facility, 8 homebases and covered outdoor learning area.
- Landscaping and public domains works including tree planting, a sports court and creation of various assembly, play and learning zones;
- A drop-off and pick-up zone, and bus zone on Buchan Avenue;
- An at-grade staff carpark in the southern part of the site with ingress and egress provided off Faulkner Way at the south-west corner of the site;
- Primary pedestrian entrance from Buchan Avenue and an additional entrance on Faulkner Way for the ground floor support unit; and
- Other ancillary infrastructure and utilities works and digital signage.

Figure 2: Proposed New Primary School in Edmondson Park

2.3 SURROUNDING RECEIVERS

A summary of the nearest noise sensitive receivers surrounding the site is shown in Table 2, including assumed approximate distances from the buildings with noise sources to the receiver boundaries, noting the type of noise receiver and if the receiver is existing or future.

ID	*Sensitive Receiver*	*Receiver Status*	*Receiver Type*	*Approx. Distance, m*
1	Edmondson Park High School	Future	Educational	< 5
2	Residential noise catchment 1	Future	Residential	35
3	Residential noise catchment 2	Future	Residential	200
4	Park	Future	Passive recreation	300
5	Edmondson Park Railway Station	Existing	---	500
6	Regional Park	Existing	Passive recreation	80
7	Residential noise catchment 3	Existing	Residential	25
8	Residential noise catchment 4	Existing	Residential	25
9	Clermont Park	Existing	Passive recreation	30

Table 2: Nearest sensitive receivers surrounding the site.

Figure 3: Nearest noise sensitive receivers surrounding the site location.

2.4 OPERATING HOURS

At this stage, it is understood that the new primary school will operate within typical school hours. The following operating hours have been assumed for the noise and vibration impact assessment purposes.

- School hours: 8am to 4pm.
- Out of Hours: 7am to 8am & 4pm to 6pm.
- Vacation Care Hours: 7am to 6pm (Monday to Friday) during School Holidays.
- Early Learning Centre (ELC): 7am to 7pm.
- There will be periodic occasions for community out of hours use / events which may include the Communal Hall up to 10pm.

3 SITE MEASUREMENTS

3.1 GENERAL

Attended and unattended noise surveys were conducted in the locations shown in Figure 4 to establish the ambient and background noise levels of the site and surrounds, in accordance with Fact Sheets A and B of the NSW Noise Policy for Industry. JHA Consulting Engineers carried out the noise surveys, in accordance with the method described in the AS/NZS 1055:2018 *'Acoustics – Description and measurement of environmental noise'*.

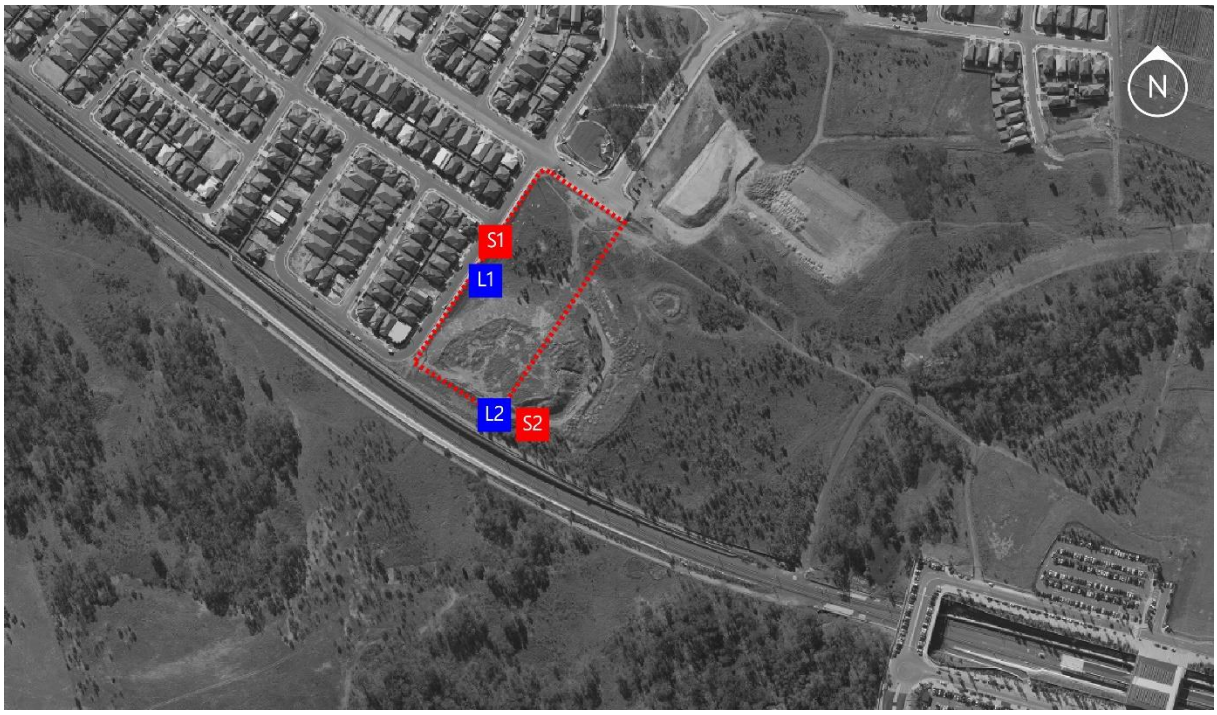

Figure 4: Noise survey locations and boundary of the site.

From observations during the noise survey, it is noted that ambient noise levels are dominated by low activity of residential, earthworks at approximately 200 meters to the East of the site plus periodic train pass-bys.

3.2 LONG-TERM NOISE MONITORING

Long-term noise monitoring was carried out from Thursday 25th March to Thursday 1st April 2021 with two Rion NL-52 noise loggers (Serial Numbers 553892 and 175549). The noise loggers recorded L_{A1}, L_{A10}, L_{Aeq} and L_{A90} noise parameters at 15-minute intervals during the measurement period. The calibration of the noise loggers were checked before and after use and no deviations were recorded.

The noise loggers were located on the boundaries of the proposed development site – as shown in Figure 4. The locations were secured and are considered to be representative of the typical ambient and background noise levels plus rail noise levels.

The noise loggers' microphones were mounted 1.5 metres above the ground and windshields were used to protect the microphones. Weather conditions were monitored during the unattended noise monitoring period.

The detailed results of the long-term noise monitoring are presented graphically in Appendix A. As stated in the NSW NPI, any data likely to be affected by rain, wind or other extraneous noise has been excluded from the calculations (shaded in the Appendix A graphs).

The Assessment Background Levels (ABLs) have been established in general accordance with the methodology described in the NSW NPI, i.e. 10th percentile background noise level (L_{A90}) for each period of each day of the ambient noise survey. The median of these levels is then presented as the RBLs (Rating Background Levels) for each assessment period.

These RBLs are shown in Table 3 and Table *4*, together with the ambient noise levels (L_{Aeq}) measured for each time period.

Date	*Assessment Background Levels, dB(A)*			*L_{Aeq} Ambient Noise Levels, dB(A)*		
	Day 0700-1800	*Evening 1800-2200*	*Night 2200-0700*	*Day 0700-1800*	*Evening 1800-2200*	*Night 2200-0700*
Thursday, 25 March 2021	---	40	38	---	48	46
Friday, 26 March 2021	43	44	39	52	50	46
Saturday, 27 March 2021	34	40	35	47	48	46
Sunday, 28 March 2021	34	43	40	46	49	48
Monday, 29 March 2021	40	41	37	50	49	46
Tuesday, 30 March 2021	43	42	38	51	51	46
Wednesday, 31 March 2021	44	41	35	51	49	45
Rating Background Levels	**41**	**41**	**38**	---	---	---
Ambient Noise Levels	---	---	---	**50**	**49**	**46**

Table 3: Results of long-term noise monitoring at Location L1.

Date	*Assessment Background Levels, dB(A)*			*L_{Aeq} Ambient Noise Levels, dB(A)*		
	Day 0700-1800	*Evening 1800-2200*	*Night 2200-0700*	*Day 0700-1800*	*Evening 1800-2200*	*Night 2200-0700*
Thursday, 25 March 2021	---	47	44	---	55	50
Friday, 26 March 2021	---	48	42	---	55	49
Saturday, 27 March 2021	35	51	43	52	58	51
Sunday, 28 March 2021	36	50	43	51	56	49
Monday, 29 March 2021	42	48	41	53	54	48
Tuesday, 30 March 2021	45	45	40	54	53	45
Wednesday, 31 March 2021	45	44	36	54	51	44
Rating Background Levels	**42**	**48**	**42**	---	---	---
Ambient Noise Levels	---	---	---	**53**	**55**	**49**

Table 4: Results of long-term noise monitoring at Location L2.

3.3 SHORT-TERM NOISE MONITORING

Short-term noise monitoring was carried out to obtain representative third-octave band noise levels of the site. On Tuesday 25th March 2021, short-term noise measurements were carried out during day-time. Short-term noise measurements were carried out with a NTI XL-2 hand-held Sound Level Meter (SLM) (Serial Number A2A-13742-E0). The calibration of the SLM was checked before and after each use and no deviations were recorded.

The SLM microphone was mounted 1.5 metres above the ground and a windshield was used to protect the microphone. Measurements were undertaken in the free-field – i.e. more than 3 metres away from any building façade or vertical reflective surface. Weather conditions were calm and dry during the attended noise monitoring.

A summary of the results of the short-term noise monitoring are shown in Table 5.

Location	*Date and Time*	*Parameter*	*Sound Pressure Level, dB (re 20μPa)*							
			Overall dB(A)	*Octave Band Centre Frequency, Hz*						
				63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
S1	25/03/2021 11:18am – 11:33am	$L_{90,15min}$	**44**	59	54	43	41	36	33	28	19
		$L_{eq,15min}$	**50**	66	59	49	46	43	39	41	36
		$L_{10,15min}$	**53**	69	62	51	49	45	44	40	30
S2	25/03/2021 11:48am – 12:03pm	$L_{90,15min}$	**46**	56	54	49	43	39	34	30	20
		$L_{eq,15min}$	**53**	62	58	53	52	46	42	39	32
		$L_{10,15min}$	**56**	65	60	56	56	50	45	42	31

Table 5: Results of short-term noise monitoring.

3.4 TRAFFIC NOISE MONITORING

Based on the long-term noise monitoring results at location L1, the traffic noise levels are summarised below in Table 6.

Location	*Measured Noise Levels, dB(A)*	
	Day period (7am-10pm)	*Day Noisiest 1h*
L1	$L_{Aeq,15hour}$ 59	$L_{Aeq,1hour}$ 60

Table 6: Day time Traffic Noise Levels.

3.5 RAIL NOISE AND VIBRATION MONITORING

An attended noise and vibration survey of the existing noise levels and vibrations from the railway corridor adjacent to the site was conducted on 30th April 2021. This survey was undertaken to assess the rail noise and vibration exposure onto the school from train pass-bys. Noise and vibration levels were obtained during train pass-bys for both directions (eastbound / westbound) at locations shown in Figure 5. A summary of the measured noise levels is shown in Table 7.

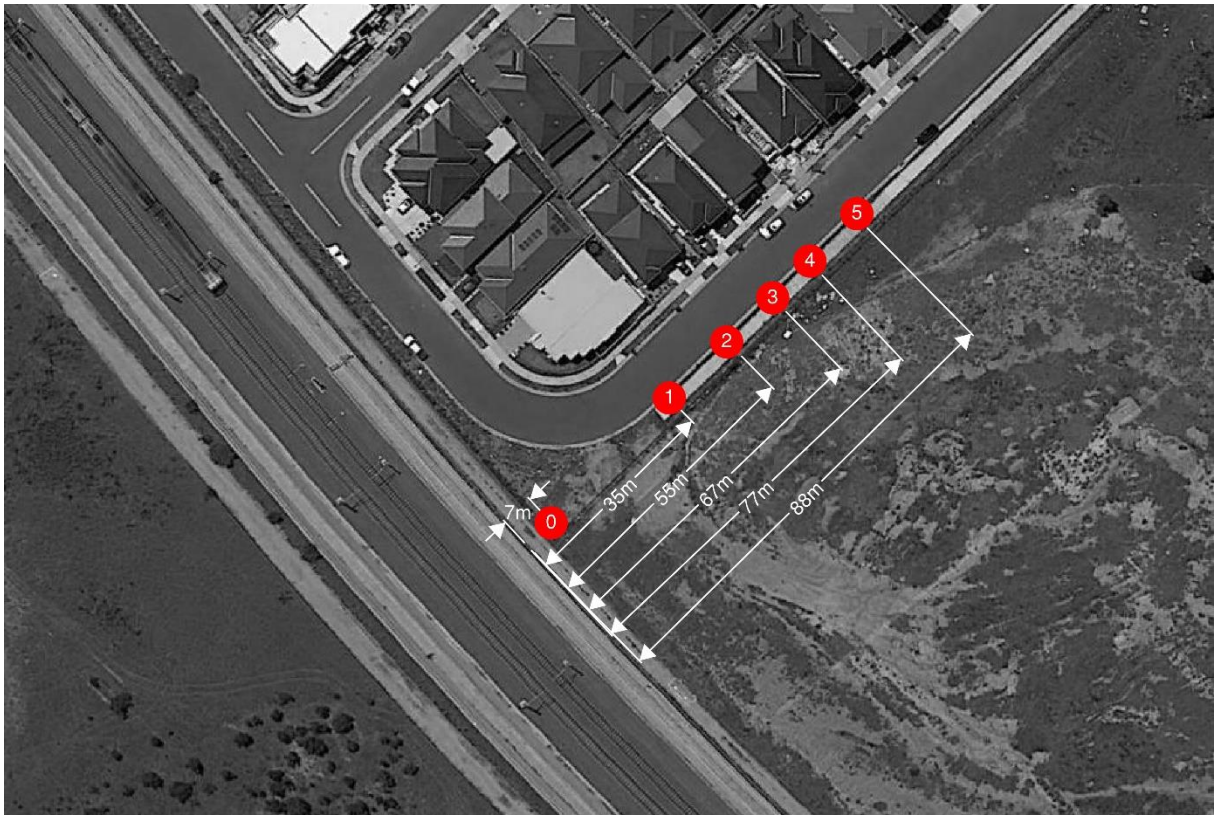

Figure 5: Locations for attended noise and vibration survey of train pass-bys.

Direction	Location	Sound Pressure Level, dB (re 20μPa)								
		Overall dB(A)	Octave Band Centre Frequency, Hz							
			63	125	250	500	1k	2k	4k	8k
Westbound	0	62	68	69	60	61	56	51	48	41
Eastbound	0	61	67	67	6	58	51	49	46	40
Westbound	1	51	58	59	51	44	45	42	49	39
Eastbound	1	51	59	57	52	45	44	45	35	25
Westbound	2	51	59	58	52	45	45	42	37	30
Eastbound	2	49	58	55	48	44	44	41	34	32
Westbound	3	51	63	58	50	47	46	43	33	30
Eastbound	3	52	60	56	52	47	46	45	38	29
Westbound	4	51	58	59	48	47	47	41	34	24
Eastbound	4	50	61	56	49	46	46	42	33	21
Westbound	5	48	60	54	45	44	43	39	30	22
Eastbound	5	48	58	57	45	44	43	40	30	20

Table 7: Results of rail noise monitoring based on train pass-bys.

Vibration measurements were undertaken with a hand-held vibration analyser Rion VA-12 (Serial Number 203184) at location 2 in Figure 5. This location is representative of the closest building façade to the railway corridor. As train pass-bys are considered intermittent vibration, it is recommended to assess against the Vibration Dose Value (VDV).

Vibration due to train pass-bys was not perceptible at the measured vibration levels location. A summary of the measured vibration acceleration levels measured is shown in Table 8.

Direction	*Measured acceleration rms, m/s^2*	*Calculated eVDV, $m/s^{1.75}$*
Eastbound	0.00127	0.00375
	0.00102	0.00301
	0.00121	0.00358
Westbound	0.00123	0.00363
	0.00121	0.00357
	0.00105	0.00311

Table 8: Measured vibration levels (z-axis) and calculated eVDV of train pass-bys.

4 RELEVANT NOISE STANDARDS AND GUIDELINES

4.1 STANDARDS AND GUIDELINES

The following standards and guidelines are considered relevant to the project and have been referenced in developing the project noise level criteria.

- Noise Emissions
  - Environmental Planning and Assessment (EP&A) Act 1979.
  - Protection of the Environmental Operations (POEO) Act 1997.
  - NSW Environment Protection Authority (EPA), Noise Guide for Local Government (NGLG) 2013.
  - Liverpool Council Planning Framework.
  - NSW State Environmental Planning Policy (State Significant Precincts) 2005.
  - Edmondson Park South Development Control Plan 2012.
  - NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI) 2017.
  - Association of Australasian Acoustical Consultants (AAAC), Guideline for Child Care Centre Acoustic Assessment v3.0 2020.
  - State Environmental Planning Policy, Educational Establishments and Child Care Facilities 2017.
- Transport Noise
  - NSW Department of Planning (DoP), Development Near Rail Corridors or Busy Roads – Interim Guideline 2008.
  - NSW DECCW, Road Noise Policy (RNP) 2011.
  - NSW DECC, Assessing Vibration: A Technical Guideline 2006.
- Construction Noise and Vibration
  - NSW DECCW, Interim Construction Noise Guideline (ICNG) 2009.
  - NSW Road Maritime Service (RMS), Construction Noise and Vibration Guideline 2016.
  - Australian Standard AS 2436:2010 '*Acoustics – Guide to Noise Control on Construction, Maintenance & Demolition Sites*'.
  - NSW EPA, Draft Construction Noise Guideline 2020.

4.2 REGULATORY FRAMEWORK

The Environmental Planning and Assessment Act 1979 (EP&A Act) provides the regulatory framework for the protection of the environment in NSW. The EP&A Act is relevantly about planning matters and ensuring that "environmental impact" associated with the proposed development is properly considered and reasonable before granting development consent to develop.

The assessment of "environmental impact" relies upon the identification of acceptable noise criteria which may be defined in a Development Control Plan, or derived from principles using guidelines like NSW EPA Noise Policy for Industry (NPI 2017) or Noise Guide for Local Government (NGLG 2013).

The Protection of the Environment Operations (POEO) Act 1997 has the objective of protecting, restoring and enhancing the quality of NSW environment. Abatement of noise pollution is underpinned by the definition of "offensive noise" as follows:

"...

(a) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances:

> *(i) is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or*
>
> *(ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or*

(b) that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances, prescribed by the regulations.

..."

4.3 NOISE GUIDE FOR LOCAL GOVERNMENT

NGLG 2013 is a guideline that is at aimed at councils and planners to provide guidance in the management of local noise problems and in the interpretation of existing policy and legislation.

Table 1.3 of NGLG 2013 contains the management for common neighbourhood noise issues and describes the Environmental Protection Agency (EPA) as the Appropriate Regulatory Authority (ARA) for public educational facilities.

NGLG 2013 provides a checklist to determine an "offensive noise". The offensive noise test aids in making a systematic judgment about the offensive nature of noise emissions. The NGLG 2013 offensive noise test considers that noise may be offensive in three ways, according to:

- Audibility.
- Duration.
- Inherently offensive characteristics.

4.4 PLANNING FRAMEWORK

Relevant Planning Documents have been reviewed for any noise requirements or criteria. Appendix 16 of the State Environmental Planning Policy (State Significant Precincts) 2005 establishes the zoning and development standards applicable to the site.

4.4.1 SEPP – STATE SIGNIFICANT PRECINCTS

The SEPP – State Significant Precincts (SSP 2005) is the environmental planning instrument that applies to the site. The new primary school site is zoned as General Residential (R1) as the surrounding area. Figure 6 shows the land zoning as per information extracted from SSP 2005 map SEPP_MD_EDP_LZN_001_20101216.

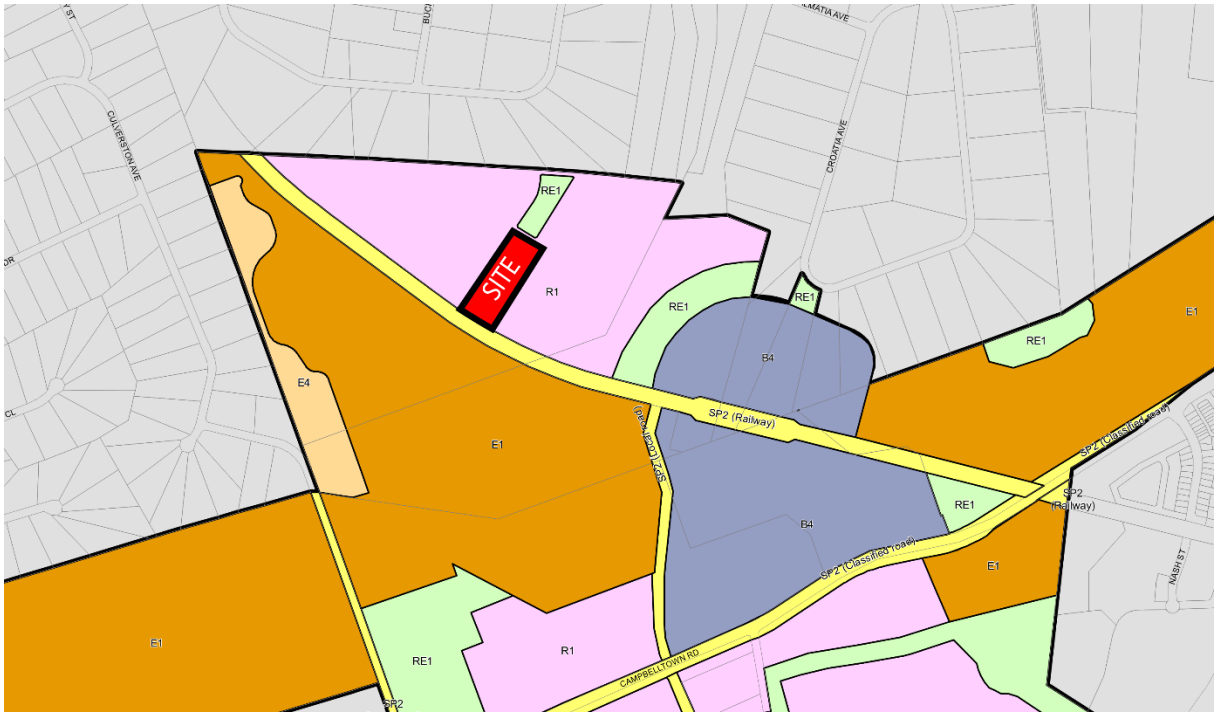

Figure 6: Land Zoning of the site and surroundings.

4.4.2 EDMONDSON PARK SOUTH DEVELOPMENT CONTROL PLAN 2012

The following relevant noise information has been found in the Edmondson Park South Development Control Plan 2012:

"...

3.7 Schools, Childcare Centres and Community Facilities

Schools and child care centres contribute to the social fabric of a neighbourhood. These community facilities encourage social interaction between local residents and add to the sense of place and attachment to Edmondson Park South. The location of schools and child care centres should encourage walking and cycling by parents and children, and they should be connected or associated to other community and services infrastructure (public transport facilities, open space and Town Centre).

Objectives

1. *To site school buildings to minimise impacts on adjacent residential and open space areas.*
2. *To locate and design childcare centres so that they do not unreasonably impact upon the amenity of residential areas.*
3. *To encourage the co-location of community and civic facilities.*
4. *To locate and design community and civic facilities so as to enhance way-finding.*

Controls

1. *The siting of school buildings is to:*
    a. *Address the street frontage.*
    b. *Be setback a minimum of 35m from the boundary of a conservation area.*
    c. *Accommodate any relevant APZ requirements.*
    d. *Meet the acoustic requirements relevant to rail and road noise.*
    e. *Retain neighbouring residential amenity.*

f. Provide appropriate provision of set down and pick up areas.

2. *Landscaping on school sites is to respect and retain major natural site vegetation or the theme of the nearest local park and streetscapes where possible.*
3. *All school developments are to include bicycle parking for students.*
4. *School set down / pick up zones are to be designed to allow the school to maintain a safe street frontage for the entry and exit of pedestrians and bicycle users.*
5. *Childcare centres within residential zones:*
    a. *will be assessed on their merits,*
    b. *have minimum site area of 700m^2 with a minimum frontage width of 22.5m, and*
    c. *address the specific child care centre provisions of the respective Council (i.e. Part 7 of Campbelltown (Sustainable) City DCP and Part 3.8 of Liverpool Development Control Plan 2008).*
6. *Places of worship should be located within centres or co-located with other community facilities so as to create a community focal point, to share facilities such as parking, and to minimise impacts on residential areas.*
7. *Education, community buildings and places of worship are encouraged to enhance community identity and way-finding through iconic and landmark building design.*

..."

4.4.3 LIVERPOOL DEVELOPMENT CONTROL PLAN

Part 3.8 of the Liverpool Development Control Plan 2008 – Non-Residential Development in Residential Zones – has been reviewed and the following relevant noise information has been found:

"...

2.9 Amenity and Environmental Impact

Noise: Development of childcare centres shall not be permitted in areas where aircraft noise levels exceed 25 Australian Noise Exposure Forecast (ANEF).

...

Acoustic Privacy

Objective

To ensure appropriate noise and vibration attenuation measures are incorporated into the development.

Controls

1. *Noise attenuation measures should be incorporated into building design to ensure acoustic privacy between on-site and adjoining buildings.*
2. *Developments in areas adversely impacted upon by rail or traffic related noises must incorporate the appropriate noise and vibration measures into the design in terms of the site layout, building materials and design, orientation of the buildings and location of sleeping and recreation areas.*
3. *The proposed buildings must comply with the Department of Environment and Climate Change criteria and the current relevant Australian Standards for noise and vibration and quality assurance.*

..."

4.5 OPERATIONAL NOISE

4.5.1 NSW EPA NOISE POLICY FOR INDUSTRY

The NSW EPA Noise Policy for Industry 2017 assesses noise from industrial noise sources – scheduled under the POEO. Mechanical noise from the development shall be addressed following the recommendations in the NSW NPI.

The assessment is carried out based on the existing ambient and background noise levels addressing the following:

- Intrusiveness Criteria, to control intrusive noise into nearby sensitive receivers.
- Amenity Criteria, to maintain the noise level amenity for particular land uses.

These criteria are established for each assessment period (day, evening and night) and the more stringent of the two criteria sets the Project Noise Trigger Level (PNTL).

4.5.1.1 Intrusiveness Criteria

The NSW NPI defines the intrusiveness criteria as follows:

"The intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source (represented by the L_{Aeq} descriptor), measured over a 15 minute period, and does not exceed the background noise level by more than 5dB when beyond a minimum threshold."

Based on the intrusiveness criteria definition and the measured background noise levels on site, Table 9 shows the intrusiveness criteria for the noise sensitive receivers.

Indicative Noise Amenity Area	*Period*	*Rating Background Level dB(A)*	*Intrusiveness Criterion dB(A)*
General Residential (R1)	Day	41	46
	Evening	41	46
	Night	38	43

Table 9: Determination of the intrusiveness criterion.

4.5.1.2 Amenity Criteria

The NSW NPI states the following to define the amenity criteria:

"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 specified in Table 2.2 where feasible and reasonable. The recommended amenity noise levels will protect against noise impacts such as speech interference, community annoyance and some sleep disturbance."

Based on the land zoning of the noise sensitive receivers plus amenity criteria definition, Table 10 shows the amenity criteria for the noise sensitive receivers.

Indicative Noise Amenity Area	*Period*	*Recommended Amenity Noise Level ($L_{Aeq,period}$) dB(A)*	*Amenity Criterion ($L_{Aeq15min}$) dB(A)*
General Residential (R1)	Day	60	58 (60-5+3)
	Evening	50	48 (50-5+3)
	Night	45	43 (45-5+3)
Public Recreation (RE1)	When In Use	55	53 (55-5+3)
School Classroom	When in Use	35 (internal)	35 (internal)

Table 10: Determination of amenity criterion.

4.5.1.3 Project Noise Trigger Levels

The PTNL's are shown in Table 6 and have been obtained in accordance with the requirements of the NSW NPI. These shall be assessed to the most affected point of within the noise sensitive receiver boundary.

Indicative Noise Amenity Area	*Period*	*Intrusiveness Criterion dB(A)*	*Amenity Criterion dB(A)*
General Residential (R1)	Day	46	58
	Evening	46	48
	Night	43	43
Public Recreation (RE1)	When In Use	---	53
School Classroom	When in use	---	35 (internal)

Table 11: PNTLs for noise sensitive receivers.

4.5.2 AAAC GUIDELINE FOR CHILD CARE CENTRE

There are no prescribed regulations or legislation that applies to outdoor playgrounds noise from schools. The AAAC guideline is addressed for assessment of childcare centres and its noise level criterion for outdoor spaces have been considered as adequate by NSW tribunal decisions. As children do not play outdoors continuously for long periods of time, and as the duration of time for children playing outside is reduced, the overall noise annoyance reduces. Therefore, it is reasonable to allow a higher level of noise impact for a shorter duration.

Whilst the AAAC guideline does not apply for schools, there are similarities in noise emissions from uses of outdoor playground areas for schools and child care centres. Therefore, we recommend that the following noise criteria shall be applied to noise impacts arising from the schools outdoor playgrounds.

Our noise assessment approach is based on:

- NSW tribunal decisions when assessing noise from the use of child care centres.
- 'Guideline for Childcare Centre Acoustic Assessment' prepared by the Association of Australasian Acoustical Consultants (AAAC).

Table 12 shows the noise level criteria proposed by the AAAC guideline for assessing noise from outdoor spaces. These are the noise levels at which it is considered that complaints are unlikely.

Use of outdoor area	*Noise Level Criteria*	*Criteria (day-time)*
Up to 4 hours (total) per day[1]	$L_{Aeq,15min}$ noise level from outdoor area not to exceed the existing background noise level ($L_{A90,15min}$) plus 10dB $L_{Aeq,15min} < L_{A90,15min} + 10dB(A)$	$L_{Aeq,15min}$ < 51dB(A)
More than 4 hours (total) per day[1]	$L_{Aeq,15min}$ noise level from outdoor area not to exceed the existing background noise level ($L_{A90,15min}$) plus 5dB $L_{Aeq,15min} < L_{A90,15min} + 5dB(A)$	$L_{Aeq,15min}$ < 46dB(A)

Table 12: Noise level criteria for the playground areas as per AAAC guideline.

4.5.3 EDUCATIONAL ESTABLISHMENTS AND CHILD CARE FACILITIES

Under the Schedule 2 Schools of the EECCF SEPP, Clause 6 establishes the following:

"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 lot boundary."

Based on the long-term unattended noise results of background noise levels, the following table shows the noise level criteria for operational noise.

Receiver	*Time Period*	*Measured RBL dB(A)*	*Criteria dB(A)*
General Residential (R1)	Day	41	46
	Evening	41	46
	Night	38	43

Table 13: Operational Noise Criteria.

[1] 4 hours are set in 2 hours in the morning and 2 hours in the afternoon.

4.5.4 SUMMARY OF OPERATIONAL NOISE LEVEL CRITERIA

Based on the criteria from the relevant noise standards and guidelines detailed in this section, Table 14 summarizes the noise level criteria for operational noise. For noise assessment purposes, the corresponding criteria is based on background noise level measured, the lowest value has been used.

Noise Emission	*Receiver*	*Time Period*	*Noise Level Criteria* $L_{Aeq,15min}$ *dB(A)*
External Mechanical Plant	General Residential (R1)	Day Time (7am – 6pm)	46
		Evening Time (6pm – 10pm)	46
		Night Time (10pm – 7am)	43
	Public Recreation	When In Use	53
	School Classrooms	When in Use	35 (internal)
Outdoor Playgrounds	General Residential (R1)	Up to 4 hours (7am – 6pm)	51
		More than 4 hours (7am – 6pm)	46
Operational Noise	General Residential (R1)	Day Time (7am – 6pm)	46
		Evening (6pm – 10pm)	46
		Night (10pm – 7am)	43

Table 14: Summary of the noise level criteria at the nearest noise sensitive receivers.

4.6 TRANSPORT NOISE

4.6.1 NSW ROAD NOISE POLICY

The NSW Road Noise Policy (RNP) establishes criteria for traffic noise from:

- Existing roads,
- New road projects,
- Road development projects,
- New traffic generated by developments.

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 up to 2.0dB (i.e. less than 2.1dB)[2] above the existing noise levels. An increase of up to 2.0dB represents a minor impact that is considered barely perceptible to the average person.

4.6.2 DEVELOPMENT NEAR RAIL CORRIDORS OR BUSY ROADS – INTERIM GUIDELINE

The guideline details the application of clauses 85, 86, 87, 102 and 103 of the Infrastructure State Environmental Planning Policy (SEPP) which is required to be used when a development is adjacent to a rail corridor, a freeway, a toll-way, a transit-way or a road with an Annual Average Daily Traffic volume (AADT) of more than 40,000 vehicles.

[2] NSW Roads and Maritime Service. Noise Criteria Guideline 2015. Page 10.

4.6.2.1 Noise from Railway

The Acoustic Assessment Zones as defined in the guideline are summarised in Figure 7, with specialist acoustic advice required for 'Zone A', and assessment consideration for 'Zone B'. The rail corridor supports passenger services at less than 80km/h, as trains are departing or arriving to the Edmondson Park Railway Station.

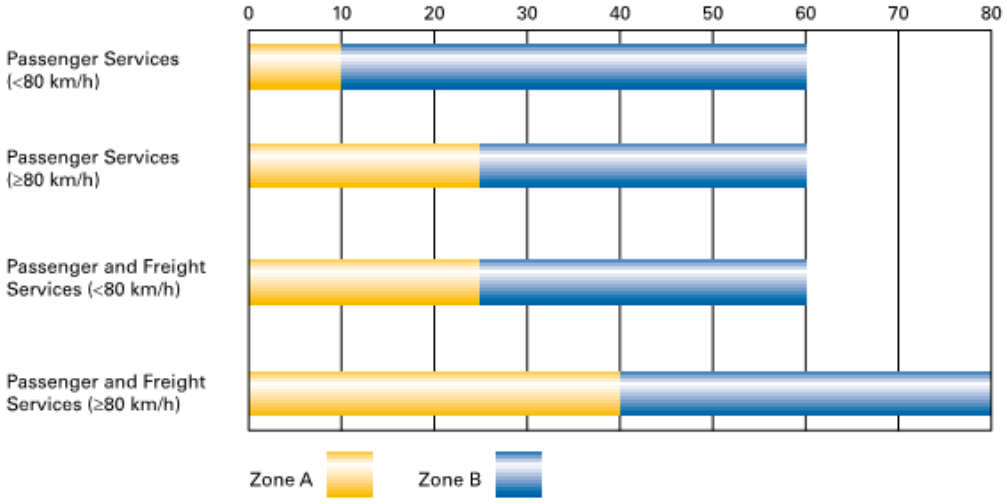

Figure 7: Acoustic Assessment Zones based on distance (m) of noise-sensitive develoment.

The southern boundary of the development site is at approximately 17 metres set-back from the rail corridor boundary and there is not direct sight of line as the train line is below the highest levels of the site by approximately 6-7m, within an engineered cutting. Therefore, a detailed assessment for rail noise is not required.

Notwithstanding the above, the Infrastructure SEPP specifies the internal noise level criteria for educational institutions including child care centres for both road and rail as shown in Table 15. Educational Facilities Services Guideline DG11 and NSW Road Noise Policy establish a similar internal noise level criteria for teaching spaces in educational institutions.

Type of occupancy	*Design Noise Level, dB(A)*
Educational institutions and childcare centres	40

Table 15: Summary of the noise level criteria for road and rail noise break-in.

4.6.2.2 Vibration from Railway

The guideline requires vibration to be assessed for vibration sensitive buildings within 60 metres of the nearest operation track of a rail corridor. A summary of the assessable zones for vibration based on proximity are shown below in Figure 8. As the closest building to the operational track is approximately 55 metres away, a detailed assessment is to be considered.

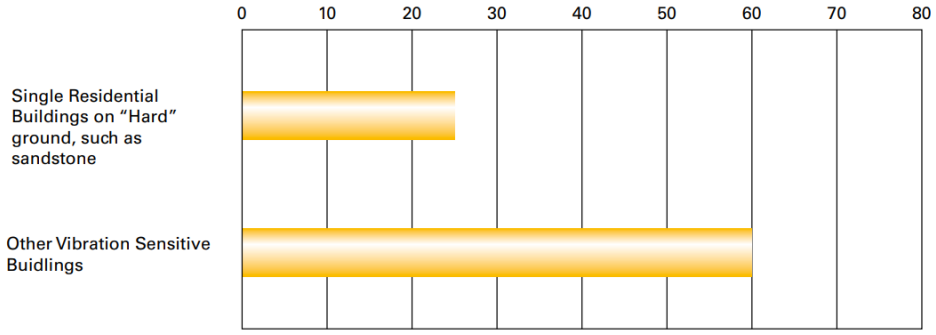

Figure 8: Acoustic Assessment Zones based on distance (m) of vibration sensitive develoment from operation track.

When assessing intermittent vibration comprising a number of events, the Vibration Dose Value (VDV) it is recommended to be used as per NSW DECC *'Assessing Vibration: A Technical Guideline'*. Table 16 shows the acceptable VDV values for intermittent vibration.

Place	*Time*	*Vibration Dose Values, m/s$^{1.75}$*	
		Preferred	*Maximum*
Offices, schools, educational and worship	When in use	0.40	0.80

Table 16: Rail vibration criteria applicable to the site.

4.6.3 AVIATION NOISE

As per information obtained from Western Sydney Airport Environmental Impact Statement, it can be confirmed that the proposed development is located outside the Australian Noise Exposure Concept (ANEC). Therefore, as per AS 2021:2015 *'Acoustics – Aircraft Noise Intrusion – Building Sitting and Construction'*, the building site is considered acceptable and there is no requirement to carry out an aircraft noise assessment. Appendix B contains the Western Sydney Airport ANEC contours.

The nearest helicopter landing site is the Liverpool Hospital (≈8.7km) to the Northeast. Based on the distance between the site and the helicopter landing site plus the helicopter flying paths, it can be stated that helicopter noise will not impact in the proposed development and therefore, a helicopter noise assessment is not required.

4.7 CONSTRUCTION NOISE AND VIBRATION

4.7.1 NOISE CRITERIA

The ICNG suggest construction noise management levels that may minimise the likelihood of annoyance being caused to noise sensitive residential receivers depending on the duration of works. The management levels for long-term duration works are as follows:

- Within recommended standard hours.

  The Management Level ($L_{Aeq,15min}$) measured at the most exposed boundary of any affected residential receiver when the construction site is in operation must not exceed the background noise level (RBL) by more than 10dB(A). This noise level represents the point above which there may be some community reaction to noise.

  However, in the case of a highly noise affected area, the Management Level ($L_{Aeq,15min}$) at the most exposed boundary of any affected residential receiver when the construction site is in operation

should not exceed 75dB(A). This level represents the point above which there may be strong community reaction to noise.

- Outside recommended standard hours.

  The Management Level ($L_{Aeq,15min}$) measured at the most exposed boundary of any affected residential receiver when the construction site is in operation must not exceed the background noise level (RBL) by more than 5dB(A). It is noted that a strong justification is required for works outside the recommended standard hours.

ICNG suggests construction noise management levels for other sensitive land uses surrounding construction sites. Table 17 below summarises the airborne construction noise criteria for most affected noise sensitive receivers surrounding the development site.

Sensitive Receiver		*Airborne Construction Noise Criteria, L_{Aeq} dB(A)*	
		Within Standard Hours	*Outside Standard Hours*
General Residential (R1)	Noise affected / External	RBL+10	RBL+5
	Highly noise affected / External	75	N/A
Public Recreation (RE1)	External	65	65

Table 17: ICNG construction airborne noise criteria for noise sensitive receivers surrounding the site.

The ICNG recommends internal ground-borne noise maximum levels at residences affected by nearby construction activities. Ground-borne noise is noise generated by vibration transmitted through the ground into a structure and can be more noticeable than airborne noise for some sensitive receivers. The ground-borne noise levels presented below from the ICNG are for residential receivers during evening and night-time periods only, as the objective is to protect the amenity and sleep of people when they are at home.

- Evening: $L_{Aeq,15min}$ 40dB(A) - internal
- Night: $L_{Aeq,15min}$ 35dB(A) - internal

The internal noise levels are assessed at the centre of the most affected habitable room.

4.7.2 VIBRATION CRITERIA

4.7.2.1 Structural Building Damage

Ground vibration from construction activities can damage surrounding buildings or structures. For occupied buildings, the vibration criteria given in previous section for Human Comfort shall generally form the limiting vibration criteria for the Project.

For unoccupied buildings, or during periods where the buildings are unoccupied, the vibration criteria for building damage suggested by German Standard DIN 4150.3:2016 *'Vibration in Buildings – Effects on Structures'* are to be adopted. Guideline values from DIN 4150.3:2016 are presented in Table 18.

Structural type	*Vibration velocity, mm/s (Peak Particle Velocity - PPV)*				
	Foundation			*Plane of floor uppermost full storey in horizontal direction*	*Floor slabs, vertical direction*
	1Hz to 10Hz	*10Hz to 50Hz*	*50Hz to 100Hz*	*All frequencies*	*All frequencies*
Type 1: Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40	20
Type 2: Residential buildings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20	15	20
Type 3: Structures that because their particular sensitivity to vibration, cannot be classified under Type 1 and 2 and are of great intrinsic value (e.g. heritage buildings)	3	3 to 8	8 to 10	8	20

Table 18: DIN 4150.3:2016 Guideline values of vibration velocity (PPV) for evaluating the effects of short-term vibration.

4.7.2.2 Human Comfort

The Department of Environment and Climate Change (DECC) developed the document '*Assessing Vibration: A Technical Guideline*' in February 2006 to assist in preventing people from exposure to excessive vibration levels within buildings. It is based on the guidelines contained in BS 6472.1:2008 '*Guide to evaluation of human exposure to vibration in buildings – Vibration sources other than blasting*'.

The guideline does not address vibration induced damage to structures or structure-borne noise effects. Vibration and its associated effects are usually classified as continuous (with magnitudes varying or remaining constant with time), impulsive (such as shocks) or intermittent (with the magnitude of each event being either constant or varying with time). Vibration criteria for continuous and impulsive vibration are presented in Table 19 below, in terms of vibration velocity levels.

Place	*Time*	*Vibration velocity, mm/s (r.m.s.) [dB re 10^{-6}mm/s]*			
		Continuous Vibration		*Impulsive Vibration*	
		Preferred	*Maximum*	*Preferred*	*Maximum*
Residences	Day-time	0.20 [106 dB]	0.40 [112 dB]	6.00 [136 dB]	12.00 [142 dB]
	Night-time	0.14 [103 dB]	0.28 [109 dB]	2.00 [126 dB]	4.00 [132 dB]
Offices, schools, educational and worship	When in use	0.40 [112 dB]	0.80 [118 dB]	13.00 [142 dB]	26.00 [148 dB]

Table 19: Continuous and impulsive vibration criteria applicable to the site.

When assessing intermittent vibration comprising a number of events, the Vibration Dose Value (VDV) it is recommended to be used. Table 20 shows the acceptable VDV values for intermittent vibration.

Place	*Time*	*Vibration Dose Values, $m/s^{1.75}$*	
		Preferred	*Maximum*
Residences	Day-time	0.20	0.40
	Night-time	0.13	0.26
Offices, schools, educational and worship	When in use	0.40	0.80

Table 20: Intermittent vibration criteria applicable to the site.

5 OPERATIONAL NOISE EMISSIONS ASSESSMENT

Noise break-out from the proposed development has the potential to impact on existing noise sensitive receivers. For the purpose of this noise impact assessment, the noise sources are assumed as follows:

- Mechanical plant from the development to the surrounding receivers.
- Public address and school bell systems.
- Activities and events within the Communal Hall and Out of Hours Community use.
- Noise from Early Learning Centre (ELC).
- Noise from Classrooms.
- Traffic generation noise.

Each of these noise sources has been considered in the noise impact assessment. The noise impact assessments have also considered the following:

- Noise levels have been considered as continuous over assessment time period to provide the worst-case scenario.
- Distance attenuation, building reflections and directivity.
- Lowest background levels measured.

5.1 EXTERNAL MECHANICAL PLANT

Noise from proposed development mechanical plant rooms should be controlled to ensure external noise emissions are not intrusive and do not impact the amenity of noise sensitive receivers.

Mechanical plant will operate continuously during operating hours. At this stage, mechanical plant selections have not been made; therefore, it is not possible to undertake a detailed assessment of the mechanical plant noise emissions.

Noise controls will need to be incorporated with the design of the mechanical plant rooms to ensure that the cumulative noise levels from plant areas to the nearest noise sensitive receivers meets the NSW NPI noise level criteria – refer to Table 14.

Usual design noise controls that may need to be implemented will typically include, but are not limited to:

- Strategic location and selection of mechanical plant to ensure the cumulative noise levels at the receiver boundaries is met.
- Selection of appropriate quiet plant.
- Acoustic noise control measures to be put in place to minimise noise impacts such as:
  - In-duct attenuation.
  - Noise enclosures as required.
  - Sound absorptive panels.
  - Acoustic louvres as required.
  - Noise barriers as required.

Acoustic assessment of all mechanical plant shall continue during the design phases of the project in order to confirm any noise control measures to achieve the relevant noise criteria at the nearest noise sensitive receivers. Acoustic design and certification of mechanical services is recommended to be provided prior to the Crown Certificate.

5.2 PUBLIC ADDRESS AND SCHOOL BELL SYSTEMS

Noise from proposed development public address and school bell systems should be controlled to ensure external noise emissions are not intrusive and do not impact on the amenity of noise sensitive receivers.

At this stage, public address and school bell systems selections have been not made; therefore, it is not possible to undertake a detailed assessment of the public address and school bell noise emissions. However, general recommendations are provided below.

Acoustic assessment of public address and school bell systems shall continue during the design phases of the project once location, number and type of loudspeakers will be nominated.

The EPA notes numerous reports of community concern arising from inadequate design and installation as well as inappropriate use of school public address and bell systems. EPA considers that appropriate design, installation and use of those systems can both:

- Meet the proponent's objectives of proper administration of the school and ensuring safety of students, staff and visitors, and
- Avoid interfering unreasonably with the comfort and repose of occupants of nearby residences.

The public address and school bell systems shall be designed, installed and operated such that the systems does not interfere unreasonably with the comfort and repose of occupants of nearby residences. It is anticipated that the noise impact to the nearest sensitive receivers will be negligible if following recommendations are implemented:

- Low-powered horn-type speakers shall be located and orientated to provide a good coverage of the school areas whilst being directly away from residences and near sensitive receivers. System coverage shall be reviewed during the design phases.
- Speakers shall be mounted with a downward angle and as close to the floor as possible.
- The noise level of the systems shall be adjusted on site so they will be clearly audible on the school site without being excessive. The systems shall initially be set so that the noise at nearby residences and sensitive receivers do not exceed noise level criteria.
- Once the appropriate noise level has been determined on site, the systems shall be limited to these noise levels so that staff cannot increase the noise levels.
- The systems shall be set so that it only occurs on school hours – to not operate out of hours.

5.3 COMMUNAL HALL AND OUT OF HOURS COMMUNITY USE

The proposed Communal Hall is expected to be used by students and teachers during the day-time as well as by parents and community occasionally during the evening period (6pm to 10pm) for out-of-hours events. Communal Halls are typically used for school assemblies, presentations, examinations and student concerts during school hours. The assessment within this section has considered amplified noise sources (such as music performances, etc.) during the evening period (out-of-hours) as a worst-case scenario.

The proposed architectural design includes four bi-fold doors along the eastern, southern (two doors) and western façades of the building. The bi-fold doors will be used to provide natural ventilation for the Communal Hall. When open, these doors represent the weakest elements of the building fabric in terms of noise break-out to the nearest noise sensitive receivers.

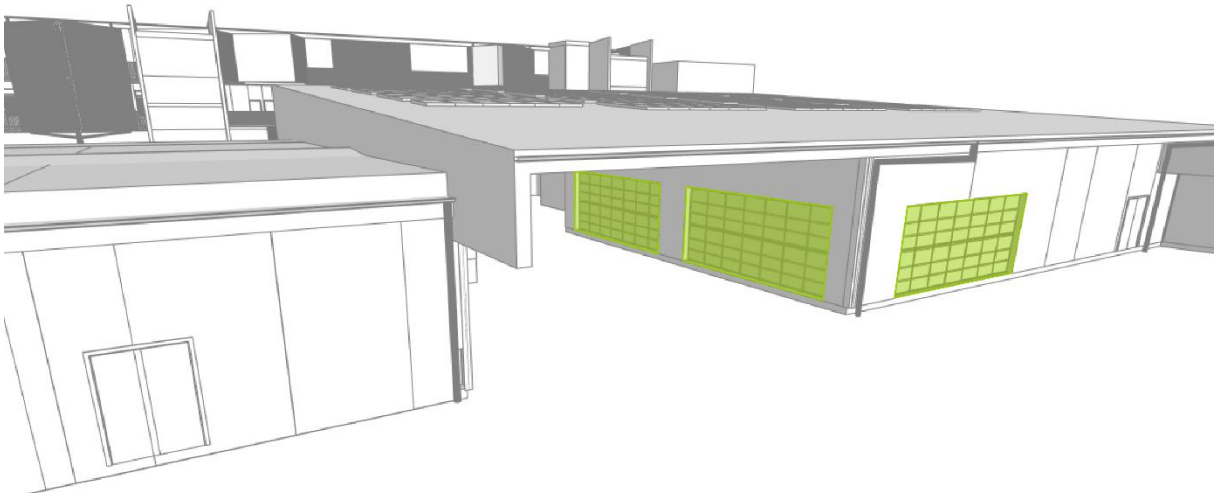

Figure 9: Bi-fold doors (green shading) in the Communal Hall – Eastern and Southern facades.

The following assumptions have been made within the assessment:

- Events occurring during evening time hours (6pm-10pm, most stringent noise criteria).
- The noise levels inside the Communal Hall during an event is expected to be 100dB(A) with amplified music as a worst-case scenario. Noise levels for typical activities within the Communal Hall – i.e. school assemblies, presentations – are between 70 and 75dB(A).
- Bi-fold doors to the Eastern and Western sides closed during amplified music events.

Based on the assumptions presented above, the assessments of the noise impact to the nearest residential receiver are shown in Table 21 and Table 22.

Calculation	*Amplified music*	
	Southern Façade	*Eastern / Western Façade*
Reverberant Internal Noise Level $L_{Aeq,15min}$, dB(A)	100	100
Composite Sound Insulation of Southern Façade, dB	-10	-25
Correction for Surface Area of Open Bi-fold Door, dB	17	14
Correction for reflections, directivity, shielding, dB	3	0
Correction for distance, dB	-38	-36
Predicted noise level at the nearest residential receiver, dB(A)	**58**	**39**
Cumulative Noise Level dB(A) / Complies with noise criteria?	**58 / No (46)**	

Table 21: Assessment of noise impacts to the nearest residential receiver during amplified music events with Eastern and Western bi-fold doors closed.

Calculation	School activities	
	Southern Façade	Eastern / Western Façade
Reverberant Internal Noise Level $L_{Aeq,15min}$, dB(A)	75	75
Composite Sound Insulation of Southern Façade, dB	-10	-10
Correction for Surface Area of Open Bi-fold Door, dB	17	14
Correction for reflections, directivity, shielding, dB	3	0
Correction for distance, dB	-38	-36
Predicted noise level at the nearest residential receiver, dB(A)	33	29
Cumulative Noise Level dB(A) / Complies with noise criteria?	34 / Yes (46)	

Table 22: Assessment of noise impacts to the nearest residential receiver during school activities with bi-fold doors open.

Based on the above results, the predicted noise levels from the Communal Hall are not expected to meet the noise level criteria during evening time (6pm to 10pm) at the nearest residential receivers during amplified music events. However, predicted noise levels during typical school activities within the Communal Hall will meet the noise level criteria at the nearest noise sensitive receivers.

Given the infrequency of amplified music events the following operational noise measures are recommended in order to further reduce any potential adverse noise impacts to the residential receivers:

- Minimise the frequency of amplified music events during the evening time period where feasible.
- During amplified music events in the evening, Eastern and Western bi-fold doors shall be closed.
- Keep the community informed of any noisy events occurring during the evening time period.
- No events within the Communal Hall to be held after 10.00pm and before 7.00am.
- A contact phone number for the relevant persons employed by the school should be made available to neighbours to facilitate communication and to resolve any neighbourhood issues that may arise due to operational noisy events of the school.

5.4 ELC OUTDOOR PLAYGROUND

The acoustic impacts for the proposed ELC will be assessed within a separate Development Application. Nevertheless, the noise breakout from the ELC outdoor playground has been assessed within this report to the nearest noise sensitive receivers. The key noise source will be children using the outdoor playground. Based on the architectural drawings, the ELC is located in the southern side of the site and the ELC outdoor playground is adjacent to the East. The ELC building will provide noise shielding to the nearest noise sensitive receivers in Faulkner Way to the West.

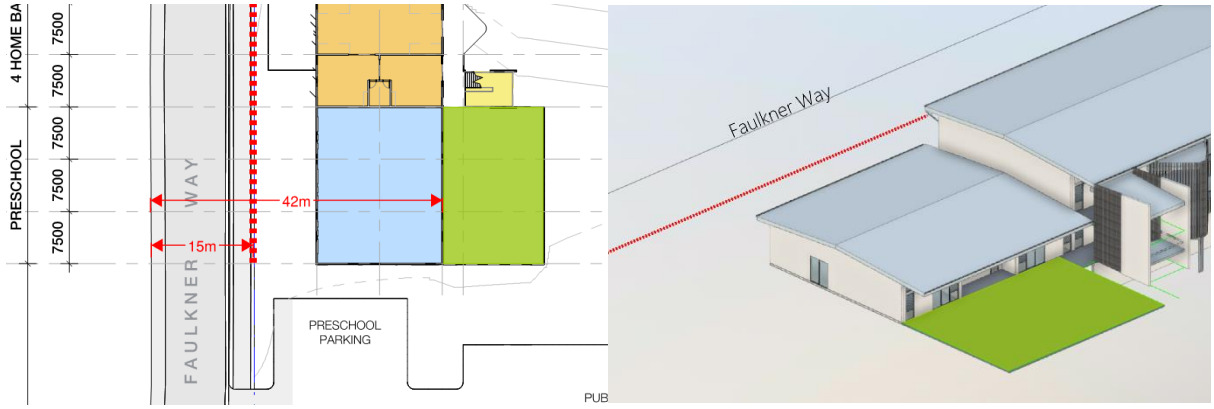

Figure 10: Location of ELC outdoor playground (green shadow) as per architectural drawings.

It has been assumed that the outdoor playgrounds will be likely to be at full capacity. The noise assessment has assumed the following:

- Children aged between 3 to 5 years – 87dB(A) sound power level for groups of 10 children playing, as per AAAC guideline. Assuming a maximum capacity of 40 children, the equivalent sound power level is 93dB(A).
- The ELC is proposed to be to the South of the site, therefore residential receivers in Noise Catchment 3 (Faulkner Way) are considered the most affected and this has been assessed as the worst-case scenario.
- A maximum number of 40 children will be using the playground.
- The children will be evenly distributed across the outdoor playground.
- The outdoor playground area will be in use during school hours – i.e. day-time (7am to 6pm).

The predicted noise levels at the nearest noise sensitive receivers and the AAAC guideline criteria are shown in Table 23.

Calculation	*Noise Level dB(A)*
L_{Aeq} of 40 children, dB(A)	82
Building Shielding Insertion Loss, dB	-20
Distance attenuation (45m), dB	-33
Resulting level at residential receiver	29
Noise Level Criterion daytime (Over 4 hours) / Complies?	51 / Yes
Noise Level Criterion daytime (More than 4 hours) / Complies?	46 / Yes

Table 23: Noise assessment at nearest residential noise sensitive receiver for the ELC outdoor playground – with building shielding.

As per the noise impact assessment results of the ELC outdoor playground, use of the ELC outdoor playground will meet the noise level criterion at the nearest noise sensitive receivers in Faulkner Way.

5.5 CLASSROOM NOISE

There will not be significant noise emissions from the use of the classrooms as, generally, noise levels within teaching spaces in a primary school are expected to be low, plus the typical façade sound insulation performance minimise the noise impacts to the nearest noise sensitive receivers.

At this stage, architectural façade drawings have not been prepared; therefore, it is not possible to undertake a detailed assessment of the sound insulation performance of the façade.

In order to achieve a sufficient façade sound insulation performance, surface of ventilation openings shall be minimised and the surface and sound insulation performance of glazing shall not reduce the overall sound insulation performance of the building façade.

Acoustic design of the façade, other external building elements and ventilation openings of the school will need to be considered throughout the design stages in order to meet the noise level criteria in the nearest noise sensitive receivers.

5.6 OFFENSIVE NOISE

Based on the noise emissions assessments presented in the sections above, the following comments regarding "offensive noise" shall be considered:

- The operational key noise sources from the proposed school will be mechanical plant, public address and school bell system, out-of-school-hours events at the Communal Hall, ELC outdoor playgrounds and classroom noise.
- Mechanical plant will be selected and noise control measures implemented to ensure that the noise levels at the nearest noise sensitive receiver do not exceed the NSW NPI noise criteria established in Section 4.5.1.
- Recommendations for the implementation and use of the public address and school bell systems has been provided in Section 5.2 in order to meet the noise level criteria at the nearest noise sensitive receivers.
- Noise levels emitted from the Communal Hall during school activities are expected to meet the required noise level criteria.
- Noise levels from the ELC outdoor playgrounds are anticipated to meet the required noise criteria and the following is stated about the noise from the ELC outdoor playground:
  - It cannot be considered as a loud noise in an absolute sense.
  - It is not irritating, it does not contain tonal components, neither is impulsive or the noise level fluctuates.
  - It would not occur during quiet time periods – i.e. night time.
- Noise levels associated with classroom noise of the school are anticipated to meet the noise level criteria.
- By controlling noise emissions (associated with the operation of the proposed development) in accordance with the relevant criteria, amenity of noise sensitive receivers will be maintained and noise emissions should not be intrusive, therefore it is not expected that people and noise sensitive receivers will be adversely affected by the development.

Based on the comments above, the development is able to satisfy the requirements of the POEO for "offensive noise" provided the relevant criteria outlined in Section 4 are achieved.

5.7 TRAFFIC GENERATION NOISE

A traffic generation noise assessment has been undertaken in order to determine the potential noise impact of traffic generated by the proposed school. Based on the information provided by Parking, Traffic and Civil Engineering, the 2026 traffic flows in Buchan Avenue and estimated school trips are presented in Table 24.

	School trips	*2026 cumulative*	*dB increase*
AM Peak Traffic Flow (vehicles/hour)	750	1,203	2.0
PM Peak Traffic Flow (vehicles/hour)	750	1,177	1.9

Table 24: Predicted traffic noise level increase.

As noted in Section 4.6.1, when considering land use redevelopment and the impact on sensitive land uses (residential / schools / hospitals / recreational) the NSW Road Noise Policy (RNP) states that an increase up to 2.0dB in relation to existing noise levels is anticipated to be insignificant. As shown in Table 21, the increase of traffic noise levels in the year 2026 due to the proposed development, is less than the maximum allowable increase of 2.1dB(A).

Therefore, the traffic increase due to the school will not result in any noticeable change in traffic noise levels and is expected to meet the NSW Road Noise Policy recommendations.

6 NOISE INTRUSION ASSESSMENT

6.1 TRAFFIC NOISE

Traffic noise from Buchan Avenue and Faulkner Way could affect the proposed development. In order to meet the EFSG DG11 internal noise levels requirements, JHA has carried out a review of traffic noise impacts and recommends the minimum glazing thickness for the buildings.

The following assumptions have been considered for the traffic noise impacts:

- Traffic noise levels and rail noise levels for the assessment are as per measured levels on site. Refer to Section 3.4 and Section 3.5.
- Internal noise levels are predicted based on noise levels incident at the façade of each space, which are based on the above measurements.
- External glazing is the weakest elements of the façade, and solid sections of the façade will provide a sound reduction index of R_W50.
- EFSG DG11 sets an internal noise level of 40dB(A) for open plan teaching spaces.

To achieve the internal noise levels in accordance with EFSG DG11, based on the above assumptions, will typically require the following:

- External glazing facing Buchan Avenue, Faulkner Way to provide a minimum sound reduction index of R_W35. A 10.38mm laminated fixed single glazing system achieves the nominated sound reduction index.

Notwithstanding with the glazing recommendations provided above, the acoustic performance of the glazing and building façade shall be reviewed during the detailed design of the project once glazing and façade areas will be defined.

6.2 RAIL NOISE AND VIBRATION

Noise and vibration impacts from the adjacent railway corridor have been assessed as per Section 4.6.2 requirements. From the attended rail noise measurements, it can be observed steady noise levels range from 48 to 51dB(A) for each train pass-by at the approximate location of the nearest building to the railway corridor. Based on the duration of train pass-bys (approximately 20 seconds) and the measured noise levels, it is expected that Infrastructure SEPP noise level criteria will be achieved with a typical façade and glazing system.

For railway vibration, the screening method detailed in the Appendix A of the NSW DECC *'Assessing Vibration: A Technical Guideline'* has been applied to assess rail vibration impact. The following assumptions have been considered to assess the vibration impact:

- Rail vibration levels for the assessment are as per measured vibration levels on site during train pass-bys. Refer to Table 8.
- Rail vibration impact will occur when the school will be in use i.e. 8am to 4pm during weekdays.
- The number of train pass-bys during the above time period is 68 as per available Sydney Trains timetables.

Based on the above assumptions and the vibration levels measured on site – refer to Section 3.5, the total estimated vibration dose over a full day in the school is 0.01077m/s$^{1.75}$, which meets the vibration criteria for schools 0.40m/s$^{1.75}$. This result meets the vibration criteria and therefore, vibration levels are acceptable on site.

7 CONSTRUCTION NOISE AND VIBRATION PLANNING

Currently a detailed construction program is not yet full defined. This section of the Construction Noise and Vibration Planning provides general recommendations only and provides applicable criteria together with feasible and reasonable noise and vibration control practices to be observed during the construction of the proposed development.

This preliminary advice in relation to construction noise and vibration management shall form the basis for the Contractor's Construction Noise and Vibration Management Plan (CNVMP) which shall identify any noise criteria exceedance once construction methods and stages are known.

Any noise from demolition and construction activities to be carried out on site must not result in *'offensive noise'* to any noise sensitive receiver. To this end, the Contractor employed to undertake the demolition and/or construction works is responsible for ensuring that any site noise and, in particular, any complaints shall be monitored, investigated, managed and controlled.

7.1 RELEVANT STANDARDS FOR CONSTRUCTION NOISE AND VIBRATION CRITERIA

Section 4.7 of this report contains the relevant legislation, codes and standards in addition to construction noise and vibration criteria for this project.

7.2 WORKING HOURS

The following construction hours are proposed as follows:

- Monday to Friday: 7am to 6pm.
- Saturday: 8am to 1pm.
- Sundays and Public Holidays: No excavation or construction works.

It is noted that the proposed construction hours are within the recommended EPA hours. Noise control measures are to be implemented during these hours following consultation and engagement with the community.

It is recommended that high noise level works – i.e. piling, excavation, etc – shall be scheduled to not occur during shoulder periods of the recommended standard hours – i.e 7am to 8am and 5pm to 6pm.

A detailed Construction Noise & Vibration Management Plan (CNVMP) shall further assess the noise impact of construction works, and shall include a protocol to minimise any potential noise impacts to identified sensitive receivers, and ensure that appropriate noise control measures are defined and implemented to comply with all relevant noise guidelines.

7.3 PRELIMINARY CONSTRUCTION NOISE ASSESSMENT

A preliminary construction noise assessment has been carried out based on typical plant and machinery expected throughout the construction stages. The preliminary noise assessment has been considered at the nearest existing residential receivers.

7.3.1 NOISE

These levels are based on the database published by the UK Department for Environmental, Food and Rural Affairs (DEFRA) & Australian Standard AS2436:2010 *'Guide to Noise Control on Construction, Maintenance & Demolition Sites'* for a 15-minute period.

The expected construction noise sources and the predicted noise levels at the nearest residential receivers are shown below in Table 25.

Item	*Typical Power Noise Level L_{A10} (dB ref 1pW)*	*Typical Noise Level $L_{A10,15m}$ at 7m (dB ref 20μPa)*	*Predicted Noise Level $L_{Aeq,15m}$ at nearest residential receiver*	*Complies with Highly Noise Affected Criteria?*
Angle grinders	104	76	53-65	Yes
Truck (>20 tonne)	108	80	57-69	Yes
Circular saw	115	87	64-76	No
Piling rig	120	92	69-81	No
10-40tn Excavator	117	89	66-78	No
40-50tn Mobile crane	111	83	60-72	Yes
Concrete pump	114	86	63-75	No
Concrete truck	110	82	59-71	Yes
Drill	94	66	43-55	Yes

Table 25: Anticipated airborne noise levels for equipment / plant used during construction works.

Based on the results of the preliminary assessment as shown above, the noise associated with the normal construction works is expected to exceed the noise limits for highly noise affected receivers within standard hours. This assessment is based on typical noise levels associated with construction sites and machinery.

Nevertheless, compliance with the relevant construction noise criteria can be achieved through specific noise mitigation measures. These noise mitigation measures are to be provided in a detailed Construction Noise & Vibration Management Plan and prepared by a qualified acoustic consultant prior to Crown Certificate.

7.3.2 VIBRATION

The NSW RMS '*Construction Noise and Vibration Guideline*' provides safe working distances for vibration intensive plant and are quoted for both 'cosmetic' damage (in accordance with BS 7385.2:1993) and human comfort (in accordance with DECC's '*Assessing Vibration: A Technical Guideline*'). The recommended safe working distances for typical construction plant are provided in Table 26.

Plant Item	*Description*	*Cosmetic Damage*	*Human Response*
Small Hydraulic Hammer	5-12 tonne	2m	7m
Medium Hydraulic Hammer	12-18 tonne	7m	23m
Large Hydraulic Hammer	18-34 tonne	22m	73m
Vibratory Pile Driver	Sheet piles	2-20m	20m
Pile Boring	<800mm	2m	N/A
Jackhammer	Hand held	1m	Avoid Contact with Structure

Table 26: Recommended minimum working distances for vibration intensive plant from sensitive receivers.

For any vibration intensive plant expected to be within close proximity of the minimum distances described above, the contractor must engage a qualified engineer to carry out a vibration survey in order to assess any potential risks.

The vibration survey and assessment will determine whether the vibration levels might exceed the relevant criteria then vibration mitigation and management measures will need to be put in place to ensure vibration impacts are minimized as far as practicable.

7.4 MITIGATION MEASURES

In order to meet the noise and vibration requirements of the site, the Contractor will be required to engage a qualified acoustic consultant to assist in the compilation of a Construction Noise and Vibration Management Plan and undertake noise and vibration monitoring for the duration of the project.

7.4.1 GENERAL CONTROL ELEMENTS

As a general rule, minimising noise and vibration should be applied as universal work practice at any time of day, but especially for any construction works to be undertaken at critical times outside normal daytime/weekday periods.

It is noted that the reduction of noise and vibration at the source and the control of the transmission path between the construction site and the receiver(s) are the preferred options for noise minimisation. Providing treatments at the affected receivers should only be considered as a last resort. Construction noise and vibration shall be managed by implementing the strategies listed below:

- *Plant and equipment*. In terms of both cost and results, controlling noise and vibration at the sources is one of the most effective methods of minimising the impacts from any work site activities. Work practices that will reduce noise and vibration at the source include:
  - Employing quieter techniques for all high noise activities such as rock breaking, concrete sawing, and using power and pneumatic tools.
  - Use quieter plant and equipment based on the optimal power and size to most efficiently perform the required tasks.
  - Selecting plant and equipment with low vibration generation characteristics.
  - Operate plant in a quietest and most effective manner.
  - Where appropriate, limit the operating noise of equipment.
  - Regularly inspecting and maintain plant and equipment to minimise noise and vibration level increases, to ensure that all noise and vibration reduction devices are operating effectively.
- *On site noise management*. Practices that will reduce noise from the site include:
  - Maximising the distance between noise activities and noise sensitive receivers. Strategically locate equipment and plant.
  - Undertaking noisy fabrication work off-site where possible.
  - Avoid the use of reversing beeping alarms or provide for alternative systems, such as broadband reversing alarms
  - Maintaining any pre-existing barriers or walls on a demolition or excavation site as long as possible to provide optimum sound propagation control.
  - Constructing barriers that are part of the project design early in the project to afford mitigation against site noise.
  - Using temporary site building and material stockpiles as noise barriers. These can often be created using site earthworks and may be included as a part of final landscape design.

  - Installing purpose built noise barriers, acoustic sheds and enclosures.
- *Work scheduling.* Scheduling work during periods when people are least affected is an important way of reducing adverse impacts. The following scheduling aspects may reduce impacts:
  - Provide respite periods, including restricting very noisy activities to daytime, restricting the number of nights that after-hours work is conducted near residences, or by determining any specific requirements, particularly those needed for noise sensitive receivers.
  - Scheduling activities to minimise impacts by undertaking all possible work during hours that will least adversely affect sensitive receivers and by avoiding conflicts with other scheduled events.
  - Scheduling work to coincide with non-sensitive periods.
  - Scheduling noisy activities to coincide with high levels of neighbourhood noise so that noise from the activities is partially masked and not as intrusive.
  - Planning deliveries and access to the site to occur quietly and efficiently and organising parking only within designated areas located away from sensitive receivers.
  - Optimising the number of deliveries to the site by amalgamating loads where possible and scheduling arrivals within designated hours.
  - Designating, designing and maintaining access routes to the site to minimise impacts.
- *Consultation, notification and complaints handling.*
  - Provide information to neighbours before and during construction.
  - Maintain good communication between the community and Project staff.
  - Have a documented complaints process and keep register of any complaints.
  - Give complaints a fair hearing and provide for a quick response.
  - Implement all feasible and reasonable measures to address the source of complaint. Implementation of all reasonable and feasible mitigation measures for all works will ensure that any adverse noise impacts to surrounding receivers are minimised when noise goals cannot be met due to safety or space constraints.

7.4.2 ADDITIONAL NOISE AND VIBRATION CONTROL MEASURES

If, during construction, an item of equipment exceeds ether the noise criteria at any location or the equipment noise level limits, the following noise control measures, together with construction best practices, shall be considered to minimise the noise impacts on the neighbourhood.

- Schedule noisy activities to occur outside of the most sensitive times of the day for each nominated receiver.
- Consider implementing equipment-specific screening or other noise control measures recommended in Appendix C of AS 2436:2010.
- Limit the number of trucks on site at the commencement of site activities to the minimum required by the loading facilities on site.
- When loading trucks, adopt best practice noise management strategies to avoid materials being dropped from height into dump trucks.
- Avoid unnecessary idling of trucks and equipment.
- Ensure that any miscellaneous equipment (extraction fans, hand tools, etc) not specifically identified in the CNVMP incorporates silencing/shielding equipment as required to meet the noise criteria.

Implementation of all reasonable and feasible mitigation measures for all internal and underground works will ensure that any adverse noise impacts to surrounding noise sensitive receivers are minimised when noise goals cannot be met due to safety or space constraints.

8 SUMMARY AND CONCLUSIONS

A noise and vibration impact assessment has been carried out for the New Primary School in Edmondson Park. This report forms part of the documentation package submitted to the Department of Planning, Industry & Environment as part of the State Significant Development Application (SSD-10224).

This report establishes relevant noise level criteria, details the acoustic assessment and provides comments and recommendations for the proposed development. Ambient and background noise surveys have been undertaken at the existing site to establish the appropriate noise criteria in accordance with the relevant guidelines.

The noise assessment has adopted methodology from relevant guidelines, standards and legislation to assess noise impact. The noise impacts have been predicted at the nearest noise sensitive receiver boundaries.

At this stage, mechanical plant selections have not been made. Therefore, recommendations have been provided to minimise the impact of external noise emissions associated with the mechanical plant of the proposed development to the nearest sensitive receivers.

Recommendations have been provided to minimise the impact of external noise emissions associated with the public address and school bell systems of the proposed development to the nearest sensitive receivers.

The predicted noise levels from the Communal Hall are expected to meet the noise level criteria for school activities at the nearest residential receivers with all bi-fold doors open. However, during amplified music events during evening time, exceedances of the noise level criteria will occur even with the eastern and western bi-fold doors closed. Given the infrequency of out-of-hours amplified music events, operational noise measures are recommended (refer to Section 5.3) in order to further reduce any potential adverse noise impacts to the residential receivers.

The noise impacts from the use of the ELC outdoor playground will meet the noise level criteria at the nearest noise residential receivers. Noise level criteria will be achieved by the shielding provided by the ELC building plus location of the ELC outdoor playground.

The noise impact from the use of the classrooms will meet the established noise level criteria at the nearest noise sensitive receivers.

The future traffic noise impact due to number of vehicles due to the school – based on the information provided by the traffic engineers – is anticipated to be meet the NSW Road Noise Policy requirements, as the noise levels will not increase more than 2.0dB at the sensitive noise receivers.

An offensive noise assessment has been carried out, and based on the comments in Section 5.6, the development is able to satisfy the requirements of the POEO for "offensive noise" provided the relevant criteria outlined in Section 4 are achieved.

Noise break-in from traffic noise and rail noise has been assessed for the external glazing facing Buchan Avenue, Faulkner Way and the railway corridor. A minimum sound insulation performance has been obtained to meet the internal noise level criteria as per EFSG DG11. Acoustic design of the external glazing shall continue during the detailed design of the project once glazing and façade areas will be defined. The assessment of rail vibration levels shows that the total estimated vibration dose due to train pass-bys meets the vibration criteria and hence vibration from train pass-bys are acceptable on site.

A preliminary construction noise assessment has been carried out. Based on the results, the noise associated with the normal construction works is expected to exceed the noise limits in accordance with the ICNG Guideline. Nevertheless, compliance with the relevant construction noise criteria can be achieved through specific noise mitigation measures – to be provided in a detailed Construction Noise & Vibration Management Plan prepared by a qualified acoustic consultant prior to Crown Certificate.

Based on the information presented in this report, relevant objectives will be satisfied and therefore approval is recommended to be granted.

APPENDIX A: LONG-TERM NOISE MONITORING

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

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

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

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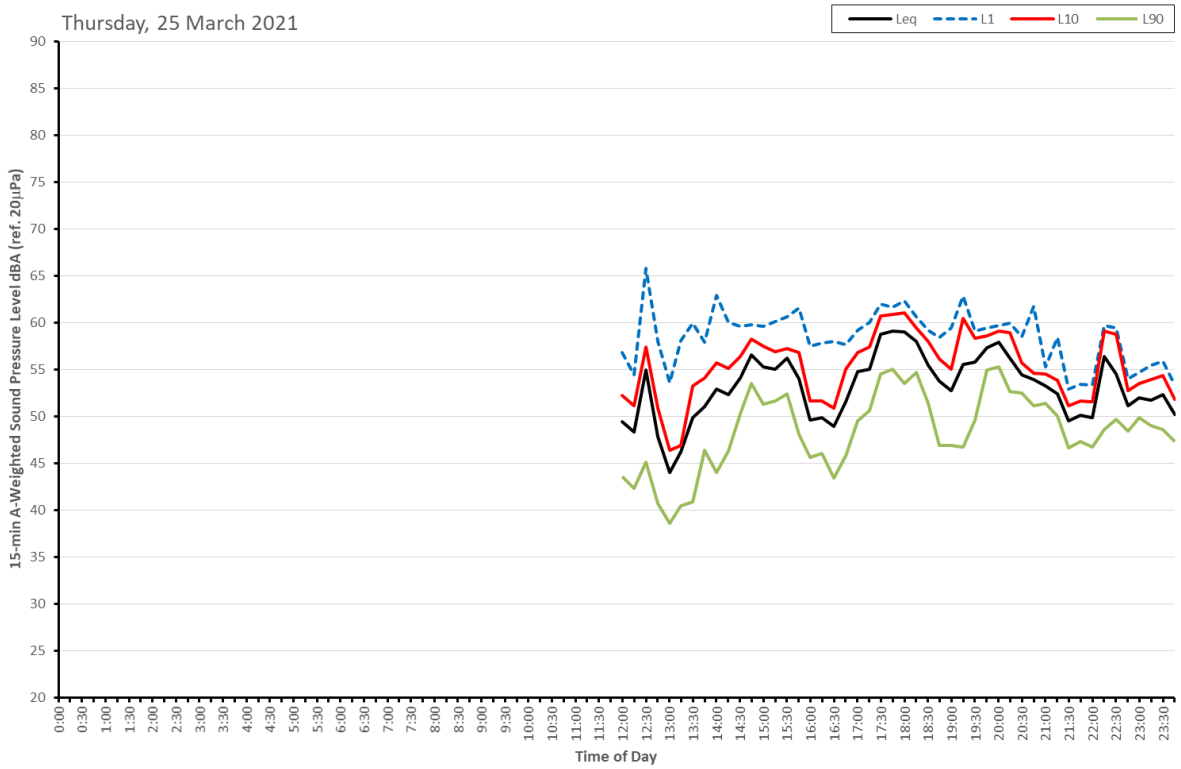
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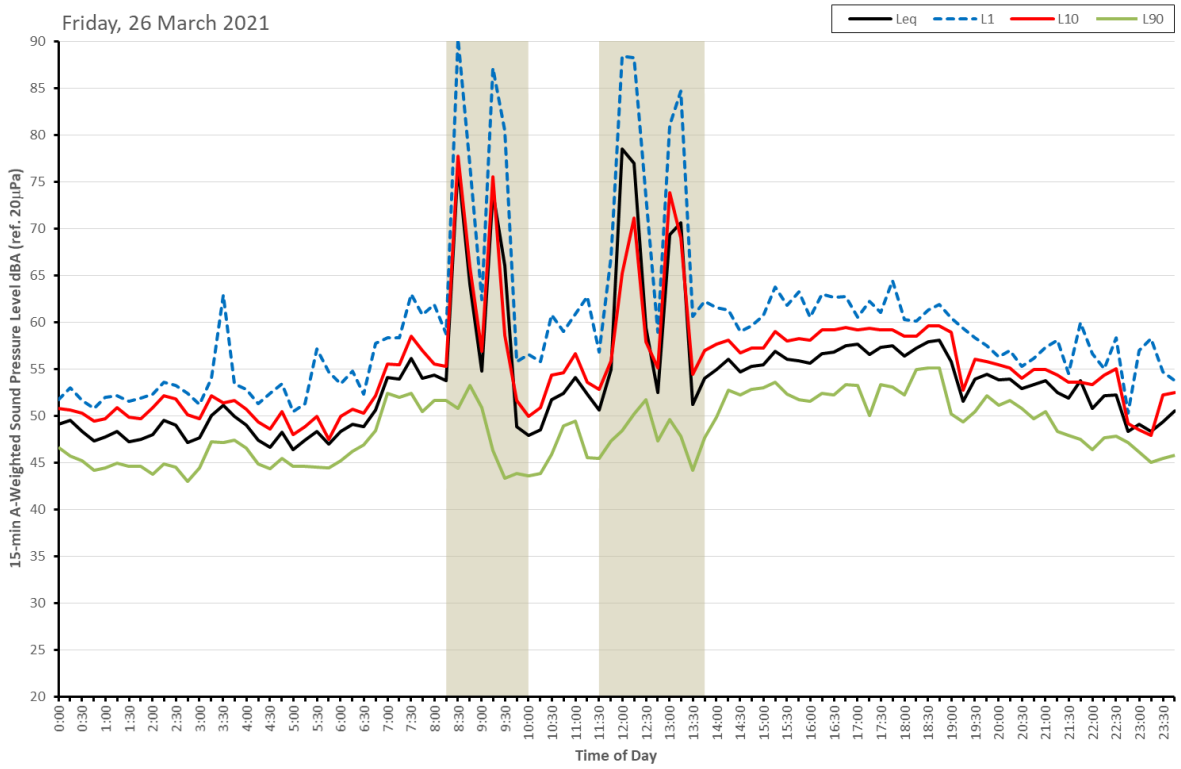
Time of Day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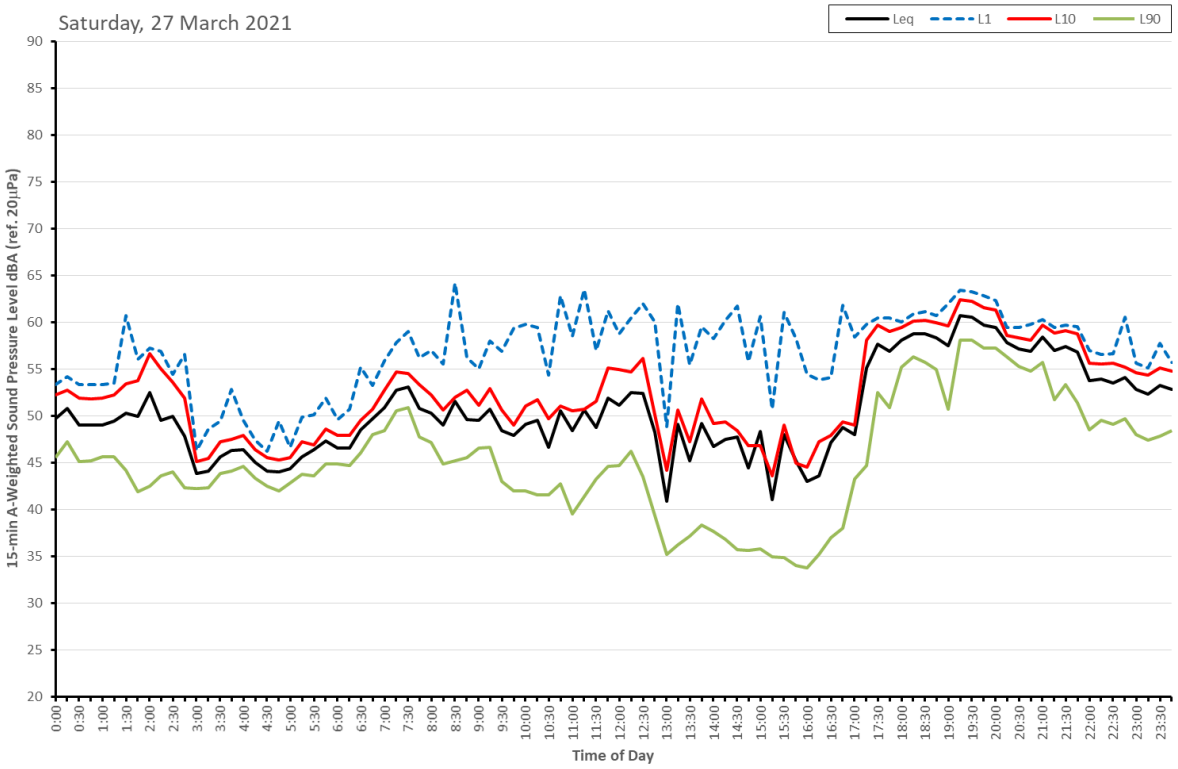
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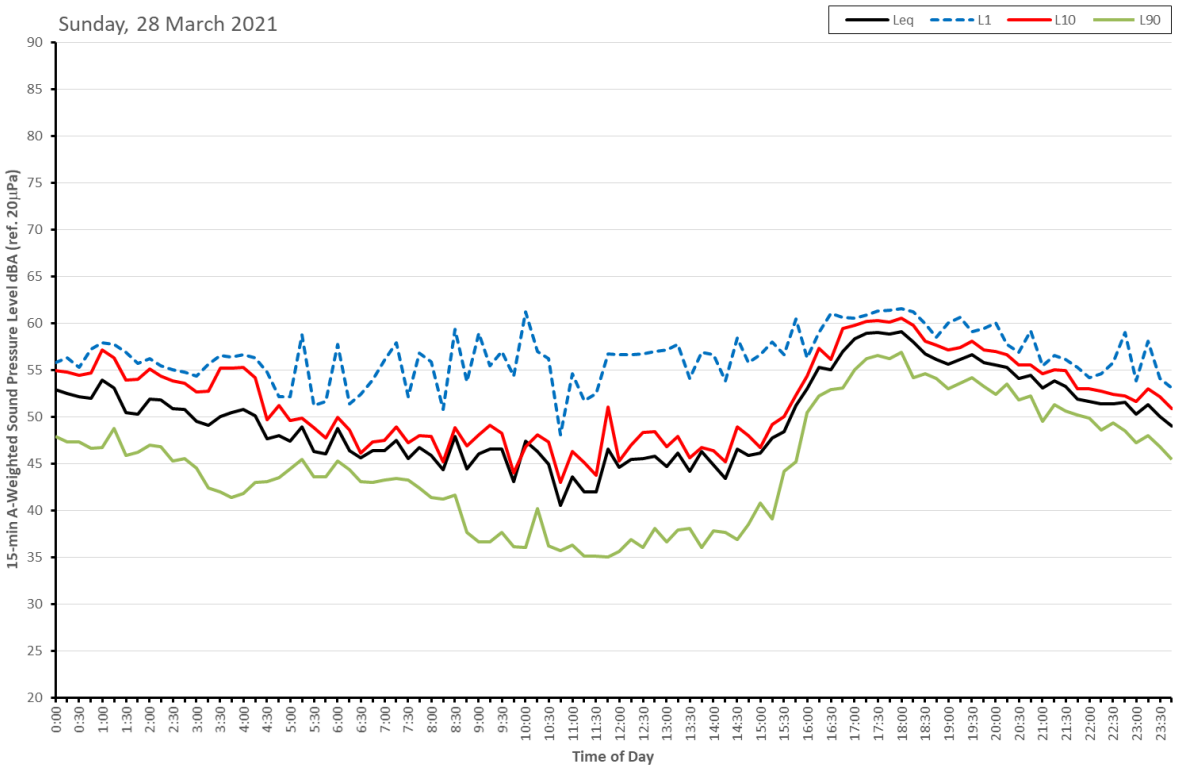
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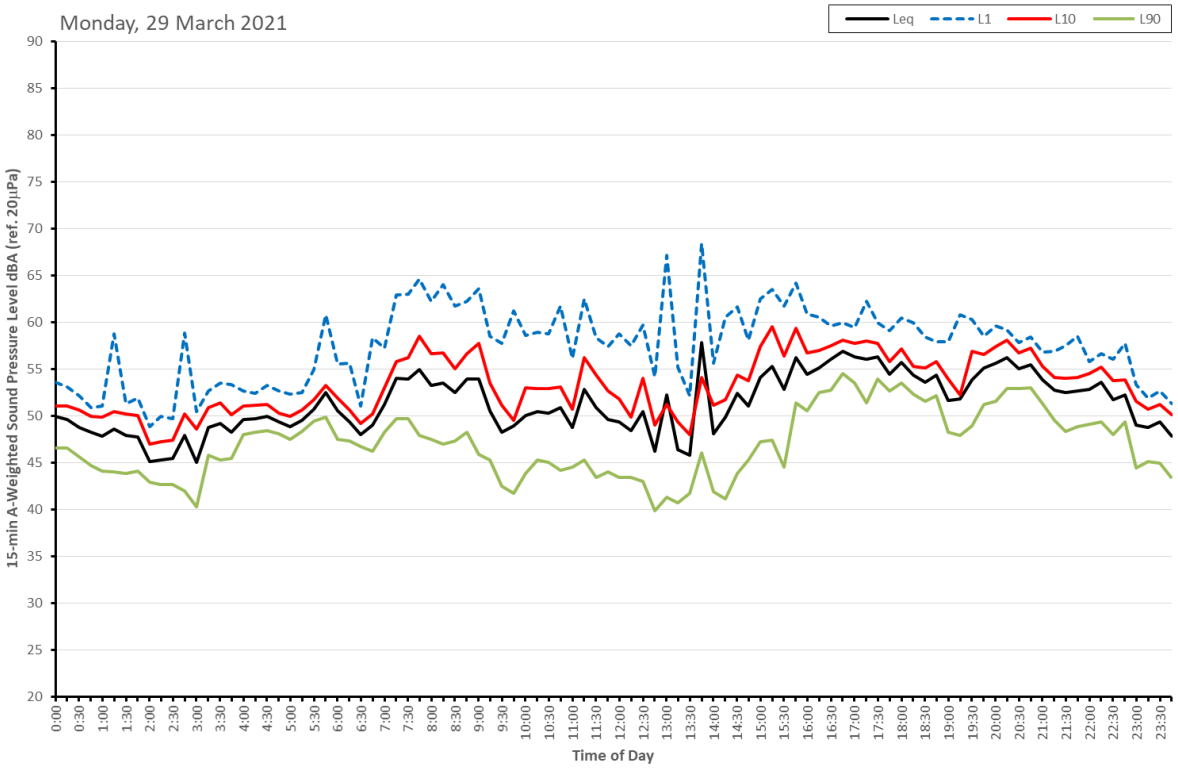
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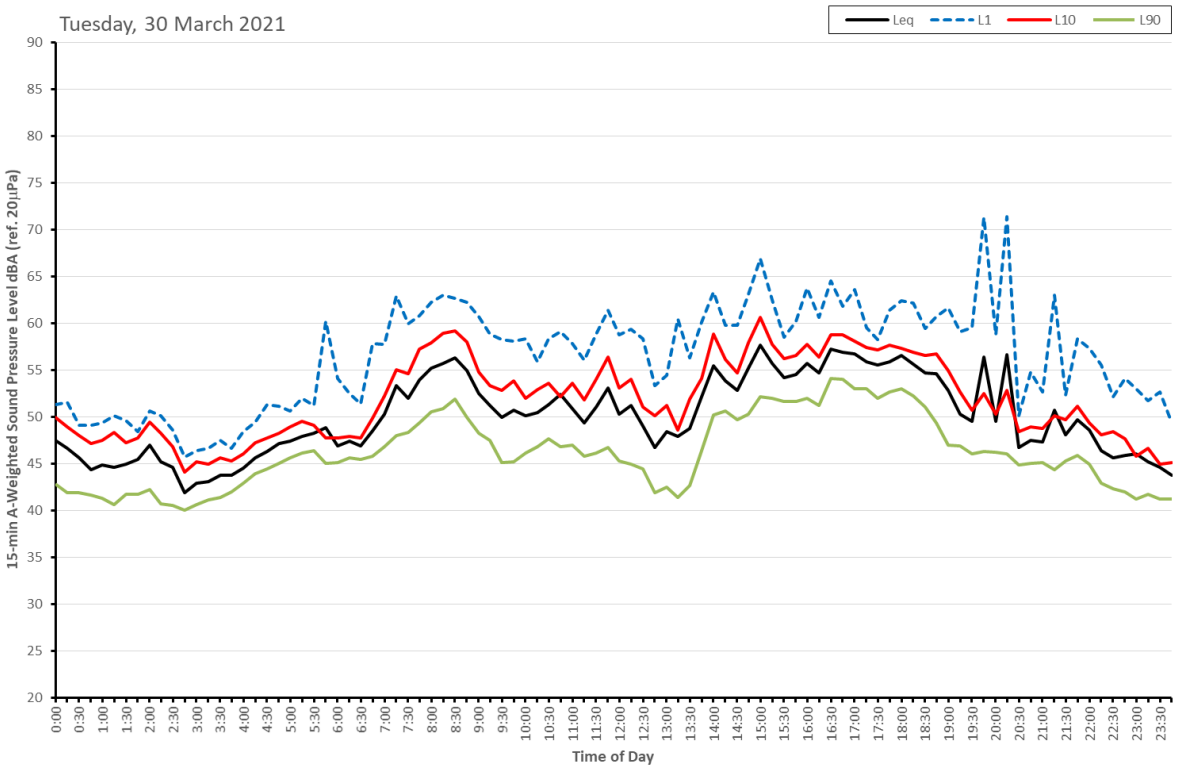
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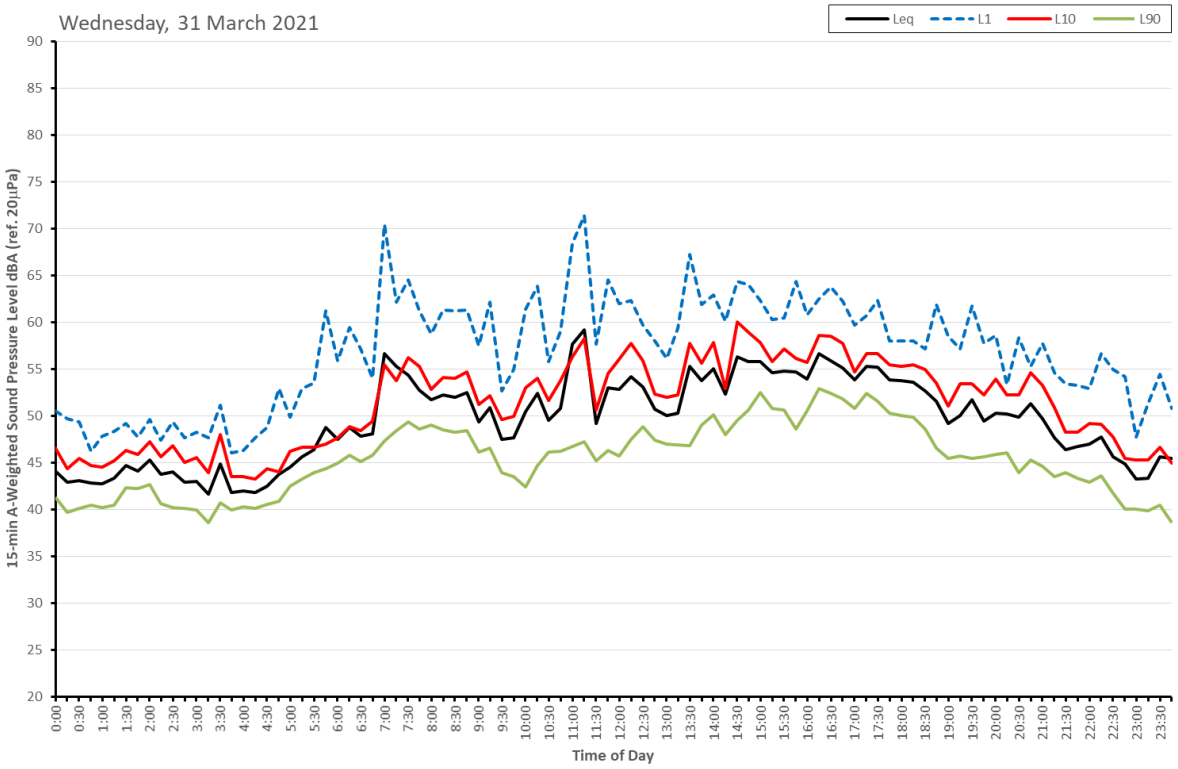
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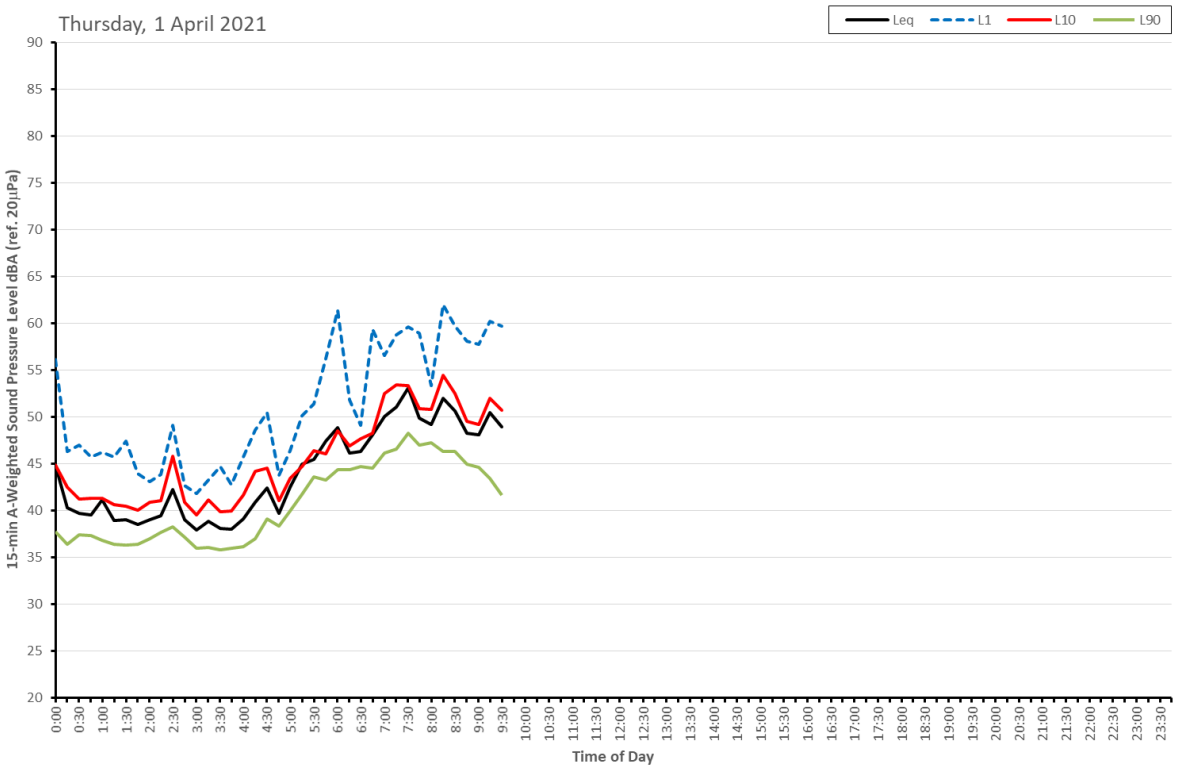
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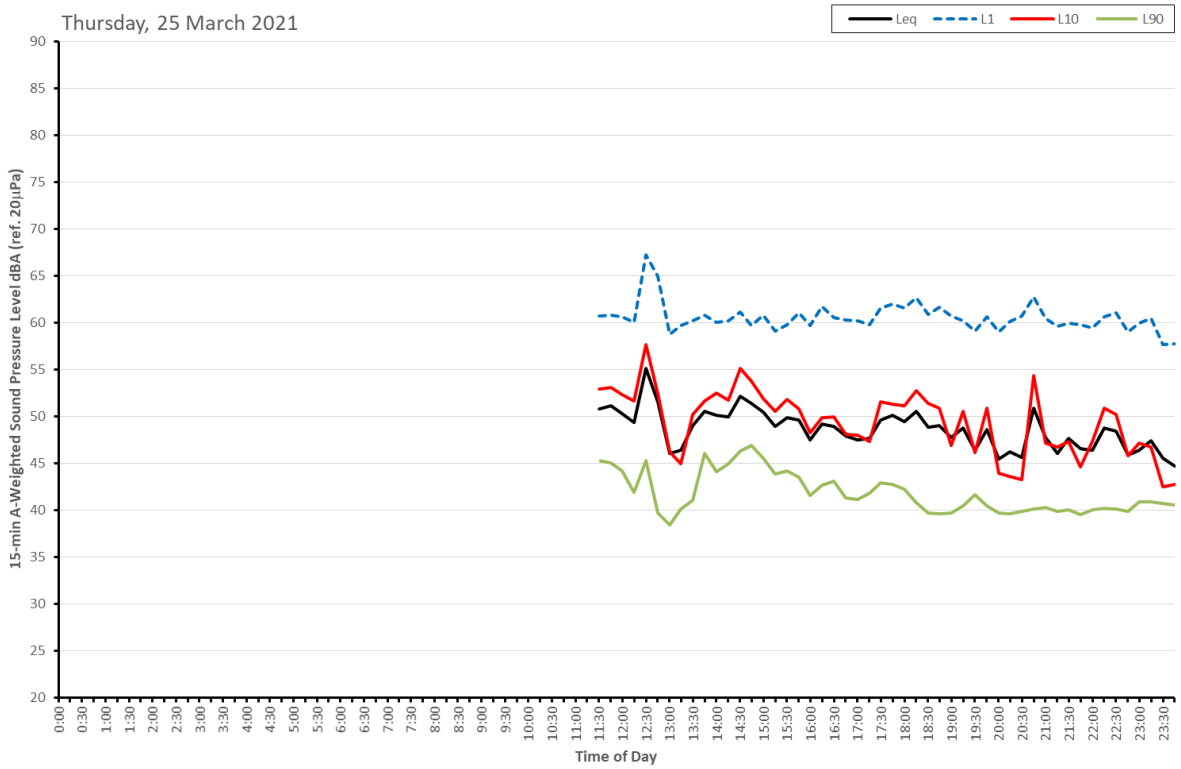
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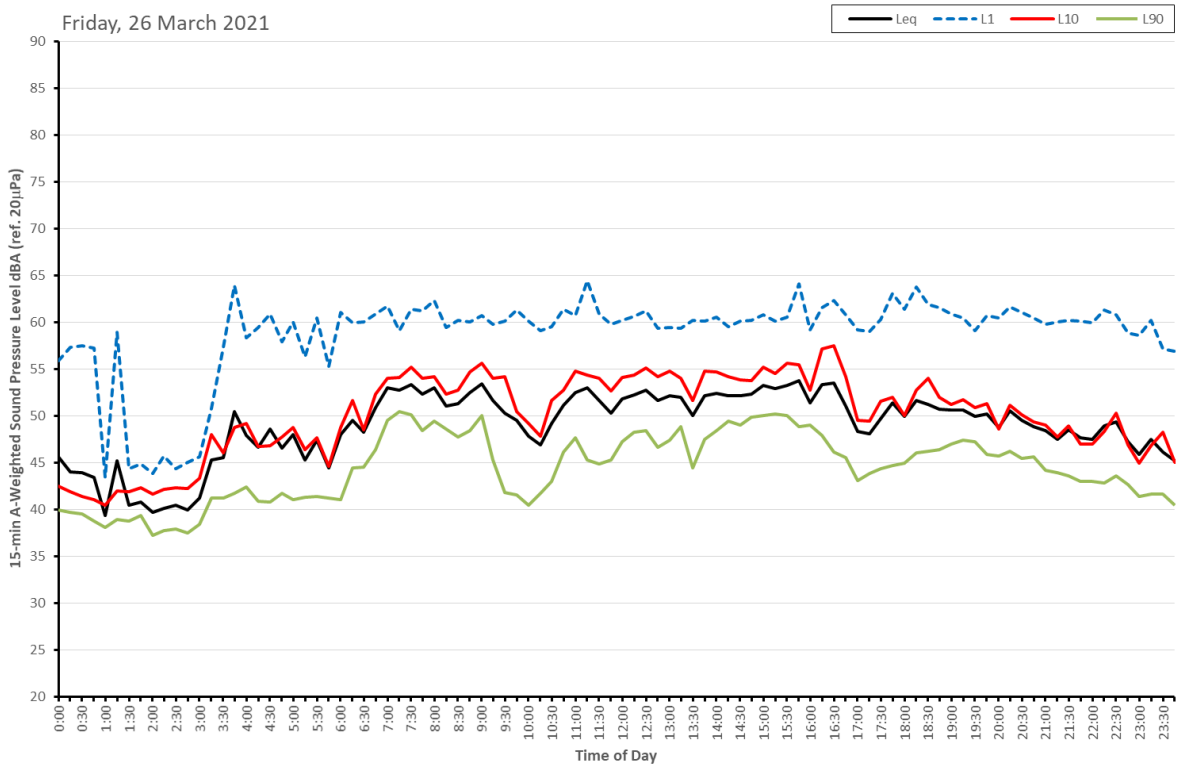
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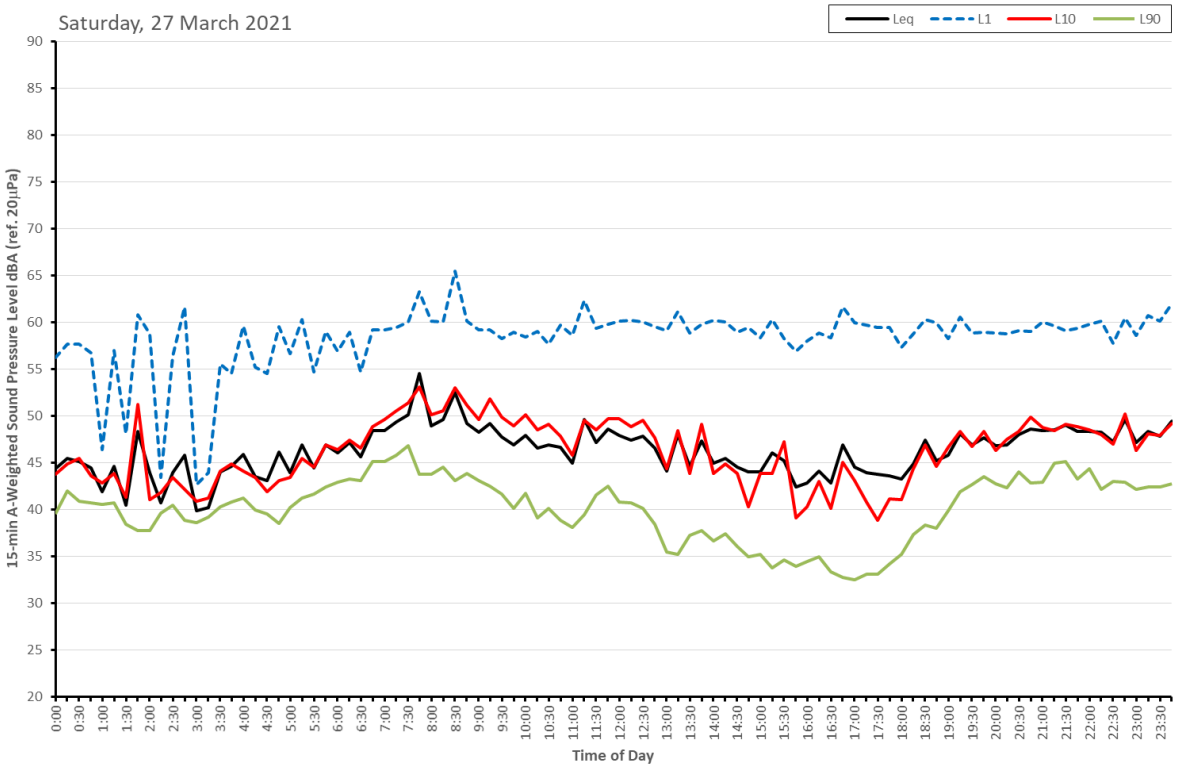
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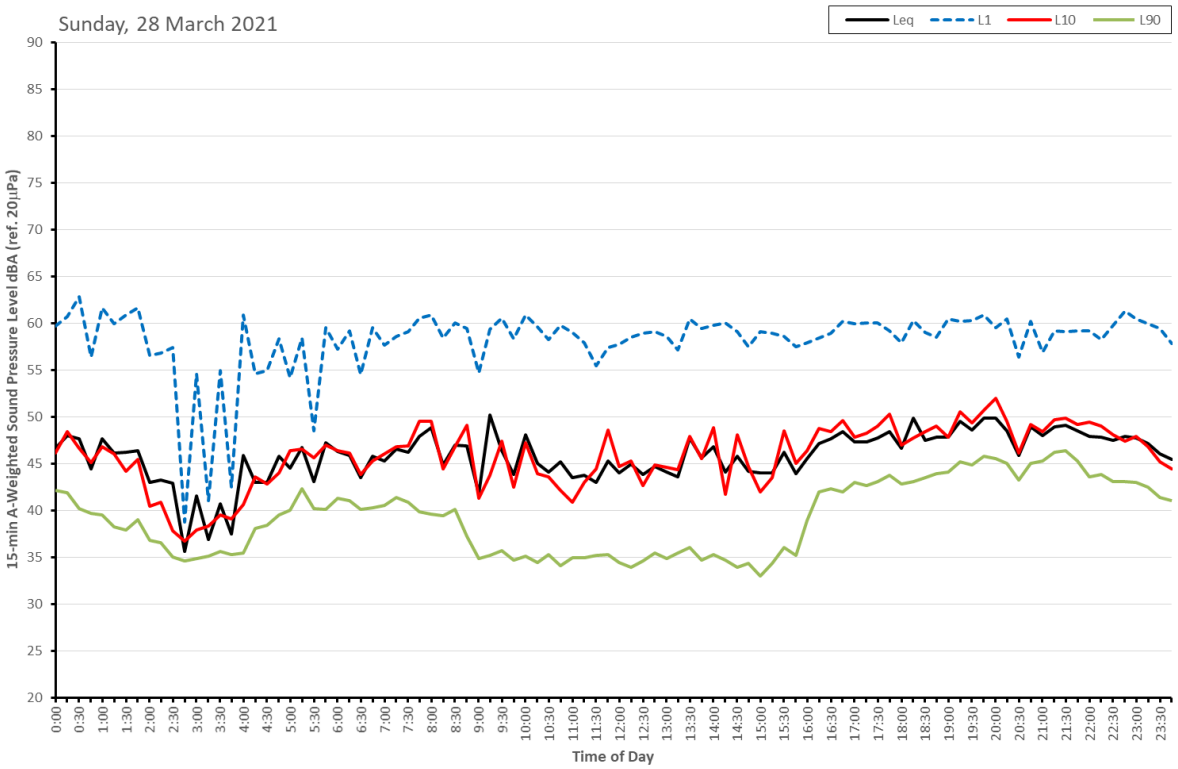
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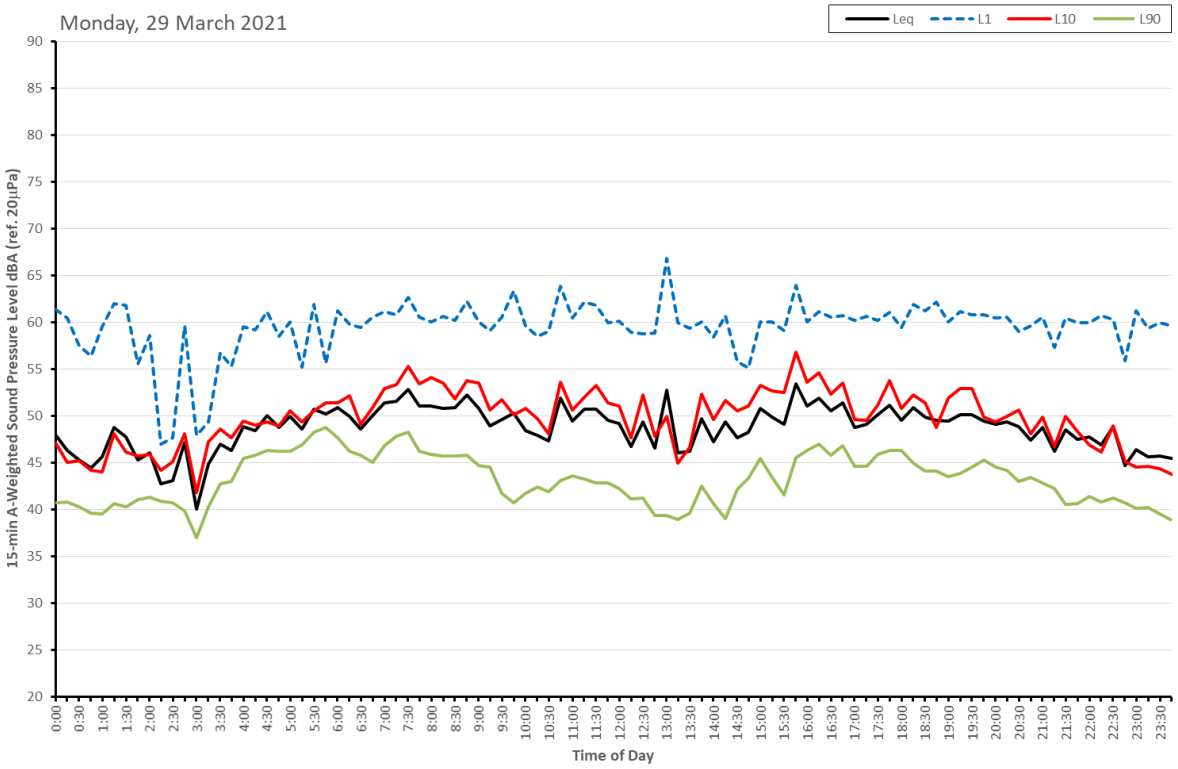
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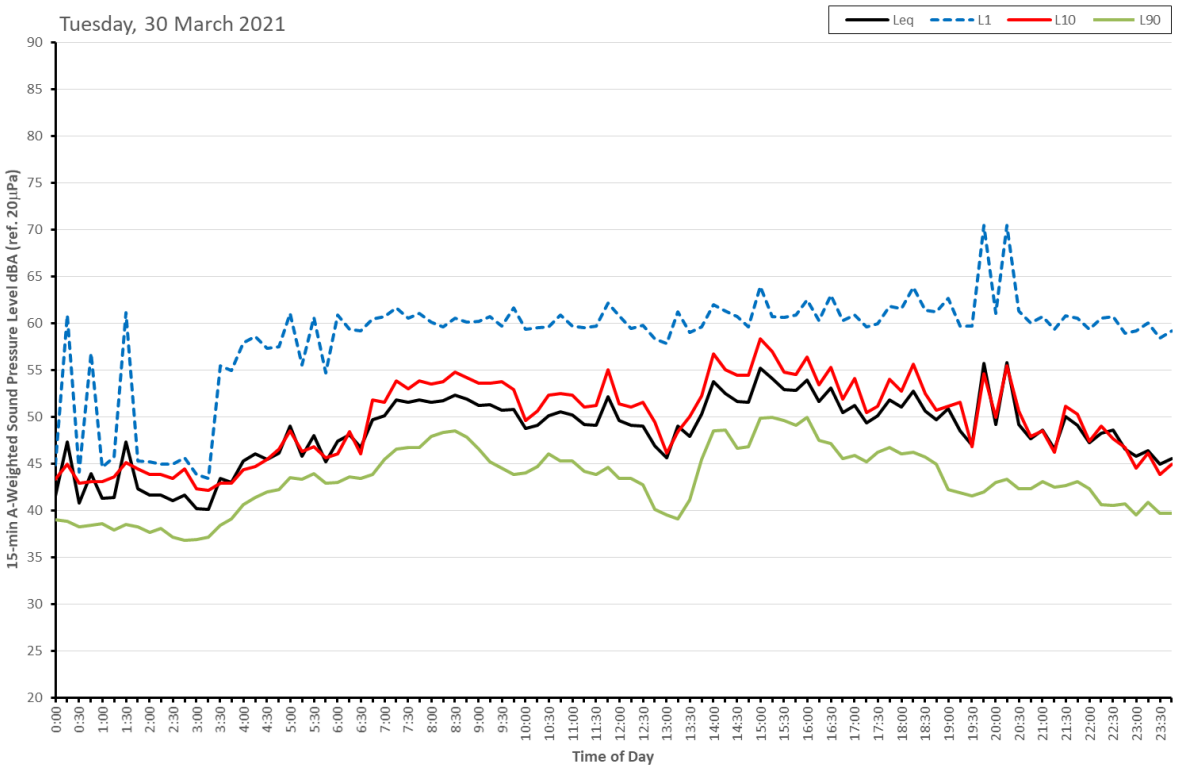
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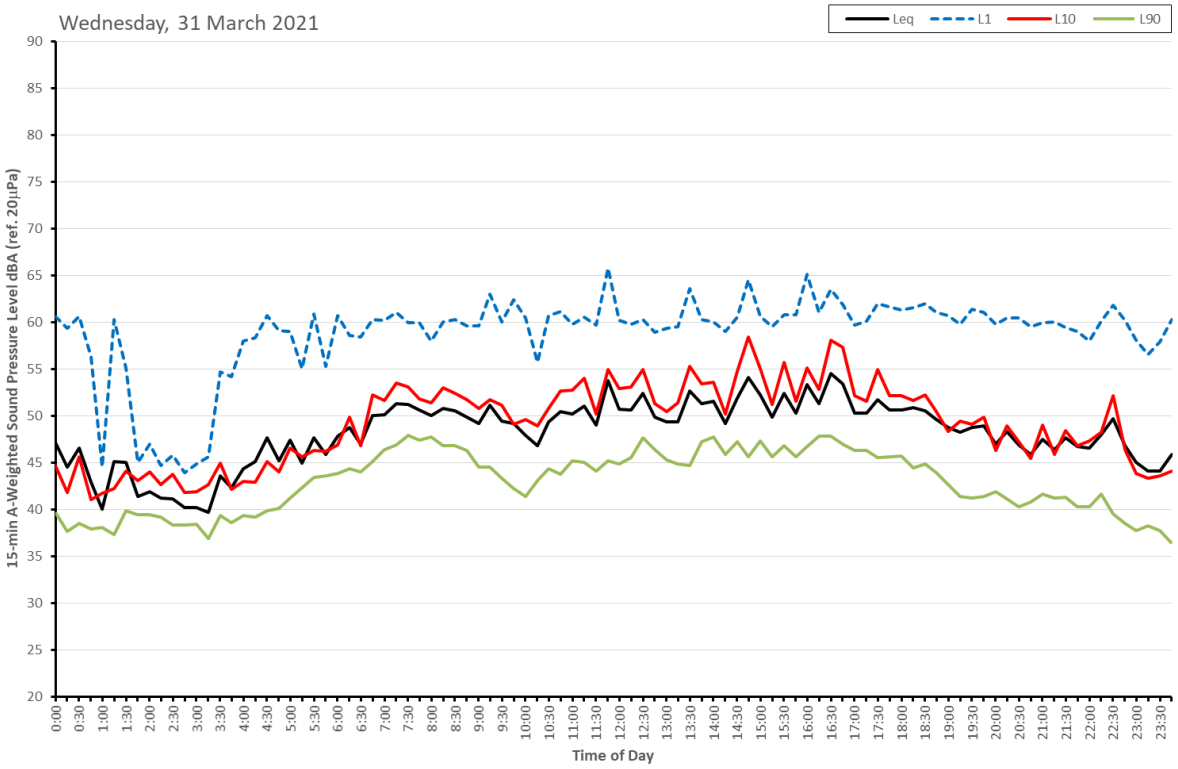
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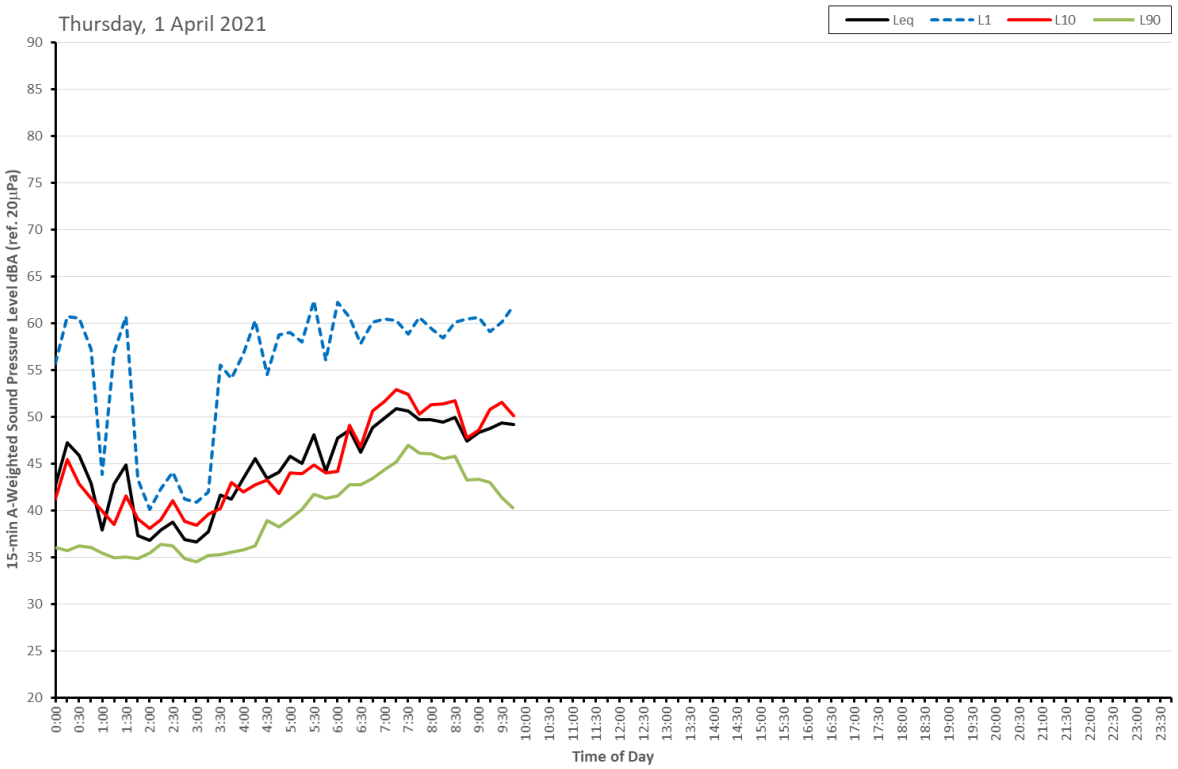
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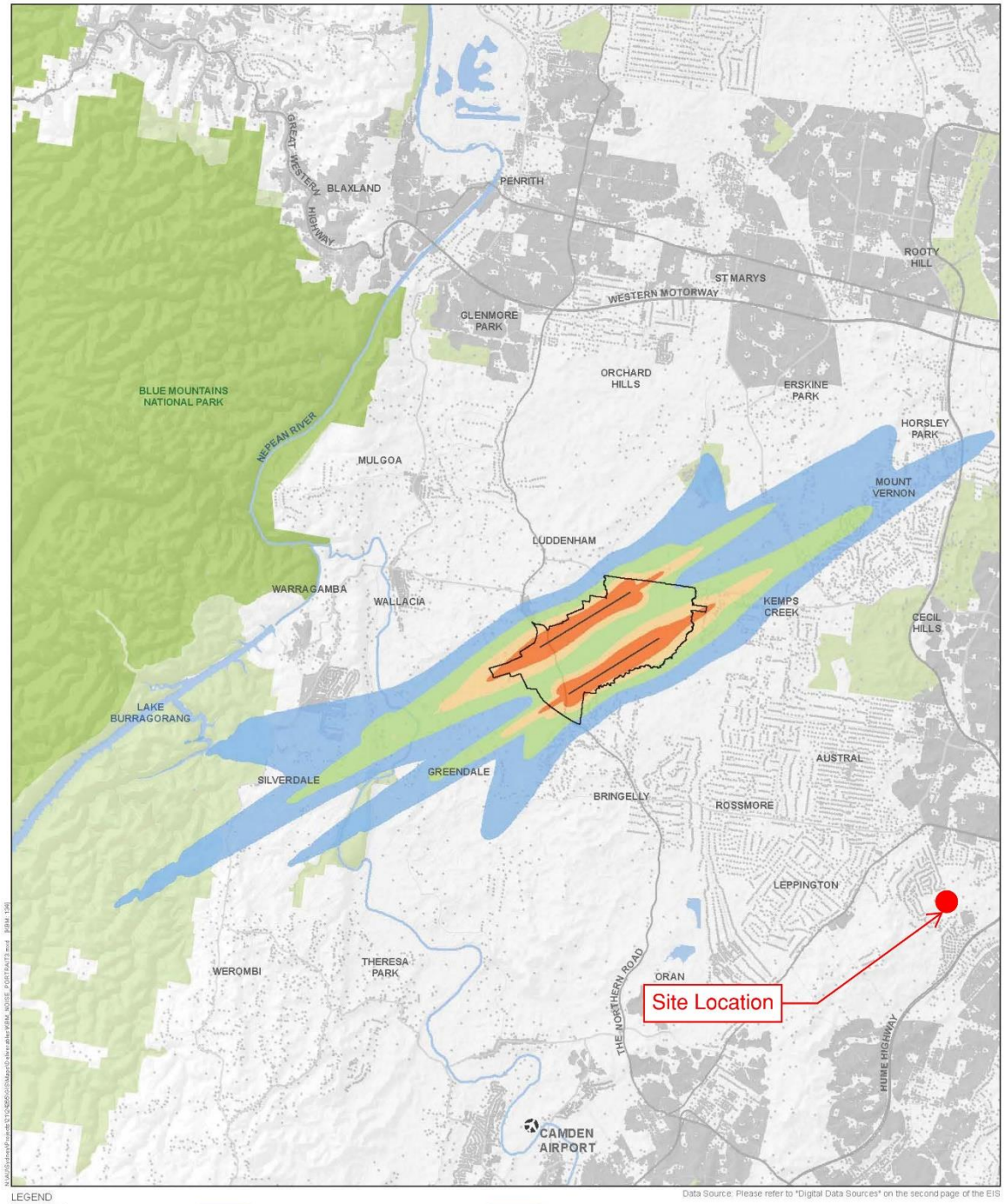
APPENDIX B: WESTERN SYDNEY AIRPORT ANEC CONTOURS



ES 19 - ANEC contours for Prefer 05 and Prefer 23 operating strategy (2063)