Environmental Noise Assessment Report

Proposed Childcare Centre

At 39 Cairo Avenue, Revesby

On behalf of Khalil Nasrallah C/- MD&A Architects Australia P/L

20SYA0046 R01_2

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Revision Record

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Executive Summary

TTM conducted an environmental noise assessment of a proposed childcare centre at 39 Cairo Avenue, Revesby.

Noise monitoring was undertaken to establish the existing ambient noise levels and the applicable noise criteria. In accordance with the *NSW Noise Policy for Industry*, the potential noise generated by the development was assessed at the nearest noise sensitive receivers. Noise associated with children playing was predicted to exceed the criteria and acoustic barriers are necessary to achieve compliance.

Attended noise measurements were conducted to establish the existing rail noise levels. Noise modelling was conducted to verify the measured levels and to predict rail noise impacts at the proposed development. Based on the predicted levels, building treatments were determined to achieve the indoor criteria for rail noise intrusion.

The proposed development is predicted to comply with the noise criteria with the inclusion of acoustic barriers, practical noise management strategies and building treatments for the protection of rail noise intrusion.

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1. Introduction

1.1. Background

TTM was engaged by Khalil Nasrallah to undertake a revised environmental noise assessment of the proposed childcare centre at 39 Cairo Avenue, Revesby. This report is a revision of 20SYA0046 R01_0 to include a rail noise assessment in accordance with Item 11 of the Canterbury Bankstown Council information request.

The assessment is based on the following:

a) Canterbury Bankstown Council information request (letter dated 12 March 2021).

b) *NSW Noise Policy for Industry*[1].

c) Development plans provided by MD&A Architects, dated 29/09/2021 (shown in Appendix A).

d) Noise measurements, analysis and calculations conducted by TTM.

1.2. Scope

The assessment includes the following:

a) Description of the development site and proposal.

b) Measurement of existing ambient and rail noise levels.

c) Statement of assessment criteria relating to environmental noise emissions and rail noise intrusion.

d) Prediction of noise generated by the operation onto the nearest sensitive receivers.

e) Prediction of rail noise onto the development.

f) Analysis of predicted noise levels.

g) Details of noise control recommendations to be incorporated to achieve predicted compliance.

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

2. Site Description

2.1. Site Location

The site is described by the following:

- 39 Cairo Avenue, Revesby
- Lot 12 DP35146

The site locality is shown in Figure 1 below.

Figure 1: Site Locality (Source: Nearmap)

2.2. Site Surrounds and Acoustic Environment

The site is bound by Cairo Avenue and residential dwellings to the north and west, residential dwellings to the east and Sphinx Avenue and residential dwellings to the south. The current acoustic environment of the area is typically comprised of typical residential activities, local road traffic noise and distant train passes.

3. The Proposed Development

3.1. Development Description

The proposal is to develop a childcare centre at 39 Cairo Avenue, Revesby. The childcare centre is proposed to comprise of the following:

- Basement level car parking, bin area and service area.
- Ground level containing entry/foyer, indoor activity area, kitchen, bathroom amenities and outdoor play areas.
- First floor containing baby sleeping room, administrative offices, service rooms and amenities.

Vehicular access is via Sphinx Avenue to the south with pedestrian access via Cairo Avenue to the north. This assessment has considered hours of operation between the hours of 6am and 10pm.

The proposed site/ground floor is shown in Figure 2 below. Further development plans are shown in Appendix A.

Figure 2: Proposed Ground Floor Plan

4. Measurements

4.1. Equipment

The following equipment was used to measure existing noise levels:

- Brüel & Kjær Type 2250L as a logger, Type 1 Sound Level Meter (S/N 3006261)
- Brüel & Kjær Type 2250, Type 1 Sound Level Meter (S/N 3004473)
- Brüel & Kjær Type 4231, Sound Calibrator (S/N 3009809)

All equipment was calibrated by a National Association of Testing Authorities (NATA) accredited laboratory. The equipment was field calibrated before and after the measurement session. No significant drift from the reference signal was recorded.

4.2. Unattended Noise Monitoring

Unattended noise monitoring was undertaken to measure the existing ambient noise levels between Wednesday 9/12/2020 and Wednesday 16/12/2020. The noise monitor was placed onsite (see Figure 3 below) in a position considered representative of the ambient noise environment experienced at the nearest sensitive receivers.

Figure 3: Noise Measurement Locations

The noise monitor was set to measure statistical noise levels in 'A' weighting, 'Fast' response, over 15 minute intervals. Noise levels were measured in accordance with Australian Standard *AS1055*[2]. The microphone was in a free-field position approximately 1.5m above ground.

Weather during the monitoring period was varied with some rainfall experienced. Rain affected data was excluded from the analysis. The temperature range during the monitoring period was between 13-29°C (source: Bureau of Meteorology, Bankstown).

4.3. Attended Rail Noise Measurements

Rail noise measurements were undertaken to establish the existing rail noise environment in accordance with the Council information request. Noise measurements were conducted on Thursday 17th June 2021 in Wilberforce Road (shown in Figure 3) approximately 32m from the nearest rail line. The microphone was positioned approximately 1.5m above ground level in a free-field location. The weather during the noise survey was fine and suitable for noise measurement.

4.4. Noise Source Measurements

Noise levels associated with typical on-site activities were taken from similar investigations conducted by TTM. All measurements were conducted generally in accordance with Australian Standard AS1055.

4.5. Results of Measurements

4.5.1. Ambient Noise Levels

Table 1 presents the measured ambient noise levels determined in accordance with the procedures of the *NSW Noise Policy for Industry*. The measurement results were used to determine the assessment criteria for the development. Graphical presentation of the unattended noise monitoring is shown in Appendix B.

Table 1: Measured Ambient Noise Levels

Time Period	Rating Background Level (RBL), L_{90} dB(A)	Existing Noise Levels, L_{eq} dB(A)
Early morning* (6am – 7am)	40	59
Daytime (7am – 6pm)	43	60
Evening (6pm – 10pm)	38	58
Night time (10pm – 7am)	32	55

*A separate time period was established for the purposes of assessing potential noise impacts during the early morning operating periods.

[2] AS 1055:2018 Acoustics - Description and measurement of environmental noise (AS1055)

4.5.2. Rail Noise Levels

Table 2 presents the measured rail noise levels at the attended measurement location. A total of 12 measurements were obtained which is deemed representative of the noise levels experienced from the daily trains passing the site.

Table 2: Measured Rail Noise Levels

Day/Date	Measurement	Train Type	Direction of Travel	Measurement Distance (m)	Measurement Duration (s)	Noise Level, $L_{Aeq,\ 15\ sec}$ dB(A)
Thursday, 17/06/2021	1	Passenger	Eastbound	39	14	64
	2	Passenger	Eastbound	32	12	69
	3	Passenger	Westbound	48	11	60
	4	Passenger	Westbound	43	38	69
	5	Passenger	Eastbound	39	16	66
	6	Passenger	Eastbound	32	12	69
	7	Passenger	Westbound	48	9	55
	8	Passenger	Westbound	43	15	68
	9	Passenger	Eastbound	39	19	65
	10	Passenger	Eastbound	32	16	71
	11	Passenger	Westbound	48	13	64
	12	Passenger	Westbound	43	17	65
Logarithmic average at measurement location						**67**

5. Noise Criteria

5.1. NSW Noise Policy for Industry (NPI)

For transient and steady-state noise emissions generated on the site resulting from the operational activities at the proposed development, such as development generated traffic, children playing, deliveries, waste removal, and mechanical plant, the relevant noise criteria are defined in the NSW Noise Policy for Industry (2017).

The policy sets out the procedure to determine the project noise trigger levels relevant to assess noise from developments. The project noise trigger level applies to existing noise-sensitive receivers.

The project noise trigger level provides a benchmark or objective for assessing a proposal or site. It is not intended for use as a mandatory requirement. The project noise trigger level is a level that, if exceeded, would indicate a potential noise impact on the community, and so 'trigger' a management response; for example, further investigation of mitigation measures.

The project noise trigger level is the lower (that is, the more stringent) value of the project intrusiveness noise level and project amenity noise level.

5.1.1. Project Intrusiveness Noise Level

The Noise Policy for Industry states:

> *The intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source (represented by the L_{Aeq} descriptor), measured over a 15-minute period, does not exceed the background noise level by more than 5 dB when beyond a minimum threshold. This intrusiveness noise level seeks to limit the degree of change a new noise source introduces to an existing environment.*

The intrusiveness noise level is determined as follows:

$$L_{Aeq,15min} \leq \text{Rating Background Noise Level} + 5\ dB$$

A modifying factor should also be added where appropriate to allow for tonality, impulsiveness, and intermittency or low frequency effects.

5.1.2. Amenity Noise Levels and Project Amenity Noise Level

To limit continuing increases in noise levels from application of the intrusiveness level alone, the ambient noise level within an area from all industrial noise sources combined should remain below the recommended amenity noise levels specified in Table 2.2 of the *Noise Policy for Industry* where feasible and reasonable. The recommended amenity noise levels will protect against noise impacts such as speech interference, community annoyance and some sleep disturbance. The noise amenity area for the noise sensitive land uses in the area are given in Table 3.

Table 3: Amenity Noise Levels (Residential – Suburban)

Receiver/ Noise amenity area	Assessment period	Recommended amenity noise level, L_{eq} dB(A)
Residential – Suburban	Day	55
	Evening	45
	Night	40

Note:
- Day-time period is from 0700 to 1800 (Monday to Saturday) and 0800 to 1800 (Sundays and Public Holidays)
- Evening period is from 1800 to 2200
- Night-time period is from 2200 to 0700 (Monday to Saturday) and 2200 to 0800h (Sundays and Public Holidays)

The recommended amenity noise levels represent the objective for total industrial noise at a receiver location, whereas the project amenity noise level represents the objective for noise from a single industrial development at a receiver location.

To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, a project amenity noise level applies for each new source of industrial noise as follows:

Project amenity noise level = Recommended amenity noise level minus 5 dB(A)

To standardise the time periods for the intrusiveness and amenity noise levels, the policy assumes that the $L_{Aeq,15min}$ is equal to the $L_{Aeq,\ period}$ + 3 decibels. Therefore, a +3dB is applied to the project amenity noise level.

5.1.3. Project Noise Trigger Level

The project noise trigger level (PNTL) for noise sensitive receivers has been determined in Table 4 and are the most stringent of the intrusiveness and project amenity noise level.

Table 4: NSW Noise Policy for Industry – Evaluated criteria

Assessment period	Project Intrusiveness Noise Level, $L_{eq,15min}$ dB(A)	Project Amenity Noise Level, $L_{eq,15min}$ dB(A)	Project Noise Trigger Level, $L_{eq,15min}$ dB(A)
Early Morning (6am –7am)	45	38	**38**
Daytime (7am – 6pm)	48	53	**48**
Evening (6pm – 10pm)	43	43	**43**
Night (10pm – 7am)	37	38	**37**

Note:
- Day-time period is from 0700 to 1800 (Monday to Saturday) and 0800 to 1800 (Sundays and Public Holidays)
- Evening period is from 1800 to 2200
- Night-time period is from 2200 to 0700 (Monday to Saturday) and 2200 to 0800h (Sundays and Public Holidays)

Table 4 details the established Project Noise Trigger Level (PNTL) criterion for residential receivers. By meeting the PNTLs at the identified noise sensitive areas, all other noise sensitive areas located further away from the development site are expected to comply with the criteria derived in this report.

5.1.4. Maximum Noise Level Event Assessment

The potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered.

The NSW Noise Policy for Industry states that a detailed maximum noise level assessment should be undertaken where the subject developments night-time noise levels at a residential location exceed the following:

- L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater.

The night time RBL is 32dB and therefore the noise limit by this methodology is 32+15=47dB. Therefore, the limit of 52dB is greater and is applicable.

Further, the *NSW Road Noise Policy* states that from research on sleep disturbance to date it can be concluded that:

- maximum internal noise levels below 50–55 dB(A) are unlikely to awaken people from sleep;
- one or two noise events per night, with maximum internal noise levels of 65–70 dB(A), are not likely to affect health and wellbeing significantly.

5.2. Bankstown Development Control Plan

Section 5 of the Bankstown Development Control Plan outlines the acoustic privacy and management requirements for a childcare centre. The Objectives and Development Controls are as follows:

<u>Objectives</u>

The objectives are:

a) To have childcare centres that do not adversely impact on the residential amenity of adjoining dwellings and the surrounding area.

b) To have development that installs appropriate acoustic privacy measures which are compatible with the prevailing character of residential areas.

c) To have the ongoing operation and management of childcare centres maintain residential amenity.

<u>Development controls</u>

The development controls to achieve the objectives are:

- Air conditioning, mechanical ventilation or any other continuous noise source must not exceed the ambient level at any specified boundary by more than 5dB(A).
- The location and design of child care centres must consider the projection of noise from various activities to avoid any adverse impacts on the residential amenity of adjoining land.

For the purpose of this clause, Council requires development applications to submit an Acoustic Report prepared by a suitably qualified acoustic consultant to determine:

a. existing noise levels at the identified sensitive receiver locations;

b. likely noise levels to emanate from the child care centre at the identified sensitive receiver locations;

c. whether the development must apply measures to ensure the noise of children playing in outdoor areas does not exceed 10dB(A) above the background noise level;

d. whether the location and setbacks of the development are sufficient to protect the acoustic privacy of adjacent dwellings;

e. whether the location of outdoor areas should avoid living areas and bedrooms of adjacent dwellings;

f. whether the development must install certain noise attenuation measures to protect the acoustic privacy of adjacent dwellings.

The Acoustic Report must measure the noise readings over a 15 minute period and must provide details of all modelling assumptions including source noise data, noise monitoring positions, receiver heights and locations, prevailing meteorological conditions during the monitoring, confirmation of the methodology adopted along with a copy of the model input and output data.

Clause 5.3 states that the maximum height for noise attenuation walls and fences along the boundary of an allotment is 2 metres.

5.3. Rail Noise

Canterbury Bankstown Council has requested further information (letter dated 12 March 2021) in regard to noise levels for sleeping areas, as required by C26 of the Child Care Planning Guideline (CCPG).

C26 of the CCPG lists noise sources with the potential to impact proposed childcare development, including industrial zoned land, aircraft noise (ANEF), rail noise, and road traffic noise. Based on the location of the site, rail noise is the only external noise source within the potential to impact the site. The rail corridor is situated approximately 60m south of the site with a row of residential dwellings in between.

No noise criteria are stated within the CCPG. Therefore, reference is made to the criteria within the *State Environmental Planning Policy (Infrastructure) 2007* and *Development Near Rail Corridors and Busy Road – Interim Guideline*. The criteria states that appropriate measures are taken to ensure that the following L_{Aeq} levels are not exceeded:

- in any bedroom in the building: 35dB(A) at any time
- anywhere else in the building: 40dB(A) at any time

For the purposes of the assessment, sleeping areas will be designed to achieve 35 dB(A) and activity areas will be designed to achieve 40 dB(A).

6. Assessment of Noise from the Development to Noise Sensitive Receivers

An assessment of onsite activities associated with the proposed development was conducted to determine the potential impacts at the nearest sensitive receivers.

6.1. Noise Sensitive Receivers

The nearest noise sensitive receivers relative to the proposed development are described below and are identified in Figure 4:

- Receiver 1: 44 Cairo Avenue, residential to the northwest.
- Receiver 2: 37 Cairo Avenue, residential to the northeast.
- Receiver 3: 46 Sphinx Avenue, residential to the east.
- Receiver 4: 57 Sphinx Avenue, residential to the south.

Figure 4: Noise Sensitive Receivers – In Proximity to Development Site

The receivers identified in Figure 4 are the nearest and most exposed noise sensitive locations in proximity to the proposed development. If compliance can be achieved at these receivers then compliance is predicted at all other noise sensitive locations.

6.2. Noise Source Levels

Table 5 presents the noise sources with the potential to impact noise sensitive receivers. The noise source levels were calculated to one metre and include corrections for tonality and impulsiveness as per the NPI.

Table 5: Typical Transient Noise Source Levels

Noise Source Description	Noise Level at 1m, dB(A)		Measured Duration (sec)
	$L_{Aeq,T}$	L_{Amax}	
Car door closure	78*	86*	2
Car bypass @ 5km/h	69	75	6
Car engine ignition	72	74	3
Conversations (external areas)	65	74	Long term
Children playing (AAAC Guideline loudest category)^	79	89	Long term
Deliveries	80	85	60
Waste collection	96*	108*	40

*Includes 5dB(A) adjustment to account for impulsiveness characteristics in accordance with AS1055.

Includes 5dB(A) adjustment to account for tonal noise characteristics in accordance with AS1055. None applicable.

^ the Association of Australasian Acoustical Consultants (AAAC) *Guideline for Child Care Centre Acoustic Assessment, Version 2.0* sound power levels for outdoor play are categorised based on the age of the children. The centre of the loudest category (3-6-year old's) was used for the assessment as the age group areas have not yet been determined for the development. Note that the AAAC noise level presented in Table 5 has been converted from a sound power level to a sound pressure level at 1m.

The AAAC Guideline does not specify L_{max} levels for children playing noise. Therefore, the adjustment between the L_{eq} and L_{max} was taken from previous TTM attended noise measurements of children playing.

6.3. Assumptions for Expected Onsite Activity

The following assumptions have been made for noise calculations:

- Noise predictions are made to the nearest noise sensitive receiver identified in Section 6.1.
- Voice levels are based on published data contained in Harris, C.M., Handbook of Acoustical Measurements and Noise Control – 3rd ed. Ch 16.3, Mc Graw-Hill Inc. The voice level at 1m (long term average) used for the assessment of conversations was taken from the 'Raised' category with an associated noise level of 65 dB(A) for an individual male.

– Children playing noise is sourced from the Association of Australian Acoustical Consultants (AAAC) 'Guideline Child Care Centre Noise Assessment' Version 2.0, which outlines sound power levels for outdoor play depending on the age of the children. This assessment is based on the average noise level for the loudest category of children aged 3 to 6 years.

– Noise attenuation provided by intervening building structures and recommended acoustic barriers was included where applicable.

– Table 6 presents the assumptions used for noise calculations for onsite activities. Details of the site operation were provided by MD&A Architects Australia P/L.

Table 6: Onsite Noise Activity Assumptions used for Noise Calculations

Noise Source Description (type of event)	Noise Source Location	Daytime/Evening/Night Period
		Events per 15min or % of period
Car door closure	Basement level car parking area	20 events (2 door closures per car)
Car bypass @ 5km/h	Car park entrance	10 events (based on the expected number of vehicles either arriving or departing during a 15-minute period)
Car engine ignition	Basement level car parking area	10 events
Conversations	Nearest outdoor area	50% of the time
Children playing	Nearest outdoor activity area	100% of the time
Deliveries	Basement level car parking area	1 event
Waste collection	Kerbside	1 event

6.4. Predicted Noise Levels

The noise impact from the development is predicted using spreadsheet calculations for a worst-case scenario and is based on the noise source levels of typical site activities given in Table 5, distance attenuation and shielding attenuation from intervening structures and recommended acoustic barriers where applicable. Sample calculations are shown in Appendix C. Details of the recommended acoustic barriers are presented in Section 7.

6.4.1. Predicted L_{Aeq} Transient Noise Levels at Receivers

Table 7 presents the predicted $L_{Aeq\ (15\ minute)}$ noise levels at the nearest noise sensitive receivers.

Table 7: Predicted $L_{Aeq\ (15\ minute)}$ Noise Levels from Proposed Development at Sensitive Receivers

Receiver	Noise Source	Predicted External Noise Level at Receiver, L_{Aeq} dB(A) Free-field	Complies with Criteria (PNTL): (Yes/No)		
			Morning 38 dB(A)	Day 48 dB(A)	Evening 43 dB(A)
Receiver 1 - 44 Cairo Avenue	Car door closure	21	✓	✓	✓
	Car bypass @ 5km/h	14	✓	✓	✓
	Car engine ignition	11	✓	✓	✓

Receiver	Noise Source	Predicted External Noise Level at Receiver, L_{Aeq} dB(A) Free-field	Complies with Criteria (PNTL): (Yes/No)		
			Morning 38 dB(A)	Day 48 dB(A)	Evening 43 dB(A)
	Conversations	35	✓	✓	✓
	Children playing	45	×	✓	×
	Deliveries	22	✓	✓	✓
	Waste collection	48	×	✓	×
Receiver 2 - 37 Cairo Avenue	Car door closure	23	✓	✓	✓
	Car bypass @ 5km/h	16	✓	✓	✓
	Car engine ignition	13	✓	✓	✓
	Conversations	36	✓	✓	✓
	Children playing	45	×	✓	×
	Deliveries	24	✓	✓	✓
	Waste collection	41	×	✓	✓
Receiver 3 - 46 Sphinx Avenue	Car door closure	29	✓	✓	✓
	Car bypass @ 5km/h	22	✓	✓	✓
	Car engine ignition	19	✓	✓	✓
	Conversations	38	✓	✓	✓
	Children playing	48	×	✓	×
	Deliveries	30	✓	✓	✓
	Waste collection	56	×	×	×
Receiver 4 - 57 Sphinx Avenue	Car door closure	31	✓	✓	✓
	Car bypass @ 5km/h	32	✓	✓	✓
	Car engine ignition	20	✓	✓	✓
	Conversations	32	✓	✓	✓
	Children playing	37	✓	✓	✓
	Deliveries	31	✓	✓	✓
	Waste collection	55	×	×	×

The summary of noise predictions is as follows:

- Car park activity is predicted to comply during all time periods.
- Conversations are predicted to comply during all time periods.
- Children playing in the ground floor outdoor play area are predicted to comply with daytime criteria only. Therefore, the outdoor play area can only be used during the hours of 7am to 6pm. Acoustic barriers are also required to achieve compliance.
- Deliveries are predicted to comply during all time periods.
- Waste collection is predicted to exceed the daytime criteria at Receiver 3 and 4. Waste collection is a known noise source in residential areas and given the short and infrequent nature, the noise impact

is considered acceptable. Waste collection will be recommended to occur during daytime hours only in order to minimise annoyance.

6.4.2. Predicted L_{Amax} Transient Noise Levels at Receivers

Table 8 presents the predicted L_{Amax} noise levels at nearby receivers. Children playing and waste collection is excluded from the analysis as these activities were determined to be non-compliant with the L_{eq} criteria during the night period.

Table 8: Predicted L_{Amax} Noise Levels at Sensitive Receivers

Receiver	Noise Source	Predicted External Noise Level at Receiver, L_{Amax} dB(A) Free-field	Complies with Criteria: 52dB (Yes/No)
Receiver 1 - 44 Cairo Avenue	Car door closure	40	✓
	Car bypass @ 5km/h	29	✓
	Car engine ignition	28	✓
	Conversations	47	✓
	Deliveries	39	✓
Receiver 2 - 37 Cairo Avenue	Car door closure	41	✓
	Car bypass @ 5km/h	30	✓
	Car engine ignition	29	✓
	Conversations	48	✓
	Deliveries	40	✓
Receiver 3 - 46 Sphinx Avenue	Car door closure	48	✓
	Car bypass @ 5km/h	37	✓
	Car engine ignition	36	✓
	Conversations	50	✓
	Deliveries	47	✓
Receiver 4 - 57 Sphinx Avenue	Car door closure	49	✓
	Car bypass @ 5km/h	47	✓
	Car engine ignition	37	✓
	Conversations	44	✓
	Deliveries	48	✓

Noise levels are predicted to comply with the sleep disturbance criteria based on the inclusion of the recommendations identified in Section 6.4.1.

6.5. Development Generated Road Traffic Noise

Additional traffic generated from the development on Sphinx Avenue is expected to be insignificant during peak hour. As such, the impact of additional traffic from the development on the existing residential properties in the local area is predicted to be low.

6.6. Preliminary Mechanical Noise Advice

To determine a preliminary noise limit for mechanical plant, a reverse calculation was conducted to determine the allowable noise source level of onsite mechanical equipment prior to the inclusion of acoustic treatment. This type of assessment was conducted as plant has not been selected during DA stage and it provides guidance around the design of mechanical equipment.

Based on the established noise criteria and distance attenuation from the nearest potential locations to the nearest residential receiver, the allowable mechanical noise levels are presented in Table 9.

Table 9: Mechanical Plant Noise Limit for Compliance Without Acoustic Treatment

Plant location	Indicative noise level at 1m from the nearest piece of plant to receiver to achieve compliance, L_{eq} dB(A)		
	Day (7am – 6pm)	Evening (6pm – 10pm)	Night (10pm – 7am)
Western facade	77	72	67
Northern façade	79	74	69
Eastern façade	62	57	52
Southern facade	78	73	68

Acoustic treatment or screening of the plant may allow a higher noise limit. Compliance with the noise limits and design criteria should be checked once plant selections are finalised.

7. Rail Noise Assessment

This section of the report assesses the potential impact of rail noise on the development. The passenger train corridor is situated approximately 60m from the site.

7.1. Rail Volumes

Train timetables provided by Transport NSW indicate an average of 300 passenger trains (both directions combined) passing the site on a typical weekday.

7.2. Rail Noise Model

7.2.1. Noise Modelling Parameters

Rail noise predictions were conducted using 'SoundPLAN' v8.2. The basis of the 'SoundPLAN' model is as follows:

Table 10: Rail Noise Modelling Parameters

Description	Value
Prediction methodology	Nordic Rail Prediction (Kilde Rep. 130)
Angle Increment	1°
Grid spacing (noise maps)	2m squares
Passenger train parameters	Frequency: 300 daily
	Length: 160m
	Speed: 60km/h (estimated)
	Source height: 0.5m above rail line
	Leq correction: 4 (for the purposes of noise model verification)
Rail noise measurement distance	32m from the nearest line
Receiver height	1.8m above ground floor level of 26m
Façade correction	+2.5 dB(A)

The model was prepared including all current buildings and the proposed development site to include known screening features surrounding the development.

7.2.2. Noise Model Verification

The logarithmic average L_{eq} measured at the attended measurement location was verified in the noise model prior to modelling noise impacts at the development. Table 11 presents the results of the rail noise model verification.

Table 11: Verification of the Rail Noise Model

SLM Location	Measured L_{Aeq}	Predicted L_{Aeq}	Required Correction
32m from rail line	67	68	0

7.3. Predicted Rail Noise Levels

Noise modelling of rail noise was conducted at the proposed development with the highest façade corrected noise impact level of 59dB(A) at ground and 62 dB(A) at upper floor. The predicted noise levels at each façade of the development are presented in Appendix D. Upgraded façade treatments will be required to achieve compliance with internal levels. Based on current floor plans, the southern façade (Sphinx Avenue frontage) of the development requires up to R_W30 glazing with standard wall and roof construction. Refer to the building treatment recommendations detailed in Section 8.4.

8. Recommendations

Noise generated from the site has been assessed at the nearest sensitive receivers. Compliance with the noise criteria outlined in Section 5 is predicted to be achieved based on the inclusion of the recommendations outlined below.

8.1. Acoustic Barriers

Acoustic barriers are required to reduce noise generated by the development to the nearest noise sensitive receivers. The location and extent of the acoustic barriers is shown in Figure 5.

The acoustic barrier details are described below:

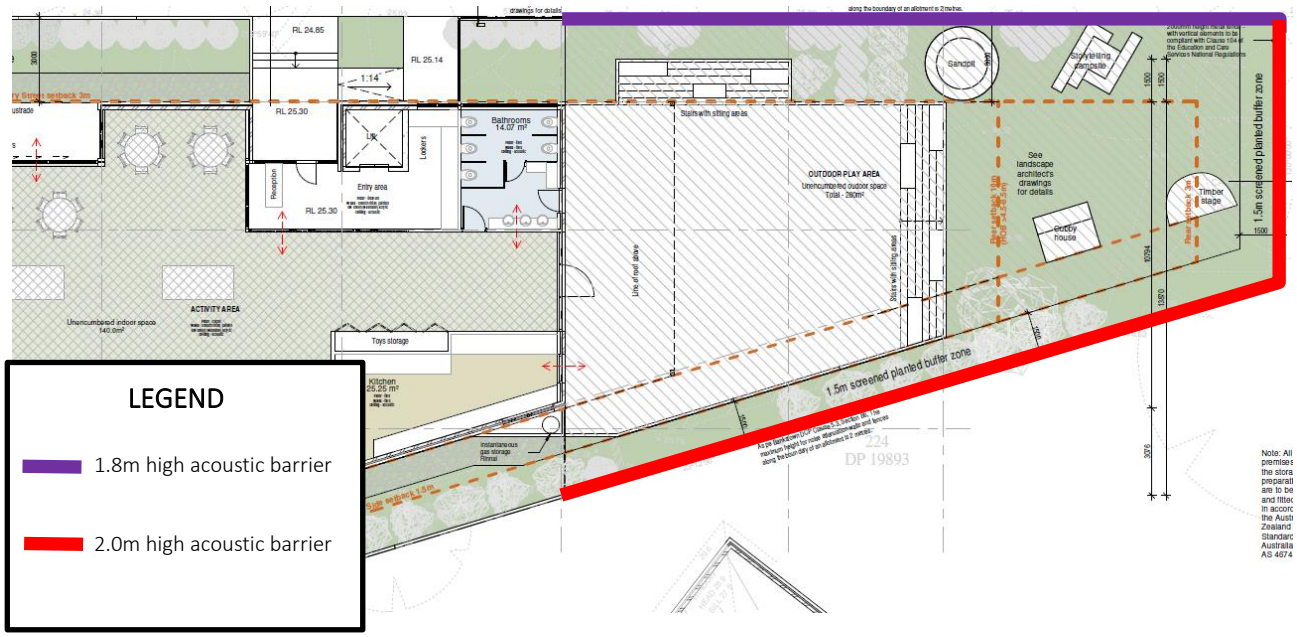
a) A minimum 2.0m high acoustic barrier (indicated by red colour) relative to natural ground levels (i.e., higher than the set down play area) is to be constructed along the NE and SE boundary for the extents shown;

b) A minimum 1.8m high acoustic barrier (indicated by purple colour) relative to natural ground levels is to be constructed along the NW boundary for the extent shown;

c) The barriers are to be built of a material with a minimum surface density of 12.5kg/m^2. Suitable materials include lapped timber palings (40% overlap), fibre cement sheet, plywood, modular wall systems, glass Perspex, concrete or masonry.

d) The barriers are to be free of gaps or holes.

Figure 5: Recommended Acoustic Barriers – Ground Floor



8.2. Noise Management Controls

The following management strategies are recommended to comply with the relevant criteria and minimise noise annoyance:

- Children playing in the ground floor outdoor area should be limited to daytime hours of 7am to 6pm.
- Waste collection should be limited to daytime hours of 7am to 6pm.
- Any speed humps should be bitumen, concrete (as part of the slab) or rubber, not metal.
- Any grates or other protective covers in the handstand and access driveway must be rigidly fixed in position to eliminate clanging and be maintained.

8.3. Mechanical Plant Noise

Because detailed plant selections are not available at this stage, it is not possible to carry out a detailed examination of the noise control measures that may be required to achieve the noise targets for mechanical plant.

Plant may need to be acoustically treated to achieve the criteria detailed in Section 5 to prevent noise emissions from adversely impacting the surrounding properties. This may include selecting the quietest plant possible, or treating the plant equipment with enclosures, barriers, duct lining and silencers, etc.

A preliminary assessment of allowable plant noise limits to achieve compliance is conducted in Section 6.5. It is recommended that any new mechanical plant equipment is checked by a suitably qualified acoustic consultant once plant selections are finalised.

8.4. Building Treatments – Rail Noise

The following building treatments are recommended for compliance with the internal rail noise criteria:

Table 12: Recommended Building Treatments due to Rail Noise

Childcare Centre Room	Minimum Acoustic Rating (R_W) to be Achieved		
	Glazing	External Walls	Roof/Ceiling
Activity room (ground floor)	28	40	40
Sleep room (upper floor)	30	40	40

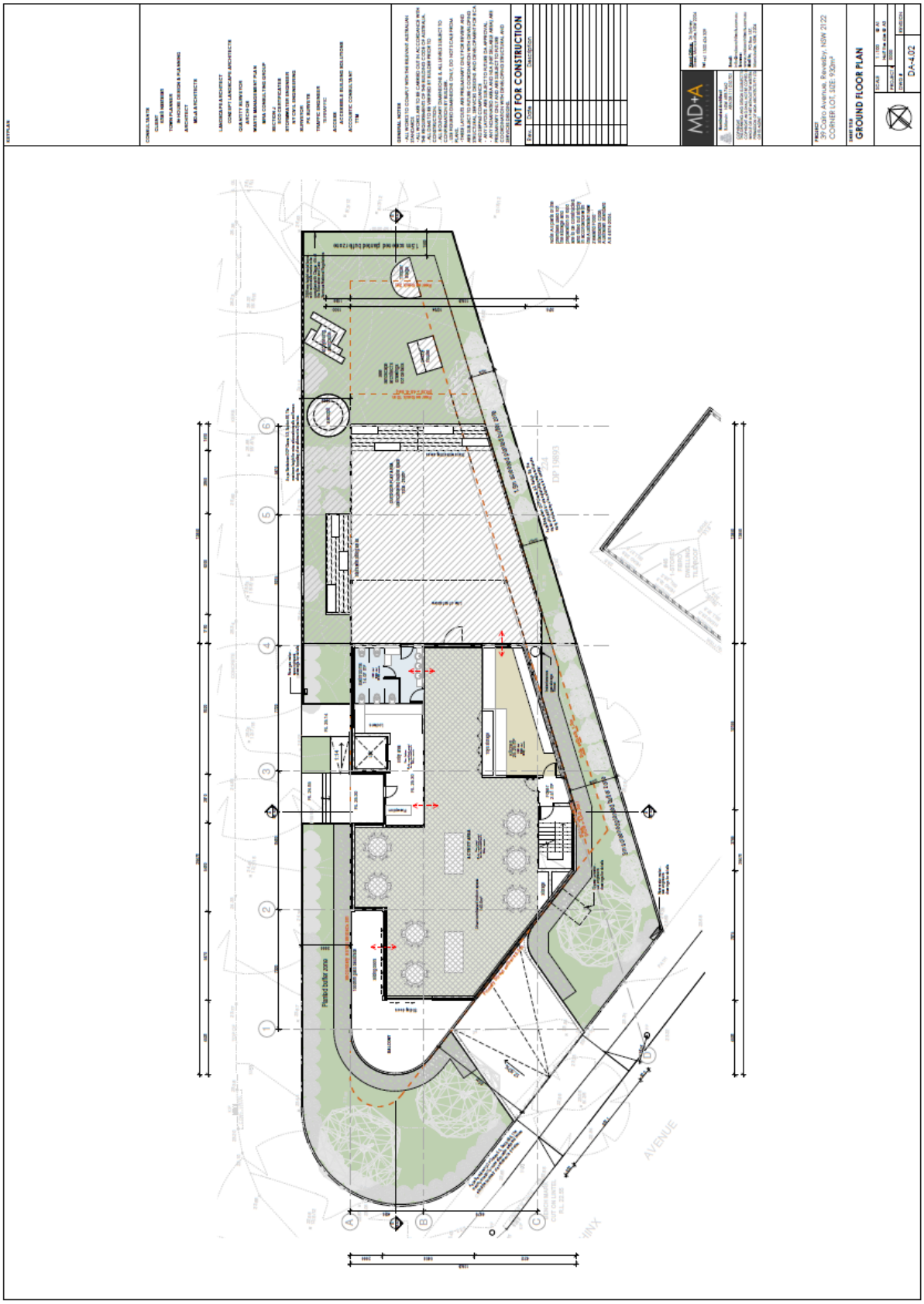
It is recommended that alternative ventilation is provided for these rooms so that doors/windows can be closed to exclude rail noise.

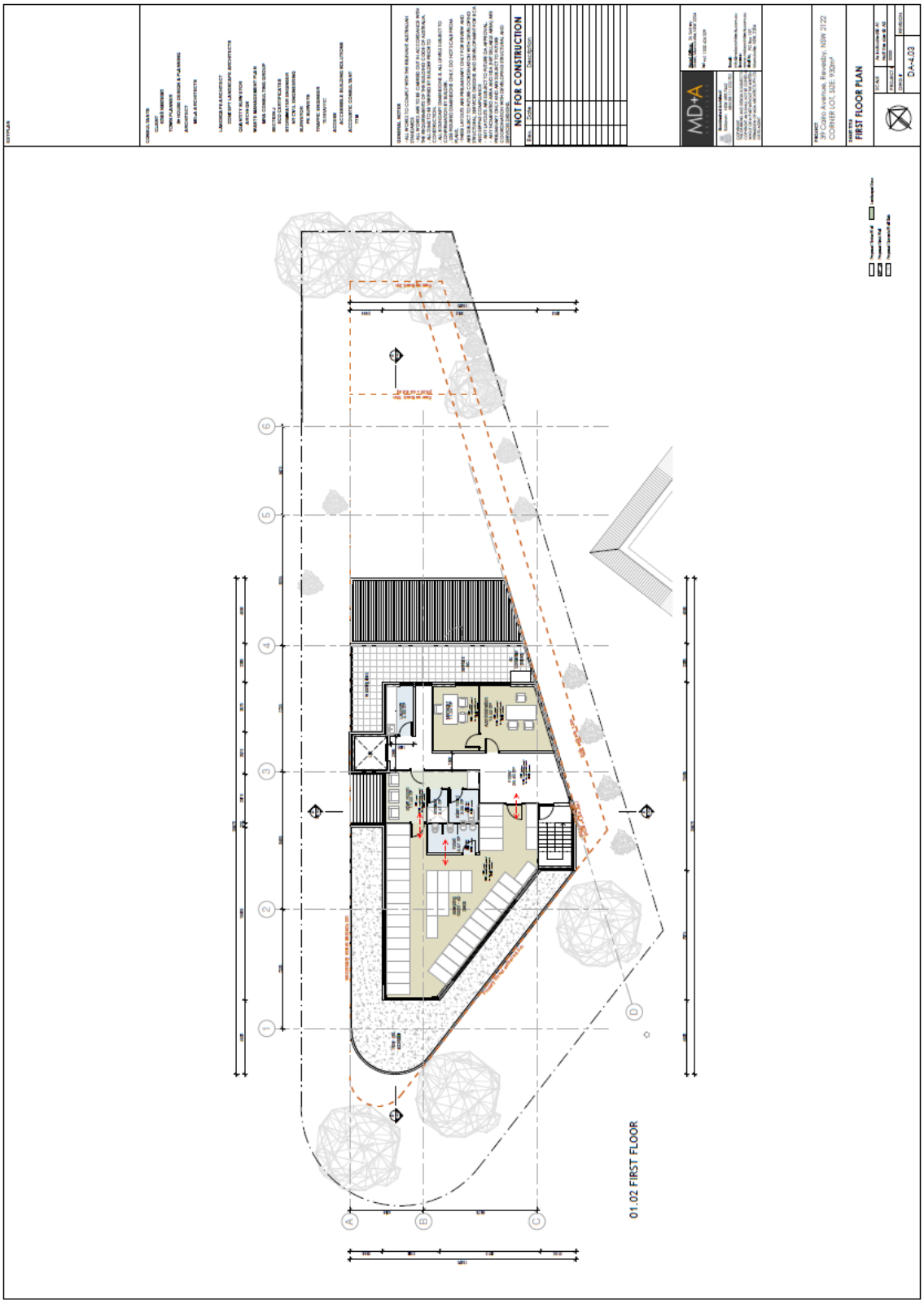
9. Conclusion

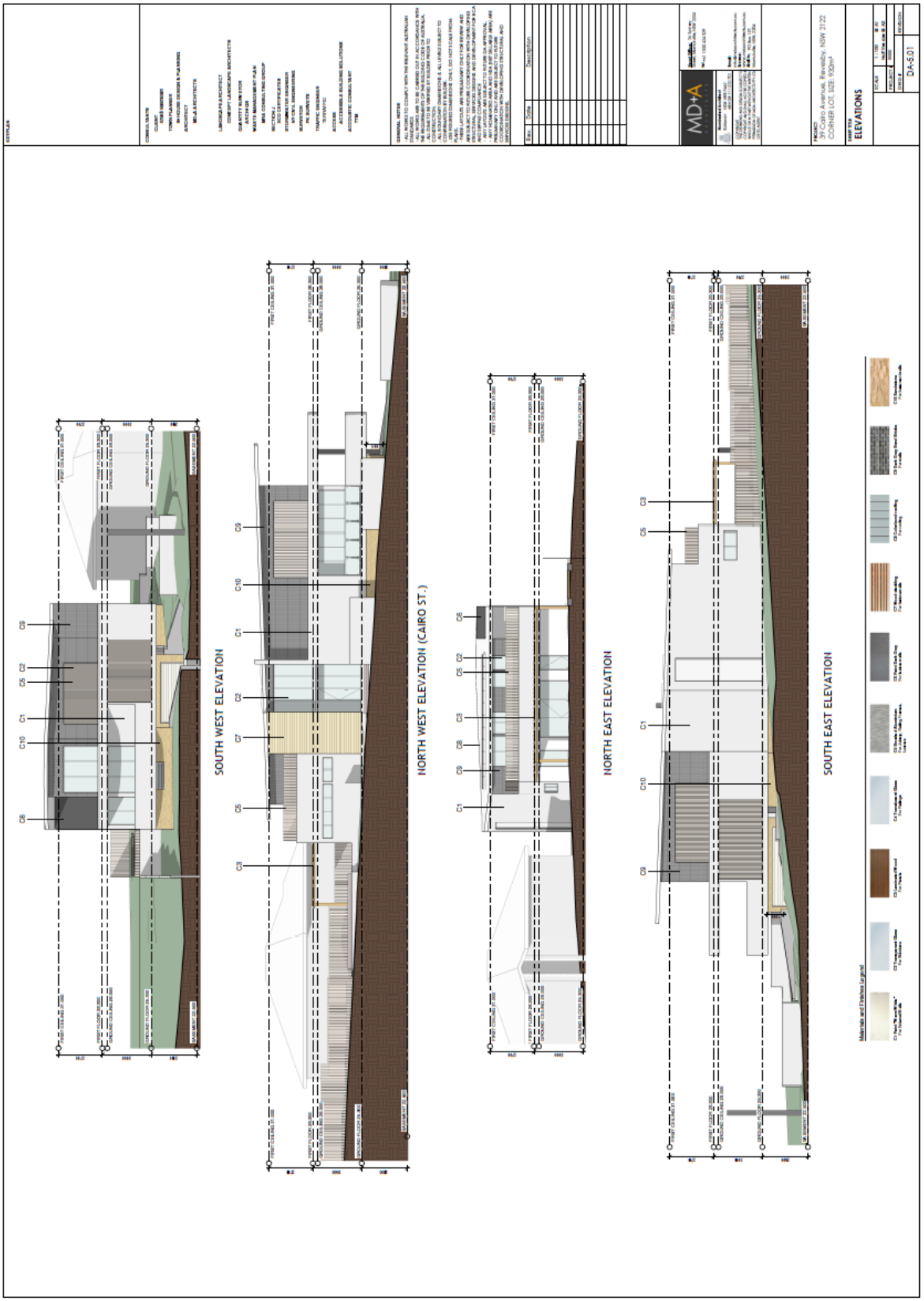
An environmental noise assessment was conducted of the proposed childcare centre at 39 Cairo Avenue, Revesby.

Provided the recommendations presented in Section 7 are implemented, the development is predicted to comply with the noise requirements outlined in Section 5.

Appendix A Proposed Development Plans

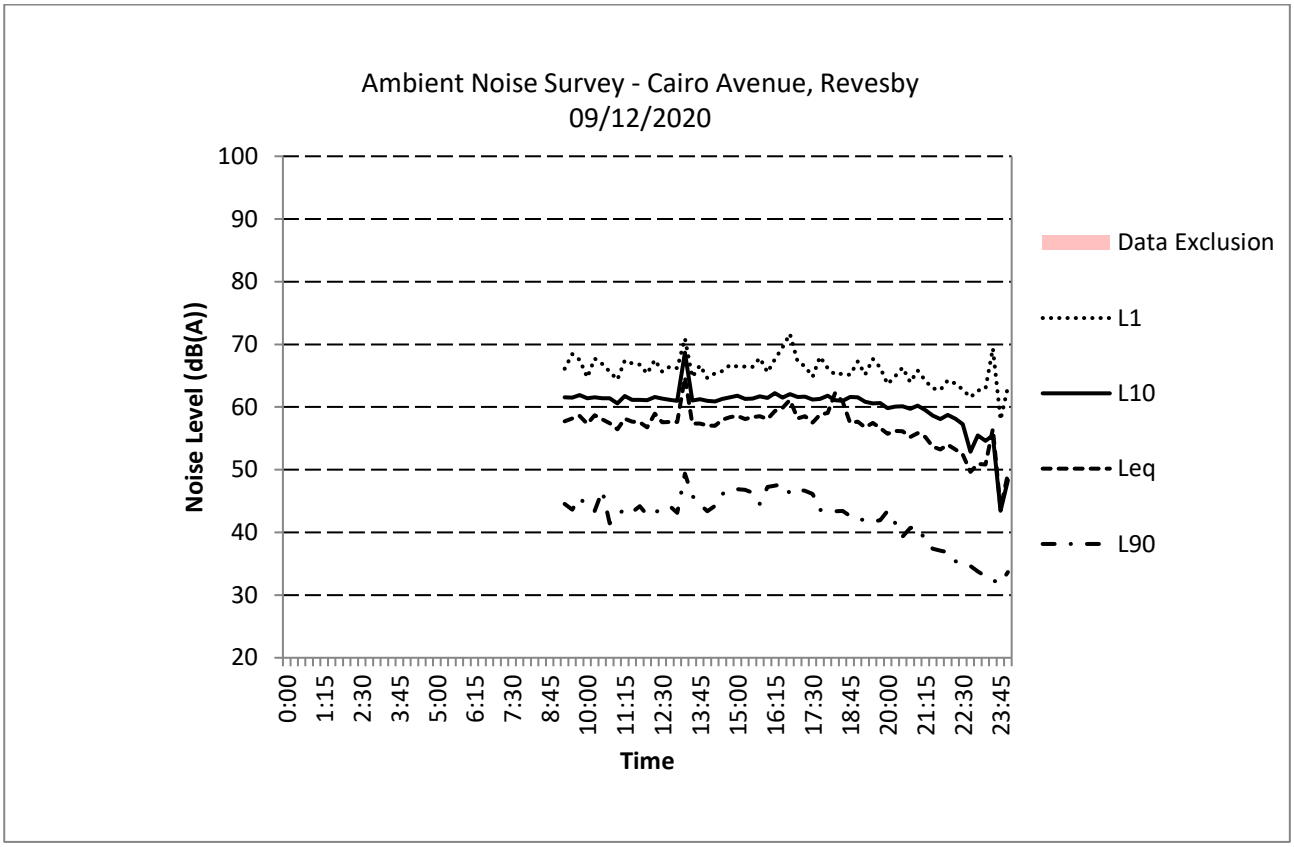

NOT FOR CONSTRUCTION
GROUND FLOOR PLAN
DA-4.02
AVENUE


NOT FOR CONSTRUCTION
39 Cairo Avenue, Revesby, NSW 2212
CORNER LOT, SIZE: 930m²
FIRST FLOOR PLAN
DA-4.03
01.02 FIRST FLOOR


SOUTH WEST ELEVATION
NORTH WEST ELEVATION (CAIRO ST.)
NORTH EAST ELEVATION
SOUTH EAST ELEVATION
ELEVATIONS
39 Cairo Avenue, Revesby, NSW 2212
CORNER LOT, SIZE: 930m²
MD+A
D4-S.01


SECTION A
SECTION B
SECTIONS
39 Cairo Avenue, Revesby, NSW 2212
CORNER LOT SIZE: 1026m²
MD+A
DA-6.01

Appendix B Unattended Noise Monitoring Graphs


Ambient Noise Survey - Cairo Avenue, Revesby
09/12/2020
Noise Level (dB(A))
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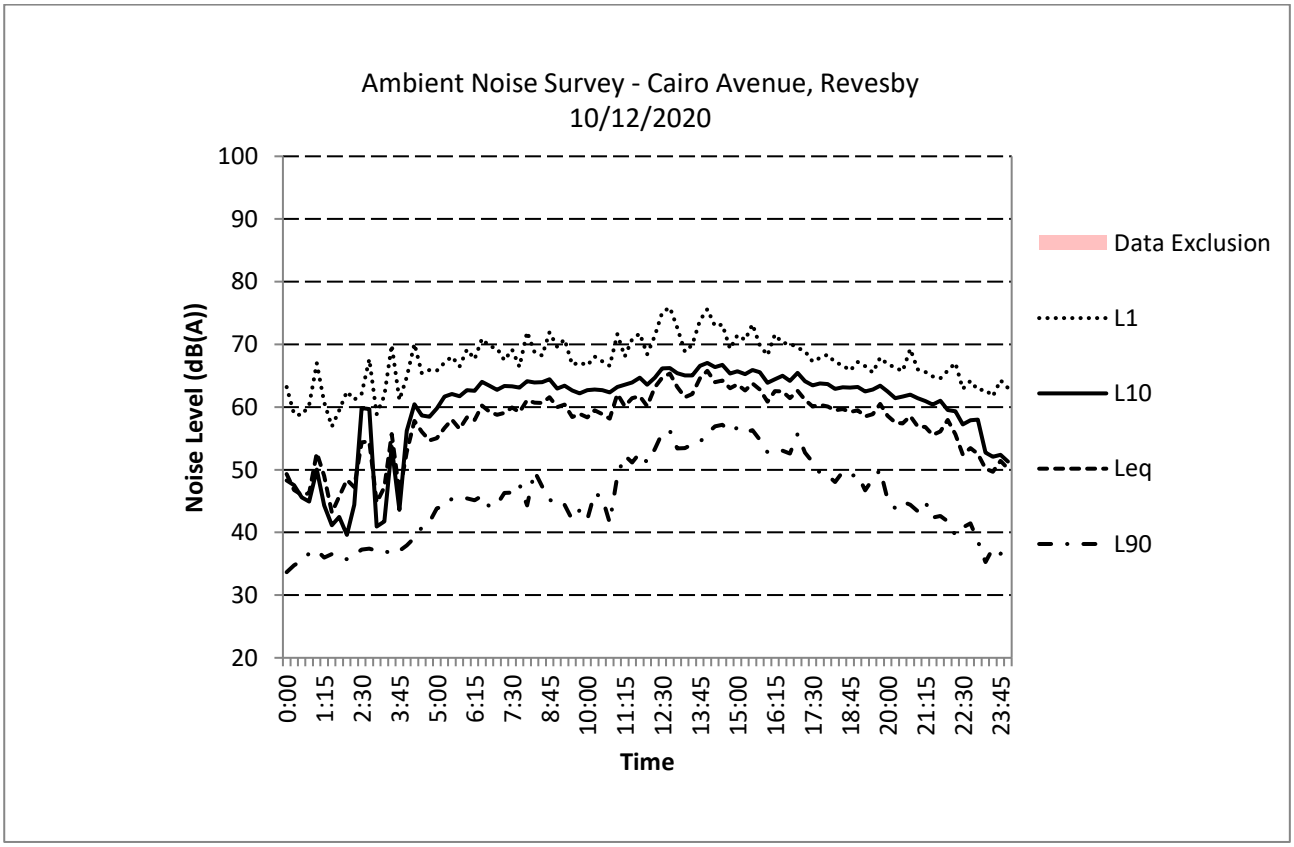
90
80
70
60
50
40
30
20
0:00
1:15
2:30
3:45
5:00
6:15
7:30
8:45
10:00
11:15
12:30
13:45
15:00
16:15
17:30
18:45
20:00
21:15
22:30
23:45
Time
Data Exclusion
L1
L10
Leq
L90


Ambient Noise Survey - Cairo Avenue, Revesby
10/12/2020
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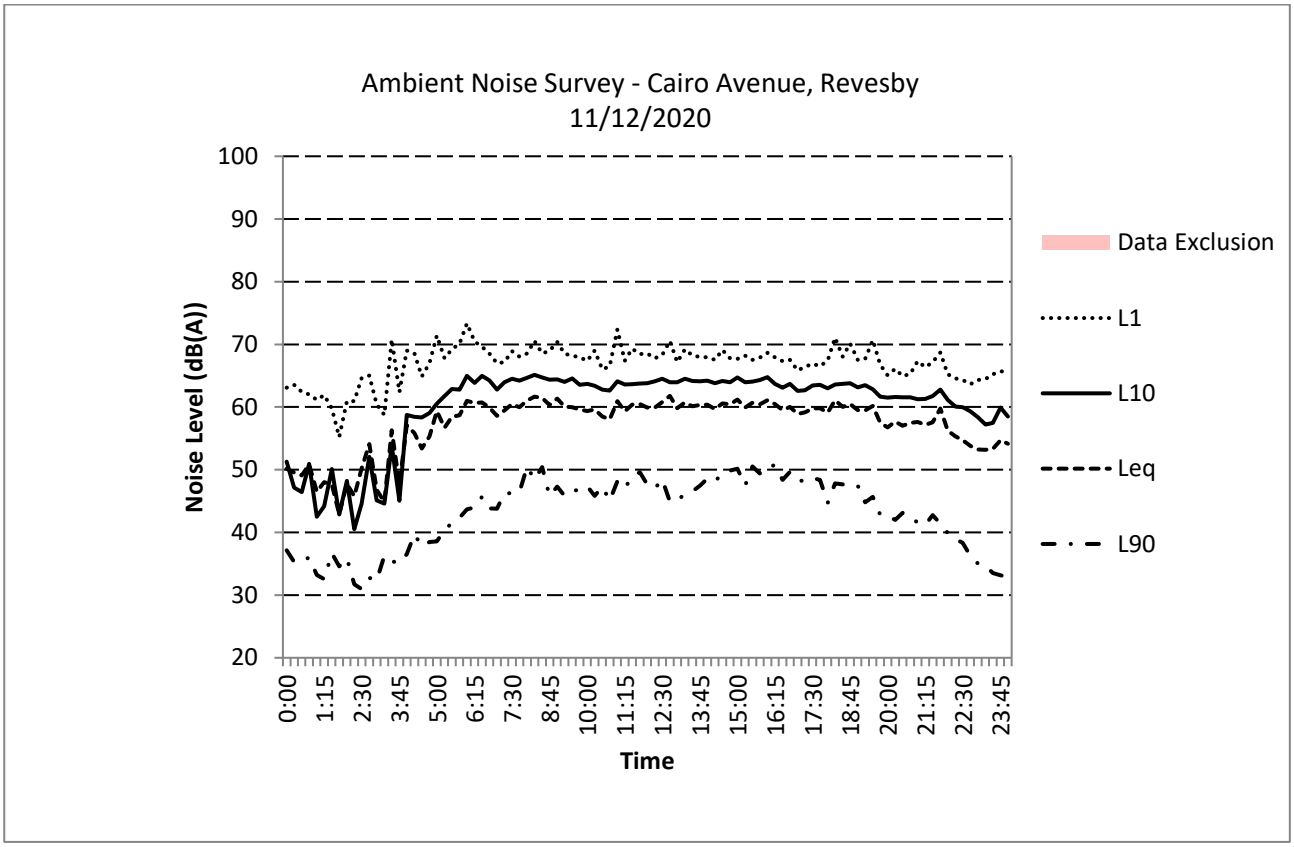
7:30
8:45
10:00
11:15
12:30
13:45
15:00
16:15
17:30
18:45
20:00
21:15
22:30
23:45
Time
Data Exclusion
L1
L10
Leq
L90


Ambient Noise Survey - Cairo Avenue, Revesby
11/12/2020
Noise Level (dB(A))
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50
40
30
20
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1:15
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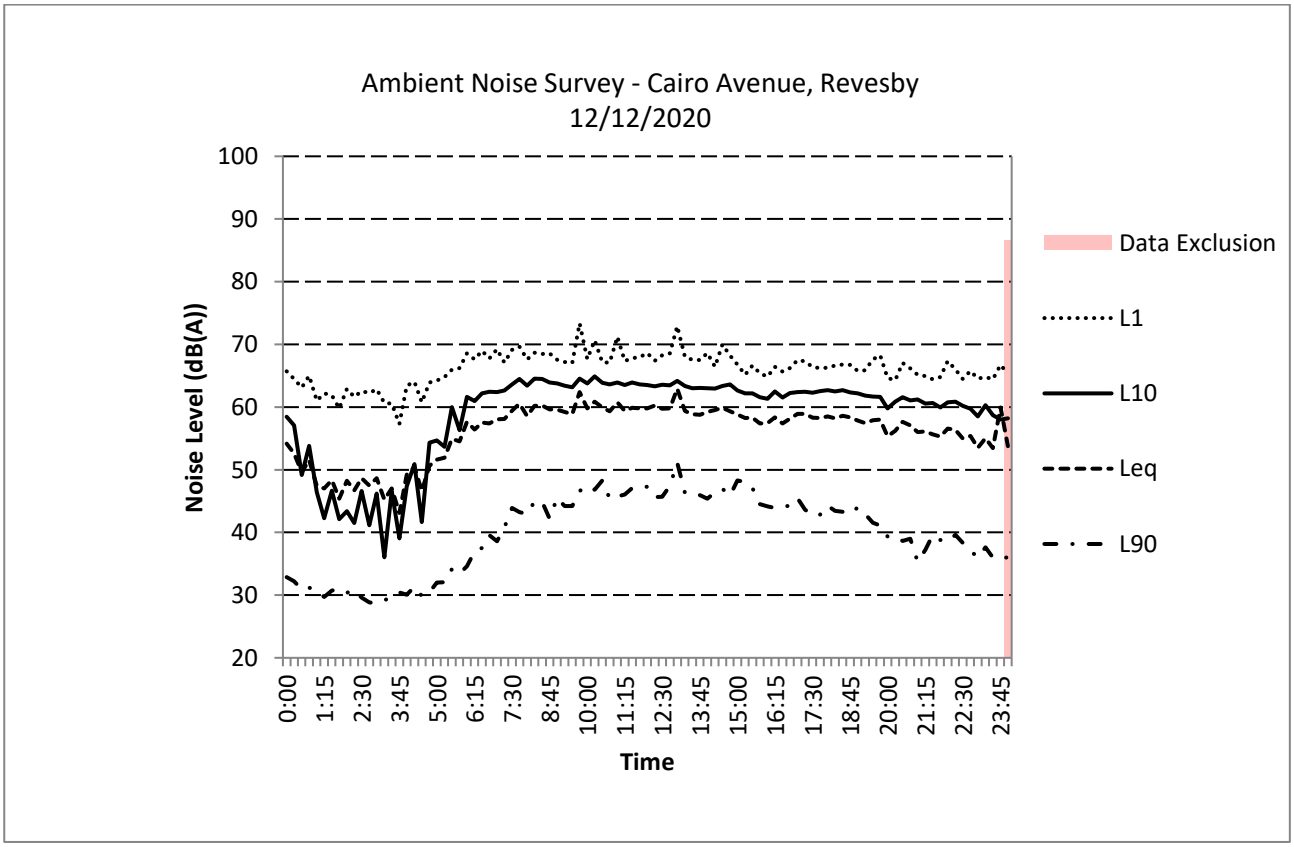
6:15
7:30
8:45
10:00
11:15
12:30
13:45
15:00
16:15
17:30
18:45
20:00
21:15
22:30
23:45
Time
Data Exclusion
L1
L10
Leq
L90


Ambient Noise Survey - Cairo Avenue, Revesby
12/12/2020
Noise Level (dB(A))
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50
40
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20
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10:00
11:15
12:30
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15:00
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17:30
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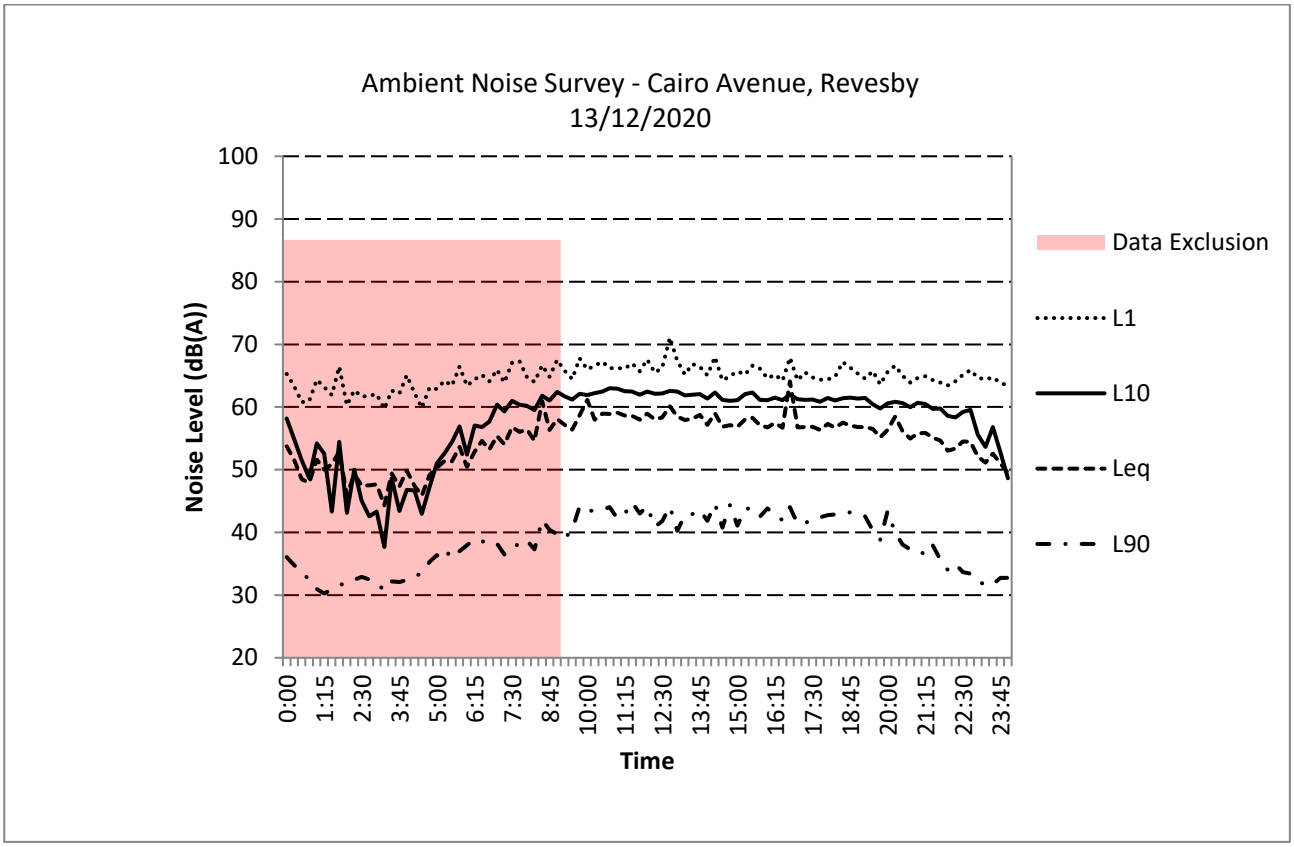
20:00
21:15
22:30
23:45
Time
Data Exclusion
L1
L10
Leq
L90


Ambient Noise Survey - Cairo Avenue, Revesby
13/12/2020
Noise Level (dB(A))
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2:30
3:45
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11:15
12:30
13:45
15:00
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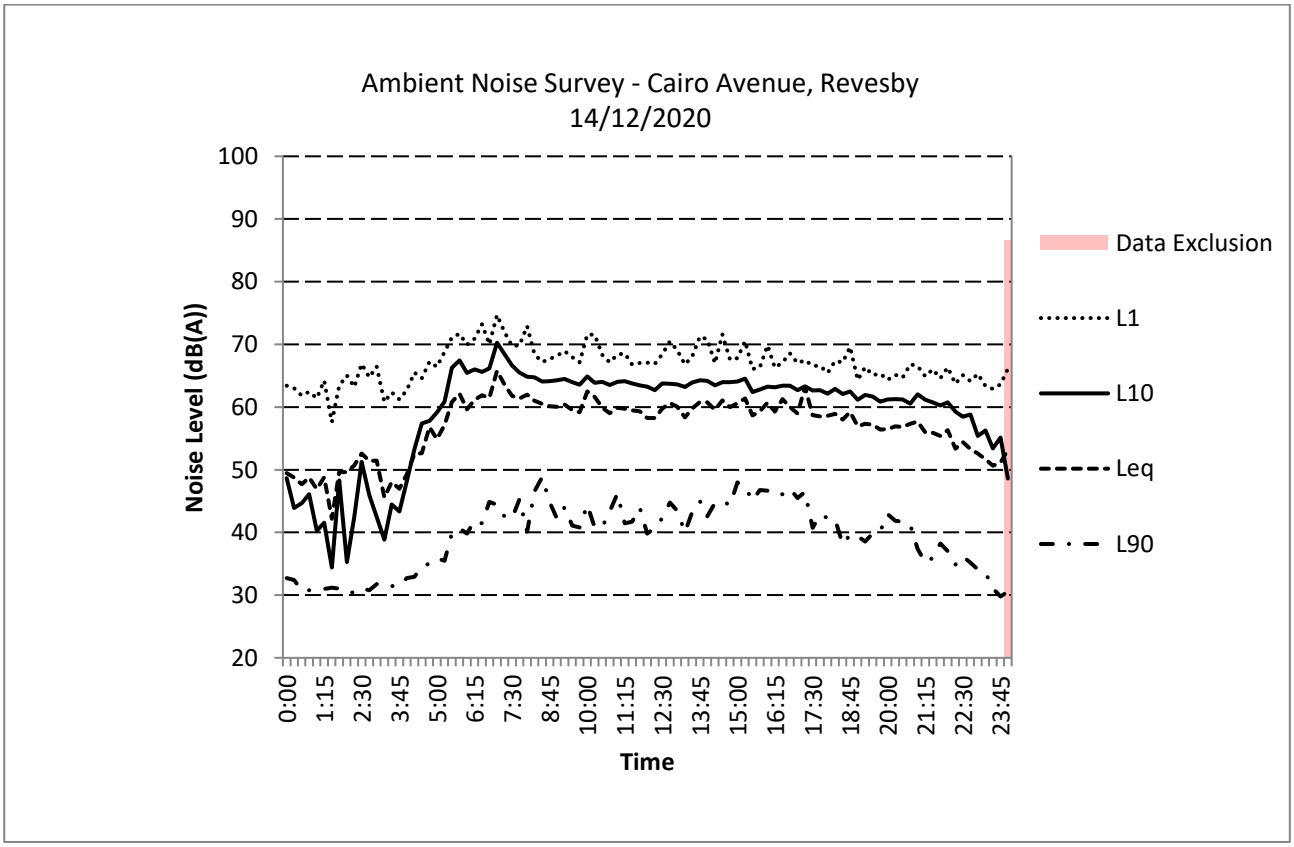
22:30
23:45
Time
Data Exclusion
L1
L10
Leq
L90


Ambient Noise Survey - Cairo Avenue, Revesby
14/12/2020
Noise Level (dB(A))
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60
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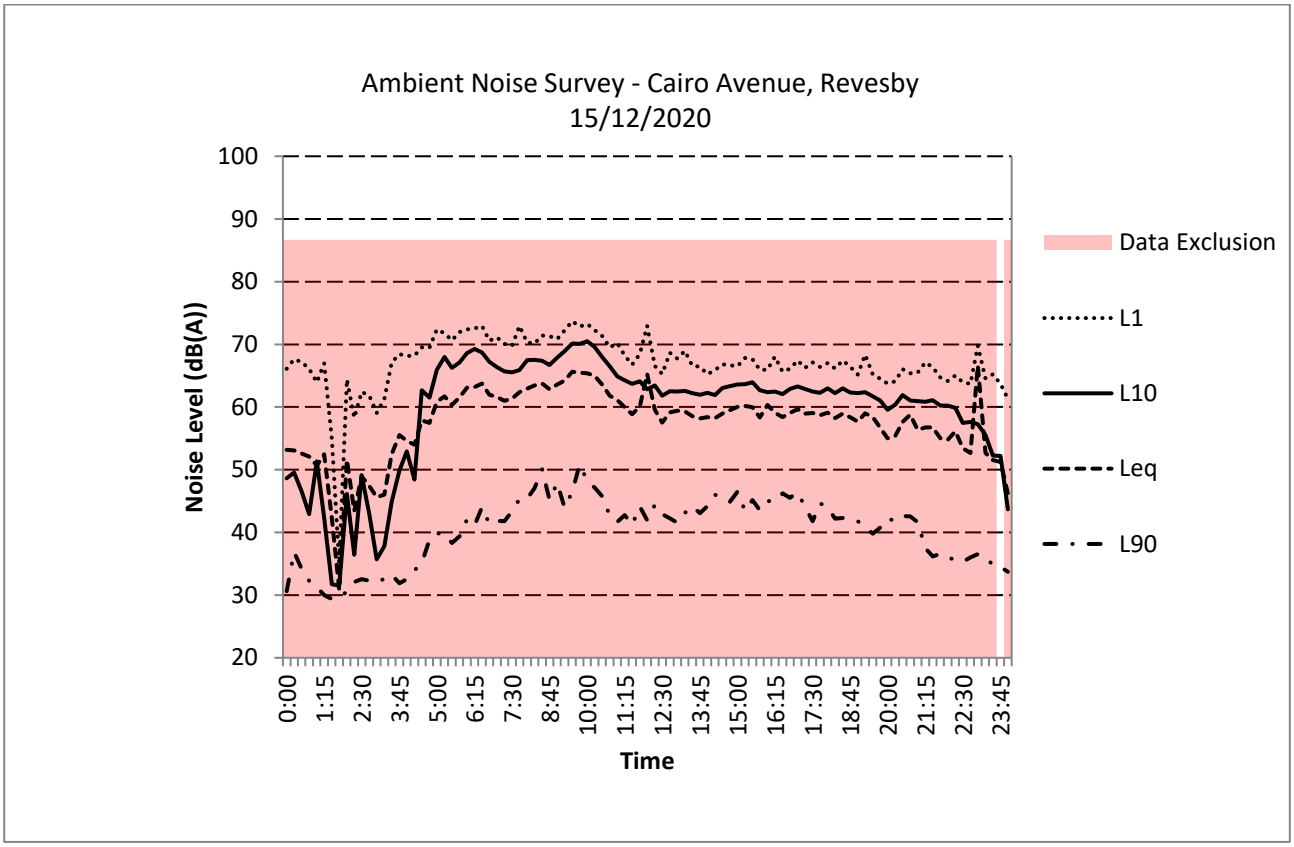
22:30
23:45
Time
Data Exclusion
L1
L10
Leq
L90


Ambient Noise Survey - Cairo Avenue, Revesby
15/12/2020
Noise Level (dB(A))
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60
50
40
30
20
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12:30
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15:00
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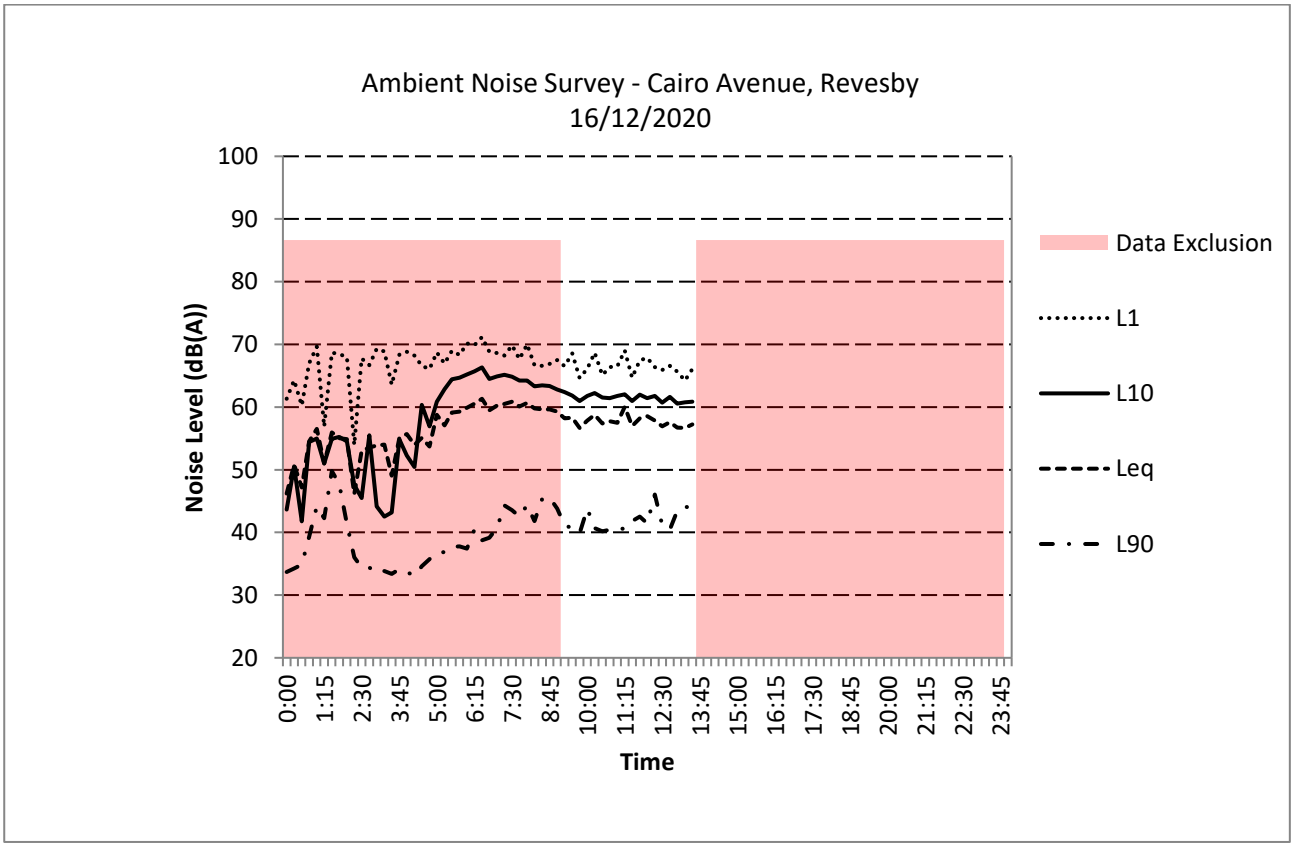
20:00
21:15
22:30
23:45
Time
Data Exclusion
L1
L10
Leq
L90


Ambient Noise Survey - Cairo Avenue, Revesby
16/12/2020
Noise Level (dB(A))
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16:15
17:30
18:45
20:00
21:15
22:30
23:45
Time
Data Exclusion
L1
L10
Leq
L90

Appendix C Sample Calculations

Onsite Leq Noise Calculations

				Distance to the Receivers			
Noise Source	**Duration**	**Leq**	**Leq 15min**	**R1**	**R2**	**R3**	**R4**
				Northwest	Northeast	East	South
Car door	2	78	51	20	17	8	35
Car bypass	6	69	47	20	17	8	25
Car ignition	3	72	47	20	17	8	35
Conversations	450	65	62	23	21	16	33
Children playing - ground floor	900	79	79	28	23	10	55
Deliveries	60	80	68	20	17	8	35
Waste collection	40	96	82	45	62	20	22
15 minute period (s)		**900**					
Noise level after Distance loss							
Car door				25	27	33	21
Car bypass				21	23	29	19
Car ignition				21	23	29	16
Conversations				35	36	38	32
Children playing - ground floor				50	52	59	44
Deliveries				42	44	50	37
Waste collection				49	46	56	55
Shielding from intervening structures							
Car door				20	20	20	6
Car bypass				20	20	20	0
Car ignition				20	20	20	6
Conversations				0	0	0	0
Children playing - ground floor				5	7	10	7
Deliveries				20	20	20	6
Waste collection				0	5	0	0
SubTotal - Noise Level at Receiver				**R1**	**R2**	**R3**	**R4**
Car door				5	7	13	15
Car bypass				1	3	9	19
Car ignition				1	3	9	10
Conversations				35	36	38	32
Children playing - ground floor				45	45	48	37
Deliveries				22	24	30	31
Waste collection				48	41	56	55
CALC	number of events per 15mins						
Activity		**Events**	**Duration**	**R1**	**R2**	**R3**	**R4**
Car door		40	2	140	194	876	1150
Car bypass		20	6	26	37	165	1695
Car ignition		10	3	13	18	83	108
Conversations		1	450	2989	3585	6176	1452
Children playing - ground floor		1	900	32039	29960	66978	5239
Deliveries		1	40	167	231	1042	1367
Waste collection		1	60	69623	12973	394237	325816

Predicted Noise Level at the Receiver	**R1**	**R2**	**R3**	**R4**
Car door	21	23	29	31
Car bypass	14	16	22	32
Car ignition	11	13	19	20
Conversations	35	36	38	32
Children playing - ground floor	45	45	48	37
Deliveries	22	24	30	31
Waste collection	48	41	56	55

Appendix D SoundPLAN Noise Model Outputs

Project 1
Assessed receiver levels - M02 - Rail measurement

Name	Floor	Leq, Rail Free-Field dB(A)
SLM - 67 dB(A)	G	67.9

Project 1
M03 - Future Prediction

Receiver	Floor	Dir	Leq Rail Noise Facade Corrected dB(A)
Development Ground - foyer	G	NW	55.8
Development Ground - front	G	S	59.4
Development Ground - kitchen	G	SE	56.2
Development Ground - rear	G	NE	53.0
Development Ground - side sliding door	G	NW	57.8
Development Ground - Sliding door	G	SW	59.3
Development Ground - stairs	G	SE	57.0
Development Upper - rear	F2	NE	55.4
Development Upper - side offices	F2	SE	56.6
Development Upper - Sleeping front	F2	SW	61.8
Development Upper - Sleeping front angled	F2	S	61.6
Development Upper - sleeping side facade	F2	NW	58.5