Noise Impact Assessment
Proposed Child Care Centre
North Rocks Park Reserve No22

PREPARED FOR:
Andrew Gerardis
25-27 Solent Circuit
Norwest business park
Baulkham hills

25 September 2015
Noise Impact Assessment
Proposed Child Care Centre
North Rocks Park Reserve No2

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<td>Revision 0</td>
<td>25 September 2015</td>
<td>Camilo Castillo</td>
<td>Rodney Stevens</td>
<td>Rodney Stevens</td>
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1 INTRODUCTION

Rodney Stevens Acoustics Pty Ltd (here forth referred to as RSA) has been engaged by Andrew Gerards from A&N Design to prepare a Noise Impact Assessment for the proposed Child Care Centre at North Rocks Park Reserve No22, 358Z North Rocks Road, Carlingford, NSW.

This report details the results of a noise survey and assesses the likely impact of noise (principally from road traffic) incident upon the proposed Child Care Centre as well as noise from the proposed Child Care Centre upon nearby residential premises.

Specific acoustic terminology is used in this report. An explanation of common acoustic terms is provided in Appendix A.

2 PROPOSED DEVELOPMENT

2.1 Development Site

The proposed child care centre is to be located within the North Rocks Park Reserve No22, 358Z North Rocks Road, Carlingford. The development site is bounded by Farnell Avenue to the west, Don Moore Community Centre to the north and adjoining residential premises to the south. The nearest residential receivers are the adjoining premises at 4 Farnell Avenue.

The development site and its surrounding environment are mainly influenced by road traffic noise on Farnell Avenue. Figure 2-1 shows an aerial image of the site area and the surrounding environment.

Figure 2-1 Site Location
2.2 The Development

The proposal is to construct a single storey Child Care Centre building at North Rocks Park Reserve No22, 358Z North Rocks Road. The western facade of the proposed Child Care Centre is to be set back approximately 18 metres from the Farnell Avenue kerbside. The outdoor play area will be located to the south east of the child care centre. A car park is to be located at ground level with vehicle entry/exit on North Rocks Road.

Figure 2-2 below are floor plans of the proposed Child Care Centre building with the arrangement of the various internal spaces and outdoor play areas.

Figure 2-2 Site Plan

Architectural Plan Courtesy of A&N Design
Children divided into four groups of 10 children
2.3 Hours of Operation
The following hours of operation are proposed:

- Monday to Friday 8:00 am until 4:30 pm.

2.4 Enrolment Numbers
The proposed Child Care Centre plans to cater for up to 40 children between the ages of 3 and 5 years of age.

2.5 Outdoor Play Activities
In RSA experience with Child Care Centres, potential noise issues occur primarily when children are engaged in outdoor play activities, in terms of intrusive environmental noise to the play areas and play area noise to nearby sensitive receivers.

We have been advised by Stephen Cullen from The Hills Shire Council that the number of children engaged in outdoor play will be 40 and the outdoor play times will only occur between 10:30am to 11:45am. We have calculated the noise from the outdoor area based on this information.

3 BASELINE NOISE SURVEY

3.1 Unattended Noise Monitoring
In order to characterise the existing acoustical environment of the area unattended noise monitoring was conducted between the dates of Thursday 10th September and Thursday 17th September 2015 at the logging locations shown in Figure 2-1

Two noise loggers were set up at the project site. One noise logger was located 10 meters from the Farnell Avenue kerbside and the second logger was located at the southern boundary near the boundary of 4 Farnell Avenue.

The first logger which was located in proximity to Farnell Avenue and monitored the road traffic noise from Farnell, while the second logger which was located at the boundary of 4 Farnell Avenue provides the baseline background noise environs of the residential area west of the project site.

Logger locations were selected with consideration to other noise sources which may influence readings, security issues for noise monitoring equipment and gaining permission for access from residents and landowners.

Instrumentation for the survey comprised of two RION NL-42EX environmental noise loggers (serial numbers 810713 and 546393) fitted with microphone windshields. Calibration of the loggers was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dB(A). All equipment carried appropriate and current NATA (or manufacturer) calibration certificates. Measured data has been filtered to remove data measured during adverse weather conditions upon consultation with historical weather reports provided by the Bureau of Meteorology (BOM).

The logger determines $L_{A1}$, $L_{A10}$, $L_{A90}$ and $L_{Aeq}$ levels of the ambient noise. $L_{A1}$, $L_{A10}$, $L_{A90}$ are the levels exceeded for 1%, 10% and 90% of the sample time respectively (see Glossary for definitions in Appendix A). Detailed results at the monitoring location are presented in graphical format in Appendix B. The graphs show measured values of $L_{A1}$, $L_{A10}$, $L_{A90}$ and $L_{Aeq}$ for each 15-minute monitoring period.
3.2 Data Processing

3.2.1 Noise Emission (*Industrial Noise Policy*)

In order to assess noise emission from the proposed Child Care Centre, the data obtained from the noise logger has been processed in accordance with the procedures contained in the NSW Environmental Protection Authority’s (*EPA* *Industrial Noise Policy* (INP, 2000)) to establish representative noise levels that can be expected in the residential vicinity of the site. The monitored baseline noise levels are detailed in Table 3-1.

Table 3-1 Measured Baseline Noise Levels Corresponding to Defined INP Periods

<table>
<thead>
<tr>
<th>Location</th>
<th>Measurement Descriptor</th>
<th>Measured Noise Level – dB(A) re 20 μPa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logger at boundary of 4 Farnell Avenue</td>
<td>( \text{L}_{\text{Aeq}} )</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>RBL (Background)</td>
<td>42</td>
</tr>
</tbody>
</table>

Notes: All values expressed as dB(A) and rounded to nearest 1 dB(A);

\( \text{L}_{\text{Aeq}} \) Equivalent continuous (energy average) A-weighted sound pressure level. It is defined as the steady sound level that contains the same amount of acoustic energy as the corresponding time-varying sound.

\( \text{L}_{\text{A90}} \) Noise level present for 90% of time (background level). The average minimum background sound level (in the absence of the source under consideration).

3.2.2 Noise Intrusion (*Road Noise Policy*)

To assess noise intrusion into the outdoor play areas and internal areas of the Child Care Centre, the data obtained from the logger location has been processed to establish representative ambient noise levels from Farnell Avenue.

The time periods used for this assessment are as defined in the EPA’s *Road Noise Policy* (RNP, 2011). Results are presented below in Table 3-2.

Table 3-2 Ambient Noise Levels Corresponding to Defined RNP Periods

<table>
<thead>
<tr>
<th>Location</th>
<th>Period</th>
<th>External Noise Levels dB(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approximately 10m from Farnell Avenue</td>
<td>Day Time 7:00 am - 10:00 pm</td>
<td>60 ( \text{L}_{\text{Aeq(1hour)}} )</td>
</tr>
<tr>
<td></td>
<td>Night Time 10:00 pm - 7:00 am</td>
<td>56 ( \text{L}_{\text{Aeq(1hour)}} )</td>
</tr>
</tbody>
</table>
4 NOISE GUIDELINES AND CRITERIA

The establishment of the noise criteria for the assessment of the Centre have been based on the Protection of the Environment Operations Act 1997 (POEO Act), the EPA’s INP, EPA’s RNP and EPA’s Noise Guide for Local Government (NGLG, 2004).


In accordance with the POEO Act, the proposed development should not cause “Offensive Noise” to the neighbouring residential receivers. The definition of “Offensive Noise” in the POEO Act is noise:

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

(i) is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or

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

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

As the POEO Act does not prescribe any numerical criteria to ensure that the development does not cause “Offensive Noise”. Hence, appropriate noise guidelines and policies to assess a child care centre development have been prescribed in this assessment report to quantify if the operation of the project will cause “Offensive Noise”.

4.2 Intrusive Noise to the Centre

The Hills Shire Council Development Control Plan 2012 does not have a specific noise criteria for noise instruction into Child Care Centre. However we have reviewed the noise criteria used in NSW from traffic noise intrusion, the following section presents the applicable noise criteria.

4.2.1 Road Traffic Noise

The Australian Standards AS 3671:1989 Road traffic noise intrusion – Building siting and construction, AS 2107:2000 Acoustics – Recommended design sound levels and reverberation times for building interiors and the State Environmental Planning Policy (Infrastructure) 2007 (Infrastructure SEPP) for the assessment road traffic noise are generally used when assessing noise intrusion from traffic noise, they provide recommended internal noise levels for different types of occupancies.

AS 3671 concerns the reduction of road traffic noise intrusion in buildings in areas near new or upgraded freeways, tollways, major roads, and national routes or other roads carrying more than 2000 vehicles per day; it may also be used to assess the acoustical adequacy of existing buildings in similar areas. It provides guidelines for determining the type of building construction necessary to achieve acceptable noise levels indoors, as recommended in AS 2107.

The Infrastructure SEPP refers to the Development near Rail Corridors and Busy Roads – Interim Guideline where development is proposed in or adjacent to a road corridor with an annual average daily traffic (AADT) volume of more than 40,000 vehicles.

As the AADT volume of vehicle on Farnell Avenue is not available, the noise criteria recommended in AS 2107 will be used to assess the road traffic noise intrusion to the proposed child care centre.
AS 2107 provides noise criteria for Educational Buildings, which specifies the following noise criteria for area typical to a childcare centre:

- Teaching spaces – Primary schools – $L_{Aeq,(1\text{hour})}$ 35 dB(A) (internal);
- Office areas – $L_{Aeq,(1\text{hour})}$ 40 dB(A) (internal); and
- Staff common rooms – $L_{Aeq,(1\text{hour})}$ 40 dB(A) (internal).

Noise levels within outdoor play areas are not covered in AS 2107 because the standard only provides recommended sound levels within building interiors. For the assessment of road traffic noise impact on the outdoor play areas, the NSW EPA's Road Noise Policy (RNP) has been used to determine the appropriate noise level. In accordance with the RNP, the noise criterion for outdoor play areas is as follows:

- Outdoor play areas – $L_{Aeq,(1\text{hour})}$ 55 dB(A) (external).

4.3 Noise Emissions from Centre

The noise criteria for noise emission from child care centre is provided in Appendix E, Section E2.9 and is as follows:

Acoustic Privacy

(c) Fencing shall be constructed of solid materials, (e.g. lapped and capped timber, brick or masonry), which will contain and manage noise generated from the development.

(d) The development is to be designed to limit the potential for noise to affect neighbouring properties. Consideration should be given to the orientation of outdoor play areas and materials used in the building to reduce reliance on acoustic barriers.

(e) The use of the premises including outdoor play areas and car parking areas shall not give rise to “offensive noise” as defined under the provision of the Protection of the Environment Operation Act 1997. The sound level output shall not exceed 5dB above the ambient background level at the receiver boundary.

(f) Equipment: The location of air conditioning systems or any other plant equipment shall not cause ‘offensive noise.’ The sound level output shall not exceed 5dB above the ambient background level at any common boundary and shall not exceed the amenity criteria as specified in the Industrial Noise Policy as published by the Office of Environment and Heritage.

4.3.1 Noise Emissions from Mechanical Plant

The noise emission from any mechanical plant associated with the proposed development, such as air-conditioning condensers, should be controlled to avoid impacting upon the acoustic amenity of nearby receivers. Responsibility for the control of noise emission in New South Wales is vested in Local Government and the EPA.

The EPA oversees the INP, released in January 2000 which provides a framework and process for deriving noise criteria. The INP criteria for industrial noise sources (e.g. mechanical plant) have two components:

- Controlling the intrusive noise impacts for residents and other sensitive receivers in the short-term; and
- Maintaining noise level amenity for particular land uses for residents and sensitive receivers in other land uses.
Assessing Intrusiveness

For assessing intrusiveness, the background noise generally needs to be measured. The intrusiveness criterion essentially means that the equivalent continuous noise level ($L_{Aeq}$) over any 15 minute period, of the source should not be more than 5 dB(A) above the measured Rated Background Level (RBL).

Assessing Amenity

The amenity criterion is based on land use and associated activities (and their sensitivity to noise emission). The cumulative effect of noise from industrial sources needs to be considered in assessing the impact. The criteria relate only to other industrial-type noise sources and do not include road, rail or community noise. The existing noise level from industry is measured. If it approaches the criterion, then noise levels from new industrial-type noise sources, (including air-conditioning plant) need to be designed so that the cumulative effect does not produce total noise levels that would significantly exceed the criterion. For areas of high road traffic, there are further considerations that influence the selection of the noise criterion.

Area Classification

The INP characterises the “Suburban” noise environment as an area with an acoustical environment that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. Subsequent to assessing the noise environment at the site, RSA has deemed this area to fall under the “Suburban” area classification.

Project Specific Criteria

Having defined the area type, the processed results of the unattended noise monitoring have been used to generate project specific noise criteria in accordance with INP principles. The project specific noise levels are the most stringent of the Intrusive and Amenity criteria and are shown in bold in Table 4-1. As the Centre will only operate during daytime period, the noise emission criteria from the Centre’s mechanical plant have been specified for daytime period only.

Table 4-1 Criteria for Mechanical Noise Emissions to Residential Receivers

<table>
<thead>
<tr>
<th>Time of Day</th>
<th>ANL 1 (period)</th>
<th>Measured RBL $L_{A90(15minute)}$</th>
<th>Measured $L_{Aeq(15minute)}$</th>
<th>INP Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Intrusive</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$L_{Aeq(15minute)}$ Criterion for New Sources</td>
</tr>
<tr>
<td>Day</td>
<td>55</td>
<td>42</td>
<td>52</td>
<td>47</td>
</tr>
<tr>
<td>Evening</td>
<td>45</td>
<td>40</td>
<td>48</td>
<td>45</td>
</tr>
<tr>
<td>Night</td>
<td>40</td>
<td>32</td>
<td>47</td>
<td>37</td>
</tr>
</tbody>
</table>

Note 1: ANL Acceptable Noise Level for a suburban area
Note 2: RBL Rating Background Level
Note 3: Assuming existing noise levels unlikely to decrease
Note 4: Project Specific Criteria are shown in bold
Note 5: As the area is influence by the surrounding urban “hum”, the Amenity criterion will be the ANL.
The project specific noise emission criterion established in accordance with the INP for this site is 42 dBA for the day time, 38 dBA for the evening and 37 dBA for the night time period. This criteria will apply to noise emission from any proposed mechanical plant as measured at the boundary of any nearby residential receivers.

4.3.2 Noise Emissions from Children Play Activities

The Hills Shire Council in Appendix E, Section 2.9 e) requires that The sound level output from the outdoor area must not exceed 5dB above the ambient background level at the receiver boundary.

Therefore, the noise criteria for noise emissions from outdoor activities to all surrounding residential receivers is (daytime $L_{A90}$ 42 dBA + 5 dBA) = $L_{Aeq(15minute)}$ 47 dBA. This is based on a measured background noise level of $L_{A90(15minute)}$ 42 dBA.

5 NOISE IMPACT ASSESSMENT

5.1 Road Traffic Noise Intrusion into Centre

5.1.1 Outdoor Play Area

Based on the measured road traffic noise level of 60 dBA $L_{Aeq(1hour)}$ from Farnell Avenue noise logger, the predicted traffic noise impacts at the outdoor play areas are presented in Table 5-1 below.

The following assumptions have been made in the noise modelling of the road traffic noise impacts on the outdoor play areas:

- Source heights for cars are usually taken to be 0.5 metres above the road pavement, however, to account for a mixed traffic of cars and heavy vehicles, a road traffic source height of 1 metre above the road pavement have been taken into account in the noise model;
- The proposed 2 m high solid barrier along the boundaries of the outdoor play areas have been taken into account in the noise model;
- The height of children between the ages of 3 and 5 have an average height of 1 metre; and
- Road traffic noise impacts have been modelled from the centre line of the road to approximately the middle of the outdoor play areas.

<table>
<thead>
<tr>
<th>Area</th>
<th>Predicted $L_{Aeq}$ Road Traffic Noise Level – dB(A)</th>
<th>Noise Criterion $L_{Aeq}$ – dB(A)</th>
<th>Compliance (Yes / No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outdoor Play Area</td>
<td>47</td>
<td>55</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Existing road traffic noise levels in the Outdoor Play areas are predicted to comply with the 55 dBA $L_{Aeq(1hour)}$ (external) criterion stipulated in Section 4.2. Based on this assessment no additional no control measures will be required.

5.1.2 Indoor Areas

The typical outdoor to indoor noise reductions provided by most standard glazed facades (i.e. without special acoustical treatment) is generally accepted as being 10 dB(A) through an open window and in the order of 20 dB(A) with windows closed.
Based on the measured road traffic noise of 60 dB(A) $L_{Aeq}$, the facade road traffic noise at the proposed child care centre building is calculated to be 57 dB(A). Using the calculated façade noise level, the resultant indoor noise levels for opened and closed windows at the eastern facade, corresponding to the typical noise reductions are as follow:

- **47 dB(A)** with windows opened; and
- **37 dB(A)** with windows closed.

The predicted internal noise levels with windows opened or closed would potentially exceed the 35 dB(A) and 40 dB(A) criteria. Therefore, additional noise control measures will be required to ensure that the road traffic noise impacts inside the child care centre building achieves the noise criteria.

5.1.2.1 Noise Control Recommendations

The calculation procedure establishes the required noise insulation performance of each surface component such that the internal noise level is achieved whilst an equal contribution of traffic noise energy is distributed across each component. Building envelope components with a greater surface area must therefore offer increased noise insulation performance.

Based on the predicted internal noise levels and upon review of the internal layout of the Child Care Centre, the following management and mitigation measures are recommended.

5.1.2.2 Glazing

The $R_w$ rating required for each window will vary from room to room. Recommendations for windows also apply to any other item of glazing located on the external facade of the building in a habitable room unless otherwise stated.

Note that the $R_w$ rating is required for the complete glazing and frame assembly. The minimum glazing thicknesses will not necessarily meet the required $R_w$ rating without an appropriate frame system. It will be therefore necessary to provide a window glass and frame system having a laboratory tested acoustic performance meeting the requirements in Table 5-2.

The window systems must be tested in accordance with both of the following:

- Australian Window Association Industry Code of Practice Window and Door – Method of Acoustic Testing; and
- AS 1191 Acoustics – Method for laboratory measurement of airborne sound insulation of building elements.

It is necessary to submit such Laboratory certification for the proposed glazing systems (i.e. windows and framing systems) (e.g. NAL or CSIRO) for approval by RSA Acoustics prior to ordering or commitment.

The entire frame associated with the glazing must be sealed into the structural opening using acoustic mastics and backer rods. Normal weather proofing details do not necessarily provide the full acoustic insulation potential of the window system. The manufacturers’ installation instructions for the correct acoustic sealing of the frame must be followed.
It is possible that structural demands for wind loading or fire rating or the like may require more substantial glass and framing assemblies than nominated above. Where this is the case the acoustic requirements must clearly be superseded by the structural or fire rating demands.

Table 5-2 presents the minimum recommended $R_w$ (weighted noise reduction) for glazing elements.

Table 5-2 Minimum Required $R_w$ Ratings for Glazing

<table>
<thead>
<tr>
<th>Room</th>
<th>Window/Glass Door</th>
<th>Highlight Window</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff Room</td>
<td>NE</td>
<td>&lt;23</td>
</tr>
<tr>
<td>Office</td>
<td>NW</td>
<td>&lt;23</td>
</tr>
<tr>
<td>Kitchen</td>
<td>NE</td>
<td>&lt;23</td>
</tr>
<tr>
<td>Foyer</td>
<td>NW</td>
<td>25</td>
</tr>
<tr>
<td>Gallery</td>
<td>NW</td>
<td>28</td>
</tr>
<tr>
<td>Library</td>
<td>NW</td>
<td>&lt;23</td>
</tr>
<tr>
<td>Classroom 1</td>
<td>SE</td>
<td>25</td>
</tr>
<tr>
<td>Classroom 2</td>
<td>SE-SW</td>
<td>25</td>
</tr>
</tbody>
</table>

Where $R_w < 23$ is specified in the above table standard (non-acoustic) glazing systems will be sufficient. I.e. for such rooms there is no specific acoustic requirement for glazing.

5.1.2.3 Roof/Ceiling Construction

The roof/ceiling structure must have a minimum $R_w$ 40 rating. This can be met by the following minimum construction:

- A steel sheet roof minimum 0.42mm with minimum Bradford Anticon 55 insulation over battens;
- Ceiling Joists or Trusses;
- RONDO furring channel;
- 215 Gold Batts R 4.0; and
- 1 x 10mm Gyprock plasterboard CD (minimum density 6.5kg/m$^2$ per sheet).

If ventilators, heat extraction units or other openings into the ceiling cavity for lighting, ventilation, decoration or other purposes are to be provided, then care should be taken to ensure that such units are properly attenuated and all penetrations are properly sealed off so as not to degrade the rating of the roof/ceiling construction system. Care should also be taken to avoid any noise paths into the ceiling cavity via the eaves.
5.1.2.4 External Wall Construction

All recommendations must be checked by others to ensure compliance with other non acoustic requirements that Council or other authority may impose (e.g. thermal requirements for BASIX compliance)

Please note that these wall constructions are given for comparison purposes only, construction details should be checked by an acoustic consultant prior to construction.

Masonry Wall Types

No further acoustic upgrade is required where standard brick veneer wall construction is specified.

Lightweight external wall types

If any lightweight external wall sections are to be used in the extended ceiling part of the building the wall will require minor upgrades. The acoustic construction will depend on the basic constructions proposed by A&N Design. As a guide however, the required acoustic rating can be achieved with the following construction:

- 1x 7.5mm CSR Cemintel Texture Base Sheet
- Sarking
- 1x 13mm GYPROCK FYRCHEK plasterboard (External)
- Timber studs at 600mm maximum centres
- 75mm SoundScreen 2.0 Insulation
- 1x 10mm GYPROCK plasterboard CD

Detailing

Note that well-detailed construction and careful installation is needed to achieve the required $R_w$ acoustic ratings. All gaps are to be minimised and fully sealed with an acoustic rated sealant, such as FireBan One by Bostik or Sikaflex Pro 2HP by Sika.

5.2 Operational Noise Emissions to Nearby Residences

5.2.1 Outdoor Play Activities Noise Impact

Potential noise management issues occur primarily when children are engaged in outdoor play activities. Noise generated by the children in the outdoor play area will occur at limited times throughout the day, with numbers of children playing and periods of play managed by the Centre staff.

The Association of Australian Acoustical Consultants (AAAC) provides a technical guideline for Child Care Centre Noise Assessment. Within this guideline it stipulates the following assumed sound power levels (Lw) for various age groups of children:

- 10 Children aged 0 to 2 years: 77 to 80 dB(A)
- 10 Children aged 2 to 3 years: 83 to 87 dB(A)
- 10 Children aged 3 to 5 years: 84 to 90 dB(A)
Spectra for average maximum noise levels (LA10) and energy-average noise levels (LAeq) have been measured by RSA of children at play at a similar facility, given below in Table 5-3. The measured spectra have been scaled based upon the overall sound power levels offered by the AAAC and the amount of children expected to be in the outdoor play area at any given time.

Following the information provided by council we have assumed all 40 children and from the ages of 3-5 years old being in the outdoor play areas at any one given time, the corresponding increase in overall noise level to those presented by the AAAC would be approximately 6 dB(A) for the 3 to 5 age group.

Table 5-3  Outdoor Free Play Activities Noise Spectrum Measured in a Typical Child Care Centre

<table>
<thead>
<tr>
<th>Noise Descriptor</th>
<th>Noise Level (dB) at Octave Band Centre Frequency (Hz)</th>
<th>Overall dB(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>63</td>
<td>125</td>
</tr>
<tr>
<td>L10</td>
<td>64</td>
<td>59</td>
</tr>
<tr>
<td>Leq</td>
<td>61</td>
<td>58</td>
</tr>
</tbody>
</table>

Calculations have been made based on the spectra above, scaled to reflect the overall power levels presented by the AAAC to determine the likely noise levels at nearby receivers due to 40 children playing in the Outdoor Play areas of the proposed Child Care Centre.

The following assumptions have been made in the noise modelling of the Outdoor Play areas noise impacts on the neighbouring residences:

- No children between the ages of 0 and 2 years old playing in the outdoor play area
- 40 children between the ages of 3 and 5 years old playing in the outdoor play area shown in Figure 2-3 with total sound power level of 96 dB(A).
- The outdoor play area is at ground level
- The height of the residential receivers have been assumed to be 1.5 metres as the residential building in the vicinity are single storey houses.
- Source height in the outdoor play area, i.e. children height, have been taken to be 1 metre for children between the ages of 3 and 5;
- The proposed 2 m high solid barriers along the boundaries of the outdoor play areas have been taken into account in the noise model;

The predicted noise levels experienced by nearest residential receivers are presented in Table 5-4 below.

Table 5-4  Predicted Outdoor Play Activities Noise Emission

<table>
<thead>
<tr>
<th>Location of Outdoor Play Area</th>
<th>Predicted Outdoor Play Activities Noise at Neighbouring Residents – dB(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 Farnell Avenue</td>
</tr>
<tr>
<td>40 Children (3-5 Years)</td>
<td>50</td>
</tr>
<tr>
<td>20 Children (3-5 Years)</td>
<td>47</td>
</tr>
</tbody>
</table>
The outdoor play activities noise levels at the surrounding residences are predicted to comply with the 47 dB(A) criterion **ONLY** if 20 children are using the outdoor area at any one time.

Based on the above assessment of the outdoor play activities noise emissions, no other noise control will be required.

5.2.2 Noise Emissions from Indoor Activities

**Child Care**

Natural ventilation will be utilized whenever possible and as such glazing is a combination of operable and fixed. The overall building design takes into account acoustical considerations such as noise breakout from internal activities and the location of larger areas of operable glazing are positioned to maximise the opportunity for attenuation over increased distance to neighbouring premises to the south and west.

Glazing located on the south-eastern facade **must** remain closed during periods when noisier activities take place within the playrooms thereby minimizing noise emissions to the neighbouring residential receivers.

Based on an internal reverberant sound pressure level of 87 dBA within classroom 1, the predicted \( L_{Aeq(15\text{minute})} \) noise level at the neighbouring residential receiver to the south (4 Farnell Avenue), with the proposed internal configuration and associated capacity, is **43 dB(A)** with **windows open**. Noise emissions to the neighbouring residence from classroom 1 is predicted to be **below 30 dB(A)** with the **glazing closed**.

Based on an internal reverberant sound pressure level of 87 dBA within classroom 2, the predicted \( L_{Aeq(15\text{minute})} \) noise level at the neighbouring residential receiver to the south (4 Farnell Avenue), with the proposed internal configuration (glazing on the south-eastern façade closed) and associated capacity, is **34 dB(A)** with **windows open**. Noise emissions to the neighbouring residence from classroom 2 is predicted to be **below 30 dB(A)** with the **glazing closed**.

The recommended assessment criterion of **47 dB(A)** can be achieved with the windows either opened or closed. Noise emissions from indoor activities will meet recommended design limits at the neighbouring residential receivers with the internal layout proposed.

**Community Facilities**

The Hills Shire Council has proposed to use the child care centre’s classroom 2 as an assembly room, where community meetings will occur on a regular basis. We have been informed by Stephen Cullen from The Hills Shire Council that the room will not be hired for any other activity apart from community meetings and it will have a capacity of up to 40 patrons. All activities carried out will be of an “inactive” nature

The proposed hours of operation for the community meetings are as follows:

- Monday to Fridays 6pm to 11pm
- Weekends 7am to 11pm

Based on an internal reverberant sound pressure level of 84 dBA within classroom 2, the predicted \( L_{Aeq(15\text{minute})} \) noise level at the neighbouring residential receiver to the south (4 Farnell Avenue), with the proposed internal configuration (glazing on the south-eastern façade closed) and associated capacity, is **34 dB(A)** with **windows open**. Noise emissions to the neighbouring residence from classroom 2 is predicted to be **below 30 dB(A)** with the **glazing closed**.

The recommended assessment criterion of **45 dB(A)** for evening period and **37 dB(A)** for night time period can be achieved with the windows either opened (glazing on the south-western façade only) or closed. Noise emissions from indoor activities will meet recommended design limits at the neighbouring residential receivers with the internal layout proposed.
5.2.3 Mechanical Noise Impact

A&N Design proposes to install 2 Actron SRA233 air conditioning units to service the proposed child care centre, the proposed locations are presented in Figure 5-1 below:

Figure 5-1 Proposed AC Unit Locations

The following table presents the sound power levels for the Actron SRA233 unit as provided by the manufacturer, these noise levels have been used for calculation purposes.

Table 5-5 Actron SRA233 Sound Power Levels

<table>
<thead>
<tr>
<th>Fan Speed</th>
<th>Noise Level (dB) at Octave Band Centre Frequency (Hz)</th>
<th>Overall dBA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>125</td>
<td>250</td>
</tr>
<tr>
<td>Low</td>
<td>72</td>
<td>71</td>
</tr>
<tr>
<td>High</td>
<td>77</td>
<td>74</td>
</tr>
</tbody>
</table>
Calculations of the noise level from the operation of the proposed air conditioning units have been carried out using the “high” fan speed setting and taking into account factors such as distance, shielding from buildings and barriers. The noise level results are presented in the table below:

**Table 5-6  Calculated AC Unit Noise Level at Receivers**

<table>
<thead>
<tr>
<th>Receiver</th>
<th>Period</th>
<th>Calculated Noise Level L_{Aeq} – dB(A)</th>
<th>Amenity</th>
<th>Intrusiveness</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Farnell Avenue</td>
<td>Day</td>
<td>28</td>
<td>42</td>
<td>47</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Evening</td>
<td>28</td>
<td>38</td>
<td>45</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Night</td>
<td>28</td>
<td>37</td>
<td>37</td>
<td>Yes</td>
</tr>
<tr>
<td>13 Farnell Avenue</td>
<td>Day</td>
<td>25</td>
<td>42</td>
<td>47</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Evening</td>
<td>25</td>
<td>38</td>
<td>45</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Night</td>
<td>25</td>
<td>37</td>
<td>37</td>
<td>Yes</td>
</tr>
</tbody>
</table>

5.2.4 Carpark Emission

The proposed car park is to be located on the north east of the site, it has a capacity of 12 car spaces, calculations of noise from the carpark have been based on typical noise generating events within a carpark such as, door slams, engine starts and cars driving away. We have assumed a scenario were 8 cars enter and leave the carpark in a span of 15 minutes.

The calculated noise levels from the activities carried out within the carpark are presented in the table below:

**Table 5-7  Calculated Carpark Noise Levels**

<table>
<thead>
<tr>
<th>Receiver</th>
<th>Period</th>
<th>Calculated Noise Level L_{Aeq} – dB(A)</th>
<th>Amenity</th>
<th>Intrusiveness</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Farnell Avenue</td>
<td>Day</td>
<td>37</td>
<td>42</td>
<td>47</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Evening</td>
<td>37</td>
<td>38</td>
<td>45</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Night</td>
<td>37</td>
<td>37</td>
<td>37</td>
<td>Yes</td>
</tr>
</tbody>
</table>
6 CONCLUSION

RSA has conducted a noise impact assessment of the proposed Child Care Centre at North Rocks Park Reserve No22, 358Z North Rocks Road, Carlingford. The assessment has comprised the establishment of noise criteria and assess noise impacts with regard to relevant statutory requirements.

Road traffic noise intrusion into the outdoor play area has been predicted to comply with the RNP, criterion. Based on the predicted compliance, no additional noise control is required.

Road traffic intrusion into the indoor areas has been assessed to potentially exceed the noise criteria as set out in the AS 3671:1989, AS 2107:2000 and the Infrastructure SEPP. Based on this assessment, management and mitigation measures have been recommended to ensure that road traffic noise impact within the internal areas of the Child Care Centre will comply with the criteria.

Noise emissions from the outdoor area play activities to the nearest residential receivers have been calculated to comply with the noise criterion, where 20 children are playing outside at one given time, as established in accordance with the Hills Shire Council. Based on this assessment no additional management or mitigation measures are required to be implemented.

Noise emissions from the proposed mechanical plant, complies with INP Intrusive and Amenity criteria as set out in this report.

Based on our assessment the proposed Child Care Centre at North Rocks Park Reserve No22, 358Z North Rocks Road, Carlingford, is deemed to not cause “Offensive Noise” to neighbouring residences provided that the noise control measures recommended is implemented. It is therefore recommended that planning approval be granted for the proposed development on the basis of acoustics.

Approved:-

Rodney Stevens
Manager/Principal
### Appendix A – Acoustic Terminology

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A-weighted sound pressure</strong></td>
<td>The human ear is not equally sensitive to sound at different frequencies. People are more sensitive to sound in the range of 1 to 4 kHz (1000 – 4000 vibrations per second) and less sensitive to lower and higher frequency sound. During noise measurement an electronic ‘A-weighting’ frequency filter is applied to the measured sound level dB(A) to account for these sensitivities. Other frequency weightings (B, C and D) are less commonly used. Sound measured without a filter is denoted as linear weighted dB(linear).</td>
</tr>
<tr>
<td><strong>Ambient noise</strong></td>
<td>The total noise in a given situation, inclusive of all noise source contributions in the near and far field.</td>
</tr>
<tr>
<td><strong>Community annoyance</strong></td>
<td>Includes noise annoyance due to:</td>
</tr>
<tr>
<td></td>
<td>- character of the noise (e.g. sound pressure level, tonality, impulsiveness, low-frequency content)</td>
</tr>
<tr>
<td></td>
<td>- character of the environment (e.g. very quiet suburban, suburban, urban, near industry)</td>
</tr>
<tr>
<td></td>
<td>- miscellaneous circumstances (e.g. noise avoidance possibilities, cognitive noise, unpleasant associations)</td>
</tr>
<tr>
<td></td>
<td>- human activity being interrupted (e.g. sleep, communicating, reading, working, listening to radio/TV, recreation).</td>
</tr>
<tr>
<td><strong>Compliance</strong></td>
<td>The process of checking that source noise levels meet with the noise limits in a statutory context.</td>
</tr>
<tr>
<td><strong>Cumulative noise level</strong></td>
<td>The total level of noise from all sources.</td>
</tr>
<tr>
<td><strong>Extraneous noise</strong></td>
<td>Noise resulting from activities that are not typical to the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.</td>
</tr>
<tr>
<td><strong>Feasible and reasonable measures</strong></td>
<td>Feasibility relates to engineering considerations and what is practical to build; reasonableness relates to the application of judgement in arriving at a decision, taking into account the following factors:</td>
</tr>
<tr>
<td></td>
<td>- Noise mitigation benefits (amount of noise reduction provided, number of people protected).</td>
</tr>
<tr>
<td></td>
<td>- Cost of mitigation (cost of mitigation versus benefit provided).</td>
</tr>
<tr>
<td></td>
<td>- Community views (aesthetic impacts and community wishes).</td>
</tr>
<tr>
<td></td>
<td>- Noise levels for affected land uses (existing and future levels, and changes in noise levels).</td>
</tr>
<tr>
<td><strong>Impulsiveness</strong></td>
<td>Impulsive noise is noise with a high peak of short duration or a sequence of these peaks. Impulsive noise is also considered annoying.</td>
</tr>
<tr>
<td><strong>Low frequency</strong></td>
<td>Noise containing major components in the low-frequency range (20 to 250 Hz) of the frequency spectrum.</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Noise criteria</strong></td>
<td>The general set of non-mandatory noise levels for protecting against intrusive noise (for example, background noise plus 5 dB) and loss of amenity (e.g. noise levels for various land use).</td>
</tr>
<tr>
<td><strong>Noise level (goal)</strong></td>
<td>A noise level that should be adopted for planning purposes as the highest acceptable noise level for the specific area, land use and time of day.</td>
</tr>
<tr>
<td><strong>Noise limits</strong></td>
<td>Enforceable noise levels that appear in conditions on consents and licences. The noise limits are based on achievable noise levels, which the proponent has predicted can be met during the environmental assessment. Exceedance of the noise limits can result in the requirement for either the development of noise management plans or legal action.</td>
</tr>
<tr>
<td><strong>Performance-based goals</strong></td>
<td>Goals specified in terms of the outcomes/performance to be achieved, but not in terms of the means of achieving them.</td>
</tr>
<tr>
<td><strong>Rating Background Level (RBL)</strong></td>
<td>The rating background level is the overall single figure background level representing each day, evening and night time period. The rating background level is the 10th percentile min $L_{A90}$ noise level measured over all day, evening and night time monitoring periods.</td>
</tr>
<tr>
<td><strong>Receptor</strong></td>
<td>The noise-sensitive land use at which noise from a development can be heard.</td>
</tr>
<tr>
<td><strong>Sleep disturbance</strong></td>
<td>Awakenings and disturbance of sleep stages.</td>
</tr>
<tr>
<td><strong>Sound and decibels (dB)</strong></td>
<td>Sound (or noise) is caused by minute changes in atmospheric pressure that are detected by the human ear. The ratio between the quietest noise audible and that which should cause permanent hearing damage is a million times the change in sound pressure. To simplify this range the sound pressures are logarithmically converted to decibels from a reference level of $2 \times 10^{-5} \text{ Pa}$. The picture below indicates typical noise levels from common noise sources.</td>
</tr>
</tbody>
</table>
dB is the abbreviation for decibel – a unit of sound measurement. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure.

**Sound power Level (SWL)**

The sound power level of a noise source is the sound energy emitted by the source. Notated as SWL, sound power levels are typically presented in $\text{dB}(A)$.

**Sound Pressure Level (SPL)**

The level of noise, usually expressed as SPL in $\text{dB}(A)$, as measured by a standard sound level meter with a pressure microphone. The sound pressure level in $\text{dB}(A)$ gives a close indication of the subjective loudness of the noise.

**Statistic noise levels**

Noise levels varying over time (e.g. community noise, traffic noise, construction noise) are described in terms of the statistical exceedance level.

A hypothetical example of A weighted noise levels over a 15 minute measurement period is indicated in the following figure:

Key descriptors:
- $L_{\text{Amax}}$: Maximum recorded noise level.
- $L_{\text{A1}}$: The noise level exceeded for 1% of the 15 minute interval.
$L_{A10}$ Noise level present for 10% of the 15 minute interval. Commonly referred to as the average maximum noise level.

$L_{Aeq}$ Equivalent continuous (energy average) A-weighted sound pressure level. It is defined as the steady sound level that contains the same amount of acoustic energy as the corresponding time-varying sound.

$L_{A90}$ Noise level exceeded for 90% of time (background level). The average minimum background sound level (in the absence of the source under consideration).

**Threshold**

The lowest sound pressure level that produces a detectable response (in an instrument/person).

**Tonality**

Tonal noise contains one or more prominent tones (and characterised by a distinct frequency components) and is considered more annoying. A 2 to 5 dB(A) penalty is typically applied to noise sources with tonal characteristics.
Appendix B – Baseline Noise Survey Graphs
Appendix C – Instrument Calibration Certificate