SAINTS PETER AND PAUL ASSYRIAN PRIMARY SCHOOL

SSDA Noise Assessment

Prepared for:

Assyrian Schools Ltd
C/- PMDL Architecture & Design Pty Ltd
Level 17, 124 Walker Street,
North Sydney, NSW, 2060

SLR Ref: 610.17101-R01
Version No: v5.0
March 2020

PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
2 Lincoln Street
Lane Cove NSW 2066 Australia
(PO Box 176 Lane Cove NSW 1595 Australia)
T: +61 2 9427 8100 F: +61 2 9427 8200
E: sydney@slrconsulting.com www.slrconsulting.com

BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with PMDL Architecture & Design Pty Ltd on behalf of Assyrian Schools Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.17101-R01-v5.0	3 March 2020	Matthew Bryce	Peter Runcie	Matthew Bryce
610.17101-R01-v4.0	24 April 2019	Matthew Bryce	Peter Runcie	Matthew Bryce
610.17101-R01-v5.0	20 March 2019	Matthew Bryce	Peter Runcie	Matthew Bryce
610.17101-R01-v5.0	30 July 2018	Matthew Bryce	Peter Runcie	Matthew Bryce
610.17101-R01-v1.0	6 July 2018	Matthew Bryce	DRAFT	

CONTENTS

CONTENTS

DOCUMENT REFERENCES

TABLES

FIGURES

APPENDICES

1 Introduction

SLR Consulting Australia Pty Ltd (SLR) has undertaken an acoustic assessment of the proposed Saints Peter & Paul Assyrian Primary School ("the School") to be developed at Kosovich Place, Cecil Hills.

The purpose of the assessment was to consider noise and vibration from the Project in relation to the Secretary's Environmental Assessment Requirements[1] (SEARs), including:

- Noise emissions associated with the School and their potential effects at nearby residences;
- Noise ingress to the School, in particular from the nearby M7 and the proposed Western Sydney Airport to be located at Badgerys Creek; and
- Noise emissions associated with construction activities.

2 Project Description

The proposed School is to be located on land at Kosovich Place in Cecil Hills. The Masterplan layout of the School is shown in **Figure 1**.

The nearest property to the School will be the Saints Peter & Paul Parish Church. That property is a related entity to the School and therefore will not be considered a sensitive receptor with regard to noise emissions from the School.

The remaining surrounding properties are generally rural residential and are described in **Table 1** and identified in **Figure 1**.

Table 1 Nearest Sensitive Receptors

Receptor	Separation Distance, m
20-30 Kosovich Place	70
15 Kosovich Place	90
56 Cecil Road	135

The significant sources of noise ingress or emission associated with the School may be:

- Noise from the M7 Motorway into school buildings;
- Noise from airconditioning plant associated with the new buildings to nearby residences;
- Noise from school bell and PA system, waste collection, maintenance using powered equipment;
- Noise from music performance events at the School Hall;
- Noise from school children in outdoor play areas;
- Noise from traffic generated by the School on Kosovich Place to existing residences; and
- Noise from aircraft utilising the proposed Western Sydney Airport;
- Construction noise emissions, including construction-related traffic on Kosovich Place.

[1] NSW Government Planning & Environment reference SSD 9210, dated 13 April 2018

The School will accommodate approximately 630 students and 35 staff and will generally be used only during school hours or immediately before or after school hours, ie between 8:00 am and 4:00 pm.

The Master Plan indicates outdoor areas ("Civic Heart") to the south and west of the school buildings and future sports (basketball and soccer) fields on the west part of the site approximately 120 m from the nearest noise sensitive receptor.

The Master Plan also includes 21 General Learning Areas (GLAs) and associated occupancies including offices, administration areas, reception, store rooms and toilets. Noise emissions from those uses would be acoustically insignificant and unlikely to be audible at nearby residences, and therefore requires no further consideration.

The Master Plan also includes a carpark and drop-off/pick-up zones located 90 m from the nearest receptor. Noise from those areas, including starting a car engine and a car door closing, tends to be low impact when observed over an assessment period due to their very short duration, and hence are usually considered in relation to sleep disturbance criteria which is applicable during the night-time period. Given that the School's operating hours do not include the night-time period, and that the likelihood of any daytime disturbance would be low, carpark activity noise does not warrant further investigation.

Blasting or piling during construction is not proposed. Additionally, the expected construction plant/activities would also not be considered significant sources of ground-borne vibration in the context of the separation distance to the nearest sensitive receptors (at least 70 m). As the likelihood of perceptible vibration at the nearest sensitive receptors is very low, further consideration of vibration emissions is not required.

H:\Projects-SLR\630.SnVirTL\610-SYD\610.17101 St Peter and Paul School\Figures\ArcGIS\SLR\610.17101_R01_SiteLocation_03.mxd

Scale: 1:2,500
GDA 1994 MGA Zone 56

03/07/2018
610.17101

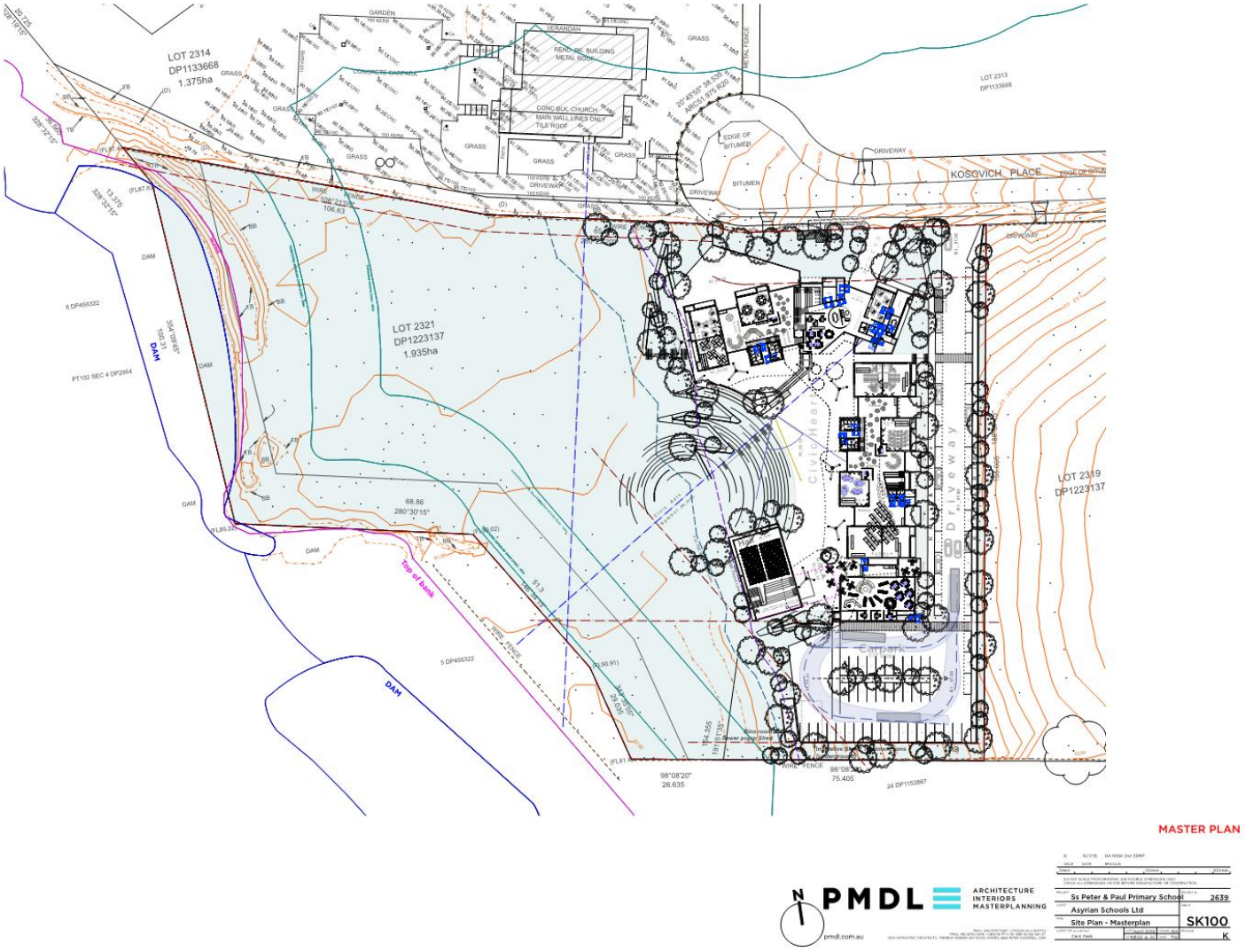
Sheet Size : A4

Site Location & Surrounds

FIGURE 1

SLR
www.slrconsultingaustralia.com.au PH: 61 2 4037 3200

Figure 2 Masterplan Layout



3 Existing Ambient Environment

Noise monitoring was conducted in order to establish the existing noise environment at and around the proposed development site. The measured noise levels assist in determining appropriate noise limits for the School and quantify the level of road traffic noise at the site.

Operator-attended and unattended noise monitoring was conducted at the site between Wednesday 22 February 2017 and Wednesday 1 March 2017.

3.1 Unattended Noise Monitoring

An environmental noise "logger" was deployed at the northern site boundary as shown in **Figure 1**.

Measurements were conducted using the 'A weighting' filter and 'fast' response. The noise logger was programmed to record noise levels in 15 minute intervals. The microphone of the noise logger was positioned 1.5 m above ground level and fitted with a microphone windshield.

The logger results were analysed in accordance with the methodology contained within the NSW "*Noise Policy for Industry*" (NPfI) and the NSW "*Road Noise Policy*" (RNP), with the noise levels summarised in **Table 2**. The monitoring results are presented in the form of daily statistical noise plots in **Appendix A**.

SLR obtained weather data from the Bureau of Meteorology (BOM) automated weather station located at Badgerys Creek (Station ID: 067108, Lat: -33.9 Lon: 150.73) for the period of noise monitoring.

The weather during the survey was generally dry with calm to light winds. Such conditions would be considered suitable for the purpose of conducting long-term noise measurements in the context of the NPfI and RNP.

Noise results obtained during periods of unsatisfactory weather for noise monitoring, ie wind speeds exceeding 5 m/s and/or rainfall exceeding 0.5 mm, have been shaded in the noise logger results graphs in **Appendix A** and were excluded from the data analysis.

Table 2 Summary of Ambient Noise Monitoring Results

Period	Rating Background Level (RBL) dBA $L_{A90(15minute)}$	Ambient Noise Level dBA $L_{Aeq(period)}$
NPfI Day (7:00 am – 6:00 pm)	44	52
NPfI Evening (6:00 pm – 10:00 pm)	46	53
NPfI Night (10:00 pm – 7:00 am)	43	51
RNP Day (7:00 am – 10:00 pm)	--	55
RNP Maximum Hourly Level	--	56

Traffic noise has been considered in terms of the maximum hourly L_{Aeq} noise level for the operating hours of the School, ie day periods of the weekdays. The dominant noise source at the site was deemed to be road traffic noise even though the intervening topography provided a degree of noise screening from the road to the site.

3.2 Attended Noise Monitoring

Short-term attended noise monitoring was also undertaken at the site (noise logger position) in order to identify and quantify noise sources that may affect the development and to qualify the unattended noise monitoring data.

The results of the operator attended noise survey are presented in **Table 3** together with a description of the source contributions to the measured noise levels present at the time of the survey.

Table 3 Operator-attended Noise Survey Results

Date / Start Time	Measured Noise Level		Comments
	dBA $L_{A90(15minute)}$	dBA $L_{Aeq(15minute)}$	
22 February 2017, 2:10 pm	52	58	Vehicles on M7 dominant, occasional wind gust caused noise from moving vegetation

The measured operator-attended noise levels were similar to those obtained by the noise logger at that time.

3.3 Instrumentation

Details of the acoustic instrumentation used in the noise monitoring are shown in **Table 4**.

Table 4 Acoustic Instrumentation

Instrument	Serial Number
ARL Type 316 Noise Logger	16-207-045
Brüel & Kjær Type 2260i Sound Level Meter	2414604
Brüel & Kjær Type 4231 Sound Level Calibrator	2482668

The calibration of the instrumentation was checked before and after the monitoring period and was found to be within an acceptable margin of ±1 dBA of the reference signal.

All items of acoustic instrumentation were designed to comply with Australian Standard (AS) IEC 61672.1 2004 *Electroacoustics – Sound Level Meters* and AS IEC 60942 2004 *Electroacoustics – Sound calibrators* and carried current NATA calibration certificates.

4 Project Noise Criteria

4.1 SEARs Requirements

Section 11 "Noise and Vibration" of the SEARs document (SSD 9210 dated 13 April 2018) states:

> *Identify and provide a quantitative assessment of the main noise and vibration generating sources during demolition, site preparation, bulk excavation, construction and operation, including consideration of any public address system, school bell, the design and location of waste storage facilities, time restrictions on grounds, maintenance using powered equipment, time restrictions on waste collection services, 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, and outline measures to minimise and mitigate the potential noise impacts on surrounding occupiers of land.*
>
> *Relevant Policies and Guidelines:*
>
> - "Noise Policy for Industry" (2017)
> - "Assessing Vibration: A Technical Guideline" (2006)
> - "Development Near Rail Corridors and Busy Roads – Interim Guideline" (Dept of Planning, 2008).

4.2 Other Relevant Policies and Guidelines

There are no criteria within the Fairfield City Council (FCC) *Fairfield Citywide Development Control Plan 2013 Amendment 16* (DCP) specifically relating to noise emissions **from** educational establishments, however the SEARs does require assessment of certain noise sources.

The FCC DCP does, however, provide requirements applicable to the School relating to ingress from road and aircraft noise. Where no other criteria or direction has been provided in the DCP, this assessment has relied upon relevant published standards, policies and guidelines, including those described in the SEARs, to assess noise sources associated with the School.

4.2.1 Road Traffic Noise Ingress

Residual traffic noise from vehicles on the M7 Motorway will be the only significant source of noise ingress to the School. The SEARs requires consideration of the NSW Department of Planning "*Development Near Rail Corridors and Busy Roads – Interim Guideline*" ("the DoP Guideline") document issued in 2008.

The DoP Guideline does not provide specific road noise criteria to be achieved inside or outside educational buildings, but does provide planning strategies to reduce potential noise effects, including:

- Creating courtyards or play areas that are protected from noise and adverse air quality by buildings.
- Directing school access to a street with low traffic volume to reduce the conflict between pedestrian access, drop off areas and high traffic volume, thereby improving road safety.

The intrusion of road traffic noise into sensitive areas within the School has been considered with regard to objectives described in Australian Standard *2107:2000 – Acoustics – Recommended design sound levels and reverberation times for building interiors* (AS 2107) and the RNP.

In order to meet the AS 2107 objectives, the external facades to the School buildings would need to be constructed to achieve the recommended internal noise levels shown in **Table 5**.

Table 5 AS 2107 Recommended Internal Design Sound Level – Educational Buildings

Type of Occupancy	Internal Design Sound Level Range, dBA L_{Aeq}
Teaching spaces/single classroom (Primary Schools)	35 – 45
Professional and Administrative Offices	35 – 40
Offices	40 – 45

It should be noted that the AS 2107 recommended values for teaching areas are consistent with the RNP criterion of 40 dBA $L_{Aeq(1hour)}$ for school classrooms "when in use".

4.2.2 Road Traffic Noise Generated by the Development

The noise impacts of road traffic generated by the development on surrounding land uses are to be assessed in accordance with the NSW RNP.

The School will generate traffic on Kosovich Place during the morning drop-off and afternoon pick-up times. The noise limit for existing residences affected by additional traffic on existing local roads is shown in **Table 6**.

Table 6 Road Traffic Noise Criteria

Road Category	Type of Project / Land Use	Day (7:00 am to 10:00 pm)[1]
Local Road	6. Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq(1hour)}$ 55 dBA

1. School operations will be within the daytime period only.

In addition, the RNP states that where existing residences and other sensitive land uses are potentially affected by additional traffic on existing roads due to land use developments, any increase in the total traffic noise level should be limited to 2 dB above the corresponding 'no build option'. The RNP notes: "*an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person*".

Therefore, based on the existing level of traffic noise at the site, 56.2 dBA $L_{Aeq(1hour)}$, noise from the School-related traffic should not exceed 58.2 dBA $L_{Aeq(1hour)}$.

4.2.3 School Noise Emissions

Potential sources of noise from the School to surrounding residential receptors include:

- Noise from mechanical plant associated with the new buildings;
- Noise from the school bell, PA system, waste collection and maintenance activities;
- Noise from vehicles during drop off and pick up; and
- Noise from school children in outdoor play areas.

The FCC has previously nominated the use of the NPfI for the assessment of noise emissions during the School operations.

It is appropriate to consider mechanical plant noise emissions with regard to the *Noise Policy for Industry 2017* (NPfI) however the NPfI was not intended to be used to assess children in school outdoor play areas. This is discussed further in **Section 4.2.3.4**.

4.2.3.1 External Mechanical Plant Noise

The NPfI provides two separate noise criteria: one to account for intrusive noise and the other to protect the amenity of particular land uses. The lower of these criteria becomes the "Project Noise Trigger Level" (PNTL) which is applicable at the "most-affected" boundary of the receptor property.

In order to protect against intrusive noise, the NPfI states that the noise level of the source in question, measured over a period of 15 minutes, must not exceed the ambient background noise level (in terms of the RBL) at the applicable sensitive receptors, ie

$$\text{Noise source (dBA } L_{Aeq(15minute)}) \leq \text{RBL (dBA } L_{A90}) + 5 \text{ dBA}$$

In order to preserve the acoustic amenity of an area, the NPfI specifies maximum noise levels for particular land uses and activities at all times.

The residential areas in the vicinity of the School would be considered 'Residences in a Rural Area' in the context of the NPfI definitions of land use types, despite the presence of the M7 Motorway.

The area surrounding the School does not contain industrial noise sources so the NPfI Amenity Criterion becomes equal to the Recommended Acceptable Noise Level (ANL) for Residences in a Rural Area.

Applying the NPfI guidelines, the PNTL for the daytime and evening assessment periods at the nearby residences are shown (in bold) in **Table 7**, being the lower of either the Intrusiveness or the Amenity Criterion.

Table 7 PNTL for Mechanical Plant Noise at Residences near to the School

Area Classification	Period	Noise Level, dBA				
		ANL, $L_{Aeq(period)}$	RBL, $L_{A90(15minute)}$	Measured $L_{Aeq(period)}$ Noise Level	Criteria for New Sources, $L_{Aeq(15minute)}$	
					Intrusive	Amenity
Residential - Rural	Day[1]	50	44	52	**49**	50
	Evening[2]	45	46	53	51	**45**

1. The period from 7:00 am to 6:00 pm Monday to Saturday or 8:00 am to 6:00 pm on Sundays and public holidays
2. The period from 6:00 pm to 10:00 pm

4.2.3.2 School Hall Noise Emissions

It has been anticipated that the noise levels in the GLAs and classrooms will be relatively low. Of the new buildings and their associated activity, it will be music or similar performances within the proposed Hall that may result in audible noise at the nearby residences.

For events within the Hall, it would be appropriate to consider the noise emissions with regard to the PNTLs established for the periods during which the activity will occur, as described in **Table 7**. The most sensitive time for noise emissions will be the evening period, when a limit of 45 dBA will be applicable.

4.2.3.3 School Bell, PA System, Waste Collection and Maintenance with Powered Equipment

The NSW EPA *Noise Guide for Local Government* (NGLG) document issued in 2013 provides guidance for the assessment of the noise sources such as a school bell and PA system, waste collection activities and the use of powered equipment. It would be common and appropriate to consider noise emissions with regard to the requirements of the NSW *Protection of the Environment Operations Act 1997*. The POEO Act regulates noise generation and prohibits the generation of "offensive noise" as defined under the POEO Act.

A range of factors are considered to determine whether the noise would be offensive, or otherwise, including the following:

- the loudness of the noise, especially compared with other noise in the area
- the character of the noise
- the time and duration of the noise
- whether the noise is typical for the area
- how often the noise occurs
- the number of people affected by the noise

In the first instance, a commonly applied test of the noise relative to the ambient background environment can assist in establishing whether a noise is offensive or not, ie:

Noise source (dBA $L_{Aeq(15minute)}$) ≤ RBL (dBA L_{A90}) + 5 dBA

It is expected that these noise sources would occur during only the daytime period (7:00 am to 6:00 pm Monday to Saturday or 8:00 am to 6:00 pm on Sundays and public holidays). Referencing the noise level at those times in **Table 3**, the applicable noise limit would be 49 dBA $L_{Aeq(15minute)}$.

4.2.3.4 Vehicles during Drop-off and Pick-up

Vehicles on the internal road between the carpark and Kosovich Place may result in noise emissions twice a day for drop-off and pick-ups of children. It would also be appropriate to consider such noise in relation to the NPfI intrusive noise criterion. The NPfI states that the noise level of the source in question, measured over a period of 15 minutes, must not exceed the ambient background noise level (in terms of the RBL) at the applicable sensitive receptors, ie

Noise source (dBA $L_{Aeq(15minute)}$) ≤ RBL (dBA L_{A90}) + 5 dBA

Referencing the noise level at those times in **Table 3**, the applicable noise limit would be 49 dBA $L_{Aeq(15minute)}$.

4.2.3.5 Children in Outdoor Play Areas

As stated above, the NPfI is not intended to be applicable to schools and SLR considers that the process of attempting to assign a noise level to this source and then comparing it with a predetermined criterion for the purposes of noise assessment to be impractical.

To the best of our knowledge, there have been no social surveys conducted to quantify the levels of noise generated from outdoor play areas of schools of varying size and type, or to document the response of the surrounding community to the noise from school children engaged in outdoor play.

Whether this is due to the noise source being of a highly variable nature – making the quantification of such emissions difficult – or because this source is considered to be an integral part of any school development, is not known.

In the instance of noise emissions from pre-school aged children involved in outdoor play (predominantly during recess and lunch breaks), the Association of Australasian Acoustical Consultants (AAAC) has produced a document entitled *Guideline for Child Care Centre Acoustic Assessment* ("the AAAC guideline"), which recommends noise limits based on the existing ambient (background) noise and the daily duration of the outdoor play. It is noted that the AAAC Child Care noise limits would be comparable to those determined in accordance with the NPfI.

With regard to noise assessment using a "background plus" criterion, the impact is not based upon satisfying 100% of the population. For example, the NPfI criteria, whilst not developed for assessing community noise, have been selected to achieve acceptable conditions for approximately 90% of the population living in the vicinity of industrial noise sources for at least 90% of the time.

The NPfI documents the "principles underpinning the noise criteria" as follows:

> *"The industrial noise source criteria set down in Section 2 are best regarded as a planning tool. They are not mandatory, and an application for a noise/producing development is not determined purely on the basis of compliance or otherwise of the noise criteria. Numerous other factors need to be taken into account in the determination. These factors include economic consequences, other environmental effects and the social worth of the development."*

In addition, the INP states that:

> *"In those cases when the project/specific noise levels are not, or cannot be achieved, then it does not automatically follow that those people affected by the noise would find the noise unacceptable."*

Further to the NPfI principles, it is reasonable to conclude that noise associated with children involved in outdoor play would not be considered "offensive" in the context of the NSW *Protection of the Environment Operations Act* (POEO Act), nor would it be expected to interfere with regular domestic activities.

Whilst undertaking similar assessments in Sydney, SLR has conducted a review of Land and Environment Court cases. In the judgement of Justice Pain in the Land and Environment Court case of Meriden School v Pedavoli, noise from children playing outdoors was found to not constitute offensive noise.

In the case of Christian Brothers v Waverley Council, which involved the use of a swimming pool, no specific criteria were mentioned but Commissioner Murrell commented that:

> *"It is important in our society for uses such as schools and residential areas to coexist".*

Those legal outcomes reinforce the view that the wider community would benefit through the provision of the School.

Children playing outdoors will make noise and, in some cases, this may be audible at nearby residences. It is inherently difficult to meaningfully quantify the level of noise received at nearby residences due to the inevitable variability of the sources (the children) and their locations. The noise level generated during recess and lunch periods may vary according to the following factors:

- the number of children with in the play area;

- the level of noise made by each student – this obviously differs from individual to individual, and factors such as age, personality, mood, activity and countless other factors also play a part;
- the louder events are not capable of being sustained over an extended period, and
- the location of the students relevant to the residences.

Notwithstanding the above, it is becoming common, given the similarities between educational facilities and Child Care Centres in terms of land use, business hours and general operations (ie playtime hours etc), to demonstrate the potential acceptability, or otherwise, of noise from school aged children in outdoor play areas by considering the level of noise likely to be received at nearby sensitive receptors in relation to the criteria within the AAAC guideline.

Based on the criterion for outdoor play areas in use for less than two hours per day, and the existing ambient background noise level, a noise limit of 54 dBA $L_{Aeq(15minute)}$ would apply.

4.2.4 Aircraft Noise

The FCC requires consideration of the potential effect of the future Western Sydney Airport (WSA) at Badgerys Creek for all development in Cecil Park. Section 4A.6.2 Objectives of the DCP states:

> *a) To mitigate against the acoustic impacts of aircraft noise on new residential development in Horsley Park and Cecil Park as a result of a Western Sydney Airport at Badgerys Creek.*
>
> *b) To provide clarification of measures required in buildings to mitigate against aircraft noise by achieving compliance with relevant deemed to satisfy criteria.*
>
> *c) To ensure measures to mitigate against aircraft noise are consistent with provisions contained in the Australian Standard – Aircraft Noise Intrusion – building, siting and construction.*

Potential aircraft noise at the School has been assessed in accordance with AS *2021:2015 Acoustics – Aircraft Noise Intrusion – Building Siting and Construction* (AS 2021) as per Option 2 of Section 4A.6.3 Controls of the DCP.

The recommended internal design sound levels relevant to the proposed future uses are provided in **Table 8**. The AS 2021 recommended internal design sound levels have been used to determine in-principle control measures for noise associated with aircraft using the future WSA.

Table 8 AS 2021 Recommended Indoor Design Sound Levels

Building and Activity Type	Indoor Design Sound Level, dBA L_{Amax}
Schools, Universities	
Libraries, study areas	50
Teaching areas, assembly areas	55
Commercial buildings, offices and shops	
Private offices, conference rooms	55

4.2.5 Construction Noise

4.2.5.1 Noise from On-site Construction Activities

The "*Interim Construction Noise Guideline*" (ICNG) document sets out ways to manage the impacts of construction noise on residences and other sensitive land uses. The guideline provides construction noise management levels (NMLs) for residential and other noise sensitive receptors based on the background noise environment and the proposed times of construction work.

The NMLs are non-mandatory criteria to identify where feasible and reasonable noise mitigation measures are likely to be required in order to reduce and control noise levels. The construction NMLs for the School, and how they are to be applied, are detailed in **Table 9**.

The NMLs apply at the property boundary that is most exposed to construction noise.

Table 9 Construction Noise Management Levels At Residences

Construction Period	NML, dBA $L_{Aeq(15minute)}$	Application
Standard day time construction hours: Monday to Friday 7:00 am to 6:00 pm Saturday 8:00 am to 1:00 pm	Noise affected RBL dBA L_{A90} + 10 dBA **54 dBA** (i.e. 44 dBA L_{A90} + 10 dBA)	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq(15min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels, duration and contact details.
	Highly noise affected 75 dBA L_{Aeq}	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: Time identified by the community when they are less sensitive to noise (such as before or after school for works near schools, or mid-morning or mid-afternoon for works near residences) If the community is prepared to accept longer construction period in exchange for restrictions on construction times.
Outside of standard day time construction hours (if required)	Noise affected RBL dBA L_{A90} + 5 dBA **Evening: 51 dBA** (i.e. 46 dBA L_{A90} + 5 dBA) **Night: 48 dBA** (i.e. 43 dBA L_{A90} + 5 dBA)	A strong justification would typically be required for works outside the recommended standard hours The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible, reasonable practices have been applied and noise is more than 5 dBA above the noise affected level the proponent should negotiate with the community.

4.2.5.2 Noise from Construction-related Traffic

When trucks and other vehicles are operating within the boundaries of construction sites, their noise contributions are included in the predicted construction activity noise emissions and assessed in relation to the NMLs described **Table 9**.

Construction-related traffic on the public road network is regarded as 'additional road traffic' rather than as part of the construction works and are assessed in accordance with the RNP, as discussed in **Section 4.2.2**.

5 Noise Assessment

5.1 Road Traffic Noise Ingress

The noise monitoring results presented in **Table 2** show that the maximum hourly road traffic noise level at the potentially worst-affected facade of the proposed development was 56 dBA $L_{Aeq(1hour)}$.

Therefore, the school facade construction would be required to achieve a noise reduction of 16 dBA to achieve the RNP classroom criterion and AS 2107 (recommended range midpoint) value of 40 dBA.

That level of noise reduction would be readily achieved with standard building constructions.

The weakest element of the school buildings, with regard to acoustic performance, will be the windows and doors. Generally, the windows and doors must be closed to achieve compliance with the selected indoor noise objectives. This does not preclude the use of natural ventilation however, where natural ventilation is to be provided for facades facing the M7 Motorway, the ventilation opening must be selected such that the overall composite sound insulation of the facade is not unduly compromised.

5.2 Road Traffic Noise Generated by the Development

The following parameters have been used to predict noise from vehicles on Kosovich Place at existing residences:

- maximum hourly traffic volume of 400 vehicles per hour (200 vehicles each way) during morning drop-off or afternoon pick-up;
- traffic speed of 50 km/h;
- nearest residence is 20 m from Kosovich Place; and
- +2.5 dBA facade reflection adjustment is included.

The predicted noise level was 57.8 dBA $L_{Aeq(1hour)}$, which will be marginally less than the RNP noise criteria based on the existing environment (58.2 dBA $L_{Aeq(1hour)}$). The predicted noise level at residences greater than 20 m from Kosovich Place would be lower and therefore also comply with the RNP criteria.

It should be noted that the predicted noise level would occur only twice per day during the morning drop-off and afternoon pick-up. School traffic-related noise at other times would be significantly lower.

5.3 Mechanical Plant Noise Emissions

At this stage, specific details of the proposed airconditioning services plant (other than their locations) are not available, as this will take place during the detailed design stage of the project.

It is understood that all such plant items would be located at ground level adjacent to each of the school buildings and that all items may operate concurrently. The nearest residence will be approximately 90 m from the nearest of the airconditioner services plant.

Based on the daytime noise limit, 49 dBA $L_{Aeq(15minute)}$, and the estimated separation distance between the nearest residence and the anticipated locations of the mechanical plant, the maximum Sound Power Level (SWL) allowed for mechanical plant items (combined) would be 96 dBA.

Noise control by way of screening and/or judicious positioning of the plant (eg using buildings to interrupt line-of-sight to residences), may also be considered if selected plant emissions exceed the nominated SWLs. Such treatments may provide noise reductions of the order of 10 dB – 15 dB, thus allowing plant with higher noise output to be considered, if required.

A detailed review should be undertaken when mechanical plant selection, location and design have been finalised to determine if additional acoustic controls will be required, however it is expected that a design compliant with the NPfI daytime noise limit would be readily achievable.

5.4 School Hall Noise Emissions

5.4.1 Activity Noise Levels

Music performances are expected to be the activity in the proposed school hall building that generates the most significant noise levels. Those activities and their expected associated noise levels, based on previous SLR assessments, have been shown in **Table 10**.

Table 10 Noise Levels Associated with Musical Performances

Activity Noise Level, dB Leq Octave Band Centre Frequency, Hz								Overall dBA LAeq
63	125	250	500	1k	2k	4k	8k	
95	95	95	93	93	88	86	85	97

5.4.2 Building Design and Construction Materials

The design and construction materials of the buildings will be finalised during the detailed design phase however, this assessment has considered noise emission breakout from the Hall building in a generic context in order to evaluate the likely effects of the activities.

Standard constructions for a school hall building may comprise:

- Walls - combination of masonry and sheet metal, cavity insulation with internal plasterboard linings
- Roof - sheet metal, roofing blanket insulation over purlins with internal plasterboard ceiling.

The noise reduction performance of each component comprising the building envelope will be influenced by the construction type and materials used together with the surface area of each component relative to the area of the other components.

Preliminary calculations based on the above music performance noise levels, the separation distance to the nearest receptor and the evening noise limit (45 dBA), indicate that the building constructions would need to achieve a sound insulation rating of the order of R_w 42.

That rating is not considered to be particularly onerous and would be achieved using standard building constructions and materials, however the control of low frequency noise breakout and noise breakout via any glass elements or ventilation openings would require judicious consideration during the detailed design stage. It is expected, however, that a compliant design for all activities in the School Hall building will be readily achievable.

5.5 School Bell, PA System, Waste Collection and Maintenance

The use of the school bell and PA system are integral to school operations, however their use is short–term and infrequent. In addition, the design of the bell and PA system can be readily modified to achieve appropriate noise limits.

Waste collection and maintenance activities using powered tools such as lawnmowers also occur infrequently.

Nonetheless, noise from those sources and activities has been considered. Their assessment has been based on the sound data obtained from the SLR measurement database as provided in **Table 11**.

Table 11 School Noise Sources – Sound Level Data

Noise Source	Sound Pressure Level, dBA L_{Aeq}	Measurement Distance, m
School Bell	90	2
PA System	90	2
Waste Collection	80	5
Lawnmower	86	2

Predictions of noise associated with the school noise sources are shown in **Table 12**.

Table 12 School Noise Sources – Predicted Noise Levels

Component	School Bell[1]	PA System[1]	Waste Collection	Maintenance (Lawn mower)
Noise Level, SPL dBA L_{Aeq}	90	90	80	86
Distance to nearest residence, m	70	70	90	90
Noise reduction adjustment due to separation distance, dBA	-31	-31	-25	-33
Duration of activity, seconds	6	30	600	900
Duration adjustment, dBA	-22	-15	-2	0
Screening by School Buildings	-10	-10	0	0
Activity Noise Level, dBA $L_{Aeq,15min}$ at nearest residence	**27**	**34**	**53**	**53**

1. Assumes the speakers are internal, and external speakers are directed towards the "Civic Heart".

It can be seen that the predicted noise associated with the school bell and PA system would comply with the applicable daytime noise limit of 49 dBA $L_{Aeq(15minute)}$.

Noise from the waste collection and lawn mowing, when occurring closest to existing residences, may exceed the noise limit by 4 dBA. An exceedance of that magnitude would not be considered significant, particularly given their infrequent occurrence. The predicted noise level would be lower when the activities occur further from the receptors.

Additionally, these noise sources would not normally be considered 'offensive' in the context of the POEO Act as they would already be occurring in the vicinity of the nearest receptors to the School. Nonetheless, it would be reasonable to restrict these activities to standard daytime hours in order to further minimise the likelihood of disturbance or annoyance to nearby receptors.

5.6 Vehicle Noise During Drop-off and Pick-up

It is expected that approximately 300 vehicles would use the internal road during the morning drop-off and afternoon pick-up period. This may equate to approximately 75 vehicles in any 15 minute period and a vehicle would travel at approximately 10 km/h. A sound power level of 85 dBA L_{Aeq} per car pass-by (approximately 30 seconds) has been used in this assessment.

Based on the above, the predicted noise level at the nearest existing receptor would be 47 dBA $L_{Aeq(15minute)}$. That level would comply with the NPfI intrusive noise criterion of 49 dBA.

5.7 Outdoor Play Area Noise

The outdoor play areas would be at large separation distances from the existing residences and tend to be screened from the nearest receptors by intervening school buildings. This screening would reduce the likelihood of significant noise emissions being observed at the nearby receptors.

Source noise levels were derived from octave band sound power data obtained from *ANSI 3.5:1997 – Methods For The Calculation Of The Speech Intelligibility Index.* The following source noise levels were used:

- 105 dBA L_W for 200 students in an outdoor area; and
- 96 dBA L_W for activities on the sports fields.

The predicted noise levels from students in the outdoor play areas and sports fields are shown in .

Table 13 Predicted Noise Levels – Outdoor Play Areas

Location	Predicted Noise Level, dBA $L_{Aeq(15min)}$				Compliance? (Limit = 54 dBA)
	Civic Heart	Basketball Courts	Soccer Oval	Total	
20-30 Kosovich Place	34	36	34	**40**	**Yes**
15 Kosovich Place	40	29	26	**41**	**Yes**
56 Cecil Road	43	37	34	**45**	**Yes**

Therefore the noise from the outdoor play areas would comply with the AAAC criterion and would not be expected to result in adverse noise impact.

The following factors will also further reduce the likelihood that outdoor play area noise would be considered unacceptable or offensive when observed at the residences:

- the outdoor area would generally be used for only short periods throughout the day;
- the outdoor area would be used only within school hours; and
- the ambient noise at the nearby residences is relatively high due to the M7 Motorway which would provide a degree of 'masking' of playground noise;

5.8 Aircraft Noise

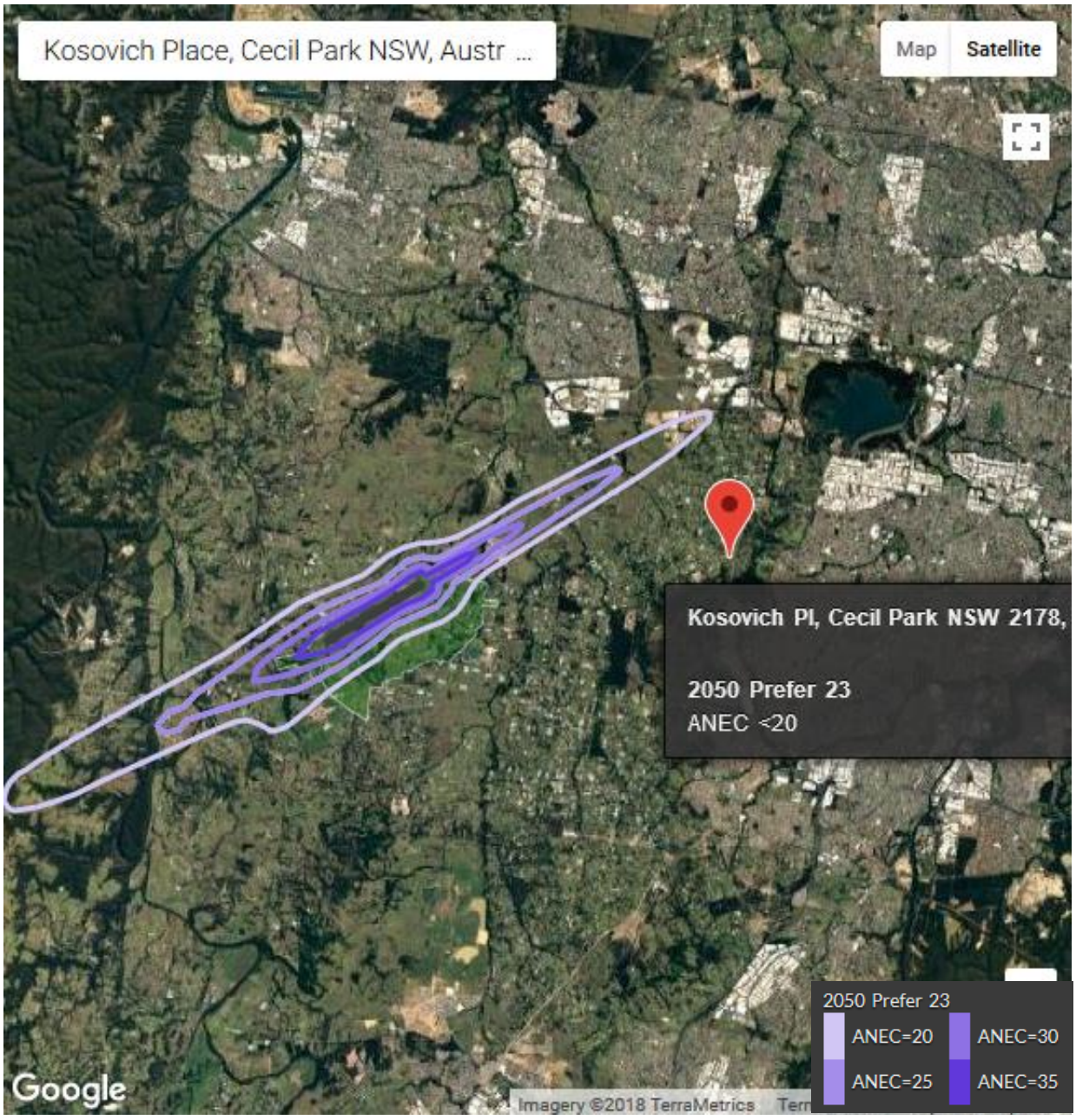
The FCC provides information relating to the WSA on the following webpage:

www.fairfieldcity.nsw.gov.au/info/20002/planning_and_building/404/western_sydney_airport_badgerys_creek

That page provides a link to the Federal Government Department of Infrastructure and Regional Development "Noise Modelling Tool", which allows users to identify land relative to the forecast Australian Noise Exposure Concept (ANEC) charts for a range of runway and flightpath configurations.

Figure 3 shows the ANEC chart for the year 2050 (single runway, landings from northeast) and the School site.

Figure 3 School Site Proximity in relation to Proposed Western Sydney Airport – ANEC



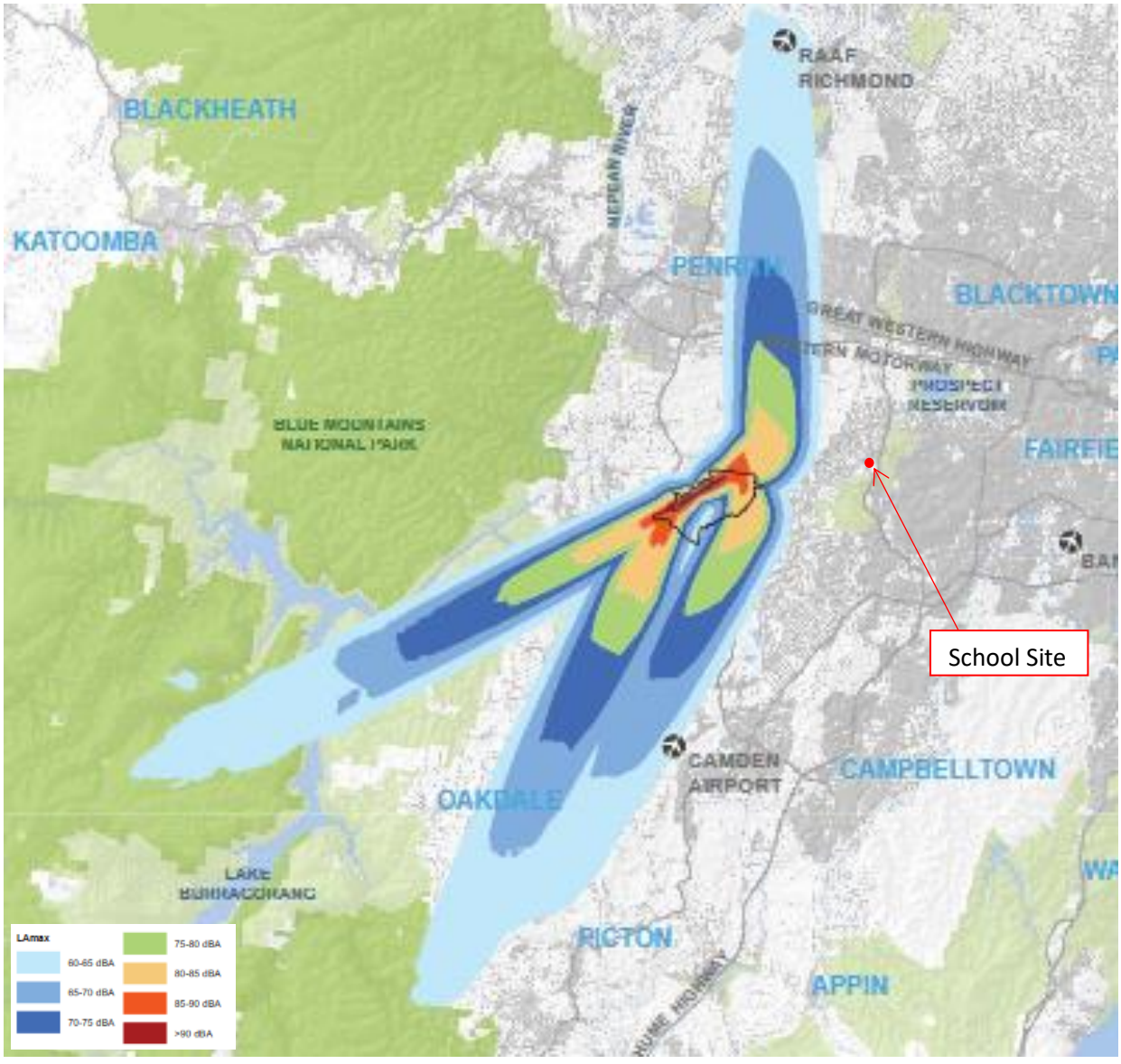
Source: http://westernsydneyairport.gov.au/about/flight-paths/noise-tool/index.aspx

It should be noted that AS 2021 relies on Australian Noise Exposure Forecast (ANEF) information. However all relevant publicly available exposure forecast information appears to be in terms of the ANEC. The two types of exposure forecast chart are similar, but not the same, however this assessment has interpreted the publicly-available ANEC footprint to be interchangeable with the output of an ANEF chart.

It can be seen from **Figure 3** that the site is well outside the ANEC 20 contour line, which means, in the context of AS 2021, that the site is acceptable for use as a school, without conditions. However, this should not be interpreted to mean that aircraft noise would be inaudible at the site.

The Environmental Impact Statement for the WSA (http://westernsydneyairport.gov.au/files/eis/2015/14-volume-2-chapter-10.pdf) also considers single event maxima noise associated with a range of possible aircraft types, fuel loads, and arrival or departure flight paths. This is shown in **Figure 4**.

Figure 4 School Site Proximity in relation to Proposed Western Sydney Airport – Single Event Boeing 747 Departure (fully fuel laden) Noise Levels



It can be seen in **Figure 4** that the School site lies well outside the 60-65 dBA L_{Amax} contour for all scenarios including the worst-case.

Therefore, the facade construction would be required to achieve a maximum noise reduction of up to 15 dBA to achieve the lowest relevant AS 2021 design objective of 50 dBA, although the exact value would be lower.

That level of noise reduction would be readily achieved with standard building constructions.

5.9 Construction Noise

5.9.1 Construction Activities

It is expected that all construction activities would be undertaken during the standard day time construction hours described in the ICNG:

- Monday to Friday: 7:00 am to 6:00 pm
- Saturday 8:00 am to 1:00 pm
- No works on Sundays or Public Holidays.

Predicted sound levels of construction plant and equipment likely to generate significant noise emissions are listed in **Table 14** for the receptor locations. The predictions have been based on the minimum separation distance between the boundary of the School and the receptor as the plant/equipment position.

The predicted values utilise sound data published in Australian Standard (AS) 2436:2010 "*Guide to noise and vibration control on construction, demolition and maintenance sites*" (AS 2436) and the ICNG.

Table 14 Predicted Construction Noise Levels

Item	Sound Power Level, per item, L_w dBA	Noise Level, dBA L_{Aeq}		
		20-30 Kosovich Place	15 Kosovich Place	56 Cecil Road
Excavator (6 tonne)	100	55	53	49
Dozer	108	63	61	57
Grader	109	64	62	58
Crane	100	55	53	49
Concrete pump truck	108	63	61	57
Truck	107	62	60	56
Hand tools	95	50	48	44
Welders	100	55	53	49
Air compressor (silenced)	95	50	48	44

From the information in **Table 14**, it can be seen that predicted construction noise levels would not exceed 75 dBA even allowing for cumulative operation of multiple plant items at the same time. Consequently, the 'highly noise affected' criterion is not expected to be exceeded.

The predicted noise levels without further mitigation exceed the NML by up to 10 dBA at 20-30 Kosovich Place, which is the nearest residence to the School.

It should be noted that the predicted levels assume the plant/equipment operating at the nearest point to the receptor which would only be the case for a short period. Consequently, the received noise levels would frequently be lower than those predicted in **Table 14**.

In addition, the predictions do not take into consideration any reduction effect likely to be afforded by intervening school buildings as they are erected.

It is common and often unavoidable for the NMLs to be exceeded in situations where construction activities occur in the vicinity of sensitive receptors. As a result of the exceedances, the construction contractor will be required to use all reasonable and feasible noise mitigation and management measures to reduce noise generation and impacts at nearby receptors.

5.9.2 Construction-related Traffic

Construction-related traffic is anticipated to travel on Kosovich Place.

The existing traffic along Kosovich Place is minimal, with generally up to one light vehicle per hour. Heavy vehicles are negligible.

The number of construction-related vehicles expected to/from the site via Kosovich Place is shown in **Table 15**, together with the existing traffic number and the predicted noise level from that traffic at the nearest receptor.

Table 15 Construction Traffic Noise Predictions

Vehicles during Day Period, 7:00 am – 10:00 pm				Predicted Traffic Noise Level, dBA	
Existing Traffic		Construction-related Traffic[1]		Existing	Construction
Light	Heavy	Light	Heavy		
40	0	50	10	47.5	57.1

1. In addition to existing traffic

It can be seen that construction traffic is likely to increase the traffic noise from Kosovich Place, which is common on lightly-trafficked roads, but is not expected to increase overall traffic noise beyond the RNP criterion value of 58.2 dBA.

6 Construction Noise Management and Mitigation Measures

The ICNG acknowledges that where construction activity occurs on construction sites in close proximity to sensitive receptors, the potential for disturbance from noise and vibration is significant.

If additional activities or plant that will emit noise and/or vibration significantly exceeding those assumed for this assessment are found to be necessary, these will, if required, be assessed by an Acoustical Consultant and appropriate mitigation measures will be implemented.

The Construction Contractor will, where reasonable and feasible, apply best practice noise mitigation measures including:

- Undertake noisy works after 9:00 am when disruption to residences would be less likely.
- Trucks delivering goods to site must wait on Kosovich Place or idle.

- Trucks being loaded on-site must not idle.
- Maximising the offset distance between noisy plant items and nearby noise sensitive receptors, particularly fixed plant such as generators and compressors.
- Use noise screening for fixed plant where practicable.
- Avoiding the coincidence of noisy plant working simultaneously close together and adjacent to sensitive receptors.
- Minimising consecutive works in the same locality.
- Orienting equipment away from noise sensitive receptors.
- Mobile plant and vehicles may be fitted with broadband non-tonal ("quacker") or volume self-adjusting type reverse alarms.
- Carrying out loading and unloading away from noise sensitive receptors.
- Schedule respite periods, particularly when long periods of noisy activities occur.

The contractor will also take reasonable steps to control noise from all plant and equipment. Examples of appropriate noise control include selection of low-noise plant/equipment where possible, and fitting efficient silencers and low noise mufflers to plant/equipment.

7 Conclusion

An assessment of noise emissions from, and noise ingress to, the proposed Saints Peter & Paul Assyrian Primary School in Cecil Hills has been conducted.

As required by the SEARs applicable to the project and other relevant noise-related policies in place in NSW, including the Fairfield City Council *Development Control Plan*, the assessment has considered:

- Noise from the M7 Motorway into school buildings;
- Noise from traffic generated by the School on Kosovich Place to existing residences;
- Noise from vehicles on the internal road used for drop-off and pick-ups to existing residences;
- Noise from airconditioning plant associated with the new buildings to nearby residences;
- Noise from music performance events at the School Hall;
- Noise from school bell and PA system, waste collection, maintenance using powered equipment;
- Noise from school children in outdoor play areas;
- Noise from aircraft utilising the proposed Western Sydney Airport;
- Construction noise emissions; and
- Construction-related traffic.

Road traffic noise from vehicles on the M7 Motorway received at future School buildings can be adequately controlled with standard building constructions.

An increase in the total traffic noise level generated as a result of additional vehicle movements on Kosovich Place associated with the school was predicted to comply with the RNP recommended maximum increase of 2 dBA.

Details of mechanical plant are unavailable at this stage. However, given the site layout and the distance to neighbouring residences, achieving acceptable noise levels during plant operations is likely with judicious consideration to plant selection and location, and, if necessary, standard noise control methods.

Noise emission breakout via the School Hall building envelope will require further consideration during the detail design phase, however it is expected that a compliant design for all activities in the Hall will be readily achievable.

Noise associated with the school bell and PA system is expected to comply with the intrusive noise criterion when observed at the nearest sensitive receptors.

Maintenance activities using powered equipment, such as lawn mowing and waste collection, may result in noise levels that marginally exceed the intrusive noise criterion at the nearest receptors, however those noise sources are not unusual for the area and occur infrequently. Consequently, the noise levels would not be likely to cause disturbance or be considered offensive at the nearby receptors. Nevertheless, it is recommended to restrict these activities to standard daytime hours.

Noise from vehicles on the internal road between the carpark and Kosovich Place during the drop-off and pick-up times would be expected to comply with the applicable NPfI noise intrusion limit.

Noise associated with students in outdoor areas is considered an integral, but unavoidable, part of the School. There are no criteria specifically relating to noise emissions from schools. Therefore, a quantitative assessment of that type of noise using the AAAC Childcare Guidelines "background plus" criterion was undertaken and predicted to comply with the established noise limit.

Nevertheless, the following factors, discussed in **Section 4.2.3.4**, apply to the assessment of noise generated by school children during outdoor play:

- accurate prediction of outdoor play area noise is inherently difficult;
- School buildings will provide a degree of noise reduction screening to the nearest residences;
- it occurs generally during short periods throughout the day;
- it occurs only within School hours;
- the noise would not be considered "offensive" in the context of the POEO Act;
- it is not reasonable to consider that this noise source would interfere with regular domestic activities which may occur during this time;
- ambient background noise at residences was measured to be relatively high and dominated by noise from the M7 Motorway; and
- the wider community benefits through the provision of the School.

Aircraft noise levels at the School site were identified based on publically available noise exposure charts for future operations at the Western Sydney Airport at Badgerys Creek. The assessment identifies that the site location is acceptable for use as a school, without conditions, and that standard building constructions will be sufficient to achieve the internal sound design objectives described in AS 2021.

An assessment of construction noise was also undertaken. Predictions of construction noise indicate that noise levels from construction activities may exceed the project Noise Management Levels at times but would not exceed the 'highly noise affected' criterion. Accordingly, appropriate noise mitigation and management recommendations have been detailed in **Section 6** of this report.

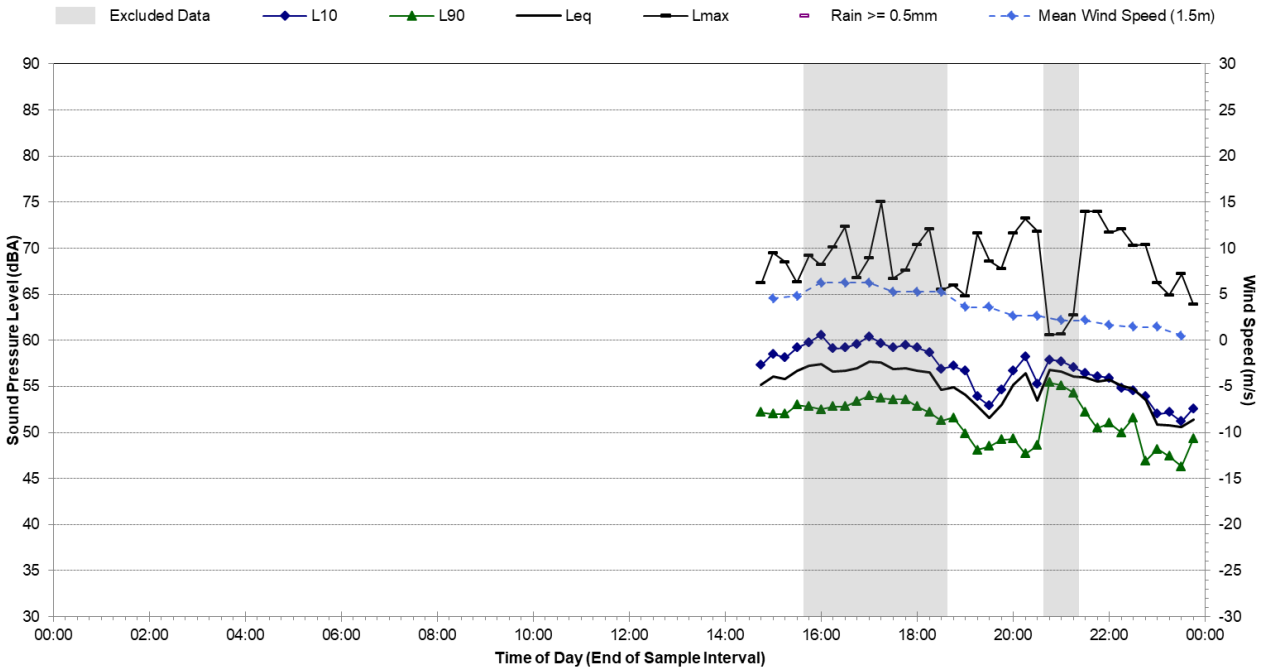
Construction-related traffic will increase the level of noise from vehicles on Kosovich Place but is expected to comply with the RNP criterion.

APPENDIX A

Daily Ambient Noise Level Graphs

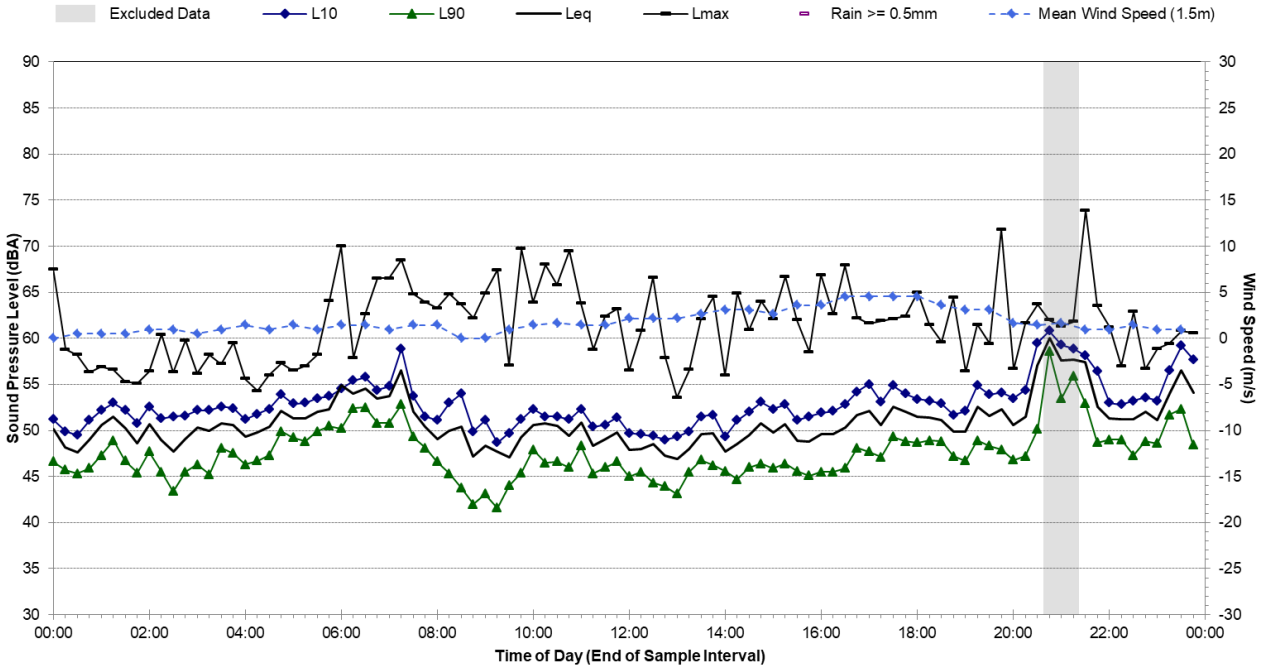
Statistical Ambient Noise Levels

Location One - Wednesday, 22 February 2017



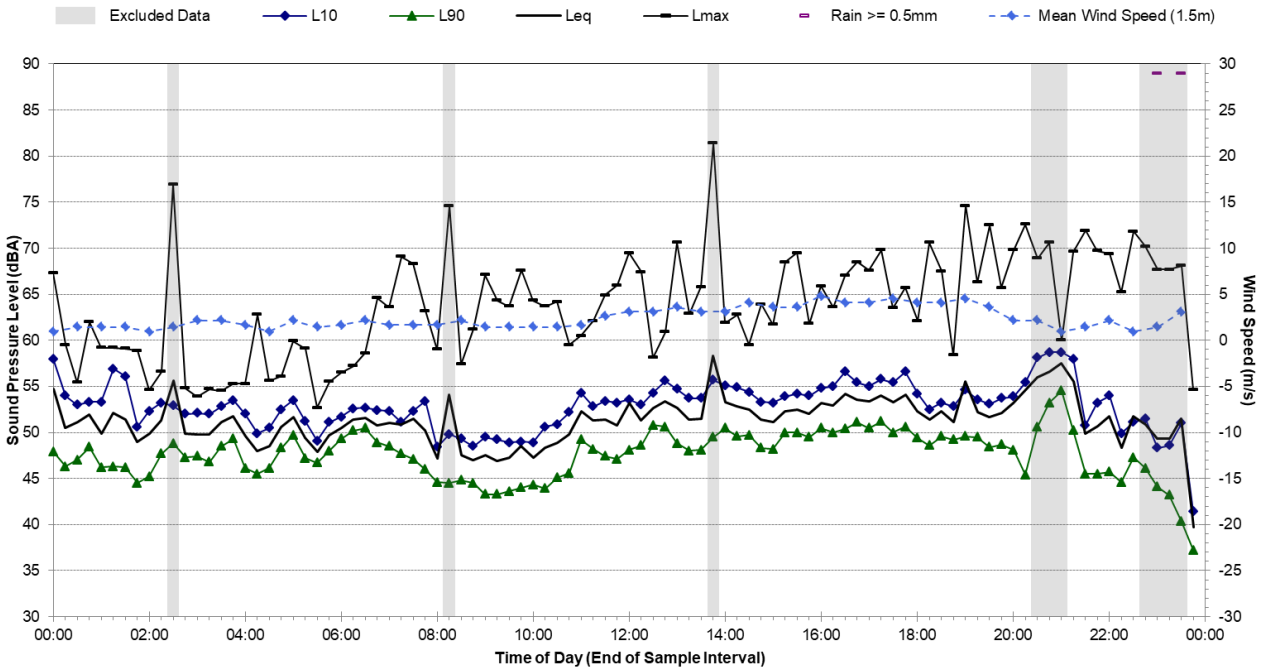
Statistical Ambient Noise Levels

Location One - Thursday, 23 February 2017



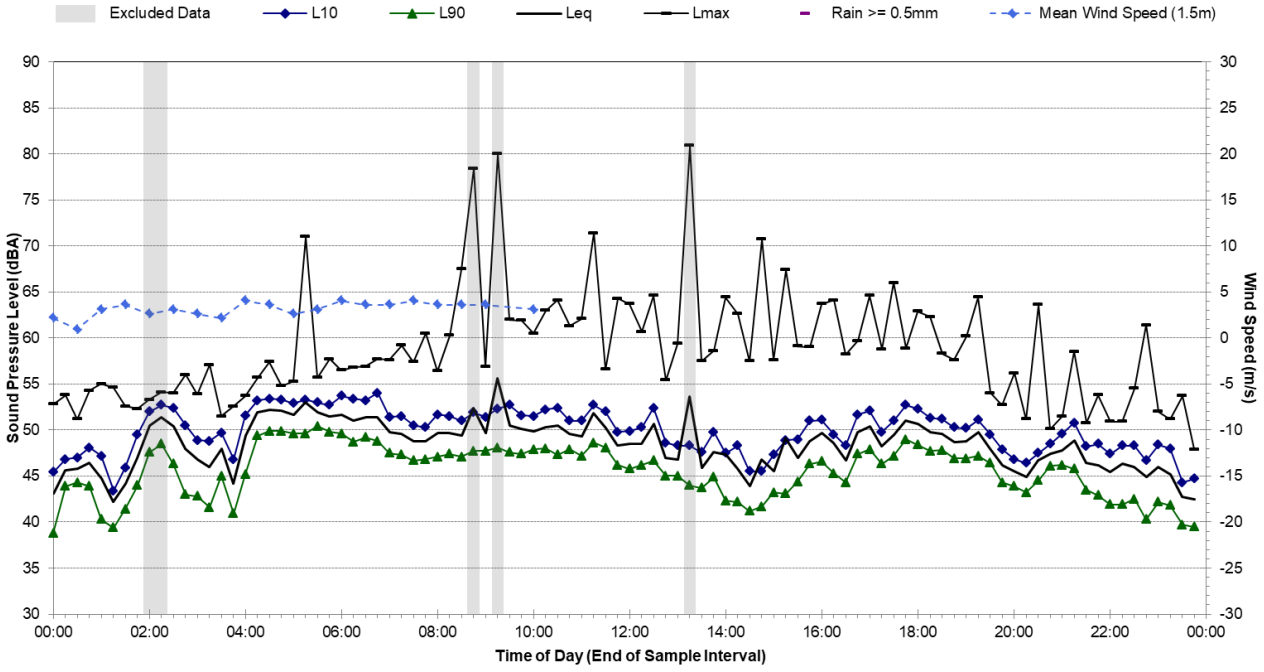
Statistical Ambient Noise Levels

Location One - Friday, 24 February 2017



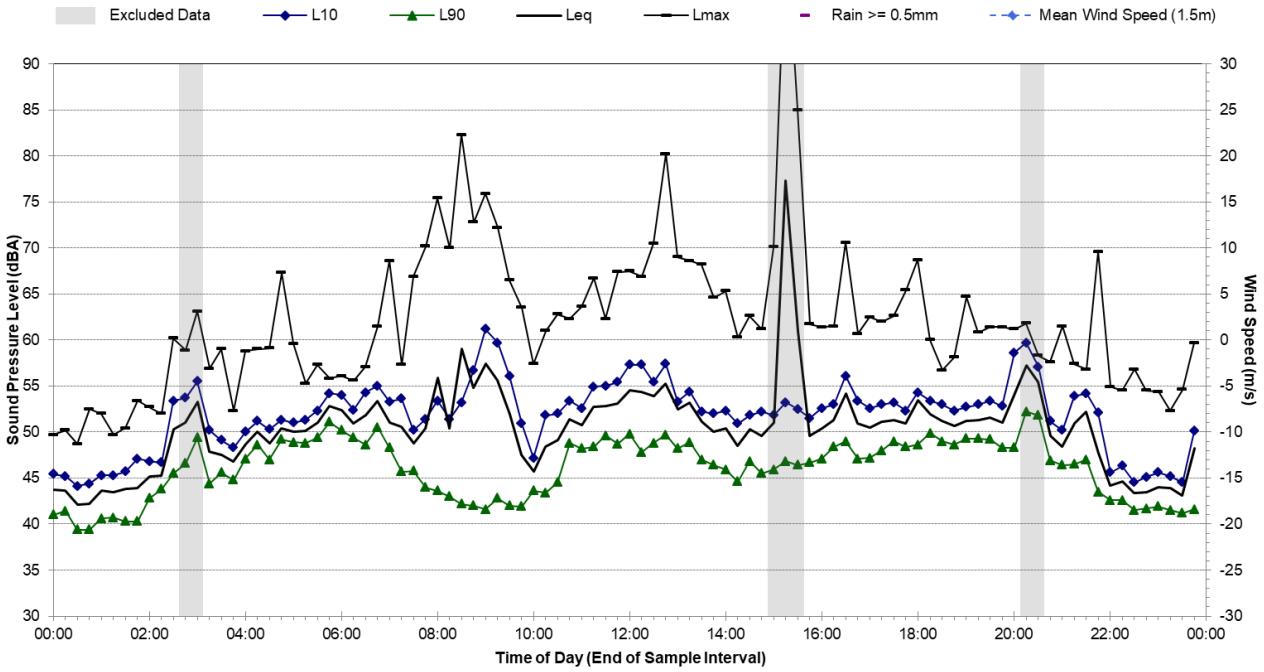
Statistical Ambient Noise Levels

Location One - Saturday, 25 February 2017



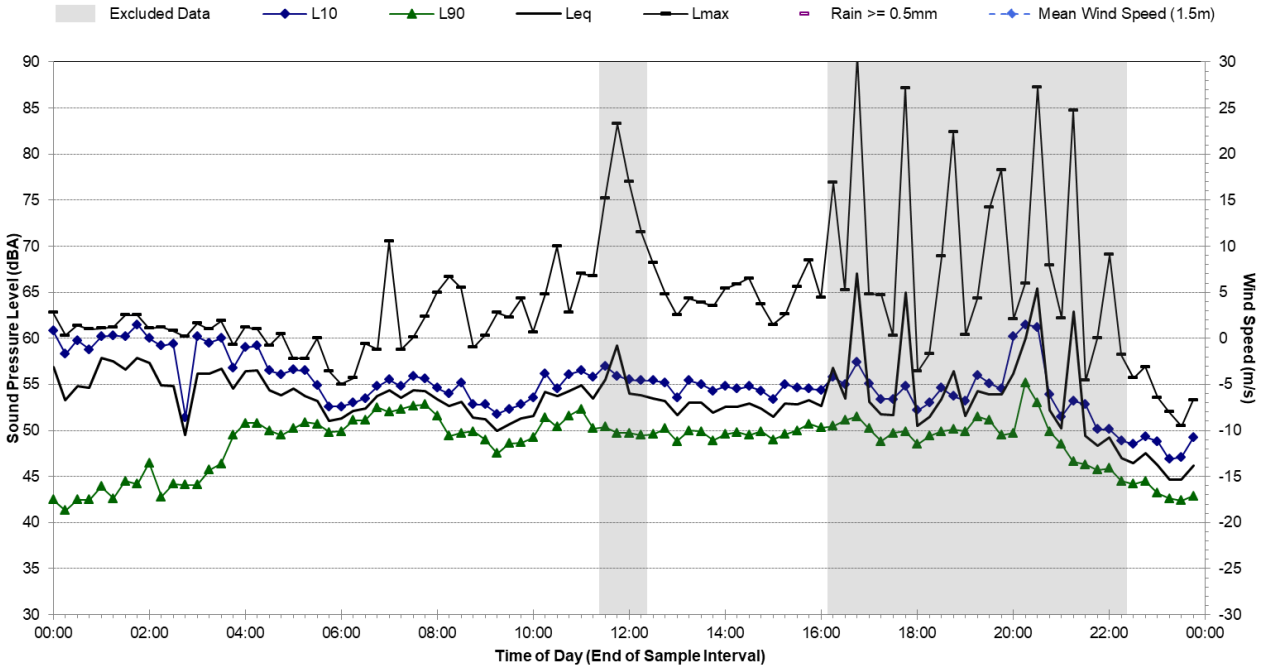
Statistical Ambient Noise Levels

Location One - Sunday, 26 February 2017



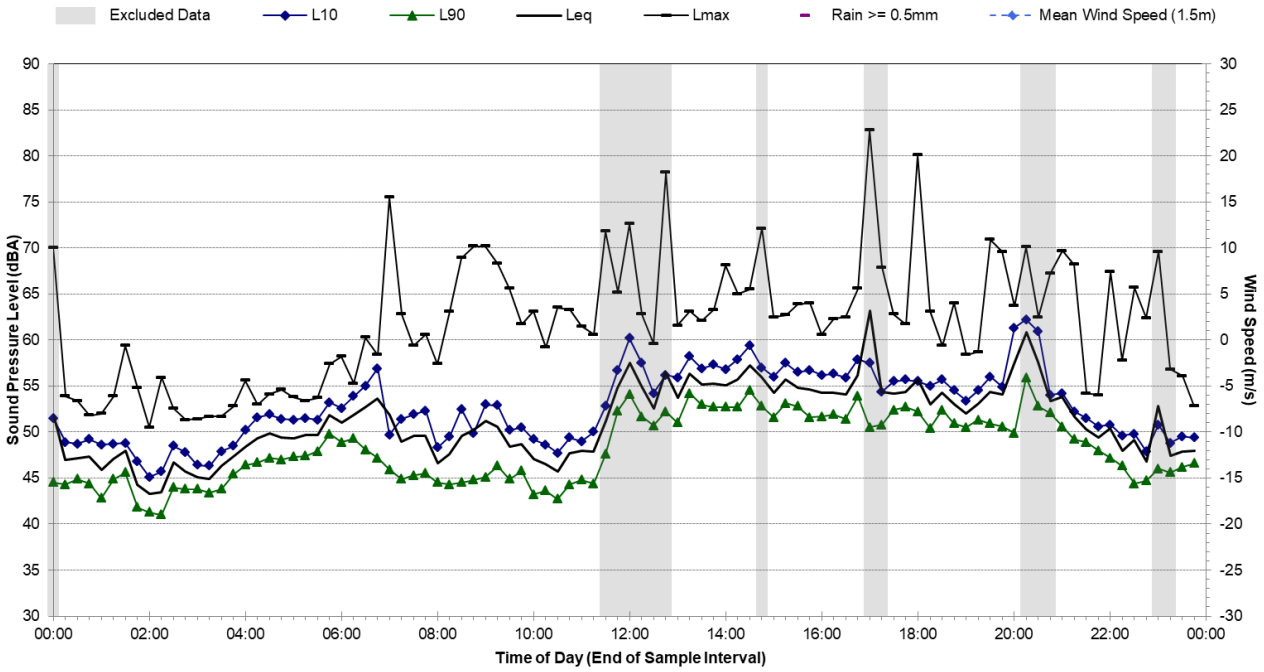
Statistical Ambient Noise Levels

Location One - Monday, 27 February 2017



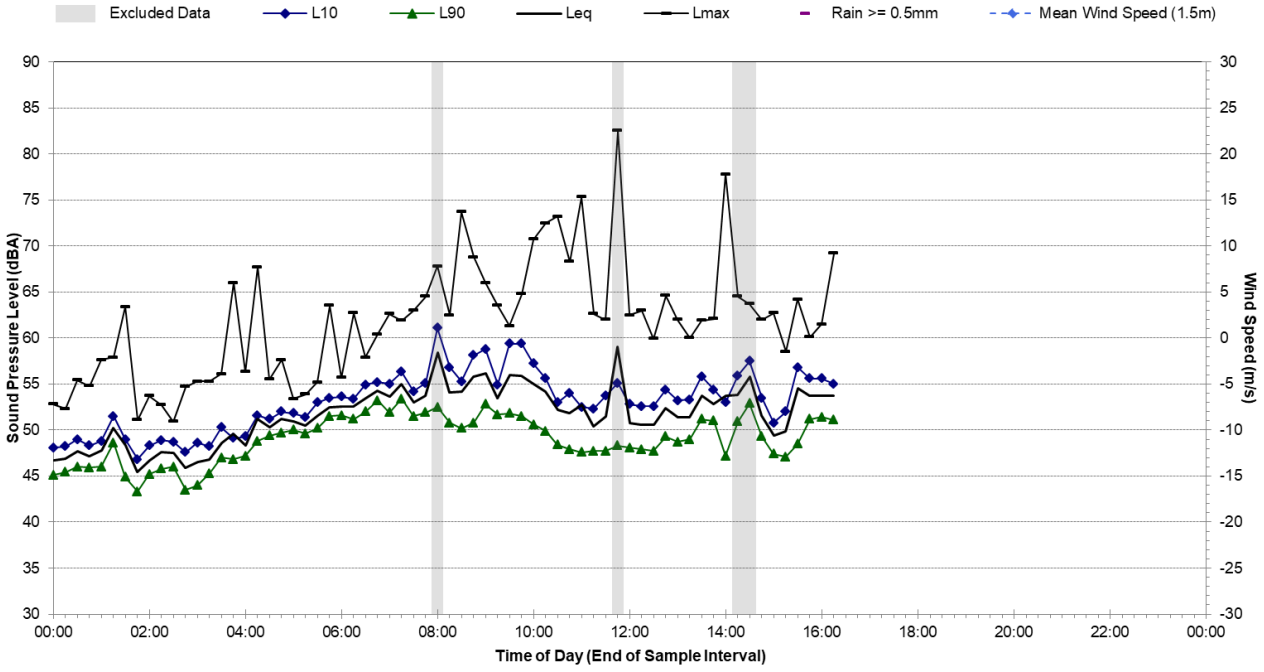
Statistical Ambient Noise Levels

Location One - Tuesday, 28 February 2017



Statistical Ambient Noise Levels

Location One - Wednesday, 1 March 2017



ASIA PACIFIC OFFICES

BRISBANE
Level 2, 15 Astor Terrace
Spring Hill QLD 4000
Australia
T: +61 7 3858 4800
F: +61 7 3858 4801

CANBERRA
GPO Box 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
F: +61 2 9427 8200

DARWIN
5 Foelsche Street
Darwin NT 0800
Australia
T: +61 8 8998 0100
F: +61 2 9427 8200

MACKAY
21 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300

MELBOURNE
Suite 2, 2 Domville Avenue
Hawthorn VIC 3122
Australia
T: +61 3 9249 9400
F: +61 3 9249 9499

NEWCASTLE
10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
F: +61 2 4037 3201

PERTH
Ground Floor, 503 Murray Street
Perth WA 6000
Australia
T: +61 8 9422 5900
F: +61 8 9422 5901

ROCKHAMPTON
rockhampton@slrconsulting.com
M: +61 407 810 417

SYDNEY
2 Lincoln Street
Lane Cove NSW 2066
Australia
T: +61 2 9427 8100
F: +61 2 9427 8200

TAMWORTH
PO Box 11034
Tamworth NSW 2340
Australia
M: +61 408 474 248
F: +61 2 9427 8200

TOWNSVILLE
Level 1, 514 Sturt Street
Townsville QLD 4810
Australia
T: +61 7 4722 8000
F: +61 7 4722 8001

AUCKLAND
68 Beach Road
Auckland 1010
New Zealand
T: +64 27 441 7849

NELSON
5 Duncan Street
Port Nelson 7010
New Zealand
T: +64 274 898 628

NEW PLYMOUTH
Level 2, 10 Devon Street East
New Plymouth 4310
New Zealand
T: +64 0800 757 695