The Acoustic Group

CONSULTING ACOUSTICAL AND VIBRATION ENGINEERS

ACOUSTICAL ASSESSMENT
PROPOSED CHILD CARE CENTRE
170 DERBY STREET, PENRITH
50.5426.R1B:MCC

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SUMMER HILL NSW 2130

Date: *15 December 2020*

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APPENDICES

1.0 INTRODUCTION

The purpose of this report is to present the results, findings and recommendations of an acoustic assessment with respect to the proposed Childcare Centre at 170 Derby Street, Penrith.

The project involves demolishing the existing single-storey building at the site (which has a residential premises and commercial use as medical consulting rooms) for the construction of a two-storey Childcare Centre with a total capacity of 86 children.

Adjoining the eastern and western boundaries of the proposed Childcare Centre site are two-storey residential dwellings. To undertake the assessment, unattended noise monitoring was conducted in the rear yard of the site (at ground and elevated locations). Monitoring at the elevated location occurred between Tuesday 25 August and Sunday 6 September 2020, whilst the monitoring at ground level occurred between Wednesday 26 August and Tuesday 8 September 2020. The unattended noise monitoring was supplemented by an attended measurement adjacent to the front boundary of the site during the retrieval of the noise loggers on the morning of Tuesday 8 September 2020.

2.0 THE SITE

The subject site is located on the southern side of Derby Street. The site currently has a single-storey building which has a residential premises and commercial use as medical consulting rooms.

The residential lot of 168 Derby Street (adjacent to the eastern boundary of the site) has a dwelling at the front of the lot and a separate dwelling at the rear of the lot. The dwelling at the front of the lot has first floor level dormer windows facing north (towards Derby Street) and west (towards the Childcare Centre site). The dwelling at the rear of the lot has first floor level dormer windows facing north and south.

Adjacent to the southern boundary of the site are the residential premises of 23 Tornaros Avenue and 56 Evan Street which have single storey dwellings. As a result of the topography of the immediate surrounding area, the elevation of 23 Tornaros Avenue is marginally higher than the Childcare Centre site. In the north-eastern corner of 56 Evan Street is a shed which will provide partial shielding of noise emission from the Childcare Centre to the residential premises.

Adjacent to the western boundary of the site at 172 Derby Street is a two-storey residential dwelling.

Opposite the site, on the northern side of Derby Street, is 161 Derby Street which is a commercial premises that provides healthcare services.

The architectural drawings of the proposed Childcare Centre prepared by Cullen Feng Architects identify that the project involves demolishing the existing single-storey building at the site for the construction of a two-storey Childcare Centre building with basement level carpark. The Childcare Centre will have outdoor play areas in the rear yard for children in the 0 to 2-year-old and 2 to 3-year-old age group, and an outdoor play area at rear (southern) end of the first floor level for children in the 3 to 6-year-old age group.

3.0 ACOUSTIC CRITERIA

In terms of general noise criteria, it is common practice for industrial and commercial activities operating on a continuous basis to utilise a concept of ambient background +5 dB(A). The assessment point is at the most sensitive location on residential properties, but for practical purposes is normally taken at the nearest residential boundaries. This criterion, in terms of EPA noise policies, is described as the “intrusiveness” noise level.

Normally the Council in acoustic matters rely upon criteria issued by the EPA and in particular the EPA’s *Noise Policy for Industry* (“NPfI”) or the *Noise Guide for Local Government* (“NGLG”).

Reference to the NPfI does not provide specific criteria for Childcare Centres but indicates modifying factors to the measured level of a source under investigation to take account of tonality impulsive events (Table C1) and an adjustment to the acceptable noise level resulting from the duration of the noise event (Table C3).

Section 6, in Part D5.2 of the Penrith Development Control Plan 2014 relates to the noise emission of Childcare Centres and noise intrusion (from road, rail or aircraft traffic) into Childcare Centres. Part D5.2 of the DCP does not provide any quantitative noise criteria but identifies that a noise impact assessment report should address the relevant provisions of the general noise and vibration controls in Part C12 of the DCP.

Part C12.4 of the DCP does not specify any quantitative noise criteria but requires industrial developments, commercial developments and licensed premises applications to demonstrate compliance with relevant State Government authority or agency standards and guidelines for noise, as well as any relevant Australian Standards and the intrusive noise criterion as defined in the EPA's *Industrial Noise Policy*. It is noted that the *Industrial Noise Policy* was superseded by the *Noise Policy for Industry* in October 2017.

It is noted that the State Environmental Planning Policy (Educational Establishments and Child Care Facilities) identifies in Clause 26 that DCP criteria/restrictions in relation to the operation of Childcare Centres no longer apply.

For various Childcare Centres/Pre-Schools/Kindergartens/Long Day Care Centres that have come before the Land & Environment Court of New South Wales, there has been no adjustment for tonality associated with children playing, although there have been adjustments in terms of the general background +5 dB(A) criterion in relation to the total duration of the outdoor play.

The Land & Environment Court has adopted over the years the concept of reduced use of outdoor areas for active play to permit a noise criterion of background +10 dB for outdoor play areas where outdoor play occurs for 2 hours per day or less. This concept has been adopted by the Association of Australasian Acoustical Consultants ("AAAC") as recommended criteria for outdoor play at Childcare Centres. Where the outdoor play exceeds 2 hours per day, the noise limit reduces to the general background +5 dB(A) limit. This position represents the current practice of the Land & Environment Court with respect to acoustic criteria for Childcare Centres.

The AAAC Guideline that has been before the Land & Environment Court has been Version 2 (dated October 2013). In September 2020, the AAAC released Version 3 of the guideline that alters the noise source levels for the children and also recommends a base criterion of 45 dB(A) for the assessment of outdoor play in residential areas where the background noise level is less than 40 dB(A).

Version 3 of the AAAC Guideline permits the use of a background +10 dB noise criterion for outdoor play areas where outdoor play occurs for up to 4 hours per day (2 hours in the morning and 2 hours in the afternoon). Where outdoor play is not limited to 2 hours in the morning and 2 hours in the afternoon, then the noise limit reduces to background +5 dB(A).

In many situations, barriers may be erected to reduce noise emission from the site (or noise intrusion to the site), in addition to the provision of a management plan to identify the use of the outdoor areas.

With the arrival of staff prior to the operating hours of the Childcare Centre, there is a possibility that driveway to the basement level carpark will be in use before 7:00 am. This use (prior to 7:00 am) falls under the night-time period set out in the NPfI.

Section 2.5 of the NPfI specifies that where the night-time noise levels at residential locations exceed the following limits, a detailed maximum noise level event assessment should be undertaken.

- an LAeq 15 minute noise target of 40 dB(A) or the prevailing Rating Background Level +5 dB whichever is the greater, and/or
- a maximum level of 52 dB(A) or the prevailing Rating Background Level +15 dB whichever is the greater.

There is normally a requirement to consider the noise impact from external road traffic on the Childcare Centre. In considering noise impacts from external road traffic on the Childcare Centre, Table 4 of the EPA's *NSW Road Noise Policy* ("RNP") provides the following noise criteria:

- The maximum internal noise level within sleeping and indoor play areas of the centre to be 35 dB(A) and 40 dB(A) respectively during operation when assessed as a 1 hour Leq.
- The maximum noise level in the outdoor play areas of the centre to be 55 dB(A) during operation when assessed as a 1 hour Leq.

The RNP provides road traffic noise assessment criteria in terms of existing residences affected by additional traffic on existing roads generated by land use developments. For residences affected by additional traffic on local roads, Table 3 of the RNP specifies a 1 hour L_{Aeq} of 55 dB, whilst for additional traffic on freeways, arterial roads and sub-arterial roads the noise target is a 15 hour L_{Aeq} of 60 dB (façade corrected, external to residential buildings). If such levels are already exceeded, then traffic noise associated with the development is permitted to be 2 dB above the existing noise level.

Approximately 870 metres to the east of the site is the intersection of Parker Street and Derby Street which is controlled by traffic lights. Parker Street is an arterial road with three lanes of traffic in either direction and carries a significant volume of traffic during the daytime period. Therefore, this assessment considers Derby Street to be a collector/sub-arterial road as it connects the local road traffic in the immediate surrounding area to Parker Street.

From the criteria above, the following noise targets would apply:

- Internal noise levels (from road traffic) 40 dB(A), L_{eq} (15 minutes)
- Internal noise levels of cot rooms (from road traffic) 35 dB(A), L_{eq} (15 minutes)
- External play areas (from road traffic) 55 dB(A), L_{eq} (1 hour)
- When the total outdoor play occurs for more than 2 hours per day in either the morning or afternoon, noise emission from the outdoor play area is not to exceed background +5 dB(A), L_{eq} (15 minutes) or 45 dB(A) L_{eq} (15 minutes) at residential receivers, whichever is greater
- When the total outdoor play occurs for not more than 2 hours in the morning and not more than 2 hours in the afternoon per day, noise emission from the outdoor play area is not to exceed background +10 dB(A) at residential receivers, L_{eq} (15 minutes) or 50 dB(A) L_{eq} (15 minutes), whichever is greater
- Noise emission from vehicles on site before 7:00 am not to exceed background +15 dB or 52 dB L_{AFmax} at bedroom windows (considered to the be most sensitive location for assessing sleep disturbance), whichever is greater
- Noise emission from vehicles on site before 7:00 am not to exceed background +5 dB(A) or 40 dB(A) L_{eq} (15 minutes) at bedroom windows, whichever is greater
- Noise emission from traffic generated by the Childcare Centre 55 dB(A), L_{eq} (1 hour) or existing L_{eq} (15 hour) +2 dB where the existing L_{eq} (1 hour) exceeds 55 dB(A)

4.0 AMBIENT MEASUREMENTS

In order to utilise the acoustic criteria in the previous section, it is necessary to obtain ambient background (L_{90}) and L_{eq} levels to be applied at the residential boundaries, and on the site respectively.

Sound level measurements for this assessment were taken in accordance with Australian Standard AS1055:2018 *Acoustics – Description and Measurement of Environmental Noise* and the ambient background measurement procedures set out in Fact Sheet B of the NPfI.

Whilst one can utilise ambient background levels from short duration measurements for compliance purposes, the preferred procedure set out in the NPfI during the planning and consent stage is to conduct noise monitoring over a period for a number of days so as to determine the daily background noise levels, which in turn are used to determine the Rating Background Level ("RBL") to be used for assessment purposes.

With respect to the NPfI document, the background level is classified in terms of a daytime period (7.00 am to 6.00 pm), an evening period (6.00 pm to 10.00 pm), and a night time period (10.00 pm to 7.00 am), except for Sundays and public holidays when the night time period is extended to 8.00 am.

Attendance to the rear yard of the site found the acoustic environment to be dominated by the noise of traffic on Derby Street and Evan Street. At the ground level of the rear yard, the noise of road traffic from Derby Street and Evan Street are subject to shielding by the surrounding buildings and the fences at the boundary of the site.

With respect to the dwelling at the rear of 168 Derby Street (to the east of the rear yard), the first floor level dormer windows are expected to have higher ambient noise levels than ground level as a result of the elevated dormer windows experiencing a lower degree of shielding (from the road traffic noise) by the surrounding buildings.

The two-storey dwelling adjacent to the western boundary of the site (at 172 Derby Street) has upper level windows along the eastern façade of the dwelling. The ambient noise level at these windows are expected to be higher than at ground level as a result of the windows having a greater exposure to Derby Street and being closer in proximity to Derby Street than the rear yard of the site.

As the residential dwellings adjacent to the eastern and western boundaries of the subject site have two-storeys with the different building levels having different acoustic environments, determination of the RBL involved unattended noise monitoring in the rear yard of the site at ground level and at an elevated microphone position (using an extension pole). The unattended noise monitoring at the ground level of the rear yard occurred between Wednesday 26 August 2020 and Tuesday 8 September 2020, whilst the unattended noise monitoring at the elevated position occurred between Tuesday 25 August 2020 and Sunday 6 September 2020.

The unattended sound level measurements were recorded using a BSWA 801 Sound Level Meter (serial no. 14988) and a SVAN 957 Sound Level Meter (serial no. 21450). The reference calibration of each meter was checked prior to and after measurements and exhibited no deviation. The calibration of the BSWA 801 and SVAN 957 Sound Level Meters to manufacturer's requirements is current.

Observation of data from the Bureau of Meteorology weather station at Penrith indicates that there was a period of rain on the late-afternoon of Friday 4 September 2020. In accordance with EPA procedures, the noise logger data for that period which was affected by rain has been excluded in the determination of the RBL.

In general, the logger graphs for weekdays show background levels during the morning and late-afternoon/evening periods that are higher than the background levels around midday, which is typical of sites affected by road traffic noise (as a result of the higher volumes of traffic during the peak periods).

The EPA's RBL assessment procedure requires determination of a background level for each day and then the derivation of the median of the individual days for the entire monitoring period.

The daytime background L_{90} and L_{eq} levels shown in Table 1 below have been derived in accordance with the NPfI procedure.

Table 1: Logger Ambient L_{90} and L_{eq} Levels – dB(A)

Date	Ground		Location 2 (elevated)	
	ABL	Daily L_{eq} Level	ABL	Daily L_{eq} Level
Wednesday 26 August 2020	-	-	44.5	60.8
Thursday 27 August 2020	39.5	50.6	43.8	53.5
Friday 28 August 2020	40.6	52.0	44.7	54.1
Saturday 29 August 2020	40.2	49.6	43.6	51.4
Sunday 30 August 2020	38.8	50.6	43.0	51.2
Monday 31 August 2020	39.6	51.2	43.7	52.4
Tuesday 1 September 2020	41.1	51.7	45.4	52.9
Wednesday 2 September 2020	41.3	51.1	45.8	53.0
Thursday 3 September 2020	41.1	50.1	45.7	52.6
Friday 4 September 2020	42.2	50.0	46.5	52.4
Saturday 5 September 2020	40.4	49.5	44.1	52.0
Sunday 6 September 2020	38.3	49.0	-	-
Monday 7 September 2020	41.2	50.2	-	-
Median **	**40.5**	-	**44.5**	-
Average **	-	**50.5**	**-**	**54.4**

** The Rating Background Level (RBL) is the median of the daily background levels (ABL), whilst the Ambient Leq is the logarithmic average of the daily results.

As the Childcare Centre is proposed to operate on weekdays, elimination of the ambient noise data obtained during the Saturdays and Sundays reveals a weekday RBL and a weekday ambient Leq level of 41 dB(A) and 51 dB(A) respectively for the ground level logger. With respect to the elevated logger, the weekday RBL and weekday ambient Leq level are 45 dB(A) and 55 dB(A) respectively.

The background levels provided in Table 1 are above the 40 dB(A) threshold identified in the AAAC Guideline (version 3) and the outdoor play occurs for more than 4 hours per day. Therefore, the outdoor play noise design targets for the subject Childcare Centre are 5 dB above the Rating Background Levels identified in Table 1.

With respect to the critical receivers adjacent to the subject site, the daytime RBL of 41 dB(A) obtained from the ground level logger results has been applied to the ground floor residential receivers at 168 Derby Street (Location A1), 23 Tornaros Avenue (Location B) and 172 Derby Street (Location C1). The daytime RBL of 45 dB(A) obtained from the elevated logger results has been applied to the northern dormer window of rear dwelling at 168 Derby street (Location A2), and the first floor level window on the eastern façade of the dwelling at 172 Derby Street (Location C2).

In addition to noise logger measurements, an attended measurement was carried out adjacent to the front boundary of the site on the morning of Tuesday 8 September 2020.

The measurements were conducted using a Brüel & Kjær Sound Level Meter Type 2250 (serial no. 3004338). The reference calibration of the meter was checked prior to and after measurements and exhibited no deviation. The calibration of the Brüel & Kjær Sound Level Meter Type 2250 to manufacturer's requirements is current.

The results of the attended measurement are provided in Appendix D as an A-weighted time splice graph and a table of statistical octave band data.

During the site visit on the morning of Tuesday 8 September 2020, the weather conditions were clear and cool (14 ^{o}C) with no wind detected at the monitoring location.

The attended measurement conducted adjacent to the front boundary of the site found the acoustic environment to be dominated by the noise of road traffic on Derby Street and Evan Street which gave rise an ambient background level of 53 dB(A) and an ambient Leq level of 65 dB(A). During the 15-minute sample measurement, 162 vehicles were observed passing the measurement location on Derby Street.

In terms of potential sleep disturbance from the arrival of Childcare Centre staff prior to 7:00 am on weekdays and utilising L90 background levels from 6:00 am to 7:00 am for each of the weekdays (set out in Appendix B), the background level obtained from the logger in the rear yard of the site (using the shoulder period methodology set out in Section A3 of the NPfI) for the weekday period of 6:00 am to 7:00 am becomes 44 dB(A) at ground level.

The primary function of considering the background level in the 6:00 am to 7:00 am period is in relation to the use of the entrance driveway to the basement level carpark by staff arriving before the Childcare Centre opens for business, where such vehicle movements before 7:00 am falls within the night-time period set out in the NPfI document.

The attended measurement adjacent to the front boundary of the site was conducted simultaneously to the logger measurements at the ground level of the rear yard. As the front of the site has a greater exposure to the noise of traffic on Derby Street and Evan Street, the attended measurement adjacent to the front boundary of the site revealed an ambient background level 10 dB higher than the logger results at the ground level of the rear yard for the same time period.

This assessment considers a background level of 54 dB(A) at the residential receiver locations towards the front of the site for the period for 6:00 am to 7:00 am. This gives rise to sleep arousal criteria of 69 dB L_{AFmax} and an $L_{eq,\ 15\ minute}$ of 59 dB(A) applied in this assessment outside bedroom windows.

Normalising the attended measurement adjacent to the front boundary of the site to the logger results at the ground level of the rear yard, a daytime background level of 51 dB(A) has been assigned to the front of the residential receivers on Derby Street for this assessment.

5.0 ACOUSTIC ANALYSIS

5.1 Impact of Childcare Centre on Surrounding Neighbourhood

In relation to the assessment of noise emission of the Childcare Centre we rely upon the noise source levels nominated in Table 1 of the AAAC Guideline (version 3).

Version 2 of the AAAC Guideline provided a range of dB(A) noise emission levels but was absent spectrum data necessary for assessing barrier effects and did not differentiate between active and passive play.

In previous Childcare Centre assessments, we have relied upon measurements of operational childcare centres to obtain octave band data for children playing. We have also adopted the situation of considering the worst case scenario being the highest sound power levels for the various age groups.

With respect to the noise emitted from children playing, Version 3 of the AAAC guideline amends the noise source level data to provide a single sound power level for each of the different age groupings (rather than a range of sound power levels). Therefore, if one adopts a worst case scenario, it would be using the single (only) sound power level value for the respective age groupings and considering all children generating the relevant sound power level.

Version 3 of the AAAC guideline provides spectral information for the noise emitted from children relevant to the specified age categories, and nominates for passive play sound power levels 6 dB below that specified for active play.

The revised AAAC guideline (version 3) has an upper age limit of children of 5 years. Where a Childcare Centre (such as the subject Childcare Centre) has children up to 6 years of age, in accordance with previous assessments and the sound power levels in the Version 2 guideline, an allocation of an additional 1 dB to the overall sound power level for the 3 to 6-year-old children grouping has been utilised in this assessment.

Appendices D3 – D4 present the ground and first floor level plans of the proposed Childcare Centre with the outdoor play area source locations and residential assessment locations superimposed onto the drawings.

With respect to the rear dwelling at 168 Derby Street, the assessment of noise emission from outdoor play has been conducted with respect to the western façade windows on the ground floor level of the dwelling (Location A1).

The first floor level of the rear dwelling at 168 Derby Street does not have any western-facing windows which overlook the rear yard of the Childcare Centre. The noise emission from outdoor play to the first floor level of the dwelling has been conducted with respect to the northern dormer window (Location A2). The northern dormer window faces away from the outdoor play areas in the rear yard and is therefore subject to shielding by the Childcare Centre building and residential building.

Adjacent to the rear (southern) boundary of the site are 23 Tornaros Avenue and 56 Evan Street which are residential premises with single-storey dwellings. 56 Evan Street has a garage in the north-eastern corner of the premises (adjacent to the Childcare Centre site) which would provide shielding of noise emission from the Childcare Centre to the dwelling and rear yard of 56 Evan Street. Therefore, this assessment considers the critical receiver to the south of the Childcare Centre to be the residential boundary of 23 Tornaros Avenue (Location B).

In terms of the residential premises at 172 Derby Street, the noise emission of the Childcare Centre has been assessed at the rear yard of the premises (Location C1) and the first floor level windows on the eastern façade of the dwelling (Location C2).

The acoustic assessment of outdoor play to the first floor level windows on the eastern façade of the dwelling at 172 Derby Street found the noise contribution of the 0 to 2-year-old outdoor play area to be significantly below the ambient background level as a result of distance attenuation and shielding by the Childcare Centre building, whilst the outdoor play area for 2 to 3-year-old children is subject to partial acoustic shielding by the Childcare Centre building.

As a result of the relationship between the different receiver assessment locations and the various outdoor play areas of the proposed Childcare Centre, the assessment requires multiple calculations to determine the resultant (cumulative) noise contributions and is present in Appendix G as a matrix of individual contributions from each noise source.

5.1.1 Outdoor Areas

The development of larger Childcare Centres and the requirement for outdoor activities has led to the concept of passive areas/activities that may be separate (physically and in time) to active activities. The use of a Plan of Management document to identify the different activities/areas form the development of the Childcare Centre in accordance with regulations governing the operation of a Childcare Centre. The different types of outdoor activities have different noise emission levels that form the basis of this acoustic assessment.

The different types of outdoor activities have different noise emission levels that form the basis of this acoustic assessment.

Table 2 below identifies the range of effective sound power levels nominated in the AAAC guideline for groups of 10 children playing.

Table 2: Effective Sound Power Levels for groups of 10 children playing

Age Group	dB(A)	Octave Band Centre Frequencies (Hz)							
		63	125	250	500	1k	2k	4k	8k
10 Children (0-2 years)	78	54	60	66	72	74	71	67	64
10 Children (2-3 years)	85	61	67	73	79	81	78	74	70
10 Children (3-5 years)	87	64	70	75	81	83	80	76	72

Effective Sound Power Level for "n" children = Effective Sound Power Level for 10 children + 10 log (n/10)

The different types of outdoor activities have different noise emission levels that form the basis of this acoustic assessment. Our analysis considers the children evenly distributed across the outdoor area and for the active play a worst-case scenario of all children simultaneously at the sound power levels nominated by the AAAC guideline. This is more conservative than the approach adopted by other acoustical engineering firms which in some cases may consider one-third of the children talking/playing simultaneously.

From the A-weighted and octave band sound power levels nominated in the AAAC Guideline (and AAAC Guideline sound power levels +1 dB for the 3 to 6-year-old grouping), the relevant distance attenuation and shielding effects were determined so as to derive a contribution for each source location with respect to each receiver locations.

The proposed Childcare Centre at 170 Derby Street, Penrith has three designated outdoor play areas with each area being used by a different age group being:

- the eastern side of the rear yard (ground level) for 0 to 2-year-old children;
- the western side of the rear yard (ground level) for 2 to 3-year-old children; and
- the rear deck on the first-floor level for 3 to 6-year-old children.

From the assessment of noise emission from outdoor play with respect to the background +5 dB(A) noise criterion at the nearest residential receivers, Table 3 below presents a matrix of the maximum capacity, types of activities and combinations of outdoor play areas that can operate simultaneously on the basis of the recommended physical noise control measures.

Table 3: Matrix of Outdoor Play Area Operations

Scenario	0-2 years Outdoor Play Area	2-3 years Outdoor Play Area	3-6 years Outdoor Play Area
1	16 children	30 children (passive)	40 children (passive)
2	-	15 children (active)	20 children (passive)
3	-	30 children (passive)	20 children (active)
4	-	-	40 children (active)

The ground of the rear yard at the site will be lowered such that the outdoor play areas in the rear yard will have level ground at an RL of 40.5 metres. As a result of the topography of the immediate surrounding area, the natural ground level at the residential receivers adjacent to the outdoor play areas have an RL between 41.4 metres to 42 metres (i.e. 0.9 metres to 1.5 metres above the ground level of the outdoor play area).

To provide shielding of noise emission from the outdoor play areas to the nearest residential receivers, the following noise control measures are to be incorporated into the design of the Childcare Centre:

- The barriers on the eastern, southern and western sides of the rear yard are to have a vertical barrier than is 1.8 metres above the natural ground level of the adjoining residential premises and of solid construction with no gaps (such as lapped-and-capped timber or precast concrete);
- The southern side of the outdoor play area for 3 to 6-year-old children (on the Level 1 rear deck) is to have a barrier with a height of 1.6 metres above the deck (i.e. RL of 45.9 metres).
- The eastern and western sides of the outdoor play area for 3 to 6-year-old children are to have vertical barriers with a height of 2.1 metres above the deck (i.e. RL of 46.4 m). The 2.1 metre high barrier extends from the rear façade of the Childcare Centre building for 5 metres. From that point onwards, the barrier can taper down to 1.6 metres at the southern end of outdoor play area.

The Level 1 Plan drawing (drawing no. DA08) identifies the eastern, southern and western sides of the outdoor play area for 3 to 6-year-old children (on the Level 1 rear deck) to have masonry planter boxes. The required barrier heights for this outdoor play area are to be achieved by installing glazed panels (minimum thickness of 6.38 mm laminated) above the masonry planter boxes.

An illustration of the proposed barriers is presented in Appendices D5 and D6.

The provision of a table of predicted noise levels, whether by a computer program or manual calculations, does not in itself identify the analysis that has been undertaken or provide material that would permit an independent review/validation of the predicted levels. To address this issue, Appendix D presents examples of the methodology used in the analysis of noise emission from children in the outdoor play areas by identification of the allocated noise source locations, the receiver assessment locations, the noise source data and the attenuation for building elements/barriers/distance that is applied to each source and receiver location.

As an example of the noise calculations for outdoor play, Appendices D7 – D14 present the calculation of noise emission from the source locations in the outdoor play areas to the northern dormer window of the rear dwelling at 168 Derby Street (Location A2).

Appendix E provides summary tables of the A-weighted contribution with respect to the relevant source and receiver locations for outdoor play.

5.1.2 Indoor Areas

The ground floor plan drawing of the proposed Childcare Centre shows that the Childcare Centre will have one classroom for 0 to 2-year-old children and two classrooms for 2 to 3-year-old children on the southern side of the Childcare Centre building. The classrooms have sliding doors on the southern façade which lead to the outdoor play areas in the rear yard of the site.

The first floor plan shows two classroom for 3 to 6-year-old children which have southern-facing sliding doors to the outdoor play area on the rear deck.

Typically the structured nature of the activities that take place indoors (such as structured learning, sleeping and painting, etc.) generate lower noise emission levels in comparison to active outdoor play. For the assessment of noise emission from the classrooms, we have considered general indoor activities to generate noise emission levels equivalent to passive outdoor play (i.e. 6 dB less than active outdoor play). For the occurrence of noisier activities in the classrooms (such as music/singing, indoor play, etc.) we have considered noise emission levels from such activities to be equivalent to the sound power levels nominated in the AAAC guideline for active outdoor play.

The assessment found the noise emission of the ground floor classrooms (via the southern façade doors) to be significantly below the ambient background level at the first floor windows of the dwelling at 172 Derby Street (Location C2) as a result of shielding by the Childcare Centre building.

To comply with the acoustic target of background +5 dB(A), the external doors/windows of the classrooms are required to be closed when noisy activities are occurring inside those classrooms.

With respect to the noise emission of the classrooms for the 2 to 3-year-old children, Classroom 2 and Classroom 3 will require acoustic absorption to 50% of the ceiling with an NRC of not less than 0.7 to reduce the reverberant build-up of sound in those classrooms.

Taking into consideration the reverberant build-up of noise in the classrooms, attenuation through open doors, distance attenuation and any shielding effects, Appendix F presents the calculations of noisy activities occurring in the classrooms to the various residential assessment locations.

5.2 Mechanical Plant

The EPA's intrusiveness noise target covers all noise from the Childcare Centre as a cumulative level which will be a contribution of mechanical plant noise and noise from children in the indoor/outdoor areas.

For the operation of the entire Childcare Centre to not exceed the EPA's intrusiveness noise target, the mechanical plant noise targets at the residential assessment locations will be less than background +5 dB(A) as a result of the requirement to consider the cumulative noise level of the Childcare Centre at the background +5 dB(A) limit.

From the calculated noise emission levels of indoor/outdoor play, Table 4 below presents the mechanical plant noise targets at the residential assessment locations so that the total noise emission of the Childcare Centre does not exceed the EPA's intrusiveness noise level of background +5 dB(A).

Table 4: Mechanical Plant Noise Targets – dB(A)

Residential Assessment Location	Noise Target – dB(A)
A1	34
A2	35
B	32
C1	40
C2	38

At the development application stage, the specific location and selection of mechanical plant is currently unknown. Normally, identification of mechanical plant associated with the proposed development and controls (if necessary) to comply with acoustic criteria occur at the Construction Certificate stage.

The ground floor plan drawing identifies two locations for air conditioning condenser units on the eastern and western sides of the Childcare Centre building (above the entrance and exit ramps of the basement level carpark). As a preliminary assessment, the noise emission of a typical single fan condenser unit on the eastern and western sides of the Childcare Centre building has been considered with respect to the adjoining residential premises at 168 Derby Street (Locations A1 and A2) and 172 Derby Street (Locations C1 and C2).

In Table 2 of the AAAC guideline, the typical sound power level of a single fan air conditioning condenser unit is 65 dB(A), whilst medium and large double fan condenser units typically have sound power levels of 70 dB(A) and 80 dB(A) respectively.

Taking into account distance attenuation, the noise emission of a condenser unit on the eastern side of the Childcare Centre building is less than the noise design targets nominated in Table 4 for Locations A1 and A2. With respect to 172 Derby Street, a condenser unit on the western side of the Childcare Centre building gives rise to a noise emission level less than the mechanical plant noise design target for Location C1, and a noise emission level at the mechanical plant noise design target for Location C2. The use of larger and/or multiple air condenser units on the western side of the Childcare Centre building may require physical noise controls (such as enclosing the air condenser unit/s) to satisfy the mechanical plant noise design targets.

5.3 Cumulative Level

Section 5.1.1 and 5.1.2 of this report present the assessment of noise emission from the outdoor play areas and classrooms separately, whilst Section 5.2 provides a design target for mechanical plant. The EPA's intrusiveness noise target of background +5 dB(A) is more stringent than the AAAC guideline as it covers **all noise emission** from the Childcare Centre (which includes noise from mechanical plant, the use of the outdoor play areas and classroom) as a cumulative level i.e. there is a conflict between the EPA's intrusive criterion and the AAAC Guideline. The conservative approach is to comply with the EPA requirements.

Appendices D, E and F provide examples of the calculation procedure for the assessment of noise emission from children at the Childcare Centre and tables of the noise contributions for the individual outdoor play areas and indoor areas as a result of the analysis. Appendix G presents a matrix of the cumulative noise levels for the various operating scenarios as set out in Table 2.

For the restriction to the operation of the outdoor play areas/classrooms and the nominated barriers, the cumulative noise levels in Appendix G do not exceed the EPA's intrusiveness noise target of background +5 dB(A) at the residential assessment locations.

5.4 Traffic Noise Impact on Outdoor Play Areas

With respect to the traffic noise at the site intruding into the outdoor areas of the Childcare Centre, the EPA's RNP identifies an $L_{Aeq,1\ hour}$ noise level target of 55 dB.

Page 48 of the RNP (Appendix B3 – Noise Monitoring Procedures) reveals the $L_{Aeq,1\ hour}$ is the "average maximum" one-hour noise level, not an energy average level over the day. The general procedure is to determine the $L_{Aeq,1\ hour}$ from the logger measurements that is exceeded 10% of the time for each day and then the median value of the individual days.

Our attendance to the site found the ambient Leq level to be controlled by vehicles on Derby Street and Evan Street.

The logger results in the rear yard of the site (ground level) reveal an $L_{Aeq,1\ hour}$ level of 53 dB(A) on weekdays. Therefore, the noise level of traffic in the ground floor outdoor play area at the rear of the site satisfies the RNP noise target of 55 dB(A).

With respect to the Outdoor Play Area for 3 to 6-year-old children on the Level 1 rear deck, the elevated logger results reveal an $L_{Aeq,1\ hour}$ level of 54 dB(A) on weekdays and therefore the noise level of traffic in the Level 1 outdoor play area satisfies the RNP noise target of 55 dB(A).

5.5 Traffic Noise Impact on Indoor Play Areas

With respect to the traffic noise at the site intruding into the indoor areas of the Childcare Centre, the RNP identifies internal noise targets of 40 dB for indoor play areas and 35 dB for sleeping areas.

Generally, the outside-to-inside attenuation of an open window is taken as 10 dB(A), whilst an attenuation of 20 – 25 dB(A) is applied for closed (single glazing) windows dependent upon the glazing thickness and area of the glazing.

The classrooms on the ground floor level are at the rear of the Childcare Centre building, with the front of the Childcare Centre building having a lobby/reception, meeting room, etc. Therefore, this assessment considers the traffic noise intrusion into the ground floor level classrooms via the rear (southern façade) doors.

From the $L_{Aeq,1\ hour}$ level of 53 dB(A) measured in the rear yard of the site, noise level of traffic external to the doors along the southern façade of the classrooms is considered to be less than 49 dB(A) as a result of shielding by the Childcare Centre building and the Level 1 rear deck above, and the shielding of the proposed boundary fence around the rear yard.

Therefore, the traffic noise levels inside the classrooms can satisfy the internal noise target of 40 dB(A) with the southern doors open.

The cotrooms do not have any external doors/windows and therefore the noise level of traffic will be negligible within the cotrooms as a result of attenuation through the building envelope and attenuation through internal walls.

The classrooms on the first floor level have two windows on the northern façade which face Derby Street, and sliding doors on the southern façade which lead to the Level 1 Outdoor Play Area.

The 15-minute sample measurement conducted adjacent to the front boundary of the site on the morning of Tuesday 8 September 2020 revealed an Leq level of 65 dB(A) from 162 vehicles passing the measurement location on Derby Street. Taking into consideration distance attenuation from Derby Street, this assessment considers a traffic noise level of 62 dB(A) external to the northern façade windows of the first floor level classrooms.

To satisfy the RNP noise target of 40 dB(A) inside the first floor level classrooms, the northern façade windows of the first floor level classrooms are required to have a minimum glazing thickness of 6 mm and are required to be closed when the classrooms are in use.

With respect to the southern façade doors of the first floor level classrooms, the elevated logger results reveal an $L_{Aeq,1\ hour}$ level of 54 dB(A) on weekdays. Taking into consideration shielding by the barriers around the Level 1 outdoor play area, the noise level of traffic external to the doors along the southern façade of the classrooms is considered to be less than 50 dB(A). Therefore, the traffic noise target of 40 dB(A) inside the first floor level classrooms can be satisfied with the southern facing door to the Level 1 Outdoor Play Area open.

5.6 Vehicle Movements On-Site

The proposed Childcare Centre will have a basement level carpark. The carpark is accessed via a ramp which runs adjacent to the eastern boundary of the site. Vehicles leave the carpark via a separate ramp which runs along the western boundary of the site.

The assessment utilises previous measurements of vehicles travelling down a 1:6.25 gradient at low speeds which revealed an average SEL of 57.0 dB(A) and maximum level of 48 dB(A) when measured at a position that has a horizontal distance of 8 metres from the vehicle path and 5.3 metres above the driveway (L&EC 254836 of 2016). The average SEL of vehicles ascending the gradient at low speeds was measured to be 60.6 dB(A) when measured at a position that has a horizontal distance of 5 metres from the vehicle path and 5.3 m above the driveway.

5.6.1 Sleep Disturbance

If staff arrive before the operating hours of the Childcare Centre and utilise the carpark, there is a requirement to consider sleep disturbance of vehicle movements on the site before 7:00 am.

The NPfI presents maximum level and Leq, 15 minute noise targets to be considered as trigger levels for sleep disturbance which are assessed external to bedroom windows.

Taking into consideration distance attenuation to the residential dwelling at the front of 168 Derby Street, the noise of a staff vehicle on the ramp to the basement carpark is calculated to have a maximum level of 48 dB(A) and an Leq, 15 minute level of 27 dB(A).

The arrival of staff vehicles gives rise to noise levels significantly less than maximum noise level target of 69 dB(A) and the Leq 15 minute noise target of 59 dB(A). Therefore, the threshold levels for an assessment of sleep disturbance are not exceeded and no detailed assessment of maximum noise level events is required.

5.6.2 Drop-Off/Pick-Up of Children

In terms of vehicle movements on site during the operating hours of the Childcare Centre (drop-off/pick-up of children), the vehicle noise (when vehicles are on the site) is required to be assessed in terms of the EPA's intrusiveness noise target of background +5 dB(A) as an Leq 15 minutes.

The drop-off/pick-up of children will occur in the basement level carpark and therefore the primary noise emission of vehicles on site will be the descending and ascending of vehicles on the ramps during the drop-off/pick-up periods.

Typically, the drop-off of children occurs over a 2 hour period. Assuming that the arrival of 86 children (maximum capacity of the proposed Childcare Centre) occurs steadily over a 2 hour period, there will be on average 11 children arriving in a 15-minute period. This assessment considers a total of 11 vehicle movements on the ramp down to the basement carpark and 11 vehicle movements on the ramp up from the basement carpark in a 15-minute period (one vehicle movement entering and one vehicle movement leaving per child).

Taking into consideration distance attenuation to the residential receivers at 168 Derby Street and 172 Derby Street, the Leq 15 minute noise level of vehicle movements on the Childcare Centre site during the drop-off period is calculated to be 38 dB(A) at 168 Derby Street, and 41 dB(A) at 172 Derby street (see Appendix H).

The noise emission of vehicle movements on the Childcare Centre site during the drop-off period is significantly below the daytime background level of 51 dB(A) at the front of the Childcare Centre site and therefore satisfies the EPA's intrusiveness noise criterion.

5.7 Traffic Movements External to Site

With respect to the additional traffic that will be generated by the Childcare Centre, the RNP specifies a 15 hour L_{Aeq} of 60 dB for residences affected by additional traffic on freeways, arterial roads and sub-arterial roads. If such levels are already exceeded, then traffic noise associated with the development is permitted to be 2 dB above the existing noise level. The assessment location is external to the façade of residential dwellings and therefore requires a façade correction from free field measurements/prediction of +2.5 dB.

The logger results in the rear yard of the site (at ground level) reveal a 15 hour L_{Aeq} level of 53 dB(A) on weekdays.

The 15-minute sample measurement conducted adjacent to the front boundary of the site on the morning of Tuesday 8 September 2020 revealed an Leq level (free field) of 65 dB(A) from 162 vehicles passing the measurement location on Derby Street. As the front of the site has a greater exposure to the noise of traffic on Derby Street and Evan Street, the attended measurement adjacent to the front boundary of the site revealed an ambient Leq noise level (from road traffic) 15 dB higher than the logger results at the ground level of the rear yard for the same time period.

Normalising the attended measurement adjacent to the front boundary of the site to the logger results at the ground level of the rear yard and taking into consideration distance attenuation to the front façade of the residential dwellings along Derby Street, this assessment considers the existing traffic to give rise to a facade corrected Leq noise level of 58 dB(A) which exceeds the 60 dB(A) noise target. Therefore from the RNP, the traffic noise associated with the development is permitted to give rise to a 2 dB increase above the existing noise level.

The proposed Childcare Centre has a maximum capacity of 86 children whilst the basement plan (drawing no. DA06) shows the carpark to have 14 spaces for staff vehicles. This assessment considers the proposed Childcare Centre to generate a maximum of 372 vehicle movements on Derby Street during the daytime period (4 vehicles movements per child from parents entering/leaving the site for drop-off and pick-up and 2 vehicle movements per staff vehicle entering/leaving the site).

The volume of road traffic generated by the Childcare Centre is relatively low in comparison to the existing traffic on Derby Street to the extent that compliance with the RNP's target of +2 dB above the existing road traffic noise level would easily be achieved. Whilst not directly applicable to low volumes of traffic, utilising the Calculation of Road Traffic Noise Methodology reveals the additional traffic generated by the Childcare Centre to have a 15 hour L_{Aeq} level of 51 dB at the critical residential receivers along Derby Street (façade corrected) which is less than the noise level of the existing traffic and less than the RNP noise target of 60 dB(A).

6.0 CONCLUSION

The proposed Childcare Centre at 170 Derby Street, Penrith has been the subject of an acoustic assessment. The project involves demolishing the existing mixed-use building at the site for the construction of a two-storey Childcare Centre with a total capacity of 86 children.

To conduct the acoustic assessment, unattended noise logger measurements were conducted at the rear yard of the site (at ground and elevated locations) to identify the existing noise environment with respect to adjacent receiver locations and traffic noise levels in external play areas. Monitoring at the elevated location occurred between Tuesday 25 August and Sunday 6 September 2020, whilst the monitoring at ground level occurred between Wednesday 26 August and Tuesday 8 September 2020. Supplementing the noise logger measurements is an attended measurement conducted adjacent to the front boundary of the site during retrieval of the loggers on the morning of Tuesday 8 September 2020.

From the assessment of noise emission from outdoor play with respect to the background +5 dB(A) noise criterion at the nearest residential receivers, Table 3 in Section 5.1.1 of this report (reproduced below) presents a matrix of the maximum capacity, types of activities and combination of outdoor play areas that can operate simultaneously on the basis of the recommended physical noise control measures.

Table 3: Matrix of Outdoor Play Area Operations

Scenario	0-2 years Outdoor Play Area	2-3 years Outdoor Play Area	3-6 years Outdoor Play Area
1	16 children	30 children (passive)	40 children (passive)
2	-	15 children (active)	20 children (passive)
3	-	30 children (passive)	20 children (active)
4	-	-	40 children (active)

With respect to noise emitted from the classrooms, the external doors/windows of the classrooms are required to be closed when the noisy activities (such as music/singing, indoor play, etc.) are occurring in the classrooms. In addition, the classrooms for 2 to 3-year-old children are required to have acoustic absorption to 50% of the ceiling with an NRC of not less than 0.7.

The above operational restrictions to achieve the acoustic criteria applicable to the subject application form part of the Plan of Management to identify a timetable or similar to permit the above constraints to apply whilst satisfying the regulatory requirements for the operation of a Childcare Centre.

In terms of noise emission from the outdoor play areas, the following physical noise controls are to be implemented into the design of the Childcare Centre:

- The barriers on the eastern, southern and western sides of the rear yard are to have a vertical barrier than is 1.8 metres above the natural ground level of the adjoining residential premises and of solid construction with no gaps (such as lapped-and-capped timber or precast concrete)
- The southern side of the outdoor play area for 3 to 6-year-old children (on the Level 1 rear deck) is to have a barrier with a height of 1.6 metres above the deck (i.e. RL of 45.9 metres).
- The eastern and western sides of the outdoor play area for 3 to 6-year-old children are to have vertical barriers with a height of 2.1 metres above the deck (i.e. RL of 46.4 m). The 2.1 metre high barrier extends from the rear façade of the Childcare Centre building for 5 metres. From that point onwards, the barrier can taper down to 1.6 metres at the southern end of outdoor play area.

The Level 1 Plan drawing (drawing no. DA08) identifies the eastern, southern and western sides of the outdoor play area for 3 to 6-year-old children (on the Level 1 rear deck) to have masonry planter boxes. The required barrier heights for this outdoor play area are to be achieved by installing glazed panels (minimum thickness of 6.38 mm laminated) above the masonry planter boxes.

An illustration of the proposed barriers is presented in Appendices D5 and D6.

In terms of traffic noise intrusion into the Childcare Centre, our assessment revealed the traffic noise level in the outdoor play areas satisfy the external RNP noise target of 55 dB(A).

To satisfy the internal RNP noise target of 40 dB(A), the northern façade windows of the first floor level classrooms (which face Derby Street) are required to have a minimum glazing thickness of 6 mm and are to be closed when the classrooms are in use. Natural ventilation to the classrooms on the ground and first floor levels can occur via open doors on the southern (rear) facade.

An assessment of noise emission from vehicle movements on the site revealed compliance with the EPA's intrusiveness noise level during the drop-off/pick-up of children and the sleep arousal criteria for the arrival of staff before 7:00 am.

The assessment of noise emission from vehicles on Derby Street reveals the additional traffic generated by the Childcare Centre will be significantly below the noise level of the existing traffic and satisfy the RNP noise criterion.

With the noise control measures specified above, we can support the application for a Childcare Centre at 170 Derby Street, Penrith as the proposed Childcare Centre can be built and operated to satisfy the various acoustic criteria applicable to the development.

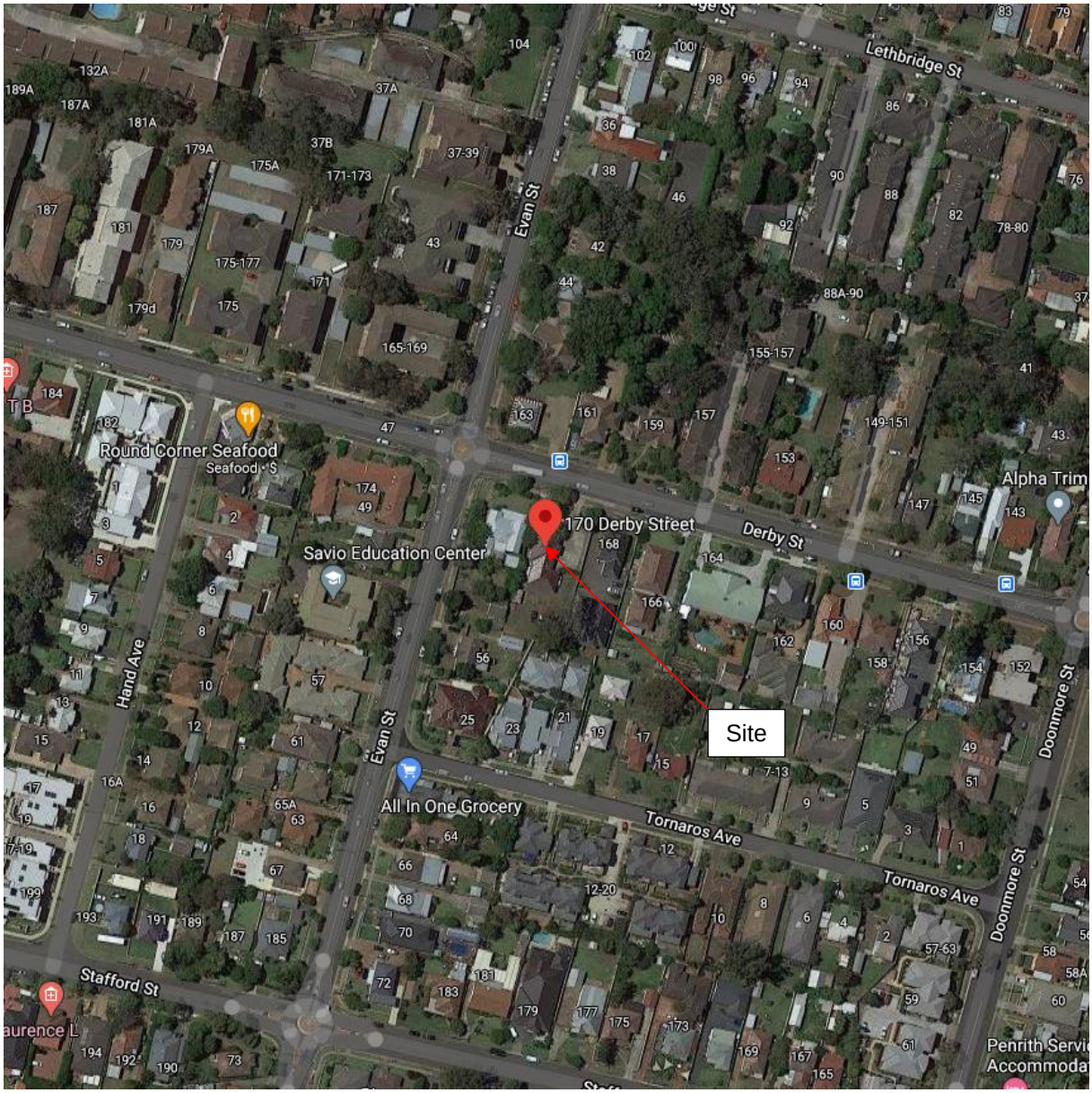
Yours faithfully,

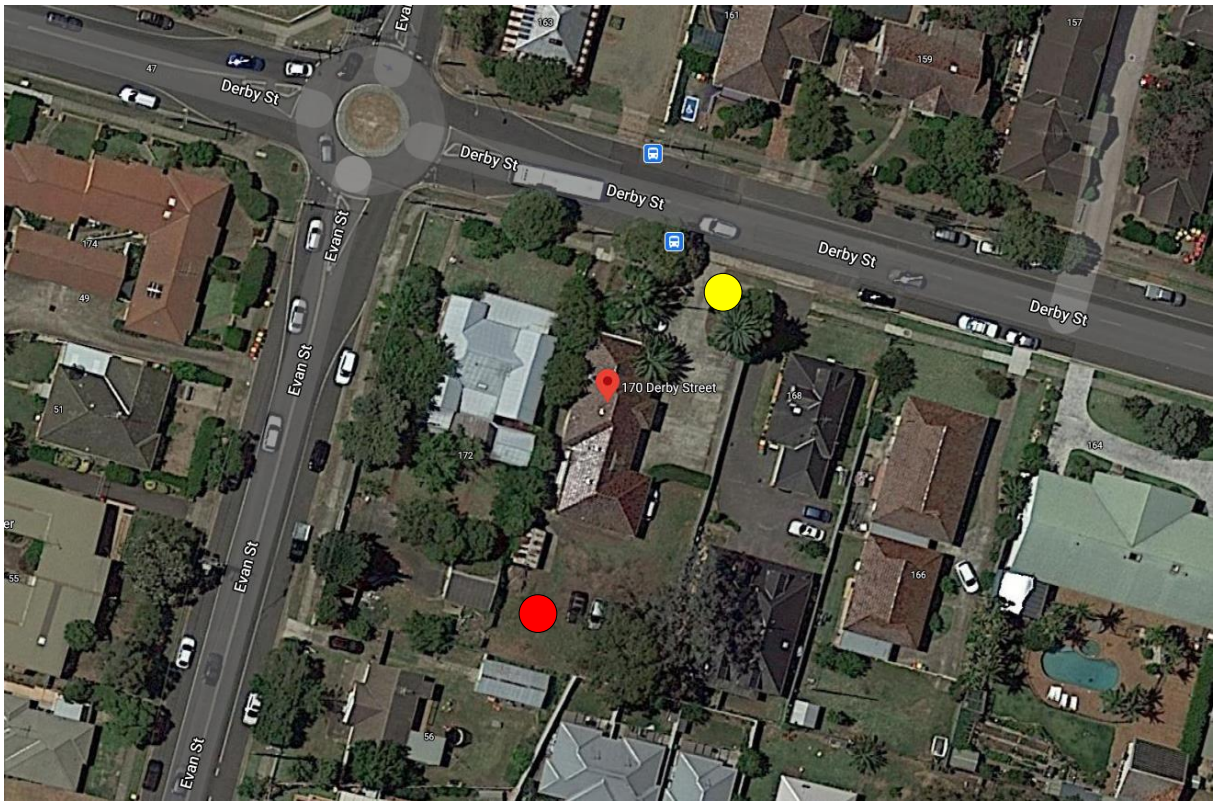
THE ACOUSTIC GROUP PTY LTD

[redacted]

CHRISTOPHER Y H CHAN

APPENDIX A: Site and Measurement Locations





Attended Measurement Location

Unattended Measurement Locations

APPENDIX B: Logger Results

Penrith Montessori

Job Number: 5426
Instrumentation: SVAN 957 21450
Logger Location: Rear Yard Elevated
Free Field: yes
Monitoring Period: Tuesday 25 August 2020 to Sunday 6 September 2020

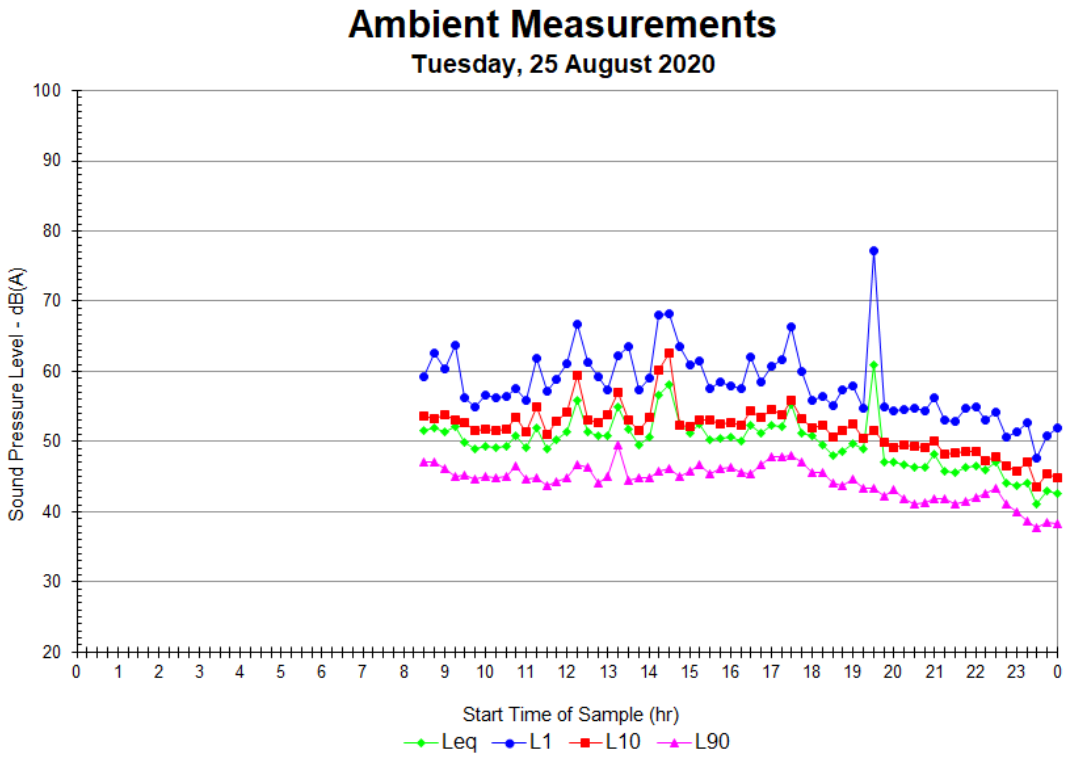
BACKGROUND AND AMBIENT NOISE MONITORING RESULTS
NSW EPA's NOISE POLICY FOR INDUSTRY, 2017

Day	L90 Background Noise Levels			Leq Ambient Noise Levels		
	Day 7am - 6pm	Evening 6pm - 10pm	Night 10pm - 7am	Day 7am - 6pm	Evening 6pm - 10pm	Night 10pm - 7am
Tuesday 25 August 2020	*	41.1	35.2	*	51.4	46.9
Wednesday 26 August 2020	44.5	41.2	35.2	60.8	48.9	47.0
Thursday 27 August 2020	43.8	42.3	35.2	53.5	49.8	47.7
Friday 28 August 2020	44.7	43.6	37.7	54.1	49.4	46.0
Saturday 29 August 2020	43.6	43.7	37.5	51.4	49.4	47.1
Sunday 30 August 2020	43.0	43.9	38.2	51.2	48.5	48.4
Monday 31 August 2020	43.7	34.4	30.1	52.4	49.1	45.9
Tuesday 1 September 2020	45.4	42.5	35.9	52.9	51.6	49.1
Wednesday 2 September 2020	45.8	45.3	40.3	53.0	49.8	49.5
Thursday 3 September 2020	45.7	44.3	37.3	52.6	51.6	47.6
Friday 4 September 2020	46.5	38.5	30.5	52.4	49.4	45.1
Saturday 5 September 2020	44.1	41.4	34.6	52.0	48.1	45.1
RBL Median	**44.5**	**42.4**	**35.6**	-	-	-
Log Average	-	-	-	**54.4**	**49.9**	**47.3**

TRAFFIC NOISE MONITORING RESULTS
DECCW's NSW Road Noise Policy 2011

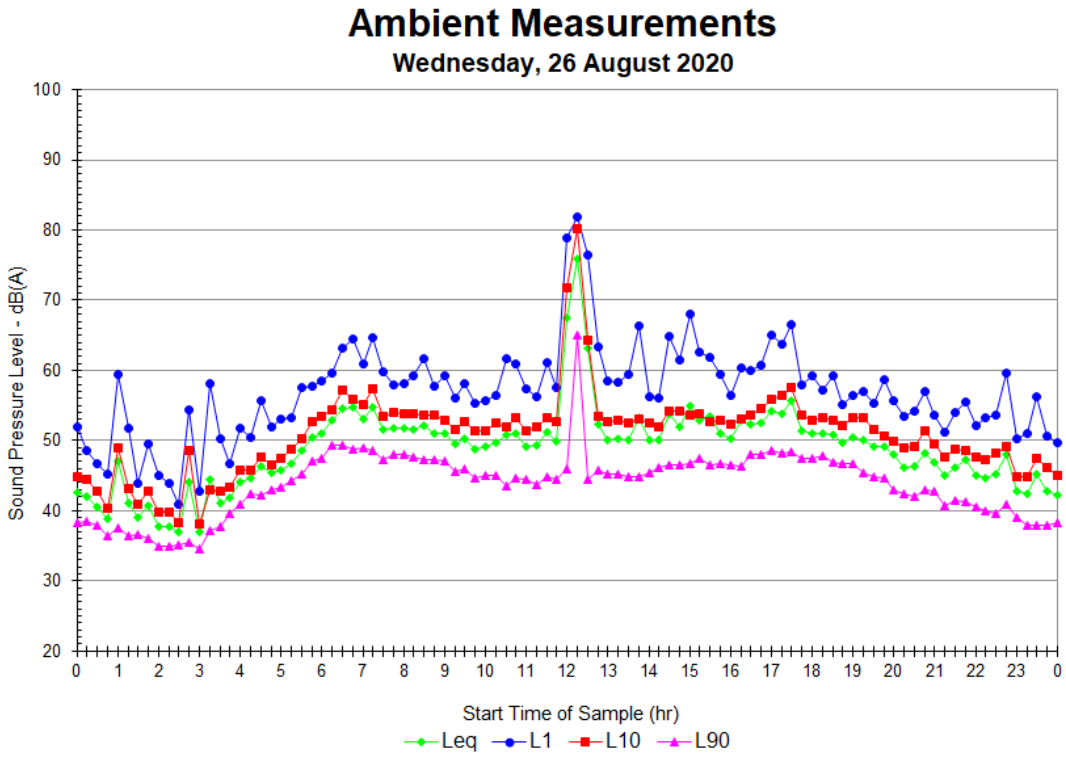
Day	Leq Ambient Noise Levels		Leq 1 Hr Noise Levels			
	Day 7am - 10pm	Night 10pm - 7am	Day - Max	Day - Min	Night - Max	Night - Min
Tuesday 25 August 2020	*	49.4	*	*	56.0	42.8
Wednesday 26 August 2020	62.1	49.5	73.2	48.9	55.8	41.8
Thursday 27 August 2020	55.2	50.2	61.5	49.5	55.7	43.9
Friday 28 August 2020	55.8	48.5	63.3	51.1	53.1	43.1
Saturday 29 August 2020	53.4	49.6	56.7	50.4	54.2	43.1
Sunday 30 August 2020	53.1	50.9	55.5	50.8	56.0	45.6
Monday 31 August 2020	54.2	48.4	57.3	45.3	56.3	36.8
Tuesday 1 September 2020	55.1	51.6	57.9	49.9	57.4	42.4
Wednesday 2 September 2020	54.9	52.0	57.1	51.1	56.8	45.6
Thursday 3 September 2020	54.9	50.1	56.7	52.5	55.2	44.4
Friday 4 September 2020	54.5	47.6	58.6	49.2	52.7	41.1
Saturday 5 September 2020	53.7	47.6	56.2	49.6	51.4	41.5
Log Average	**56.1**	**49.8**	**64.1**	**50.2**	**55.4**	**43.2**

* indicates an incomplete set of data for a given time period
# Nighttime for a given day continues through to the following morning



Penrith Montessori
SVAN 957 21450

5426
Rear Yard Elevated

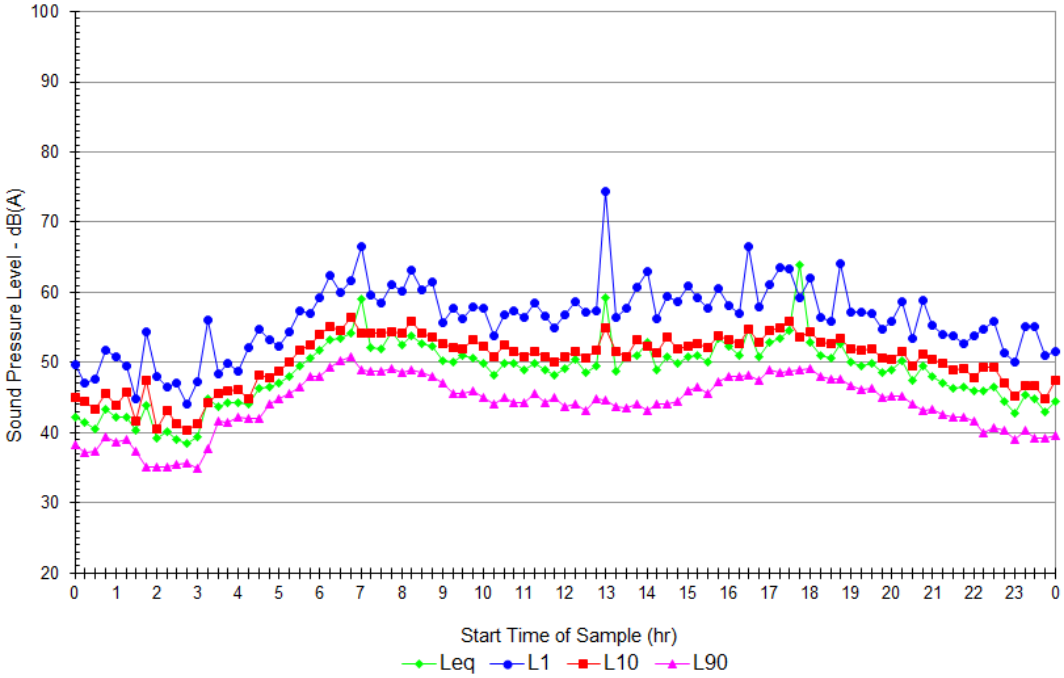


Penrith Montessori
SVAN 957 21450

5426
Rear Yard Elevated

Ambient Measurements

Thursday, 27 August 2020

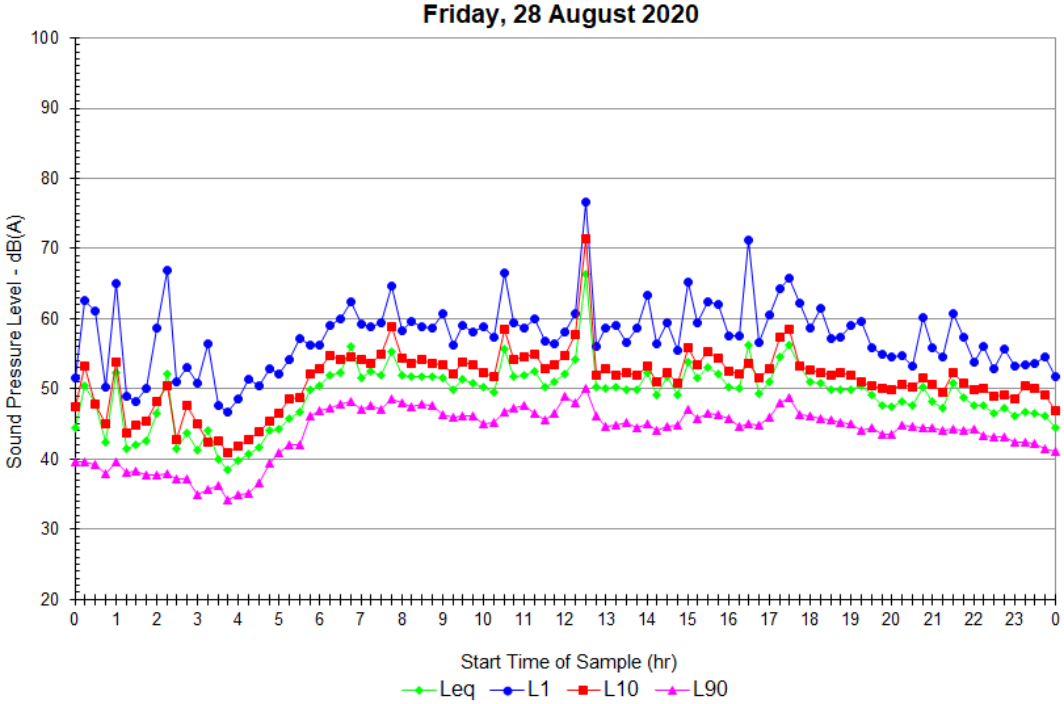


Penrith Montessori
SVAN 957 21450

5426
Rear Yard Elevated

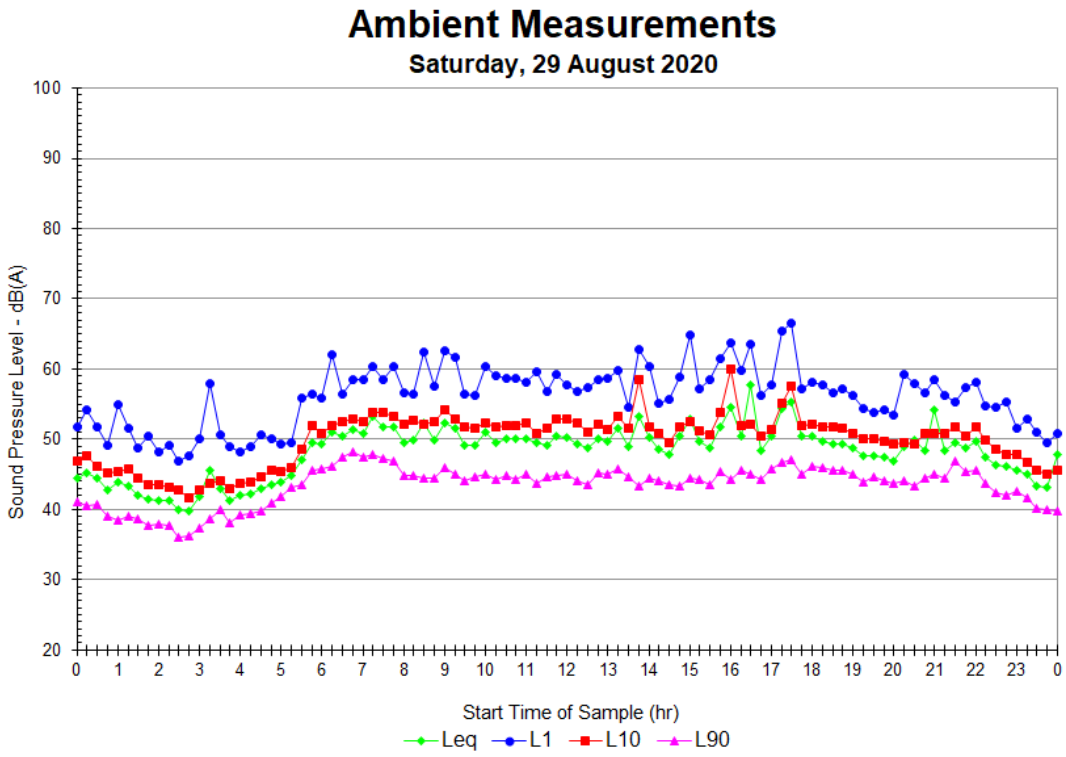
Ambient Measurements

Friday, 28 August 2020



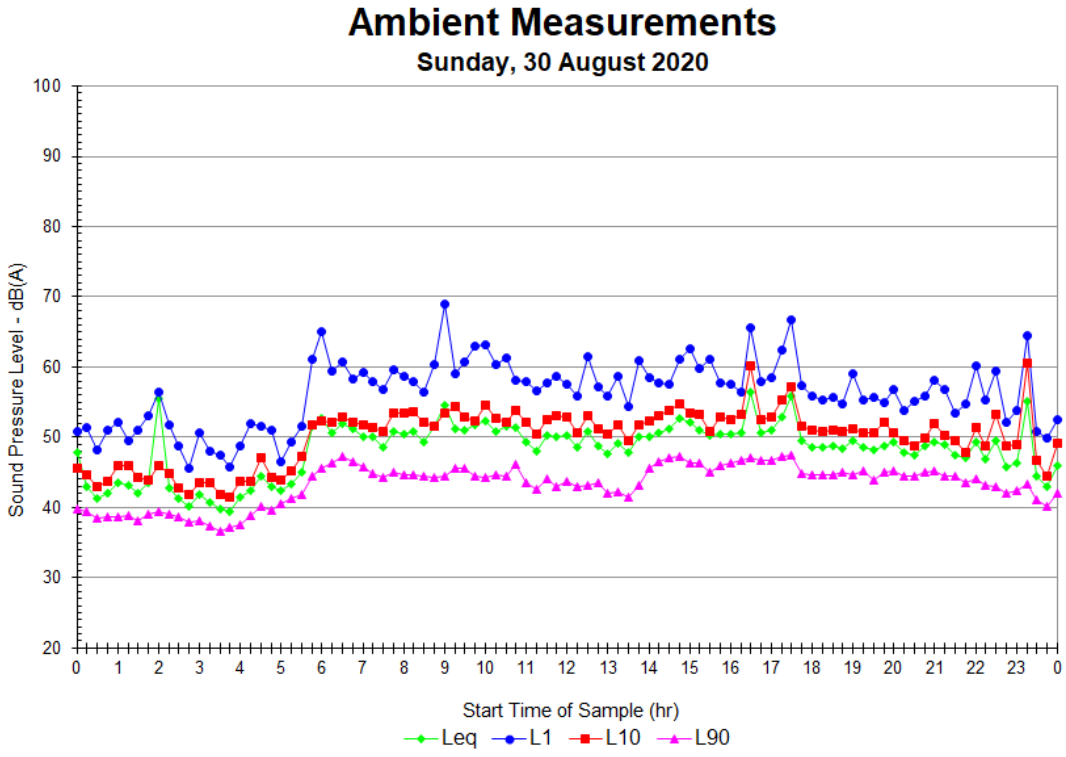
Penrith Montessori
SVAN 957 21450

5426
Rear Yard Elevated



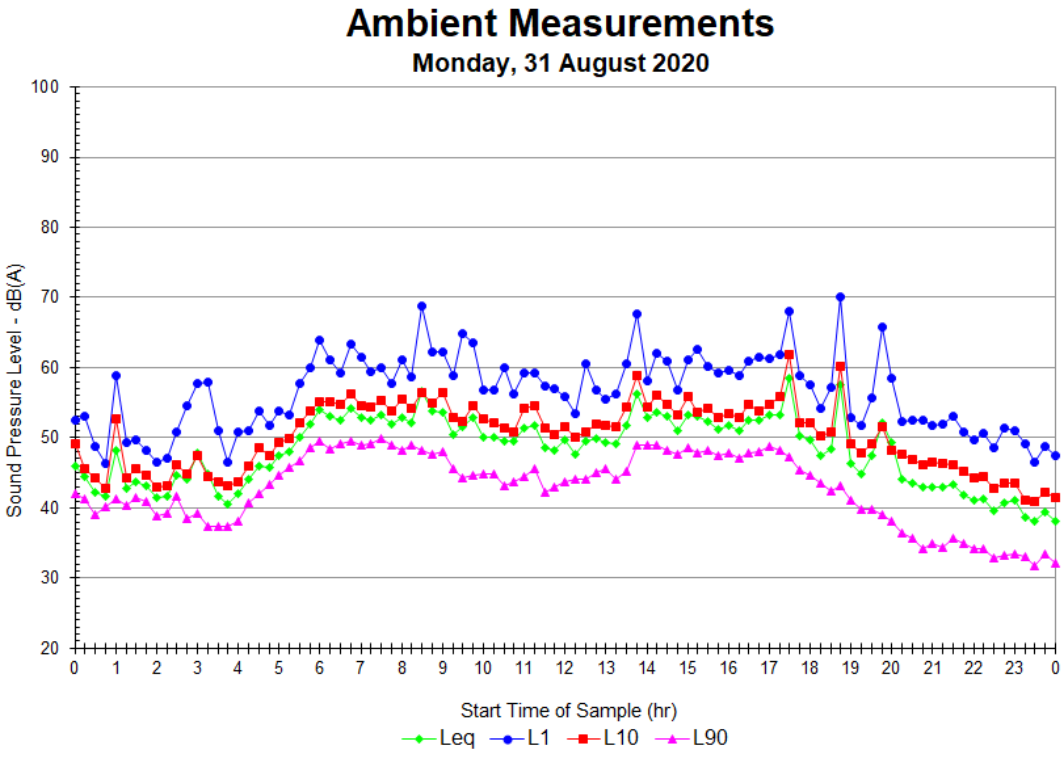
Penrith Montessori
SVAN 957 21450

5426
Rear Yard Elevated



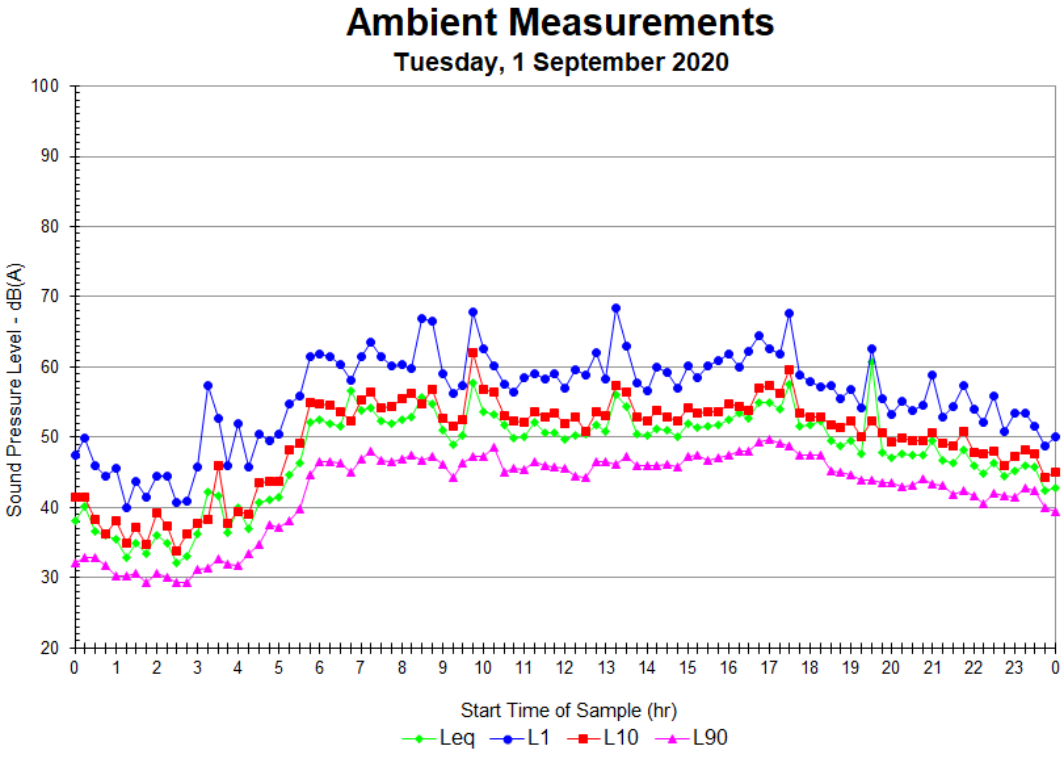
Penrith Montessori
SVAN 957 21450

5426
Rear Yard Elevated



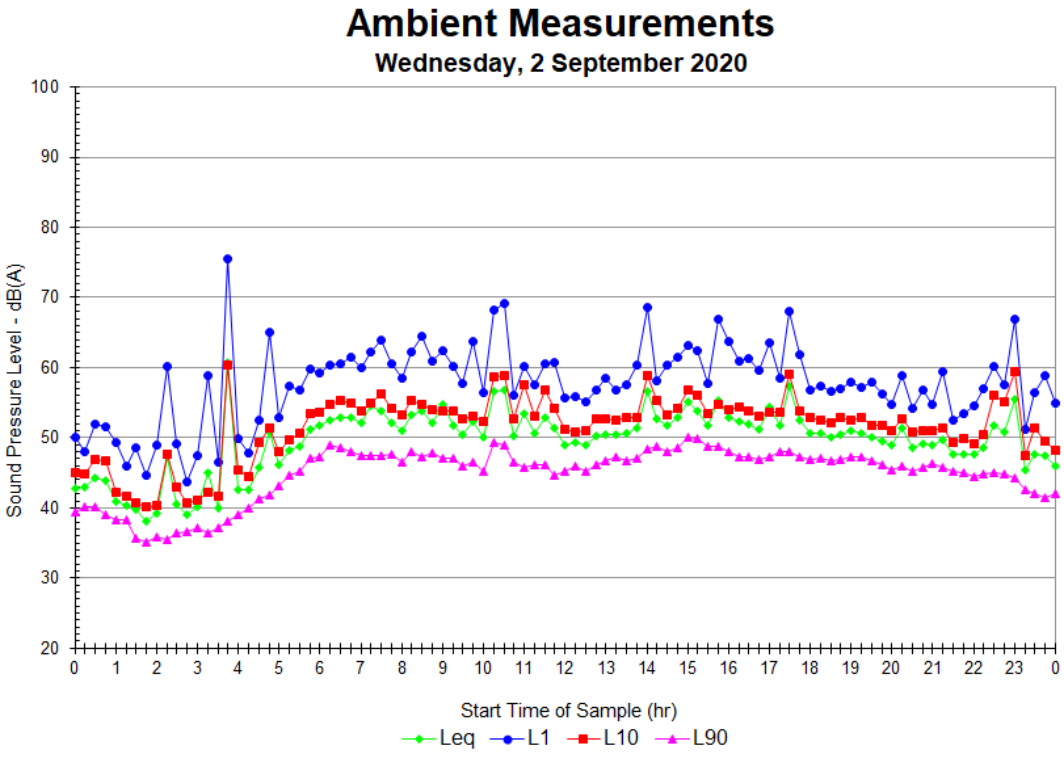
Penrith Montessori
SVAN 957 21450

5426
Rear Yard Elevated



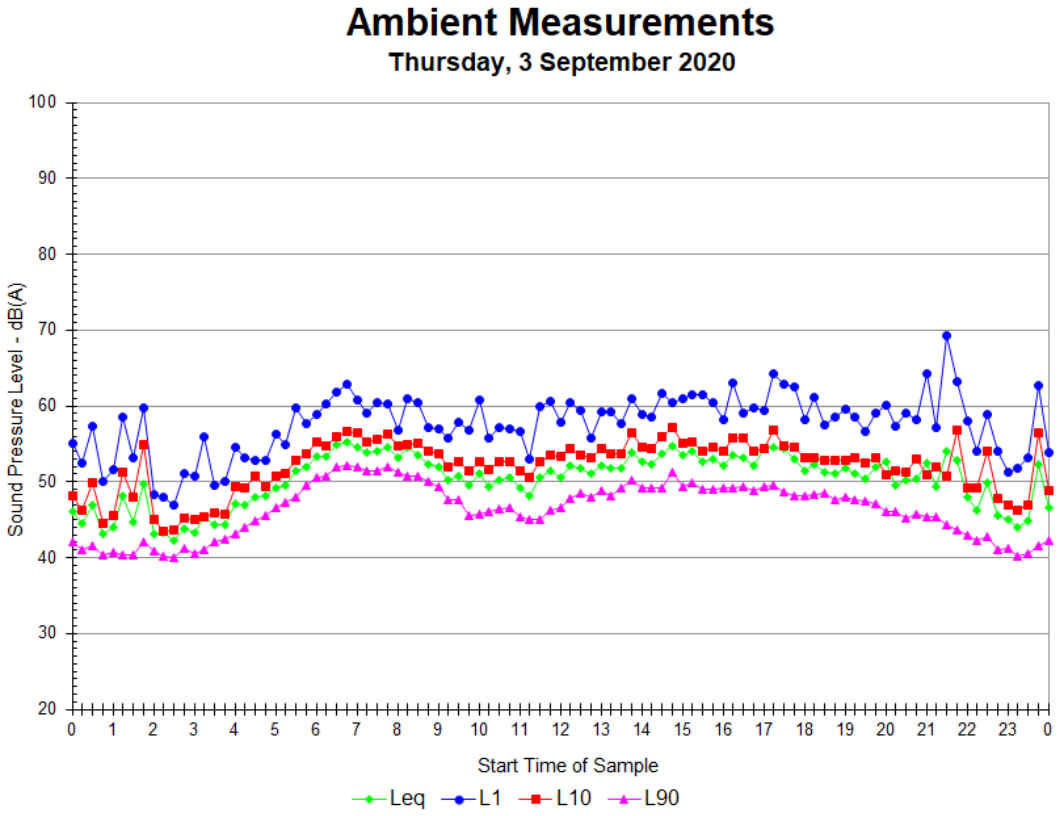
Penrith Montessori
SVAN 957 21450

5426
Rear Yard Elevated



Penrith Montessori
SVAN 957 21450

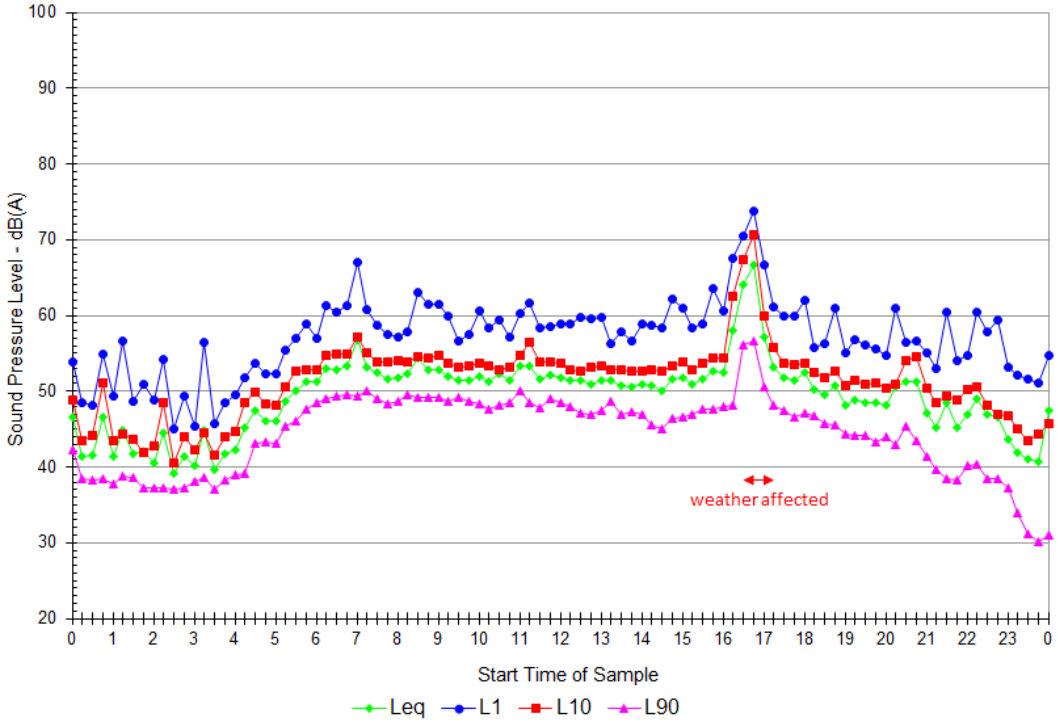
5426
Rear Yard Elevated



Penrith Montessori
SVAN 957 21450

5426
Rear Yard Elevated

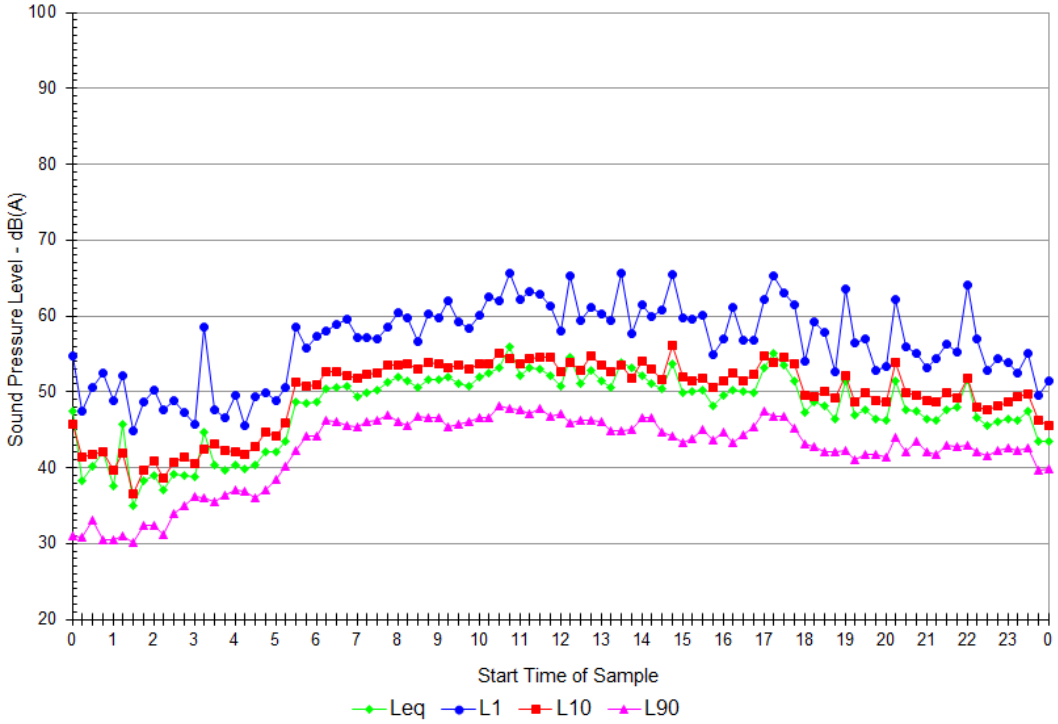
Ambient Measurements
Friday, 4 September 2020



Penrith Montessori
SVAN 957 21450

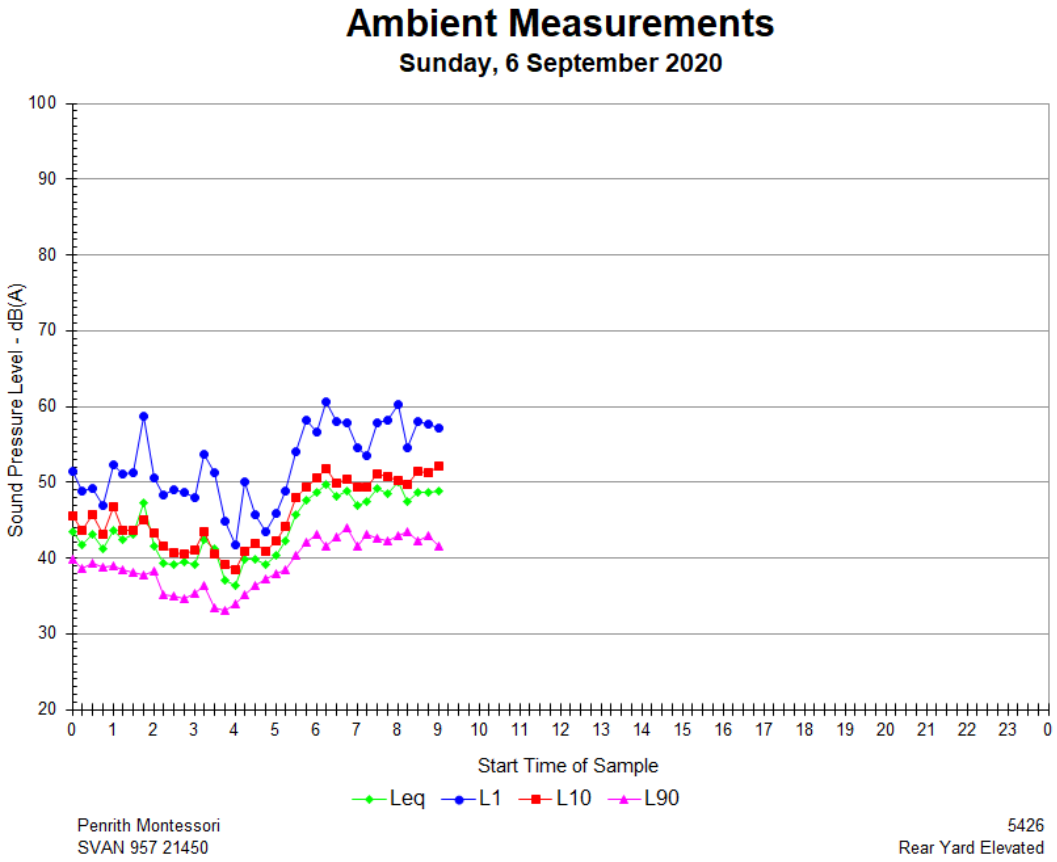
5426
Rear Yard Elevated

Ambient Measurements
Saturday, 5 September 2020



Penrith Montessori
SVAN 957 21450

5426
Rear Yard Elevated



Penrith Montessori

Job Number: 5426
Instrumentation: BSWA 801 14988
Logger Location: Rear Yard Ground
Free Field: yes
Monitoring Period: Wednesday 26 August 2020 to Tuesday 8 September 2020

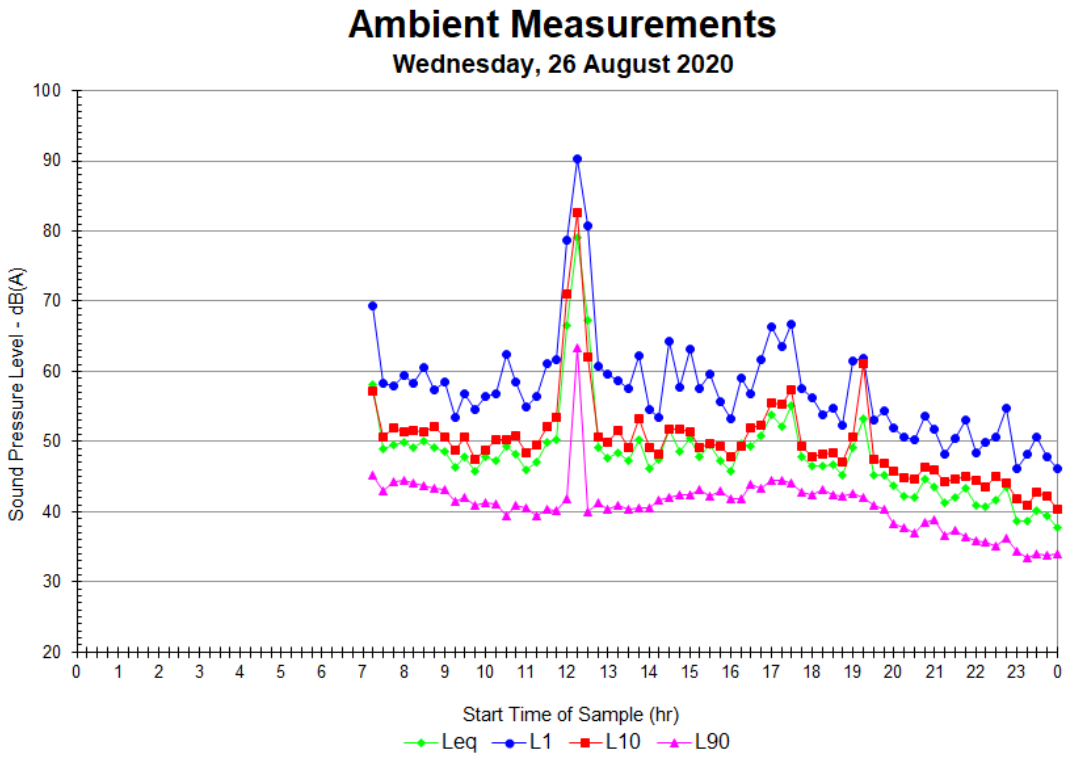
BACKGROUND AND AMBIENT NOISE MONITORING RESULTS
NSW EPA's NOISE POLICY FOR INDUSTRY, 2017

Day	L90 Background Noise Levels			Leq Ambient Noise Levels		
	Day 7am - 6pm	Evening 6pm - 10pm	Night 10pm - 7am	Day 7am - 6pm	Evening 6pm - 10pm	Night 10pm - 7am
Wednesday 26 August 2020	*	36.6	30.5	*	46.3	44.2
Thursday 27 August 2020	39.5	39.1	32.4	50.6	46.1	45.8
Friday 28 August 2020	40.6	38.6	33.3	52.0	46.0	43.4
Saturday 29 August 2020	40.2	40.1	33.5	49.6	46.4	45.0
Sunday 30 August 2020	38.8	40.3	35.8	50.6	45.0	46.4
Monday 31 August 2020	39.6	30.3	24.2	51.2	47.5	46.9
Tuesday 1 September 2020	41.1	38.4	32.2	51.7	49.4	48.0
Wednesday 2 September 2020	41.3	41.9	38	51.1	46.2	47.6
Thursday 3 September 2020	41.1	41.3	34.2	50.1	48.3	45.1
Friday 4 September 2020	42.2	34.0	26.2	50.0	46.0	42.7
Saturday 5 September 2020	40.4	36.5	30.2	49.5	44.9	42.8
Sunday 6 September 2020	38.3	33.3	24.5	49.0	45.6	43.8
Monday 7 September 2020	41.2	38.2	32.5	50.2	44.8	44.4
RBL Median	**40.5**	**38.4**	**32.4**	-	-	-
Log Average	-	-	-	**50.5**	**46.6**	**45.4**

TRAFFIC NOISE MONITORING RESULTS
DECCW's NSW Road Noise Policy 2011

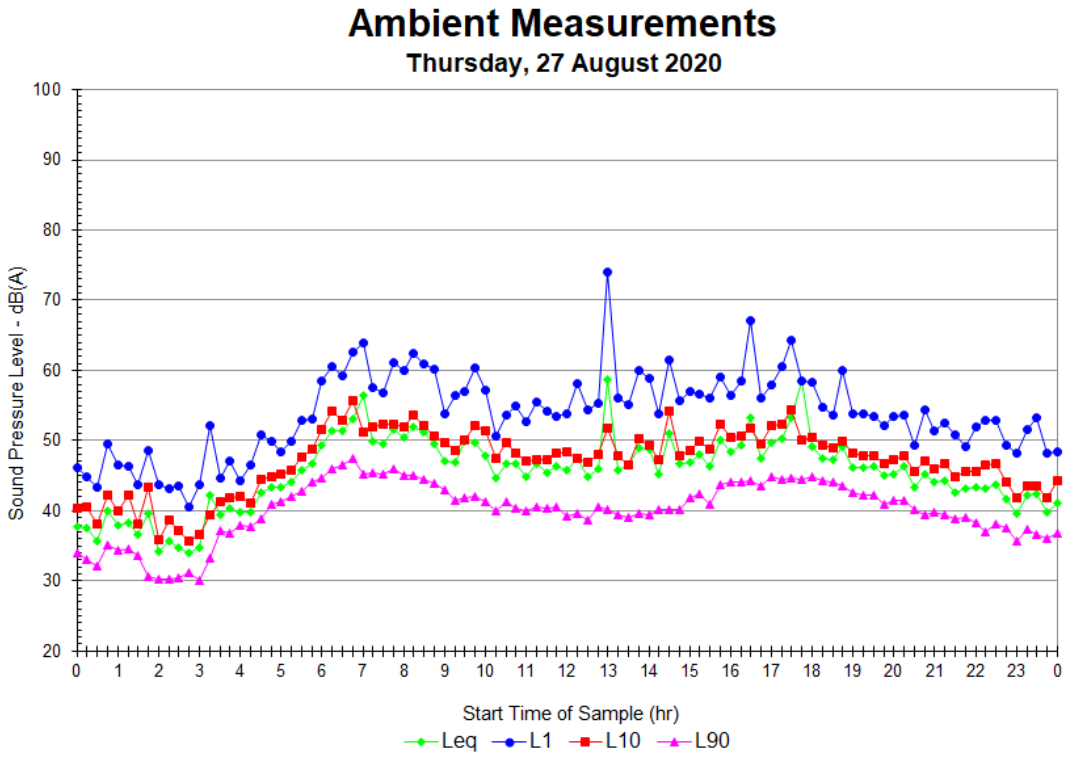
Day	Leq Ambient Noise Levels		Leq 1 Hr Noise Levels			
	Day 7am - 10pm	Night 10pm - 7am	Day - Max	Day - Min	Night - Max	Night - Min
Wednesday 26 August 2020	*	46.7	*	*	53.9	37.2
Thursday 27 August 2020	52.3	48.3	57.0	46.1	54.1	40.7
Friday 28 August 2020	53.5	45.9	60.7	47.4	52.2	38.9
Saturday 29 August 2020	51.5	47.5	55.8	47.9	54.0	39.1
Sunday 30 August 2020	52.2	48.9	57.8	47.4	55.1	43.2
Monday 31 August 2020	52.9	49.4	57.4	41.6	58.3	31.9
Tuesday 1 September 2020	53.7	50.5	57.1	46.0	57.2	38.3
Wednesday 2 September 2020	52.7	50.1	55.5	48.0	55.9	42.7
Thursday 3 September 2020	52.2	47.6	55.0	49.2	53.5	41.3
Friday 4 September 2020	52.0	45.2	57.0	45.9	51.5	37.2
Saturday 5 September 2020	51.1	45.3	54.7	45.6	51.0	36.9
Sunday 6 September 2020	50.8	46.3	55.5	42.4	54.2	33.6
Monday 7 September 2020	51.8	46.9	56.3	46.6	54.1	38.6
Log Average	**52.3**	**47.9**	**57.0**	**46.6**	**54.7**	**39.4**

* indicates an incomplete set of data for a given time period
# Nighttime for a given day continues through to the following morning



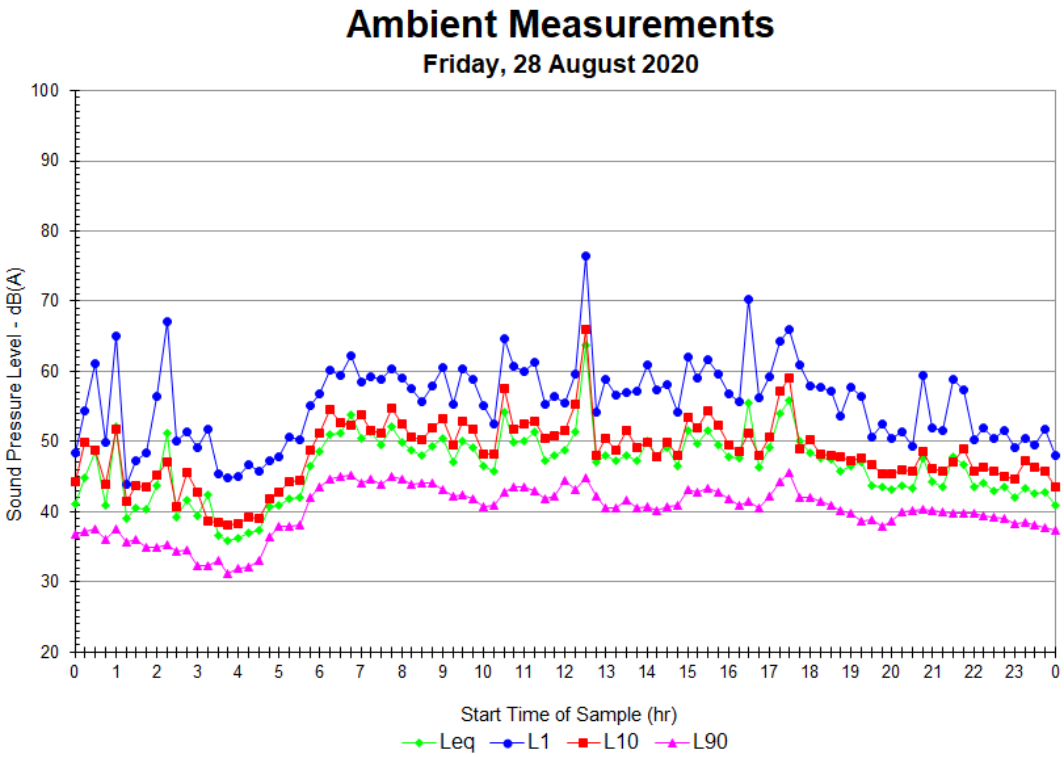
Penrith Montessori
BSWA 801 14988

5426
Rear Yard Ground



Penrith Montessori
BSWA 801 14988

5426
Rear Yard Ground



Penrith Montessori
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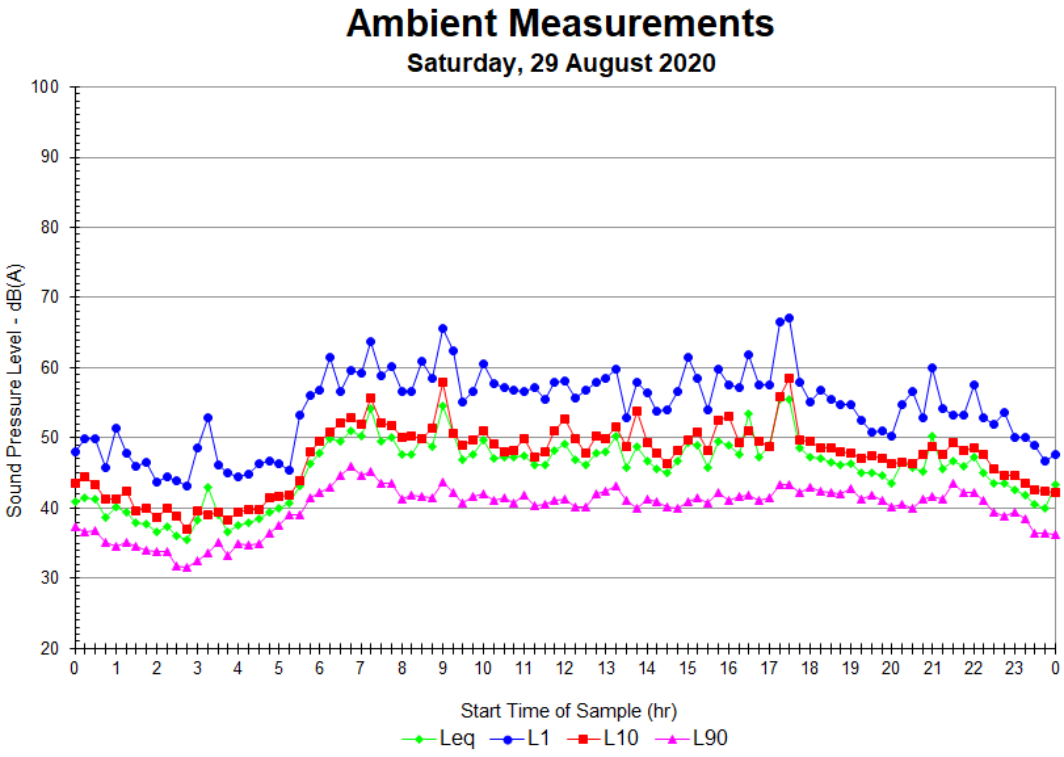
5426
Rear Yard Ground



Penrith Montessori
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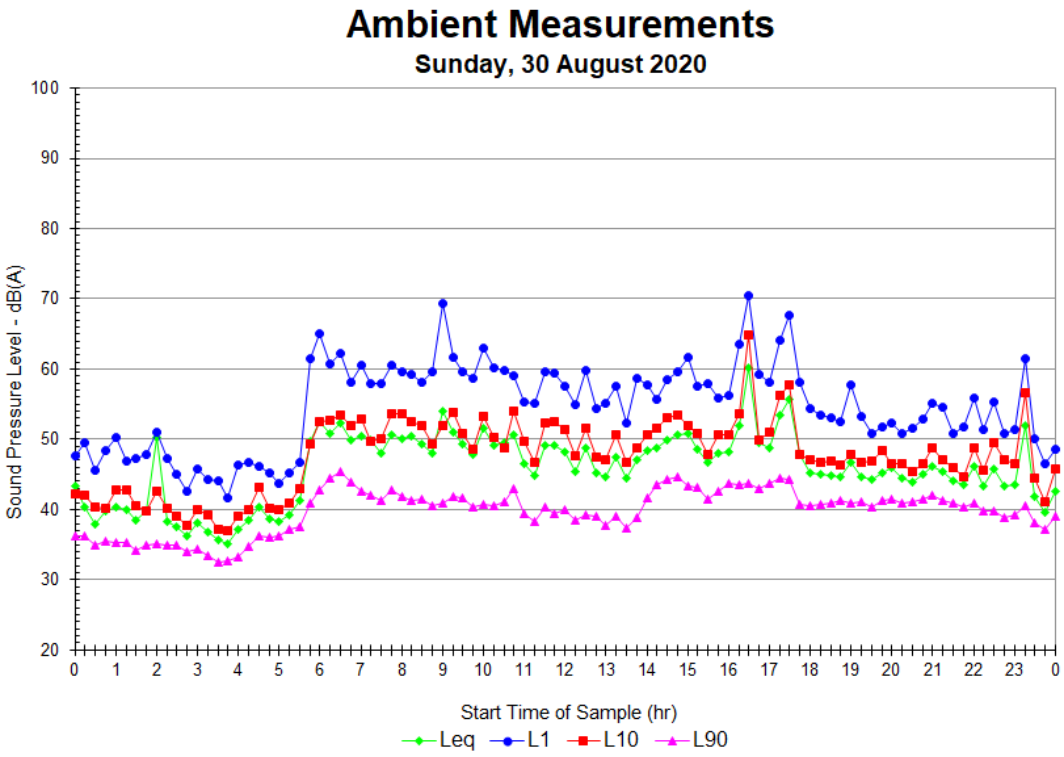
5426
Rear Yard Ground



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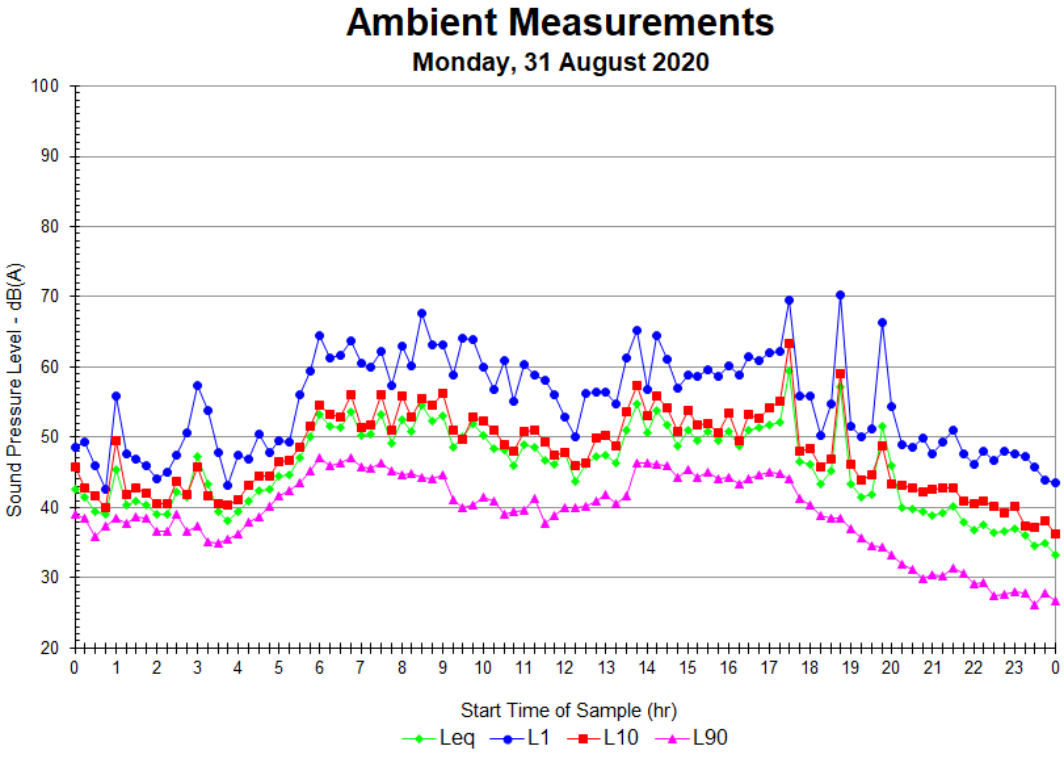
5426
Rear Yard Ground



Penrith Montessori
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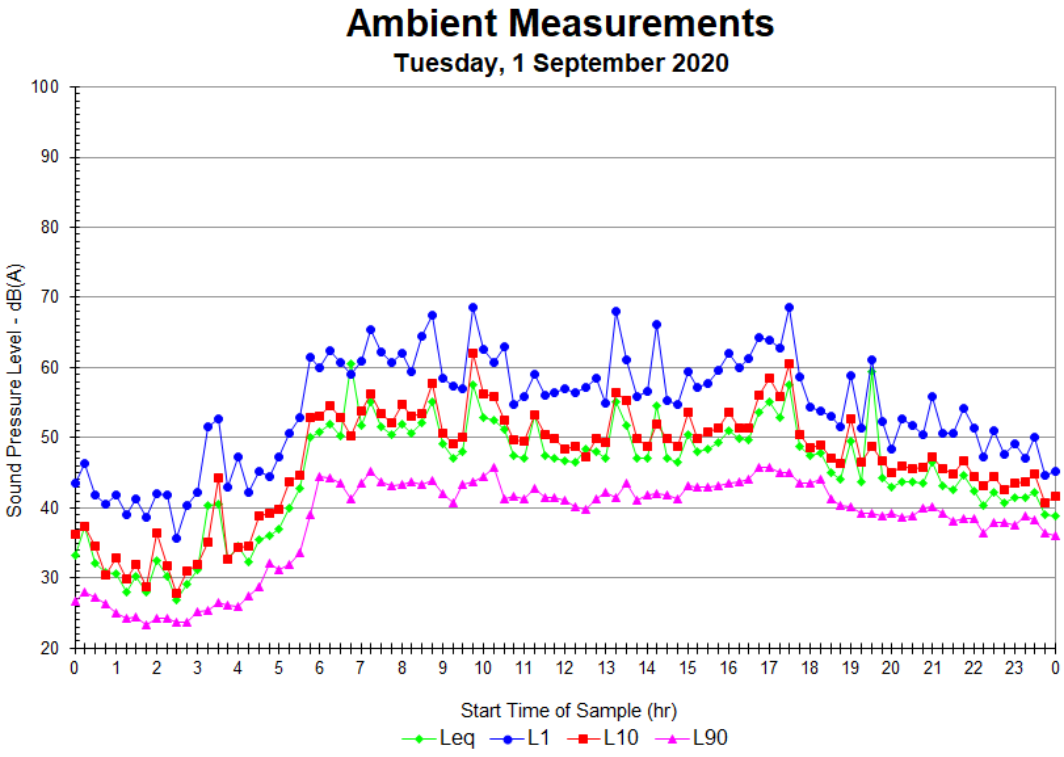
5426
Rear Yard Ground



Penrith Montessori
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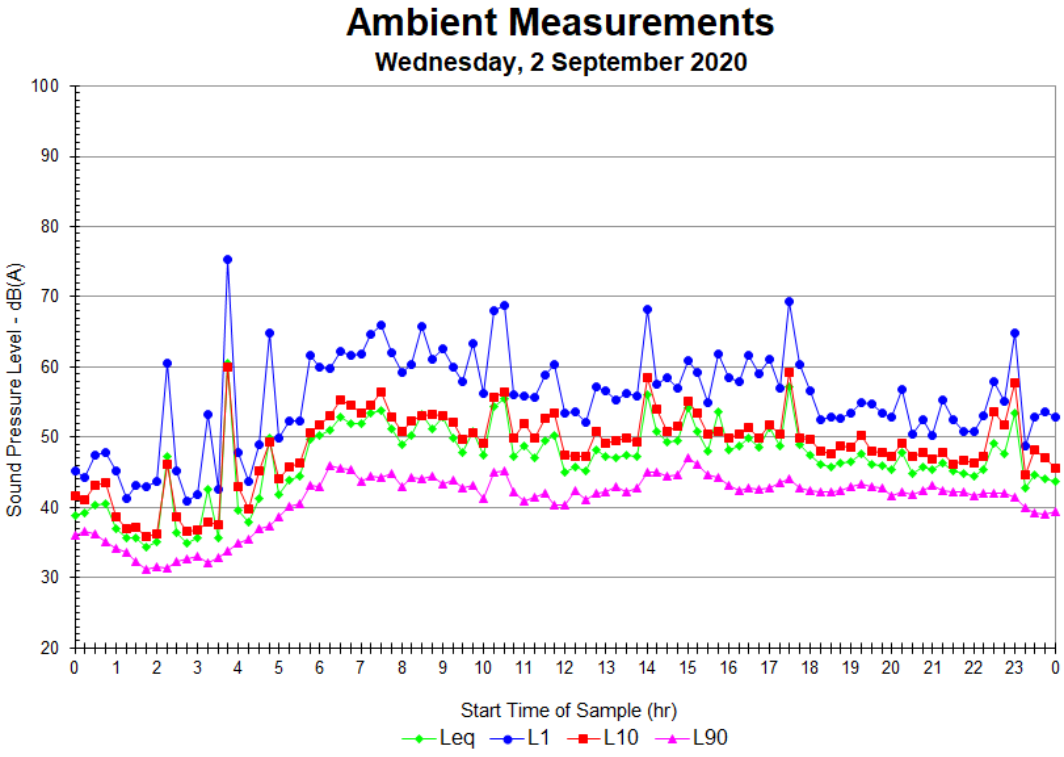
5426
Rear Yard Ground



Penrith Montessori
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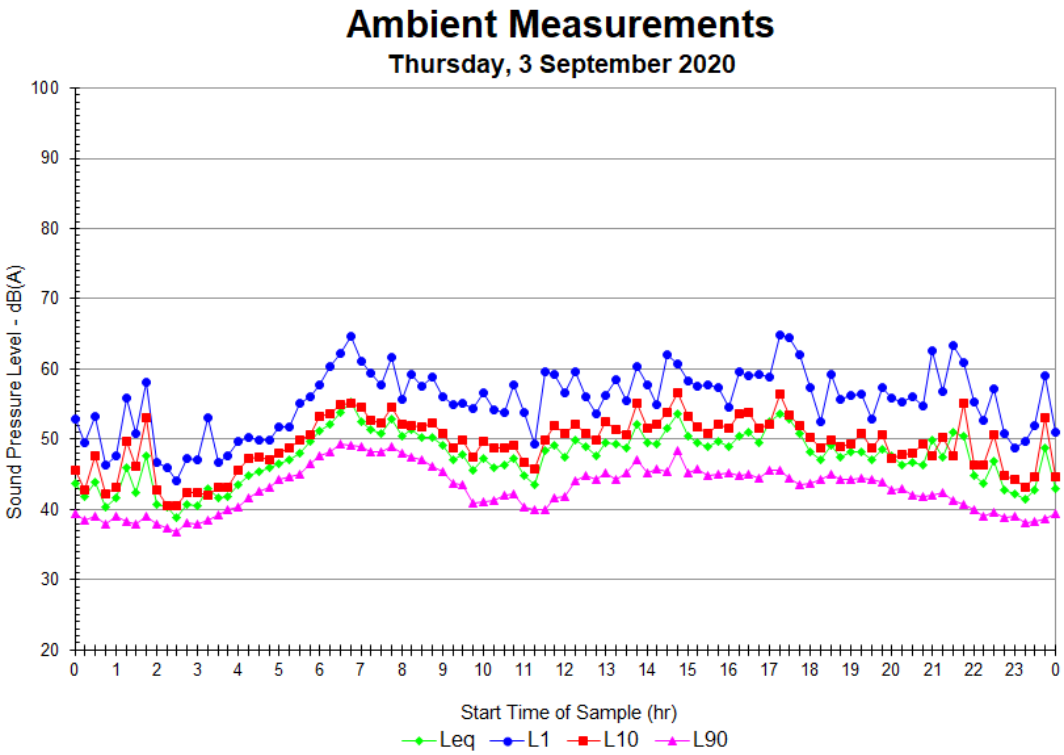
5426
Rear Yard Ground



Penrith Montessori
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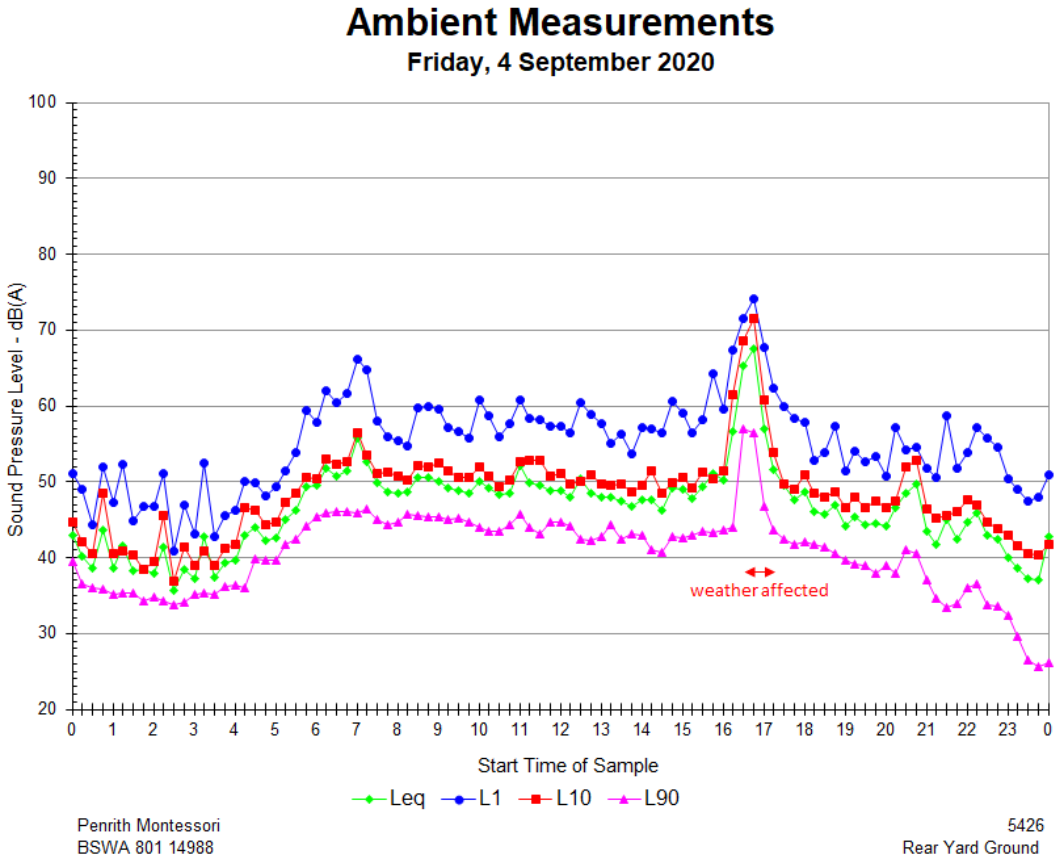
5426
Rear Yard Ground



Penrith Montessori
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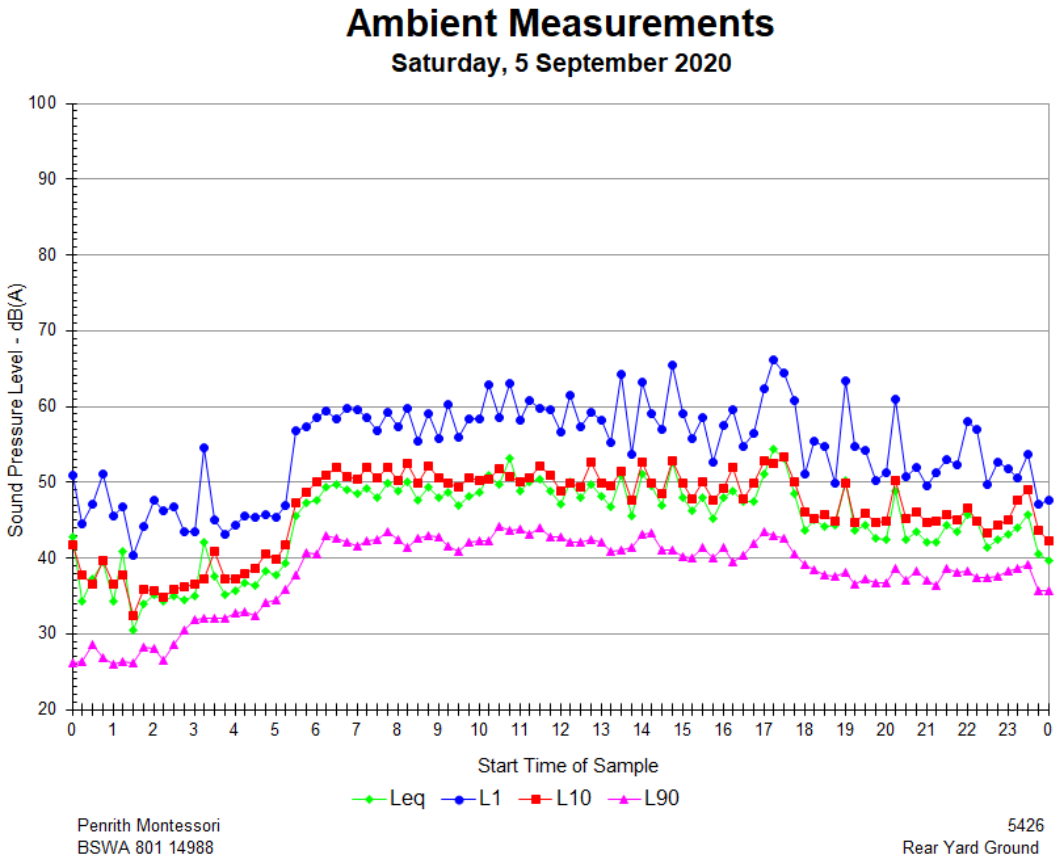
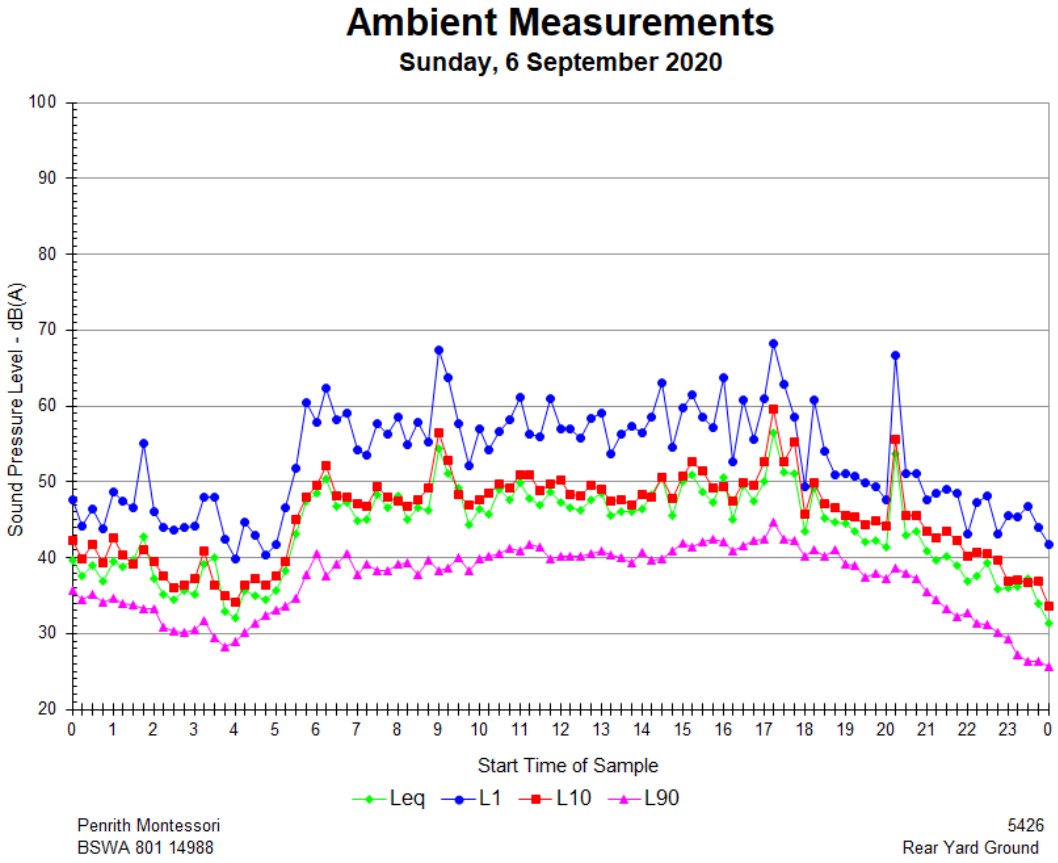
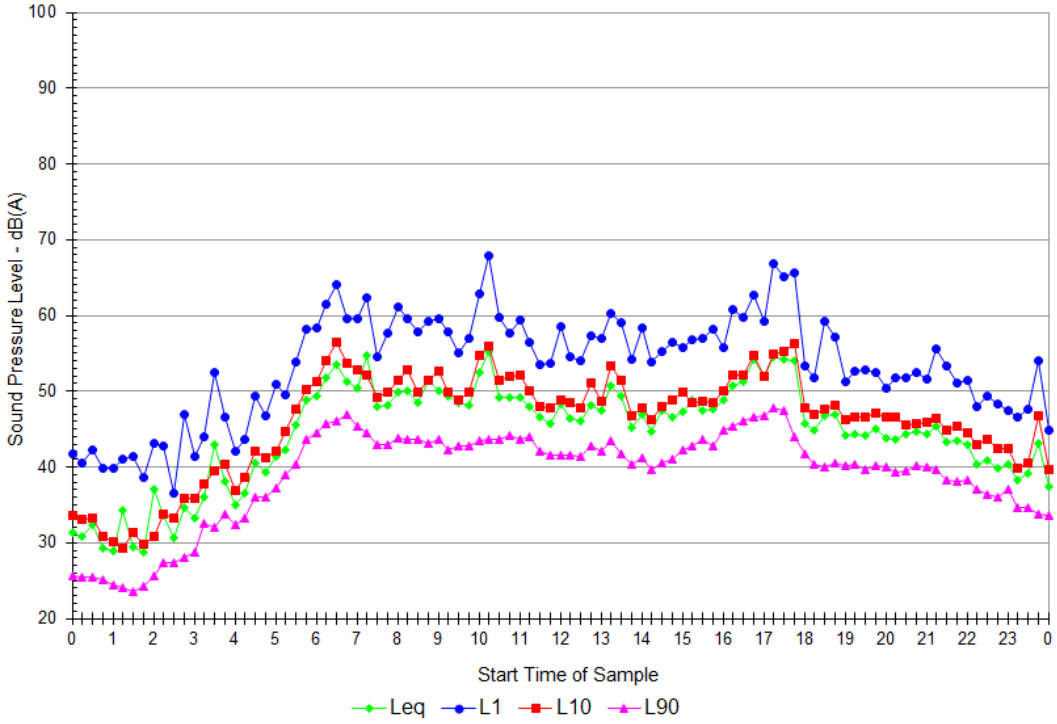
5426
Rear Yard Ground





Ambient Measurements

Monday, 7 September 2020



Penrith Montessori
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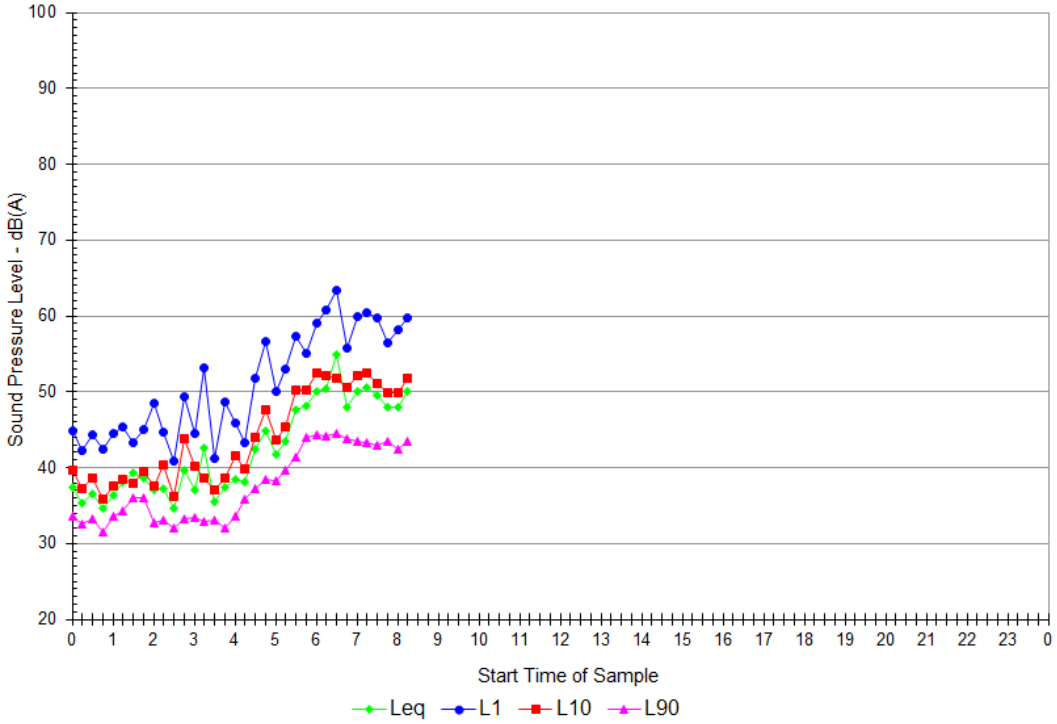
5426
Rear Yard Ground

Ambient Measurements

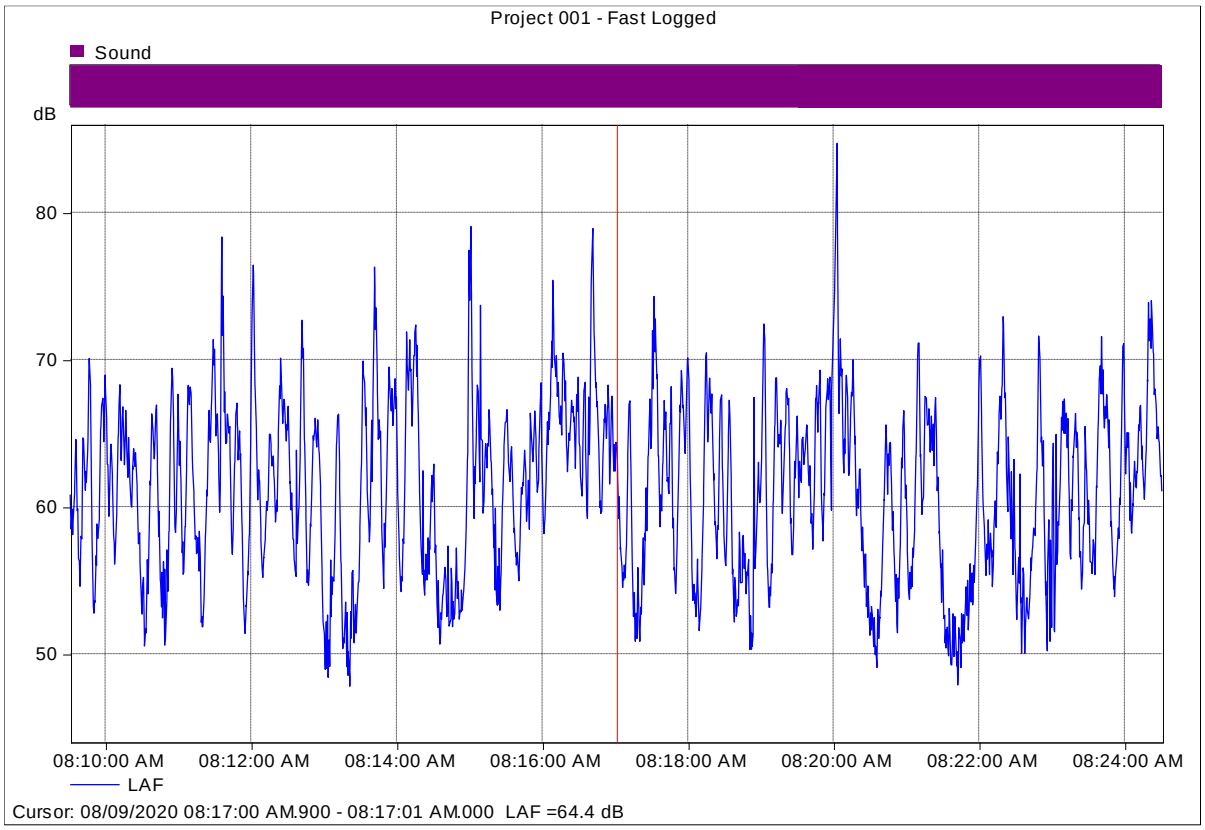
Tuesday, 8 September 2020



Penrith Montessori
BSWA 801 14988

5426
Rear Yard Ground

APPENDIX D: Attended Measurement Results



Location	Parameter	dB(A)	A-weighted Octave Band Centre Frequency (Hz)								
			31	63	125	250	500	1k	2k	4k	8k
Front Boundary	Ambient L_{10}	68	36	47	52	54	59	65	62	55	46
	Ambient L_{eq}	65	33	45	52	53	56	62	59	53	44
	Ambient L_{90}	53	21	33	38	41	43	48	46	42	30

APPENDIX D: Analysis of Outdoor Area Noise Emissions

The proposed Childcare Centre at 170 Derby Street, Penrith has three designated outdoor play areas with each area being used by a different age group being:

- the eastern side of the rear yard (ground level) for 0 to 2-year-old children;
- the western side of the rear yard (ground level) for 2 to 3-year-old children; and
- the rear deck on the first-floor level for 3 to 6-year-old children.

As a result of the acoustic requirements, the different areas in which outdoor play may occur and the allocation of passive/active play leads to a number of permutations with respect to the combination of outdoor play areas that can be used simultaneously. The following pages set out the basis of the analysis and provide examples of calculations for individual source locations in the outdoor play areas with respect to Location A2 (northern dormer window of residential dwelling at 168 Derby Street), which is a critical residential receiver.

Appendices D3 and D4 present the ground floor plan and first floor plan of the Childcare Centre with an illustration of the outdoor play area noise source locations and residential assessment locations used in this assessment. Appendices D5 and D6 presents in plan view the proposed barriers.

Appendix D7 provides the calculations of noise from the 0 to 2-year-old outdoor play area at the eastern side of the rear yard to the residential receiver at Location A2. The appendices provide individual calculations from each source location to Location A2 which identify the source sound power level of the children, attenuation from barriers/buildings (if applicable) and distance attenuation (including conversion of sound power level to sound pressure level) to determine the resultant contribution of that source location to the receiver location.

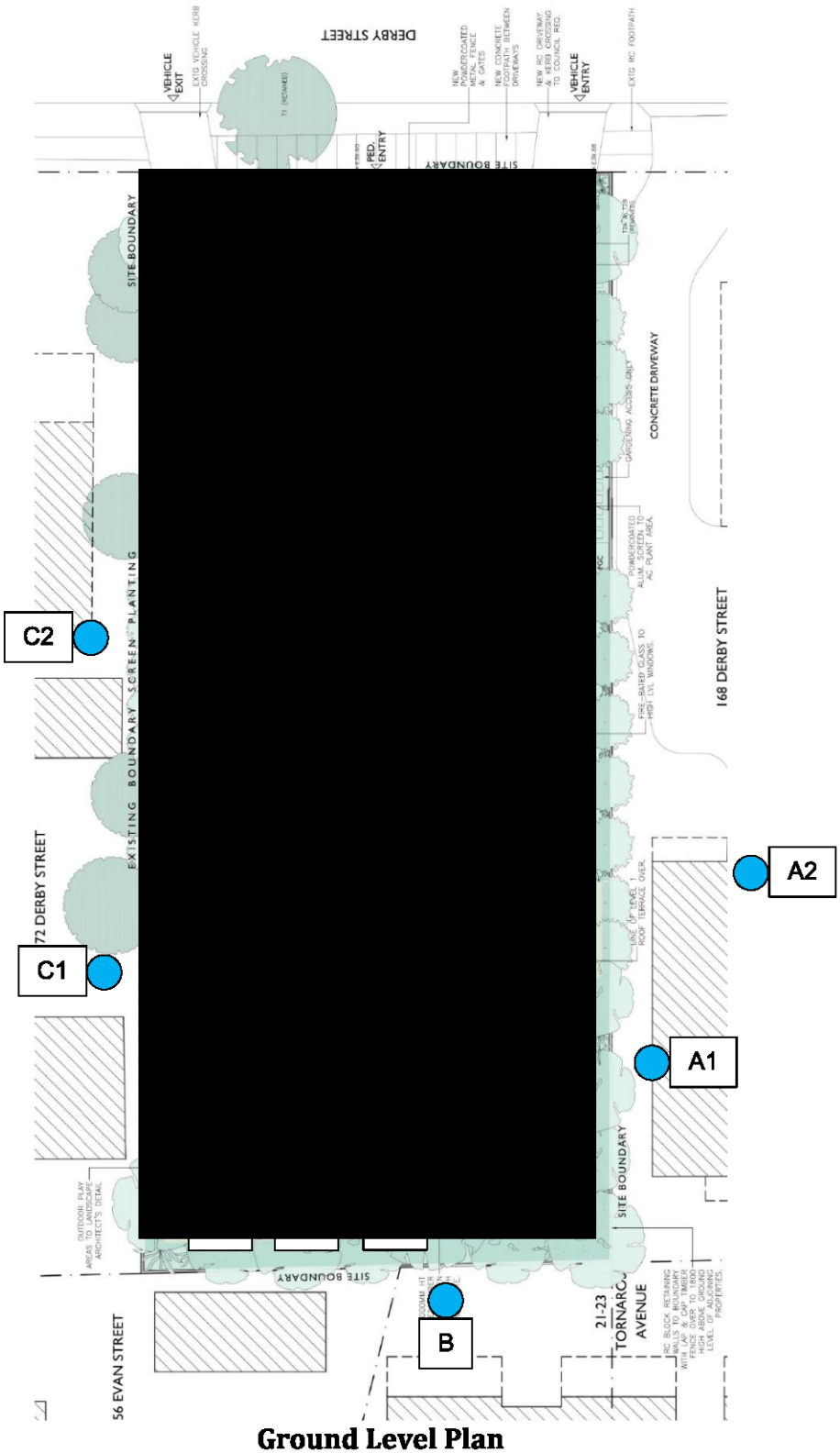
As the attenuation for barriers is dependent upon the frequency of the noise source and cannot be expressed as a dB(A) value, the calculations are carried out in octave bands from which the resultant dB(A) contribution is determined. Appendix D8 then provides the individual contributions in octave bands per source location and the cumulative noise level of those source locations in octave bands to Location A2.

Appendices D9 – D11 present the same calculation procedure for the use of the 2 to 3-year-old outdoor play area at the western side of the rear yard to Location A2, whilst the calculations of noise emission from the 3 to 6-year-old outdoor play area on the Level 1 rear deck to Location A2 are presented in Appendices D12 – D14

Appendix E provides the dB(A) noise level contributions for the various outdoor play areas for each residential assessment location where the A-weighted contribution has been determined in the same format as set out in Appendix D.

Appendix F presents the calculations of noise emission from the indoor areas using the procedures as described above but with additional consideration to the reverberant condition of the indoor area and the inside-to-outside attenuation of the noise via an open doorway/window.

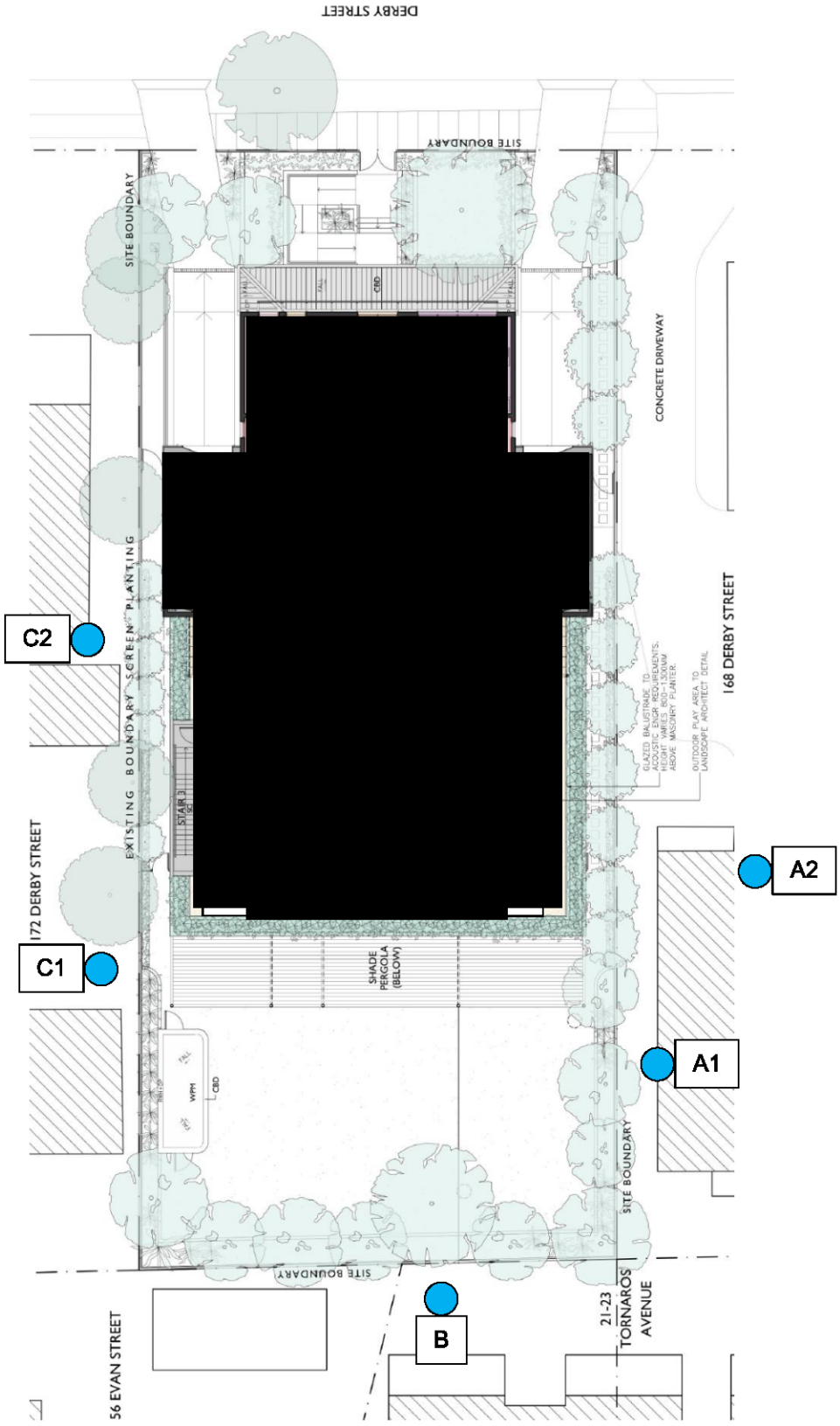
Appendix G utilises the material set out in Appendices E and F to examine the cumulative noise emission of children at the Childcare Centre with respect to the noise design targets.



Ground Level Plan

Source Locations

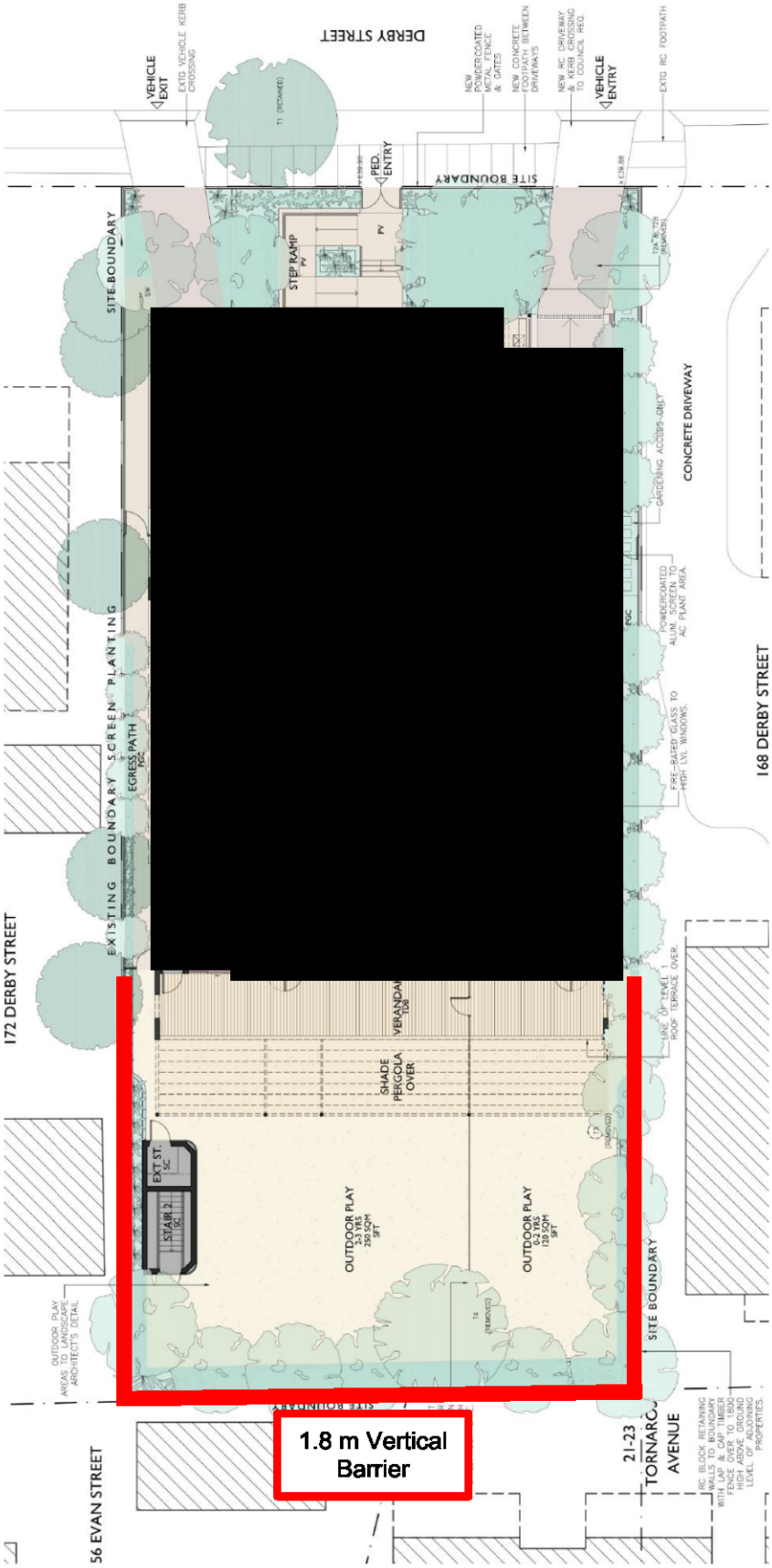
Assessment Locations



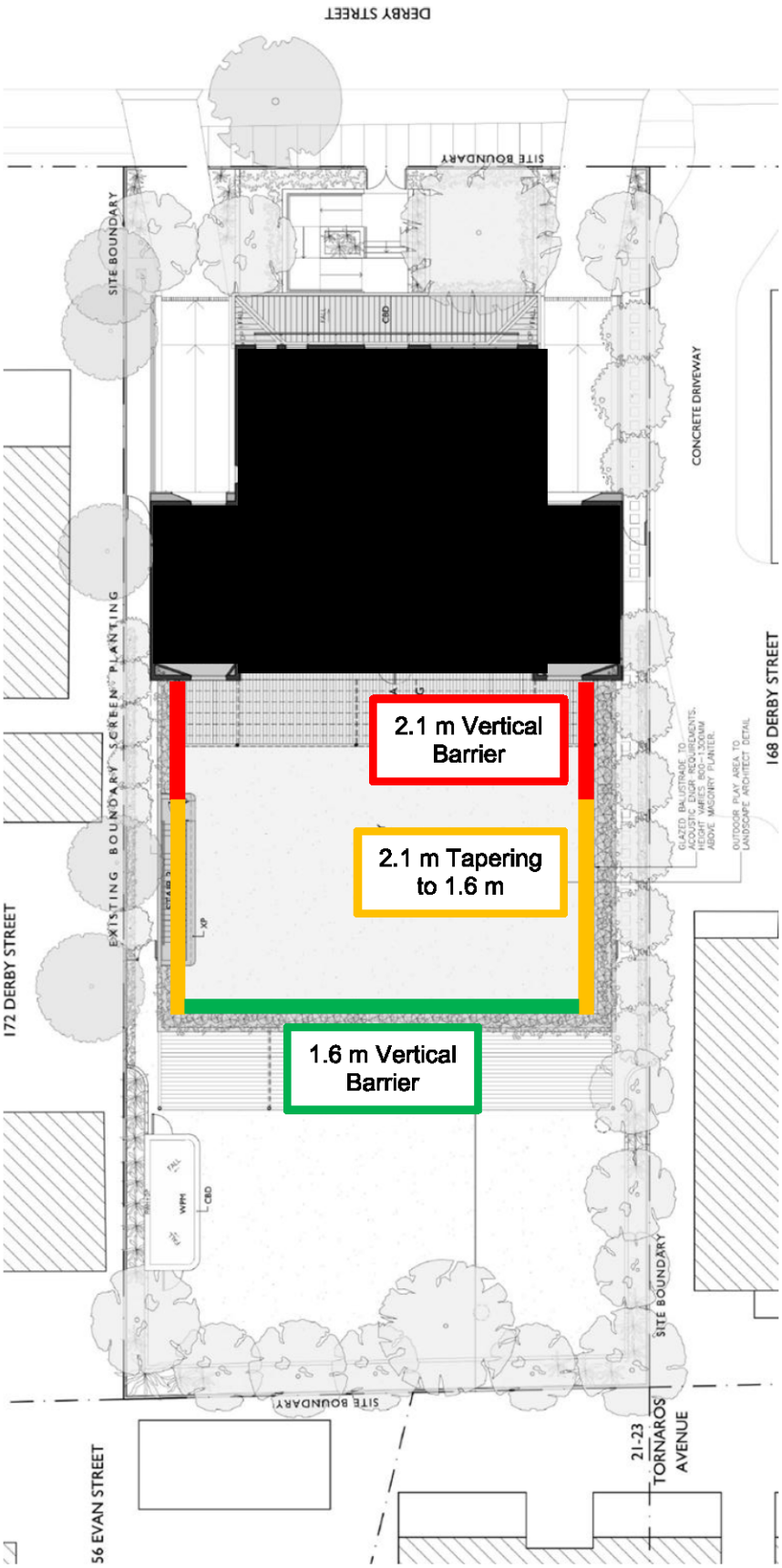
Level 1 Plan

Source Locations

Assessment Locations



Ground Level Plan



Level 1 Plan

Calculation of 16 Children (0-2 years) Conducting Active Play to Assessment Location A2 (northern dormer window)

Location	1
Source	4 children (0-2 years)
Distance from Source to Receiver	15.6 m
Path Length Difference	0.03 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Source Lw (active)	74	24	40	53	65	70	68	64	59
Barrier Attenuation		-5	-5	-6	-6	-7	-9	-11	-14
Distance Attenuation		-32	-32	-32	-32	-32	-32	-32	-32
SPL Contribution	34	-13	3	15	27	31	27	21	13

Location	2
Source	4 children (0-2 years)
Distance from Source to Receiver	12.5 m
Path Length Difference	0.00 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Source Lw (active)	74	24	40	53	65	70	68	64	59
Barrier Attenuation		-5	-5	-5	-5	-5	-5	-5	-5
Distance Attenuation		-30	-30	-30	-30	-30	-30	-30	-30
SPL Contribution	39	-11	5	18	30	35	33	29	24

Location	3
Source	4 children (0-2 years)
Distance from Source to Receiver	21.1 m
Path Length Difference	0.09 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Source Lw (active)	74	24	40	53	65	70	68	64	59
Barrier Attenuation		-6	-6	-7	-9	-11	-13	-16	-19
Distance Attenuation		-34	-34	-34	-34	-34	-34	-34	-34
SPL Contribution	28	-16	-1	11	22	25	20	13	5

Location	4
Source	4 children (0-2 years)
Distance from Source to Receiver	19.0 m
Path Length Difference	0.21 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Source Lw (active)	74	24	40	53	65	70	68	64	59
Barrier Attenuation		-6	-7	-9	-11	-14	-17	-20	-23
Distance Attenuation		-34	-34	-34	-34	-34	-34	-34	-34
SPL Contribution	26	-16	-1	10	20	22	17	10	2

0-2 years OPA to Assessment Location A2 (northern dormer window)

Source Contribution	dB(A)	A-weighted Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
1 (active)	34	-13	3	15	27	31	27	21	13
2 (active)	39	-11	5	18	30	35	33	29	24
3 (active)	28	-16	-1	11	22	25	20	13	5
4 (active)	26	-16	-1	10	20	22	17	10	2
Total Contribution	40	-7	8	21	32	37	34	30	24

Calculation of 15 Children (2-3 years) Conducting Active Play to Assessment Location A2 (northern dormer window)

Location	5
Source	1 child (2-3 years)
Distance from Source to Receiver	28.9 m
Path Length Difference	0.80 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Source Lw (active)	75	25	41	54	66	71	69	65	59
Barrier Attenuation		-9	-11	-14	-17	-20	-23	-26	-29
Distance Attenuation		-37	-37	-37	-37	-37	-37	-37	-37
SPL Contribution	17	-21	-7	3	12	14	9	2	-7

Location	6
Source	1 child (2-3 years)
Distance from Source to Receiver	23.8 m
Path Length Difference	0.71 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Source Lw (active)	75	25	41	54	66	71	69	65	59
Barrier Attenuation		-9	-11	-14	-16	-19	-22	-25	-28
Distance Attenuation		-36	-36	-36	-36	-36	-36	-36	-36
SPL Contribution	19	-19	-5	5	14	16	11	4	-5

Location	7
Source	2 children (2-3 years)
Distance from Source to Receiver	19.0 m
Path Length Difference	0.59 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Source Lw (active)	78	28	44	57	69	74	72	68	62
Barrier Attenuation		-8	-10	-13	-16	-19	-22	-25	-28
Distance Attenuation		-34	-34	-34	-34	-34	-34	-34	-34
SPL Contribution	25	-14	0	11	20	22	17	10	1

Location	8
Source	2 children (2-3 years)
Distance from Source to Receiver	30.4 m
Path Length Difference	0.10 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Source Lw (active)	78	28	44	57	69	74	72	68	62
Barrier Attenuation		-6	-6	-7	-9	-11	-14	-17	-20
Distance Attenuation		-38	-38	-38	-38	-38	-38	-38	-38
SPL Contribution	28	-15	0	12	22	25	20	14	5

Location	9
Source	2 children (2-3 years)
Distance from Source to Receiver	25.6 m
Path Length Difference	0.02 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Source Lw (active)	78	28	44	57	69	74	72	68	62
Barrier Attenuation		-5	-5	-5	-6	-6	-8	-9	-12
Distance Attenuation		-36	-36	-36	-36	-36	-36	-36	-36
SPL Contribution	34	-13	3	15	27	31	28	22	14

Location	10
Source	2 children (2-3 years)
Distance from Source to Receiver	21.4 m
Path Length Difference	0.47 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Source Lw (active)	78	28	44	57	69	74	72	68	62
Barrier Attenuation		0	0	0	0	0	0	0	0
Distance Attenuation		-35	-35	-35	-35	-35	-35	-35	-35
SPL Contribution	43	-7	9	22	34	39	37	33	27

Location	11
Source	1 child (2-3 years)
Distance from Source to Receiver	33.2 m
Path Length Difference	0.47 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Source Lw (active)	75	25	41	54	66	71	69	65	59
Barrier Attenuation		0	0	0	0	0	0	0	0
Distance Attenuation		-38	-38	-38	-38	-38	-38	-38	-38
SPL Contribution	36	-13	3	16	28	33	31	27	21

Location	12
Source	2 children (2-3 years)
Distance from Source to Receiver	28.8 m
Path Length Difference	0.01 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Source Lw (active)	78	28	44	57	69	74	72	68	62
Barrier Attenuation		-5	-5	-5	-5	-6	-6	-7	-9
Distance Attenuation		-37	-37	-37	-37	-37	-37	-37	-37
SPL Contribution	34	-14	2	15	27	31	29	24	16

Location	13	
Source	2	children (2-3 years)
Distance from Source to Receiver	25.0	m
Path Length Difference	0.04	m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Source Lw (active)	78	28	44	57	69	74	72	68	62
Barrier Attenuation		-5	-6	-6	-7	-8	-10	-13	-16
Distance Attenuation		-36	-36	-36	-36	-36	-36	-36	-36
SPL Contribution	33	-13	3	15	26	30	26	19	10

2-3 years OPA to Assessment Location A2 (northern dormer window)

Source Contribution	dB(A)	A-weighted Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
5 (active)	17	-21	-7	3	12	14	9	2	-7
6 (active)	19	-19	-5	5	14	16	11	4	-5
7 (active)	25	-14	0	11	20	22	17	10	1
8 (active)	28	-15	0	12	22	25	20	14	5
9 (active)	34	-13	3	15	27	31	28	22	14
10 (active)	43	-7	9	22	34	39	37	33	27
11 (active)	36	-13	3	16	28	33	31	27	21
12 (active)	34	-14	2	15	27	31	29	24	16
13 (active)	33	-13	3	15	26	30	26	19	10
Total Contribution	45	-3	13	25	37	41	39	35	28

Calculation of 40 Children (3-6 years) Conducting Active Play to Assessment Location A2 (northern dormer window)

Location	14
Source	5 children (3-6 years)
Distance from Source to Receiver	27.6 m
Path Length Difference	0.06 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Source Lw (active)	85	36	52	64	76	81	79	75	69
Barrier Attenuation		-5	-6	-6	-7	-9	-11	-14	-17
Distance Attenuation		-37	-37	-37	-37	-37	-37	-37	-37
SPL Contribution	38	-6	9	21	32	35	31	24	15

Location	15
Source	5 children (3-6 years)
Distance from Source to Receiver	23.1 m
Path Length Difference	0.07 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Source Lw (active)	85	36	52	64	76	81	79	75	69
Barrier Attenuation		-5	-6	-7	-8	-10	-12	-15	-18
Distance Attenuation		-35	-35	-35	-35	-35	-35	-35	-35
SPL Contribution	39	-5	11	22	33	36	32	25	16

Location	16
Source	5 children (3-6 years)
Distance from Source to Receiver	18.6 m
Path Length Difference	0.10 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Source Lw (active)	85	36	52	64	76	81	79	75	69
Barrier Attenuation		-6	-6	-7	-9	-11	-14	-17	-20
Distance Attenuation		-33	-33	-33	-33	-33	-33	-33	-33
SPL Contribution	40	-3	12	23	34	37	32	25	16

Location	17
Source	5 children (3-6 years)
Distance from Source to Receiver	14.4 m
Path Length Difference	0.22 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Source Lw (active)	85	36	52	64	76	81	79	75	69
Barrier Attenuation		-6	-8	-9	-12	-14	-17	-20	-23
Distance Attenuation		-31	-31	-31	-31	-31	-31	-31	-31
SPL Contribution	39	-2	13	24	33	35	31	24	15

Location	18
Source	5 children (3-6 years)
Distance from Source to Receiver	27.6 m
Path Length Difference	0.03 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Source Lw (active)	85	36	52	64	76	81	79	75	69
Barrier Attenuation		-5	-5	-6	-6	-7	-9	-11	-14
Distance Attenuation		-37	-37	-37	-37	-37	-37	-37	-37
SPL Contribution	40	-6	10	21	33	37	33	27	18

Location	19
Source	5 children (3-6 years)
Distance from Source to Receiver	21.9 m
Path Length Difference	0.04 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Source Lw (active)	85	36	52	64	76	81	79	75	69
Barrier Attenuation		-5	-5	-6	-7	-8	-10	-12	-15
Distance Attenuation		-35	-35	-35	-35	-35	-35	-35	-35
SPL Contribution	41	-4	12	23	34	38	34	28	19

Location	20
Source	5 children (3-6 years)
Distance from Source to Receiver	17.1 m
Path Length Difference	0.06 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Source Lw (active)	85	36	52	64	76	81	79	75	69
Barrier Attenuation		-5	-6	-6	-7	-9	-11	-14	-17
Distance Attenuation		-33	-33	-33	-33	-33	-33	-33	-33
SPL Contribution	42	-2	14	25	36	39	35	28	19

Location	21
Source	5 children (3-6 years)
Distance from Source to Receiver	12.4 m
Path Length Difference	0.15 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Source Lw (active)	85	36	52	64	76	81	79	75	69
Barrier Attenuation		-6	-7	-8	-10	-13	-16	-19	-22
Distance Attenuation		-30	-30	-30	-30	-30	-30	-30	-30
SPL Contribution	42	0	15	26	36	38	34	27	18

3-6 years OPA to Assessment Location A2 (northern dormer window)

Source Contribution	dB(A)	A-weighted Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
14 (active)	38	-6	9	21	32	35	31	24	15
15 (active)	39	-5	11	22	33	36	32	25	16
16 (active)	40	-3	12	23	34	37	32	25	16
17 (active)	39	-2	13	24	33	35	31	24	15
18 (active)	40	-6	10	21	33	37	33	27	18
19 (active)	41	-4	12	23	34	38	34	28	19
20 (active)	42	-2	14	25	36	39	35	28	19
21 (active)	42	0	15	26	36	38	34	27	18
Total Contribution	49	6	21	32	43	46	42	35	26

APPENDIX E: A-weighted Outdoor Play Area Noise Contributions

0 to 2-year-old Outdoor Play Area (eastern side of rear yard) – 16 children (active)

Source	Contribution at Residential Receiver – dB(A)				
	A1	A2	B	C1	C2
1 (active)	35	34	30	30	-
2 (active)	33	39	30	29	-
3 (active)	36	28	34	29	-
4 (active)	35	26	33	28	-
Total Contribution	41	40	38	35	-

2 to 3-year-old Outdoor Play Area (western side of rear yard) – 15 children (active)

Source	Contribution at Residential Receiver – dB(A)				
	A1	A2	B	C1	C2
5 (active)	32	17	29	37	21
6 (active)	36	19	30	38	15
7 (active)	38	25	33	35	9
8 (active)	35	28	34	26	37
9 (active)	37	34	35	37	20
10 (active)	35	43	36	35	12
11 (active)	32	36	34	22	37
12 (active)	36	34	36	36	24
13 (active)	38	33	35	34	17
Total Contribution	45	45	44	45	41

2 to 3-year-old Outdoor Play Area (western side of rear yard) – 30 children (passive)

Source	Contribution at Residential Receiver – dB(A)				
	A1	A2	B	C1	C2
5 (passive)	31	16	28	36	18
6 (passive)	33	18	29	33	11
7 (passive)	33	21	29	32	7
8 (passive)	31	25	31	24	33
9 (passive)	34	30	32	33	17
10 (passive)	34	40	31	32	10
11 (passive)	31	35	31	20	36
12 (passive)	33	30	32	33	20
13 (passive)	33	30	33	30	14
Total Contribution	42	42	41	42	38

2 to 3-year-old Outdoor Play Area (western side of rear yard) – 15 children (passive)

Source	Contribution at Residential Receiver – dB(A)				
	A1	A2	B	C1	C2
5 (passive)	26	11	23	31	15
6 (passive)	30	13	24	32	9
7 (passive)	32	19	27	29	3
8 (passive)	29	22	28	20	31
9 (passive)	31	28	29	31	14
10 (passive)	29	37	30	29	6
11 (passive)	26	30	28	16	31
12 (passive)	30	28	30	30	18
13 (passive)	32	27	29	28	11
Total Contribution	39	39	38	39	35

3 to 6-year-old Outdoor Play Area (Level 1 rear deck) – 40 children (active)

Source	Contribution at Residential Receiver – dB(A)				
	A1	A2	B	C1	C2
14 (active)	34	38	35	37	43
15 (active)	34	39	35	34	42
16 (active)	35	40	35	31	40
17 (active)	35	39	35	29	39
18 (active)	34	40	37	40	41
19 (active)	38	41	37	35	41
20 (active)	39	42	37	32	40
21 (active)	40	42	37	30	38
Total Contribution	46	49	45	44	50

3 to 6-year-old Outdoor Play Area (Level 1 rear deck) – 20 children (active)

Source	Contribution at Residential Receiver – dB(A)				
	A1	A2	B	C1	C2
14 (active)	30	34	31	33	39
15 (active)	32	37	31	32	38
16 (active)	33	37	33	29	38
17 (active)	33	35	33	25	37
18 (active)	30	38	34	36	39
19 (active)	35	37	35	33	39
20 (active)	35	38	33	30	36
21 (active)	36	39	33	26	34
Total Contribution	42	46	42	41	47

3 to 6-year-old Outdoor Play Area (Level 1 rear deck) – 40 children (passive)

Source	Contribution at Residential Receiver – dB(A)				
	A1	A2	B	C1	C2
14 (passive)	28	32	29	31	37
15 (passive)	28	33	29	28	36
16 (passive)	29	34	29	25	34
17 (passive)	29	33	29	23	33
18 (passive)	28	34	31	34	35
19 (passive)	32	35	31	29	35
20 (passive)	33	36	31	26	34
21 (passive)	34	36	31	24	32
Total Contribution	40	43	39	38	44

3 to 6-year-old Outdoor Play Area (Level 1 rear deck) – 20 children (passive)

Source	Contribution at Residential Receiver – dB(A)				
	A1	A2	B	C1	C2
14 (passive)	24	28	25	27	33
15 (passive)	26	31	25	26	32
16 (passive)	27	31	27	23	32
17 (passive)	27	29	27	19	31
18 (passive)	24	32	28	30	33
19 (passive)	29	31	29	27	33
20 (passive)	29	32	27	24	30
21 (passive)	30	33	27	20	28
Total Contribution	36	40	36	35	41

APPENDIX E: Analysis of Classroom Noise Emissions

Calculation of 16 Children (0-2 years) in Class 1 to Assessment Location A1

Class 1
Source — 16 children (0-2 years)
Distance from Source to Receiver — 13.4 m
Path Length Difference — 0.06 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)						
		125	250	500	1k	2k	4k	8k
Source Lw (passive)	73	39	52	64	69	67	63	58
Reverberant Space		3	3	3	3	3	3	3
Inside-to-Outside Attenuation		-4	-4	-4	-4	-4	-4	-4
Barrier Attenuation		-6	-6	-7	-9	-12	-14	-17
Distance Attenuation		-31	-31	-31	-31	-31	-31	-31
SPL Contribution	32	3	15	26	29	25	18	10

Calculation of 20 Children (0-2 years) in Class 1 to Assessment Location A2

Class 1
Source — 16 children (0-2 years)
Distance from Source to Receiver — 15.8 m
Path Length Difference — 1.84 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)						
		125	250	500	1k	2k	4k	8k
Source Lw (passive)	73	39	52	64	69	67	63	58
Reverberant Space		3	3	3	3	3	3	3
Inside-to-Outside Attenuation		-4	-4	-4	-4	-4	-4	-4
Barrier Attenuation		-15	-18	-21	-24	-27	-30	-33
Distance Attenuation		-32	-32	-32	-32	-32	-32	-32
SPL Contribution	16	-8	2	11	13	8	1	-7

Calculation of 20 Children (0-2 years) in Class 1 to Assessment Location B

Class 1
Source — 16 children (0-2 years)
Distance from Source to Receiver — 21.4 m
Path Length Difference — 0.07 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)						
		125	250	500	1k	2k	4k	8k
Source Lw (passive)	73	39	52	64	69	67	63	58
Reverberant Space		3	3	3	3	3	3	3
Inside-to-Outside Attenuation		-4	-4	-4	-4	-4	-4	-4
Barrier Attenuation		-6	-7	-8	-10	-12	-15	-18
Distance Attenuation		-35	-35	-35	-35	-35	-35	-35
SPL Contribution	28	-1	11	22	25	20	13	5

Calculation of 20 Children (0-2 years) in Class 1 to Assessment Location C1

Class 1

Source 16 children (0-2 years)

Distance from Source to Receiver 18.4 m

Path Length Difference 0.06 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)						
		125	250	500	1k	2k	4k	8k
Source Lw (passive)	73	39	52	64	69	67	63	58
Reverberant Space		3	3	3	3	3	3	3
Inside-to-Outside Attenuation		-4	-4	-4	-4	-4	-4	-4
Barrier Attenuation		-6	-7	-8	-10	-12	-15	-18
Distance Attenuation		-33	-33	-33	-33	-33	-33	-33
SPL Contribution	29	0	12	23	26	22	15	7

Calculation of 15 Children (2-3 years) in Class 2 to Assessment Location A1

Class 2

Source 15 children (2-3 years)

Distance from Source to Receiver 17.5 m

Path Length Difference 0.03 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)						
		125	250	500	1k	2k	4k	8k
Source Lw (passive)	76	43	56	68	73	71	67	61
Inside-to-Outside Attenuation		-4	-4	-4	-4	-4	-4	-4
Barrier Attenuation		-5	-6	-6	-8	-9	-12	-15
Distance Attenuation		-33	-33	-33	-33	-33	-33	-33
SPL Contribution	35	5	17	28	32	29	22	13

Calculation of 15 Children (2-3 years) in Class 2 to Assessment Location A2

Class 2

Source 15 children (2-3 years)

Distance from Source to Receiver 20.7 m

Path Length Difference 1.54 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)						
		125	250	500	1k	2k	4k	8k
Source Lw (passive)	76	43	56	68	73	71	67	61
Inside-to-Outside Attenuation		-4	-4	-4	-4	-4	-4	-4
Barrier Attenuation		-14	-17	-20	-23	-26	-29	-32
Distance Attenuation		-34	-34	-34	-34	-34	-34	-34
SPL Contribution	19	-6	4	13	15	10	3	-6

Calculation of 15 Children (2-3 years) in Class 2 to Assessment Location B

Class 2

Source	15 children (2-3 years)
Distance from Source to Receiver	21.9 m
Path Length Difference	0.07 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)						
		125	250	500	1k	2k	4k	8k
Source Lw (passive)	76	43	56	68	73	71	67	61
Inside-to-Outside Attenuation		-4	-4	-4	-4	-4	-4	-4
Barrier Attenuation		-6	-7	-8	-10	-12	-15	-18
Distance Attenuation		-35	-35	-35	-35	-35	-35	-35
SPL Contribution	31	2	14	25	28	24	17	8

Calculation of 15 Children (2-3 years) in Class 2 to Assessment Location C1

Class 2

Source	15 children (2-3 years)
Distance from Source to Receiver	13.4 m
Path Length Difference	0.08 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)						
		125	250	500	1k	2k	4k	8k
Source Lw (passive)	76	43	56	68	73	71	67	61
Inside-to-Outside Attenuation		-4	-4	-4	-4	-4	-4	-4
Barrier Attenuation		-6	-7	-8	-10	-13	-16	-19
Distance Attenuation		-31	-31	-31	-31	-31	-31	-31
SPL Contribution	35	6	18	29	32	27	20	11

Calculation of 15 Children (2-3 years) in Class 3 to Assessment Location A1

Class 3

Source	15 children (2-3 years)
Distance from Source to Receiver	23.1 m
Path Length Difference	0.02 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)						
		125	250	500	1k	2k	4k	8k
Source Lw (passive)	75	42	55	67	72	70	66	60
Inside-to-Outside Attenuation		-5	-5	-5	-5	-5	-5	-5
Barrier Attenuation		-5	-5	-6	-7	-8	-10	-13
Distance Attenuation		-35	-35	-35	-35	-35	-35	-35
SPL Contribution	33	1	14	26	30	26	21	12

Calculation of 15 Children (2-3 years) in Class 3 to Assessment Location A2

Class 3
Source 15 children (2-3 years)
Distance from Source to Receiver 27.1 m
Path Length Difference 1.40 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)						
		125	250	500	1k	2k	4k	8k
Source Lw (passive)	75	42	55	67	72	70	66	60
Inside-to-Outside Attenuation		-5	-5	-5	-5	-5	-5	-5
Barrier Attenuation		-14	-17	-20	-23	-26	-29	-32
Distance Attenuation		-37	-37	-37	-37	-37	-37	-37
SPL Contribution	16	-9	2	11	13	8	1	-8

Calculation of 15 Children (2-3 years) in Class 3 to Assessment Location B

Class 3
Source 15 children (2-3 years)
Distance from Source to Receiver 24.1 m
Path Length Difference 0.06 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)						
		125	250	500	1k	2k	4k	8k
Source Lw (passive)	75	42	55	67	72	70	66	60
Inside-to-Outside Attenuation		-5	-5	-5	-5	-5	-5	-5
Barrier Attenuation		-6	-6	-8	-9	-12	-15	-18
Distance Attenuation		-36	-36	-36	-36	-36	-36	-36
SPL Contribution	30	0	13	24	27	22	16	7

Calculation of 15 Children (2-3 years) in Class 3 to Assessment Location C1

Class 3
Source 15 children (2-3 years)
Distance from Source to Receiver 7.6 m
Path Length Difference 0.16 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)						
		125	250	500	1k	2k	4k	8k
Source Lw (passive)	75	42	55	67	72	70	66	60
Inside-to-Outside Attenuation		-5	-5	-5	-5	-5	-5	-5
Barrier Attenuation		-7	-8	-10	-13	-16	-19	-22
Distance Attenuation		-26	-26	-26	-26	-26	-26	-26
SPL Contribution	36	9	21	31	33	28	21	12

Calculation of 20 Children (3-6 years) in Class 4 to Assessment Location A1

Class 4

Source 20 children (3-6 years)

Distance from Source to Receiver 24.4 m

Path Length Difference 0.26 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)						
		125	250	500	1k	2k	4k	8k
Source Lw (passive)	83	50	62	74	79	77	73	67
Reverberant Space		3	3	3	3	3	3	3
Inside-to-Outside Attenuation		-5	-5	-5	-5	-5	-5	-5
Barrier Attenuation		-8	-10	-12	-15	-18	-21	-24
Distance Attenuation		-36	-36	-36	-36	-36	-36	-36
SPL Contribution	32	7	17	26	28	23	16	7

Calculation of 20 Children (3-6 years) in Class 4 to Assessment Location A2

Class 4

Source 20 children (3-6 years)

Distance from Source to Receiver 19.1 m

Path Length Difference 0.10 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)						
		125	250	500	1k	2k	4k	8k
Source Lw (passive)	83	50	62	74	79	77	73	67
Reverberant Space		3	3	3	3	3	3	3
Inside-to-Outside Attenuation		-5	-5	-5	-5	-5	-5	-5
Barrier Attenuation		-6	-7	-9	-11	-14	-17	-20
Distance Attenuation		-34	-34	-34	-34	-34	-34	-34
SPL Contribution	37	10	21	31	34	29	23	14

Calculation of 20 Children (3-6 years) in Class 4 to Assessment Location B

Class 4

Source 20 children (3-6 years)

Distance from Source to Receiver 34.1 m

Path Length Difference 0.10 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)						
		125	250	500	1k	2k	4k	8k
Source Lw (passive)	83	50	62	74	79	77	73	67
Reverberant Space		3	3	3	3	3	3	3
Inside-to-Outside Attenuation		-5	-5	-5	-5	-5	-5	-5
Barrier Attenuation		-6	-7	-9	-11	-14	-17	-20
Distance Attenuation		-39	-39	-39	-39	-39	-39	-39
SPL Contribution	32	5	16	27	29	25	18	9

Calculation of 20 Children (3-6 years) in Class 4 to Assessment Location C1

Class 4

Source 20 children (3-6 years)

Distance from Source to Receiver 24.8 m

Path Length Difference 0.55 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)						
		125	250	500	1k	2k	4k	8k
Source Lw (passive)	83	50	62	74	79	77	73	67
Reverberant Space		3	3	3	3	3	3	3
Inside-to-Outside Attenuation		-5	-5	-5	-5	-5	-5	-5
Barrier Attenuation		-10	-12	-15	-18	-21	-24	-27
Distance Attenuation		-36	-36	-36	-36	-36	-36	-36
SPL Contribution	28	4	14	23	25	20	13	4

Calculation of 20 Children (3-6 years) in Class 4 to Assessment Location C2

Class 4

Source 20 children (3-6 years)

Distance from Source to Receiver 18.4 m

Path Length Difference 0.09 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)						
		125	250	500	1k	2k	4k	8k
Source Lw (passive)	83	50	62	74	79	77	73	67
Reverberant Space		3	3	3	3	3	3	3
Inside-to-Outside Attenuation		-5	-5	-5	-5	-5	-5	-5
Barrier Attenuation		-6	-7	-9	-11	-13	-16	-19
Distance Attenuation		-33	-33	-33	-33	-33	-33	-33
SPL Contribution	38	11	22	32	35	30	23	14

Calculation of 20 Children (3-6 years) in Class 5 to Assessment Location A1

Class 5

Source 20 children (3-6 years)

Distance from Source to Receiver 28.6 m

Path Length Difference 0.22 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)						
		125	250	500	1k	2k	4k	8k
Source Lw (passive)	83	50	62	74	79	77	73	67
Reverberant Space		3	3	3	3	3	3	3
Inside-to-Outside Attenuation		-5	-5	-5	-5	-5	-5	-5
Barrier Attenuation		-7	-9	-11	-14	-17	-20	-23
Distance Attenuation		-37	-37	-37	-37	-37	-37	-37
SPL Contribution	31	5	16	25	28	23	16	7

Calculation of 20 Children (3-6 years) in Class 5 to Assessment Location A2

Class 5

Source 20 children (3-6 years)

Distance from Source to Receiver 25.9 m

Path Length Difference 0.06 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)						
		125	250	500	1k	2k	4k	8k
Source Lw (passive)	83	50	62	74	79	77	73	67
Reverberant Space		3	3	3	3	3	3	3
Inside-to-Outside Attenuation		-5	-5	-5	-5	-5	-5	-5
Barrier Attenuation		-6	-6	-8	-9	-12	-14	-17
Distance Attenuation		-36	-36	-36	-36	-36	-36	-36
SPL Contribution	36	8	19	30	33	29	22	13

Calculation of 20 Children (3-6 years) in Class 5 to Assessment Location B

Class 5

Source 20 children (3-6 years)

Distance from Source to Receiver 35.1 m

Path Length Difference 0.10 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)						
		125	250	500	1k	2k	4k	8k
Source Lw (passive)	83	50	62	74	79	77	73	67
Reverberant Space		3	3	3	3	3	3	3
Inside-to-Outside Attenuation		-5	-5	-5	-5	-5	-5	-5
Barrier Attenuation		-6	-7	-9	-11	-14	-17	-20
Distance Attenuation		-39	-39	-39	-39	-39	-39	-39
SPL Contribution	32	5	16	26	29	24	18	9

Calculation of 20 Children (3-6 years) in Class 5 to Assessment Location C1

Class 5

Source 20 children (3-6 years)

Distance from Source to Receiver 19.9 m

Path Length Difference 0.34 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)						
		125	250	500	1k	2k	4k	8k
Source Lw (passive)	83	50	62	74	79	77	73	67
Reverberant Space		3	3	3	3	3	3	3
Inside-to-Outside Attenuation		-5	-5	-5	-5	-5	-5	-5
Barrier Attenuation		-9	-11	-13	-16	-19	-22	-25
Distance Attenuation		-34	-34	-34	-34	-34	-34	-34
SPL Contribution	32	8	17	27	29	24	17	8

Calculation of 20 Children (3-6 years) in Class 5 to Assessment Location C2

Class 5

Source 20 children (3-6 years)

Distance from Source to Receiver 10.4 m

Path Length Difference 0.15 m

Description	dB(A)	A-weighted Octave Band Centre Frequency (Hz)						
		125	250	500	1k	2k	4k	8k
Source Lw (passive)	83	50	62	74	79	77	73	67
Reverberant Space		3	3	3	3	3	3	3
Inside-to-Outside Attenuation		-5	-5	-5	-5	-5	-5	-5
Barrier Attenuation		-7	-8	-10	-13	-16	-19	-22
Distance Attenuation		-28	-28	-28	-28	-28	-28	-28
SPL Contribution	41	15	26	36	38	33	26	17

APPENDIX G: Noise Contribution

Row	Appendix Reference	Area	Contribution at Assessment Locations – dB(A)				
			A1	A2	B	C1	C2
A	Appendix E1	Outdoor Play (20 children, 0-2 years)	41	40	38	35	-
B	Appendix E1	Active Outdoor Play (15 children, 2-3 years)	45	45	44	45	41
C	Appendix E1	Passive Outdoor Play (30 children, 2-3 years)	42	42	41	42	38
D	Appendix E2	Passive Outdoor Play (15 children, 2-3 years)	39	39	38	39	35
E	Appendix E2	Active Outdoor Play (40 children, 3-6 years)	46	49	45	44	50
F	Appendix E2	Active Outdoor Play (20 children, 3-6 years)	42	46	42	41	47
G	Appendix E3	Passive Outdoor Play (40 children, 3-6 years)	40	43	39	38	44
H	Appendix E3	Passive Outdoor Play (20 children, 3-6 years)	36	40	36	35	41
I	Appendices F1 – F2	Class 1	32	16	28	29	-
J	Appendices F2 – F3	Class 2	35	19	31	35	-
K	Appendices F3 – F4	Class 3	33	16	30	36	-
L	Appendices F5 – F6	Class 4	31	37	32	28	38
M	Appendices F6 – F8	Class 5	31	36	32	32	41

Operating Scenario	Contribution at Assessment Locations – dB(A)				
	A1	A2	B	C1	C2
A + C + G	46	47	44	44	45
B + H + I + J + M	46	47	45	46	46
C + F + I + M	46	48	45	45	48
I + J + K + L + M	42	40	39	42	43
Noise Target	46	50	46	46	50

APPENDIX H: Analysis of Noise Emission from Vehicle Movements on Site

Drop-off of Children to 168 Derby Street

	LAE	Correction for number of vehicles	Correction for distance	LAE to Leq, 15 min	Contribution dB(A)
Vehicles arriving	57.0 dB(A)	+10	0	-30	38

Drop-off of Children to 172 Derby Street

	LAE	Correction for number of vehicles	Correction for distance	LAE to Leq, 15 min	Contribution dB(A)
Vehicles exiting	60.6 dB(A)	+10	0	-30	41